An International Publishers

3rd International Conference

Innovative Approaches in Agriculture, Horticulture & Allied Sciences (IAAHAS- 2023)

Book of Abstracts

Organized by

Indian Society of Agriculture & Horticulture Research Development, (ISAHRD) Chandigarh

SGT University, Gurugram (ICAR Accredited) and Just Agriculture- the Magazine

on

29th- 31st March, 2023

at

SGT University, Gurugram

Editors

- Dr. Utkarsha P. Gaware
- Dr. D. P. S. Badwal
- Mohit Bharadwaj
- Himani Gautam
- Dr. Meenakshi Devi

VITAL BIOTECH PUBLICATION

Innovative Approaches in Agriculture, Horticulture & Allied Sciences (IAAHAS- 2023)

3rd International Conference
Book of Abstracts

Organized by
Indian Society of Agriculture & Horticulture Research Development, (ISAHRD) Chandigarh
SGT University, Gurugram (ICAR Accredited) and
Just Agriculture- the Magazine
on
29th- 31st March, 2023
at
SGT University, Gurugram

Editors
Dr. Utkarsha P. Gaware
Dr. D. P. S. Badwal
Mohit Bharadwaj
Himani Gautam
Dr. Meenakshi Devi

VITAL BIOTECH PUBLICATION
Kota, Rajasthan, India
http://www.vitalbiotech.org/bookpublication/

An International Publishers

VITAL BIOTECH get Accredited by following International organization

https://www.portico.org/publishers/vital/
101 Greenwich Street, 18th Floor
New York, NY 10006

Copyright © 2023 VITAL BIOTECH PUBLICATION
Published by Vital Biotech Publication
First Edition: 2023

All Rights Reserved
No part of this book may be reproduced in any form, by photostat, microfilm, xerography, or any other means, or incorporated into any information retrieval system, electronic or mechanical, without the written permission of the publisher.

Product Form:
Digital download, online and Paperback

Edition:
ISBN: 978-93-92953-79-8

Head, Production (Higher Education and Professional) & Publishing Director
Dr. Jitendra Mehta

Product Manager
Dr. K.S Nama

Graphic Designer
Mukesh Kumar

Information contained in this work has been obtained by Vital Biotech Publication (India), from sources believed to be reliable. However, neither Vital Biotech Publication (India) nor its authors guarantee the accuracy or completeness of any information published herein, and neither Vital Biotech Publication (India) nor its authors shall be responsible for any errors, omissions, or damages arising out of use of this information. This work is published with the understanding that Vital Biotech Publication (India) and its authors are supplying information but are not attempting to render engineering or other professional services. If such services are required, the assistance of an appropriate professional should be required.

Office Address:

VITAL BIOTECH PUBLICATION
772, Basant Vihar, Kota,
Rajasthan-324009 India
Visit us at: http://www.vitalbiotech.org
Contact No. +91-9784677044

Printed at: Vinayak Printers, Kota

BOOK OF ABSTRACTS

3rd International Conference on Innovative Approaches in Agriculture, Horticulture & allied Sciences (IAAHAS- 2023)

29th- 31st March, 2023

Co-editors
Dr. Piyush Choudhary
Dr. Paresh P. Baviskar
Pavithra S
Er. Ramesh Abhishek
Dr. Heena

डॉ. अजीत कुमार कर्नाटक
कुलपति
Dr. Ajeet Kumar Karnatak
Vice-Chancellor

Phone : 91-294-2471101 (O), 2470682 (Fax) and 9412120801 (M)
Email : vc_mpuat@yahoo.co.in and a_karnatak@yahoo.co.in

Maharana Pratap University of Agriculture and Technology
University Campus, Udaipur – 313 001 (Rajasthan), INDIA

महाराणा प्रताप कृषि एवं प्रौद्योगिकी विश्वविद्यालय
विश्वविद्यालय परिसर, उदयपुर - 313 001 (राजस्थान), भारत

No. PS/VC/MPUAT/2023/269
Date: 18th April, 2023

Foreword

I am glad to learn that Just Agriculture Education Group has successfully organized 3rd International Conference on Innovative Approaches in Agriculture, Horticulture & Allied Sciences (IAAHAS- 2023) in collaboration with ISAHRD, Chandigarh and SGT University, Gurugram at SGT University, Gurugram during 29th-31st March, 2023. Such conferences offer a unique platform for researchers to discuss new findings and showcase outcomes of their research. By presenting at conferences, researchers can establish new collaborations, build partnerships and conscript new team members for their research projects. Additionally, conferences are an excellent way to establish a presence in the academic community and stay up-to-date with the latest research in their field. I congratulate the organizers for the success of the conference. There were many valuable insights shared and discussed that will undoubtedly benefit us all in coming future. I urge the participants of this conference to carry the momentum and lessons learned from this conference forward and continue to strive for excellence in their work. This volume of abstracts of the conference will act as a reference to the scientists in planning future research.

I applaud Dr. D.P.S. Badwal, Founder & CEO, Just Agriculture Education Group, his dedicated team and everyone who was a part of this grand event.

(Dr. Ajeet Kumar Karnatak)

आज़ादी का अमृत महोत्सव

चौधरी सरवण कुमार हिमाचल प्रदेश कृषि विश्वविद्यालय
पालमपुर – 176062 (हि०प्र०)
CSK Himachal Pradesh Agricultural University, Palampur-176062
Telephone: 01894-230521(0) | Fax : 01894-230465, 230511
E-mail: vc@hillagric.ac.in

Prof. Harinder Kumar Chaudhary
Vice-Chancellor
Ph.D. (Plant Breeding)
PDF (Molecular Genetics, UK & Japan)
Commonwealth Fellow, CSC, London, UK
FISTCRAD & FISGPB

I am extremely happy that **3rd International Conference on "Innovative Approaches in Agriculture, Horticulture and Allied Sciences (IAAHAS-2023)** has been organized during 29-31 March, 2023. This conference was organized collectively by **Just Agriculture Education Group, SGT University, Gurugram** and **ISAHRD, Chandigarh** with a mission to promote new innovations and modern technologies in Agriculture.

Agriculture is an important aspect of every society for its social, economic and environmental growth. There should be co-ordination of scientific programmes for enhancing productivity and agriculture produce. The policies and technologies that are conducive to sustainable use of natural resources must be shared. This international conference might have facilitated sharing of experiences by different stakeholders across academia and administrators.

The organizers have decided to publish an abstract book of the conference by including abstracts of all the papers presented in different technical sessions during the course of deliberations. I congratulate the convener and committee members on having successfully compiling the abstract book in a very nice way.

(H K Chaudhary)

Prof. Rajeshwar Singh Chandel
Vice Chancellor

Dr. Y S Parmar University of Horticulture and Forestry

Ref. No. 69 Date 19.05.23

Message

I am pleased to note that Just Agriculture Education Group, SGT University, Gurugram (ICAR Accredited) and Indian Society of Agriculture and Horticulture Research Development (ISAHRD), Chandigarh successfully organized 3rd International conference on 'Innovative Approaches in Agriculture, Horticulture & Allied Sciences (IAAHAS- 2023)' from March 29 to 31, 2023 at SGT University, Gurugram.

Agriculture, horticulture, forestry and other allied land use sectors feed the worlds' 8 billion people and are expected to continue feeding ever growing population, which is projected to be around 9.7 billion by 2050. In India, agriculture sector is generating employment for about half of the country's population. The sector has undergone significant changes over the previous several decades. Factor productivity has declined over the years, and the increase in yields and returns are not proportional to the increase in inputs. The present input intensive and monoculture-based farm practices have also been reported to cause soil degradation, immense stress on water resources and loss of crop productivity, quality, biodiversity and as a result human health. India should now focus on sustainable agriculture, which has minimal effects on the environment. The United Nations has recognised globally that all forms of Agroecology are the way forward for future Sustainable Agri-Food Systems. Low cost and sustainable climate-resilient natural practices can be a boon for maintaining the agroecology. Natural Farming in its optimal sense is the closest when it comes to applied Agroecology in India. The Government of India is also promoting natural farming under the umbrella of *Bhartiya Prakritik Krishi Paddhati*. Himachal has already taken a lead in this direction by implementing '*Prakritik Kheti Khushhal Kisan Yojana*' (PK3Y), an initiative for the promotion of local input based eco-friendly Natural Farming practices, and millet-based local food systems.

Conferences are the extraordinary mediums for the dissemination of new technologies, sharing information & innovative ideas, and networking with peers in the field. And I am very sure that this conference must have provided a global platform to all the researchers, academicians, scientists and scholars to discuss their views, results and case studies across the globe as well as provided numerous networking and collaboration opportunities to promote sustainable agricultural practices. I congratulate the organizers for the successful organization of this event.

(Rajeshwar Singh Chandel)

Nauni, Solan-173230, Himachal Pradesh | Phone: +91-1792-252363, 252356, (M) 82196-77767 | Fax: +91-1792-252242
Email: vcuhf@yspuniversity.ac.in | Web: www.yspuniversity.ac.in

Assistant Director General
Indian Council of Agricultural Research
Human Resource Management Unit
Indian Council of Agricultural Research, New Delhi 110012
Phone: 011-25842262/Extn. 1319
Mobile: 9414430757
Email: shanti.sharma1@icar.gov.in

Message From Chief Guest

It gives me immense pleasure to be part of the 3rd International Conference on Innovative Approaches in Agriculture, Horticulture & allied Sciences (IAAHAS-2023) from March 29 to 31, 2023 at SGT University, Gurugram organized by Just Agriculture Education Group, SGT University, Gurugram and ISAHRD, Chandigarh as Chief Guest of the Event. Like other sectors of the economy, disruptive transformation through innovations is occurring in agriculture also. Innovations in agriculture are crucial to improve efficiency, food security, sustainability, economic growth, and climate adaptation. Hence, organizing a conference on Innovative approaches is the need of the hour. This conference acted as a platform for researchers, scientists, scholars, and industry leaders to present their research findings, innovative ideas, and novel technologies to a broader audience. As informed by organizers, more than 1000 participants joined the conference through hybrid mode across 13 countries and various eminent speakers, invitees and delegates across the world graced this conference. Meaningful discussions were made during the conference and I am very sure that outcome of this conference will help in developing strategies and action plans to promote sustainable agriculture.

I congratulate the organizers for the successful organization of this International Conference. Also, I would like to congratulate all the participants of this International Conference. I wish that you all will be benefitted from the knowledge, skill and experience gained during this conference and will be useful for your future endeavors.

(DR. SHANTI KUMAR SHARMA)

Dr. R.K. Yadav
Director, ICAR-CSSRI, Karnal, Haryana- 132001
Email: director.cssri@icar.gov.in

Message from Guest of Honour

It gave me immense pleasure to attend *the International Conference on Innovative Approaches in Agriculture, Horticulture & Allied Sciences (IAAHAS-2023)* being organized in collaboration with *Just Agriculture Group* and *Indian Society of Agriculture & Horticulture Research Development* (ISAHRD) during 29-31 March, 2023 at Shree Guru Gobind Singh Tricentenary University Gurugram, Haryana.

I take this opportunity to appreciate the research efforts of scientists, dedication and hard work of our farmers, and also thank government for making supportive and enabling policies which have helped the country to produce about 324 million tonnes of food grains. We have made great strides in every area of production, but still we need to increase input use efficiency. The rising population and changing food habits, climate change and diversion of productive land to other sectors of economy are the major challenges to present day agriculture in the country as well as world. I firmly believe that this conference has deliberated on these challenges and available possible technologies to improve production and productivity and simultaneously preserving our natural resources. This international conference has given us all a wonderful opportunity to reflect on these issues.

Studies have established that adopting precise irrigation methods such as micro-irrigation i.e. sprinkler and drip can increase irrigation water use efficiency up to >80% as surface method of application, we can increase our water use efficiency from 75 to 80 percent, efficient methods of irrigation are precise determination of growth stages. In particular for input of nitrogen, farmers in Mexico have optimized the use efficiency by adoption of precise application methods and schedules. We cannot afford to underfeed and malnourish our population, which is currently around 1.35 billion and is expected to stabilize at around 1.6 billion. In this modern era the environmental effects and other problems altogether contribute to global warming which is not a positive sign to sustainability so proper measures need to devised and used. And I have noted this conference has delved upon, deliberated and came out with concrete recommendations on such issues and challenges.

Here I congratulate the organizers for timely discussion on the challenges of present day agriculture and making useful suggestions after brain storming sessions on the use of basic and applied sciences in agriculture for the benefits of not only farmers but also the general public of the country and globe.

(Dr. R. K. Yadav)

महाराणा प्रताप बागवानी विश्वविद्यालय, करनाल-132001 (हरियाणा)
Maharana Pratap Horticultural University, Karnal,-132001 (Haryana)
(Established vide Haryana Act No. 32 of 2016)

Dr. Ajay Singh
Registrar

Message

I am intensely delighted that Faculty of Agricultural Sciences, SGT University has organized an International Conference on Innovative Approaches in Agriculture, Horticulture & Allied Sciences (IAAHAS-2023) in collaboration with Just Agriculture Group and Indian Society of Agriculture & Horticulture Research Development (ISAHRD) from 29-31 March, 2023 at Shree Guru Gobind Singh Tricentenary University Gurugram, Haryana.

There is a lack of knowledge regarding innovative approaches in agriculture among farmers and mushroom farming is one of them, which results in low yield and expensive prices of mushrooms in the country. It is very secure crop in protected cultivation and it generate more employment. A person from any stream like horticulture, agriculture, or a farmer may begin the production of the mushroom. The most environmentally friendly way to lower the level of nutrients to an acceptable range is to be used as manure to grow mushrooms on these agricultural wastes. A well-defined combination of agricultural wastes also produces a large output of mushrooms in an economical way in addition to solving paddy straw burningissue.

Due to indoor activity and the lack of employment during the Corona period, the popularity of mushrooms surged significantly. Since foreign countries have different input suppliers and farmers, we can establish this type of mushroom production business here as well. Because mushrooms don't need sunlight, we can grow them on erected or thatched dwellings. There are different types of mushrooms grown in India namely oyster mushrooms, paddy straw mushrooms,white button mushrooms, Portobello Mushrooms, Shiitake Mushroom, Enoki Mushrooms, Shimeji Mushrooms, Porcini Mushrooms, Cordyceps mushrooms. These are the commonest mushrooms and carry a mild taste.Cordyceps mushrooms are parasitic fungi that include over 400 different species. They grow all over the world in countries like China, Japan, India, the United States, Australia, Peru, Bolivia, and many more. They typically infect insects and arthropods, with each species of Cordyceps infecting a very specific bug.

I have noticed that this conference has sensitized the researchers to work on this subject. I applaud the efforts of the organizers for timely discussion on the challenges of present day agriculture and making useful suggestions after brain storming sessions on the use of basic and applied sciences in agriculture for the benefits of not only farmers but also the peoples at large.

AJAY SINGH
Digitally signed by AJAY SINGH
Date: 2023.04.24 12:38:07 +05'30'
(Dr. Ajay Singh)

SGT UNIVERSITY

SHREE GURU GOBIND SINGH TRICENTENARY UNIVERSITY
(UGC & AICTE Approved) Gurugram, Delhi-NCR

Chairperson's Message

Smt. Madhupreet Kaur Chawla
Chairperson
Dashmesh Educational Charitable Trust

Message

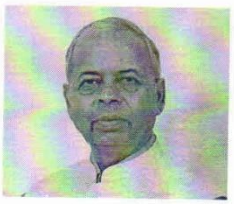
It gives me immense pleasure to know that SGT University has organized International Conference on "Innovative Approaches in Agriculture, Horticulture & Allied Sciences (IAAHAS-2023" from 29-31 March, 2023. The goal of this conference was to bring together eminent academics, researchers, scientists and students to discuss crucial issues and difficulties in the field of agriculturaland allied sciences and their applications. A platform like this has played the role of an excellent opportunity for budding scientists and students to interact with the eminent personalities in their respective fields and gain broader perspective on many current issues plaguing our world. Our University thrives to propagate the idea of innovation and research at every level of the learning process and this conference was a perfect opportunity for all to rise to this occasion. I express my gratitude to the members of the organizing committee, dedicated students, staff and especially delegates. I am elated and feel pride to mention here that the Faculty of Agricultural Sciences has always put consistent efforts to serve the University in the best possible ways which its spirit is reflected in organizing valuable trainings, seminars etc. I have noticed that this conference has played very important role in bringing together experts, researchers and practitioners from across the world to exchange ideas, share their experiences and contribute towards the development of the agriculture sector. On behalf of the University, I thank all the delegates and participants for attending this conference.

(Smt. Madhupreet Kaur Chawla)

Prof. (Dr.) O. P. Kalra

Vice- Chancellor

SGT University, Gurugram



Message

It is a matter of great pleasure for me that the Faculty of Agricultural Sciences of SGT University, has organizedInternational Conference on "Innovative Approaches in Agriculture, Horticulture & Allied Sciences (IAAHAS-2023)" from 29-31 March, 2023. The conference was aimed at helping students, experts and scholars to keep abreast of the latest developments in the area of Agriculture and Allied Sciences and its applied field. It served as an effective platform for scientists, educators and scholars from various institutions for sharing ideas and present their work. My heartfelt congratulations to the organizing team for the successful organization of this event at SGT University, Gurugram. This conference has emerged as an outstanding contribution to the areas of research in all related sciences. This International Conference has provided a platform to the scholars and other academicians across the globe to put their ideas in front of the world.

I extend my heartfelt gratitude to all the faculty members, students, staff and participating delegates for attending this conference and making it grand successful.

Prof. (Dr.) O. P. Kalra

MESSAGE FROM CONFERENCE DIRECTOR & ORGANIZING SOCIETY PRESIDENT

The development and adoption of innovative technologies have been instrumental in improving the lives of millions of farmers across the country by increasing their income, reducing their costs, and minimizing losses. As agriculture continues to evolve, the role of innovation will become even more critical in enhancing sustainability, resilience, and competitiveness in the sector. Keeping these facts in mind 3rd International Conference on "Innovative Approaches in Agriculture, Horticulture & allied Sciences (IAAHAS- 2023)" was planned by Just Agriculture Education Group, & ISAHRD, Chandigarh in collaboration with SGT University, Gurugram (ICAR Accredited) during 29th to 31st March, 2023. The conference was embellished by the presence of Chief Guest, Dr. S.K. Sharma ADG (HRM), ICAR, New Delhi and Guests of Honour Dr. R. K. Yadav Director, ICAR-CSSRI, Karnal, Haryana & Dr. Ajay Singh, Registrar, MHU, Karnal. The grand success of this event was due to the joint efforts of Prof. O.P. Kalra (Hon'ble Vice-Chancellor, SGT University, Gurugram), Prof. R.K. Sharma (Hon'ble Pro Chancellor, SGT University, Gurugram), Dr. R.S. Yadav (Dean FASC, SGT University, Gurugram), Dr. Meenakshi Devi (HOD, Entomology, FASC, SGT University, Gurugram), other faculty members of FASC, SGT University, Gurugram and Team Just Agriculture.

The attendees were impressed with the quality of the sessions, the level of engagement and interaction, and the overall organization of the event. The feedback we have received has been overwhelmingly positive, with many participants expressing their satisfaction with the insightful and informative presentations, as well as the excellent networking opportunities. The conference was a great platform for professionals and experts from different industries to come together, exchange ideas, and explore new opportunities. The keynote speakers and panelists provided valuable insights on a range of topics, from the latest developments in technology and innovation to the challenges facing businesses in a rapidly changing world. The success of this conference would not have been possible without the hard work and dedication of our organizing committee and volunteers. We are grateful for their support and contributions towards making this event such a huge success. Thank you to all the attendees for making this a memorable and enriching experience. We look forward to seeing you again at our future events, where we will continue to bring together the best minds in the industry and create valuable opportunities for learning and growth.

Dr. DPS Badwal
President (ISAHRD, Chandigarh)
Founder & CEO, Just Agriculture Education Group

TAMIL NADU AGRICULTURAL UNIVERSITY
Horticultural College and Research Institute
Coimbatore – 641 003

Dr. P. Irene Vethamoni, Ph.D., FISVS.,
Dean (Horticulture)

We live in a world of dazzling scientific advances and technologies. Agriculture development is one of the most powerful tools to end extreme poverty, and feed nearly 9.7 billion people by 2050. Growth in the agriculture sector is more effective in raising income among the poorest compared to other sector. Agriculture is also crucial to economic growth accounting for 4% of global gross domestic product (GDP) and in some least developing countries, it can account for more than 25% of GDP.

Over the years, Horticulture has emerged as one of the potential enterprise in accelerating the growth of the economy. As a result of number of innovative research technologies, policy initiatives and inputs, Horticulture in India today has become a sustainable and viable venture for the small and marginal farmers.

Animal husbandry is one of the most important sections of rapid socio-economic development of the state. Fast growth in this sector is essential not only to achieve higher productivity levels in livestock production but also for increase in rural house hold income. Main objective is to make strong rural economy through encouraging livestock.

In this context, the 3rd International Conference on "Innovative approaches in Agriculture, Horticulture and allied Sciences (IAAHAS) – 2023 conducted at Shree Guru Gobind Singh Tricentenary University, (SGT University) Gurugram during 29th – 31st March 2023, valuable discussion were made on various innovative approaches and technologies in Agriculture and allied sectors. I would like to congratulate the organizers for the successful conduct of this conference.

(P. IRENE VETHAMONI)

TeL (D): +91422-6611270, Tel (O): +91422 – 6611371, Mobile: 9486056711 (O)
Email : deanhortcbe@tnau.ac.in, Website : www.tnau.ac.in

चारा उत्पादन अनुभाग
Forage Production Section
भा.कृ.अनु.प. - राष्ट्रीय डेरी अनुसंधान संस्थान
ICAR-National Dairy Research Institute
(मान्य विश्वविद्यालय Deemed University)
करनाल 132001, (हरियाणा) भारत
Karnal 132001, (Haryana), India

डॉ अनुराग सक्सेना
प्रधान वैज्ञानिक एवं प्रभारी
Dr. Anurag Saxena
Principal Scientist & In-Charge,

The agriculture sector is a significant contributor to India's economy, accounting for around 18% of the country's Gross Domestic Product (GDP). India is the world's largest producer of milk and dairy products, and the dairy sector plays a crucial role in the country's economy, contributing about 4% to the GDP. The agriculture sector in India is diverse, with several crops being cultivated across the country. The major crops include rice, wheat, maize, pulses, oilseeds, and cotton. Apart from this, India also produces fruits and vegetables, sugarcane, tea, coffee, and spices. India has the largest cattle population in the world, which is a significant contributor to the country's milk production. The government has launched several schemes and initiatives to support the dairy sector, including the National Dairy Plan, which aims to increase the productivity of the dairy sector and provide better market access to small and marginal farmers. Research and extension activities are also crucial for the overall development of Agriculture sector as it helps in the development and dissemination of new technologies, improve agricultural and dairy practices, increase productivity, and enhance the income of farmers and dairy producers. Conferences are the means of dissemination of new technologies, sharing information, presenting new and innovative ideas, and networking with peers in the field. In this context, I am extremely happy to note that Just Agriculture Education Group in collaboration with SGT University Gurugram has successfully organized the 3rd International Conference on "Innovative Approaches in Agriculture, Horticulture & allied Sciences (IAAHAS- 2023)" at SGT University, Gurugram during 29th to 31st March, 2023. It is also noteworthy that 1000+ participants across 13 countries participated in this International Conference and I am very much confident that during this conference meaningful discussions were made on various innovative approaches, emerging technologies and sustainable practices that have the potential to revolutionize the agriculture sector and create a positive impact on our environment and economy. I would like to congratulate the organizers of this International Conference especially Dr. DPS Badwal (Founder & CEO, Just Agriculture Education Group) for the huge success of this conference.

(Anurag Saxena)

दूरभाष/Tel: 0184-2259322 फैक्स/Fax: 0184-2250042 ई मेल/e-mail: Anurag.Saxena@icar.gov.in

MOHAN BABU UNIVERSITY

Sree Sainath Nagar, Tirupati 517102, Andhra Pradesh, India

School of Agriculture

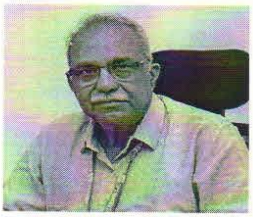
Message

I deem it an honour to be a part of and have associated with **Just Agriculture Education Group, SGT University, Gurugram (ICAR Accredited)** in the conduct of the International Conference on Innovative Approaches in Agriculture, Horticulture & Allied Sciences (IAAHAS- 2023) in physical as well as virtual mode during **March 29 to 31, 2023** at **SGT University, Gurugram.** I am sure that the conference has created a platform for researchers, scientists, scholars, and industry leaders to share their research ideas and publish their research findings and novel technologies to both national and international audiences. It offered an opportunity for researchers to connect and collaborate with peers, and exchange their ideas.

Indeed, this conference has assumed importance as it created an impetus for creating knowledge sharing platforms, promoting innovations and collaboration, advancing scientific knowledge, facilitating personal and professional growth of the attendees. I would like to extend my warmest congratulations and heartfelt appreciation to Dr. DPS Badwal, the founder and CEO of Just Agriculture Education Group, Dr. Utkarsha Gaware (Chief Organizing Secretary, IAAHAS, 2023), as well as the entire team and everyone involved in the organization of this exceptional event, their dedication, and commitment to promoting the education and development of agriculture is truly inspiring. The efforts of the Just Agriculture team have undoubtedly contributed to the advancement of agricultural science, leading the way in shaping the future of farming. All the best to all of you for your future endeavours. May you all achieve your goals and your hard work, perseverance & determination take you to great heights of success.

(Dr. Gowri Sankara Rao)

Prof. R.S. Yadav
Dean, Faculty of Agricultural Sciences
SGT University, NCR, Gurugram-122505
Phone: 0124-2278183-85 Ext.no. 6188
Contact No. 9414604793
Email: dean.fasc@sgtuniversity.org



Message

It was a great honor for the SGT University to organize international conference on a wide spectrum of issues and challenges (IAAHAS-2023) from 29-31 March, 2023. The conference was aimed to bring together eminent academicians, researchers, scientists and students to engage in critical issues and challenges with latest developments on cutting-edge research and technology in the area of Agriculture and Allied Sciences and its applied field. This conference covered a number of plenary scientific talks with leading academicians, agriculturists, researchers and scientists who shared crucial interventions as well as important current developments and issues in the fields of Agricultural Sciences and Allied Sciences. The deliberations of this conference were very enlightening and enriching experience for all the participants. It is noteworthy to mention that there was an overwhelming response to the conference. More than 1000 participants across the country and from abroad hasparticipated in this conference. I hope the outcome of this mega event would benefit not only the farming community but also other stakeholders in developing effective collaborations and linkages amongst institutions. I am very thankful to our management and to all my colleagues for their unstinted help in organizing this conference.

(Prof. R. S. Yadav)

National Institute of Food Technology, Entrepreneurship and Management- Thanjavur (NIFTEM-T)
(Ministry of Food Processing Industries, Govt. of India)
Liaison Office, Aditya Complex, Model Town, Phase II,
Bathinda, 151001 Punjab, India
Dr. B.K. Yadav
Professor & In-charge, NIFTEM-T LO Bathinda

MESSAGE

I am very glad to know that **Just Agriculture Education Group, SGT University, Gurugram (ICAR Accredited)** has organized three days International conference on Innovative Approaches in Agriculture, Horticulture & allied Sciences (IAAHAS- 2023) from **March 29 to 31, 2023** at **SGT University, Gurugram.** Numerous eminent speakers, invitees and delegates across the world joined this conference. It is a great matter of joy that 1000+ participants across 13 countries participated in this International conference.

Many congratulations to the organizers for the success of this conference. Overall, this conference was an enriching experience for everyone involved. The discussions and debates on the various topics provided a deeper understanding of the challenges faced by the agricultural sector, and the possible solutions to overcome them. I hope that the ideas and recommendations generated at this conference will contribute to the advancement of modern agriculture and enhance food security for the growing population. Happy to know that the organizers are compiling the abstract book of this conference, which - containing a summary of each presentation given at the conference - will serve as a valuable resource for all participants. It will be useful for recalling important points discussed during the conference, for referencing research and data presented, and for sharing ideas and findings with colleagues who were unable to attend. The abstract book will also serve as a record of the conference proceedings, contributing to knowledge sharing in the field for years to come.

Again, I would like to congratulate Dr. DPS Badwal (Founder & CEO, Just Agriculture Education Group), Dr. Utkarsha Gaware (Chief Organizing Secretary, IAAHAS, 2023), entire team of Just Agriculture and SGT, University Gurugram and all the organizers on this significant milestone, and I wish you all the best in your future endeavors.

Prof. B.K. Yadav
I/c NIFTEM-T, LO Bathinda

DEPARTMENT OF AGRONOMY
COLLEGE OF AGRICULTURE
CENTRAL AGRICULTURAL UNIVERSITY
IROISEMBA, IMPHAL – 795004
MANIPUR (INDIA)

Dr. Edwin Luikham
Prof. & Head, Department of Agronomy.

Contact No. 9612166954
E-mail : edluikham@gmail.com

Message

Present time is the era of technology and it is quite evident that technology has revolutionized each and every sector including Agriculture sector. Advancements in farming technologies have made the farming activities more efficient, sustainable and productive and has brought numerous benefits to farmers. The future of agriculture looks bright, and it will undoubtedly continue to be shaped by technological innovations. In this context, Just Agriculture Education Group, SGT University, Gurugram and ISAHRD, Chandigarh has organized a three days 3rd International Conference via Hybrid Mode on Innovative Approaches in Agriculture, Horticulture & allied Sciences (IAAHAS- 2023) during 29th-31st March, 2023.

This conference covered various technical sessions on technological advancements in conventional as well as digital agriculture like precision farming, artificial intelligence, hydroponics, drone technology etc. The conference has offered a diverse platform for invited talks, lead papers, oral presentations and poster sessions. Meaningful discussions were made on the important issues of Modern Agriculture. It provided a unique opportunity to the participants to share information, exchange their ideas and develop new vistas for their future endeavours in the field of agriculture and allied sciences. I congratulate Dr. DPS Badwal, Founder & CEO, Just Agriculture Education Group, all the team members of Just Agriculture Education Group and members of organizing committee for their hard work and relentless efforts in organising this International Conference.

(Edwin Luikham)

DEPARTMENT OF AGRICULTURAL ECONOMICS
कृषि अर्थशास्त्र विभाग
COLLEGE OF AGRICULTURE
कृषि महाविद्यालय
INDIRA GANDHI KRISHI VISHWAVIDYALAYA, RAIPUR
इंदिरा गांधी कृषि विश्वविद्यालय,रायपुर
Email: ageconigkv@gmail.com

Dr. Vijay Kumar Choudhary
Professor & Head
Email. Choudhary.igkv@gmail.com

Message

India is anagrarian country and is known for its strong agricultural sector. About 58% of the Indian population relies on agriculture for their livelihoods. Agriculture contributes around 18% of India's gross domestic product (GDP). India is one of the largest producers in the world of crops like rice, wheat, pulses, cotton, tea, jute, and sugarcane. Our country also has a significant livestock sector, with the largest population of cattle, buffaloes, and goats in the world. Despite the growth of industries and the service sector, agriculture still plays a vital role in India's economy and the lives of millions of people. Agriculture sector demonstrates the importance of using modern technology to enhance sustainable methods of farming so that farmers can reap the benefits of these modern techniques and equipment. By investing in agricultural technology and knowledge sharing, we can improve food production, increase yields, and promote sustainable farming practices for generations to come.

It gives me immense joy to know that recently a 3 days International conference on Innovative Approaches in Agriculture, Horticulture & allied Sciences (IAAHAS- 2023) has concluded at **SGT University, Gurugram.** SGT University, Gurugram (ICAR Accredited) and Just Agriculture Education Group has very smoothly organized this event during March 29 to 31, 2023. Conferences are an excellent method of knowledge exchange and like that IAAHAS-2023 provided a common platform to all the participants to share information, exchange their ideas and develop new vistas for their future endeavours in the field of agriculture and allied sciences. Valuable discussions were made and important information was sharedwhich will undoubtedly benefit all of us.I applaud theefforts of all the organizers and sponsors who worked tirelessly to make this event possible. Their hard work and dedication made this conference way successful.

(Vijay Kumar Choudhary)

DEPARTMENT OF ENTOMOLOGY
CENTRAL AGRICULTURAL UNIVERSITY
IROISEMBA, IMPHAL-795004
MANIPUR (INDIA)

Dr. Kh. Ibohal Singh
Professor & Head (Entomology)
LF (Entomological Society of India & AZRA)

Contact no: 8413056516
E-mail: singhki_ento@yahoo.com

MESSAGE

I am delighted to know that Shri Guru Gobind Singh Tricentenary (SGT) University, Gurugram, Haryana; Just Agriculture Education Group and Indian Society of Agriculture & Horticulture Research Development (ISAHRD), Chandigarh has jointly organized the 3rd International Conference on "Innovative Approaches in Agriculture, Horticulture & Allied Sciences (IAAHAS – 2023)" during March 29-31, 2023.

The country has made a significant progress in Agriculture, Horticulture and other allied sciences like, Dairy, Fisheries etc., which have made us self-reliant in most of the food items. This has been possible due to advancement of technologies in these fields. Now-a-days, agricultural land is shrinking due to development of roads, rail lines, other civil developments and urbanization whereas, on other side, human population is increasing so fast. In such situation, innovative approaches in agriculture and allied areas are utmost need to be adopted for sustainable agriculture production.

I am confident that the 3rd International Conference being hosted by SGT University in collaboration with Just Agriculture Education Group and ISAHRD during March 29-31, 2023 has provided a platform to all agricultural scientists and academicians to flash the rays of attention for the judicious use of available technologies. Heartfelt congratulations to the organizers for the successful organization of this International Conference.

(Khumukcham Ibohal Singh)
Professor & Head (Entomology)

MESSAGE FROM CHIEF ORGANIZING SECRETARY

It gives me immense pleasure to share that **ISAHRD, Chandigarh** and Just Agriculture **Education Group** in collaboration with **SGT University, Gurugram (ICAR Accredited)** have successfully organized the 3rd International Conference on **Innovative Approaches in Agriculture, Horticulture & allied Sciences (IAAHAS- 2023)** at **SGT University, Gurugram** during 29th to 31st March, 2023 in a hybrid mode. I believe that this conference has played an important role in bringing together experts, researchers and practitioners from across the world to exchange ideas, share their experiences and contribute towards the development of the agriculture sector. We have witnessed several innovative approaches, emerging technologies and sustainable practices that have the potential to revolutionize the agriculture sector and create a positive impact on our environment and economy.

The conference has also highlighted the significance of collaboration among different stakeholders including government, academia, industry and farmers. Through constructive discussions, we have identified the key challenges faced by the agriculture sector and the possible solutions to address them. In conclusion, I would like to congratulate the organizing team for the successful organization of the 3rd International Conference (IAAHAS- 2023). We look forward to the next edition of this conference and hope to witness more innovative ideas and practices in the field of agriculture. Thank you all for your participation and support.

Dr. Utkarsha P. Gaware
Vice President (Strategy & Partnership)
Just Agriculture Education Group

MESSAGE FROM ORGANIZING SECRETARY

I am very glad that Just Agriculture Education Group and & ISAHRD, Chandigarh in collaboration with SGT University, Gurugram (ICAR Accredited) has successfully organized three days International conference on "Innovative Approaches in Agriculture, Horticulture & allied Sciences (IAAHAS- 2023)" from 29th to 31st March, 2023 at SGT University, Gurugram. The efforts made by the organizing committee are truly commendable, and I congratulate all of them on the successful organization of this conference. I am confident that the deliberations held during the conference would pave the way for future growth and prosperity of the agriculture sector.

I would like to extend my sincere gratitude to the organizers and all the stakeholders who had contributed to making this conference a grand success. I hope that the knowledge and insights gained from the conference would empower all of us to contribute more effectively towards the development of sustainable agriculture practices that are environmentally friendly and socially responsible. I once again express my heartfelt appreciation to all the stakeholders who had participated in the conference, and I look forward to seeing the outcomes and recommendations of the conference being put into practice.

Mohit Bharadwaj
Chief Editor, Just Agriculture the Magazine

MESSAGE FROM ORGANIZING SECRETARY

I feel extremely happy to share that Just Agriculture Education Group, ISAHRD, Chandigarh in collaboration with SGT University Gurugram has successfully organized the 3rd International Conference on **"Innovative Approaches in Agriculture, Horticulture & allied Sciences (IAAHAS- 2023)"** at SGT University, Gurugram during 29th to 31st March, 2023. The conference saw a great turnout of delegates, researchers and practitioners from around the world who participated in various discussions and presentations on diverse topics related to the theme of the conference. The keynote speakers were exceptional and gave insightful talks that inspired and stimulated new thought processes among the attendees. The presentations were thought-provoking and informative, generating lively discussions and debates. Delegates were able to network and build new relationships with colleagues from different parts of the world, exchanging ideas and techniques, and exploring potential collaborations.

The organizing committee deserves immense credit for putting together such a well-organized and meaningful event. Their efforts in planning, coordinating and executing the conference were exemplary, and they ensured that everything ran smoothly throughout the entirety of the conference. Overall, the conference was a grand success, and we look forward to organizing the next edition in the future, which will undoubtedly build upon the achievements of this year's event. Thank you to all who made this event possible, and for your participation, dedication and enthusiasm in ensuring a successful outcome.

Himani Gautam
Vice- President (Branding & Development)
Just Agriculture Education Group

Organizing Secretary Message
Dr. Meenakshi Devi
Assistant Professor
SGT University

Message

It was a great honor for the SGT University to organize international conference on "Innovative Approaches in Agriculture, Horticulture & Allied Sciences (IAAHAS-2023) from 29-31 March, 2023. The conference was organized in a hybrid mode of both offline as well as online.

First off, I want to express my gratitude to the scientists, researchers, policymakers, and young professionals who contributed their immense presence and to share their tremendous knowledge to the International Conference. Through this the participants as a researcher, must have gained the vision, the knowledge, the resources and the experience to pave their way into the future technical activities regarding agri-innovation.

Agriculture is essential for the socio-economic development of the nation. Population increase, shifting dietary habits, resource depletion and degradation, climate change, a lack of qualified labour, and ongoing land degradation which is producing agricultural distress all put pressure on the business today. Hence, diversification in nutrient-dense, climate-resilient, commercially viable, and locally accessible or adaptable species should be emphasized in improved agriculture and food systems. I'm hoping that the attendees gained a wealth of knowledge about agricultural development as a result of the exchange of ideas provided by scientists, research experts, and students on the conference's numerous issues.

I'm thankful to all the respected guests and participants for making this conference successful. We looked forward to welcoming you all and prayed the almighty to bless us for making this international conference a grand success

Meenakshi

(Dr. Meenakshi Devi)

TABLE OF CONTENT

IAAHAS/LP/2023/001

Antimicrobial Properties of Seed Spices

[1.] P. Irene Vethamoni and J.E. Adeline Vinila

[1] Dean (Horticulture), Horticulture College and Research Institute
Tamil Nadu Agricultural University, Coimbatore, 641003

INTRODUCTION

Currently, several thousands of diseases are attacking the human population, and to tackle them it has become substantial for us to explore the antibiotics. Synthetic antibiotics are available in stores but each of it has its own side effects. Hence, scientists are in pursuit of antibiotics which are naturally present in plants.

Most of the world's population uses spice materials as traditional medicine due to their strong antimicrobial properties. Recently, the use of natural products has become ideal for treatment of microbial infections due to the possible toxic or harmful effects produced by synthetic antimicrobial agents. The application of spices in treating ailments would be an ideal alternative and can also open up opportunities for the development of anticancer, antimicrobial, and antiviral drugs with lower side effects. Many research works have been done in spices that suggest their usage as a potential antimicrobial agent. Pharmacological properties of Cumin, Coriander, Fennel, Fenugreek, Ajwain,Dill, Black cumin, Celery, Aniseed and Caraway with good potential for antimicrobial, antiviral, and radical scavenger abilities is observed. Considering the decisive role of antimicrobial drugs in human life, these new fields in the drug industry have become increasingly more acceptable. Designing new antimicrobial drugs free from side effects will not only create a new area of study but can also help meet the expanding human needs.

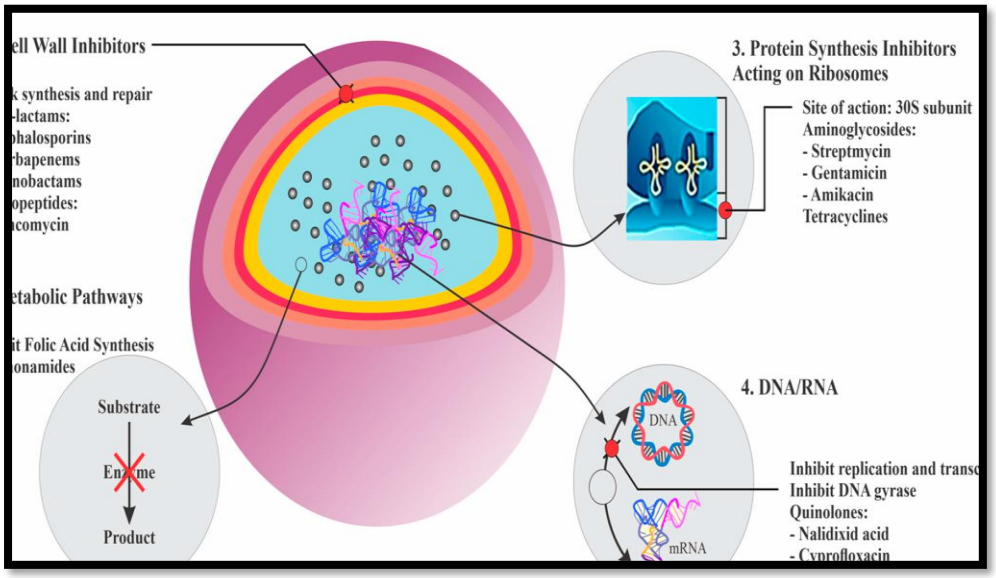
Antimicrobial agent

- An agent which can kill microorganisms or stop their growth is known as an antimicrobial agent or antimicrobial medicine.
- Antimicrobial medicines are categorized based on the primary microorganisms they act against such as bacteria and viruses Antimicrobial agents are divided into two groups based on their different chemical substances.

- Synthetic antimicrobial agents (chemical antimicrobial agents) - antibiotic drugs and metal and metal oxide nanoparticles including silver, silver oxide, and so on.
- Herbal antimicrobial agents.

Synthetic antimicrobial agents

Synthetic antimicrobial agents are antimicrobial drug used to control infections in the human body. But Cost production is high and leads to high adverse effects like hypersensitivity (allergic reaction), depletion of beneficial gut, especially increasing reactive oxygen species (ROS). ROS are very toxic to human health & have been thought to play a main role in producing cancer. This has created immense clinical problem in the treatment of infectious diseases.



Herbal antimicrobial agents

To counter these problems -the search for "naturally derived" alternative antimicrobials Plants are known to produce diverse secondary metabolites that are associated with anti-infective mechanisms against the invasion of pathogenic microorganisms.

Among them, plant-derived spices and their essential oils contain many different bioactive compounds present in variable amounts, these components are generally recognized as safe (GRAS) with no historical records of detrimental impacts and with modern toxicological verification.

The bioactive constituents of spices can be divided into volatile and non-volatile compounds the volatile compound present in the spices mainly responsible for the antimicrobial activity of spices. In this way seed spices could be used as a good alternative.

Seed spices

- It is annual herbs, whose dried seed or fruits are used as spices
- Seed spices are part of everyday cooking and significant quantities may be consumed in India in meals. These data show a realistic possibility to achieve therapeutic doses of the active ingredients in seed spices by dietary consumption alone. However, for many patients, treatment with functional foods or nutraceuticals with enhanced concentrations of the active ingredients of the spices may be necessary
- The seed spices constitute an important group of agricultural commodities and play a significant role in our national economy. Historically, India has been recognized as a land of spices. The states, Rajasthan and Gujarat have together contributed more than 80 per cent of the total seed spices produced in the country.
- Seed spices produce numerous secondary metabolites or phytochemicals, these are naturally occurring, biologically active chemical compounds in plants, where they act as a natural defense system for host plants and that have historically been used as pharmaceuticals, fragrances, flavor compounds, dyes, and agrochemicals. With the help of modern biological and computational science technology chemo informatics will help us to development of novel drugs.
- Even today, these metabolites are a major source of new drugs. They are a gold mine of possibilities in our search for beneficial bioactive compounds for pharmacology and other health related issues. Chemo informatics opens a new way to explore seed spices as gold mines for pharmaceuticals industries.

SGT University, Gurugram and Just Agriculture Education Group

BOTANICAL CLASSIFICATION OF SEED SPICES

NAME	SCIENTIFIC NAME & FAMILY	PARTS USED	MAJOR COMPOUND	USES
Coriander	*Coriandrum sativum* Apiaceae	Leaves & Seeds	Linalool	Carminative, and diuretic, Digestive, stimulant, anti-inflammatory, antioxidant
Fenugreek	*Trigonella foenum-graecum* Fabaceae	Leaves & seeds	Diosgenin trigonelline 4-hydroxyisoleucine	Carminative, tonic, aphrodisiac, antibacterial, diabetes and oral contraceptive
Cumin	*Cuminum cyminum* Apiaceae	Seeds	cuminaldehyde, β-pinene γ-terpinene	Gastrointestinal, Antimicrobial, antioxidant
Fennel	*Foeniculum vulgare* Apiaceae	Seeds	Anethole fenchone phenols	Antioxidant, hepatoprotective, anticancer, Stimulant, carminative, stomachic, aphrodisiac, antimicrobial
Ajwain	*Trachyspermum ammi* Apiaceae	Seeds	Thymol, γ-terpinene, p-cymene, palmitic acid and xylene	Digestive, mild stimulant, stomachic, carminative, aphrodisiac, antiseptic, antifungal, antibacterial
Celery	*Apium graveolens* Apiaceae	Leaves and Seeds	d-limonene (60%), ß-selinene (10-12 %)	Antioxidants, digestion
Black cumin	*Nigella sativa* Ranunculaceae	Seeds	Nigellone & Thymoquinone, thymohydroquinone	Diuretic, antihypertensive, antidiabetic, anticancer, immuno modulatory, analgesic, antimicrobial, anthelmintics & antioxidant properties **antiviral**
Caraway	*Carum carvi* Apiaceae	Seeds	Carvone (60%) and limonene	Antispasmodic, antiseptic, antiparasitic, lactogenic, aromatic, carminative, digestive, and stimulant
Dill	*Anethum graveolens* Apiaceae	Seeds	Limonene, carvone, anethofuran	Digestion, insomnia, diarrhea, menstrual disorders, respiratory disorders

ANTIVIRAL PROPERTY OF BLACK CUMIN

PHYTOCHEMICALS

- Alkaloids
- Flavonoids
- Phenolic
- Terpene
- Essential Oils
- Saponin

Alkaloids

- Largest group of secondary chemical constituents
- Made from ammonia compounds
- Basically, of nitrogen bases synthesized from amino acid

Example

Fenugreek - trigonelline (0.2-0.36%), choline (0.5%), gentianine and carpaine

Mode of action

✓ It possesses the ability to intercalate with DNA, thereby disrupting transcription and replication & also can inhibit cell division, thereby resulting in cell death

Tannins

Crop	Virus	Sources
Black cumin	Avian influenza (H9N2)	Sajid Umar *et al. (*2016)
Black cumin	antiviral	Hossain MS *et al.* (2000)
Black cumin	Hepatitis C virus	F. Forouzanfar *et al*. (2014)
Black cumin	Infectious laryngotracheitis virus in chickens	S. Zerizer *et al*. (2012)
Black cumin	SARS-CoV-2	Andrei P *et al.*(2020)
Black cumin	Murine cytomegalovirus in mice	M L Salem *et al* .(2000)

- Widely distributed in plant flora
- Phenolic compounds of high molecular weight, water-soluble, astringent Found in root, bark, stem and outer layers of plant tissues

Example

Fennel, Coriander

Mode of action

Inactivation of cell envelope transport proteins such as adhesins, enzyme inhibition, or disruption of cell membranes

Essential oil

Odours & volatile liquids found in flowers, roots, barks, leaves, seeds, fruits, and wood

Example

- ✓ Coriander oil – linalool
- ✓ Ajwain - Thymol

Mode of action

- ✓ Essential oils or their active compounds containing hydroxyl group (-OH) are highly antimicrobial
- ✓ The presence of aromatic nucleus with a polar functional group determines the inhibitory properties of the essential oils
- ✓ A hydroxyl group is much more effective compared to a carbonyl group
- ✓ The hydroxyl group can easily bind the active site of enzymes and alter their metabolism

Flavonoids

- ✓ Important group of polyphenols
- ✓ Widely distributed among the plant flora
- ✓ Synthesized in the cytoplasm of the plant cell and then accumulate in vacuoles that fuse with the central vacuole of epidermis and cortex cells
- ✓ More than 4000 distinct flavonoids identified
- ✓ Nearly present in 70% of plants

Example

- Fennel - Quercetin

Mode of action

It interacts with membrane proteins that are present on bacterial cell walls increasing the permeability of the membrane and disrupting it then cause cell death

Phenolics

- Polyphenols, a series of pigments with the quinonic structure are responsible for the color of fruits and flowers

Mode of action

- Sensitize the phospholipid bilayer of the microbial cytoplasmic membrane causing increased permeability and unavailability of vital intracellular constituents.

Saponins

Saponins are compounds derived from steroids or triterpenoid glycosides, which occur in many plants and act on microbial cells by permeabilization of the membrane.

Example

Fenugreek – Diosgenin (2 to 7%)

ADVANTAGE

- ✓ It is often stated that bacteria do not develop resistance to herbal medicines, or at least the level of resistance (Radulovic, N.S *et al*., 2014)
- ✓ It has a high antimicrobial potential at a lower price.
- ✓ Less toxic and side effect-free nature compared to synthetic antimicrobial agents.

Antimicrobial property of seed spices against human pathogenic organisms

Spice	Extraction	Bioactive component	Test microorganism	References
Black cumin	Essential oil	36-38% fixed oils, proteins, alkaloids, saponin and 0.4 -2.5% essential oil	*Aeromonas hydrophila* (Endocarditis)	Ali and Blunden, 2003 Muhammet Arici, 2005
Fenugreek	Aqueous extract	Seed saponin	*Pseudomonas aeruginosa* (infections in the blood)	Abdul Kahaleq *et.al.,* (2016)
Caraway	Essential oil	Carvone(60%) and limonene	*S.aureus (*abscesses) *and E. coli (*diarrhea)	Herba pol (2015)
Coriander	Aqueous decoctions and infusion	Flavonoids - quercitin, kaempferol, rhamnetin, and Phenolic acid	Gram-positive and Gram-negative bacteria, including *Listeria monocytogenes*	Lopes-Lutz *et al*. (2008)
Celery	Essential oil	Limonene	*Bacillus subtilis, (*septicemia) *Aspergillus niger* (Aspergillosis)	Justyna A. *et. al.* (2020)
Aniseed	Essential oil	trans-anetole, estragole, γ-hymachalen	*Clostridium perfringens* (Gastroenteritis)	Kanika Sharma *et al*. (2017)
Fennel	Essential oil	Tocopherols Flavonoids	*E. coli (*diarrhea) *and B. subtilis, (*septicemia)	Oktay *et al.,* 2003 Anwar *et al.,* 2009

Ajwain	Essential oil	Carvacol and thymol	*Klebsiella pneumoniae, E. coli*, *Staphylococcus aureus (*abscesses)	Nahid Sepehri *et al*. (2014)
Cumin	Essential oil and alcoholic extract	Cuminaldehyde	*Bacillus sp,(*anthrax) *Klebsiella pneumoniae (*bloodstream infections)	Agrawal and Gour, 1992 Meena *et al., 2018*
Dill	Essential oil	Limonene, carvone, anethofuran	*Pseudomonas aeruginosa,* (infections in the blood) *Staphylococcus aureus*	Carvalheira *et al*.,2017

Antimicrobial property of seed spices against Plant pathogenic organisms

Spices	Causal organism	Disease	Reference
Cumin	*X. campestris pv. vesicatoria, X. campestris pv. campestris*	Bacterial leaf spot	Lacobellis *et al.,* 2005
Fennel	*Rhizopus stolonifer*	Mold	El Ouadi Y *et al.,*2017
Aniseed	*Aspergillus flavus, Alternaria alternata, Botrytis cinerea*	Rot, Leaf spot, gray mold	Behdani *et al.* (2012)
Caraway	*Altenaria solani*	Early blight	El-Mougy, 2009
Ajwain	*Curvularia lunata, Fusarium chlamydosporum*	Curvularia leaf spot and wilt	Khanuja *et al.* (2004)
Coriander	Seed borne pathogens of *Pyricularia oryzae & Alternaria sp*	Rice seedling blight, Leaf spot	Zare-Shehneh *et al.* (2014)
Celery	*Septoria apicola*	Leaf spot	Donovan *et al*. (2014)
Dill	*Sclerotinia sclerotiorum*	Sclerotinia Rot	Bingxin Ma *et.al.* (2015)

Antimicrobial property of seed spices against Animal pathogenic organisms

Coriander	Cat & Dog	*Microsporum canis(*upper, dead layers of skin)	Soares BV *et al.* (2012)
Dill	Dog	*Candida albicans (*abnormal amount of drooling)	Zeng H *et al.* (2012)
Fennel & Ajwain	Cat & Dog	*Microsporum gypseum,* (ring worm) *Microsporum canis (*circular lesions)	Zuzarte M *et al.* (2013)
Caraway	Sheep & goat	*Clostridium perfringens (*enterotoxemia)	Schone *et al.* (2006)
Black Cumin	Bovine	*Coagulase - negative staphylococci (*mastitis)	Abdalhamed AM *et al*. (2018)

ACTIVE PRINCIPLE EXTRACTION METHODS

Crop	Form	Extraction method	Content	Compound analysis	Sources
Coriander	Essential oil	Stean distillation	Linallol	GC-Ms analysis	Yuelin Zhang et al. (2016)
Fenugreek	Crude extract	Microwave Assisted Extraction	Diosgenin		Myrene Dsouza et al (2018)
Fennel	Essential oil	Hydro distillation	Trans anethole		Damjanović, et al (2008)
Cumin	Essential oil	MW-assisted hydro distillation	Cuminaledyde		R. Ascrizzi et al (2017)
Black cumin	Essential oil	Steam distillation	Thymo quinone		Demis Zelelew et al. (2018)
Dill	Essential oil	hydro distillation	β-phellandrene		Elaheh et al. (2018)
Ajowain	Essential oil	hydro distillation	Thymol		Mohammad et al. (2014)
Celery	Essential oil	Ultrasound-Assisted Hydro distillation	limonene		Justyna Zorga et al. (2020)
Caraway	Essential oil	supercritical fluid extraction	Carvone		Csaba D. András et al. (2015)
Aniseed	Essential oil	Steam Distillation Method	Anethole		Sudhir Yadav et al. (2014)

CONCLUSION

Seed spices are used day to day life in our kitchen. Other than kitchen value it has many pharmaceutical significances because of it contain antioxidant, antimicrobial property. The major seed spices like coriander, Fenugreek, fennel, cumin having antimicrobial property against human, plant, and veterinary pathogens. Not only major spices the minor seed spices like ajwain, celery, aniseed, caraway and dill also contain antimicrobial properties against human, plant and veterinary pathogens. Other than this black cumin is one of the minor seed spices it contains antiviral property. Because of this the seeds spices can also be used in suitable pharmaceutical dosage form to treat infections in human, animal & veterinary diseases.

Future Thurst

- ✓ Herbal materials have created a novel exciting field in all sciences, especially in medicine, agriculture, veterinary sciences for future studies due to their unique properties.

- ✓ Their medicinal applications have already led to the development of new medical productions.
- ✓ Considering the decisive role of antimicrobial drugs in human life, these new fields in the drug industry have become increasingly more acceptable.
- ✓ Designing new antimicrobial drugs free from side effects will not only create a new area of study but can also help meet the expanding human needs Therefore, future research can focus on the characterization of the active component and the effect of herb–herb combinations for future therapeutic advancements and pharmaceutical product development.
- ✓ Since the coriander, cumin, fennel, fenugreek having anti- bacterial and anti-microbial properties and **black cumin having anti- viral** properties they can be used as a pharmaceutical industry and these biomaterials are suggested for use against the COVID-19 virus.

REFERENCES

- ❖ Aelenei, P, C Rimbu, E Guguianu, G Dimitriu, A Aprotosoaie, M Brebu, C Horhogea, and A Miron. 2019. "Coriander essential oil and linalool–interactions with antibiotics against Gram-positive and Gram-negative bacteria." *Letters in applied microbiology* 68 (2):156-164.
- ❖ Al Aboody, MS. 2021. "Cytotoxic, antioxidant, and antimicrobial activities of Celery (Apium graveolens L.)." *Bioinformation* 17 (1):147-156.
- ❖ Anwar, F, M Ali, AI Hussain, and M Shahid. 2009. "Antioxidant and antimicrobial activities of essential oil and extracts of fennel (Foeniculum vulgare Mill.) seeds from Pakistan." *Flavour and Fragrance Journal* 24 (4):170-176.
- ❖ Anwar, F, AI Hussain, STH Sherazi, and MI Bhanger. 2009. "Changes in composition and antioxidant and antimicrobial activities of essential oil of fennel (Foeniculum vulgare Mill.) fruit at different stages of maturity." *Journal of herbs, spices & medicinal plants* 15 (2):187-202.
- ❖ Bakathir, HA, and NA Abbas. 2011. "Detection of the antibacterial effect of nigella sativa ground seedswith water." *African Journal of Traditional, Complementary and Alternative Medicines* 8 (2).
- ❖ Bano, S, N Ahmad, and A Sharma. 2016. "Phytochemical investigation and evaluation of anti-microbial and anti-oxidant activity of Foeniculum vulgare (fennel)." *International Journal of Pharma Sciences and Research* 7 (7):310-314.

- Bhatt, V. 2018. "Antimicrobial effect of ajwain seed ethanolic extract against food borne pathogenic bacteria." *International Food Research Journal* 25 (3):908-912.
- Bose, D. 2018. "Potentials of Cuminum cyminum in Microbial Control." *International Journal of Advancement in Life Sciences Research*:8-12.
- Bouchentouf, S, and N Missoum. 2020. "Identification of compounds from Nigella sativa as new potential inhibitors of 2019 novel Coronasvirus (COVID-19): Molecular docking study."
- Dávila-Rodríguez, M, A Lopez-Malo, E Palou, N Ramírez-Corona, and MT Jiménez-Munguía. 2019. "Antimicrobial activity of nanoemulsions of cinnamon, rosemary, and oregano essential oils on fresh celery." *LWT* 112:108247.
- Dharajiya, D, H Jasani, T Khatrani, M Kapuria, K Pachchigar, and P Patel. 2016. "Evaluation of antibacterial and antifungal activity of fenugreek (Trigonella foenum-graecum) extracts." *International Journal of Pharmacy and Pharmaceutical Sciences* 8 (4):212-217.
- Dimov, M, K Dobreva, S Damyanova, and A Stoyanova. 2017. "Chemical composition, antioxidant and antimicrobial activities of dill essential oils (Anethum graveolens L.)." *Annual Assen Zlatarov University*:37-42.
- Ghazanfari, N, SA Mortazavi, FT Yazdi, and M Mohammadi. 2020. "Microwave-assisted hydrodistillation extraction of essential oil from coriander seeds and evaluation of their composition, antioxidant and antimicrobial activity." *Heliyon* 6 (9):e04893.
- Ilić, DP, LP Stanojević, DZ Troter, JS Stanojević, BR Danilović, VD Nikolić, and LB Nikolić. 2019. "Improvement of the yield and antimicrobial activity of fennel (Foeniculum vulgare Mill.) essential oil by fruit milling." *Industrial crops and products* 142:111854.
- Javed, S, S Mushtaq, I Khokhar, R Ahmad, and MS Haider. 2012. "Comparative antimicrobial activity of clove and fennel essential oils against food borne pathogenic fungi and food spoilage bacteria." *African Journal of Biotechnology* 11 (94):16065-16070.
- Jeya, K, M Veerapagu, and V Sangeetha. 2019. "Antimicrobial and antioxidant properties of Coriandrum sativum L. seed essential oil." *American Journal of Essential Oils and Natural Products* 7 (2):06-10.
- Kačániová, M, L Galovičová, E Ivanišová, NL Vukovic, J Štefániková, V Valková, P Borotová, J Žiarovská, M Terentjeva, and S Felšöciová. 2020. "Antioxidant, antimicrobial and antibiofilm activity of coriander

(Coriandrum sativum L.) essential oil for its application in foods." *Foods* 9 (3):282.

- Kostova, I, V Lasheva, D Georgieva, S Damyanova, A Stoyanova, S Stefanov, and O Gubenia. 2020. "Antimicrobial active packaging paper based on dill weed essential oil." *Cellulose Chemistry and Technology* 54 (3-4):347-354.
- Kubo, I, K-i Fujita, A Kubo, K-i Nihei, and T Ogura. 2004. "Antibacterial activity of coriander volatile compounds against Salmonella choleraesuis." *Journal of agricultural and food chemistry* 52 (11):3329-3332.
- LUPAŞCU, G, A Ciocarlan, I Dragalin, and L LUPAŞCU. "Antimicrobial activity of the volatil Coriander oil (Coriandrum sativum L.)."
- Mafakheri, H, and SM Mirghazanfari. 2018. "Antifungal activity of the essential oils of some medicinal plants against human and plant fungal pathogens." *Cellular and Molecular Biology* 64 (15):13-19.
- Mazumder, J, R Kumria, and D Pathak. 2014. "Evaluation of synergistic antimicrobial activity and antioxidant activity of blend of essential oil contains fennel, coriander, ajowan and caraway." *IOSR Journal of Pharmacy and Biological Sciences* 9 (1):87-94.
- Nandagopal, S, D Dhanalakshmi, AG Kumar, and D Sujitha. 2012. "Phytochemical and antibacterial studies of fenugreek Trigonella foenum-graecum L.-A multipurpose medicinal plant." *J Pharm Res* 5 (1):413-415.
- Norziah, M, F Fezea, R Bhat, and M Ahmad. 2015. "Effect of extraction solvents on antioxidant and antimicrobial properties of fenugreek seeds (Trigonella foenum-graecum L.)." *International Food Research Journal* 22 (3):1261.
- Oraby, A, I Abd Aleem, H Abou Aly, A Abdel Azeiz, A El Sayed, and A El-Hadary. 2020. "Identification of an Antimicrobial Compound from Apium graveolens Seeds (Celery Seeds)." *Journal of Agricultural Chemistry and Biotechnology* 11 (7):219-222.
- Pillay, SR, A Roy, S Rajeshkumar, and T Lakshmi. 2019. "Antimicrobial activity of turmeric, cumin, and ginger oil on oral pathogens." *Drug Invention Today* 11 (5).
- Roby, MHH, MA Sarhan, KA-H Selim, and KI Khalel. 2013. "Antioxidant and antimicrobial activities of essential oil and extracts of fennel (Foeniculum vulgare L.) and chamomile (Matricaria chamomilla L.)." *Industrial crops and products* 44:437-445.

- Said-Al Ahl, HA, AM Sarhan, M Abou Dahab, E-SN Abou-Zeid, MS Ali, NY Naguib, and MA El-Bendary. 2015. "Essential oils of Anethum graveolens L.: Chemical composition and their antimicrobial activities at vegetative, flowering and fruiting stages of development." *Int. J. Plant Sci. Ecol* 1:98-102.
- Scazzocchio, F, L Mondì, MG Ammendolia, P Goldoni, A Comanducci, M Marazzato, MP Conte, F Rinaldi, ME Crestoni, and C Fraschetti. 2017. "Coriander (Coriandrum sativum) essential oil: effect on multidrug resistant Uropathogenic Escherichia coli." *Natural product communications* 12 (4):1934578X1701200438.
- Seidler-Łożykowska, K, B Kędzia, E Karpińska, and J Bocianowski. 2013. "Microbiological activity of caraway (Carum carvi L.) essential oil obtained from different origin." *Acta Scientiarum. Agronomy* 35 (4):495-500.
- Senthamil, L, YC VetriselviPM, and R Kumaresan. 2015. "Study on antibacterial activity of some medicinally important plants." *Journal of Chemical and Pharmaceutical Research* 7 (3):2520-2524.
- Shahat, AA, AY Ibrahim, SF Hendawy, EA Omer, FM Hammouda, FH Abdel-Rahman, and MA Saleh. 2011. "Chemical composition, antimicrobial and antioxidant activities of essential oils from organically cultivated fennel cultivars." *Molecules* 16 (2):1366-1377.
- Sharma, L, D Agarwal, S Saxena, H Kumar, M Kumar, J Verma, and B Singh. 2018. "Antibacterial and Antifungal activity of ajwain (Trachyspermum ammi) in different solvent." *Journal of Pharmacognosy and Phytochemistry* 7 (3):2672-2674.
- Sharma, V, P Singh, and A Rani. 2016. "Antimicrobial activity of Trigonella foenumgraecum L." *Fenugreek). Eur Exp Biol* 7 (1).
- Shokrian, T, NSA SADAT, GA Nematzadeh, and SM Alavi. 2016. "Evaluating Antibacterial Activity of In Vitro Culture of Ajwain (Trachyspermum copticum) Extract and Comparison with Seed Extract and Essential Oils."
- Singh, G, S Maurya, C Catalan, and M De Lampasona. 2004. "Chemical constituents, antifungal and antioxidative effects of ajwain essential oil and its acetone extract." *Journal of agricultural and food chemistry* 52 (11):3292-3296.
- Singh, G, S Maurya, M DeLampasona, and C Catalan. 2006. "Chemical constituents, antimicrobial investigations and antioxidative potential of volatile oil and acetone extract of star anise fruits." *Journal of the Science of Food and Agriculture* 86 (1):111-121.

- Tian, J, X Ban, H Zeng, J He, Y Chen, and Y Wang. 2012. "The mechanism of antifungal action of essential oil from dill (Anethum graveolens L.) on Aspergillus flavus." *PloS one* 7 (1):e30147.
- Umar, S, MT Munir, S Subhan, T Azam, Q Nisa, MI Khan, W Umar, Z Rehman, AS Saqib, and MA Shah. 2016. "Protective and antiviral activities of Nigella sativa against avian influenza (H9N2) in turkeys." *Journal of the Saudi Society of Agricultural Sciences* 10.
- Walli, RR, RA Al-Musrati, HM Eshtewi, and FM Sherif. 2015. "Screening of antimicrobial activity of fenugreek seeds." *Pharm Pharmacol Int J* 2 (4):1-4.

IAAHAS/LP/2023/002

Impact of Antibiotic Use for Animal Production

Jinu Manoj[1], and Manoj Kumar Singh[2]

[1]Disease Investigation officer, College Central Laboratory Lala Lajpat Rai University of Veterinary & Animal Sciences, Hisar-125004, Haryana

[2]Assistant Professor, Department of Livestock Production Management, College of Veterinary and Animal Sciences, SVPUAT, Meerut- 250110, U.P

Introduction

Antibiotics are substances produced by microorganisms that selectively inhibit or kill the growth of other microorganisms. Antimicrobial growth promoters like antibiotics are applied to selectively kill intestinal bacteria and alter the intestinal microbiota of animals in subtherapeutic doses. These increase the animal performance by lowering bacterial and host competition for nutrients. Antimicrobial resistance (AMR) is a phenomenon of natural evolution. However, the indiscriminate use of antibiotics, improper dose and regime of the antibiotics, poor hygienic and sanitary measures and poor infection control practises all contribute to AMR.

Antibiotic resistance is one of the most important public health threats of the 21st century (WHO, 2014). Globally, an estimated 700,000 deaths are attributable to resistant pathogens each year and by 2050, an estimated 300 million premature deaths per year globally will be attributable to antimicrobial

resistance, with a cumulative economic cost of US$100 trillion (The Review on Antimicrobial Resistance, 2014). This is mainly because of the over use of antimicrobials in human, veterinary, agriculture and aquaculture profession. Between 2000 and 2010, worldwide consumption of antibiotics by humans increased by 36% in BRICS countries and 23% of the increase in the retail sales volume was attributable to India. Worldwide consumption of antibiotics in animals is estimated to rise from 63,151 tons in 2010 to 105,596 tons in 2030. By 2030, consumption is expected to be double as the population increases by 13%. Antibiotic purchases and prescriptions for viral or non-bacterial infections also contribute to AMR.

The use of antimicrobials for disease treatment, prevention and control in both domestic and non-domestic animals also contribute significantly to the issue. Additionally, antibiotics are widely used as growth promoters in aquaculture and for promoting the faster growth of livestock in agriculture. AMR and MDR will remain an on-going problem even with the development of new chemotherapeutic/antimicrobial agents. Therefore, it is important to find out the ways to control and reduce the spread of such pathogens in animal, humans, aquaculture and environment.

Mechanism of AMR

Bacterial species gain antibiotic resistance through several mechanisms such as

(1) Pathogens prevents the antimicrobial agent to reach its target site by reducing its ability to penetrate into the cell
(2) Expulsion of the antimicrobial agents from the cell via general or specific efflux pumps
(3) By inactivation/destroy of antimicrobial agents
(4) By modifying the antimicrobial agents
(5) By modifying the target sites within the bacteria

AMR in Veterinary Sector

As the global demand for animal protein is increasing day by day, antibiotics are extensively used to raise food-producing animals in intensive production system, mostly to promote growth. An estimated 80% of all antibiotics consumed by the United States were used in food animals. Global antibiotic consumption in livestock was conservatively estimated as 63,200 tons in 2010, accounting for nearly two-thirds of the estimated 100,000 tons of antibiotics produced annually worldwide. By 2030, consumption is projected to rise by two-thirds to 105,600 tons. Two thirds of the increase is due to increase in the number of animals, and the remaining one third is due to the

shift from extensive to intensive farming. Agricultural use of antibiotics can be categorized as therapeutic use, prophylactic use for disease prevention, metaphylactic use for infection control and as animal growth promoters. Use of same class of antibiotics for humans and for food-producing animals increase the emergence of resistant pathogens. Most commonly used antibiotics in animals include tetracycline as growth promoters and therapeutics in cattle, beta-lactams, cephalosporin and macrolides for disease treatment and growth enhancement and peptidomimetics as growth promoters in poultry. Since 1980, several feed formulations containing antibiotic were licensed for use in food producing animals. Many such feed formulations are used in India especially in livestock and poultry sector. This results in excretion of large amounts of active antibiotics and their metabolites through feces, milk, meat and their products. There were several reports of antibiotic residues in foods of animal and poultry origin from all over the globe including India. These antibiotic residues then enter into human and animal gut, soil, water and environment and affect the natural microbiota. The antimicrobial resistance genes then easily transmitted through mobile genetic elements like plasmids and transposon to unexposed groups of organism. Use of animal manure as a fertiliser also contributes to this antibiotic pollution as well as potentially resistant bacteria. Furthermore, the nutrients present in the manure stimulate microbial growth and horizontal gene transfer between the different species present. Use of antibiotics such as sulfadimethoxine, ormetoprim, and oxytetracycline in aquaculture also contributed antibiotic pollution. However, fish do not metabolise antibiotic drugs effectively and so excrete them in their active form into the environment which results into development of AMR among the microbes.

Bacterial species associated with food producing animals are *Campylobacter jejuni, Salmonella enterica, Typhimurium DT104, E. coli* O157:H7, *Listeria monocytogenes, Aeromonas,* and *Clostridium* spp. while *Salmonella* and *Vibrio* are associated with aquaculture. The use of fluoroquinolones particularly ciprofloxacin in poultry production since 1995 led to the emergence of ciprofloxacin resistant *Campylobacter,* which was subsequently detected in the breast meat of sacrificed animals. The antibiotic avoparcin which is used as growth promoter in livestock is believed to also promote vancomycin resistance. A paper published in 2008 showed that vancomycin-resistant *E. faecium* was still highly prevalent in poultry in Europe. Some in *vivo* transfer studies indicated that *vanA* gene was located in transposon Tn1546 and may be transferred between animal and human adapted enterococci. The *vanM* gene was also located in transferable element

and could transfer by conjugation. Similar strains of VRE have been isolated from both farm animal and human, indicating that some of those strains may adapt to farm animals and cause infectious diseases in humans. Amoxycillin+sulbactam, ceftriaxone, enrofloxacin, gentamicin, Ceftiofur and cefquinome are exclusively used as veterinary medicines for the treatment of mastitis caused by *Staphylococcus aureus*, with ceftiofur also used prophylactically in piglets to prevent arthritis, meningitis, septicemia, and diarrhea. The use of cephalosporins has resulted in the emergence of ESBL producing *E. coli* which is transmissible to human hosts via contaminated food and water. Colistin also known as polymyxin E is used for the treatment of MDR gram negative pathogens especially for the carbapenemase producing *Enterobacteria ceaesince* the 1990s. Colistin was banned from human use in the 1970s due to its nephrotoxic effect on the kidneys but remained in use asprophylactic and as a growth promoter in pigs. Resistance to colistin has now emerged in *Klebsiella pneumonia*, an important human pathogen that causes hospital-acquired and community acquired infections.

Chickens can be reservoirs for several food-borne pathogens besides *Campylobacter*. Transmission of *Campylobacter* to human beings occurs mainly through contaminated foods of animal origin, particularly raw or undercooked poultry meat, unpasteurized milk and dairy products. Therefore, chicken is considered as the primary source of infection to human with a very low dose of infection i.e. 500 organisms. Once infected, it will be well adopted by the intestinal tract. The two predominant species, particularly *Campylobacter jejuni* and *Campylobacter coli* are major cause of foodborne bacterial gastroenteritis in humans. Antimicrobial resistance in bacteria isolated from slaughtered and retail chickens, as well as free-ranging chickens has been reported in several publications. There are several reports worldwide describing fluoroquinolone-resistant *Campylobacter* infections in humans. TheFQ-resistant *Campylobacter* population could eventually colonize into intestinal tract of birds and may be transmitted to human via the contaminated poultry meat.

Methods to Reduce AMR

Administration of low doses (5–40 mg/kg. feed) of antimicrobial growth-promoters in animal feed were banned by Europe (EU) in 2006 to protect public health, and this ban drew a great attention of other countries and international organizations since this low dose drug exposure over a long period of time could elicit selective pressure leading to the emergence of resistant bacteria. In many countries including India, this ban has not been implemented where antibiotics are continually and extensively used for

agricultural purposes. Furthermore, the use of quinolones for aquaculture was banned in several industrialized countries, as AMR to one type of quinolone typically results in resistance to all members of this class of antibiotics. Reduction in antibiotic consumption in both agriculture and aquaculture sector will help to reduce the number of AMR bacteria in the environment. Though the development of new antibiotics are challenging but there is a need for development of antibiotic agents particularly effective against AMR and MDR strains. Research at present is ongoing assessing the potential for nanomaterials such as titania dioxide (TiO2) and graphene oxide (GO) as antimicrobial surface coatings. Bacteriophages as antibacterial agents are also a possibility as phage's causes specific bacterial cell death while not affecting the animal host. In our opinion, development of herbal preparations against resistance pathogens will be more meaningful than the synthetic antibiotics. Besides these, the optimum and appropriate use of antibiotic is very much essential. The most important thing is to protect our self, our livestock and our environment through proper sanitation and hygiene. Surveillance of antimicrobial resistance is also equally important to combat the AMR problem.

Antimicrobial resistance surveillance is one of the pillars of the World Health Organization's (WHO) 2015 global action plan on AMR. AMR is also prioritized under the Global Health Security Agenda (GHSA), and India is one of the contributing countries. Antimicrobial resistance (AMR) surveillance system keep vigilant on microbial population dynamics, allows the early detection of resistant strains of public health importance, and supports the swift warning and investigation of outbreaks. The findings AMR surveillance is required to advise clinical therapy decisions, to guide policy recommendations, and to assess the impact of resistance containment interventions. Antimicrobial resistance surveillance is enhanced when linked to monitoring of antimicrobial use practices. The AMR surveillance studies is critical for establishing trends in antimicrobial resistance pattern of pathogens and for identifying emerging pathogens at the national and global levels. The information assists in the development of targeted approaches to control antimicrobial resistance. The surveillance data concerning variations in trends among different countries, regions, and local facilities (e.g., hospitals and nursing homes) can help to guide treatment decisions so that clinicians may avoid initiating inappropriate antimicrobial therapy. The routine antimicrobial surveillance is an important tool for nations, regions, and local facilities, since it is essential to ensure accurate information to establish and modify treatment guidelines and to assist in the prescription of appropriate empirical antimicrobial therapy.

WHO emphasis the establishment of effective, epidemiologically sound surveillance of antimicrobial use and AMR among common pathogens in the community, hospitals and other health-care facilities as one of the key public health priorities. Global programmes that monitor resistance in *Mycobacterium tuberculosis* and *Neisseria gonorrhoeae* have been in place for many years. In addition, regional surveillance programmes have been monitoring resistance in selected geographical areas, such as the Central Asian and Eastern European Surveillance of Antimicrobial Resistance (CAESAR), the European Antimicrobial Resistance Surveillance Network (EARS-Net) and the Latin American Antimicrobial Resistance Surveillance Network (ReLAVRA).

Several national and international surveillance programmes have been initiated all over the world. International surveillance programme includes Global Antimicrobial Resistance Surveillance System (GLASS), NNIS System/National Healthcare Safety Network (NHSN), Alexander Project, Hospitals in Europe Link for Infection Control through Surveillance (HELICS), Tracking Resistance in the United States Today (TRUST), SENTRY Antimicrobial Surveillance Program, Meropenem Yearly Susceptibility Test Information Collection (MYSTIC) Program, European Antimicrobial Resistance Surveillance System (EARSS), Prospective Resistant Organism Tracking and Epidemiology for the Ketolide Telithromycin (PROTEKT), ECO·SENS Project, Surveillance of Antimicrobial Use and Antimicrobial Resistance in ICUs (SARI), Gonococcal Antimicrobial Surveillance Programme (GASP), European Surveillance of Antimicrobial Consumption Network (ESAC-Net) and European Antimicrobial Resistance Surveillance Network (EARS-Net). Government of India also initiated Indian Network for Surveillance of Antimicrobial Resistance (INSAR), Antimicrobial Resistance Surveillance Research Network (AMRSN), National Action Plan on Antimicrobial Resistance (NAP-AMR), Indian Network for Fishery and Animals Antimicrobial Resistance (INFAAR), National Programme on Containment of Antimicrobial Resistance programmes to combat AMR. Political agendas, legislation, development of therapies and educational initiatives are essential to mitigate the increasing rate of antibiotic resistance. Prescribers, policymakers and researchers are charged with the complex task of mitigating antibiotic resistance in an era when new treatments for bacterial infections are limited. More infections caused by resistant microorganisms fail to respond to conventional treatment, and even last-resort antibiotics. In addition, industry pipelines for the development of novel antibiotics have run dry over the past few decades. A recent World Health Day by the WHO with the theme “Combat drug resistance: no action today means no cure tomorrow” triggered an increase in research activity, and several

promising strategies have been developed to restore treatment options against infections by resistant bacterial pathogens.

A growing concern

The WHO estimates that in 2011, out of the total 12 million TB cases worldwide, 630,000 were MDR. Extensively drug resistant TB has been identified in 84 countries. The disease was found to be treatable before 2005, now difficult. Further, dense human population and close contact with animals may also favors the transmission of AMR-TB as well as other pathogens. Immediately after rainy season in India, cases of malaria and dengue have been reported from all parts of India especially Northern, Southern, central and Western India. Malarial parasites now gaining resistance to chloroquine and sulfadoxine pyrimethamine. *Plasmodium falciparum* resistance to artemisin derivatives is already knocking on the doors in South East Asia. In India it is estimated that, drug resistant infections are responsible for 58,000 neonatal sepsis deaths. Antimicrobial resistant bacteria of animal origin can be transmitted to humans through the environment and food products and to agricultural workers by direct contact with the animals. The recent worldwide estimate of global antibiotic resistance published by the World Health Organization (WHO) in 2014, listed *E. coli, K. pneumoniae,* and *S. aureus* as the three agents of greatest concern, associated with both hospital and community acquired infections. *Shigella* is showing a widespread resistance to Ciprofloxacin, the only antibiotic currently recommended by WHO for treating infections by it. Carbapenem resistant metallo beta-lactamse, known as the New Delhi superbug, was detected in December 2009 in a Swedish patient in India, now reported from many other countries. Apart from these, vancomycin resistant Enterococci (VRE), Extended-Spectrum Beta-Lactamase (ESBL) producing *Enterobacteriaceae*, MDR *Pseudomonas, Shigella, Vibrio* and *Acinetobacter*, antifungal resistant fungi and antiviral resistant viruses are playing havoc in treatment facilities around the world, causing several deaths and economic burden. Operations and treatment of burns and extensive wound/injuries are now difficult due to infectious MDR organism. Pathogenic microbial biofilm is also considered to be a worldwide challenge due to the inherent antibiotic resistance conferred by its lifestyle. Biofilms containing extracellular DNA can be an easiest source of infections when they grow in medical devices. Bacterial biofilms, resistant to antibiotics, disinfectant chemicals and to phagocytosis are present in several places including Indian kitchens. It is known, for example, that the persistence of staphylococcal infections in udder is due to biofilm formation. In addition, *S. aureus* expresses several virulence factors such as toxins, enzymes, adhesins, and other surface

proteins that allow it to survive under extreme conditions. Community-associated methicillin-resistant *S. aureus* (CA-MRSA) and Livestock Associated (LA-MRSA) are growing problems. *Acinetobacter baumannii*, a Gram-negative, opportunistic pathogen can form biofilm and increasing resistance to antibiotic agents presents challenges for infection control.

Activities at national level

There are wide ranges of challenges to reduce the occurrence of Antimicrobial resistance in India despite the National Policy for Containment of Antimicrobial Resistance in India. However, "Jaipur Declaration on Anti Microbial Resistance e 2011" is witness for reduction in antimicrobial use. There were several approaches to combat the AMR in India.

1. Control / regulations over the counter sale of antimicrobials, their inappropriate use in agriculture, aquaculture and human sector.
2. Development of SOP / standard treatment guidelines for common infectious diseases
3. Awareness about impact of AMR on human and animal health to the public through social media, pamphlets, radio-talk, extension activities.
4. Maintain personal hygiene by nutritious and adequate diet, regular exercise, yoga, meditation, tobacco and alcohol banned, avoid junk foods and regular consumption of fruits will help for personal protection by improving immunity and health.
5. Cleanliness of house, kitchen, surrounding and our environment. Effective public health measures such as improved hygiene and sanitation, improving immunization coverage, rapid outbreak response, promoting AYUSH and other holistic systems of healing will reduce reliance on antimicrobials and break the chain of transmission of resistant microbes.
6. Continuous surveillance of AMR pathogens for monitoring resistance in human, animals and aquaculture is necessary.

Conclusion

When antimicrobials are used heavily to prevent disease and promote growth, it may be favourable for the spread of organisms with elevated levels of resistance. Antibiotic prophylaxis at key junctures during the rearing period is frequently used to control bacterial diseases in animals. It would be ideal to determine each country's disease burden for each pathogen and if necessary, implement prophylactic vaccination. Recent years have seen an increase in research into the potential benefits of using botanicals to treat infectious infections in animals. Restricting the access of antimicrobials in animal production, which are thought to be crucial for human medicine, would be a part of advisable practises. The strategies like teaching good farming practises,

limiting the availability of antibiotics and gathering knowledge on the AMR profile of animal pathogens can promote the biosecurity in the livestock industry and the impact of AMR on human health.

IAAHAS/LP/2023/003

Extending Shelf-life of Indian Sweets (Burfi and Gulab Jamun) Using Herbs, Soy, and Oat Flour

Shrinka[1], BK Yadav[2*], Rishabh Thakur[2]

[1]Doon P.G. College of Agriculture Science and Technology, Shri Dev Suman Uttarakhand University, Badshahithaul, Tehri (Garhwal), Uttarakhand-249199, India

[2]National Institute of Food Technology, Entrepreneurship and Management – Thanjavur, (NIFTEM-T) Formerly Indian Institute of Food Processing Technology, LO-Bathinda- 151001 (Punjab), India

1. Introduction

In India, sweets hold a special value and are consumed widely almost on each and every occasion. Sweets ssignify joy, happiness, and most importantly a token of love to fellow beings. Sweets are offered to express gratitude, respect, and play a means to acknowledge presence of loved ones. Different types of sweets are popular throughout the country or are region-specific. Gulab Jamun, Rasgulla, Rabri, Sandesh, Kaju Katli, Ladoo, Burfi, Mysore Pak, Rasmalai and Ghevar etc. are most widely consumed sweets. Among them Gulab Jamun and Burfi are placed among top 10 most popular sweets and are consumed throughout the country. Lower shelf-life, microbial contamination, and poor nutritional characteristics are the major concern. At different stages such as during production, packaging and storage, low hygiene practices may favour the growth of various microorganisms which causes early deterioration of the product. Apart from these many other biotic and abiotic factors (temperature, air humidity or light) can also leads to the degradation of some quality aspects of sweets. Researchers have made many efforts to increase shelf-life of sweets by utilizing numerous chemical preservatives and packaging solutions. However, addition of these chemicals badly affects the health of the consumer. Excessive packaging also contributes to extra cost and leave environmental footprint. Nowadays consumer has become smart and demand for products which contains minimal chemicals. In an survey about the parameters considered before purchase/consumption of the sweets by the consumers were focused 25% each on health benefits, quality, taste and price of the sweets (Fig. 1). This shift in behaviour of consumers has lead researchers think more consciously to find some alternatives for extension of shelf-life of sweets. Herb extracts are known to possess antimicrobial, anti-inflammatory, and anti-oxidant properties in addition to basis physicochemical effect they have. Herbs extract such as cardamom also improves the taste of the product

and find wide application in food industry. Refined flour a major ingredient of many sweets is not good for health but is used widely. There is always a scope to find an alternative or reduce the level of it by replacing with some other nutritional ingredient. Whole cereals, legumes, millet, and pseudocereal are nutritionally rich and has been used as a substitute to refined flour either fully or partially. Soy flour is rich source of protein, fiber, minerals like Calcium, Phosphorous, and Vitamins (A, B, C, and D). Oat (*Avena sativa* L.) is another unique starchy grain and widely cultivatable all over the world. Oat contains high amounts of protein (12-16 %), fat (5-9%), carbohydrate (66-70%), fiber (11%), ash, and β-glucan. If replacement of refined flour is not feasible one can supplement the product with such flours. In present study a survey was undertaken to know the shelf-life of Burfi and Gulab Jamun available at local shops in Bathinda region of Punjab during different seasons. In survey shelf-life of Burfi and Gulab Jamun in summers (refrigerated and non-refrigerated), winters, and rainy season was evaluated. On the basis of survey attempts were made to incorporate herb extracts, soy/oat flour to improve shelf-life of the selected sweets and impart some nutritional characteristics. Overall objective was to develop formulation for making Gulab jamun and Burfi using nutritious grain, herbs/spices in order to improve health benefits and added advantage of extending shelf-life. Specific objective of the study include:

- Survey of local vendors in Bathinda, Punjab to determine the shelf-life of loose selling Gulab Jamun and Burfi
- Application of herb extracts, soy flour, and oat flour for improving nutrition profile and extending the shelf-life
- Development of package and practice to optimize shelf-life of loose selling sweets

2. Indian sweets market and consumer preference

Based on fruits, dairy, pulses and cereals or different combinations of different ingredients, the traditional Indian sweets, boast of a nearly inconceivable range. India has very large sweets market which can be divided into organized (packaged) and unorganized sectors (loose sweets). Majority (90%) of the Indian sweets market is unorganized with INR 533 Billion market value and only 10% is organized. On the basis of type of sweet, 28% sweets are milk based, 17% are dry fruit based, 21% is soan papdi and 34% are *miscellaneous* sweets. Consumption of sweets is also region-specific with major contribution of Northern region (35%) followed by Eastern (28%), Western (24%), and Southern region (13%).

Fig. 1 Consumer preference when choosing sweets

3. Methodology

The amount of addition of herbs was decided based on literature and keeping in view the sensory attributes of the product. A synergistic approach was employed involving use of herb extract in combination. The proximate composition was estimated using standard AOAC method (AOAC, 2002) and % DPPH was measure using Bandoniene et al. (2002). The overall acceptability of prepared samples was evaluated using 9-point hedonic scale. Steps involved in preparation of Burfi and Gulab jamun are as:

Herb incorporated Burfi

Buffalo/cow milk (6% fat;9% SNF) → filtration of milk→ heating of milk until boiling→ preparation of khoya+ addition of herb extract→addition of sugar (7%)→heating till solid mass obtained→spread for setting & cut into desire shape→packaging and storage

Gulab jamun

Filtration and heat until boiling→preparation of khoya (same as for burfi) → preparation of dough (refined flour and other ingredients addition including 3.3% soy flour and 10% oat flour) → portioning & formation of dough balls→deep fat frying (140-160 ^{0}C) →soaking into sugar syrup (addition of basil extract)→ packaging and storage.

4. Result and discussion

4.1 Survey of local vendors regarding shelf-life of loose selling Burfi and Gulab Jamun

The survey revealed that shelf-life of Burfi and Gulab Jamun during summers under non-refrigeration condition was 5.83±0.69 and 5.0±0.58 days and in refrigeration (10±2°C) it was 9.33±0.74and 8.0±1.15 days, respectively.

In rainy season sweets reported a shelf-life of 4.8±0.4 and 4.2±0.74 days and in winter it was 9.2±0.74 and 8.0±0.9 days, respectively for Burfi and Gulab jamun. The vendors were also asked about their knowledge regarding preservatives. Most of the vendors were unaware of preservatives and some were hesitating and didn't disclose name and quantity of preservative they add.

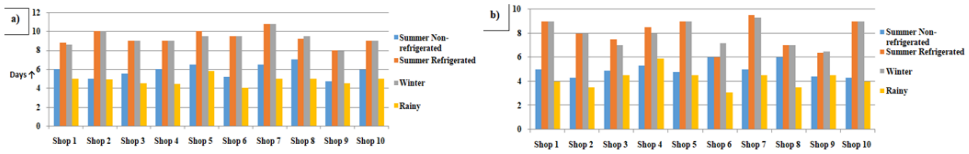


Fig. 2 a) Shelf-life of Burfi and **b)** Gulab jamun based on survey conducted

4.2 Physicochemical analysis of Burfi and Gulab jamun samples

The prepared sample showed good overall acceptability in terms of taste, colour, texture and flavour evaluated using 9-point hedonic scale. There was substantial increase in protein, fat, ash, and antioxidant activity in herb incorporated Burfi and Gulab jamuns. The percentage change in physicochemical properties of control (without herb extract & soy/oat flour) and sample made in combination to observe synergistic effect are presented in Table 1 and Table 2.

Table 1 Proximate composition of Burfi

Parameter (%)	Control	Herb extract incorporated Burfi				
		Turmeric (500 mg/Kg)	Black pepper (20 mg/Kg)	Cardamom (500 mg/Kg)	Ginger (1g/Kg)	Turmeric+ black pepper+ cardamom+ ginger
Moisture	16.01±0.18	16.26±0.25	16.07±0.34	16.09±0.70	16.0±0.69	16.04±0.74
Crude Ash	2.48±0.22	2.67±0.11	2.51±0.23	2.69±0.15	2.56±0.11	2.90±0.41
Crude Fat	17.10±0.09	17.21±0.24	17.13±0.24	17.27±0.17	17.14±0.64	17.44±0.15
Crude Protein	13.42±0.13	13.57±0.17	13.44±0.04	13.71±0.30	13.47±0.08	13.93±0.08
Antioxidant (% DPPH)	4.61±0.07	19.85±0.31	7.21±0.11	8.63±0.09	9.51±0.17	11.45±0.11

Table 2 Proximate composition of Gulab jamun

Parameter (%)	Control	Herb extract incorporated Gulab Jamun			
		Soy flour (3.3%)	Oat flour (10%)	Basil extract (0.25 mg/Kg)	Soy/oat flour+ Basil extract
Moisture	28.87±0.30	26.68±0.33	28.7±0.36	28.84±0.29	28.91±0.36
Crude Ash	1.06±0.9	1.31±0.07	1.29±0.07	1.07±0.08	1.32±0.03
Crude Fat	11.26±0.22	11.80±0.05	11.33±0.21	11.27±0.20	12.14±0.32
Crude Protein	9.08±0.17	9.61±0.08	9.66±0.11	9.10±0.03	10.35±0.13
Antioxidant (% DPPH)	5.22±0.10	15.62±0.13	14.10±0.19	18.95±0.27	19.12±0.32

5. Summary and conclusions

Burfi is being sold by the vendor on an average 4.8 days in rainy season to 9.28 days in winter under non-refrigerated condition. It is sold up to 9.33 days under refrigerated condition. Gulab jamun is being sold by the vendor on an average of 4 days in rainy season to 8 days in winter. It is being sold for 8 days in refrigerated condition. The study revealed that nutritional profile of the Burfi and Gulab jamun can be improved adding flour of nutritionally rich grains and herb extracts. It was observed that adding a small amount of turmeric (500 mg/kg) can increase more than double the antioxidant properties of the burfi as compared to control. The corresponding increase in the gulab jamun was witnessed more than 3 times. The shelf-life of optimized burfi increased from 8 to 12 days with the addition of the herb/spices. The shelf-life of the gulab jamun increased from maximum 8 days to 11 days under ambient condition. The work is still progressing with microbial study and micronutrients improvement in the products.

IAAHAS/LP/2023/004

Aquaritin 19: Nano-Silica based smart delivery vehicle for sustained release of Nano nutrients for Turf Health

Pawan Kaur*, Michi Suniya and Sunil Nanda
Bio-Nanotechnology Research Centre (Excellence in water quality and Turf Health),
J S Aquaritin Global Company Pvt Ltd., Gurgaon, India-122002

Introduction

We are an avantgarde Nano-Biotech Company located in Gurgaon, India. Our expertise is designing, developing and manufacturing advanced nanoscale nutrient formulations and bionanofungicides for agriculture and turf. We manufacture our products under the brand name 'Aquaritin'. We primarily export 87 % our products to the US, UK, and Europe. In India we are supplying to Delhi Golf Course, Airforce G C, Gurgaon, Karma Lakeland, Puna GC, Pune, Willingdon GC Mumbai etc.

We primarily supply to 700 Golf Courses that are 1) challenged by high incidences of pests and disease, 2) aim to reduce the use of fungicides and pesticides and 3) want to improve turf quality. On the retail side, we have over 15,000 customers globally.

Our headquarter is located in Gurgaon, Haryana, India. But we have representative offices in Africa, Australia, Indonesia, Malaysia, UK and USA. Nearly 60%of our business is based on the export of our product to various countries across the globe. Our product is employed by Golf courses, Farms and even in various Government based projects throughout the world. The efficacy and merit of our products is recognized worldwide. We export our manufactured products to USA, Australia, Singapore, Malaysia, Thailand, Indonesia, Canada and Africa.

1.1 What is Aquaritin?

Aquaritin is an advanced Nano- scale formulation which combines a balanced mix of Micro and Macro nutrients along with the power of Silica. It is a breakthrough range of products that deliver amazing results in Agriculture and Turf health. It helps in revival of sick crops, reduces pests and diseases significantly, reduces water usage, improves soil quality and mitigates impact of climate change especially drought like conditions.

Aquaritin 19 is a 4th Generation Nanotech advanced Nano scale foliar spray which combines a balanced mix of 10 nutrients in a single formulation. It contains primary nutrient (N, P, K); Secondary nutrient (Ca, Mg); Micro nutrients (Fe, Zn, B,Mo) in addition to Silica. The particles are between 1 and 30 nano meters in size and each nutrient is adsorbed on to a silica molecule preventing them from bonding with each other, water, or the atmosphere. Due to its fine particle size, the nutrients are absorbed through by the plant, delivering all the nutrients essential for an efficient photosynthesis directly on the leaf. The combination of all the 10 nutrients in Nano scale increases the plant efficiency to absorb the nutrients by 40 times as compared to the chelated conventional fertilizers available on the nutrient.

1.2 Aquaritin for Turf Management

Aquaritin contains both Macro and Micro nutrients in a single formulation that can be made easily accessible to the turf through fertigation. Turf Grass, like any other living organisms, require the concurrence of different elements both to synthesize their cell constituents and adequate metabolism. Nutrients-crosstalk occurs when a nutrient interacts simultaneously with more than one nutrient. Upon addition of two nutrients, there is an increase in yield in comparison with adding only one, a positive (synergistic) interaction. For example, Boron plays a role in the calcium and phosphorus utilization. In other cases, a scarce element can be substituted by another element of similar characteristics i.e., size and charge. In staggered nutrient delivery, the deficiency symptoms of one nutrient can be misinterpreted as well. Also, there can be an increase in one nutrient concentration which will ultimately result in the reduced bioavailability of other nutrients. Even in the perfect environmental growing conditions, perfect water, temperature, sunlight, and carbon dioxide, if the plant does not have required nutrients, photosynthesis will slow down. Chlorophyll levels can often be increased by making sure that plants have adequate levels of magnesium, iron, and nitrogen. If K or Mg is not present in sufficient quantities in photosynthetic tissues, complex interactions of anatomical, physiological and biochemical responses result in a reduction of photosynthetic carbon assimilation. Aquaritin boosts Photosynthesis efficiency leading to higher yields, promotes immediate and long-lasting colour response. In crops, we have recorded an increase of PE from 6% to 12% after use of Aquaritin. It also reduces water consumption by at least 20% through reduction of transpiration loss.

1. Case Study: Royal Colombo Golf Club, Sri Lanka

The **Royal Colombo Golf Club** being the oldest golf club in Sri Lanka is home to the Sri Lanka Golf Union, the governing body of Golf in Sri Lanka and

maintains links with The Royal and Ancient Golf Club of St Andrews in Scotland. Established in 1880, it is located in the capital city of Colombo at The Ridgeway Links also known as the Anderson Golf Course (6°54′16.36″N79°52′56.2″E). The RCGC is total 18-hole, 6560-yard (6,000 m) par 71 golf course with Tifeagle Grass on their greens and Cow Grass on the fairways.

Being in coastal country, RCGC's Green are prone to various pest and fungal diseases which acts as a major constraint against the flourishing of the Golf Course itself. To this we introduced a 4th Generation Nano Tech Solution 'Aquaritin 19' (futuristically designed for Golf Course) containing Silica as an active ingredient with 9 essential nutrients. The Aquaritin 19 was trialled in practice Green starting from 28th January 2023 to 20th February by the Course Supervisor and turf quality was monitored every time while dosing. Based on the data obtained from the trail, JS Aquaritin Global Company Pvt. Ltd analysed the findings which is being stated in the following report.

2.1 Materials and Method

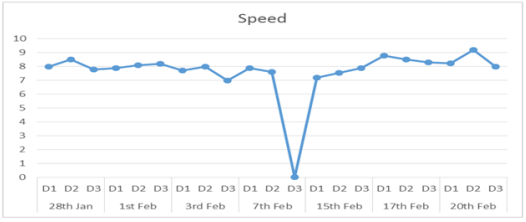
Practice Green having the *Tifeagle Grass* was selected for the Aquaritin 19 trial in RCGC. Dosing of Aquaritin 19, irrigation and management were handled by the Course Supervisor. Evaluation of speed from 3 different direction namely D1, D2 and D3 using *Stimp Meter* were conducted every day of dosing Aquaritin 19 by the Course Supervisor.

32 ml of Aquaritin 19 was diluted in 16 litres of Back mounted sprayer and dosed on Practice Green 8 times from 28th January 2023 to 20th February as an intensive dosing phase. Turf grasses were analysed by JS Aquaritin Global Company Pvt. Ltd using Turf Analyser software which smartly detects the density & uniformity of the Turf on the basis of photograph.

2.2 Results and Observations

On contrary to the Pre-Treatment observation, significant improvement was observed in the treated area in regards to the consistency of the speed, uniformity, density and reduction in earthworm casting.

Graph 1: *Speed Performance of Practice Green using Aquaritin 19*



As per the data obtained from the trial, the findings are given in Table 1.

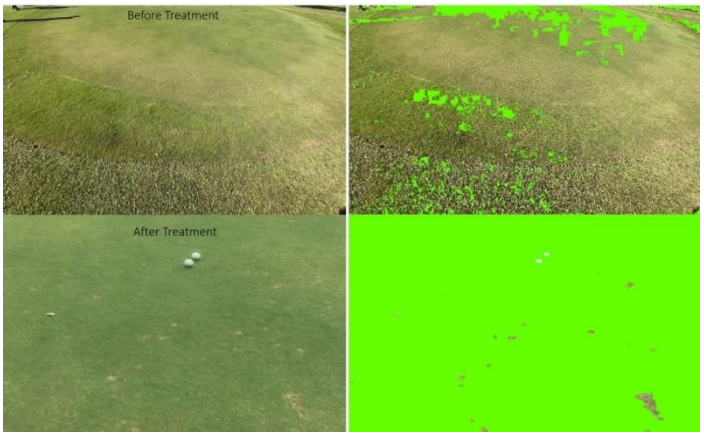
Table 1: *Effect of Aquaritin 19 on RCGC Practice Green*

Area	28th January		1st February		3rd February		7th February		13th February		15th February		17th February		20th February	
	Dose	Speed	Dose	Speed	Dose	Speed	Dose	Speed	Dose	Speed	Dose	Speed	Dose	Speed	Dose	Speed
D1	32 ml	8.0 cm	32 ml	7.9 cm	32 ml	7.7 cm	32 ml	7.9 cm	32 ml	-	32 ml	7.2 cm	32 ml	8.8 cm	32 ml	8.25 cm
D2		8.5 cm		8.1 cm		8 cm	16 ml	7.6 cm		-		7.55 cm		8.5 cm		9.2 cm
D3		7.8 cm		8.2 cm		7 cm		-		-		7.9 cm		8.3 cm		8 cm

In D1, 3.12% surge in speed was noticed in 22 days i.e., from 28th January - 20th February.

In D2, 8.2% surge in speed is noticed from 28th January to 20th February

In D3, 2.5% surge in speed is noticed in 22 days i.e., from 28th January to 20th February.



Pic 1: Pictures showing the uniformity of Greens post treatment with Aquaritin 19

Turf grasses were analyzed by JS using Turf Analyser software which smartly detects the density & uniformity of the Turf on the basis of image processing technology.

Conclusion

The purpose of the trial at RCGC was to determine the effect of Aquaritin 19 on the overall wellbeing of turf grasses. With the above case study, it is to conclude that application of Aquaritin 19 in various Green has shown significant improvement in terms of stress, Turf quality, uniformity, speed, pest & disease resistance by reducing the inputs like pesticides, fungicides, conventional fertilizers etc regardless of different terrains, climatic conditions, soil and water quality. The usage of Aquaritin 19 has proved to reduce the earthworm casting as well in the Royal Colombo Golf Course just after 8 applications of Aquaritin 19 alone.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/LP/2023/005

Potential Ameliorative Approaches of Heat Stress in Poultry Production

[1]Manoj Kumar Singh, [2]Jinu Manoj, [3]D.K. Singh, [4]Amit Kumar, [5]Ahmad Fahimand, [6]Mohit Bharadwaj, [7]Sachin Dongare and Anuj Kumar[8]

[1,5]Assistant Professor, [4]Professor and Head, [3]Professor, Department of Livestock Production Management, College of Veterinary and Animal Sciences, SVPUAT, Meerut- 250110, U.P

[2]Disease Investigation officer, [1]College Central Laboratory Lala Lajpat Rai University of Veterinary & Animal Sciences, Hisar-125004, Haryana

[6]Research scholar, Department of Animal Nutrition, G.B.Pant University of Agriculture & Technology, Pantnagar, Uttarakhand- 263145

[7]Research scholar, Department of Livestock Production Management, G.B. Pant University of Agriculture & Technology, Pantnagar, Uttarakhand- 263145

[8]Ph.D Scholar, Department of Livestock Production Management, COVAS, SVPUAT, Meerut, Uttar Pradesh

1. Introduction

The poultry industry is growing across the world to fulfill the increasing demands of poultry meat and eggs. Poultry meat contains a low amount of saturated fatty acids and is rich in protein, vitamins, and minerals. Similarly, poultry eggs are the most affordable source of animal protein. Besides
vitamins, minerals, and proteins, eggs are also rich in antioxidants such as lutein and zeaxanthin, which possess major benefits for eye health. To fulfill the demands, there has been an immense improvement in chicken genetics in the past decade. Improved broilers and laying hens have higher metabolicrates and production performances. Due to a higher metabolic rate, they produce more body heat and are prone to heat stress. High stocking density of birds, along with the high ambient temperature, increases the propensity of heat stress.

Heat stress is a major problem in the poultry industry affecting the health and performances of poultry. Heat stress resulted in high annual economic losses in the poultry industry, and with the rise of global temperature, this number is speculated to increase more in the coming years. Heat stress is a condition where chickens are unable to maintain a balance between body heat production and heat loss. Heat stress results from the interaction of different factors such as high environmental temperature,

humidity, radiant heat, and airspeed; among them, high ambient temperature plays a significant role. The normal body temperature of the chicken is around41–42 °C, and the thermoneutral temperature to maximize growth is between 18–21 °C. Environmental temperature higher than 25 °C elicits heat stress in poultry. Various physiological, neuroendocrine, and behavioral changes occur in poultry under heat stress, and potential mitigation strategies against heat stress in broiler chickens are:

2. Biological Changes in Poultry Due to Heat Stress

Heat stress in poultry results in several behavioral, physiological, and neuroendocrine changes that influence health and performances.

Behavioral changes	**Physiological changes**	**Neuroendocrine changes**	**Production changes**
Reduced feeding	Oxidative stress	Increased Corticotropin factor (CRF)	Increased mortality
Increased drinking	Acid-base imbalance	Increased Adrenocorticotropin hormone (ACTH)	Decreased feed intake
Panting	Respiratory alkalosis	Increased Catecholamine	Reduced FCR
Reduced movement	Increased H/L ratio	Increased Plasma cortisol	Reduced Body weight
Wing spreading	Altered cecal microbial profile	Decreased T_3, GnRH, FSH and LH	Decreased quality and quantity of egg and meat

2.1. Physiological Changes

Major physiological changes that take place in the heat-stressed birds are:

2.1.1. Oxidative Stress

Reactive oxygen species (ROS) are free radicals and peroxides produced typically within the cells during regular metabolism. They are essential for many cellular processes such as cytokine transcription, immunomodulation, and ion transportation. The excess ROS produced within cells are eliminated by physiological detoxifying mechanisms present within the cells. During the thermoneutral condition, activation of transcriptional factor Nrf2 causes the additional synthesis of a group of antioxidant molecules, which deals with increased ROS produced inside the cell. However, due to the imbalance between these systems, either by higher production of ROS or by a decrease in the effectiveness of the antioxidant defense system, the cells are exposed to stress conditions commonly known as oxidative stress. Excess free

radicals produced during oxidative stress damage all the components of the cells including proteins, lipids, and DNA. Effects of oxidative stress depend upon its severity and range from small reversible changes to apoptosis and cell death in the case of severe oxidative stress. The oxidative stress in poultry is associated with biological damage, severe health disorders, lower growth rates, and economic losses.

2.1.2. Acid-Base Imbalance

Birds lack sweat glands and have feathers throughout the body. Those features impair thermoregulation, and as a consequence, they need to release heat via active mechanism (i.e., panting) during higher ambient temperature. During panting, excretion of CO2 occurs at a greater rate than the cellular production of CO2, which alters the standard bicarbonate buffer system in the blood. The reduction of CO2 leads to a decrease in the concentration of carbonic acids (H2CO3) and hydrogen ions (H+). In contrast, the concentration of the bicarbonateions (HCO3-) is increased; thus, raising the blood pH, i.e., the blood becomes alkaline. To cope with this situation and maintain the normal blood pH, birds will start excreting more amount of HCO3- and retain H+ from the kidney. The elevated H+ alters the acid-base balance leading to respiratory alkalosis and metabolic acidosis and is associated with the decline in production performances of poultry.

2.1.3. Suppressed Immunocompetence

Heat stress is known to suppress immunity in the chicken. As a result, the prevalence of contagious and infectious poultry diseases, such as Newcastle disease (ND) and Gumboroo disease, is relatively higher during the summer season in tropical countries. Besides this, the size of immune-related organs such as the spleen, thymus, and lymphoid organs are regressed and level of antibodies was also lowered in heat-stressed birds.

2.2. Neuroendocrine Changes

The neuroendocrine system plays a crucial role in maintaining homeostasis and normal physiological functioning of birds during heat stress. In birds, the sympathoadrenal medullary (SAM) axisis activated and regulates homeostasis during the early stage of heat stress. The increase in ambient temperature is perceived by the sympathetic nerves, which transmit the impulse to the adrenal medulla. The adrenal medulla increases the secretion of catecholamines, which cause a surge of glucose release in the blood, deplete liver glycogen, reduce muscle glycogen, increase respiration rate, vasodilate the peripheral blood vessels, and increase neural sensitivity to cope with the

stress. As stress persists for a more extended period, the hypothalamic-pituitary-adrenal (HPA) axis is activated. In response to the stress, corticotrophin-releasing hormone (CRH) is secreted from the hypothalamus, which triggers the release of an adrenocorticotrophic hormone (ACTH) from thepituitary. ACTH increases the production and release of corticosteroid by the adrenal glands. Corticosteroid stimulates gluconeogenesis to increase plasma glucose levels. Thyroid hormones, triiodothyronine (T3) and thyroxine (T4), released by the thyroid gland, also play a critical role in maintaining metabolic rate. T3 concentrations were lowered in the heat-stressed birds, whereas T4 concentrations were found inconsistent. The reduction of T3 concentration during heat stress is due to a decrease in peripheral deiodination ofT4 to T3. There is also a difference in T3 secretion between selected breeds and native breeds. The plasma T3 levels in dwarfs (dw) chicken are usually less than half of the levels in selected breeds of chicken. Dwarf gene (dw) is found to inhibit the conversion of T4 to T3 in peripheral tissue, resulting ina lower T3 level in dwarfs. Lower level of T3 were also noticed in Naked neck laying hens as compared to Lohman white and New Hampshire laying hens. Besides this, the secretion of the gonadotrophin-releasing hormone is also found to be impaired in heat-stressed birds. Moreover, sex hormones such as plasma progesterone, testosterone, and estradiol were also found to be lowered in heat-stressed White Leghorns. These hormonal changes are responsible for reduced growth performance and reproductive efficiency of hyperthermic birds.

2.3. Behavioral Changes

When birds are exposed to a higher environmental temperature than their thermoneutral temperature, they try to dissipate excess heat produced inside the body, which is manifested by specific behavioral changes in birds. Chickens in the thermal stress condition spend less time walking and standing, consume less amount of feed and more water, spread wings, and cover their body surface in the litter. Furthermore, the characteristic signs of panting are also observed in heat-stressed birds. These major physiological, neuroendocrine, and behavioral changes lead to increased mortality, decreased feed intake, reduced final body weight, decreased quality of meat and eggs, and increased feed conversion ratio (FCR) in poultry. Thus, heat stress has been of paramount importance in the poultry industry considering global warming and economic losses. To cope with this problem, different strategies have been employed by researchers and farmers.

3. Potential Strategies to Mitigate Heat Stress in Poultry

Major strategies that have been used to mitigate the detrimental effects of heat stress in poultry are:

3.1. Feeding Strategies

3.1.1. Feed Restriction

Restricting the feed during the hotter period of the day has been a common practice in poultry production. In this practice, feed intake is reduced by withdrawing feed for a certain period (generally8 a.m. to 5 p.m.) to reduce the metabolic rate of birds. Feed restriction is found to reduce rectal temperature, minimize mortality and decrease abdominal fat in heat-stressed broilers. Restricting the availability of feed to 8 h a day during the hot periods in broilers improved feed efficiency and shortened tonic immobility; a measure to determine fearfulness in which birds are placed on its back for observing righting reflex. Similarly, in the case of broiler hens, limiting feed provision was found to reduce heat production by 23%. Yet, this approach is not widely used in the poultry industry, as it results in reduced growth rate and delayed marketing age of the birds.

3.1.2. Dual Feeding Regime

Practical observations have shown that feed restriction results in overcrowding and rush at are-feeding time resulting in some additional mortality. Thus, the dual feeding regime has been used to ensure birds have access to feed throughout the day. The thermic effects of proteins are higher than carbohydrates and produce higher metabolic heat. Taking this into account, the protein-rich diet is provided during cooler times and the energy-rich diet during the warmer period of the day. Providing a protein-rich diet from 4 p.m. to 9 a.m. and an energy-rich diet during the9 a.m. to 4 p.m. heat stress period was found to reduce the body temperature and mortality in the heat-stressed broilers. However, this approach could not enhance growth and feed efficiency in heat-stressed birds.

3.1.3. Wet Feeding

During heat stress, birds lose a high amount of water through the respiratory tract, and there is a marked increase in water intake to restore thermoregulatory balance. Adding water in the feed helps increase water intake and reduces viscosity in the gut resulting in the faster passage of the feed. Wet feeding stimulates pre-digestion, improves absorption of the nutrients from the gut, and accelerates the action of the digestive enzyme on the feed. In broilers, wet feeding improved the feed intake, body weight, and weight of the GI tract. In laying hens, feeding of wet feed during the high

temperature increased dry matter intake, egg weight, and egg production. Although this approach was found to have beneficial effects in heat-stressed birds, it is less common among poultry farmers, as there is a risk of fungal growth in the feed causing mycotoxicosis in the birds.

3.1.4. Adding Fat in the Diet

Higher energy diets were effective in partially mitigating the effects of heat stress in poultry. During metabolism, fat produces lower heat increment as compared to protein and carbohydrates. Considering this fact, supplementation of fat in the diet has been a general practice in the hot climatic regions to increase the energy level and diminish the detrimental effects of heat stress. Supplementation of fat in the poultry diet not only helps to increase the nutrient utilization in the GI tract by lowering the rate of food passage but also helps to increase the energy value of the other feed constituents. Adding fat at the level of 5% to the diet in heat-stressed laying hens was found to increase feed intake by 17%. Similarly, significant improvement in the broiler performance was observed when the5% fat diet was provided. Increasing the oil supplementation in the higher protein concentration diet relieved the negative effects of chronic heat stress on broiler performance, meat lipids, and physiological and immunological traits. In addition to these benefits, adding fat significantly increased abdominal fat in heat-stressed broilers.

3.1.5. Supplementation of Vitamins, Minerals, and Electrolytes

Vitamin E

Vitamin E (alpha-tocopherol) is a fat-soluble vitamin that has antioxidant activity and helps to scavenge free radicals produced inside the cell. Vitamin E is found to modulate inflammatory signaling, regulate the production of prostaglandins, cytokines, and leukotrienes, and also improve the phagocytic activity of macrophages in birds. Furthermore, Vitamin E also helps to improve immunity by inducing proliferation of lymphocytes. Dietary supplementation of vitamin E in heat-stressed laying hens is found to improve egg production, egg weight, eggshell thickness, egg specific gravity, and Haugh unit. Dietary supplementation of 250 mg vitamin E/kg of feed is optimum for alleviating adverse effects of chronic heat stress in laying hens. The liver is an essential organ for egg formation as it helps in the synthesis and release of egg yolk protein-vitellogenin. Vitamin E helps to improve the egg production by preventing liver damage in the heat-stressed birds and thus, facilitate the synthesis and release of vitellogenin. Similarly, broilers supplemented with vitamin E (250 mg/kg of feed) have reduced liver and serum malondialdehyde (MDA) concentration, and increased serum and liver vitamin E and A

concentration in heat stress conditions. The combination of vitamin E (100 mg/kg of feed), vitamin C (200 mg/kg of feed) and probiotics (*Saccharomyces cerevisiae* and *Lactobacillus acidophilus* at 2 g/kg of feed) was found to be more effective to attenuate negative effects of heat stress in broilers under chronic condition.

Vitamin A

Vitamin A is associated with antibody production and T cell proliferation. Vitamin A is the most effective antioxidant at low oxygen tensions, which is found to quench singlet oxygen, neutralize thiyl radicals, and combine with and stabilize peroxyl radicals. Supplementation of a higher level of vitamin A (6000 and 9000 IU/kg of feed) was found to increase the egg weight in the heat-stressed laying hens. Birds exposed to heat stress immediately after NDV (Newcastle disease virus) vaccination require a higher amount of vitamin A for an adequate level of antibody production. In broilers, supplementation of vitamin A (IU/kg of feed) was found to increase the live weight gain, improve feed efficiency, and decrease the serum MDA concentration in the heat-stressed birds.

Vitamin C

Vitamin C is a water-soluble antioxidant that protects against oxidative stress by scavenging ROS, neutralizing vitamin E-dependent hydroperoxyl radicals, and protecting proteins from alkylation and by electrophilic lipid peroxidation products. Vitamin C is also known to improve immunity by enhancing the differentiation and proliferation of T and B cells. Although poultry can synthesize vitamin C, the amount is limited during heat stress conditions. Thus, dietary supplementation of vitamin C is an effective strategy to reduce the harmful effects of heat stress in poultry. Supplementation of vitamin C (250 mg/kg of feed) improved growth rate, nutrient utilization, egg production, and quality, immune response, and antioxidant status in heat-stressed birds. Dietary supplementation of vitamin C lowered the serum concentration of MDA, homocysteine, and adrenal corticotrope in hormone in heat-stressed Japanese quail. In broilers, dietary supplementation of 200 mg ascorbic acid per kg of feed improved body weight gain and FCR.

Zinc

Zinc is an essential nutrient required for the enzymatic activity for more than 300 different enzymes. Zinc is associated with the antioxidant defense system, immune function, and skeletal development. Zinc also plays an essential role in the synthesis of metallothionein, which acts as a free radical scavenger. Moreover, zinc is an integral component of carbonic anhydrase, the enzyme that catalyzes the formation of carbonates, an essential compound for

eggshell mineralization. The supplementation of zinc helped to suppress the free radicals by being part of superoxide dismutase, glutathione, glutathione S-transferase, and hemeoxygenase-1. So of the organic form of zinc (40 mg/kg of feed) was effective in improving body mass growth, reducing the level of the lipid peroxide, and increasing the activity of superoxide dismutase enzyme during summer. Supplementation of 30 mg of Zinc (Zn) and 600 mg of Magnesium (Mg) per kg of feed improved live weight gain, feed intake, and hot and chilled dressing percentage in the heat-stressed quails. The supplementation of zinc (60 mg/kg of feed) in the diet of egg-laying Japanese quail was also associated with reduced MDA concentration, increased serum vitamin C and vitamin E level, and egg production. In laying hens, dietary supplementation of zinc (80–100 mg/kg of feed) as Zn-methionine was effective in improving the eggshell thickness and mitigating the eggshell defects seen in the laying hens under heat stress.

Chromium

Chromium is an essential mineral, which is an integral component of chromodulin and is also necessary for insulin functioning. Moreover, chromium is also involved in carbohydrate, protein, lipid, and nucleic acid metabolism. The effects of chromium supplementation (chromium picolinate CrPic) were associated with an increase in body weight, feed intake, and carcass quality. It also decreased level of serum corticosterone, serum glucose, cholesterol, and increased serum insulin level. Moreover, the organic form of chromium supplemented as chromium methionine was also found to improve the cellular and humoral immune responses in broilers during heat stress. In laying hens, dietary supplementation of 0.4–2 mg chromium/kg of feed as CrPic improved immune response, egg quality, Haugh unit, and reduced serum glucose, cholesterol, and triglyceride concentration.

Selenium

Selenium is a vital component of at least 25 different seleno proteins, most of which are the different parts of the enzymes, such as glutathione peroxidase and thioredoxin reductases. Type I deiodinase enzyme is one such enzyme that helps in the conversion of thyroxin into active triiodothyronine. Two different forms of selenium, i.e., inorganic forms (sodium selenite and selenite) and organic forms (selenomethionine and selenium-yeast) are used as supplements for poultry. The organic forms are more easily absorbed than inorganic forms. Dietary supplementation of selenium (0.3 mg/kg of feed) is found to improve the liveweight and FCR in broilers during heat stress.

Similarly, supplementation of sodium selenite at 0.1 or 0.2 mg/kg of feed improved the carcass quality and performance of quails reared under high temperature. Selenium is found to improve the productive and reproductive performance of laying hens. Supplementation of the selenized yeast in the diet of laying hens also improved the egg weight, egg production, Haugh units, and eggshell strength during heat stress. In laying quails, there was a linear increase in feed intake, body weight, and egg production; and improvement in feed efficiency upon selenium supplementation (0.15 and 0.30 mg/kg of feed sodium selenite or selenomethionine) under heat stress.

Electrolytes

Panting in heat-stressed bird alters the acid-base balance in blood plasma and ultimately leads to respiratory alkalosis. This acid-base imbalance can be recovered by supplementation of electrolytes such as NH4Cl, NaHCO3, and KCl. During respiratory alkalosis, birds excrete a higher amount of bicarbonate ions from the kidney to restore normal blood pH. These bicarbonates ions are further coupled with Na+ and K+ ions before being excreted through the kidney. Ultimately, the loss of ions results in an acid-base imbalance. Thus, sodium and potassium supplementation is preferred in heat-stressed birds to increase the blood pH and blood HCO3-, while chloride is supplemented to reduce these parameters. A higher range of dietary electrolyte balance (DEB), i.e., 200–300 mEq/kg, has been suggested to be effective in ameliorating the detrimental effects of heat stress in poultry. Sodium bicarbonate (NaHCO3) can be given as the salt of choice during heat stress as it contains Na+ and HCO3-. Moreover, supplementation of NaHCO3 in heat-stressed laying hens is also found to improve eggshell quality. Incorporation of NaHCO3 (up to 0.5%) into broiler diets also enhanced the performance of heat-stressed broiler birds. Similarly, dietary levels of 1.5–2.0% K from KCl were effective in improving FCR during chronic heat stress conditions. Besides including these salts in the diet, supplementation of 0.2% NH4Cl or 0.15% KCl,0.6% KCl, 0.2% NaHCO3, and carbonated water in drinking water also improves the performance in the heat-stressed broiler chickens.

3.1.6. Supplementation of Phytochemicals

Different types of phytochemicals have been supplemented in the diet to mitigate heat stress in poultry. Some of them are:

Lycopene

Lycopene is a predominant carotenoid mainly found in tomatoes and tomato products, and is known to enhance the production of antioxidant

enzymes through activation of antioxidant response element in the DNA. Supplementation of lycopene (200 or 400 mg/kg of feed) in heat-stressed broilers improved the cumulative feed intake, body weight, and FCR. Lycopene is found to improve the level of antioxidant enzymes such as superoxide dismutase (SOD) and glutathione peroxidase (GSH-Px) in broilers. In laying hens, dietary supplementation of lycopene improved oxidative status, enhanced vitamin levels in the egg, and also improved oxidative stability and yolk color of the egg.

Resveratrol

Resveratrol is natural bioactive polyphenols mainly found in grapes, peanuts, berries, and turmeric. Supplementation of resveratrol (400 mg/kg of feed) enhanced the antioxidant capacity in the broilers during heat stress. Supplementation of resveratrol at 300or500 mg/kg of feed improved the average daily gain, decreased the rectal temperature, lowered the level of corticosterone, adrenocorticotropin hormone, cholesterol, and MDA in yellow-feather broilers under heat stress. Additionally, resveratrol also increased the level of triiodothyronine, glutathione, total superoxide dismutase, catalase, and glutathione peroxidase during heat stress. Resveratrol also improved different gut health parameters such as microbial profile, villus-crypt structure, and expression of the tight junction and adherence junction related genes in the heat-stressed broilers. Interestingly, resveratrol improved meat quality in the heat-stressed broilers by increasing the muscle total antioxidant capacity (T-AOC) and activity of antioxidant enzymes (catalase, GSH-Px). In laying hens, supplementation of 200 mg resveratrol/kg of feed improved the egg production, while 400 mg resveratrol/kg of feed reduced the total serum cholesterol and triglycerides, reduced egg cholesterol content, improved antioxidant activity, and improved egg sensory scores.

Epigallocatechin Gallate (EGCG)

Epigallocatechin gallate (EGCG) is the polyphenols present in green tea extract that possess high antioxidant and anti-inflammatory properties. EGCG increases bodyweight, improves feed intake, and increases the level of serum total protein, glucose, alkaline phosphatase activity in the liver and serum. Furthermore, it increases the antioxidant enzymes (GSH-Px, SOD, and catalase) activities in the heat-stressed birds.

Curcumin

Curcumin is the primary polyphenols extracted from turmeric and possesses antioxidant and anti-inflammatory properties. It is also used as a potential compound to mitigate heat stress in poultry. Improves the growth performance of heat-stressed broiler birds. Inclusion of curcumin at 100

mg/kg of feed significantly improved the final body weight in broilers under heat stress conditions. Curcumins fortification reduced the mitochondrial MDA level; reduced the ROS production by increasing the activity of Mn-SOD, GSH-Px, Glutathione S-transferase (GSST) and increased gene expression ofthioredoxin-2 and peroxiredoxin-3during heat stress in broilers. In laying hens, supplementation of curcumin improved the laying performance, egg quality, antioxidant enzyme activity, and immune function during heat stress.

3.1.7. Supplementation of Osmolytes

Betaine

Betaine is a small zwitterionic quaternary ammonium compound found in microorganisms, animals, and plants. Betaine is incorporated in the animal diets in different forms; as anhydrous betaine, betaine monohydrate, or betaine hydrochloride. Betaine possesses two fundamental metabolic activities, i.e., methyl donor activity and osmotic activity. Under heat stress, betaine plays avital role in regulating the cellular osmotic environment, preventing dehydration by increasing the water-holding capacity of the cell. Furthermore, betaine is also found to have anti-inflammatory properties and improves the intestinal function. During heat stress, supplementation of betaine ranging from 0.05–0.20% improved the feed intake, carcass trait, and egg production parameters in broilers, layers, and ducks. Chand et al. In chronic heat-stressed broilers significant improves feed intake, weight gain, and FCR. Furthermore, they also found a lower H/L ratio and improvement in the dressing percentage. In laying hens, supplementing betaine (1000mg/kg of feed) along with vitamin C (200 mg/kg of feed) improved laying performance during the chronic heat stress. In roosters, supplementation of betaine (1000 mg/kg of feed) improved sperm concentration and livability, seminal plasma total antioxidant capacity, fertility, and welfare under chronic heat stress.

Taurine

Taurine, 2-aminoethanesulfonic acid, is one of the most abundant amino acids distributed indifferent parts of animal tissues. Taurine plays a role in antioxidant action, bile acid conjugation, maintenance of calcium homeostasis, osmoregulation, and membrane stabilization. Under chronic heat stress, supplementation of0.1% taurine in the drinking water improves final body weight of chronic heat-stressed broilers. Moreover, expression of heat shock proteins was lowered in the taurine supplemented broilers indicating improved thermotolerance in these birds under heat stress. Similarly, supplementation of taurine (5 g/kg of feed) in broilers under heat stress improved jejunal morphology, decreased the concentrations of serum ghrelin,

increased the concentrations of somatostatin and peptide YY in the duodenum and increased the expression of appetite-related genes. Taurine supplementation was found to reduce fat deposition in the liver of chronic heat-stressed broilers. Supplementation of the taurine (0.1%of feed) in the laying hen enhances oviductal health and reduced oviductal injury.

3.2. Genetic Approach

Improved broiler lines have a higher metabolic rate; as a result, they are more susceptible to heat stress. Thus, developing poultry lines incorporating some of the genes that help to reduce heat stress can be beneficial in further improving the production traits of these breeds in the hot and arid areas.

3.2.1. Naked Neck (Na) gene

Na gene is the single dominant autosomal gene that helps to reduce feathers in the neck region, thus helps to dissipate heat through the neck region in birds. The naked neck gene reduces the feather cover by20% and 40% in Na/na (heterozygous necked neck) and Na/Na (homozygous necked neck), respectively, as compared to normal siblings (na/na). Na gene in broilers is associated with the increase in breast muscle and body weight, reduce abdominal fat, and body temperature. The total plasma cholesterol level and H/L ratio were significantly lowered in the naked necked birds as compared to typical birds during the summer season. Laying birds with a naked neck gene also displayed an improvement in egg mass, number, and quality under hot temperatures.

3.2.2. Frizzle Gene

The frizzle (F) gene causes the curving of the outline of the feather resulting in a reduced feather weight and insulating property of the feather cover and increases heat radiation from the body. Homozygous frizzle gene in laying hens improved the egg production and quality traits by increasing the magnitude of heat dissipation as compared to heterozygous carriers and normal feathered hens. reported a significant interaction between feathering genotype (FF) and environmental temperature for all reproductive traits (egg production, hatchability, and chick production) except sexual maturity under heat stress. At higher temperatures, they reported a distinct reduction in all reproductive traits except sexual maturity for normally feathered hens compared with frizzle-feathered hens, whereas under lower temperatures (19 °C), egg production, and the number of chicks of the FF genotype were reduced and sexual maturity was delayed. The beneficial effect of the F gene as compared to the Na gene is lower in broilers at high temperatures. However, there is an additive effect in the double heterozygous (Na/Na F/f) broiler. So,

the frizzle gene is another potential target for developing heat-tolerant chickens.

3.2.3. Dwarf (dw) Gene

The dwarf gene is a sex-linked recessive gene associated with reduced body weight by about 40%and 30% in homozygous males and females, respectively. The inherent heat tolerance of dw genotype in laying hens was uncertain. It has been found that the dw gene in fast-growing broiler chickens under chronic heat stress conditions did not improve heat tolerance.

3.3. Housing

Naturally ventilated open-type housing is most common in the tropics, which should be oriented in the east-west direction. The width of such housing should not exceed 12 m, while the length of the building can depend upon the convenience. In the case of long buildings, doors should be placed at an interval of 15–30 m. It is recommended to have a sidewall height of at least 2.1 m along with curtails that can be raised or lowered easily. Regarding the roof, a roof slope of 45 °C is recommended as it reduces the heat gain of the roof from direct solar radiation. It has been observed that farmers used different local materials such as thatched and bamboo to insulate the roof. In the case of an uninsulated metal roof, a sprinkling roof with cool water has also been a common practice to reduce heat load in poultry houses. Moreover, in this kind of housing, fans (either suspended from the interior building structures or vertical ceiling fans), interior fogging, and sprinkling systems can be used effectively. With the advancement of technologies, there has been a surge in the use of a closed house system for more intensive farming systems recently. Closed housed systems equipped with air conditioning, cooling pads, cool perches, and exhaust fans are found useful in attenuating the negative effects of heat stress in poultry. However, such houses are expensive to build and operate in developing nations, and therefore dietary manipulations are more appropriate.

3.4. Others

In addition to the aforementioned strategies, some other strategies have been used to combat heat stress in poultry, such as early heat conditioning (EHC), early feed restriction (EFR), reducing stocking density of birds, and thinning the litter during summer seasons. In EHC, birds are exposed to high temperatures (36 °C) for 24 h at 3 to 5 d of age, while in EFR about 60%of feed is restricted on days 4, 5, and 6. EHC and EFR developed the tolerance capacity of birds against high temperature during the later growth stage before marketing. EHC may play a role in the acquisition of heat tolerance capacity by suppressing the expression of an uncoupled protein (avUCP) and

by improving the expression of HSP70 while EFR might possess beneficial effects in heat stress by improving the expression of HSP70. Reducing the stocking density of birds increases the feed and water accessibility, and also increases heat dissipation from the body. Thinning of the litter helps to make the litter dry, making it favorable for birds to cool their body by dust bathing. In ovosupplementation of nutrients is known to induce post-hatch immunity, antioxidant indices, and growth performances. Sulfur amino acids are known to play a crucial role in protein structure, metabolism, immunity, and oxidation. Recently, in ovo inoculation of sulfur-containing aminoacids in heat stressed embryo induced serum antioxidant indices and antioxidant related genes expression, reduced HSP70 gene expression, corticosterone concentrations, and lipid profile in hatched broiler chicks. Dietary supplementation of N-acetylcysteine improved the growth performance and intestinal function of broilers exposed to heat stress. N-acetylcysteine also mitigated heat stress in breeder Japanese quail under heat-stressed conditions. Thus, further studies are required to delineate the dietary supplementation of Sulfur amino acids in heat-stressed broiler chickens and laying hens.

4. Conclusion

With the rising global temperature, heat stress has been a severe challenge to the growth of the poultry industry. Several strategies have been tried and tested to counteract heat stress in poultry. However, only a few of them are widely used in the poultry industry. Heat stress in poultry results from the interplay of several factors, such as high environmental temperature, humidity, radiant heat, and airspeed, and causes several physiological, neuroendocrine, and behavioral changes. So, no single approach alone is enough to negate the impacts of heat-stress on poultry. Therefore, there is a need for a holistic approach to attenuate the negative effect of heat stress in poultry. The potential use of Na and F genes, along with proper nutrition, housing, and management should be beneficial in mitigating heat stress. Further research testing a combination of some approaches for ameliorating heat-stress mentioned in this article, to observe their efficiency and cost-benefit in the poultry industry is warranted.

5. References

1. Marangoni, F.; Corsello, G.; Cricelli, C.; Ferrara, N.; Ghiselli, A.; Lucchin, L.; Poli, A. Role of poultry meat in a balanced diet aimed at maintaining health and wellbeing: An Italian consensus document. *Food Nutr. Res.*2015, *59*, 27606.

2. Alexandratos, N.; Bruinsma, J. *World Agriculture towards 2030/2050: The2012 Revision*; ESA Working Papar No. 12-03; FAO: Rome, Italy, 2012.
3. Zuidhof, M.J.; Schneider, B.L.; Carney, V.L.; Korver, D.R.; Robinson, F.E. Growth, efficiency, and yield of commercial broilers from 1957, 1978, and 2005. *Poult. Sci.* 2014, *93*, 2970–2982.
4. Tallentire, C.W.; Leinonen, I.; Kyriazakis, I. Breeding for efficiency in the broiler chicken: A review. *Agron. Sustain. Dev.* 2016, *36*, 66.
5. Goo, D.; Kim, J.H.; Park, G.H.; Delos Reyes, J.B.; Kil, D.Y. Effect of Heat Stress and Stocking Density on Growth Performance, Breast Meat Quality, and Intestinal Barrier Function in Broiler Chickens. *Animals* 2019,*9*, 107.
6. Lara, L.J.; Rostagno, M.H. Impact of heat stress on poultry production. *Animals* 2013, *3*, 356–369.
7. Naga Raja Kumari, K.; Narendra Nath, D. Ameliorative measures to counter heat stress in poultry. *World's Poult. Sci. J.* 2018, *74*, 117–130.
8. Donkoh, A. Ambient temperature: A factor affecting performance and physiological response of broiler chickens. *Int. J. Biometeorol.* 1989, *33*, 259–265.
9. Surai, P.F.; Kochish, I.I.; Fisinin, V.I.; Kidd, M.T. Antioxidant Defence Systems and Oxidative Stressin Poultry Biology: An Update. *Antioxidants* 2019, *8*, 235.
10. Betteridge, D.J. What is oxidative stress? *Metab. Exp.* 2000, *49*, 3–8.
11. Mishra, B.; Jha, R. Oxidative stress in the poultry gut: Potential challenges and interventions. *Front. Vet. Sci.*2019, *6*, 60.
12. Estévez, M. Oxidative damage to poultry: From farm to fork. *Poult. Sci.* 2015, *94*, 1368–1378.
13. Richards, S.A. Physiology of thermal panting in birds. *Ann. Biol. Anim. Biochim. Biophys.* 1970, *10*,151–168.

IAAHAS/LP/2023/006

Adaptations of Horsegram [*Macrotyloma uniflorum* (Lam.) Verdc.] to water deficit during critical growth phases of flowering and pod setting

Roshni Vijayan[1*], Moossa P.P[1], Thulasi V[1], Purushothaman S.M[1], Raji.P[1]

[1]Regional Agricultural Research Station-Central Zone, Pattambi, Kerala Agricultural University

Abstract

Horsegram (*Macrotyloma uniflorum* (Lam.) Verdc.) is an orphan legume crop grown in the tropics which is accommodating as a climate smart crop. Its seeds are a valuable source of protein, vitamins, and income for humans. However, horsegram cultivation faces climatic constraints such as water stress caused by a prolonged absence of rain during the growing season. Thus, this work aims at selecting horsegram varieties that can be cultivated in times of drought without compromising their yields and yield components. Twenty-two horsegram accessions were used. The experiment was conducted at the Regional Agricultural Research Station- Central Zone, Kerala and laid at a split-plot design with four replicates. Each genotype was exposed to three water treatments: fully irrigated control, vegetative stress (when plants were 25 days old, drought stress was imposed for 30 days), and reproductive stress (once the first flowers were observed, water stress was imposed for 30 days). The results showed that yield, chlorophyll content, and relative water content were reduced under water deficit at the vegetative and reproductive stages. But there were no significant differences in proline content among horsegram varieties. Agronomic traits such as number of days to flowering, number of pods, yield per plant, weight of 100 seeds, and harvest time showed significant differences under water stress. Overall, the cultivars including KS-2, HG-645, and landraces like IC 139474, IC 145311A were the most tolerant to drought stress at the vegetative and reproductive stages and could potentially be used in breeding programs to improve drought tolerance of horsegram.

1. Introduction

Horsegram (*Macrotyloma uniflorum* (Lam.) Verdc.) is a highly drought tolerant crop which has found very less utilization as a food legume. Currently utilized as a domesticated crop, has its origin as a wild plant and is a native of southern Asia. Water deficit is a key limiting factor to horsegram production due to poor

and irregular rainfall. However, horsegram exhibits, to some extent, resistance to water stress when compared to other crops. Horsegram demonstrates tolerance to water stress conditions that could have been very disastrous to several other annual crops. It is also able to produce a higher yield under dry conditions than any other cultivated crop. Major objectives of this study are to identify the effect of water stress on vegetative as well as the reproductive stages of the crop. The study is focused on the physiological as well as agronomical traits to grasp the concepts of drought tolerance of horsegram. The identified superior genotypes can be further utilized in hybridization for the development of superior entries of horsegram with drought tolerance.

2. Materials and methods

The experiment was conducted at Regional Agricultural Research Station-Kerala. Twenty-two horsegram genotypes were screened for their drought tolerance. The accessions utilized in this study are AK-1 (V1), AK-21(V2), IC 145311A (V3), CRIDA 18 (V4), IC 139435 (V5), KS-2 (V6), IC 139464 (V7), IC 139474 (V8), HG 833 (V9), HG 645 (V10), CRIDA 19 (V11), IC 123040 (V12), HG 998 (V13), IC 023453 (V14), IC 022805 A (V15), HG 1164 (V16), IC 22759 (V17), HG 1017 (V18), HG 1127 (V19), HG 366 (V20), IC 019343 (V21), IC 264704 (V22). Each experimental plot was selected with a size of $4m^2$. Five percent diluted carbofuran was used to treat the soil against microorganisms. The seeds were sown on December 28, 2020 and watered daily. Plants were grown under natural conditions. During the experiment, weather data were collected and plotted (Figure 1). The plots were hand weeded regularly. The drought stress at the vegetative stage was imposed on January 20, 2021, and ended on February 19, 2021, while the drought stress at the reproductive stage started on February 17, 2021, and it was terminated on March 19, 2021. There was no rainfall during the drought imposition at both vegetative and reproductive stages.

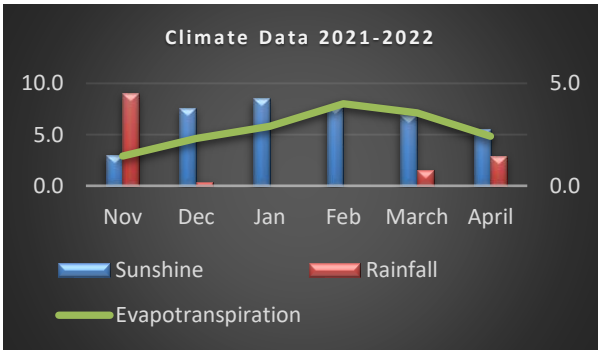


Fig 1. Climate data of the station

A split plot with 4 replications and 2 factors was used. The main factor was water regime with 3 levels: R0 at no drought, R1 at vegetative stress, and R2 at reproductive stress. Two drought treatments were initiated, one at the vegetative stage and one at the reproductive stage. For the vegetative stage, drought treatments were initiated 23 days after sowing during. Plants were either irrigated daily or exposed to drought (no water) for 30 days. For the reproductive stage, the drought stress was initiated 40 days after sowing, when the first flowers appeared. During this reproductive phase, plants were either watered daily or exposed to drought for 30 days. The subplot was the variety factor with 22 levels (V1 to V22), generating 66 interactions repeated 4 times given 264 experimental units (Plots)(Figure 2).

Fig 2. Field view of the experimental plots

A portable chlorophyll meter (Minolta SPAD-502, Soil Plant Analysis Development, Minolta Co., Osaka, Japan) was used to determine the chlorophyll content of the horsegram plants. After stress, the relative water content (RWC) of different plants was determined. Here, 3 leaflets on the third leaf from the apex were taken per plant in each treatment and immediately wrapped in aluminium foil to avoid loss of water. The samples were brought to the laboratory to determine their fresh weight (FW). The leaflets were placed in bottles containing 150 ml of distilled water left in the dark for 24 hours at 16°C (Daouda *et al.,* 2017). The leaf discs were then removed and weighed again to determine the weight of the full turgor (WFC). The dry weight (DW) was obtained after oven-drying at 80°C for 24 hours. The weighing of the leaf discs was carried out using a 0.01 g precision balance. The relative water content (RWC) of the leaves was calculated by the formula of Turner and Begg (1981):

RWC = (FW − DW)/(WFC − DW) × 100. Proline was determined according to Bates and Hall (1981).

Agronomic traits measured included the number of days from sowing to flowering, number of pods per plant, yield per plant, the weight of 100 grains, and harvest time, i.e., from the first harvest to the last. Data were analysed statistically using analysis of variance (ANOVA). All analyses were performed with R version 4.0 software.

3. Results and Discussion

3.1 Physiological Traits

Water stress significantly ($p < 0.001$) reduced RWC, and chlorophyll content of genotypes. Water stress affects physiological parameters in vegetative and reproductive stages. Chlorophyll fluorescence represents the quantitative measure of the photosynthetic performance of plants under stress conditions. It is a good tool for the identification of genotypes tolerant to abiotic stress especially drought stress. However, V2, V19 and V7 recorded the highest values RWC among stressed plants at the end of vegetative stress (Table 1). At the end of reproductive stress, there was a significant ($p < 0.001$) difference between genotypes for physiological parameters such as chlorophyll content, and relative water content. Chlorophyll content increased in almost all the stressed plants at the vegetative phase; especially in V2, V12, V13, V14, V19, and V7 whereas, at the reproductive stage, their chlorophyll contents were negatively affected by drought conditions when compared with the controls, indicating that reproductive stage was the most affected. The relative water content is a parameter indicating the water status of a plant. In the present study, water deficit had a significant effect on the RWC of stressed plants. The unavailability of water caused the stressed plants to lose their water and their turgidity which was illustrated through the lower values of the recorded RWC. Our results on relative water content were significantly ($p < 0.01$) decreased in stressed plants during the vegetative and reproductive phases, as suggested by Anyia & Herzo, 2004; Lobato & Costa, 2008, Lobato *et al* 2009 and Meftha 2012. V2, V7, and V19 recorded the highest relative water content during the vegetative phase, while V2, V8, V11, V15, V16 and V19 performed better than others in the reproductive stage. The proline content in plants under drought conditions was higher than that of the control plants. There were significant differences ($p < 0.05$) in proline content among the varieties under drought stress during the reproductive stage (Table 1). The

varieties V19, V16, and V7 had the highest proline contents under water deficit during the reproductive stage (Table 1).

Table.1 RWC, chlorophyll content and Proline content of accession subjected to drought stress at two different growth regimes.

	Drought stress at flowering stage				Drought stress at Pod setting stage					
	RWC (%)		Chlorophyll content		RWC (%)		Chlorophyll content		Proline (mg/g. MS)	
	R0	R1	R0	R1	R0	R1	R0	R1	R0	R1
V1	80.39 ab	53.71e	38.40e	50.43c	81.90 ab	14.05h	38.40e	48,43a	20.49 ef	23.53bcdef
V2	83.35 ab	85.37 ab	46.20b	58.20b	83.34 ab	85.48a	46.20b	37,10c	26.27 cd	25.24 bcdef
V3	79.36 ab	65.12d	38.66e	47.25d	79.51 ab	15.48h	38.66e	37.40c	19.79 ef	20.31cdef
V4	81.33 ab	75.12c	39.00e	44.53e	82.02 ab	72.41b	39.00e	38.03c	18.05f	17.74 def
V5	83.50 ab	84.32b	45.55b	56.91b	77.97 ab	66.16f	40.98d	45.85b	28.30d	20.05 cd
V6	79.03 ab	18.0200g	39.18e	30.80h	83.60 ab	79.97a	45.55b	40.45 bc	27.76c	32.72 bc
V7	73.61 ab	57.37 ab	35.78e	51.98a	78.00 ab	12.028h	39.18e	34.23d	20.48 ef	16.81 ef
V8	82.97ab	90.14 ab	43.85 cd	56.90b	82.37 ab	58.95c	43.85 cd	49.85a	38.44a	37.06 ab
V9	79.96 ab	14.88g	39.53e	31.03h	79.97 ab	84.25a	39.53e	41.65b	20.51 ef	21.31 cdef
V10	83.61 ab	12.80g	49.07a	29.34h	83.06 ab	16.17h	49.07a	49.85a	38.17a	31.70bcd
V11	76.51b	13.46g	38.80e	30.58h	76.02b	47.02e	38.80e	40.43 bc	27.07c	33.01 bc
V12	79.21 ab	55.35e	42.98d	47.75d	79.22 ab	82.32a	42.98d	40.60 bc	26.14 cd	21.05 cdef
V13	81.33 ab	87.37 ab	38.48e	58.78b	81.78 ab	36.16f	38.48e	40.63 bc	23.35 de	29.99 bcde
V14	85.38a	89.42 ab	49.05a	58.23b	84.88a	15.32h	49.05a	50.33a	28.39c	28.53 bcdef
V15	82.83ab	63.03d	38.78e	61.98a	83.67 ab	21.66g	38.78e	40.50bc	18.30f	29.17 bcde
V16	84.44a	61.90d	44.73 bc	46.88d	84.69a	83.80a	44.73 bc	48.60a	31.08b	36.73 ab
V17	81.33 ab	34.26f	38.38e	48.45d	82.08 ab	85.51a	38.38e	40.13 bc	27.71c	45.09a
V18	81.07 ab	66.77d	43.55 cd	36.53g	81.07 ab	11.48h	43.55cd	40.50 bc	23.25 de	28.64bcdef
V19	81.12 ab	13.50g	38.38e	29.13h	81.03 ab	36.22f	38.38e	38.00c	18.72f	25.95 bcdef
V20	82.23 ab	90.88a	39.50e	58.65b	82.24 ab	85.69a	39.50e	38.38 bc	38.43a	45.59a
V21	83.38 ab	76.10c	49.70a	40.00f	84.88a	51.32d	49.70a	50.70a	21.85 ef	14.90f
V22	74.44a	76.77d	35.50e	42.45d	80.24 ab	61.48h	40.55c	48.00c	25.71c	20.17 bc

p value	0.00676**	2.2e – 16***	2.2e – 16***	2.2e – 16***	0.00529	2.2e – 16	2.2e – 16	2.2e – 16	2.2e – 16	3.14e – 09
LSD at 0.05	3.99	4.44	1.32	1.65	4.43	4.27	2.1	3.36	2.56	8.16

3.2 Agronomic Traits:

Under water stress conditions, the agronomic traits were significantly affected especially when there is water stress at the beginning of the inflorescence. These results confirm those of previous work by Leite *et al* 2000, Mendes *et al*, 2007 who showed that water stress negatively and significantly affected the flowering and filling of horsegram pods, which considerably reduced yield. The severity of this stress is because it affects parameters related to seed formation including photosynthesis and translocation of assimilates (Mendes *et al*, 2007, Farooq *et al*., 2009, and Praba *et al.*, 2009). Ahmed and Suliman, 2010 observed a significant reduction of over 40% under water deficit. In this study, there was a significant ($p < 0.001$) difference between the water regimes for all agronomic parameters (Figure 3). For the stress during the vegetative phase, the number of pods increased as well as the number of days to flowering while for the stress at the reproductive phase, the weight of seeds significantly decreased. However, V1, V2, V17 and V19 gave the best performance among genotypes subjected to drought stress at the vegetative phase, which had the best yields with large seeds. V16, V19, and V2 demonstrated high yield with small seeds among the 20 genotypes under water deficit stress at the reproductive phase. V16 had the biggest seeds among the genotypes subjected to drought conditions at the vegetative phase, while V2 and V19 were more productive than others under drought at the reproductive phase (Figure 4). The varieties V2, V4, V16, V17 and V19 recorded the highest number of pods under drought stress at the vegetative stage, obtaining 24, 18, 28, 25, and 39 pods, respectively, while V2, V4, V10, V8, V15, V16 and V19 produced 18, 23, 19, 24, and 30 pods under drought stress at reproductive stage, respectively. On the other hand, V1, V9 and V18 had fewer pods under water stress at the vegetative stage, producing 13, 6, and 13 pods, respectively, and V3, V9, V5, V12, and V17 had 5, 6, 7, 8, and 7 pods, respectively, under water stress at reproductive stress.

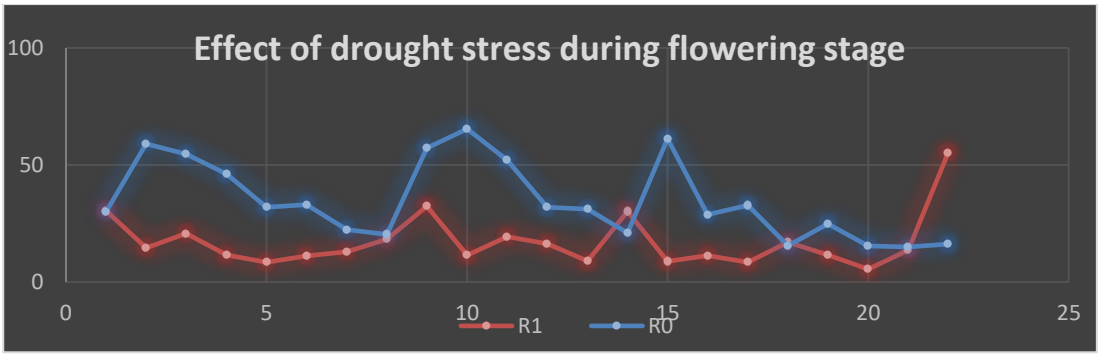


Figure 3: Impact of drought on 22 accessions at flowering stage for pod number

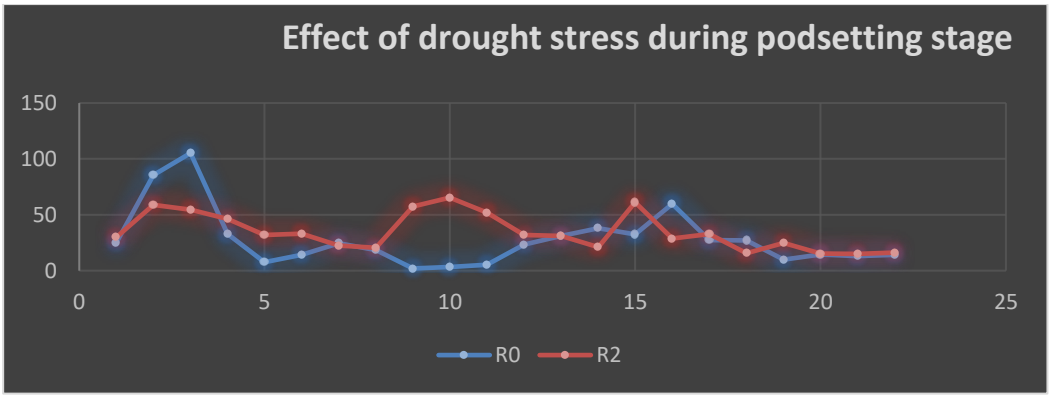


Figure 4: Impact of drought on 22 accessions at pod setting stage for pod number

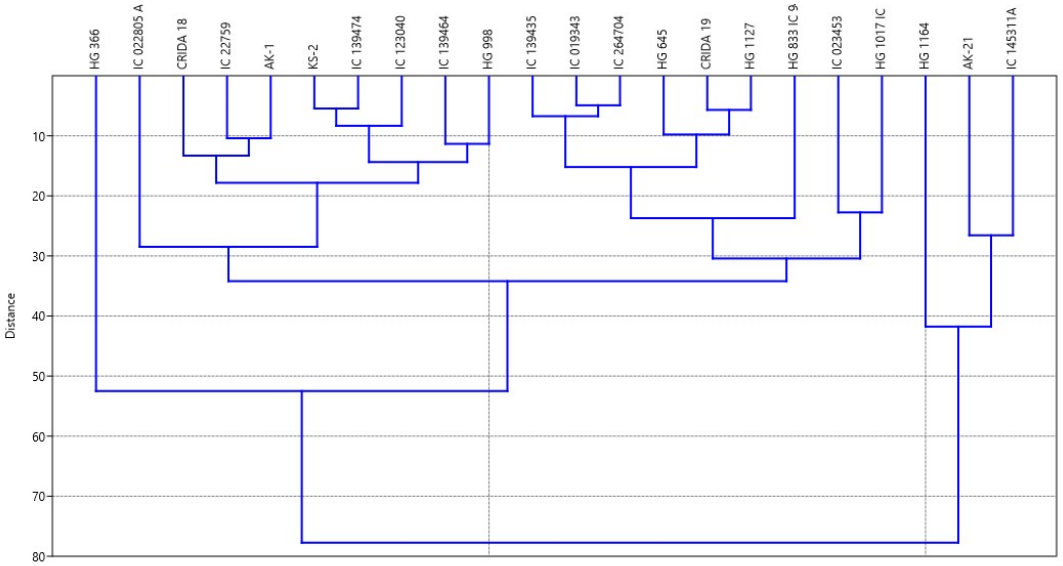


Figure :5 Clustering analysis of the 22 Horsegram accessions

The cluster analysis of the 22 accessions showed the 2 major clusters. The entries V2, V16, which is identified as the highest yielder in vegetative as well as in reproductive stage stress are in one cluster and the rest other entries like V19, V15 and V7 forms another cluster. Crosses made from various clusters make them highly suitable for hybridisation with a better genetic base (Fig. 5) and yield superior varieties in future.

4. Conclusion

The varieties V19, V7, and V2 gave the highest grain yields and were found to be the most drought-tolerant under water stress at the vegetative stage and the varieties V19, V16, V15, and V2 gave the highest grain yields and were found to be the most drought-tolerant under water deficit at the reproductive stage. To have more efficient genotypes in the condition of water stress, we must initiate crosses between the different tolerant genotypes and between tolerant genotypes and those sensitive to water stress to combine the different mechanisms of tolerance.

5. References

Ahmed, F. E., and A. S. H. Suliman. 2010. “Effect of water stress applied at different stages of growth on seed yield and water use efficiency of cowpea,” Agriculture and Biology Journal of North America, vol. 1, pp. 534–540.

Anyia, A. O. and H. Herzo. 2004 “Genotypic variability in drought performance and recovery in cowpea uncontrolled environment,” Journal of Agronomy and Crop Science, vol. 190, pp. 151–159.

Bates, L. M. and A. E. Hall. 1981. “Stomatal closure with soi1 water depletion not associated with changes in bulk leaf water status,” Oecologia, vol. 50, pp. 62–65.

Daouda Toudou, A. K., S. Atta, M. M. Inoussa, and Y. Bakasso. 2017. “Mecanisme de tol´erance ´ a la s`echeresse du ni´eb´e pendant la´ phase v´eg´etative,” Journal of Applied Bioscience, vol. 117, p. 11737.

Farooq, M., A. Wahid, N. Kobayashi, D. Fujita, and S. M. A. Basra, 2009. “Plant drought stress: effects, mechanisms and management,” Agronomy for Sustainable Development, vol. 29, pp. 185–212.

Leite, M. D. L., J. D. Rodrigues, and J. S. Virgens Filho. 2000. “Das Efeitos do d´eficit h´ıdrico sobre a sultura do caupi, cvEMAPA-821. III-Produção,” Revue de l’Agriculture, vol. 75, no. 9–20.

Lobato, O. and R. C. L. Costa. 2008 “Biochemical and physiological of *vigna unguiculata* (L.) walp. under water stress during the vegetative phase,” Asian Journal of Plants Sciences, vol. 7, no. 1, pp. 44–49.

Lobato, O., C. F. Neto, G. G. Santos Filho et al., 2009. “Consequence of the water deficit on water relations and symbiosis in *Vigna unguiculata* cultivars,” Plant Soil and Environment, vol. 55, no. 4, pp. 139–145.

Meftah, M.Y. 2012. “Effet du stress hydrique sur le comportement de deux populations de ni´eb´e (*Vigna unguiculata* L.) inocul´ees par quatre souches rhizobia autochtones. Memoire en vue de ´ l’obtention du dipl ̂ome de magist`ere et en agronomie,” Ecole ´ Nationale Sup´erieure Agronomique El-Harrach-Alger, vol. 97.

Mendes, R. M. S., J. A. Tavora, F. Jos ´ e, J. B. Pitombeira, and ´ J. M. Nogueira. 2007. “Source-sink relationships in horsegram under drought stress,” Revista Ci ̂encia Agronomica ̂, vol. 38, pp. 95–103.

Praba, M. L., J. E. Cairns, R. C. Babu, and H. R. Lafitte. 2009. “Identification of physiological traits underlying cultivar differences in drought tolerance in rice and wheat,” Journal of Agronomy and Crop Science, vol. 195, pp. 30–46.

Turner, N. C. and J. E. Begg. 1981. “Plant-water relation and adaptation to stress,” in Soil Water and Nitrogen in Mediterranean Type Environment, J. Monteith and C. Webb, Eds., Springer, Berlin, Germany, pp. 97–131.

SGT University, Gurugram and Just Agriculture Education Group

IAAHAS/AB/2023/001

The combined effect of enzymatic and ohmic heating on oil yield from hydrolyzed black cumin seed

Sawant Sanket R[1]; Bibek bahadur Shrestha[2]; P. K. Sharma[3] and Indra Mani[4]

[1,2]Assistant Professor, Vignan's foundation for Science, Technology and Research, Vadlamudi-Andhra Pradesh 52213.

[3]Prinicpal Scientist, I.C.A.R-Indian Agricultural Research Institute, New Delhi-110012

[4]Vice-Chancellor, VNMKV, Parbhani, Maharashtra-431402

Black cumin seed (*Nigella sativa* L.) has the potency to overcome various medical issues and its oil has been used in functional foods, nutraceuticals, and the pharmaceutical industry. Black cumin seed oil is considered as one of the newer sources of edible oil. In aspect to enhance the yield of oil need to develop new methodology. The combined effect of enzymatic and ohmic heating found a potential yield of oil from the black cumin seed. Pectinase enzyme (1.5%) concentration, incubation conditions (50ºC and 12 h), Agitation conditions (100 r.p.m and 1 h), centrifugal conditions (8000 r.p.m and 30 min) along with ohmic heating conditions consisting of electric field strength (750, 850 and 950 V/m), end point temperatures (70, 80 and 90 ºC) and holding time (0, 10 and 15 min) were taken as processing parameters. The treatments were designed by using the response surface methodology technique. The resultant yield of oil from combined treatment by enzyme and ohmic heating was found in between 78 to 85% (32.5 ml out of 37.5 ml). The obtained oil was good in the quality range as per FSSAI-2009 rules and regulations. It was concluded that the combined effect of enzyme and ohmic heating found a positive effect in terms of enhancement of oil yield from hydrolyzed black cumin seed.

Keywords*: Black cumin seed, pectinase enzyme, ohmic heating, oil yield, response surface methodology*

IAAHAS/AB/2023/002

Conception Rate Increasing Efficacy of Different Drugs Promoted in Non-Infectious Repeat Breeder Buffaloes

Vaibhav V. Choutmal[1] Manjusha G. Patil[2], Pankaj B. Hase[3*] and Lalit Misalwar[4]

[1]M.V.Sc Scholar, Department of Animal Reproduction Gynaecology and Obstetrics, College of Veterinary and Animal Science, Parbhani
[2]Assistant Professor, Department of Animal Reproduction Gynaecology and Obstetrics, College of Veterinary and Animal Science Parbhani
[3*]Assistant Professor, Department of Veterinary Clinical Medicine, Ethics & Jurisprudence Mumbai Veterinary College, Parel, Mumbai
[4]M.V.Sc Scholar, Department of Animal Reproduction Gynaecology and Obstetrics, College of Veterinary and Animal Science Parbhani

A total of 76 repeat breeder buffaloes were studied in the current study. Genital abnormalities were checked in the chosen repeat breeder non-infectious buffaloes. Based on their histories, screening results for the body score condition, white side test, PMNs cell count, cervical pH, fern pattern and serum phosphorus, the chosen animals were divided into four groups. Sixty buffaloes were chosen and randomly assigned to four treatment groups (each with 12 animals) and one control group (12 animals). The treatment groups were as follows: Group I (GnRH at the time of AI), Group II (Inj. Inorganic Phosphorus), Group III (Powder Herbominvit), Group IV (Glycine Chelated Mineral mixture) and Group V. (Control). Among the five categories mentioned above, the study's conception rates were estimated. Before treatment, it was found that the pH of the cervical mucus in five groups of non-infectious repeat breeder buffaloes ranged from 7.34 to 7.67. For all groups, the white side test value prior to therapy was negative. While in groups I to V, the Polymorphonuclear cells count is below 3 prior to treatment and the proportion of atypical animals with typical fern patterns is 85% and 25%, respectively. All groups received insemination while treatment. It was discovered that the conception rates for the buffaloes in groups I through V were 83.33, 50, 75, 66.66, and 41.66 percent, respectively. The highest rate of conception and pregnancy was seen in non-infectious repeat breeder buffaloes treated with GnRH at the time of AI and Powder Harbominvit.

Keywords: *Repeat Breeder Buffaloes, Glycine Chelated mineral mixture, GnRH, Harbominvit, Conception rate*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/003

Farmers perception and adaptation strategies followed by the farmers to cope climate change

Rathod A. S., Dr. P. R. Deshmukh and Dr. Kadam R.P
Department of Agricultural Extension Education, College of Agriculture, VNMKV, Parbhani

Farmers are most vulnerable group who are affected by climate change. Farmers' perception of climate change is crucial in adaptation intention and process. However, farmers' perceptions may not be timely, accurate and systematically consistent with the direction and significance of observational records. Adaptation is the way to deal with the impact of climate change; that means anticipating the adverse effect of climate change, and taking appropriate action required to minimize the damage that can cause or take advantage of opportunities that may arise. farmers are aware of climate change through personal observations. Farmers perceived climate change as a state of increasing temperatures, depicted by dry and rainy season temperatures and frequent drought; increasing wind, depicted by greater intensity in both seasons, and a pattern of decreasing rainfall as indicated by the intensity and quantum of both annual and rainy season rainfall. The use of drought tolerant or early maturing varieties ranked among the top three adaptation strategies adopted by farmers to combat risks from climate change. The other top three strategies are growing different crops or engaging in mixed cropping and changing of planting dates. The remaining adaptation strategies include production of more livestock, planting trees for shading and shelter, engaging in off-farm jobs, using soil conservation techniques and irrigation facilities, increasing water conservation through water harvesting schemes.

Keywords: *Adaptation, Climate Change, Drought Tolerant and Irrigation*

IAAHAS/AB/2023/004

Response of Gram (*Cicer arietinum* L.) Growth to STCR based fertilizer application

Arpita Kokate*[1], VP Suryavanshi[2], Varsharani Gore[3]

[1]M.Sc. Scholar, Department of Agronomy, College of Agriculture, Latur, Maharashtra, India

[2]Extension Agronomist, RAEEC, Ambajogai, Maharashtra, India

[3]Ph.d. Scholar, Department of Agronomy, Mahatma Phule Krushi Vidyapeeth, Rahuri

A field experiment was conducted during rabi season of 2020-2021 at Experimental Farm Agronomy section, Oilseeds Research Station, Latur, to assess the response of gram (*Cicer arietinum* L.) growth to STCR based N, P and K fertilizer application on productivity of gram in vertisol. The topography of experimental field was uniform and leveled. The soil of experimental plot was clayey in texture, moderately alkaline in reaction having pH 7.02 with chemical composition such as low in available nitrogen (231 kg ha^{-1}), very low in available phosphorous (8.55 kg ha^{-1}) and very high in available potassium (580.89 kg ha^{-1}). The experiment was laid out in Randomized Block Design. The seven treatments were replicated thrice. The treatments were T_1: 100% RDF, T_2: 100% RDF + Vermicompost @ 2.5 t ha^{-1}, T_3: NPK as per STCR, T_4: NPK as per STCR + Vermicompost @ 2.5 t ha^{-1}, T_5: 100% RDF + Vermicompost @ 2.5 t ha^{-1} + $ZnSO_4$ @ 20 kg ha^{-1}, T_6: NPK as per STCR + Vermicompost @ 2.5 t ha^{-1} + $ZnSO_4$ @ 20 kg ha^{-1} T_7: Control. The application of N, P and K as per STCR + Vermicompost @ 2.5 t ha^{-1} + $ZnSO_4$@ 20 kg ha^{-1} (T_6) recorded higher growth attributing characters viz., plant height (cm), number of branches $plant^{-1}$ and dry matter accumulation (g) $plant^{-1}$ were influenced significantly due to different treatments. Maximum plant height, number of branches per plant of gram and dry matter accumulation (g) $plant^{-1}$ which was at par with the application of N, P and K as per STCR + Vermicompost @ 2.5 t ha^{-1} (T_4) and 100% RDF + Vermicompost @ 2.5 t ha^{-1} + $ZnSO_4$@ 20 kg ha^{-1} (T_5) and found significantly superior over rest of the treatments.

Keywords: *STCR, vermicompost, $ZnSO_4$*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/005

Association studies of bio-inoculants and PGRs on germination and growth of wild ber (*Ziziphus rotundifolia* Lamk.)

Aayush[1&2], Mukesh Kumar[3], JR Sharma[1]& Maya[4]
[1]Department of Horticulture, CCS HAU, Hisar-125 004
[2]Young Professional-1, Department of Genetics & Plant Breeding, CCSHAU, Hisar-125004
[3]College of Agriculture, Bawal, CCS HAU, Hisar-125 004
[4]PhD Scholar, Division of Fruits and Horticultural Technology, IARI, New Delhi- 110 012

The present experiment was conducted to study association between bio-inoculants and PGRs on germination and growth on seeds of wild ber. The experiment was carried out in the laboratory of Department of Seed Science and Technology, Hisar with CRD design (2021-22). The seeds removed from stone were treated with five bio-inoculants *viz*, Azoteeka- Mac 27, Azoteeka-HT 54, Phosphoteeka- P 36, *Azospirillum*, integrated biofertilizer by soaking for 30 min and dipped in six PGRs *viz.*, GA_3 @ 50 ppm & 100 ppm, NAA @ 50 ppm & 100 ppm, IBA @ 50 ppm & 100 ppm for 24 hrs along with the control. Under *in-vitro* condition, seeds were sown with in between paper method. Correlation coefficient analysis revealed that biomass per plant exhibited positive and highly significant association with root length and shoot length under laboratory conditions whereas, it showed negative and highly significant correlation with mean germination time. Path coefficient analysis revealed that maximum direct effect on biomass per plant was shown by traits viz., root length followed by shoot length and fresh weight of seedling under *in-vitro* condition.

Keywords: *Bio-inoculants, plant growth regulators, seeding growth, seed treatment, wild ber seeds*

Effect of *Azolla pinnata* feeding on Linear Type Traits and its Relation to Economic Feasibility in Sahiwal Calves

Ninad Bhatt* and Ramesh Chandra

PhD Research Scholar, ICAR-NDRI, Karnal

The present study was conducted to see the effect of *Azolla pinnata* feeding on linear type traits along with the economics of feeding in Sahiwal calves at National Dairy Research Institute, Karnal. The feeding trial was conducted on eighteen female Sahiwal calvesfor90 days at LRC, NDRI, Karnal. The animals were distributed into three groups (T_0, T_1 and T_2). The animals in (T_0) group were fed as per ICAR 2013 feeding standard. In the (T_1 and T_2) group, *Azolla pinnata* was fed by replacing 15% and 30% protein content of concentrate with *Azolla pinnata* on DM basis, respectively. Proximate analysis revealed that the *Azolla pinnata* was the rich source of protein. There was no significant difference in all the parameters used for estimating the linear type traits (LTT) in all the groups. Body weight measured through Schaeffer's formula showed a significant difference between the T_0 and T_2 groups. The significant difference ($p<0.05$) was obtained for feed cost/kg weight gain in between the T_0 and T_2 groups. The reduction in the feed cost/kg weight gain in T_1 and T_2group as compared to T_0 group was Rs. 7.28 and 14.51 respectively. It was concluded that Azolla inclusion at 30% replaced level was the most profitable replacement in the feeding trial.

Keywords: *ADG, Azolla pinnata, Economics, Linearty petraits, Sahiwal calves.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/007

Intervention of Stakeholders in the Technological Utilization Pattern of Precision Farming

Padma S.R
Assistant Professor (Agricultural Extension)
TNAU, Coimbatore, Tamil Nadu

Precision agriculture is a complete approach to farm management with the following goals and outcomes: greater profitability and sustainability, improved product quality, effective and efficient pest management, energy, water, and soil conservation, and protection of surface and ground water. The districts of Dharmapuri, Krishnagiri, Coimbatore and Erode in Tamil Nadu's north western and western zones were taken as study area. The samples comprise of 200 precision farm practitioners totally @ 25 from each block and 50 stakeholders viz., @ 25 from each zone. As the result of technological utilization pattern of precision farmers, except Remote Sensing Technology, the rest eight technologies were adopted by the sample. Among them three technologies were followed by cent per cent of the sample. Researchers, Extension personnel, Officials of State Department of Agriculture, Horticulture were frequently intervened in the PF activities as stated by 76 per cent of the sample. More than 60% of respondents identified input dealers and produce marketing personnel as occasionally interfered sources. Drip marketers intervened only infrequently (48%) and on unusual occasions (43.50 per cent).

IAAHAS/AB/2023/008

Effect of integrated weed management in Mustard (*Brassica juncea* L) in North Haryana

Ashish Kumar Yadav, Hansraj Shivran and Rohit
FASC, SGT University, Gurugram, Haryana

A field experiment was carried out at research farm, faculty of agriculture science, Shree Guru Gobind Singh Tricentenary University, Gurugram, Haryana, during *Rabi* seasons of 2022-23 to Effect of integrated weed management in Mustard (*Brassica juncea* L) in North Haryana. The treatments in mustard during rabi seasons comprising twelve treatment was laid out in a randomized block design with three replications mustard variety Pioneer 45S46 was sown at 45 cm row spacing using a seed rate of 5 kg/ha. Among the treatment Pendimethalin @ 1.0 kg a.i. ha^{-1} (PE) significantly reduced the weed density and dry matter of weeds. Pendimethalin @ 1.0 kg a.i. ha^{-1} (PE) also enhance the primary and secondary of branches, plant height, number of pod/plant, seed, straw and biological yield and remained statistically at par with Pendimethalin @ 0.75 kg a.i. ha^{-1} (PE), Pendimethalin @ 1.0 kg a.i. ha^{-1} (PPI), Pendimethalin @ 1.0 Kg a.i. ha^{-1} (PE) + Glyphosate @25 ml at 25 DAS and 50 ml/ha at 50 DAS and over to the weedy check, Pendimethalin @ 0.75 kg a.i. ha^{-1} (PPI), Pendimethalin @ 0.75 kg a.i. ha^{-1} (PPI) + Glyphosate @25 ml at 25 DAS and 50 ml/ha at 50 DAS and One hand weeding at 20 DAS.

Keywords: *Pendimethalin, seed yield, pod and mustard*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/009

Integrated Pest Management module to suppress fruit fly, *Bactrocera* spp., in the guava ecosystem

Irsad and Parvez Qamar Rizvi
Department of Plant Protection, Faculty of Agricultural Sciences, Aligarh Muslim University, Aligarh

Fruit flies (Diptera: Tephritidae) are recognized as one of the most devastating pests, causing severe damage to the guava fruits. This considerable damage renders fruit and makes it inconsumable and unmarketable. *Bactrocera* spp. are highly polyphagous; guava is the preferred host plant. Using visual and olfactory chemical cues, female flies recognize the suitable host at an optimal distance. Host selection is made based on sugar content, delicacy, and aroma released from the fruits for the survival and development of immature. The maggots remain inside and feed the internal contents of fruits. With this view, the experiment was carried out to develop a cost-effective integrated pest management strategy to combat fruit flies in guava orchards for 2018 and 2019. Eight treatments, including the control, were implemented in the trial, which was set up using a randomized block design with three replications. All the treatments were found effective over the control. The most effective method for reducing the average fruit fly infestation to 8.66% and 7.66% for the years 2018 and 2019, respectively, were found to be hoeing under the tree canopy at intervals of 15 days, along with collecting fallen fruits and burying them deep in the soil and spraying spinosad (Treatment-5). Recorded yield for the years 2018 and 2019 is 205.0, and 213.67 kg/three trees, respectively (Treatment-5) with a cost-benefit ratio of 1:12.5 Treatment-6 (Hoeing+Sanitation+Malathion) was found to be effective after Treatment-5 with an average fruit infestation 9.65 and 8.00% for the year 2018 and 2019, respectively with 180.67 and 187.67 yields (kg/three trees) (CBR= 1: 4.7). Hoeing under tree canopy alone proved to be least effective with an average fruit fly infestation 20.35 and 17.67% for the year 2018 and 2019, respectively with lower CBR.

Keywords: *Fruit Fly, guava fruit, IPM, Sanitation and Bait sprays*

IAAHAS/AB/2023/010

A Study on attitudes or willingness of College Students to use face mask against Coronavirus

***Rupanagudi Beena Fareq[1] and Dr. Rupal Babel[2]**

[1]M.Sc. Scholar, Dept. of Textiles and Apparel Designing, College of Community and Applied Sciences, MPUAT, Udaipur, Rajasthan

[2]Associate Professor, Dept. of Textiles and Apparel Designing, College of Community and Applied Sciences, MPUAT, Udaipur, Rajasthan

Coronavirus disease 2019 (COVID-19) is an infectious illness caused by the coronavirus 2 severe acute respiratory syndrome (SARS-CoV-2). It is contracted by inhaling air contaminated with viral droplets and small airborne particles and the risk is highest when people are in close proximity. Infected fluids can also be transmitted if they splash or spray into the mouth, nose, or eyes, or, less commonly, if they come into touch with contaminated surfaces. Even if they are asymptomatic, persons can spread the virus for up to 20 days while staying contagious. The aim of the study is to analyze the attitudes or willingness of College Students to use facemask against Corona virus. A sample of 200 students (100-girls and 100-boys) were selected randomly from colleges of MPUAT, Udaipur, Rajasthan. Structured questionnaire was developed and used to collect the desired information from the students. The results shown that most of the students are willing to wear reusable cloth masks and in particular they preferred cloth masks. Significant difference was found between boys and girls' habit of using number of facemasks preferred to wear at once in crowded places. It was known that main reason for using facemask during covid pandemic was to protect oneself/others from being transmitted by virus and due to college or university rules. The study concludes that most of the students have positive attitudes regarding following safety precautions against Corona virus.

Keywords: Handloom, SDGs, Economy, Environment friendly.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/011

Agroforestry an Approach to Sustainable Farming System in India – Empirical Study

C. Saranya
PhD Scholar, Tamil Nadu Agricultural University, Coimbatore

Agroforestry is derived from the integrations of various sectors like crops, forestry, and livestock which seek to optimize mutualism and commensalism to minimize predation on crops and livestock and reduce competition inside and amid species. It is a low-cost land-use approach for the sustenance of farmers' livelihoods. India is the first nation in the world to adopt the Indian agroforestry policy which seeks to overcome many of the obstacles to the adoption of agroforestry due to its good prominence and success in this type of land use system. This study analyzed the proportion of adoption and non-adoption of agroforestry practices for the sustainable farming system, and the factors leading to their adoption in India. 400 respondents were selected from agroforestry and horticulture farmers through simple random sampling using a structured questionnaire. The proportion of adoption of agroforestry practices in the Indian area far exceeds that of non-adoption. Six factors exert a positive and significant (p-value = 0.05) effect on peasant decisions to adopt agroforestry practices in India, including education, forestry experience, tree planting, job training, farmers group, and commission agents. Age, human capital, and irrigation did not positively influence adoption of these practices. Thus, the results of this study supported an upsurge in the awareness of the farming community on agroforestry practices. In conclusion, still research is needed on approaches to grading up the profits and techniques of agroforestry across large farming areas in our country, and educating responsiveness for sustainability through various extension services through the government.

Keywords*: Agriculture, Agroforestry, Farming Technology, Sustainable Practices.*

IAAHAS/AB/2023/012

Integrated Weed Management in Wheat

Vangala Vennela
M. Sc. (Agriculture) Agronomy Student, Faculty of Agricultural Sciences
SGT University, Gurugram, Haryana

Wheat (*Triticum aestivum* L.) is the second most important cereal crop of India next to rice and accounts for 31.5% of the total food grain basket of the country. The total area of wheat in the world is around 221.12 mha with production of 697.8 mt. The average world productivity is 3155 k/ha. In India it covers an area of 29.64 mha with total production of 92.46 mt and average productivity of 3120 kg/ha. Limiting Wheat crop contributes substantially to the national food security by providing more than 50 % of the calories to the people who mainly depend on it. The weed free treatment recorded significant improvement in yield. Effect of different treatments on plant growth and yield of wheat. To evaluate the weed density and weed species under different treatments. To estimate the economics of different treatments. Weeds not only reduce the yield but also make the harvesting operation difficult. Therefore, for sustaining food grain production to feed ever-increasing population and ensuring food security, effective weed management is very essential.

Keywords: *Wheat, plant growth, weed density, Economics of different treatments*

IAAHAS/AB/2023/013

Biochemical and molecular characterization of probiotic bacteria isolated from the gastrointestinal tract of *Schizothorax richardsonii* from Gaula River, Uttarakhand

Seeta Dewali*, Netrapal Sharma, Deepak Chandra Melkani and Satpal Singh Bisht

Department of Zoology, D.S.B. Campus, Kumaun University, Nainital-263002, Uttarakhand, India

The Schizothorax richardsonii is a cold-water fish locally known as "*Asela*." Snow trout is an indigenous cold-water fish found across Indian mountains from Kashmir to North-East India, including the coldwater rivers of Uttarakhand, with an altitude ranging from 300 to 2810 masl. Schizothorax sp. prefers to dwell in snow-fed rivers or streams. According to the 2012 IUCN Red List, 2172 fish species are threatened and the snow trout has been considered as vulnerable. Aquaculture with probiotics is the farming of aquatic creatures interfering in the development and production of aquatic organisms, which is more popular than standard fish production. Probiotics are used in various aquaculture operations, including fish production, to boost disease resistance, aquatic organism development, and feed efficiency. In addition, probiotics are used to minimize bacterial infections and enhance the quality of drinking water. According to several findings, probiotics enhance food digestion, boost stress tolerance and promote reproduction. Currently, there are commercial probiotic products prepared from various sources. Naturally, probiotics are found in water, sediment, and organisms in a restricted system; a sizable number of fish gut bacteria have been reported worldwide with their probiotic potential. The current study focuses on the gut-associated bacteria of *Schizothorax richardsonii*. After dissecting the collected fish, total gut content was collected under sterile conditions, followed by incubation at 37°C. After a series of standardized microbiological methods, Pure colonies were obtained, the isolates were tested for their in vitro probiotic potential, and promising bacterial isolates were further characterized by 16SrRNA gene sequencing.

Keywords*: Probiotics; Schizothorax richardsonii; Aquaculture; River; Uttarakhand*

IAAHAS/AB/2023/014

Characterization of Brewer Spent Grains- an agro industrial waste and its sugar analysis for potential production of Xylitol

Srishti Mathur, Dinesh Kumar*
School of Bioengineering and Food Technology, Shoolini University of Biotechnology and Management Sciences, Solan

Beer production generates a lot of waste, much of which is lignocellulosic biomass in the form of brewer's spent grains (BSG) (cellulose, hemicellulose, and lignin). In the present study, moisture (6.12 ± 0.06), pH (7.37 ± 0.18), fat (11.01 ± 0.02), protein (19.6 ± 0.23), CHO (59.49 ± 1.03), crude fiber (15 ± 0.15), ash (3.1 ± 0.05), hemicellulose (21.5 ± 0.32), cellulose (25.5 ± 0.40), lignin (10 ± 0.56), total solid (93.88 ± 0.54) were determined, respectively. Economic conversion to value-added products is a fundamental motivation for sustainable LCB biorefineries. If we want to leverage biotechnology to turn alcohol sugars like xylitol and erythritol into valuable resources for other sectors, we need to focus on BSG. That could significantly affect the outcome of the game. This paper demonstrates how Brewer Waste Grain may be characterized to extract hemicellulose concentrate that can then be targeted with different pretreatments to examine their effect on sugar yield. Three different pretreatments were tested under ideal conditions: acid hydrolysis, hydrothermal (water bath), and a hybrid of the two. DNS and HPLC analysis were used to determine the xylose yield in the pretreated LCB. It was found that combining acid hydrolysis with hydrothermal treatment produced the greatest results in 30 minutes. This leads us to the conclusion that hydrothermal followed by acid hydrolysis pretreatment is the suitable pre-treatment for BSG in terms of optimizing sugar release.

Keywords: *Brewer Spent Grain, Lignocellulosic biomass, Xylitol, Acid Hydrolysis, Hydrothermal.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/015

Thermal Time Requirements for Phenophases of Different Mango Cultivars Under Semi-Arid Tropics of Vidarbha Region

P. L. Deshmukh[1]*, S. D. Patil[2], S. G. Bharad[3], D. M. Panchbhai[4] and S. S. Wanjari[5]

[1]*Assistant Farm Manager, Hortifal Services Private limited, Mumbai, Maharashtra
[2] College of Agriculture Dhule (M.P.K.V., Rahuri) Maharashtra
[3 & 4] Department of Fruit Science, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra
[5] Departments of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra

A field experiment was conducted to study thermal time requirements for phenophases of seven mango varieties during the mango seasons of 2016-17, 2017-18 and 2018-19 at the experimental farm of Department of Fruit Science, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (M.S.). The results revealed that, agro meteorological indices *viz.,* Growing degree days, heliothermal units, photothermal units and hydrothermal unit requirement of seven mango cultivars for various phenophases was distinct. Among the studied mango cultivars *cv.* Pairi accumulated least heat units for flower bud differentiation (1294.65 ^{0}C day) and flowering span (284.80 ^{0}C day), however *cv.* Vanraj accumulated least heat units for initiation of flowering (614.44 ^{0}C day) and fruit maturity (1110.06 ^{0}C day). The growing degree days and other agro-meteorological indices had direct influence on flowering to fruit maturity but didn't show any direct influence on fruit characters as well as quantitative and qualitative characters. In respect of thermal use efficiencies, the highest heat use efficiency, Heliothermal use efficiency, Photothermal use efficiency and Hydrothermal use efficiency was noted in *cv.* Pairi (4.47, 0.52, 0.34 and 0.15 respectively) and least in *cv.* Neelum (1.98, 0.23, 0.15 and 0.07 respectively). The weather parameters viz., temperature, bright sunshine hours, relative humidity, day length and annual rainfall had significant correlation with fruit drop and fruit yield. On the basis of thermal use efficiencies *cv.* Pairi followed by *cvs.* Mallika, Kesar were found to be more suitable for semi-arid tropic conditions of western vidarbha region.

Effect of Urban Compost on Wheat-Maize (Fodder) Cropping Sequence on Soil Quality and Residual Effect under Climate Smart Agriculture

***Amruta Raut, B.D. Bhakare, Ritu Thakare and A.G. Durgude**
Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

The field experiment entitled "Effect of urban compost on wheat-maize (fodder) cropping sequence on soil quality under climate smart agriculture" was conducted during 2019-20 at Post Graduate Institute, Research Farm, Mahatma Phule Krishi Vidyapeeth, Rahuri. The experiment was laid out in randomized block design comprising of eight treatments and three replications for wheat crop. For maize (fodder), experiment was laid out in split plot design superimposed on the treatments of preceding crop wheat as sub plot comprising eight main plot and five sub plot treatments (i.e total 40 treatment combinations). At the end of cropping sequence, soil physical properties (MWHC, pore space, volume expansion and porosity) were highest in the treatment 100% N through vermicompost in main plot while for sub plot highest in the treatment residue of 100% N through vermicompost.From the above one year sequence crop study, it can be concluded that the application of GRDF (120:60:40 N, P_2O_5 and K_2O kg ha^{-1} + FYM 10 t ha^{-1}) for wheat crop significantly improved physical, chemical and biological properties however, it was at par with application of 25% N through urban compost alongwith 75% N through urea and 100% N through vermicompost along with recommended dose of P and K. Application of 25% N through urban compost (residue of urban compost applied to wheat crop) alongwith 75% N through urea for maize (fodder) crop recorded improved soil quality, however, it was at par with 100% N through vermicompost (residue of vermicompost applied to wheat crop) alongwith recommended dose of P and K. The application of organic manures in the form of FYM, vermicompost and urban compost and their residual effect for succeeding crop were found to be beneficial in improving physical properties, increasing microbial population, β-glucosidase and dehydrogenase activity which ultimately helped in improving soil health under wheat-maize (fodder) crop sequence.

Keywords: *Urban compost, soil quality, vermicompost, climate smart agriculture*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/017

Drudgery Reduction of Farm Women While Performing Turmeric End to End Production

Dr. Madhuri Sudhakarrao Revanwar[1] and Dr. Priyanka Rajkumar Khole[2]
[1]Scientist – Home Science (I/C Senior Scientist and Head
[2]Scientist - Agriculture Engineering
Sanskriti Samvardhan Mandal's Krishi Vigyan Kendra, Sagroli

Study was conducted to assess the performance of turmeric end to end technology on drudgery reduction of farm women while performing sowing to post harvest activities. Total 60 farm women were selected to conduct the study from turmeric growing villages (Sagroli, Kedarwadgaon and Takalgaon) from Nanded District of Maharashtra state. Activities like Turmeric sowing, fertilizer application, harvesting and drying are performing manually by farm women. While performing these activities, women faces drudgery and health related issues. To reduce the health problems and drudgery of women, small tools developed by College of Community Science, Vasantrao Naik Marathwada University Parbhani was taken for the study. The small tools were manual digger, fertilizer carrying bag, wooden rake and hand mittens. The performance of these tools was evaluated in terms of Rated perceived exertion and field capacity of the tools. Result revealed that in the improved technology showed highly significant values as compared to traditional methods. As compared to traditional method, area covered byf digger, wooden rake, hand mittens and fertilizer carrying bags were 5, 17.69, 2.27, and 3.25 percent respectively. While in case of rated perceived exertion, as compared to traditional method, highly significant difference was found in improved method i.e. 2.93 ± 0.57 and 1.13±0.33in digger, 3.66±0.47 and 1.93±0.57 in wooden rake, 3.73±0.44 and 1.4±0.48 in hand mittens, 3.93±0.57 and 2.93±0.57 in fertilizer carrying bags.

Keywords: *Drudgery, farm women, Technology, Turmeric technology, Harvesting.*

Phytoremediation of Wastewater through Implemented Wetland – A Review

Purti Bilgaiyan[1], Niharika Shivhare[2], N R N V Gowripathi Rao[3*], N Kavya Shruthi[4]

[1]Unitedworld School of computational Intelligence,
Karnavati University Gandhinagar, Gujarat
[2]Shri Vaishnav Institute of Science and Technology,
Shri Vaishnav Vidyapeeth Vishwavidyalaya Indore, M.P.
[3]Karnavati School of Research, Karnavati University Gandhinagar, Gujarat India
[4] School of Information Technology and Cyber Security,
Rashtriya Raksha University Gandhinagar, Gujarat

Contrary to the typical treatment system, built wetland systems have become high-performance wastewater treatment technology in recent years. In India as well, this technology is becoming more important for reducing water pollution. A built wetland is essentially a tank that has been planted with plants tolerant of waterlogged conditions and filled with a substrate. In this method, wastewater is treated by plants through phytoremediation. A manmade wetland's plant species is crucial in maintaining the temperature needed for a variety of biological and physiological processes necessary for the efficient treatment of wastewater. Hydraulic retention time (HRT), plant type, and bed material make up a built wetland's key elements. Generally, gravels and sand are used as the bed media and the plant species used are grasses like typha grass, canna indica, para grass, etc. Environmental-related parameters that are taken into consideration are pH, COD, BOD, TSS, NH_3-N, PO_4, nitrate, and Fecal coliform count in one complete macrophyte life cycle. The present paper gives information about the different types of constructed wetlands, pollutants removal mechanism by microphytes, engineering design used, and application of implemented wetlands.

Keywords: *Implemented wetland, wastewater, microphytes, pollutant removal.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/019

Defense inducing Molecules against Plant Pathogen

Aastik Singla*[1], Pooja Upadhyay[2]
Department of Plant Pathology, SGT University, Gurugram, Haryana

Abiotic stress and biotic stress are great loss to plant yield. For understanding alternative control strategies for emerging diseases enables plants to respond to biotic and abiotic stress. many chemical treatments are capable of triggering induced resistance (IR) through priming mechanism. Universal plant pathways include elicitors which induce resistance. Elictorsare classified as physical, chemical and biological. The first identified synthetic SA analogs such as 2,6 dichloroisonicotinic acid and its benzol (1,2,3) thiadiazole-7-carbothioic acid S-methylester (both) which triggers sar. aminobutyric acid (BABA) due to its versality and its priming for different defense responses dependent on distinct hormones pathways and challenging stresses. Other defense including molecules under research are chitosan, harpin protein, riboflavin, thiamine, Para-aminobenzoic acid (PABA), salicylic acid, jasmonoyl acid. there are compounds commercially released as plant health promoters. Priming of defense minimizes costs and improving resistance to attack consistent with effects of seed treatments. Other factors influencing expression of induces resistance like genotype, environment and other factors. There is need to standardize the method band dose of mechanism underlying in priming activity of these chemicals.

Keywords*: Stress abiotic and biotic, chemical treatments, priming, elictors, resistance, genotype.*

IAAHAS/AB/2023/020

Evaluation of nanocomposite-based coating for prolonging shelf life of Nagpur mandarin (*Citrus reticulata*)

Swapnil D. Deshmukh[1*], Surendra R. Patil[2] and Anita S. Patil[3]

[1*]Assistant Professor, College of Agriculture, Mul, Dr PDKV, Akola

[2] Professor, Department of Fruit Science, Dr. PDKV, Akola

[3] Professor, Dept. of Biotechnology, SGBAU, Amravati

The present investigation entitled "Evaluation of nanocomposite based coating for prolonging shelf life of Nagpur mandarin (*Citrus reticulata*)" was carried out in the Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, with the objectives to investigate the effect of green silver nanoparticles coating in prolonging the shelf life of Nagpur mandarin, to find out best nanoparticle treatment for better shelf life of Nagpur mandarin and to study the physico-chemical changes and microbial status during the storage of Nagpur mandarin. The nano particles were synthesized eco-friendly method by using different leaf extract and $AgNO_3$. The experiment conducted with eleven treatments and four replications under RBD experimental design. Results were confirmed that, Nagpur mandarin fruits coated with GSNp Tulsi treatment and stored in cold storage conditions remained in good condition up to 60 days of storage in mrig bahar and 45 days of storage in ambia bahar without disturbing the quality of Nagpur mandarin fruits.

Keywords: *Nagpur mandarin, GSNp, Mrig bahar, Shelf life, Citrus reticulata.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/021

Carbon Farming: A Source of Carbon Credit to the Future

***Rose Maria Paul, *Nisith Nishank Purohit and **Bindhya B N**
*M.Sc. Agronomy, College of Agriculture, Punjab Agricultural University, Ludhiana
**Ph.D. Agronomy, College of Agriculture, Punjab Agricultural University, Ludhiana

Carbon farming is an agricultural management system that reduces carbon (C) emissions to the atmosphere and increases the sequestration of C into sinks such as soil and vegetation. As per the Food and Agriculture Organization, there is 24% emission of Green House Gases (GHG) from agriculture, forestry, and other land use practices altogether and 7.1 gigatons emissions of CO_2-equivalent per year, which is 14.5% of anthropogenic GHG emissions. However, carbon farming involves sustainable agricultural practices such as reduced tillage, residue management, mixed cropping with perennials, and agroforestry systems which enhance the restoration of C into the soil and elevates the stored C over time. The stored C is understood as C credits, which is a promising source of trade in the market for global industries. With the expansion of carbon markets, carbon farming has a huge potential for creating more employment opportunities and income generation for farmers. Carbon credits are valued at 10-90 USD over the global market and buyers of these credits are petrochemical companies, tech companies, etc. Moreover, this farming system influences the agroecosystem by integrating agricultural crops with perennial and forest crops, increasing biodiversity, buffering drought with greater water use efficiency, and reducing GHG emissions. Thus, carbon farming is a win-win strategy for farmers and global industries to earn from C credits and address the C emissions. Yet, it demands more scientifical approaches to find out the prospects and challenges in the system as it is an emerging agricultural management system.

Keywords: *Carbon farming, Carbon Credits, Green House Gases, CO_2 equivalent, Agroforestry, Carbon Markets.*

An insight into soil quality parameters under different agroforestry systems in Erode district of Tamil Nadu

***K. Sivakumar[1], V. Ramasamy[2], M. Tilak[3], K. Ramah[4], V. Davamani[5] and E. Parameswari[6]**

Associate Professor,[1]ICAR - Krishi Vigyan Kendra, TNAU, Dharmapuri,
[2]Department of Soil Science & Agricultural Chemistry, TNAU, Coimbatore
[3]Forest College and Research Institute, TNAU, Mettupalayam
[4]Agricultural Research station, TNAU, Bhavanisagar
[5]Directorate of Natural Resource Management, TNAU, Coimbatore
[6]Nammazhvar Organic Farming Research Centre, TNAU, Coimbatore

A research work was carried out to assess the soil quality parameters of different agroforestry systems in Erode district of Tamil Nadu during the period of 2021-22. Soil samples were collected from three major agroforestry systems *viz*., agrisilviculture, silvipasture and silvihorticulture. Under each major system, five different agroforestry based cropping systems were selected for soil sample collection and one open barren land soil which served as a control. Collection of soil samples were taken in two depths *viz*., surface (0-30 cm) and subsurface (30-60 cm) at a distance of one metre away from root zone of tree species in two replications. Soil quality parameters such as, soil physical (bulk density, particle density, porosity, field capacity, permanent wilting point and available water content), physico chemical (Soil reaction, EC, organic carbon and CEC), fertility (available macronutrients, micronutrients) properties were analysed. Results from the study revealed that, *Bambusa vulgaris* + Tuberose system showed superior performance in all the soil attributes followed by *Ceiba pentandra* + Arecanut system than other agroforestry systems. The results emanated from this study revealed that, agroforestry systems had the capacity to improve the fertility status of the soil and it also helps in sustaining the soil quality in a beneficial way to create a better land use system. Silvipasture and silvihorticulture based agroforestry cropping systems were found to be promising approach which helps in sustaining the soil quality by recycling and nourishing the soil nutrients through enhancing the soil physical, chemical and biological attributes than the open barren land.

Keywords: *Agroforestry, Soil fertility, silvipasture, nutrient status, physico-chemical properties, soil quality*

Carbon balance as a key determinant of high night temperature sensitivity in contrasting rice cultivars

Nitin Sharma[1] and Anjali Anand[1]
[1]ICAR – Indian Agricultural Research Institute, New Delhi

The rise in global surface temperature is asymmetrical, with nighttime temperatures increasing three times faster than daytime temperatures, resulting in a 10% reduction in rice yield for every 1°C increase in seasonal nighttime temperatures. A study was carried out with two contrasting rice cultivars, Vandana (high night temperature susceptible) and Nagina 22 (high night temperature tolerant), by subjecting them to an increase in mean seasonal night temperature of 4°C (HNT 28°C vs Ambient 23.96°C) from anthesis till physiological maturity. In Vandana, night time respiration rate on leaf area basis (R_n) significantly increased by 91% ($P< 0.05$) while subsequent day photosynthetic rate on leaf area basis (P_n) declined by 19% ($P< 0.05$) at 10 days after anthesis (DAA) while both remain at par at 20 DAA. In Nagina 22, R_n significantly increased by 33% ($P< 0.05$) while subsequent P_n increased by 59% ($P< 0.05$) at 10 DAA while both remain at par at 20 DAA. At 10 DAA, a lower P_n/R_n ratio in Vandana resulted in carbon limitation, which increased spikelet sterility, reduced ^{14}C labelled sugar translocation towards panicle, and lower grain filling rate during the early and middle phases of grain filling (5-15 DAA), resulting in a reduction in grain weight per plant from 25.32 to 20.78g ($P< 0.05$) and a 20% reduction in total dry matter production. Higher Pn/Rn in Nagina 22 increased the carbon pool, which reduced spikelet sterility, higher ^{14}C sugar translocation towards panicle, and higher grain filling rate during early and middle phase, resulting in higher grain weight per plant from 19.04 to 21.44g ($P< 0.05$) and par total dry matter production. Overall, our study found a compensatory mechanism in tolerant cultivars that increases carbohydrate availability for grain filling by increasing subsequent day photosynthetic rate in response to increased night time temperatures.

Cryptorchidism in German Shepherd Dog and it's ultrasonographic diagnosis

Manjusha G. Patil[1], Lalit Misalwar[1], Pankaj B. Hase[2] and Vaibhav V. Choutmal[1]

[1]Assistant professor Department of Animal Reproduction Gynaecology and Obstetrics, College of Veterinary and Animal Science, Parbhani

[1]M.V.Sc Scholar Department of Animal Reproduction Gynaecology and Obstetrics, College of Veterinary and Animal Science, Parbhani

[2]Assistant professor Department of Veterinary Clinical Medicine, Ethics & Jurisprudence Mumbai Veterinary College, Parel, Mumbai

[1]M.V.Sc Scholar Department of Animal Reproduction Gynaecology and Obstetrics, College of Veterinary and Animal Science, Parbhani

Cryptorchidism is a common congenital pathology affecting reproduction and general behaviour of dogs. Majority of cases of cryptorchidism is observed in dogs followed by cat but can also be observed in other animal species. The condition can be unilateral or bilateral, characterised by failure of descent of testis into scrotum from the abdominal cavity. A four years old German shepherd male dog was presented to the TVCC (Teaching veterinary Clinical Complex) of COVAS, Parbhani (College Of veterinary and Animal Science), with the complaint of failure of conception even with subsequent mating with different female dogs. Inspite of showing excessive sexual desire and achieving erection and successful mating the female dogs was failed to conceive. Visual examination and palpation of scrotum and inguinal area revealed that the dog had normal penis with rudimentary scrotum and complete absence of both the testes in scrotal sac. It was decided to go for transabdominal ultrasonography and the method used was real time B-mode using transabdominal curvilinear probe of frequency ranging 2-5 MHz. With animal in its lateral recumbency the kidneys were located and the retained testes were searched starting from caudal border of kidney and moving downwards to inguinal region, searching area around the scrotal sac and urinary bladder. The retained testes can be recognised by its echogenicity and texture in comparison with other abdominal organs. Use of ultrasonography has become a major tool for diagnostic imaging technique for small animals. As for cryptorchism ultrasonography is highly effective in differentiating lymph nodes, tumour or intestinal faecal material, which can be

confused by palpation, by which using USG the echo-texture of these structures varies greatly due to anatomical differences and the retained testes can be easily differentiated and useful to locate the site for surgical removal. As for the case both the retained testes were located successfully using ultrasonography and the retained testes were successfully removed surgically.

IAAHAS/AB/2023/025

A Review: Potential of Wine Production from different fruits

Ashutosh Dalal
MSc Student, Lovely Professional University, Jalandhar

Wine is regarded as a gift from God and has also been described as a divine fluid in Indian mythology from ancient times. In Rigveda we find mention of wine as oldest fermented product known to man. Wine is an alcoholic beverage typically made of fermented juice. The fermentation process of juice into wine is a complex biochemical reaction involving microorganisms. Each gram of alcohol provides 7.1 kcal, and each milliliter provides 5.6 kcal. Alcoholic beverages are worldwide produced and they are most popular around the world for several centuries. Most wines as we know it is made with grapes, but it can technically be made from other fruits, flowers and vegetables too. The article presents review on potential of wine production from various fruits and current status of wine industry. Various wine classes such as fruit wine, blended wine, etc. have been discussed in this paper.

IAAHAS/AB/2023/026

Effect of Wrapping Materials and Growth Regulators on Quality and Storage Life of Papaya (*Carica papaya L.*) cv. Red Lady

Srinu B[1]*., Manohar Rao A[2]., Veena Joshi K[3]., Harish Kumar Sharma[5]and Narender Reddy S[4]

[1*]School of Agriculture, SR University, Ananthasagar, Hasanparthy, Warangal

[3]College of Horticulture, S. K. L. T. S. H. U, Rajendranagar, Hyderabad

[2, 4&5]College of Agriculture, P. J. T. S. A. U, Rajendranagar, Hyderabad

Papaya (*Carica papaya* L.) is evergreen herbaceous commercial fruit crop of tropical and subtropical region, cost-effectively important and a popular fruit. It is consumed as fresh fruit and vegetable and also used as processed product. Papaya fruit has occupied a place of pride in human diet because of its striking nutritional and medicinal values. This present experiment was carried out at college of horticulture, SKLTSHU, Hyderabad. To study the effect of different wrapping materials and growth regulators on fruit quality and storage life of papaya cv. Red lady was investigated at ambient temperature during storage. The effect of different Packaging materials and growth regulators on shelf life and quality of papaya cv. Red lady was stored at room temperature during the investigated. Among the different chemical treatments and combined with packaging materials imposed in the present investigation showed lowest physiological loss of weight (PLW) in fruits treated with $CaCl_2$ @ 3.0 % and packed in newspaper (7.65%), whereas, highest PLW was found in control (38.93%). Maximum fruit firmness was observed in the fruits treated with T_1- $CaCl_2$ @ 3.0 % and packed with newspaper (2.03 kg cm^{-2}) and T_1 recorded significantly minimum spoilage (23.34%) over other treatments. Maximum TSS recorded in T_7 - control (10.80^0Brix). The post-harvest storage life was found maximum in T_1 - fruits dipped in $CaCl_2$ @ 3.0% and packed with newspaper (17.58 days) and followed by T_3- GA_3 @ 100ppm and packed in newspaper (16.25 days). However, control has shown poor storage life (9.00 days).

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/027

Intrinsic evidence to understand the biocontrol potentials of *Coniothyrium minitans* with ligand binding ability against *Sclerotinia sclerotiorum*

Ruppavalli M.V[2]*, Parthiban V.K[1], Johnson I[1], Karthikeyan M[1] and Jayakanthan M[3]

[1]Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore
[2]SRS Institute of Agriculture and Technology, Vedasandur, Dindigul, Tamil Nadu
[3]Department of Plant Molecular Biology and Bioinformatics, Tamil Nadu Agricultural University, Coimbatore

"*Sclerotinia sclerotiorum* (Lib.) de Bary", is an economically important plant disease with an extensive host range. Sclerotia are attacked and deteriorated in the field by a variety of mycoparasites. In this study, a total of thirty-three mycoparasitic fungi were isolated from the sclerotial bodies of *Sclerotinia sclerotiorum*, causing cabbage head rot and canola stem rot. All the isolates were further molecularly characterized using the ITS regions. Among which the *Coniothyrium minitans* CM-1 showed maximum mycelial inhibition of 80.37% compared to control. The colonization and degradation of pathogenic sclerotia by pycnidiospore suspension of CM-1 isolate was screened on different days. Thirty antimicrobial compounds were identified in CM-1 isolate using GCMS analysis and those identified compounds were predicted using molecular docking analysis against pathogenic virulence protein, succinate dehydrogenase (SDH) in comparison with synthetic Boscalid fungicide. Among the screened metabolite androsterone-acetate and ethyl-iso-allocholate showed higher binding affinity of -7.6, and -7.4 kcal/mol than boscalid -7.2 kcal/mol. Based on these observations, *C. minitans* CM-1 can be suggested as a bio-fungicide for the effective management of *S. sclerotiorum* in cabbage and canola.

IAAHAS/AB/2023/028

Precision smart farming and farming with virtual reality/augmented reality

***Himani Sharma, Atin Kumar**
School of Agriculture, Uttaranchal University, Dehradun

Smart farming/Precision farming is about using the new technologies which have arisen at the dawn of the Fourth Industrial Revolution in the areas of agriculture and cattle production to increase production quantity and quality, by making maximum use of resources and minimizing the environmental impact. Also, the implementation of technology in agriculture and cattle production will make it possible to boost food security throughout the world. Conventional farming practices are area-centric. There is a general set of crops cultivated throughout an area. All the farmers in that area follow the same procedures with respect to the sowing, nourishing, irrigation, and harvesting period. These practices result in unpredictability, overuse of resources, and uncontrolled waste production. Before the use of technology in agriculture, a farmer's probability of yielding good produce was as good as tossing a coin and wishing for heads. Since farmers had no information on their farms, there was no way of learning the cause of crop loss. This practice pushed the farmers towards losses and debt. Advancements in farming created optimism for the agriculture sector, thereby combating the issue of unpredictability. Virtual reality is an application of artificial intelligence. It is an example of computer technology. It helps in creating an artificial imitation of the surrounding that is similar to the original surrounding. The application of AR to farming will increase farm output. Agriculture will undergo a technological revolution as a result of augmented reality. In the coming decades, the human population will grow steadily. As a result, augmented reality becomes more significant in agriculture.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/029

Effect of foliar Application of silicon on Banana

Panchal, R.K. and Patil, S. J.
Department of Horticulture
N. M. College of Agriculture, Navsari Agricultural University, Navsari

The present experiment was conducted at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2017-18 and 2018-19. An experiment was laid out in a randomized block design, comprising of three levels of potassium silicate and silicic acid (1, 2 and 3 ml/l/plant) along with control. The treatments were replicated thrice. The effects of foliar applications at 2nd, 3rd and 4th months after planting of different levels of potassium silicate and silicic acid on yield and yield attributes of banana cv. Grand Nain were recorded. The results indicated that foliar application of potassium silicate @ 3ml/l/plant at 2nd, 3rd and 4th MAP recorded significantly the maximum length and girth of bunch,weight of bunch number of hands per bunch, fingers per bunch, weight of 3rd hand, length of finger and finger weight from 3rd hand and fruit yield.

IAAHAS/AB/2023/030

Accessibility, Availability, Frequency and Purpose of ICT Usage by Farmers of South Gujarat

Keyur Modi* and Dr. Swati Sharma**

*Ph.D. Scholar (Agribusiness Management) and corresponding author, ASPEE Agribusiness Management Institute, Navsari Agricultural University, Navsari, Gujarat

**Assistant Professor (Agribusiness Management), ASPEE Agribusiness Management Institute, Navsari Agricultural University, Navsari, Gujarat

ASPEE Agribusiness Management Institute

Navsari Agricultural University, Navsari

Agriculture is an enormous sector of the Indian economy as its share to gross domestic product (GDP) is almost 17.76 per cent. In India 60 per cent of the population has agriculture as main occupation. In spite of a large of Indian economy, agriculture is lagging behind in many aspects and characterized by poor connectivity, disintegration of market, unreliable and delayed information to the farmers, small land holdings, non-adoption or less adoption of improved technology and many other factors. It has become indispensable to explore various ways to keep our farmers updated about modern technologies and relevant information to pace up them in current technological era. Information and Communication Technology (ICT) in agriculture is a growing model that focuses on enlightening agricultural and other development in India. ICT's can make agribusiness more lucrative and a profitable occupation for farmers by providing location based subject specific relevant information. It saves money, time and efforts and reduces dependency on so many factors in the chain of extension. There has been a rapid growth in the ICT sector and the use of ICT has expanded radically. Access to ICT means has possibility to make substantial influence in the empowerment of farmers and support their effort for improvement of production in various farm activities. Through ICT, they directly keep in touch with market personals and offer their produce with reasonable prices, and also keep them aware for weather forecast for agriculture input application like fertilizer and pesticides which might be affected by un fore seen disasters as communicated by metrological department. In this regard the present paper discusses accessibility, availability, frequency and purpose of ICT usage by farmers. It could be

concluded that accessing ICT tools can benefit in advancement agricultural practices which would lead to prosperity of farmers and agri-stakeholders.

Keywords: *Information Communication and Technology, Availability, Accessibility, frequency, Purpose*

IAAHAS/AB/2023/031

Development of the Pentaplex PCR Assay for Abortogenic Microbial Agents

Anil Kumar Mishra, K. Gururaj, Ashok Kumar, Nitika Sharma and Shiv Kumar

Animal Health Division, ICAR-Central Institute for Research on Goats (ICAR-CIRG), Makhdoom, Farah-281122, Mathura, Uttar Pradesh, India

Reproductive diseases of goats cause heavy economic losses to goat farmers/keepers. Amongst the reproductive abnormalities, the major ones are abortion, retention of placenta and stillbirth. Out of these abnormalities, abortion is a common one, which adversely affects production potential of the affected goats. Infectious along with non-infectious agents may cause abortion in goats. However, in majority of cases, abortions in goats are caused by infectious agents, that is, viruses, bacteria, chlamydia, rickettsia, mycoplasma, fungi and parasites. Under the infectious agents, the most common ones are *Brucella melitensis*, *Chlamydophila*, *Coxiella burnetii, Campylobacter, Listeria monocytogenes* and *Leptospira* spp. in case of goats. Under this study, we targeted *Brucella melitensis*, *Chlamydophila* spp., *Coxiella burnetii, Campylobacter* spp. and *Brucella abortus* for the development of the pentaplex PCR Assay. *Brucella abortus* was also included in the study, because most of time, goats are reared along with cattle and buffalo, and abortion in goats caused by this organism is the least studied. For the development of the pentaplex PCR Assay, the primers were designed using online softwares (BioEdit and OligoAnalyzer). Simplex PCRs with newly designed primers for the target organisms were standardized. Thereafter, the pentaplex PCR targeting *Chlamydia* spp., *Brucella melitensis, Campylobacter* spp., *Brucella abortus* and *Coxiella burnetii* was developed. The amplified gene products were sent for the nucleotide sequencing for further evaluation and refinement.

IAAHAS/AB/2023/032

Stem Cell Therapy is a Modern Approach in Veterinary Gynecology

Vaibhav V. Choutmal[1] Manjusha G. Patil[1], Pankaj B. Hase[2*] and Lalit Misalwar[1]

[1]M.V.Sc Scholar Department of Animal Reproduction Gynaecology and Obstetrics, College of Veterinary and Animal Science, Parbhani

[1] Assistant professor Department of Animal Reproduction Gynaecology and Obstetrics, College of Veterinary and Animal Science, Parbhani

[2*]Assistant professor Department of Veterinary Clinical Medicine, Ethics & Jurisprudence Mumbai Veterinary College, Parel, Mumbai

[1]M.V.Sc Scholar Department of Animal Reproduction Gynaecology and Obstetrics, College of Veterinary and Animal Science, Parbhani

Regenerative medicine is a discipline of medicine that studies how to create, repair or replace cells, organs and tissues that have been damaged or diseased. Just a few years the past, it has gained considerable traction. The primary goal of regenerative medicine is stem cell treatment. According to academic research, stem cell treatment can now be used to treat a variety of animal reproductive issues. Regenerative medicine is a branch of medicine that investigates ways to generate, restore or replace damaged or diseased cells, organs or tissues. Embryonic stem cells (ES), adult stem cells, induced pluripotent stem cells (iPSCs), fetal stem cells and umbilical cord blood stem cells are among the origins of pluripotent and progenitor cell lineages. In multicellular organisms, stem cells are specialized cells. They have the unusual capacity to separate and diversify themselves into a range of various types. A collection of specialized cells Stem cells have a unique property that allows them to perform a variety of functions, one of which is to repair damaged tissue. In veterinary obstetrics, many complications of tissue injury, tearing of internal organs and degeneration of uterine parenchyma are seen in cases like dystocia, torsion, vaginal prolapse and many more. Stem cells of embryonic origin have specific importance in invitro fertilization and embryo transfer. Some work has been done with the help of stem cells in veterinary gynecology which are Spermatogonia stem cells to advance the restoration of infertility in Breeding Bull, Endometrial repair by using stem cells in farm animals, Recent advancements in testis tissue xenografting to help genetically valuable animals

regain their reproductive potential, stem cells, and vaginal reconstruction. These cells can be easily isolated, safely transplanted to damaged tissue, and can be grafted from donor to recipient, making them the greatest tool for the restoration of fertility and preservation of endangered species in captive breeding management.

IAAHAS/AB/2023/033

Effect of growing media on rooting and growth of grape (*Vitis vinifera* L.) propagated through hardwood cutting

Pooja Pant
Faculty of Agricultural Sciences, Shree Guru Gobind Singh Tricentenary University, Gurgaon, Haryana

Growing media is one of the most important factors for rooting and growth of grape cuttings. Growing media is an important substrate used for raising healthy plants and supporting the plants in overall development by providing required growing elements. The combination of various organic and inorganic potting mixture, supplements the unavailable nutrients in soil which significantly influenced the growth and development of the cuttings. Growing media should be considered an essential part of the propagation system because rooting competency depends on the type of medium used. An ideal growing is well-drained, porous, good aeration, CEC (Cation Exchange Capacity), water holding capacity and are cheap and easily available.

Keywords: *Grape cutting, growing media, roots, shoots, aeration.*

IAAHAS/AB/2023/034

Characterization of rhizobia isolated from soybean, identifying and evaluating the effectiveness of isolated rhizobia for inoculants preparation by checking its PGPR activities

Anisha Shrivastava* and Diptimayee Dash
Department of Agricultural Microbiology, College of Agriculture,
Indira Gandhi Krishi VishwaVidyalaya, Raipur, Chhattisgarh

A study was conducted to evaluate rhizobia isolated from soybean *Glycine max* (L.).Its identification, morphological, physiological and biochemical characterization is done for developing inoculants for increasing PGPR activities of crop. Total 15 soil samples are taken and used for isolation of rhizobium in which 12 are fast growing isolates. Soil samples were collected from Department of Genetics and Plant Breeding, IGKV, Raipur. In Gram staining reaction all the 15 isolates were found Gram-negative and circular shaped. Biochemical characterization of rhizobium strains showed that all the 15 isolates have positive reaction with urease test, Starch utilization test was negative with all isolates except for NRC-138, MACS-1493, RSC-1103, PS1611, RSC-1107. Catalase test was found positive for all isolates except NRC-138, PS1611, samec as oxidase test also found positive for all except NRC-138, MACS-1493, NRC-137.Stress tolerance test was conducted, isolates NRCSL-1, RKS-18 show fast growth in high temperature rest show moderate to low growth. In pH test rhizobium isolates show positive result in low ph are NRC-138, RSC-1107, NRC-137 NRC-130, NRCSL-1, JS-9752, SKFPS-11 and salt test RKS-18 show the best growth NRCSL-1, JS-9752, SKFPS-11, NRC-136 show high to moderate growth. Screened down isolates were forwarded for drought and salinity tolerance test.

IAAHAS/AB/2023/035

Role of Biostimulants in fruit crops

Dr. V. V. Padmaja, K. Pavani, Dr. K. Lalitha, Dr. M. Jayaprada, Dr. K. Swarajyalakshmi and Dr. K. Gopal
Dr.Y.S.R.HU- College of Horticulture, Anantharajupeta, Annamayya, AP, India

In recent years, several technical and technological innovations were proposed in order to improve the sustainability of production systems through a significant reduction of agrochemicals. One such best approach to increase crop productivity is the development of environment-friendly organic products named "Biostimulants" (Du Jardin, 2015). There are eight categories of substances that act as biostimulants: (1) humic substances, (2) complex organic materials, (3) beneficial chemical elements, (4) inorganic salts including phosphite, (5) seaweed extracts, (6) chitin and chitosan derivates, (7) anti-traspirants and (8) free amino acids and N-containing substances (Rose et al., 2014). The effect of chitosan coated on postharvest quality of guava cv. Allahabad Safeda fruits were studied at room temperature by treating with chitosan (1 and 2%), acetic acid 1% or untreated and results revealed that chitosan 1% treated fruits stored at 12°C had shown higher firmness, TSS, titratable acidity and maintained greenness with a slow increase in yellow colour by the end of storage. (Krishna and Rao, 2017). A challenge is now to use this knowledge and these tools for the characterisation of biostimulants and their effects on a wide range of fruit crops to improve fruit yield and quality.

IAAHAS/AB/2023/036

Biomass-based Materials for Remediation of Heavy Metals from Industrial Effluent water

Neha Dahiya*and Yuvraj Yadav
School of Agricultural Studies, Geeta University, Panipat

Recent studies are focusing on removing industrial and agricultural contaminants from sewage treatment and talking about the prospect of using this water again for farming. Due to their high toxicity at extremely low concentrations, non-biodegradability in the environment, and cumulative effects on living species, chemical pollutants are among the most hazardous forms of contaminants found in water. Lead, mercury, and chromium are the heavy metals that are most dangerous. According to Blacksmith Institute's Global Worst Pollution Problems, the anticipated worldwide effect of lead is 18–22 million people and that of mercury is 15–19 million people in 2010. These components can pollute the entire food chain by contaminating water supplies, which poses a serious danger to the ecology. Consequently, the global lack of potable water becomes a major issue. Among the most significant studies that can help solve issues linked to water purification and quality improvement that can be used even in agriculture, for example, rather than being wasted and abandoned. Many scientific techniques have been used in this aim. These include of oxidation and biosorption procedures, as well as adsorption, precipitation, ion exchange, reverse osmosis, electrochemical processes, membrane filtering, and evaporation. Nevertheless, several of these methods have drawbacks such insufficient metal removal, large reagent and energy demands, and the production of hazardous sludge or other waste products. The adsorption method is the most advantageous from an economic and separation standpoint among all of these. Researchers have focused on less expensive materials like natural and agricultural goods rather than utilising commercial ones. While heavy metal removal has been the subject of several studies, the current work focuses on the sorbents based on biomass and how well they remove heavy metals from waste water.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/037

Assessment of Ash Gourd [*Benincasa hispida* (Thunb.) Cogn] For identification of Small Fruited and High Yielding Genotypes Suitable for Bower System of Cultivation

Rakesh Tadkal
PhD Scholar, Department of Vegetable Science, Horticultural College, and Research Institute, TNAU, Coimbatore

The present investigation was carried out at the College Orchard, Department of Horticulture, Agricultural College and Research Institute, Madurai during Oct 2018–Feb 2019 with the objective to identify suitable ash gourd genotype for short fruited and high yielding under pandal system of cultivation. Among thirteen genotypes evaluated, G-12 exhibited highest vine length (3.74m), the genotype G-12 showed highest internodal length (12.13 cm), G-9 exhibited highest number of branches (13.20). The genotype G-1 exhibited the lowest node number for first male flower (13.3) and the genotype G-2 exhibited the lowest node number for first female flower (15.45). The genotype G-1 and G-2 exhibited the least number of days for first male and female flower *i.e.,* (59 and 61.8 respectively). The genotype G-6 exhibited the lowest sex ratio (male to female) (5.01). The genotype G-5 and G-6 exhibited lowest and highest fruit weight (0.61 and 2.60 kg per fruit respectively), the genotype G-5 and G-6 also recorded the highest and lowest number of fruits per vine (6.6 and 2.1 respectively). The genotype G-12 exhibited the highest yield per plant (6.72 kg per plant), yield per plot (67.2 kg) and yield per hectare (16.8t ha-1). The maximum flesh thickness was noticed in the genotype G-1 (3.2 cm). The highest fruit girth was found in the genotypes G-6 (50.8 cm). The highest total soluble solid was recorded in the genotype G-13 (4.4 ^{0} brix). The highest crude fibre was recorded by the genotype G-1 (4.25 mg/100 g). Among the thirteen genotypes evaluated, the genotypes G-5, G-9, G-10 and G-11 were found to be small fruited which also exhibited a greater number of fruits per vine. Amidst the small fruited genotypes, the genotype G-10 and G-11 were small fruited and high yielding which are suitable to grow under bower system of cultivation.

IAAHAS/AB/2023/038

Design and Development of Intercrop Planter

[1]H. S. Chaudhary[*], [2]R. N. Singh and [3]V. M. Modi

[1*]Young Professional-II, Centre for Natural Resources Management, SDAU

[2]Research Scientist, Centre for Natural Resources Management, SDAU

[3]Principal and Dean, College of Renewable Energy and Environmental Engineering, SDAU

A planter for intercrops was designed and developed at CREEE, SDAU, Sardarkrushinagar. Intercrop planter's overall width is 2.6 m. It maintains 120 cm castor spacing and 45 cm green gram spacing. Two rows of castor and four rows of green gram were planted in the intercrop planter for a 2:4 intercrop. Using the grease belt method, the intercrop planter was evaluated under laboratory conditions. Following laboratory and field evaluations of intercrop planters, 60 degrees inclination angles and maximum seed dimensions on plates gave the best results. The theoretical seed rate for castor and green gram seed was 4.73 kg/ha and 13.19 kg/ha, respectively. Castor and green gram seed spacing were more accurate when the angle of inclination was 60, and the maximum seed size on the plate was 60.26 cm and 9.95 cm, respectively. There was a 10.40 percent missing index in castor, and a 8% missing index in green gram. There were no multiple indexes found in both crops when the angle of inclination was 60 degrees and the size of the seed cell was the maximum. In the developed intercrop planter, the average speed of operation, draft, theoretical capacity, effective capacity, field efficiency, and fuel consumption were observed to be 4.5 km/h, 233 kgf, 0.90 ha/h, 0.79 ha/h, 84.43 percent and 3.61 litres per hour, respectively. We calculated that the cost of the planter would be approximately ₹ 56500.00/- while the total cost of operating an intercropping operation would be approximately ₹ 608.00 per hour and ₹ 770.00 per hectare. In comparison to the manual method of sowing seed, 46.15 and 92.25 percent were saved in terms of cost and time. The breakeven point was 24.76 h/annum and payback period of intercrop planter 2.06 year.

Keywords: *Intercropping, Planter, Seed spacing, Seed rate, Quality of feed index and Cost of operation*

Assessing the Potentials of Agricultural Residue Derived Smoke Water on Crop Growth

Parameswari E, T. Ilakiya, P. Kalaiselvi, V. Davamani, K. Suganya and S. Paul Sebastian
Tamil Nadu Agricultural University, Tamil Nadu, India

Plant derived smoke plays a vital role in enhancing the germination of many seeds of both agricultural and horticultural crops. One pre-requisite for the application of plant derived smoke for enhancing seed germination and seedling growth is the use of smoke must be purely obtained from burning of plant material. It is a good substitute for traditional agricultural practices applied to enhance seed germination and plant growth as it is of low cost, easily approachable and of more useful method to obtain high yield. In this study, smoke water was collected from paddy straw in order to check the efficiency of seed gemination and growth of *Amaranthus sp.* (Variety TNAU *Amaranthus* Co-2).Gas Chromatography-Mass Spectrometry (GC-MS) analysis of smoke water revealed that the active compounds like 9,12-Octadecadienoylchloride, (Z,Z), Hexadecanoic acid, methyl ester, Hexadecanoic acid,1a,2,5,5a,6,9,10,10a-octahydro-5,5a-dihydroxy-4-(hydroxymethyl)1,1,7,9-tetramethyl-11-oxo-1H-2, 8a methanocyclopenta [a] cyclopropa [e]cyclodecen-6-yl ester, [1aR- (1aa,2à,5á,5aá,6á,8aà,9à,10aà)], 9-Octadecenoic acid (Z)-, hexyl ester, Hexadecanoic acid, 1-(hydroxymethyl)-1,2-ethanediyl ester, Heptadecanoic acid, 16-methyl-, methyl ester, Oleic Acid, Glycidyl palmitate, Squalene, 9-Octadecenamide, (Z), Methyl stearate are present in the smoke water.

The efficacy of paddy straw derived smoke water on *Amaranthus sp*. Growth and yield was assessed through pot culture experiments. Among the various treatments imposed, the treatment which is having 1% of smoke water treatment (T_2) recorded the higher germination percentage (96%), root length (4.9 cm), shoot length (9.9cm) and vigor index (1376.40) and increased the green yield up to 26.82 %. Hence 1% of smoke water can be effectively utilized for treating the seeds to get higher yield of *Amaranthus sp*. Also, it achieved a Benefit Cost ratio of 2:1 which reveals its economic feasibility.

Keywords: *Smoke water, Agro-wastes, seed vigor, germination*

IAAHAS/AB/2023/040

Foetal Anasarca a cause of Dystokia in Does

Manjusha G. Patil[1], Lalit Misalwar[1], Pankaj B. Hase[2] and and Vaibhav V. Choutmal[1]

Assistant professor Department of Animal Reproduction Gynaecology and Obstetrics, College of Veterinary and Animal Science, Parbhani

[1]M.V.Sc Scholar Department of Animal Reproduction Gynaecology and Obstetrics, College of Veterinary and Animal Science, Parbhani

[2]Assistant professor Department of Veterinary Clinical Medicine, Ethics & Jurisprudence Mumbai Veterinary College, Parel, Mumbai

[1]M.V.Sc Scholar Department of Animal Reproduction Gynaecology and Obstetrics, College of Veterinary and Animal Science, Parbhani

Dystocia can be termed as difficulty in parturition arising as a result of any feotal pathology or possible distress of dam including exhaustion and disease condition of dam. Feotal anasarca and ascites in one the possible cause of dystocia. The foetal anasarca is termed as generalized oedema and widespread swelling of skin which is characterised by fluid accumulation due to death of fetus, can be genetic cause and possible spread of infectious agents in to the developing feotus resulting into foetal death and fluid accumulation. Two different cases dystocia in doe were presented at different days in the Obstetrical unit of Teaching Veterinary Clinical Complex (TVCC), College of Veterinary and Animal Science, Parbhani. Both the cases were diagnosed for dystocia and an oedematous foetal head was seen in the vaginal canal. As for case-1, it was a seven years old multiparous ND doe with full term gestation, showed straining for two to three hours but unable to deliver. Per-vaginal examination revealed a dilated cervix and large oedematous and disproportionate foetus lodged in pelvic inlet. Attempts were made to deliver by traction but failed due to oversized foetus and was successfully removed by caesarean section under local anaesthetic. In case-2, it was four years old ND doe with similar history, the oedematous fetal head was ouside the vaginal canal. Per-vaginal examination revealed oedematous foetus, but the size was comparatively small as compared to case-1. So, it was delivered successfully using traction. Both the cases were treated successfully, followed by medicinal and supportive treatment given for 5-6 days, the both the animals were recovered uneventfully.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/041

Standardization of spray technique for PRE herbicides in ZT-wheat with rice residue retention

Charul Chaudhary[1], Dharam Bir Yadav[2]*, Ashok Yadav[3], VS Hooda[4]
[1,4]Deptt of Agronomy, College of Agriculture,
CCS Haryana Agricultural University, Hisar-
[2]Regional Research Station, CCSHAU, Bawal
[3]Galotias College of Engineering and Technology, Noida

The present investigation entitled, "Standardization of PRE herbicide spray in ZT-wheat with rice residue retention" was conducted at the research farm of CCSHAU, Regional Research Station (RRS), Karnal during winter seasons of2019-20 and 2020-21. In the experiment, ZT-wheat (var. HD 2967) was sown with happy seeder under surface residue load of 6 t/ha (chopped) on 18th November, 2019, and 25th November 2020. Fourteen weed control treatments including PRE herbicide (pendimethalin 1500 g/ha), sequential application of PRE *fb* POE (pendimethalin 1500 g/ha *fb* pinoxaden 50 g/ha), weedy check and weed-free checks were arranged in a randomised block design with three replications. PRE herbicides were applied on the top of rice residues using two water volumes (500 and 1000 L ha^{-1}) and three types of nozzles (flat-fan, flood-jet and air-injection). Among weed species, *Rumex dentatus* and *Phalaris minor* showed greater suppression under residue mulch and *Medicago denticulate* showed least suppression. Pendimethalin 1500 g/ha *fb* pinoxaden 50 g/ha (1000 L ha^{-1}) (Flood-jet) was statistically similar to weed-free in terms of grain yield, net returns and B-C ratio in both the years followed by pendimethalin 1500 g/ha *fb* pinoxaden 50 g/ha (1000 L ha^{-1}) (Air-injection) and pendimethalin 1500 g/ha *fb* pinoxaden 50 g/ha (1000 L ha^{-1}) (Flat-fan). Recommendations generated through present investigation will facilitate proactive management of rice crop residues in wheat crop by controlling herbicide resistant weeds through synergistic integration of PRE and POE herbicides through appropriate spray technologies in wheat grown with rice residue retention on soil surface.

Keywords: *Crop residue, zero-tillage, rice-wheat system, weeds, herbicides.*

IAAHAS/AB/2023/042

Effect of Edible Coating on Postharvest Quality and Storage of Guava (*Psidium guajava* L.) CVs. L-49

Ganesh Kumar Choupdar*, Sajeel Ahamad, Vivek Saurabh, Nirmal Kumar Meena

Division of Food Science and Postharvest Technology, ICAR-Indian Agricultural Research Institute, New Delhi 110012, India

The fresh and mature guava fruits were harvested from plants and treated with different edible coatings and analysed for their physiological, biochemical parameters. Different combination of edible coating T_1-control, T_2 - Sago starch- 10%, T_3 - Sago starch- 15%, T_4 - Aloe vera gel-5%, T_5 - Aloe vera gel-10%, T_6 - $Cacl_2$- 1%, T_7 - $Cacl_2$- 2%, T_8 - Sago-10% + Guava Leaf Extract - 0.05%, T_9 - Sago-15%+ Guava Leaf Extract- 0.05%, T_{10} - Aloe vera- 5 % + Guava Leaf Extract- 0.05%, T_{11} - Aloe vera 10% + Guava leaf Extract -0.05%, T_{12} - $Cacl_2$- 1% + Guava Leaf Extract - 0.05 % and T_{13} - $Cacl_2$- 2% + Guava Leaf Extract - 0.05 %. Among the treatments physiological loss in weight (6.5%) and shelf life (16 days) were found significantly maximum with T_{13} ($Cacl_2$- 2% + Guava Leaf Extract - 0.05 %) treatment. However, the biochemical parameters total soluble solids (10.20° Brix), reducing sugar (4.97 %), non-reducing sugar (3.90 %), total sugar (8.87 %), ascorbic acid (269.00 mg/100 g pulp) and total phenol content (155.73 %) were found significantly maximum in T_{13} ($Cacl_2$- 2% + Guava Leaf Extract - 0.05 %) treatment.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/043

Seasonal variation in Sexual behaviour of Deoni (*Bos indicus*) Bulls

Dr. Prashant Kumar[1], Dr. Mukund A. Kataktalware[2] and Dr. S. Jeyakumar[2]
[1]Department of Livestock Production Management, School of Agriculture, S R University, Warangal-506 371, Telangana, India
[2]Dairy Production Section, Southern Regional Station of ICAR-National Dairy Research Institute, Adugodi, Bengaluru-560 030, Karnataka, India

The objective of the present study was to evaluate the effect of season on sexual behaviour in Deoni bulls. This study was carried out at Southern Regional Station of ICAR-National Dairy Research Institute, Adugodu-560 030, Bengaluru (Karnataka). A total of six mature adult bulls were used, which were suitable for reproduction and under regular collection. They were subjected to semen collection at weekly intervals and recording of the sexual behavioral traits i.e. libido, protrusion and intensity of thrust score, reaction time, dismounting time and total time taken in mounting; was also done simultaneously. The climatic variables i.e. maximum-minimum temperature, dry and wet bulb temperature, relative humidity were also recorded on daily basis. To calculate the Temperature-humidity Index (THI), we used the formula suggested by National Research Council, 1971 [THI = (DB+WB)* 0.72+40.6]. One way ANOVA was used to determine the effect of different seasons on sexual behaviour. We found that the season had non-significant (P>0.05) effect on sexual behavioral traits except dismounting time in Deoni bulls. The libido score (0-10), reaction time (seconds) and total time taken in mounting (seconds) were non-significantly (P>0.05) higher during winter (7.50±0.23, 42.00±4.8, 44.00±4.8, respectively) as compared to other seasons. The protrusion score (0-4) and intensity of thrust (0-4) were non-significantly (P>0.05) higher during the summer (2.60±0.14 and 2.50±0.13) as compared to other seasons. The dismounting time (seconds) was significantly (P<0.05) higher during summer (2.90±0.16) as compared to other seasons. Based on the results of the present study it can be concluded that the Deoni bulls had good sexual behaviour scores across the year, however, bulls showed better sexual behaviour except dismounting time during the winter as compared to other seasons.

IAAHAS/AB/2023/044

Environmental Impact Assessment of National Highway (NH-22) Bypass (Shoghi-Shimla-Dhali) Expansions on Floristic Composition, Himachal Pradesh

Shelly Banyal[1], Rajeev Kumar Aggarwal[2]

[1]Shelly Banyal, Department of Environmental Science, Dr. YS Parmar University of Horticulture and Forestry Nauni, Solan (H.P) India

[2]Rajeev Kumar Aggarwal, Department of Environmental Science, Dr. YS Parmar University of Horticulture and Forestry Nauni, Solan (H.P) India

The present investigations report the outcomes of environmental impact Assessment of bypass national highway (NH-22) expansions on floristic composition. The area was divided into four uniform segments based on distance *viz.,* Site 1, Site 2, Site 3, Site 4 study site was divided into three zones on the basis of habitat which are top, slope and moisture at different elevation. Quadrats were laid down in stratified random manner along as altitudinal gradient. 12 quadrats of 0.1 ha and 24 quadrats of 5m x 5m laid out randomly for enumerating trees and shrubs in each site. In each quadrat, the numbers of trees and shrubs were counted. The diameter at breast height (dbh) of tree species was measured individually by tree caliper. The diameter of shrubs was measured by digital caliper. In case of trees, height was determined by Ravi multimeter and expressed in meter. The phytosociological parameters were studied from basic data viz., number, diameter and height on quadrat basis for trees, using different formulae like abundance, density, basal area, percent frequency, importance value index, Shannon-Wiener index of diversity, Shimpson's index of dominance and species richness. Plant species grown along the national highway bypass mostly belongs to the Rosaceae family. The maximum (42) and minimum (31) number of plant species occurred in Majhhar and Dhali respectively. The maximum average basal area (23,839.30 cm^2 ha^{-1}) for shrubs among different sites was recorded at Shunghal whereas for trees (44.295.56 cm^2 ha^{-1}) it was recorded at Majhhar. The plant species showed contiguous pattern distribution of vegetation among all sites as abundance/frequency ratio become > 0.050.IVI value of tree and shrub species suggested that dominance of a species changed with site and habitat zone. The plant species like *Elaeagnus conferta, Rubus ellipticus, Myrica esculenta, Ficus*

auriculata and *Ficus palmata* were observed as they used for rejuvenation of degraded land as well as for the management of soil erosion in mountainous area during highway expansion since they have deep root system.

Keywords: *Composition Floristic, Highway, National, Sites, Species*

IAAHAS/AB/2023/045

Feasibility of biochar and flyash as soil amendment on growth and yield of Bajra Napier Hybrid (DHN 6) in interspace of coconut plantation of coastal sandy soil

Surekha[1*], Koppalkar, B.G.[2], Ravi Bhat[1], Subramanian, P.[1], Desai, B.K.[2], Satyanarayana Rao[2], Narayana Rao, K[2]., Kurubar, A.R[2]., Alka Gupta[1] and Neenu, S[1]

[1]ICAR-Central Plantation Crop Research Institute, Kasaragod, Kerala, India

[2]University of Agriculture Sciences, Raichur, Karnataka, India

Field experiment was conducted at ICAR-CPCRI, Kasaragod during 2018-19 and 2019 – 20 to study the role of soil amendments in coastal sandy soil management and their effect on yield and quality of fodder crops in the interspace of coconut plantations. Factorial Randomized Complete Block Design (FRBD) was followed with two factors viz., factor I- Soil amendments with seven levels: (1) biochar @ 10 t ha^{-1} , (2) biochar @ 20 t ha^{-1} , (3) flyash @ 10 t ha^{-1} , (4) flyash @ 20 t ha^{-1} , (5) biochar @ 5 t ha^{-1} + fly ash @ 5 t ha^{-1} , (6) biochar @ 10 t ha^{-1} + fly ash @10 t ha^{-1} (7) control (husk burial @ 5 t ha^{-1}) and factor II- fertilizer levels with three levels: (1) 75 % RDF, (2) 100 % RDF (3) 125 % RDF (RDF based on soil test values). Owing to skeletal nature of coastal sandy soil, it responded remarkably and significantly to soil amendments and higher fertilizer levels. If there is availability of biochar and fly ash both, then combined application of both @ 10 t ha^{-1} can be recommended, however if there is availability of any one, then either biochar

or fly ash can be applied @ 20 t ha^{-1}. As the coastal sandy soils are hungry in nature, inorganic fertilizers at higher levels of 125% RDF (based on soil test values) can be recommended for the Hybrid Bajra Napier (cv. DHN 6) to grow under the shade of coconut plantations. Under coconut plantation, Hybrid Bajra Napier (cv. DHN 6) performed better with growth and yield as well as nutritious. Therefore, Hybrid Bajra Napier (cv. DHN 6) as intercrop in coconut garden under irrigated condition of west coast region with combined application of biochar and fly ash with 125% RDF can be recommended to get higher yield with higher B:C by improving the soil properties.

IAAHAS/AB/2023/046

Khejri (*Prosopis cineraria*): A Multipurpose Tree of the Thar Desert

Preeti Singh and Manjri
Faculty of Agricultural Sciences, SGT University, Gurugram- 122505, Haryana, India

The *Prosopis cineraria* (L) Druce locally name as Khejri in Rajasthan is an important tree that contributes to rural economy of the North Western arid region of India as mentioned in ancient literature. It belongs to the family Leguminosae and is the important tree component of the agroforestry system practised in these regions of India. This is a versatile species providing Fiber, Fuel, Fodder and Food. The tree leaves are used for feeding camels and goats as they are considered as good fodder. The pods (locally called "Sangri") are used as a vegetable and are one of the main ingredients in the preparation of Panchkuta (Rajasthani dish). The flowers are useful for honey production. The wood is useful for house construction, making cart and agricultural implements and is ideal for domestic heating. *Prosopis cineraria* improve soil and stabilize sand dunes. The bark infusion of the tree is taken orally as abortifacient and purgative. Khejri is well known for the treating asthma and worm. Therefore, this review is focused to delineate its botany, silviculture, ecology, socio-economic importance, nutritional importance, uses, medicinal importance and photochemicals, precisely.

Keywords: *Prosopis cineraria, Khejri, nutritional importance, phytochemicals, Thar desert*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/047

Development of Turmeric Sower and Harvester: A Review

Chandramohan V[a], *Rakesh A[b], Nirmal Raj M[b], Kavin Kumar T[b], Ravirajkumar R[b]

[a]Assistant Professor of Agriculture Engineering Department, Nandha Engineering College, Pichandampalayam, Erode 638052, India

[b]Student of Agriculture Engineering Department, Nandha Engineering College, Pichandampalayam, Erode 638052, India

Rancher needs more work and time for planting and reaping due to absence of information and abilities about present day machines. A fitting digging device, to be specific, a digging edge and a dirt partition and rhizome assortment component would make the reaper complete in all regards. On the off chance that a reasonable instrument could be produced for eliminating the dirt accompanying rhizome and gathering the rhizome, it very well may be more effective and useful to ranchers. With this view, the examination is embraced to foster a reasonable work vehicle worked turmeric reaper to recover and gather the turmeric rhizome and with planting hardware. In this paper, we are zeroing in on fostering a turmeric reaper to recover and gather the turmeric rhizome and with cultivating component. In the start of the machine improvement, they utilize carry out to make wrinkles and for planting. After that seed tubes are utilized for the planting. Then the machine is created with planting, plowing and showering. Further the machine was created with the seeds metering instrument for planting and for gathering the machine is finished with the parts like roller chain transport and digging edge.

Keywords: *Sowing; Harvesting; Digging blade; Conveyor; Seed metering mechanism*

IAAHAS/AB/2023/048

Sustainability in Agroforestry System and it's Economics

Kamana Pilania*[1], Ritika Choudhary[1]
[1]Student, CCS Haryana Agricultural University, Hisar

Sustainable agroforestry is an approach of integrating woody perennials with annual cropping systems and livestock for farm diversification, natural resource conservation, better forest production and reduced financial risk with more income generation. Deforestation, environmental degradation has led to biodiversity losses and ecological imbalance that's why agroforestry models are needed to improve the condition as these are based on co-existence of farm and forest. Formulating such models needs economic analysis of complementary combinations of annual and perennial woody crops according to resources available with the farmer, his objective of subsistence needs and profitability on par with market conditions while considering future risks and uncertainties so that system can be made flexible and adaptable to changes. It is done by plotting PPC (Production Possibility Curve) that gives the efficient combinations at given level of inputs and Iso-revenue line giving value output based on market price of the chosen options. The tangency point of these gives maximum income. Majority of such adopted models are agri-silvi-horti-cultural systems. Farmers are indecisive for adoption of such system due to its complicated management, vigorous economic analysis requirement. These problems can be alleviated by making more generalizations based on case studies; government support; extension activities as per short and long run targets, farm expenditure, farm income, climate change, cultural acceptability, marketability; improving nursery, pre-planting, planting, silvicultural, harvesting, marketing practices; including ecosystem services like microclimate improvement, reduced erosion control costs to popularize these models as these are more financially rewarding than monoculture forestry and agriculture on pasture, poor crop lands.

Keywords*: Agroforestry, Sustainability, Management.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/049

Identification of drought tolerant *desi* cotton genotypes based on drought tolerance indices

Jogender[1], Omender Sangwan[2], Shreya[1*], Kanika[3] and Gourav Beniwal[4]

[1]Ph.D. Research Scholar, Department of Genetics and Plant Breeding, CCS HAU, Hisar, (Haryana), India

[2]Assistant Scientist, Department of Genetics and Plant Breeding, CCS HAU, Hisar, (Haryana), India

[3]M.Sc. Student, Department of Extension Education and Communication Management, CCS HAU, Hisar, (Haryana), India

[4]UG Student, College of Agriculture, CCS HAU, Hisar, (Haryana), India

The present experiment entitled "Identification of drought tolerant *desi* cotton genotypes based on drought tolerance indices" was conducted in two environments *viz.* irrigated and rainfed, with three replications in randomized block design at Research Area of Cotton Section, Department of Genetics & Plant Breeding, Chaudhary Charan Singh Haryana Agricultural University, Hisar (Haryana) during *Kharif* 2021-22. Fifty elite *desi* cotton (*Gossypium arboreum L.*) genotypes were grown as experimental material. Five plants were randomly selected from each genotype and observations were recorded on eight morphological traits *viz.* plant height, number of monopods per plant, days to first flower, number of bolls per plant, boll weight, seed cotton yield per plant, number of seeds per boll, ginning out turn and six physiological traits *viz.* relative water content, photosynthesis rate, stomatal conductance, transpiration rate, total chlorophyll content, proline content. Under both the environments, sufficient amount of variability was present among all the genotypes for all the studied traits. The significant decrease in mean performance of all genotypes was observed for all traits except proline content under rainfed condition. Based on drought tolerance indices *viz*. YSI (Yield Stability Index) and DSI (Drought Susceptibility Index), *per se* performance and other yield contributing traits, genotypes *viz*. P 533, P 551, PAIG 129, DA-3/02 and DA-2/02 were found most drought tolerant among all the test genotypes and these may be used in future cotton breeding programs to develop higher yielding and drought tolerant varieties.

Keywords: *Drought, desi cotton, variability, tolerant and yield.*

IAAHAS/AB/2023/050

In vivo Rapid Seed Potato Multiplication through Sprouts

Tanuja Buckseth*, PS Naik, MJ Sadawarti, C Challam, RK Singh, JK Tiwari, AK Sharma, A. Bairwa and Vinod Kumar

ICAR-Central Potato Research Institute, Shimla- 171 001 HP India

The use of sprouts for rapid multiplication was advocated as early as the mid-forties in India. This is a simple rapid multiplication technique of conventional seed system. Medium to big-sized tubers are ideal for multiplication through sprouts because they can nutritionally support the growth of sprouts emerging from well-spaced eyes (in small tubers the eyes are crowded). De-sprouted mother tubers can also be used as normal seeds. In continuation to the earlier reports, a study was undertaken for which healthy mother tubers of varieties viz., K. Jyoti, K. Lauvkar, K. Chipsona-1, K. Chipsona-3, K. Sindhuri, K. Surya and K. Chandramukhi were taken out from the cold store in the month of October. The apical eye of the tubers was removed by scooping and giving 2-3 small cuts between the eyes on the tuber to break the apical dominance. These tubers were treated with a mixture of 0.2 percent Dithane M-45 and Gibberellic acid (2 ppm) and spread in a single layer in a shed. Tubers were allowed to sprout in the shed by exposing the tubers to alternate dark (5 days) and fluorescent light (2 days). Sprouts were repeatedly harvested from mother tubers at an interval of 10-15 days. The number of harvested sprouts progressively increases after 1st sprout harvest. Planting of harvested sprouts was done in pro-trays filled with soil-FYM (1:1) under shade. Thereafter, sproutlings were allowed to grow in pro-trays under shade. In a period of 40-45 days (to fit into seed window), desprouting was done 3-4 times which led to the multiplication rateranging from 10.5 sproutlings/tuber (Kufri Chipsona-1) to 18 in Kufri Sindhuri. Transplanting ofestablishedsproutlings was donein net-house. The crop was raised following recommended POP for seed crops in the region. Interestingly, the overall rate of multiplication per tuber was more than 100 though the averagetuber weight of minitubers varies from 6g (Kufri Sindhuri) to 20g (Kufri Jyoti). Thissystem can be utilized under rapid multiplication seed potato production scheme. Stage-I index tuber due to its large size and virus freedom is ideal for multiplication through sprouts because scooping of an apical eye during indexing breaks apical dominance, and can support (nutritionally) growth of a number of sprouts emerging from well-spaced eyes.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/051

Climatic vulnerability and impact of climate change on capsicum crop: A Ricardian approach study

Pardeep Singh[1*] and Manoj K Vadiya[2]
[1]ICAR-National Institute of Agricultural Economics and Policy Research, Pusa, New Delhi [2retd]Department of Social Sciences, Dr YSP UHF Nauni, Solan HP, India

The impact of climate change on the agriculture sector is likely to be more severe, as this sector is highly dependent upon climatic factors, more so ever in the case of the Himalayan region where the majority of the households highly depend on the agricultural sector for their livelihood security. In this context, the present study analyzed the impact of climate change on the net crop revenue of capsicum growers. By using the vulnerability index, developmental blocks of low and mid hills of Himachal Pradesh were identified, and blocks were classified into low, moderate, and highly vulnerable groups; a sample of 480 farmers were selected using a multistage stratified random sampling technique. The study's outcomes revealed that the cost of production is directly proportional from low to highly vulnerable groups while it was inversely related to productivity and farm profitability. As far as the climatic factors are concerned, the maximum temperature had a significantly negative impact on the net crop revenue in the case of all vulnerable groups. The cumulative crop net revenue was decreased by 5.23 percent in all the vulnerable groups selected for the study, the reason being one percent change in the average rainfall and maximum temperature will ultimately decline the net revenue of the capsicum growers. The farmers should improve their agronomic practices and stress-tolerant varieties which strengthen their adaptive capacity. Furthermore, the government should take the initiative to provide field demonstrations under the proper supervision of the extension workers thus improving their livelihood security and coping with the climate change mitigation strategies.

Keywords: *Climatic vulnerability, Impact, Ricardian and capsicum.*

IAAHAS/AB/2023/052

Heterotic studies in sunflower (*Helianthus annuus* L.)

AK Choudhari[1]* and MK Ghodke[2]
[1]Department of Agriculture Botany, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani., [2]Oilseed Research Station, Latur, Maharashtra, India

Heterosis for seed yield and its attributing traits was studied in 54 crosses developed through LxT mating design involving 6 CMS lines and 9 testers. Analysis of variance revealed the presence of significant differences due to parents, crosses and parents vs crosses, indicating variability. The hybrids 17A x J/6, 17A x EC-623008, 17A X RHA-1-1 and 2A X RHA-1-1 were identified as best heterotic crosses for seed yield/plant and some of its component traits like, days to 50% flowering, days to maturity, head diameter, seed filling %, 100 seed weight and volume weight. For oil content, 2A X EC-623008 and 2A X RHA-1-1 recorded high heterotic effect. This study could prove useful in the development of new high-yielding sunflower hybrids.

Keywords: *Heterotic studies, Helianthus annuus L., seed yield*

IAAHAS/AB/2023/053

Effect of sulphur fertilization and levels of drip irrigation on fodder yield and quality of groundnut in arid region

Priyanka Gautam[1], S.R. Bhunia[2], B. Lal[3], A. Sahoo[1], R.K. Sawal[1], Shantanu Rakshit[1], V.K. Yadav[1],
[1]ICAR-National Research Centre on Camel, Bikaner-334001
[2]Deptt. of Agronomy, College of Agriculture, SKRAU, Bikaner
[3]ICAR-Indian Institute of Pulses Research, RRC, Bikaner

Availability of ample and nutritious fodder for livestock is always a challenge in arid region. Choice of crop such as groundnut that can fulfil the requirement of fodder with its crop residues along human needs can be a viable option to bridge the gap between availability and requirement of fodder.

The fodder yield and quality largely depend on soil moisture and nutrient supply especially sulphur (S), a key nutrient for improving groundnut fodder quality. However, no researchers have given emphasis on coupling effect of drip irrigation (DI) and sulphur on fodder yield, quality, digestibility and water use efficiency (WUE). Therefore, the study was conducted to determine the effects of different regimes of DI and S on productivity and quality of fodder. Results revealed that higher regimes of DI i.e. 0.8 +1.0 PE and 1.0 PE level of irrigation along with 40 kg S ha^{-1} significantly improved the yield, primary quality traits (crude protein, ether extract and ash), digestibility indices and significant reduction in fibres which indicates improvement in quality of fodder. Fodder productivity was 27.0 and 25.6% higher in 1.0 PE and 0.8+1.0 PE level of irrigation, respectively, as compared to 0.6 PE level (lower water regime) of irrigation, although 0.6 PE level of irrigation recorded higher WUE and was at par with 0.8 PE and 0.6 +1.0 PE level of DI. By changing the levels of DI from 1.0 PE to 0.8+1.0 PE, considerable water can be saved without affecting the yield and quality of fodder. Similarly, crop responded to S upto 60 kg ha^{-1} but at par with 40 kg S ha^{-1} indicating that application of extra S after 40 kg did not warrant any extra benefit in terms of yield, WUE and quality of fodder. Thus, adjusting the PE levels of DI for water saving and optimal S application can be a sustainable strategy to improve the productivity and quality of groundnut fodder in arid region.

IAAHAS/AB/2023/054

Effect of Different Concentrations of Sugar and Citric Acid on Storage Quality of Guava Fruit Bar

Bhadke T.G

Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola

An experiment entitled “Effect of different concentrations of sugar and citric acid on storage quality of guava fruit bar” was carried out during the year 2016-17 at Post Harvest Technology Laboratory, Section of Horticulture, College of Agriculture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola with the objectives to study the different recipes for preparation of guava fruit bar and to find out suitable recipe for guava fruit bar.The experiment was

conducted in RBD consisted of 10 treatment combinations *viz*., T_1 (Guava pulp with 30% sugar + 1.5% citric acid), T_2 (Guava pulp with 30% sugar + 2% citric acid), T_3 (Guava pulp with 40% sugar + 1.5% citric acid), T_4 (Guava pulp with 40% sugar + 2% citric acid), T_5 (Guava pulp with 50% sugar + 1.5% citric acid), T_6 (Guava pulp with 50% sugar + 2% citric acid), T_7 (Guava pulp with 60% sugar + 1.5% citric acid), T_8 (Guava pulp with 60% sugar + 2% citric acid), T_9 (Guava pulp with 70% sugar + 1.5% citric acid), T_{10} (Guava pulp with 70% sugar + 2% citric acid).From the findings it was observed that, guava fruit bar prepared by using guava pulp with 50% sugar and 2% citric acid and stored at ambient condition remain better without spoilage at 120th day of storage. The guava fruit bar prepared by using guava pulp with 50 per cent sugar and 2 per cent citric acid and stored at ambient condition secured the highest score in colour, flavour, taste and overall acceptability as compared to other recipes at 120th day of storage.

IAAHAS/AB/2023/055

Heavy metal assessment in acid soil and groundwater of Assam using geospatial technique

Prarthana P. Hazarika[1], B.K. Medhi[2], D. Saikia[3]

[1]Young Professional (Agriculture), North Eastern Regional Institute of Water and Land Management, Tezpur

[2] Professor, Department of Soil Science, Assam Agricultural University, Jorhat

[3]RA, ICAR-DRMR-APART Project, District Agricultures Office, Jorhat

Heavy metal contamination of the soil and groundwater is a worldwide concern that negatively affects the environment and human health. Biomagnification of heavy metals via the agricultural system is detrimental to the food system. Thus, characterization of heavy metals and their extent of distribution is critical for making informed decisions to manage the soil and groundwater as a resource. The current study characterized and assessed the distribution of heavy metals, including Cd, Cr, Cu, Zn and Mn, in soil and groundwater using different geospatial analyses. The study was conducted in acid soil of Central Assam, India, emphasizing basically in high agricultural chemicals dependent Nagaon district from 2018 to 2021. Heavy metals were

assessed using a random sampling method with a 5 x 5 km grid, and a total of 160 samples were collected from a depth of 0 – 15 cm for soil and for groundwater, one sample was collected from each specified grid. Chloropleth maps were created to show the distribution and hotspots of pollution. Geospatial analyses from different thematic maps of heavy metals revealed significant vulnerable points of elevated concentrations of Cd (> 0.31 mg/kg) in soil and Cd (>0.01 mg/L), Cr (>0.05 mg/L), Cu (>1.3 mg/L) and Mn (> 0.1 mg/L) in groundwater which is presumed to be due to anthropogenic factors. The three-dimensional trend over the distribution of metals throughout the district best fitted the second-order polynomial for Cd, Cu, Zn and Mn in soils while both first and second-order polynomials according to XZ and YZ dimensions fitted well for Cd, Mn, and Cu in groundwater. The current study provides baseline data to update the mitigation approaches to better manage the heavy metal contamination in soil.

Keywords: *geospatial, geostatistical, pollution indices, GIS, Assam, India*

IAAHAS/AB/2023/056

An approach to develop a novel nano-based fungicide for sustainable plant disease management

Masudulla Khan
Botany Section, Women's College, Aligarh Muslim University

Herein, we screen the fungicidal potential of green synthesized magnesium oxide nanoparticles (MgO-NPs) against *Phomopsis vexans* causing fruit rot and leaf blight disease on eggplant. Ultra-violet (UV) visible spectroscopy, scanning and transmission electron microscopy (SEM, TEM) were done to validate and characterize MgO-NPs. The crystalline nature of MgO-NPs was determined using SAED (selected area electron diffraction). Foliar application of MgO-NPs at 100 and 200 mg L^{-1} resulted in significant improvement of plant growth, photosynthetic pigments, phenol and proline contents, and defense enzymes activity of eggplant. Spraying of MgO-NPs at

200 mg L^{-1} caused highest increase in plant growth, photosynthetic pigments, phenol and proline contents, and defense enzymes in eggplant. The leaf blight indices and percent disease severity were also reduced when sprayed with MgO-NPs.

Keywords: *Green synthesis; MgO nanoparticles; Phomopsis vexans; Photosynthetic pigments; Defense enzymes; Eggplant*

IAAHAS/AB/2023/057

Effect of 24-epibrassinolide on wheat genotypes under salinity stress

Pooja Ahlawat* and Anita Kumari
Department of Botany and Plant Physiology
Chaudhary Charan Singh Haryana Agricultural University, Hisar

One-quarter to one-third of all agricultural land is affected by salinity, which is one of the most influential abiotic influences on crop yield. Wheat is a primary source of carbohydrates and calories for the majority of the world's population. The effects of salt stress on wheat growth, development, and productivity are detrimental. In the present study, the influence of different concentrations of 24-epibrassinolide (0M, 0.1M, 0.5M and 1M) on shoot length, root length, and MDA content in four wheat genotypes (0 dSm-1, 6 dSm-1, 8 dSm-1, and 10 dSm-1) was examined. The presence of salt stress significantly decreased the shoot length, root length, and MDA content compared to control values, as deduced from the results. The reduction was more pronounced when a greater quantity of salinity was applied (10 dSm-1). Comparing the reduction under each treatment, the reaction of each genotype of wheat was unique. Nevertheless, KRL 210 showed the least reduction, followed by WH711, and WH711 showed the greatest reduction relative to controls. 0.1M was found to be the optimal concentration of 24-epibrassinolide.

Keywords: *Wheat, 24-epibrassinolide, salinity, MDA content, shoot, root length*

IAAHAS/AB/2023/058

Synthesis of Hydroxyapatite using Animal Bones for Bone Tissue Regeneration

Ayushi Sawhney*[1], D.K. Dwivedi[1], Sharad Kumar[2] and Neelesh Sharma[3]

[1]Division of Veterinary Surgery and Radiology, F.V.Sc. & A.H., SKUAST-JAMMU, R.S. Pura, 181102

[2]Division of Veterinary Gynaecology and Obstetrics, F.V.Sc. & A.H., SKUAST-JAMMU, R.S. Pura, 181102

[3]Division of Veterinary Medicine, F.V.Sc. & A.H., SKUAST-JAMMU, R.S. Pura, 181102

Biomaterial is defined as "a material intended to interface with biological systems to evaluate, treat, augment or replace any tissue, organ or function of the body. Because of its chemical similarities with the natural bone, Hydroxyapatite (HA) represents the large quantity of regenerative graft material available in the market. Synthetic HA with chemical formula of $Ca_{10}(PO_4)_6(OH)_2$ is the most frequently studied, clinically tested, and used for bone replacement and dental reconstruction. However, due to absence of other trace elements (e.g., Na, Mg, and Al) in the synthetic HA, it cannot mimic apatite extracted from natural sources. Biologically sourced HA along with presence of inherent inorganic minerals and other trace elements, promotes environmental friendliness and being economical are also the advantages of choosing natural materials as source for obtaining HA. The objective of the study was to synthesize hydroxyapatite from a natural source such as animal bones. In present study, animal bones were collected from fallen carcass and underwent processing to obtain hydroxyapatite. The bones were manually cleaned followed by cutting the epiphyseal regions and boiling in water for 1 hour. The attached tissues were removed and bone was further crushed into small pieces and subjected to acetone for 2 hours and then washed with distilled water. The bones were crushed with help of mortar pestle and milled to get finer particle size. The particles underwent thermal calcination at 750ºC for 3 hours in a muffle furnace. Synthesized material was confirmed to be hydroxyapatite after characterization using Field emission scanning electron microscopy (FESEM) and X-Ray diffraction analysis (XRD).

IAAHAS/AB/2023/059

Effect of Gibberellic acid and Naphthalene Acetic Acid on the seed germination of Berberis (*Berberis asiatica* Roxb. ex DC.)

Manju, Gargi Goswami and KC Singh
College of Horticulture, VCSGUUHF Bharsar Pauri Garhwal
Uttarakhand-246123, India

Berberis asiatica DC. Commonly known as Kilmora, Indian barberry, "daru haldi" or tree turmeric belongs to the family of berberridaceae. In India, Berberidaceae is represented by three genera and 68 species (Rao and Hajra 1993). Majority (>95%) of them are distributed in the Himalayan region. *Berberis* spp were eradicated from the Himalayan region during the early phase of green revolution and again several species of Berberis have been eradicated from the Himalayan region in order to reclaim the hill slopes for agriculture or to extract valuable drug 'Berberidine' from the roots and stem of *B. asiatica, B. aristata* and *B. lyceum*. The present investigation was therefore carried out to evaluate the effect of GA_3 and NAA concentrations on seed germination and seedling growth of Berberis *(Berberis asiatica* Roxb. ex DC.). The experiment was laid out in Randomized Block Design with seven treatments and three replications. The result revealed that for Berberis GA_3 @ 75ppm was the most effective treatment of enhancing seed germination, height of plant and number of leaves per plant as compared to other treatment.

Keywords: *Berberis, kilmora, seed, berberidine*

IAAHAS/AB/2023/060

Marker Assisted screening for yield enhancing and fertility restorer genes in 'AR9-18R' restorer Line

Kadthala Bhargava[1] and P. Sadhana[1]

[1]Genetics and Plant Breeding, PJTSAU, Rajendranagar, Hyderabad-500030, Telangana

AR 9-18R is a robust restorer with mid-early duration, medium tall plant stature, long bold grain and suitable for aerobic conditions. For *per se* yield improvement in AR 9-18R, yield enhancing genes *Gn1a* and *OsSPL14* was introgressed through marker assisted selection utilizing YPK 198 (A derivative of Swarna/Habataki//Swarna/ST12) as donor parent at ICAR-Indian Institute of Rice Research (IIRR), Hyderabad. Parental polymorphism between parents was carried out; subsequently F_1s were generated and fixed for its hybridity through morphological and molecular analysis. True F_1 plants were selfed to generate F_2 population. The polymorphic markers were used for screening segregating F_2 population for the presence of yield enhancing (*Gn1a* and *OsSPL14*) and fertility restorer (*Rf3* and *Rf4*) genes. The observed data on genotyping was subjected to $\chi 2$ analysis to test their goodness of fit to check for the appropriate mendelian ratios. The results revealed that the populations were segregated as 1:2:1 ratio for both yield enhancing genes, indicating both genes showed a normal Mendelian segregation pattern. Whereas, for fertility restorer genes the population showed deviation from the normal Mendelian segregation pattern, indicating the trait is not governed by single gene. The promising plants with both the yield enhancing genes showed improved grain number per panicle. The positive plants for yield enhancing genes were further forwarded to next generation for evaluation and the improved restorer lines will be utilized for generation of aerobic hybrids for unfavorable water limited conditions.

IAAHAS/AB/2023/061

Effect of Hydrocolloids on physico-chemical, whey syneresis, textural, microbiological and sensory properties of Reduced Fat Whey Cheese Spread during storage

Avinash Chandra Gautam*, Nitika Goel, Veena N., P.K. Singh and Gopika Talwar

College of Dairy Science and Technology, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004, Punjab

Whey obtained as the major by-product from Cheese industry, is considered as waste and usually discarded. Whey Cheese Spread (WCS) hold great potential to utilize this by-product. WCS is prepared from the mixture of whey and mixed milk (1.5% fat) in a definite proportion by heat-acid precipitation followed by homogenization along with addition of salt. But during storage it showed considerable amount of whey syneresis which affect the sensory and keeping quality as well. Hence, to reduce or stop the whey syneresis in WCS, effect of various hydrocolloids viz. guar gum, locust bean gum and xanthan gum on properties of product were studied individually at two different level each during storage. During storage period, acidity values increased whereas whey syneresis values decreased in WCS samples treated with different hydrocolloids. L* value of all the samples decreased significantly as storage period proceeds whereas a* value of all the samples increased toward green hue during the storage. No significant change was observed in b* value during storage. Firmness (g), work of shear (g.s), stickiness (g) and work of adhesion (g.s) of all the samples were found to be increased during storage. A significant decrease in standard plate count and coliforms was observed in all the samples treated with different hydrocolloids. The yeast and mold count were found to be nil in all the samples throughout the storage. The product was highly acceptable till 12th day of the storage.

Keywords: *Whey Cheese Spread, guar gum, locust bean gum, xanthan gum, whey syneresis*

Improving soil physical properties in Wheat farming through application of Biochar

Haziq Shabir *, Peeyush Sharma, Gulzar Bhat, Bhumika Sharma
Sher-e-Kashmir University of Agriculture Science and Technology of Jammu, Jammu, India

Biochar is a type of charcoal produced from the pyrolysis of organic material. It has been increasingly studied for its potential benefits in agriculture, including improving soil physical properties. In wheat farming, biochar has been shown to enhance soil porosity, water-holding capacity, and nutrient retention, leading to improved plant growth and yields. Biochar can also reduce soil erosion and increase soil microbial activity, which can further enhance plant growth. However, the effectiveness of biochar application in wheat farming can depend on factors such as the type and dosage of biochar, soil type, and climate conditions. The research trail was positioned in the foothills of the Shiwalik range of the North-Western Himalayas, precisely situated at a latitude of 32°40'33" N and longitude of 74°58'45" E, located at an altitude of 332 meters above the average sea level. Two levels of biochar were compared with the control. Line to line sowing of Wheat crop was done which were 19cm apart and each plot received the recommended dose of N:P:K. Two different quantities of biochar i.e. 5 and 10 tons per hectare were compared with control and it was observed that the bulk density of the soils reduced upto 4% by applying 10 tons of biochar per hectare. Furthermore, the water holding capacity and porosity of soils applied with 10 tons of biochar per hectare increased by upto 20.58% and 6.56% respectively. Overall, the use of biochar in wheat farming shows promise as a sustainable and effective method for improving soil physical properties and enhancing crop productivity.

Keywords: *Biochar, Porosity, Bulk Density, Water Holding Capacity.*

IAAHAS/AB/2023/063

Impact of different inoculum density of root-rot fungus, *Fusarium solani,* on morphological, physiological and biochemical parameters of green gram

Irfan Ahmad
Department of Plant Protection, Faculty of Agricultural Sciences, Aligarh Muslim University, Aligarh, India

An experiment was conducted to evaluate the effect of different inoculum densities (0.5g/pot, 1.0g/pot, 1.5g/pot, 2.0g/pot, 3.0g/pot, 4.0g/pot, 6.0g/pot, and 8.0g/pot) of root-rot fungus caused by *Fusarium solani* on the green gram, *Vigna radiata* cv. SML-668 under pot condition. In this experiment, the inoculum density of root-rot fungus, *F. solani,* increased with significantly decreased plant growth parameters, *viz.,* shoot length, root length, shoot weight, root weight, and root weight, and also reduced grain yield. The data collected at harvest showed that an increase in the inoculum density of *F. solani* correspondingly decreased the plant growth parameter and grain yield. Maximum decrease in growth parameter and biomass was recorded at an inoculum density of 8.0g/pot and minimum decrease at 2.0g/pot as compared to the uninoculated control. However, a significant decrease occurred at 8.0g/pot inoculum density. The plants inoculated with 2g-8.0g/pot inoculum density recorded a significant decrease in leaf chlorophyll. In infected plants, the photosynthesis rate decreased significantly, whereas transpiration and stomatal conductance increased. The phenolic and salicylic acid contents gradually increased to 8.0g/pot inoculum density over control. Still, they tended to decrease from 3.0g/pot inoculum density in comparison to 8.0g/pot.

Keywords: *Root-rot fungus,morphological, physiological and biochemical, F. solani,Vigna radiata.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/064

Biomass, carbon stock and carbon allocation of existing Agri-forestry system in mid-hills of Himachal Pradesh

Rupinder Kaur[1*], Shivangi Negi[2], Manish Chauhan[3], Mamta Sharma[4] and Sunil Puri[5]

[1, 2, 3]Department of Agriculture, Tula's institute, Dehradun (UK), India
[4]Department of Botany, Sardar Patel University, Mandi (HP), India
[5]Dean Academics-cum- Registrar, Shoolini University, Solan (Himachal Pradesh), India

Carbon is a critical element that trees accumulate and use to support their structure and sustain physiological processes. Besides being a key element in forest ecosystems, carbon is also essential for sustaining life on a global scale. The study attempted to quantify biomass, carbon stock and carbon per cent in different tree components of *Toona ciliata*, *Grewia optiva* and *Bauhinia variegata* which were important tree species in the existing agro forestry system of mid-hill Himalayas. Volumetric equations were used for estimating the biomass of associated tree species. The total biomass (AGB+BGB) of *Toona ciliata*, *Grewia optiva* and *Bauhinia variegata* was calculated as 31.29, 30.40 and 25.92 Mg/ha was observed in, respectively. Total carbon stock was highest (14.08 Mg/ha) in *Toona ciliata* and it was 1.02 times more in comparison to *Grewia optiva* (13.68 Mg/ha). Total carbon stock was minimum in *Bauhinia variegata*. Total vegetation biomass of agro forestry system was 2495.7 Mg/ha/year which includes both tree biomass (87.6 Mg/ha/year) and crops biomass (2408.1 Mg/ha/year) and total carbon stock of land use system was 1123.06 Mg/ha/year. The percent contribution of above ground biomass to the total biomass was 79.41% in *Toona ciliata*, 79.37% in *Grewia optiva* and 79.35% in *Bauhinia variegata.* Average total carbon stock was highest (14.08 Mg/ha) in *Toona ciliata* and minimum (11.65 Mg/ha) in *Bauhinia variegata.* Percent carbon contribution of different components in *Bauhinia variegata* revealed that stem wood component contributed highest C (46.7-48.2%) followed by roots (43.7-45.3%), branches (43.1-44.3%) and leaves (35.8-38.3%). Similarly, in *Toona ciliata* stem had maximum (47.9-51.4%) carbon content followed by roots (45.9-48.6%), branches (41.6-44.6%) and leaves (39.2-41.8%). Data revealed that in *Grewia*

optiva carbon content was in the order of stem> roots> branches> leaves. Total leaf, stem, branch and root carbon allocation increased year wise.

Keywords: *Agro forestry, biomass, carbon stock, carbon allocation, above ground biomass, below ground biomass.*

IAAHAS/AB/2023/065

Impact of Biotech Crop in Crop Improvement

Aakriti, Payal, Ishika and Khushboo Chandra
Faculty of Agricultural Sciences, SGT University, Gurugram, Haryana

A biotech crop DNA has been modified in such a way that it can't develop normally through mating or recombination. By using a progressive approach to plant breeding, people have been altering plant DNA for a long time. In recent years, scientists have improved the speed of floral modification by altering their DNA in a lab. Depending on the method employed to manufacture GMOs, a single gene may be transmitted from one organism to all other organisms of the same species or genes may be transferred across unrelated species. By changing the DNA of the plants, genetic modification primarily aims to give them magical properties. To accomplish this 1.) Determining the genes responsible for desired/needed features like pest and drought tolerance. In this procedure, the PCR (polymerase chain reaction) method is applied. 2.) Cloning the desired gene, which involves making multiple copies of the desired gene and inserting them into a construct? 3.) The selection of changed plant cells and their regeneration into whole plants because only a tiny percentage of plant cells take up the generated substance that causes the mutation. 4) Ensuring that the gene is introduced and inherited is accomplished to normally necessary. To ascertain the amount of copies, tests are run. 5.) Testing a plant's performance. Providing antiviral or weed-resistant strains by gene marking is frequently used to distinguish mutant cells from unchanging ones. The final step is to analyse the risks to human health and the environment. GMOs crops have a range of advantages such as its seeds boost agriculture yields, plants produced are insect resistant, reduction in usage of herbicide, pesticide and tillage, provide additional vitamins, nutrients and minerals. Despite the many benefits, some experts are concerned about the widespread usage of GMO crops, which has led to a variety of issues, including: 1) they could provide useful insects, such butterflies, thread. 2) GMO plants

persist in the soil for an extended length of time, producing unintended long-term effects. 3) Researchers are concerned about the possibility that there are antibiotic-resistant genes present. First genetically modified plant commercially released in India is BT cotton. This has been developed by MAHYCO (Maharashtra Hybrid Seed Company) in collaboration with American company Monsanto. Cotton is the only GM crop currently allowed for cultivation in India. Research is also being done by the state-run Indian Council of Agricultural Research (ICAR) and other organisations to develop GM seeds for potato, pigeon pea lentils, chickpeas and banana.

Keywords: *Biotech Crop, GMOs, BT Cotton, Hybrid Seed, Foreign DNA*

IAAHAS/AB/2023/066

Comparative Growth and Yield Potential of Okra in Punjab, Haryana and India

Sarthi[1] and Vishal Johar[1]*

[1]Department of Horticulture, Lovely Professional University, Phagwara (Punjab)

[2]Department of Agricultural Economics and Extension,
Lovely Professional University, Phagwara (Punjab)

Okra is one of the most important vegetable crops in India, which is also the world's top producer of the crop. The main goal of this study is to determine the growth pattern and volatility of okra in Haryana, Punjab, and India. Two methods, coefficient of variation and Cuddy-Della Valle index were used to pinpoint the instability in the okra area, production and productivity. In all approaches, the CDVI index was discovered to be a more accurate indicator of the area, production, and productivity instability of the okra. In case of area the instability is higher in the Punjab (35.88%) followed by Haryana (14.31%) and India (6.43%). In Production, the CDVI found higher in Haryana (17.47%) followed by India (9.31%) and Punjab (7.78%). In case of productivity, CDVI higher in Haryana i.e., 18.31 percent as compared to Punjab (11.75%) and India (3.60%). Economic growth, production, and productivity of okra in Punjab, Haryana, and India shown positive trends. In comparison to Haryana and India, Punjab has a greater CAGR for area, production, and productivity.

Keywords: *CAGR, Haryana, India, Instability, Okra, Punjab*

IAAHAS/AB/2023/067

Design and Fabrication of Manually Operated of Seed Sowing Machine

Amitabh Soni*, Bibek Bahadur Shrestha
Department of Applied Engineering, VFSTRU, Vadlamudi, 522213

The rate and quality of industrial and agricultural product production have been influenced by and increased by technological innovation. The purpose of this study was to develop and produce portable seed-sowing machine using materials that could be found nearby. The paper primarily discusses the design and production of the seeder machine. The design feature takes into consideration each part's geometrical components and driving power determination. AutoCAD software was used for part details and assembly drawing. Functionality, durability, cost and local availability were considered when choosing materials. Hence, Steel sheet was used for the fabrication of the seed hopper, seed metering disc was fabricated from sheet metal steel and the power transitions elements like transitions shafts and gears also fabricated from round steel bar. The frame of the seeder machine was permanently joined using arc welding. In order to assess the effectiveness and functionality of the seeder, experimental experiments have been carried out. It was observed that the machine had been put (dropped) the seed at desired depth.

Keywords: *Portable seed-sowing machine, AutoCAD, Steel sheet, seed metering disc, Driving power, Arc Welding.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/068

Biodynamic Farming - From Primitive Pseudo-Science to The Modern Organic Farming Approaches

Ritvik Katoch[1]*, Baljinder Singh[2]
[1]M.Sc. Scholar, Dept. of Plant Pathology, CSK HPAU, Palampur, HP 176062
[2]M.Sc. Scholar, Dept. of Soil Science, CSK HPAU, Palampur, HP 176062

Biodynamic farming is a multi-disciplinary approach to farming, which treats the farm as a living entity that interacts with the environment, to maintain good soil health and raise crops that nourish mankind. Just like other approaches to organic farming biodynamics has much in common to them, it stresses the use of organic amendments while excluding the use of synthetically derived chemical fertilizers. Where it differs is in its treatment of soil, crops and animals as one integrated system, emphasizing upon the importance of local production and distribution system and inculcating the use of old and newly developed breeds and variations. It also involves spiritual and mythical perspectives. The term biodynamics is derived from greek words 'bios' meaning life and 'dynamic' meaning energy. Hence, at its essence it holds the value of working with forces, which produce and preserve life, true to itself. It was the first organic farming approach in the contemporary era driven by Rudolf Steiner. His lectures were released in November 1924, and The Agricultural Course, the first English translation, was published a year later in 1928.

The underlying principle behind biodynamic farming involve the simple concept of recycling nutrients and using dead compost-like amendments to vitalize soil and the crop stand. It involves using green plants as mulch. It abstains from using any form of chemical fertilizers. Avoiding soil compaction by excessive mechanization of the farm, especially in wet weather and keeping soil covered with pasture during fallow periods. It involves the preparations named BD-500 to BD-507, which are homologous to today's organic formulations essential in natural farming practices, like *Beejamrit*, *Ghanjeevamrit*, etc. These formulations included various plant products derived from *Achillia millifolium, Matricaria chamomilla, Urtica* sp. (Stinging nettles), Himalayan Oak, dandelions, etc. They also included various animal derived ingredients like cow horns, cow dung, stag bladder, etc.

Biodynamic farming though seemingly primitive, laid the foundation for today's holistic and massively successful organic farming efforts. Modern organic farming principles are based on health (health of soil, crops and animals and planet as one), ecology (work with living ecosystems and help sustain them), fairness (build on relationships that ensure fairness with regard to the common environment and life opportunities.), care (undertaken in a precautionary manner to ensure the wellbeing of current and future generations.

In the contemporary times, the relevance of organic farming has evolved immensely. With produce that is high in nutritional value, market that fetches maximum profits because of increasing awareness among the masses and the employment opportunities that comes with it, organic farming indeed is the golden goose of farming in present times and all of it has been made possible by the foundation laid by now primitive, Biodynamic farming.

IAAHAS/AB/2023/069

Effect of Addition of Seed Spices on Sensory Properties of *Burfi*

Kumare K. D., Londhe G.K and Zine P.L.
Department of Animal Husbandry and Dairy Science,
College of Agriculture, Vasantrao Naik Marathwada Krushi Vidyapeeth Parbhani (Maharashtra), India

The study was carried out to prepare a burfi with addition of black pepper (*Piper nigrum*) and turmeric (*Curcuma longa*) powder to study the sensory quality of burfi. The study was conducted in the Department of Animal Husbandry and Dairy Science, College of Agriculture, VNMKV, Parbhani. Sensory evaluation of product was carried out from the panel of experts for flavor, color and appearance, body and texture, and overall acceptability by using 9-point hedonic scale. *Burfi* was prepared from buffalo milk (standardized with 6 per cent fat and 9 per cent SNF) with constant level of sugar (30 per centby weight of *khoa*) In the present study three levels of each of the three variables were attempted *viz.* black pepper (0.6%, 0.8%, 1.0%) and turmeric powder (0.5%, 1.0%, 1.5%) on the basis of preliminary trials. In total thirteen formulations prepared using different proportions of ingredients as per CCRD design using RSM. Also, the *Burfi* prepared by addition of black

pepper and turmeric powder was subjected to sensory evalution. Only one formulation comparing 1.01 % turmeric powder and 0.90 per cent black pepper powder was suggested by the design expert software. The predicted sensory score was rated 8.81 for flavour, 8.65 for body and texture, 8.41 for colour and appearance and 8.62 for overall acceptability. The actual score for *Burfi* prepared by addition of black pepper and turmeric powder rated 8.9 score which was for flavour, 8.8 for body and texture, 8.6 for colour and appearance and 8.76 for overall acceptability. It is concluded from the optimization study that black pepper and turmeric powder added burfi containing 1.01 per cent turmeric and 0.90 per cent black pepper powder scored maximum with respect to flavor, body and texture, colour and appearance, and overall acceptability as compared to the control burfi.

IAAHAS/AB/2023/070

Histopathological alterations of fish liver as a biomarker of heavy metal pollution in internationally important Harike wetland, India

Dr. Sulochana Jangu
Faculty of Life Sciences, PDM University Bhadurgarh, India

The histostructure of the liver of fish from Harike wetland was studied in order to detect the effects of heavy metal pollution. Fish samples were collected from two sampling sites i.e. Harike wetland and the river Beas during the breeding season. The river Beas merges with the river Sutlej at Harike wetland and carries pure water as compared to the water of the river Sutlej. This river receives pollutants from its tributaries namely Budha Nallah and East Bein which ultimately pollute the internationally important Harike wetland and resultantly cause morphological alterations in the liver of fish from Harike wetland. A histopathological alteration in fish liver is a good bioindicator and can be used for the detection of pollution in fish. During this study, the effect of heavy metals presents in the Harike wetland i.e. Cadmium (Cd), Zinc (Zn), Chromium (Cr), Lead (Pb), Nickel (Ni) and Copper (Cu) was

investigated with the aim of determining the significant histological changes in the liver of the Indian major carp, *Labeo rohita*. The histological changes included hyalinization, vacuolation, cellular swelling and congestion of blood vessels. It can therefore be concluded that heavy metal exposure resulted in histological alterations in the liver of fish. Hence, the liver of *Labeo rohita* can be used as a pollution biomarker in Harike wetland.

Keywords: *Wetland, heavy metals, histology, bioindicator, pollution*

IAAHAS/AB/2023/071

The Holistic Approach of Integrated Disease Management

Ritvik Katoch[1]*, Tarun Kapoor[2]

[1]M.Sc. Scholar, Dept. of Plant Pathology, CSK HPAU, Palampur, HP 176062

[2]M.Sc. Scholar, Dept. of Genetics and Plant Breeding, PAU, Ludhiana, Punjab 141004

In 1960's, when the country was going through the green revolution winds. The indiscriminate use of fungicides and insecticides was at an all-time high level and this attracted the eyes of many environmentalists. This overuse of chemicals created problems such as environmental pollution, toxic chemical residues in the produce, land and water. The concept of IDM involves cultural, biological, epidemiological and alternative means to achieve disease control. It is a culmination of all possible and sustainable management techniques undertaken to manage diseases.

Host resistance is the first and the most practical method of controlling diseases, even those that are caused by viruses since viral disease management is the most exhaustive and expensive one. The role of bio-control agents is of immense value since the aim is to develop sustainable agro practices. Species of *Bacillus, Gliocladium, Trichoderma, Pseudomonas,* etc. are being used in the management of various plant diseases. The overuse of chemical has also resulted in the development of adverse effects on non-target organisms and development of resistance against common extensively used pesticides. The use of plant-based pesticide or pesticide of plant origin, which possess anti-pathogenic properties, reduces such risks pesticide toxicity in organisms. Extracts from plants like *Allium sativa, Eucalyptus sp., Chenopodium ambrosioides,* etc. have proved to be effective against a number

of diseases. Plant nutrition also plays an important role in determining the susceptibility of plants to diseases. Both deficient and over-nourished plants invite the high disease incidence. The increased emergence of sporadic plant diseases and pests has made agriculture very risk-prone and less remunerative. Transgenic crops are now established as a novel approach in which resistance in conferred against a particular plant pathogenic race. Different cultural practices like mulching, crop rotation, soil solarization, manipulating sowing dates when applied in a holistic, combined manner have proved to be very efficient in managing disease.

IAAHAS/AB/2023/072

Bamboo: A Boon for Rural Livelihood

S.S. Hrishikesh, Vishal Johar*, Vikram Singh, and Navkiran Kaur
Department of Horticulture, School of Agriculture,
Lovely Professional University, Phagwara (Punjab) 144411

Bamboo is a member of grass family with woody growth habit. It is having a huge diversity which is distributed throughout the world. Diverse nature and widespread availability of this plant gives rise to its numerous uses. Rapid propagation, high rate of growth, low-cost extraction and low-cost processing make them important for subsistence. Bamboo is quickly changing its image from the "poor man's tree to a high-tech, industrial raw material and substitute for wood. Bamboo is also being consumed in many different ways. Inclusion of bamboo would certainly help in restoration of land, protecting forest covers, establishment of rural small-scale industries and can check the migration of rural workforce to the urban areas in search of livelihood.

Keywords: *Bamboo, sustainable growth, food source and economic development*

IAAHAS/AB/2023/073

A Study on Smoke Point and Peroxide Values of Different Edible Oils Available in Pulivendula, Kadapa District of Andhra Pradesh

G. Manasa, R. Aruna, SK. Abshar, A. Nataraj, D. Yuvateja, M. Vijay Kumar
Department of Food Safety and Quality Assurance, College of Food Science and Technology, ANGRAU, Pulivendula, Andhra Pradesh-India

Edible vegetable oils are triglycerides of plant origin that include palm, sunflower, groundnut, sesame oil etc. These oils are important nutritional components that act as an energy source in our body. Vegetable oils may rancid and loss their nutritional value and flavor upon improper extraction process, handling and storage. In quality control several parameters such as peroxide value, moisture content, specific gravity and acid value are key parameters. They determine the quality and hence the economic value of oils. In the present study smoke point value and peroxide values of the groundnut oil, sesame oil, palm oil and sunflower were analysed. Smoke point of Sunflower oil is 254.5ºC, ground nut oil is 170.8ºC, palm oil 161.5ºC and for sesame oil is 158.5ºC. The peroxide value (POV) is defined as the reactive oxygen contents expressed in terms of mill equivalents (meq) of free iodine per kilogram of fat.A lower number of peroxide value indicates a good quality of oil and a good preservation status. Unsaturated free fatty acids react with oxygen and form peroxides, which determine a series of chain reactions that generate the production of smelling volatile substances. Heat was applied for 6hrs continuously and samples were collected with 1hr interval, peroxide values of these oils were studied as it indicates the extent of deterioration of oils. Peroxide values were low for sesame oil, followed by palm oil, unrefined sunflower oil, ground nut oil. The results were useful for selection of oils for different food processing methods. For deep fat frying sesame oil, palm oil, sunflower oils are ideal as they are having less peroxide value. Smoke point values was high for sunflower oil hence it can be used for food processing methods where need of application of high temperature.

Keywords*: Edible oils, smoke point, peroxide value.*

Antimicrobial activity of *Streptomyces rochei* against *Fusarium oxysporum* and *Meloidogyneincognita* in cucumber

Akshaya, S.B[1*], Ashokkumar, N[1], Krishnamoorthy A.S.[2]and Nakkeeran, S[3]
[1]Assistant Professor, Department of Plant Protection, SRM College of Agricultural Science, SRMIST, Chengalpattu
[2] Professor, Department of Plant Pathology, TNAU, Coimbatore
[3]Dean, Agricultural College and Research Institute, Kudimiyanmalai

Wilt complex is a soil-borne fungal cucumber disease caused by *Fusarium oxysporum* associated with the nematode *Meloidogyne incognita*. Typical symptoms of wilt complex are yellowing of leaves, stunting, and wilting of plants. Root galls or Knots are the characteristic symptoms of *M. incognita*. Haphazard application of chemical fungicides to control plant diseases poses a threat to the environment, humans, and plants which causes undesirable side effects on non-target organisms. Besides fostering fungicidal resistance against plant disease Alternatively, scientists look forward to beneficial bacteria to overcome plant disease. In the present study, cell-free culture filtrate of *Streptomyces* spp *viz*., *S. aurantiogriseus, S. griseoviridis, S. rochei, S. hundugenisis, S. fungicidicus and Streptomyces* sp tested against *F. oxysporum* and *M. incognita*. The result revealed that the cell-free culture filtrate of *S. rochei* reduced the mycelial growth (53.3 and 52.2 per cent, respectively) of *F. oxysporum.* Among all the actinobacterial isolates tested, the cell-free culture filtrate of *S. rochei* (15.00) and *S. griseoviridis* (22.33) showed the minimum egg hatching compared to the control after 24 h exposure. The *S. rochei* possessed the highest juvenile mortality at 72 h (91.00 per cent). The GC-MS (Gas Chromatography and Mass Spectrometry) analysis of the ethyl acetate fraction of CFC of *S. rochei* indicated the presence of 24 compounds. Among these, the highest peak area was recorded in n Hexadecenoic acid (15.21 RT), Isopropyl palmitate (12.94 RT), cis-Vaccenic acid (10.18 RT), and Pyrrolidine (10.16 RT), which might have antimicrobial activity against the pathogen. The major metabolic key pathway is the fatty acid biosynthesis pathway, which was detected with high intensity. Glycerolipid metabolism, plasmalogen synthesis, and mitochondrial beta-oxidation of long-chain fatty acids are also identified. This study infers that *S. rochei* possesses antimicrobial

activity against *F. oxysporum and M. incognita. Further* studies should be direct toward identifying novel compounds to develop biopesticide formulation.

Keywords: *Antimicrobial activity, cell-free culture filtrate, Metabolic Pathway, Juvenile mortality, and GCMS.*

IAAHAS/AB/2023/075

Farmer Producer Organization- Challenges and Opportunities

Lade AH[1], Ahire RD[2] and Deshmukh PR[3]

[1]Ph. D. Scholar, Department of Agricultural Extension Education, COA, VNMKV, Parbhani

[2]Associate Dean and Principal, College of Agriculture, Badnapur

[3]Associate Professor, Department of Agricultural Extension Education, COA, VNMKV, Parbhani

Indian agriculture is predominating characterized by large number of dispersed and fragmentation small holdings. Around 85 % of the land holdings belong to small and marginal farmers. A producer company is basically a corporate body registered as a Producer organization under Companies Act, 1956 (As amended in 2002). Its main activities consist of production, harvesting, processing, procurement, grading, pooling, handling, marketing, selling, export of primary produce of the members or import of goods or services for their benefit. These organizations were designed to bring together desirable aspects of the cooperative and corporate sectors for the benefit of primary producers, especially small and marginal farmers.

FPOs continue to face challenges like lack of market access and credit linkages, inadequate financial support and lack of managerial skill. FPO is estimated that at best 30% of these FPOs are currently operating viably and around 20% are still struggling to survive. Around 50% are still in the phase of mobilization, equity collection, business planning and other management related developmental stages. Presently, around 5000 FPOs (including FPCs) are in existence in the country. These were formed under various initiatives of the Govt. of India (including SFAC), State Governments, NABARD.On July 5, 2019, the centre announced a plan to promote 10,000 new farmer producer companies with total budgetary provision of Rs. 4,496.00 Cr. for 2019-2024.

SGT University, Gurugram and Just Agriculture Education Group

Producers' organizations help in reducing the transaction costs and provide a forum for members to share information, coordinate activities and make collective decisions. FPOs create opportunities for producers to get involved in value all supply chain activities such as input supply, credit, processing, marketing and distribution. It also includes, promoting mutual assistance, welfare measures, financial services, insurance of producers or their primary produce.

Keywords: *FPO, Small and Marginal farmer, Challenges and Opportunity*

IAAHAS/AB/2023/076

Serum Corticosterone and Heterophilto Lymphocyte Ratio: A Stress Profile in Pearl Guinea Fowl as Influenced by Age, Sex and Rearing Systems

Chongtham Sonia*[1], M. Norjit Singh[2], Blessa Sailo[3], Menalsh Laishram[4] and Chongtham Tania[5]

*[1,3,4,5] ICAR RC For NEH Region, Manipur Centre

[2]CAU, Imphal

The present study was designed to evaluate the effect of age, sex and rearing system on serum corticosterone and hetyerophil to lymphocyte ratio in pearl guinea fowl. Twenty-four Pearl Guinea fowls each were placed in cage and on floor and the birds were maintained under standard managemental conditions. Once every four weeks from the fourth week onwards blood was collected from these birds up to 16 weeks of age. Two milliliters of blood were collected from all 48 birds using a 3ml syringe. Drop of blood was used for smear preparation and staining with Modified Leishman- Giemsa stain for the differential count to obtain heterophil to lymphocyte ratio and the remaining blood was kept undisturbed for two hours for separation of serum for performing ELISA test for serum corticosterone estimation. The heterophil to lymphocyte ratio was significantly ($P<0.01$) affected by age and rearing system of guinea fowl. Older birds of 12 and 16 weeks of age had a higher heterophil lymphocyte ratio of 1.4 ± 0.16 and 1.38 ± 0.19 respectively. Caged reared birds had a significantly ($P<0.01$) higher heterophil to lymphocyte ratio. All the interactions except rearing system × sex × age was highly significant ($P<0.01$).

Other than rearing system, neither age nor sex had influenced the serum corticosterone level in pearl guinea fowl. Birds reared on floor had higher corticosterone levels of 1.12 ± 0.03 ng/ml than those raised in cages (1.00 ± 0.15) ng/ml and this was highly significant (P<0.01). The result of the present study revealed that a higher heterophil to lymphocyte ratio identified in older birds (12-16 week) to be more stressed than the younger (4-8week) guinea fowls. Guinea fowls reared on floor had higher serum corticosterone levels than those reared on cages while heterophil to lymphocyte ratio was higher in cage reared birds.

Keywords*: pearl guinea fowl, serum corticosterone, heterophil, lymphocyte, age, sex, rearing systems*

IAAHAS/AB/2023/077

An Economic Analysis of Production of Cabbage in Sultanpur District of Uttar Pradesh

Ajeet Kumar[1], Pavan Kumar Singh[2], Bhrtendu Yadav[3]
[1]Om Sterling Global University Hisar Haryana,
[2]Mangalayatan University Aligarh,
[3]C.S.A University of Agri. and Tech. Kanpur

The present investigation was undertaken to study about costs and returns from the cultivation of cabbage in Sultanpur district of Uttar Pradesh. In this study, primary data were collected from the selected cabbage cultivators through personal interview method with the help of pre- structured schedule. The study concluded that, on average, total costs of cabbage cultivation was estimated at Rs.79786 per hectare. Out of which, overall total operational costs were observed as Rs. 55718 per hectare (i.e., 69.83 percent of total costs). It was decreased with the increase in farm size holdings whereas, total fixed costs were calculated at Rs. 24068 per hectare which accounts for 30.17 per cent of total costs. It was found positive relationship with the size of farms holdings. Total cost of cultivation of cabbage was highest on medium farms (Rs. 91764) and lowest on marginal farms (Rs.77511). The results also revealed that major components of cost of cabbage cultivation were found

human labour with Rs. 22482 per hectare followed by rental value of owned land (Rs. 21265 per hectare), cost of manure (Rs. 10340 per hectare) and cost of improved seed (Rs. 9498 per hectare). The results of study indicated that overall gross returns obtained from cabbage cultivation were Rs. 243275 per hectare. Gross returns were found to be highest (Rs. 286750 per hectare) on medium farm and lowest (Rs. 231250 per hectare) on marginal farms. On an average, cost of production in cabbage was estimated at Rs. 670. The cost of production was found maximum (Rs. 682 per quintal) on marginal farms and minimum (Rs. 651 per quintal) on medium farms. It was decreased with increase in the farm size groups. It was observed that, an overall return per rupee earned from cabbage cultivation was Rs. 2.77. Among the farm size groups, return was estimated as Rs. 2.71, Rs. 2.82, Rs. 2.83 and Rs. 2.84 per rupee on marginal, small, semi-medium and medium farm, respectively.

Keywords: *Production, Cultivation, Analysis, Cost and Return*

IAAHAS/AB/2023/078

Impact of zinc application on yield and yield attributing traits in Lathyrus (*Lathyrus sativus*)

Anirudh

M.Sc. Scholar, Department of Agronomy, Dr, Rajendra Prasad Central Agricultural University, Pusa, Smastipur, Bihar

An experiment was conducted at Tirhut College of Agriculture's research farm in Dholi (Muzaffarpur) during Rabi 2020-21 to investigate the effect of soil and foliar application of zinc on yield attributing characters and yield in Lathyrus (*Lathyrus sativus*). Eight treatments with different composition were used at different growth stages. RDF 100%+ $ZnSO_4$ @ 20 kg ha^{-1} as a basal application was noticed to be significant compared to RDF 100%+ $ZnSO_4$ @ 15 kg ha^{-1} as a basal application, RDF 100% + $ZnSO_4$ @ 0.5% foliar spray at pre flowering and pod initiation, and significantly superior to application of RDF 100% + 10 kg ha^{-1} Zn application and RDF 100% + one foliar spray at pre flowering stage of Lathyrus. In comparison to control and other zinc application treatments, RDF 100%+ $ZnSO_4$ @ 20 kg ha^{-1} as a basal

application increased the number of pods produced per plant and was on par with RDF 100%+ $ZnSO_4$ @ 15 kg ha^{-1} as a basal application and RDF 100% + $ZnSO_4$ @ 0.5% foliar spray at pre flowering and pod initiation. Zinc application methods and doses had a significant impact on the yield both of grain and straw. Comparing to foliar application and no zinc application, RDF 100%+ $ZnSO_4$ @ 20 kg ha^{-1} as a base application increased grain production and straw yield. Among different application method, soil application recorded higher grain and straw yield but no significant effect was recorded on harvest index.

Keywords: *Basal application, Foliar spray, Yield, Zinc*

IAAHAS/AB/2023/079

A comprehensive study of lateral flow immunoassay (LFIA) and it's benefits over traditional and PCR methods for detection of potyviruses in grass family in Australia

Anshul Phaugat
Masters of Agricultural Sciences (Horticulture & Plant Protection),
School of Agriculture and Food sciences,
The University of Queensland, Australia

The demand for a diagnosis method which is simple, reliable, and specific with reference to the fact that it has to be performed by a farmer is greater than ever because of the increased disease infections. Traditional and polymerase chain reaction diagnosis have various on-field limitations. These limitations can be overcome by the use of lateral flow immunoassay. The grass family consists of high-agriculture important crops such as wheat, rye, maize, and sorghum. Potyvirus is the biggest group of viruses causing yield reduction in different crops. Seven leaf samples were randomly selected from the grass family for diagnosis of potyviruses and were initially studied for symptoms and signs of pathogens. The following Agdia Potyvirus ImmunoStrip® Test kit was used to perform the lateral flow immunoassay: The comparison between the traditional diagnosis and lateral flow immunoassay was studied, and the demerits of polymerase chain reaction were directly compared with the

results. According to the results of potyvirus detection, of 7 samples analysed by the immunostrip test kit, 71.42% were found to be incorrectly diagnosed when diagnosed using traditional methods. Lateral flow immunoassay provides different levels of specificity, making it easier to optimize it in accordance with the level that is required to draft integrated management strategies for controlling the disease effect on economic and biological plant yield.

Keywords: *Lateral flow immunoassay, virus diagnosis, grass family, serology.*

IAAHAS/AB/2023/080

Innovative approaches in Soil Health, Land Resources and Land Use Planning & Management

Anirban Sarkar[1*] and Arun Alfred David[2]
Department of Soil Science and Agricultural Chemistry
Naini Agricultural Institute
Sam Higginbottom University of Agriculture Technology and Sciences
Prayagraj

Soil health is a state of a soil meeting its range of ecosystem functions as appropriate to its environment. We present a framework for how the crop production industry can advance soil health by developing system of crop production innovation that simultaneously target soil health outcomes, either through direct impact on soil or by enabling practices that promote soil health outcomes. Such an approach could lead to cross-sectoral, integrated agricultural solutions that achieve agronomic, environmental and economic goals. India is currently experiencing heavy pressure on its available land resources. The country accommodates around 18 per cent of the world's population, despite making up approximately 2.2 per cent of the overall global geographical area. Together with the Land Use Planning and Management (LUPM) project, the Indian state planning institutions developed and implemented standardised instruments for integrated spatial land use planning and management. These instruments help to plan eco-sensitive zones, special industrial areas and special economic zones. Supporting the

development of policies and guidelines for integrated land use planning and management. These policies and guidelines are derived through extensive discussions with the main sectoral ministries and bodies, both, at the policy and the technical levels. Engaging the central and state departments, the local administrations, private sector, academia, and the local population to develop standard planning tools and processes for territorial strategic development. At the state level, bringing together cross-sectoral planning institutions with relevant sector authorities to consolidate goals for integrated spatial and land use planning. Building specific competencies to adequately apply the developed policies, guidelines, tools, and processes. The project offers human capacity development measures for technical specialists and managers of cross-sectoral and sector planning institutions at the state and municipal level.

Keywords: Soil health, Crop production, Land Resources, Land Use Planning & Management

IAAHAS/AB/2023/081

Influence of Different Organic Sources of Nutrient on Growth, Yield, Quality and Soil Nutrient Status of *Allium odorum*

Ch. Tania[*1], S.S. Roy[2], Ch. Premabati Devi[3] and T. Basanta[4] and Chongtham Sonia[5]
[*1,2,3,4,5] ICAR RC For NEH Region

The field experiment on standardization of organic nutrient management of *Allium odorum* was carried out at ICAR Horticultural farm Langol to study the effect of different organic sources of nutrient on growth, yield and quality of *Allium odorum*. The design of the experiment is RBD with three replication and 11 treatments. The result of the investigation revealed that among the organic sources the maximum plant height (27.08 cm) and number of leaves/plant (21.69), yield/plot (3.13 kg) and projected yield/ha (13.86 t/ha) was recorded with 100% vermicompost + *Azospirillum* +PSB + *AM*. The overall growth and yield of *Allium odorum* was achieved with control treatment which recorded plant height (29.28 cm), number of leaves per plant (21.83), yield /plot (3.48 kg) and projected yield (15.47 t/ha). The anitioxidant

activity (39.081±2.02 micromole trolox E/g sample), total phenolics (2.454±0.46 mg GAE/g sample) and flavonoids (28.011±4.42 mgQE/g sample) was found to be maximum with treatment 50% N through FYM+50 % N through vermicompost while the highest Vitamin A content was recorded highest with treatment100% vermicompost + Azospirillum +PSB + AM**.** The soil analysis after harvest of *Allium odorum* indicated better building of soil nutrient status *i.e*, N, P and K with the treatment 100% vermicompost + Azospirillum +PSB + AM which recorded the highest soil pH (6.38), organic carbon (1.68%), available nitrogen (452.66 kg/ha), available phosphorous (26.59 kg/ha) and available potassium (473.68 kg/ha) was found with the treatment 100% vermicompost + Azospirillum +PSB + AM while the lowest soil fertility status after harvest was recorded with control plot. It appears from the results that application of 100% vermicompost + Azospirillum +*PSB* + *AM* proved most effective organic treatment.

Keywords: *Growth, yield, Organic, antioxidant, available nitrogen, available, phosphorous, available potassium*

IAAHAS/AB/2023/082

Isolation of *Lactobacilli* from freshly drawn raw milk from desi cows and crossbreed cows of Gurugram region, Haryana

Prachi[1], Dr. Sandhya[2]

[1&2]Department of Microbiology, Shree Guru Gobind Singh Tricentenary University, Gurugram

Cow milk is of great concern these days because of its high nutritional value as well as the probiotic flora present in it, which confer several benefits to the human body. *Lactobacillus* is one such beneficial bacteria present in milk that helps the human body against allergic reactions, gastrointestinal diseases, irritable bowel syndrome, and many more. The current study aims to determine the prevalence and isolation of *Lactobacillus* present in milk. The study *was* designed in a way that raw cow milk samples were collected from two categories of cows: desi cows and cross-breed cows. As raw cow milk is said to be harmful for human consumption due to the presence of pathogenic microflora. The raw cow milk samples were cultured on MRS agar (selective media) to isolate the diversity of Lactic acid bacteria (LAB) present in cow milk as probiotic flora. Twelve milk samples were taken in total, 5 from the cross-breed cows and 7 from the desi cows. Samples were cultured on MRS agar anaerobically for 24-48 hours. The bacterial isolates were tested for morphological characters, and biochemical tests including catalase, oxidase, citrate, sulfide, indole motility, and tolerance at physiological conditions like growth at different temperatures (ranging from 25- 45^{0}C), growth in different saline concentrations (2%, 4%, 6%, 8%, and 10%), and growth in different pH (4, 5, 6, 7, 8). At the end of the study, three isolates were found which were found to be gram-positive rods, 2 were catalase-negative and one was catalase positive. All three strains were able to tolerate some physiological conditions so that these can be further used as preservatives in some food items to increase their nutritional value as well as further molecular studies can be carried over for the identification of particular potent *Lactobacillus* species. Some new strategies should be implemented to make the identification of LAB strains more efficient.

Keywords: *Raw milk, Lactobacillus, Probiotics, Natural source, Biochemical tests, Physiological tolerance.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/083

Optimization of foaming agent and modelling during drying of foamed Nagpur Mandarin Juice

Bhagyashree N. Patil[1]*, Suchita V. Gupta[2] and Nivrutti B. Patil
[1*]Department of Agricultural Process Engineering, Dr. PDKV, Akola Maharashtra, India
[2]Department of Farm Structures, Dr. PDKV, Akola Maharashtra, India.
[3]Krishi Vigyan Kendra Karda Risod

Nagpur mandarin is seasonal fruit crop. Therefore, bulk of the produce is used for table purpose and is handled at ambient conditions causing considerable post-harvest losses. Therefore, for reduced the losses the present study was carried out. For optimization of foaming levels soya protein isolate (3 to 9%), Guar gum (0.3 to 0.9%) and sugar (5 to 15%) with different whipping time 3 to 9 min was taken and dried in microwave (720 W microwave power) at 2 to 6 mm drying bed thickness. The six thin layer drying models were fitted at three drying bed thickness. The optimized conditions for guar gum 0.45%, soya protein isolate 3.30%, sugar content 10% and whipping time 6 min was found with overall desirability 0.629. The Midilli et al model is best fitted with higher values of coefficient of determination ($R^2 > 0.997$). The effective moisture diffusivity $(D_{eff})_{avg}$ values are ranged from 0.365×10^{-7} to 2.483×10^{-7} for 2 to 6 mm drying bed thickness.

Keywords: *Guar gum, Microwave drying, Modelling, Nagpur mandarin, Soya protein isolate*

IAAHAS/AB/2023/084

Improved Regression in Ratio Type Estimators Based on Robust Regression M-Estimation

Khalid Ul Islam Rather[1]*, Eda Gizem Koçyiğit[2]

[1*]Division of Statistics and Computer Science, Main Campus SKUAST-J, Chatha Jammu-180009, India

[2] Department of Statistics, Dokuz Eylül University, Buca 35390 İzmir, Türkiye

In this article, we propose new robust ratio type estimators using the Uk's redescending M-estimator technique under the simple random sampling (SRS). The proposed estimators have been compared with the traditional ratio type estimators, robust regression estimators, and other existing redescending M-estimators. Mean square error (MSE) is obtained theoretically for the proposed estimators. A real-life data and simulation study are used to justify the efficiency of the proposed estimators. It has been seen that the proposed estimators give better results than other estimators in the literature on simulations and real data studies.

Keywords: *Robust Regression; Outliers; Ratio estimators; M-Estimation; Simple Random Sampling*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/085

An Idea for a Healthy Country: India's Organic Farming

Erra Jaya Sudha
M.sc Agronomy Student, School of Agriculture, Lovely Professional University, Phagwara, Punjab

The two key considerations that are gaining steadily more attention from the general public are food quality and safety. Conventional fertilizers have a greater amount of pesticide residue, more nitrate, heavy metals, antibiotic residue, and genetically modified organism and are less nourishing. Health benefits and rising food safety concerns, consumer's desire for organically cultivated food has expanded over the past few decades. Organic food production is described as farming without the use of synthetic pesticides, plant growth regulators, or antibiotics, as well as artificial fertilizers and pesticides. Several agricultural systems, like the traditional agriculture practiced in India, are familiar with many of the techniques employed in organic farming, such as intercropping, mulching, and integrating crops and livestock. The main characteristics include preserving soil fertility over the long term by maintaining levels of organic matter, promoting soil biological activity, careful mechanical intervention, nitrogen self-sufficiency through the use of legumes and biological nitrogen fixation, effectively recycling organic materials like crop residues and livestock wastes and weeds, and disease and pest control relying primarily on crop rotations, natural predators, diversity, and organic management. It is highly prioritized to maintain soil fertility by recycling all wastes, primarily through compost, in order to reduce the time between nitrogen fertilizer addition and elimination from the soil. Due to their nutritional value and health advantages, organic foods are becoming more and more popular every day. Additionally, organic farming preserves the environment and boosts a nation's economic status. India is endowed with native abilities and the potential for growth in organic agriculture. Despite the fact that India lagged behind other countries in the globe in the adoption of organic farming, it has made significant progress in this area in recent years and is currently among the biggest organic producers worldwide. As a result, organic farming significantly improves the health of a country like India by promoting sustainable growth.

Keywords: *Organic farming, Conventional fertilizers, Food safety, Sustainable growth*

IAAHAS/AB/2023/086

Correlation and path analysis study direct and indirect contribution of different component characters on seed yield sesame (*Sesamum indicum* L.)

S. H. Pohekar[1], M. P. Wankhade[2], S. B. Ghuge[3], R. R. Karpe[4] and S. A. Cheke[5]

[2]Asstt. Prof. Dept. of Agril. Botany, VNMKV, Parbhani, Safflower Breeder,

[3]Safflower Research Station, VNMKV., Parbhani and

[1,4&5]M. Sc. Scholar, Dept. of Genetics and Plant Breeding, VNMKV, Parbhani.

Twenty-five genotypes including one check were studied for character association for yield and its components. Correlation study estimates gives some idea as to the relative importance of each of the components to final seed yield, although it is an established fact that nature and magnitude of associations would vary with the composition of the material. In present study simple correlation co-efficient were estimated at both the phenotypic and genotypic levels in twenty-five genotypes. It was observed that the magnitude of association varied among the genotypes. Correlation studies revealed that, seed yield per plant had significant positive association with plant height, number of capsules per plant, number of seed per capsule, capsule length, capsule width and 1000 seed weight and non-significant positive association with number of primary branches per plant point out that the importance of these characters in selection programme for selecting high yielding genotypes in sesame.

Keywords: *Correlation, path analysis, sesame, phenotypic and genotypic.*

IAAHAS/AB/2023/087

Optimization and Nutritional Quality Evaluation of Mulberry (*Morus alba* Linn.) Leaves Based Beverage

Monika Chand[1] and Dr. Sarita Srivastava[2]
[1]MSc. Foods and Nutrition, College of Home Science, GBPUAT Pantnagar, Uttarakhand,
[2]Professor, Department of Foods and Nutrition, College of Home Science, GBPUAT Pantnagar, Uttarakhand

The present study aimed to develop an optimized mulberry leaves-based beverage using fresh mulberry leaves, amla, ginger, and lemon extract. Mulberry leaves are generally underutilized and discarded but are rich in antioxidants, vitamins, and minerals, which can help boost the immune system, protect against chronic diseases like cancer and cardiovascular diseases, and have anti-inflammatory and anti-aging properties. There is an increase in demand for fresh and natural eco-sustainable products with appealing sensory characteristics, high nutritional, therapeutic value, and protein-rich lactose free, and vegan products in today's era. The optimization was based on nutritional and sensory parameters using the Box-Behken model of response surface methodology. The independent variables included mulberry leaves extract (ME), sugar, and amla extract (AE). The dependent variables were total soluble solids, pH, vitamin C, taste, flavor, color, appearance, and appearance overall acceptability. The nutritional quality analysis revealed that optimized mulberry leaves based beverage contains 3.52% crude protein, 0.60mg/100ml iron, 2.78 mg/100ml calcium 4.16mg/100ml beta carotene and 80±0.05% antioxidant activity. The optimized beverage was highly acceptable to consumers, with 11% of subjects rating it as extremely likable, 44% rating it as liking very much, and 41% rating it as liking moderately. During storage, the total soluble solids increased significantly from 5.5 to 6.3, while pH decreased significantly from 4.05 to 3.70. However, microbial analysis during storage revealed that the beverage was stable up to 2 months. Sensory evaluation also showed that the beverage was acceptable even after 60 days of storage at room temperature It can be recommended as healthy cum tasty beverage for all age groups.

IAAHAS/AB/2023/088

Role of Handloom Sector in Achieving Sustainable Development Goals in India

Rupanagudi Unesha Fareq* and Dr. Seema Kwatra

*PhD Scholar, Department of Family Resource Management, College of Home Science, GB Pant University of Agriculture and Technology, Pantnagar, Uttarakhand.

Professor, Department of Family Resource Management, College of Home Science, GB Pant University of Agriculture and Technology, Pantnagar, Uttarakhand.

The handloom industry is a distinct feature of India's rich cultural heritage and plays an important role in Indian economy. After agriculture, the handloom sector is the second highest income generating activity in India. According to the India Handloom Census (2019-20), the total number of households engaged in handloom activities in India is 31.45 lakhs. By 2030, the Sustainable Development Goals have served as a universal call to action to end poverty, protect the environment, and create opportunities for advancement and prosperity. The handloom sector has environmental friendly production processes, and has been a silent contributor to the achievement of some sustainable development goals, such as (i)Goal 5-Gender equality: over 70% of handloom weavers and allied workers are women, and this serves as a key to women's empowerment. (ii)Goal 7-Affordable and clean energy: no electricity used in the manufacturing process, and a switch from a manual machine to a solar-powered loom, resulting in a high output. (iii)Goal 8-Decent Work and Economic Growth:the handloom sector contributes to 6% of India's GDP and accounts for 13% of exports, and plays an important role in the socio-economic development of the rural population by encouraging entrepreneurship through self-employment opportunities and raising the standard of living. (iv)Goal 12-Responsible consumption and production promoting sustainable fashion and conscious consumerism, as consumers are interested in environmentally friendly clothing because of its durability. (v)Goal 13-Climate action: Handlooms are not highly mechanised resulting in low electrical consumption and the industry uses less energy than other textile industries, resulting in a low carbon footprint. As a result, handloom products are in high demand and appreciation in both domestic and international markets. Handloom industry is ecofriendly and technologically self-sufficient and regarded as the economy's second driving segment, providing greater sustainability and growth to small-scale enterprise. Therefore enhancing the handloom sector contributes to the achievement of India's broader Sustainable Development Goals.

IAAHAS/AB/2023/089

Development & Quality evaluation of Edible Cutlery from food-waste

[1]Muskan Gupta and [2]Dr. Divya Sanghi

[1]Student (M.Sc. Nutrition & Dietetics, Department of Nutrition & Dietetics, Faculty of Allied Health Sciences), Manav Rachna International Institute of Research & Studies

[2]Professor & HOD (Department of Nutrition & Dietetics, Faculty of Allied Health Sciences), Manav Rachna International Institute of Research & Studies.

Around 1.3 billion tons (32% of total food production) each year of food produced for human utilization is universally lost or squandered. Cutleries made of plastics today is a major issue globally. The food served in these plastic cutleries when consumed by people along with the toxins present in the cutlery causes several deathful health problems. Edible cutlery can be a solution to overcome this concern. The aim of this experimental study is production of biodegradable and nutritious edible cutleries from waste watermelon rind and pea peel. The present experimental study was conducted in Faridabad, Haryana. Fresh watermelon rinds and pea peel were collected from the local fruit juice & vegetable vendors. Rinds were desiccated at 50ºC for 24 hours into dehydrator and grinded into a flour and the non-edible parts of the pea peel were removed manually after which the pea peels were blanched for 1 minute and grinded for 60 seconds to form a fine paste. One standard (T0) and T1 & T2 with different formulations were prepared. A dough was prepared using peal peel paste (T1-25%, T2-30%), wheat flour (T1- 30%, T2- 20%), watermelon rind flour (T1- 25%, T2-30%), watermelon seed (T1&T2- 10%), salt (T1 &T2- 3%) and natural flavouring agents for different flavours (carom, cumin, cinnamon, chocolate) (T1 &T2- 6%) and turmeric (T1 & T2-1%) for colour well to incorporate anti-microbial properties. The dough was then moulded into different cutleries (spoon, fork and straw) and baked at 180ºC for 40 minutes. Further, to determine the acceptability of the samples, 9-point hedonic rating scale was utilized. The most acceptable sample was then sent to authorized food laboratory testing for its nutrient analysis and microbial verification. The statistical analysis revealed T125% of the rind flour and 25% pea peel as the most acceptable with respect to its colour, taste, appearance and texture. Spoons were mostly preferred due to its appealing texture and depth. Further, Natural flavours such as cinnamon and turmeric delayed the microbial spoilage as well as increasing the shelf life of the product.

Hence, watermelon rind and pea peel can be used in several value-added food products. The study concluded that edible cutleries when coated can be a good and sustainable approach towards the ecosystem and is a nutritious alternative of other edible cutleries.

Keywords: *Edible cutlery, waste management, watermelon rind, pea peel.*

IAAHAS/AB/2023/090

Assessment of genetic variability, heritability and genetic advance in okra genotypes for yield and its contributing traits

Meenakshi Kumari[1], S.S. Solankey[2], Pooja Upadhayay[3], Preeti Singh[4] and Manjeet[5]

[1,3,4,5] Department of Agricultural Science, Shree Guru Gobind Singh Tricentenary University, Gurugram, Haryana- 122505, India

[2]Department of Vegetable & Floriculture, Agriculture Research Institute, Patna, Bihar-800002, India

A study of genetic diversity in 31 okra genotypes including two checks viz., Pusa A-4 and Pusa Sawani for 16 important quantitative morphological and biochemical traits. The experiment was laid out in randomized block design with three replications during 2017-18. The phenotypic (PCV) and genotypic coefficients of variation (GCV), heritability in broad sense (h2bs), and genetic advance of these characters were studied. The genotypes demonstrated wide range of variability for all the characters. Moderate to wide range of mean values were observed among the genotypes studied for different characters. Phenotypic coefficient of variation (PCV) was slightly higher than its corresponding genotypic coefficient of variations (GCV) for all the characters studied. High PCV and GCV were observed for total chlorophyll content (110.87%, 110.84%) followed by total carotenoids content (64.98%, 64.97%), per cent disease incidence (37.31%, 36.90%) number of primary branches/plants (25.27%, 20.85%) and plant height (26.98%, 24.48%). Whereas, moderate for number of fruits per plant (17.60%, 14.76%), fruit yield

per plant (18.45%, 15.70%) while low for days to first flowering (8.04%, 7.42%). High heritability coupled with high genetic advance in per cent of mean was highest for total carotenoid content (99.96%, 133.80%) followed by total chlorophyll content (99.95%, 228.27%), total phenolics content (99.38%, 23.95%), per cent disease incidence (97.80%, 75.20%), number of seeds per fruits (86.20%, 29.91%) and plant height (82.30%, 45.76%). The genotypes, viz. IIVR-11, Kashi Kranti and Pusa A-4 were found promising for most of the yield contributing traits. These genotypes could be used further in hybrid breeding programme.

Keywords: *Heritability, okra, Variability, yield, genetic advance*

IAAHAS/AB/2023/091

Diversity Analysis and Screening Genotypes against Stem Rust in Wheat

Dayanand, Satynarayan Dahayalal Solanki, Jasvantlal Manilal Patel and Saurabh Kumar

CPCA, SDAU, Sardarkrushinagar, Dantiwada, Gujrat

Thirty genotypes of wheat were studied for generating scientific information on nature and magnitude of genetic diversity. The experiment was conducted in a randomized block design with four replications at the Agronomy Instructional Farm, CPCA, SDAU, Sardarkrushinagar during *rabi* 2020-21. The observations were recorded for various eleven traits *viz*., days to heading, days to maturity, plant height, number of effective tillers per meter, number of grains per spike, spike length, 1000 grain weight, ear weight, biological yield per plant, harvest index and grain yield per plant.

The genetic diversity analysis based on D^2-statics of 30 wheat genotypes were grouped into the eight clusters indicate that a maximum number of diverse genotypes (17 genotypes) appeared in cluster I followed by cluster II and cluster V (each 3 genotypes). The maximum inter-cluster distance (D=37.71) was found between cluster II and VIII, followed by cluster IV and V (D=37.08) whereas maximum intra cluster distance was observed for cluster I (13.67). Therefore, it was concluded that the genotypes belonging to this cluster should be inter crossed to generate more variability.

Genetic material comprised of thirty genotypes was screened using Modified Cobb's Scale at Botanical Garden, CPCA, SDAU, Sardarkrushinagar during *rabi* 2020-21. Inoculation of stem rust uredospores by syringe method was done at boot leaf stage in wheat genotypes. Out of thirty genotypes, genotypes viz., VA 2019-03, VA 2019-04, VA 2019-17, VA 2019-18, VA 2019-34, VA 2019-35, VA 2019-36, VA 2019-37, VA 2016-22, GW 366, GW 451, GW 496, HI 1544, HD 2864 and DBW 110 showed near to immune response against stem rust. VA 2019-02, VA 2019-19 and VD2019-4 genotypes had stem rust in traces i.e., less than five percent. A-9-30-01 and LOK 1 showed susceptibility against stem rust infection while maximum susceptibility against stem rust was observed in Agra Local, Lal Bahadur, A-206. Resistant genotypes can be used as parents in breeding programmes to make stem rust resistant varieties in wheat.

Key words: *Diversity, Genotypes, Wheat.*

IAAHAS/AB/2023/092

Effect of Nutrients on Performance of Turmeric (*Curcuma Longa* L.) under Eucalyptus (*Eucalyptus tereticornis)* based Agroforestry System

Dayanand Sai Painkra[1]*, Pratap Toppo[2], Manish Kumar Mankur[3], Jaimangal Tirkey,[4] Shashi Kiran Minj[5]

[*1,2,3,4]Department of Forestry, College of Agriculture, IGKV, Raipur, India
[5]Department of Floriculture and Landscape Architecture, College of Agriculture, IGKV, Raipur, India

A field experiment was conducted at Herbal Garden of Department of Forestry, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). During the season of 2021-22 with a view to study the "Effect of Nutrients on Performance of Turmeric (*Curcuma longa* L.*)* Under Eucalyptus (*Eucalyptus tereticornis)* Based Agroforestry System". The field experiment was conducted on turmeric *(Curcuma longa L.)* intercrops under Eucalyptus tree crop were used to grown and treatment was replicated three times in randomized block design (RBD) with plant spacing 40 cm x 30 cm. The soil of experimental field was clay to loam soil. The investigation, There were The fertilizer mixture FYM and NPK were used, which were applied at different concentrations in turmeric

intercrop in eight treatments *viz*., T_1: - 100 % recommended dose of fertilizer inorganic (N:P:K-120:60:60 Kg ha^{-1}), T_2: - 75 % of fertilizer inorganic, T_3:- 50 % of fertilizer inorganic, T_4:- 75% of fertilizer inorganic + 25 % FYM, T_5:- 50 % of fertilizer inorganic + 50 % FYM, T_6:- 25 % of fertilizer inorganic + 75 % FYM, T_7: - 100 % FYM and T_8:- control zero fertilizer. The crop growth parameters *i.e.,* Plant height (cm), No. of Leaves $tillers^{-1}$, No. of tillers $plant^{-1}$ and Collar diameter (mm) were significantly superior in the treatment T_1 (100 % recommended dose of fertilizer inorganic (N:P:K- 120:60:60 Kg ha^{-1}) at different crop growth stages at 30, 60, 90, 120 and at harvest. On the basis of above findings, treatment T_1 (100 % recommended dose of fertilizer inorganic (N:P:K-120:60:60 Kg ha^{-1}) stand could be better performance first in position and T_4 (75% of fertilizer inorganic + 25 % FYM) stand in second order of preference. However, treatment T_5 (50 % of fertilizer inorganic + 50 % FYM) comes in next in order. Therefore, it may be concluded that treatment T_1 (100 % recommended dose of fertilizer inorganic (N:P:K- 120:60:60 Kg ha^{-1})) may be prefer for higher growth in crop turmeric.

Keywords: *Growth parameter, Forestry, turmeric intercrops, Eucalyptus tree crop, randomized block design (RBD), fertilizer inorganic, FYM, NPK and agroforestry system.*

IAAHAS/AB/2023/093

Biochemical finger printing of apoptotic pathway of drug induced protoscoleces of *Echinococcus granulosus*

M. Norjit Singh*[1], Chongtham Sonia[2], Blessa Sailo[2], Menalsh Laishram[2] and Chongtham Tania[2]

[1]* College of Agriculture, Central Agricultural university, Iroisemba, Imphal, Manipur

[2] ICAR-RC for NEH Region, Manipur Centre, Lamphelpat, Imphal

Cystic echinococcosis (CE) caused by larval stage of *Echinococcus granulosus* is a classical example of cyclozoonosis. Infection of this parasite can be controlled by chemotherapy in canine. In human being, surgery is

supplemented with continuous therapy with anthelmintics. But continuous use of chemotherapeutic agents leads to increase in resistance parasite population which is having a negative impact to formulate the control strategies. To mitigate the issue benzimidazole (albendazole), ergosterol blocker (Amphotericin B) and calcium channel blockers (berberine chloride and tetrandrine) have been chosen to find out alternative chemotherapeutic regime. Present investigation has assessed the chemotherapeutic agents on the basis of phenotypic evaluation, biochemical mining and molecular signatures. Result of scanning electron microscopy indicated alteration of morphology of protoscoleces in the treated protoscoleces which was indicative of damages of machinery of cells. Estimation of free radical scavengers and Lipid Peroxidase (LPO) activity showed up regulation of free radical scavengers which could be linked with initiation of apoptotic changes. Effector caspase activation in treated group also indicated apoptosis of treated parasite since the effector caspase remain within the central dogma of apoptosis. Observation on apoptosis was further strengthened on the basis of qualitative and quantitative estimation of DNA fragmentation. DNA fragmentation was evidenced only in treated group. Therefore, on the basis of our finding this could be concluded that benzimidazole, ergosterol blocker and calcium channel blocker has effect on the protoscoleces of *E. granulosus* which has opened a new avenue of research towards development of alternative chemotherapeutic approach for *E. granulosus* complex.

Keywords: *Echinococcus granulosus, Apoptosis, Amphotericin B, Berberine, Tetrandrine*

IAAHAS/AB/2023/094

Combined effect of the foliar application of multiple nano nutrients on the overall growth and yield of wheat plants

Sapna Grewal[1], Promila[1], Santosh Kumari[1], Sonia Goel[2] and Aditi Arya[3]
[1]Department of Bio & Nano Technology, Guru Jambheshwar University of Science &Technology, Hisar, Haryana, India-125001
[2]Faculty of Agricultural Sciences, SGT University, Gurugram, Haryana, India-122006
[3]Department of Biotechnology, Deenbandhu Chhotu Ram University of Science and Technology, Murthal, Haryana, India

The study was aimed at evaluating the effect combination nanofertilizers on the growth and yield of wheat plants. As both macro and micro-nutrients are essential for plant growth, we developed, characterised and used a combination of nano-Nitrogen (nanoN), nano-Potassium (nanoK) and nano-Zinc (nanoZ) in our study maintaining 5 different set ups- 1) Control - Plants with no external zinc, nitrogen, potassium supplement (2) Bulk fertilizers - Plants supplemented with bulk/chemical zinc (zinc nitrate hexahydrate), nitrogen (urea), and potassium (potassium sulphate) (3) Nano 1 constituting 40 ppm nano ZnO, 40 ppm nano N & 20 ppm nano K (4) Nano2 constituting 80 ppm nano ZnO, 80 ppm nano N & 40 ppm nano K and (5) Nano 3 constituting 80 ppm nano ZnO, 80 ppm nano N & 40 ppm nano K. We observed that the nano-2 set up resulted in best results in almost all measured parameters of wheat plants. Nano-2 treatment resulted in 12.54 g average fresh weight of shoot and 6.25 g of average fresh weight of roots whereas treatment with chemical fertilizer resulted in mere 6.09 g average fresh weight of shoot and 2.64 g average fresh weight of root, respectively. The average dry shoot weight & average dry root weight was found to be 5.65 g and 2.14 g under nanonutrient application which was much better than that observed in case of bulk fertilizer application (3.24 g average dry shoot and only 0.92g average dry root weight). Application of nano-2 spray resulted in 33.13% increase in protein content over chemical fertilizers and 58.63% increase in protein content over control group. In addition to this, nano-2 spray also resulted in 36.74%, 34.69% and 32.58% increase in chlorophyll a, chlorophyll b and carotenoids content respectively over chemical fertilizers.

IAAHAS/AB/2023/095

Effect of Sulphur and Bio-fertilizers on Productivity of Fenugreek (*Trigonella foenum-graecum* L.)

P.C. Chaplot[1] and Ashok Kumar Samota[1]

[1]Department of Agronomy, Rajasthan College of Agriculture, MPUAT, Udaipur

A field experiment entitled "Effect of Sulphur and Bio-fertilizers on Productivity of Fenugreek (*Trigonella foenum-graecum* L.)" was conducted at Instructional Farm of Agronomy, Department of Agronomy, Rajasthan College of Agriculture, MPUAT, Udaipur during the *rabi* season of 2021-22 to study the effect of varying levels of sulphur and biofertilizers inoculations on productivity of crop. The soil of experimental field was clay loam in texture, slightly alkaline in reaction (pH 8.0), medium in available nitrogen (277.19 kg ha^{-1}) and phosphorus (18.02 kg ha^{-1}) while high in available potassium status (309.50 kg ha^{-1}). The experiment was conducted in Factorial RBD. The treatment consisted of four levels of sulphur *viz*., 10, 20, 30, 40 kg ha^{-1} and four combinations of biofertilizers *viz*., control, *Rhizobium*, *Rhizobium* + PSB, NPK consortia thereby making 16 treatment combinations replicated thrice. Fenugreek crop variety PRM-45 was used as test crop.

The results revealed that application of 40 kg sulphur ha^{-1} registered significantly higher growth characters *i.e.,* plant height, dry matter at successive growth stages, number of primary and secondary branches, number of effective nodules and their weight $plant^{-1}$. The fenugreek raised with 40 kg sulphur ha^{-1}significantly improved yield attributes *i.e.,* Pods $plant^{-1}$, pod length, seeds pod^{-1} and test weight thereby enhanced seed, haulm and biological yield by over application of 30 kg sulphur ha^{-1} by 6.5, 7.3, 7.1, 20 kg sulphur ha^{-1} by 14.8, 16.1, 15.7 and 10 kg sulphur ha^{-1} by 31.2, 29.0, 29.6 per cent, respectively. The crop accumulated highest quantum of total uptake of N, P, K and S over application of 30, 20 and 10 kg sulphur ha^{-1}, respectively. The crop under the influence of 40 kg sulphur ha^{-1} fetched highest net return of ₹ 102180 ha^{-1} and B-C ratio of 3.31 over rest of sulphur levels.

Results further revealed that inoculation of fenugreek seed with NPK consortia recorded maximum plant height, dry matter, number of effective nodules and their fresh weight, primary and secondary branches $plant^{-1}$ with the inoculation of NPK consortia which remained at par with dual inoculation

of *Rhizobium* + PSB. Inoculation of fenugreek seed with NPK consortia proved significantly higher pods plant^{-1}, pod length, seeds pod^{-1} and test weight with concomitant increase in seed and haulm yield by 16.4 and 21.0 per cent over control which was found at par with dual inoculation of *Rhizobium* + PSB with 16.4 and 21.0 per cent increase in both yields respectively. The fenugreek seed inoculated with NPK consortia total uptake of N, P, K and S over control. The maximum net return of ₹ 96029 ha^{-1}and the higher B-C ratio of 3.19 was also recorded when seeds were inoculated with NPK consortia.

IAAHAS/AB/2023/096

Detection and diagnosis techniques for seed borne plant pathogens

Pooja Upadhyay*
SGT University, Gurugram, Haryana

Seed is considered as major potential source for any variety which is responsible to determine the production and productivity of any crop grown in any cropping system. But these seeds are affected by a number of diseases and pest which affect their production and productivity. Thus, in recent years farmers, growers, traders and consumers all have become aware about the seed health as use of disease free healthy seed is the first line of management for sustainable production. For the methods starting from visual observation to PCR based molecular methods of seed health, timely detection and diagnosis is the need of the hour for the management of seed borne pathogens. According to the guidelines of ISTA various pathogen identifying methods have been developed and modified for the detection seed borne pathogens. These methods may start from visually identifying the pathogen up to molecular methods which are based on PCR analysis. As identifying the correct pathogen at right time is the first and most crucial step for the management of any pathogen so some novel methods Hence novel methods of pathogen identification along with methods of seed testing seem to be essential tools to avoid the shortcomings in the bulk production of seeds. So that a cost effective and impressive management strategy can be developed for the management of seed borne pathogens.

Keywords: *Detection and diagnosis, seed borne pathogen, seed health, ISTA*

IAAHAS/AB/2023/097

Effect of Tillage and Weed Management Practices on Weed Density and Yield of *Bt* Cotton (*Gossypium hirsutum* L.) in Vertisol

Pawar S. B. [1*], Karle A. S.[2], More V. R.[3] and Narkhede W. N.[4]

[1 & 3]Ph.D. Research scholar, Dept. of Agronomy, College of Agriculture, VNMKV, Parbhani

[2]Chief Agronomist, AICRP on Integrated Farming Systems, VNMKV, Parbhani

[4]Head, Dept. of Agronomy, VNMKV, Parbhani, MS, India

The field experiment was conducted at experimental farm, AICRP on Integrated Farming Systems, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (M.S.) during *kharif*2019-20 and 2020-21 seasons to study "Response of Bt cotton (*Gossypium hirsutum* L.) to tillage and weed management practices in vertisol".Treatment consisted of sixteen treatment combinations comprising four tillage practices (T_1- Conventional tillage, T_2- Rotary tillage, T_3- Minimum tillage, T_4- Zero tillage) in main plot, and four weed management practices (W_1 - Weed check,W_2 - Weed free, W_3 – Pendimethalin (30% EC) @ 0.75 kg ha^{-1} as PE + Quizalofop ethyl (5% EC)@ 50 g ha^{1}(PoE) + Hoeing. and W_4- Pendimethalin (30% EC) @ 0.75 kg ha^{-1} as PE +Pyrithiobac-sodium (10% EC) @ 62.5 g ha^{-1} (PoE) + Straw mulching 2.5t/ha. The result of the study revealed that conventional tillage (T_1) recorded lesser weed population and weed dry weight and higher weed control efficiency with lower weed index and higher seed cotton yield (kg ha^{-1}) than other treatments and however it was at par with rotary tillage (T_2). Among the weed management practices weed free (W_2) recorded) recorded lesser weed population and weed dry weight and higher weed control efficiency with lower weed index and higher seed cotton yield (kg ha^{-1}) and however it was at par with Pendimethalin (30% EC) @ 0.75 kg ha^{-1}as PE + Pyrithiobac-sodium (10% EC) @ 62.5 g ha^{-1} (PoE) + Straw mulching 2.5t/ha (W_4).

Keywords: *Herbicide, Weed density, weed control efficiency, weed index, seed cotton yield.*

IAAHAS/AB/2023/098

Epitransciptomics in plant stress response

Aiswarya S. and R. Preetha
Centre for Plant Biotechnology and Molecular Biology, Kerala Agricultural University

Epitranscriptomics refers to the study of modifications in RNA molecules that affect their function and stability without changing the sequence of nucleotides. In recent years, epitranscriptomics has emerged as a new field in molecular biology and is being explored as a potential mechanism to understand how plants respond to different stress conditions. Plants are constantly exposed to environmental stresses such as high salinity, drought, extreme temperatures, and pathogen attack, which can have a negative impact on growth, development, and yield. Epitranscriptomic modifications, such as RNA methylation, can modulate the expression and activity of stress-responsive genes, and therefore, play a critical role in the plant's response to stress. Recent studies have shown that RNA modifications, such as N^6-methyladenosine (m^6A), can regulate gene expression and play a role in plant adaptation to different stress conditions. In Arabidopsis, the RNA methylation enzyme MTA and RNA-binding proteins have been found to be involved in plant resistance to drought stress. In addition to m6A, other RNA modifications such as N^4-acetylcytidine (ac4C) and 5-methylcytosine (m^5C) have also been linked to plant stress responses. Epitranscriptomic modifications in non-coding RNA molecules, such as microRNAs and long non-coding RNAs (lncRNAs), have also shown to regulate gene expression in response to stress. On the whole, epitranscriptomics is emerging as a promising new area of research that has the potential to uncover new insights into the molecular mechanisms of plant stress responses and could lead to the development of new strategies to improve plant resilience under adverse environmental conditions.

IAAHAS/AB/2023/099

Effect of different pruning methods, GA_3 application and spacing on quality attributes of *rabi* onion (*Allium cepa* L.) under Chhattisgarh plains

Nisha Jangre, Vijay Kumar and Anjeet Jangre*
Department of Vegetable Science, IGKV, Raipur
Department of Agronomy, IGKV, Raipur

Field experiment was carried out during the year 2017-18 and 2018-19 in *rabi* season at the Sant Kabir College of Agriculture and Research Station, Kabirdham, Ghotia farm (C.G.) to assess the quality parameters of *rabi* onion as influenced by seedling pruning, GA_3 application and spacing. The experiment was laid out in Factorial Randomized Block Design (RBD) having three replications. The treatments comprised of 24treatmentcombination which include four methods of pruning(no pruning, leaf pruning, root pruning and leaf and root pruning) two level of GA_3 (without GA_3 application and GA_3 at 150 ppm) and three level of spacing (20x15 cm, 20x10 cm and 15x10 cm).Among the seedling pruning, the quality parameters was recorded significantly higher under P1*i.e.* (leaf pruning)during both the year *i.e*. Dry weight of bulb (13.81, 14.01 g), Sulphur content in bulb (8.44, 8.42%), Neck-diameter(11.38, 11.31mm),Nitrogen content in bulb **(**2.28, 1.90%**),** Phosphorus content in bulb (0.22, 0.27 %), Potassium content in bulb((2.08, 2.08%).Among Gibberellic acid the quality parameters was recorded significantly higher under G_1*i.e.*GA_3 at 150 ppm during both the year i.e. Dry weight of bulb (10.11, 10.39g), Sulphur content in bulb (8.63, 8.51%), Neck-diameter (10.97,10.84mm), Nitrogen content in bulb (1.90,2.10%), Phosphorus content in bulb (0.15, 0.28%), Potassium content in bulb(1.67, 1.65%).Among spacing the quality parameters was recorded significantly higher under D_1-20 x 15 cm during both the year *i.e* Dry weight of bulb (9.99,10.17 g), Sulphur content in bulb (8.07,8.01%), Neck-diameter (10.93,10.80mm), Nitrogen content in bulb (1.88, 1.87%), Phosphorus content in bulb(0.15, 0.24%), Potassium content in bulb(1.61 ,1.60%). Where in case of interaction the treatment P1G1D1 i.e (leaf pruning,150 ppm GA_3 and 20x15 cm spacing) recorded maximum value during both the year.

Keywords*: Pruning, GA3, onion, spacing, quality.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/100

Efficacy of various mutagens against *Fusarium oxysporum* f.sp. *ciceri,* causing chickpea wilt

Dr. M. G. Patil
Department of Plant Pathology, College of Agriculture, VNMKV, Parbhani, (M.S.) India

Chickpea (*Cicer arietinum* L.) is one of the most popular pulse crops grown throughout the world. Chickpea wilt caused by *Fusarium oxysporum* f. sp. *ciceri* is the most destructive and widespread fungal disease, causing severe yield losses. *F. oxysporum* f. sp. *ciceri* is a soil-borne as well as seed-borne fungus, a serious threat inflicting heavy quantitative as well as qualitative losses in chickpea and many crops. Therefore, present investigation entitled "Efficacy of various mutagens against *Fusarium oxysporum* f.sp. *ciceri*, causing chickpea wilt" was undertaken to identify suitable mutant or a combination of mutants and their role in imparting resistance to *Fusarium* wilt in chickpea. The present studies on effect of mutagenic treatments of gamma radiations (@ 20, 30, and 40 KR) and EMS (@ 0.2, 0.3, and 0.4%) revealed significant and deleterious impacts on biometric as well as physiological parameters of test the chickpea cultivars in M_2 generation. Further mutagenic effects steadily increased with increasing dosages of the test mutagens. Thus, it is deduced that both the physical (Gamma rays) and chemical (Ethyl Methane Sulphonate) test at various dosages, alone and in combination exerted detrimental effects in all four test cultivars of chickpea. All four chickpea cultivars (M_2 generation) tested under wilt sick plot/field were further subjected to the screening in laboratory by water culture technique. The test mutagens exerted significant effect in chickpea cultivar VIJAY, followed by JG62, BDNG798 and JAKI9218, in M_2 generation. As usual, cv. JG 62 was found highly susceptible with wilt incidence in the range of 97.35 to 100 per cent. Cultivars Vijay and BDNG 798 expressed resistant and moderately resistant reactions against wilt, whereas, cv. JAKI 9218 showed moderately resistant and moderately susceptible reactions against wilt disease in both screening technique.

IAAHAS/AB/2023/101

Performance of different weedicide combinations on growth and yield of Wheat (*T. aestivum*) under clay loam soil of Western Maharashtra

Varnekar K.D., Sunkara Rupa Aishwarya, Kamble A. B., Ilhe S. S.
Department of Agronomy, Mahatma Phule Krishi Vidyapeeth, Rahuri

The present investigation entitled "Integrated weed management in Wheat (*Triticum aestivum L.*)" was conducted during *Rabi* 2020–21 at Agronomy Farm, College of Agriculture, Pune. The experiment was laid out in Randomized Block Design with ten treatment combinations and three replications. The gross and net plot size were 4.00 m x 3.15 m and 3.50 m x 2.70 m, respectively. The treatment combinations consisted of T_1-Metribuzine 70% WP PE @ 0.175 Kg/ha *fb* 1 HW at 30 DAS,T_2- Pendimethalin 38.7% CS PE @ 677.25 g/ha *fb* 1 HW at 30 DAS, T_3- Metribuzine 70% WP PE @ 0.175 Kg/ha *fb* 2,4-D Dimethyl amine salt 58% SL PoE @ 0.75 Kg/ha at 40 DAS, T_4- Pendimethalin 38.7% CS PE @ 0.175 Kg/ha *fb* 2,4-D Dimethyl amine salt 58% SL PoE @ 0.75Kg/ha at 40 DAS, T_5- Tank mix 2,4-D Dimethyl amine salt 58% SL @ 0.50 Kg/ha + Clodinafop-Propargyl 15% WP @ 60 g/ha PoE at 35 DAS, T_6- Metsulfuron methyl 20% WP PoE @ 4 g/ha at 25 DAS *fb* Hand uprooting of Weed at 45 DAS, T_7- Ready mix Clodinafop- propargyl 15% + Metsulfuron methyl 1% WP PoE @ (60+ 4) g/ha at 35 DAS (Vesta), T_8- Ready mix Mesosulfuron Methyl 3% + Iodosulfuron Methyl Sodium 0.6% WG PoE @ (12+ 2.4) g/ha at 35 DAS (Atlantis), T_9- Weed free check upto 60 DAS (1 Hoeing at 20 DAS + HW at 30 DAS + Hand Uprooting of weeds at 50 DAS) and T_{10}-Weedy check.

The soil of the experiment field was clay loamy, low in available nitrogen (190 kg ha^{-1}), medium in available phosphorus (19.80 kg ha^{-1}) and high in available potassium (374.70 kg ha^{-1}).The wheat variety Phule Samadhan was sown at row spacing of 22.50 cm on 1st December, 2020 and harvesting was completed on 24th March, 2021.The dominant weed flora in experimental plots were *Cynodon dactylon, Cyperus rotundus, Digitaria sanguinalis, Echinochloa colonum, Amaranthus viridis, Parthenium hysterophorous, Convolvulus arvensis.*

The corresponding values of growth attributes such as plant height, number of tillers per running metre and dry matter $plant^{-1}$ in weed free check

were 79.21 cm, 180.33 and 20.18 g respectively, at harvest. Among the integrated weed management treatments, Ready mix Mesosulfuron Methyl 3% + Iodosulfuron Methyl Sodium 0.6% WG PoE @ (12+ 2.4) g/ha at 35 DAS (Atlantis), Ready mix Clodinafop- propargyl 15% + Metsulfuron methyl 1% WP PoE @ (60+ 4) g/ha at 35 DAS (Vesta), Metsulfuron methyl 20% WP PoE @ 4 g/ha at 25 DAS fb Hand uprooting of Weed at 45 DAS and Pendimethalin 38.7% CS PE @ 677.25 g/ha *fb* 1 HW at 30 DAS also registered the higher values of all these growth characters and hence were at par with the weed free check.

Similarly, the yield attributing characters such as length of spike, number of spikelets spike^{-1}, number of grains spike^{-1}, test weight, grain and straw yield of wheat were maximum in weed free check and the corresponding values were 8.07 cm, 17.16, 38.01, 41.20 g, 40.18 q ha^{-1} and 58.36 q ha^{-1} respectively. The weed free check was at par with the Ready mix Mesosulfuron Methyl 3% +Iodosulfuron Methyl Sodium 0.6% WG PoE @ (12+ 2.4) g/ha at 35 DAS (Atlantis), Ready mix Clodinafop- propargyl 15% +Metsulfuron methyl 1% WP PoE @ (60+ 4) g/ha at 35 DAS (Vesta), Metsulfuron methyl 20% WP PoE @ 4 g/ha at 25 DAS *fb* Hand uprooting of Weed at 45 DAS as they have recorded significantly higher values of these yield attributes. Whereas, Pendimethalin 38.7% CS PE @ 677.25 g/ha *fb* 1 HW at 30 DAS was found to be at par with the Metsulfuron methyl 20% WP PoE @ 4 g/ha at 25 DAS *fb* Hand uprooting of Weed at 45 DAS. However, minimum values of yield attributes were noted with weedy check treatment. The lowest grain (20.33 q ha^{-1}) and straw (28.66 q ha^{-1}) yield were observed in weedy check.

IAAHAS/AB/2023/102

Significance of Honey as Sugar Substitute in New Food Product Development

Suhani Agarwal[1]*, Er. Dr. Parimita[2]

[1*]Ph. D. Research Scholar, Assistant Professor[2]

Warner College of Dairy Technology, Sam Higginbottom University of Agriculture, Technology and sciences, Prayagraj

Natural sweeteners are sugar alternatives that have a sugar-like flavour but containing fewer calories than sugar and may have additional health benefits such as improving digestion. Honey is the world's oldest natural sweetener and is utilized for a variety of health and medical purposes. Honey is a natural sugar substitute producer by honey bees from blossom nectar, and it

is a sweet and flavourful liquid. Honey contains all essential nutrients such as carbohydrates, proteins, enzymes, amino acids, minerals, and vitamins. Presently, Honey is used in food industry as sugar replacer in development of new food product. Nonetheless, honey is serving as an antioxidant, anti-inflammatory, antibacterial, and antimicrobial agent in the food sector as well as medicine for burns, ulcers, diabetes, and wound healing. In this review, we discuss about the composition of honey, uses of honey as natural sugar substitute in food products, health benefits of honey and the utilization of honey for development of food products such as bakery, confectionary and dairy products. The new product may be successful on the local market and aid in the development of a family-sized apiary.

Keywords: *Essential nutrients, Health benefits, Honey, Natural sugar, Sugar substitute*

IAAHAS/AB/2023/103

Bypass Nutrient Technology the Need of Time

PP Singh[1], RPS Tomar[2], Reeta Mishra[3], SVS Chauhan[4] and BPS Raghubanshi[5]

[1,2,3,4]Rajmata Vijayaraje Sciendia Krishi VishwaVidayalaya-
[5]Rajmata Vijayaraje Sciendia Krishi VishwaVidayalaya-
Krishi Vigyan Kendra- Lahar (M.P)

India has been the highest milk producer in the world with 198.44 million tonnes milk production in 2019-20 but the productivity is very less. Most of the animals in developing countries including India are fed on agriculture by-products and low quality crop residues, which have inherent low nutritive value and digestibility. The shortage of feed resources coupled with their poor nutritive value lowers the productivity of dairy animals. The health and degree of productivity of dairy Cows and buffaloes are dependent on balanced and adequate quantities of all necessary nutrients to meet their requirement for a given physiological stage. The cereal crop residues fed to dairy animals are low in nutrients, high in crude fibre and lignin that restrict

intake and digestibility by the rumen microbes, and cause negative energy balance (NEB), adversely affecting milk production, and often result in low daily milk yields, short lactation periods with long calving intervals. In tropical countries, there is horizontal growth in terms of animal numbers and now needs to achieve vertical growth in terms of improving productivity, so that future demand of milk would be meet. The problem of nutrients for dairy animals could be overcome by newer feeds and by the use of alternative feed technologies, which may lead to better and more efficient utilization of available feed resources.

Protected nutrition technology (Bypass Nutrient Technology) is a feed management strategy involving passive manipulation of rumen to protect the nutrients against hydrolysis to aid their digestion and absorption from the lower tract. The protected nutrients mainly include protected fat and protein and it is also called as bypass nutrients technology. The technology of bypass fat protects the nutrient from degradation and biohydrogenation in rumen with increase in the energy density of the diet enabling the animals to meet their energy and essential fatty acid requirements. The protected fat can be obtained by various methods such as encapsulation technique and calcium salt formation of fatty acids. Calcium salts are being manufactured commercially from fatty acids obtained by palm oil which is cheaper and environment friendly. Some of the naturally occurring animal feeds such as maize gluten meal, cottonseed cake, fish meal, tannin rich legumes and coconut oil cake are good sources of naturally bypass proteins however mustard oil cake and ground nut cakes are highly degradable cakes. In the case of soluble protein meals, effective protection against rumen degradation can be obtained by various methods such as heat treatment at 125-1500 C for 2-4 hours could protect proteins very efficiently other methods include chemical treatment with formaldehyde, acetaldehyde and gluteraldehyde. Mostly treatment of proteins with formaldehyde is preferred because it is available readily and also economical.

Keywords: *Ruminant, bypass protein, bypass fat, heat treatment, protected nutrient, formaldehyde treatment*

IAAHAS/AB/2023/104

Effect of biostimulants on crops: A review

Manjri and Preeti Singh
Faculty of Agricultural Sciences, SGT University, Gurugram

Biostimulants are biological stimulator which provides a beneficial effect on growth of the plants, resistance to abiotic stress and production of the crops. They can be successfully used in both agri- and horticultural crops. The main active substances used in such preparations are humic and fulvic acids, protein hydrolysates, compounds containing nitrogen, seaweed extracts, beneficial fungi, and bacteria. In small concentrations, these substances are efficient, favoring the good performance of the plant's vital processes, and allowing high yields and good quality products. In addition, biostimulants applied to plants enhance nutrition efficiency, abiotic stress tolerance and/or plant quality traits, regardless of its nutrient contents. Several researches have been developed in order to evaluate the biostimulants in improving plant development subjected to stresses, saline environment, and development of seedlings, among others. Furthermore, various raw materials have been used in biostimulant compositions, such as humic acids, hormones, algae extracts, and plant growth-promoting bacteria. The application of an appropriate biostimulant can enhance the sress tolerance capacity in crops and it can improve vigourness of root and shoot and also increase in yield production of crops. However, the selection of appropriate biostimulants is critical as the effects can vary markedly between species.

Keywords: *Stress, Biostimulant, Humic acid, Fulvic acid and Seaweed extract*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/105

Effect of tillage, mulch and biofertilizer on some soil quality parameters, and growth and yield of maize in red and lateritic soils of Indo Gangetic Plains

Subhajit Banerjee[1], Arijit Mondal[2], Prabir Mukhopadhyay[3], Ramyajit Mondal[4], Prodipto Sow[5]

[1,2,4] Department of Agronomy, [3,5] Department of Soil Science and Agricultural Chemistry
Seacom Skills University, Kendradangal, Bolpur 731236, West Bengal, India

A field experiment was conducted at the research farm of Seacom Skills University, Kendradangal (87^{0}38'26.2" E,23^{0}42'02.8" N), Birbhum, West Bengal, India, to study the effect of tillage, rice straw mulch and application of different combinations of fertilizer on some soil quality parameters, yield attributes and yield of maize (*Zea mays* L.) crop grown during summer season, 2022. The experiment was laid out in RBD comprising of eight treatments (T_1-T_8) namely, T1= Conventional tillage (CT) + recommended dose of fertilizer (RDF) (160:80:80), T2= CT +RDF+rice straw mulch:@6t/ha, T3=CT+RDF+rice straw mulch:@6t/ha+ biofertilizer (mixed inoculum:@6kg/ha),T4=CT+RDF+rice straw mulch: @6t/ha+biofertilizer (mixed inoculum:@6kg/ha)+chelated Zn spray at 0.25% twice at 30 and 45 DAS, T5= Zero tillage (ZT) + RDF, T6= ZT+ RDF + rice straw mulch:@6t/ha, T7= ZT + RDF + rice straw mulch:@6t/ha + biofertilizer (mixed inoculum:@6kg/ha), T8= ZT+ RDF + rice straw mulch:@6t/ha + biofertilizer (mixed inoculum:@6kg/ha) +chelated Zn spray at 0.25% twice at 30 and 45 DAS; each treatment was replicated thrice. The results reveal that yield attributes(plant height, dry matter accumulation, number of cobs/m^2, cob weight, grains/cob and test weight) and maize yield, dehydrogenase and phosphatase enzyme activity, total nitrogen as well as organic carbon content in 0-20cm soil layer increased significantly ($p<0.001$) in the treatment plot wherein zero-tillage was combined with application of rice straw mulch, biofertilizer and foliarsprayofchelatedzincat0.25%twice (T_8), the increase in grain yield being 50.68% over control (T_1)(conventional tillage + RDF). In respect of enzymatic activity, dehydrogenase and phosphatase resulted to

show higher values in all the treatment plots under zero tillage with straw mulch. Total nitrogen and organic carbon followed the same pattern in respect to tillage, mulching and fertilizer management. The overall finding of the study was combination of zero tillage + RDF (N160:P80: K80) + straw mulch + chelated zinc foliar spray twice performed better in terms of growth, yield attributes and yield of summer maize in red and lateritic soils of Indo Gangetic Plains of West Bengal.

Keywords: *Tillage, Mulch, Biofertilizer, Soil quality, Yield, Maize.*

IAAHAS/AB/2023/106

Carbon Mineralization Pattern in Field Soils Under Two Different Crop Seasons in a Rice-Wheat Rotation as Influenced by Long-Term Tillage, Residue and Bio-Fertilizer Practices

Prodipto Sow[1], Prabir Mukhopadhyay[2], Abhas Kumar Sinha[3]
[1,2,3]Department of Soil Science and Agricultural Chemistry, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar 736165, West Bengal, India

Soil carbon mineralization is a process in carbon cycle and it depicts the important pathway in which carbon is returned to the atmosphere from soil. Research on carbon mineralization in long-term experimental set up under the influence of soil tillage practices in different crop seasons can provide a useful information about seasonal variability of carbon loss or gain in field soils. In this study, it is aimed to find out the carbon mineralization pattern along with kinetics parameters in field soils after the harvest of rice and wheat crop grown in a crop rotation as influenced by tillage, reside and biofertilizers in the Terai agro-ecological situation of West Bengal, eastern India (26°24'04.1"N 89°23'11.6"E). Undisturbed soil cores were collected after the harvest of rice and wheat crops from 0-10 cm and 10-20 cm layer for laboratory incubation for 28 days. The first order exponential model $C_m=C_0*(1-e^{-kt})$ is appeared as the best-fit model because it produced lower MSE and

higher R^2 value. Long-term effect of conventional tillage, with residue and biofertilizer application resulted into in higher values of potential mineralizable carbon and cumulative carbon mineralized than Zero tillage, without application of residue and biofertilizer. Carbon mineralization rate constant (k) varied between 0.063 – 0.089 & 0.042- 0.127 in post-rice soils and 0.025- 0.050 & 0.019- 0.107 in post-wheat in 0-10 cm and 10-20 cm soil depth respectively. The carbon mineralization pattern was curvilinear (increased exponentially) in all the treatments at both soil depths. Lower values of Cumulative CO_2 emission in 10-20 cm soil layer were due to less labile Carbon and microbial activity. The post wheat soils, which have a higher metabolic quotient, should be supplied with an adequate amount of carbon source to maintain microbial carbon demand than in rice soils. In this context, it is evidenced that the no-tillage practice with residue retention and biofertilizer application showed microbiologically sound sustainable environment than in the conventional tillage practice.

Keywords: *Carbon mineralization, Kinetic Parameters, CO_2 Fluxes, Rice-wheat cropping system, Conservation agriculture.*

IAAHAS/AB/2023/107

Incidence of Fall Armyworm (*Spodoptera frugiperda*) from central plain agro-climatic zone of Uttar Pradesh

Sanket Shekhar Mahajan[1]*, Ashwani Kumar[2]
Ph. D. Research Scholar[1*], Associate Professor and Head[2]
Department of Entomology, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj

Fall armyworm, *Spodoptera frugiperda* (J. E. Smith), is an economically significant insect widespread to tropical and subtropical America that has lately infiltrated India, inflicting additional harm to maize and sorghum. The

fall armyworm is a notorious pestiferous pest with great dispersal ability, a wide host range, and high fecundity, making it one of the most severe economic pests. A survey was conducted in the provinces of Prayagraj District during the Kharif season of 2021 and 2022 to assess its existence in Uttar Pradesh. Field surveying was carried out in order to evaluate the frequency of damage and estimate the severity caused by *S. frugiperda*. On the basis of morphology and taxonomy, these samples were identified as *Spodoptera frugiperda*. Recently kharif 2021 and 2022 its feeding on one to two months old paddy crop, variety (Pusa-Basmati 1) was noticed at SHUATS, Central Research Farm, Naini and Palpur village and of Prayagraj District (Uttar-Pradesh). Other than Paddy, it was also reported on maize, sorghum in different districts of Uttar-Pradesh. Infestation on Paddy was less than 5 per cent in year 2021 and infestation was increased in 2022, in the area of central agroclimatic zone. On Paddy (Pusa Basmati 1) it was ranges from 18-23 per cent in year 2021 and 34-37 per cent in year 2022. The natural enemies like *Campoletis chloridae* and *Noumuraea rileyi* activity was meager.

Keywords: *Fall Armyworm, Incidence, Notorious pestiferous, Prayagraj, Survey, Uttar-Pradesh*

IAAHAS/AB/2023/108

Role of cropping systems in the management of Potato Cyst Nematodes (*Globodera* spp.) in the Northern-western hills of India

Aarti Bairwa[1], Sanjeev Sharma[1], Ashwani K Sharma[1], Dalamu[1], Manoj Kumar[3], Priyank H Mhatre[2], Kailash C Naga[1], Chandan Maharana[1], Brajesh Singh[1]

[1]ICAR-Central Potato Research Institute, Shimla-171001, Himachal Pradesh, India

[2]ICAR-Central Potato Research Station, Udhagamandalam- 643004, Tamil Nadu, India

[3]ICAR-Central Potato Research Institute Regional Station, Modipuram -250110

Potato cyst nematodes (PCNs), a major pest of potatoes, have been transported with seed tubers from South America into Europe and from Europe to Asian nations. The two most common species, *Globodera rostochiensis* and *G. pallida*, are present in practically all areas of the world

where potatoes are grown. Recently, PCNs occurrence are reported in some parts of northern Indian hills of Himachal Pradesh, Jammu & Kashmir, and Uttarakhand hills. Due to the presence of PCNs, the Indian government forbade the transfer of potato seeds from selected regions to other Indian states. In the absence of a host crop, PCN remain persistent in the soil. Due to the long-term survival of the eggs and emergence from the cysts when triggered by the root exudate emitted by a host crop potato, managing PCNs is challenging. After PCNs are reported in a field, managing population sizes becomes the main objective. Due to the limited host range of both PCN species, crop rotations are followed to keep PCN population densities below the yield loss level. In order to determine the ideal crop rotation for controlling the PCNs population, the effects of non-host crops like rajmash, oat, mustard, potato trap crop, fallow, and potato as seed crop in various crop rotation combinations were assessed (w.e.f. 2019 to 2022) in PCNs sick field at Kufri and Fagu farms of ICAR-CPRI, Shimla. After four years of following management strategies at Kufri Farm, Oat-Oat-Mustrad-Trap resulted in maximum reduction (61.4%) of PCNs population followed by Potato-Rajmash-Trap-Rajmash (48.7%). Whereas at Fagu farm, Oat-Mustard-Rajmash-Trap had maximum reduction (63.3%) followed by Oat-Rajamsh-Trap-Rajamsh (62.9%) and Potato-Oat-Mustard-Mustard (54.6%).The study reveals crop rotation is an effective, eco-friendly strategy to manage PCNs populations. and can be combined with chemicals treatments.

IAAHAS/AB/2023/109

Variability Study of Mung Bean Genotypes at high temperature for different yield attributing traits

Khushboo Chandra and Navneet Shetty
Faculty of Agricultural Sciences, SGT University, Gurugram

Indian mustard is a significant oilseed crop in northern India. In order to improve food security, plant biology research aims to boost crop yield, resilience to biotic and abiotic stress, and food nutritious levels. Many commercially significant plants that produce a range of condiment-producing

edible portions, including as edible stems, leaves, buds, and seeds, belong to the family Cruciferae's Brassica genus. Heritability gauges the impact of the environment. The breeders' desired trait, seed yield, impacted by unrelated environmental factors as well as the number of physical qualities that are genetically regulated.The "Genetic Variability studies for Yield Attributes in Mungbean (Vigna radiata L. Wilczek)" which was conducted on 15 Mung bean genotypes at Horticulture Research Farm, SGT, Gurugram, Haryana during kharif 2021, was set up in a Randomized Block Design with three replications based on variability, heritability (in the broad sense), and genetic advance for 16 morpho-physiological characters.For all characteristics under high temperature, the analysis of variance indicated extremely significant variations between accessions. There is potential for improvement in traits with high mean and high range, such as Days to 50% blooming, Days to initial flower opening, Days to cessation of flower, Relative water content, Biological Yield, Harvest Index, and Grain yield per plant. IPM205-7 demonstrated advantage in terms of early blooming as well as a number of yield-related features. Height of the plant, number of secondary and primary branches per plant, number of pods, root length, and number of roots, biological yield, harvest index, and grain yield per plant. For traits like Days to First Flower Open, Days to Fifty Flowering, Plant Height, Number of Secondary Branch Per Plant, Number of Primary Branch Per Plant, Pod Length, Root Length, Root Dry Weight, Biological Yield, Harvest Index, and Grain Yield Per Plant, high heritability along with high genetic advance as a percentage of mean was discovered. The traits Days to 50% flowering, Days to first flower opening, Days to flower cessation, Relative water content, Biological Yield, Harvest Index, and Grain yield per plant showed high heritability along with high genetic advance as a percent of mean, providing a lot of opportunity for selection of these traits, which is found to be superior in genotype IPM205-7.

Keywords: *Brassica species, Oilseed, Variability, Heritability, Physiological traits, High temperature*

Perception of Dairy Stakeholders towards Co-Operative and Non-Co-Operative Dairy Industries: An Analytical Study

Vijay Kele[1] and Preeti Nair[2]
[1]Associate Professor, Department of Dairy Technology,
[2]Professor, Faculty of Management Studies, Parul University, Vadodara

The analytical study was conducted through a survey of dairy stakeholders, including dairy farmers, consumers, retailers and industry experts. The survey consisted of questions related to the perception of cooperative and non-cooperative dairy industries. The survey results showed that dairy farmers and consumers had a more positive perception of cooperative dairy industries compared to non-cooperative dairy industries. The stakeholders perceived that cooperative dairy industries provided fair pricing and access to resources, while also promoting sustainable and ethical practices. In contrast, non-cooperative dairy industries were perceived as profit-driven and lacking transparency. However, industry experts had a more nuanced view of the dairy industry, recognizing the advantages of both cooperative and non-cooperative dairy industries. The experts perceived that cooperative dairy industries provided stability and security to farmers, while non-cooperative dairy industries provided greater efficiency and innovation. The analytical study concludes that the perception of dairy stakeholders towards cooperative and non-cooperative dairy industries is influenced by several factors, such as fair pricing, access to resources, sustainability, and transparency. While cooperative dairy industries are perceived more positively by dairy farmers and consumers, industry experts recognize the advantages of both cooperative and non-cooperative dairy industries. The study suggests that the dairy industry needs to strike a balance between the advantages of cooperative and non-cooperative dairy industries to cater to the needs of all stakeholders.

Keywords: *Cooperative Dairy, non-co-operative Dairy, perceptions, Dairy stakeholders*

IAAHAS/AB/2023/111

Effect of systemic and non-systemic fungicides against *Fusarium oxysporum* f. sp. *vasinfectum* causing wilt disease cotton

Rahul Kumar Sharma* **and Mujeebur Rahman Khan**
Aligarh Muslim University, Aligarh

An experiment has been conducted to evaluate the effectiveness of systemic and non-systemic fungicides to control the cotton wilt disease-causing pathogen, *Fusarium oxysporum* f. sp. *vasinfectumin vitro* condition. The eight fungicides, namely; Mancozeb, Copper oxychloride, Amistar Top, CM75% (carbendazim+mancozeb), Vitavex, Carbendazim, Propiconazole, and Propineb, were used against the cotton wilt fungal pathogen. The different concentrations of fungicides were used in this study, such as; 50 ppm, 100 ppm, 150 ppm, and 200 ppm. These fungicides inhibit the mycelial growth of the pathogen to a varying extent, from 73% to 100%, at even its lower concentration of 50 ppm. The most significant reduction in mycelial growth up to 100% was recorded with carbendazim, mancozeb, CM75%, and propined at the lowest dose. Other fungicides also inhibited fungal growth significantly. These four fungicides can be used as seed treatments and soil applications for managing cotton wilt disease in field conditions.

Keywords: Cotton, fusarium wilt, *Fusarium oxysporum* f. sp. *vasinfectum*, fungicides, and systemic or non-systemic

Isolation and characterization of rhizospheric and endophytic bacteria from different crops to study influence on plant stress

Rajat laller[1], Prem Kumar Khosla[2], Nitika[1*]
[1,1*,2,] Faculty of Applied Sciences and Biotechnology, Shoolini University, Solan, Himachal Pradesh, India

PGPR refers to a group of freeliving bacteria that colonize the rhizosphere and helps in root growth and increases tolerance to biotic and abiotic stresses. Rhizospheric and endophytic bacteria help plants during drought and salt stress, that can be used as formulations in field to improve crop growth and productivity during abiotic stress. Drought and salt stress, among other abiotic stress, have left substantial areas of land unproductive or less productive. According to estimates, excessive salinity affects 20% of total farmed and 33% irrigated agriculture fields globally. Keep in view the following project was designed to target *Arabidopsis thaliana* and *Solanum lycopersicum* crops with the help of PGPRs isolated and screened on the basics of various biochemical tests for assaying of germination patterns. For the particular work further proceed by methodology, sampling sites and biochemical characterization. Biochemical characterization followed by Grams staining, catalase test, phosphate solubilisation, HCN production, Auxin (Indole-3-acetic acid) production. Further work carried for the identified by 16sRNA high-lightened the PGPR potential. PGPR has the ability to increase the availability of nutrient concentration in the rhizosphere by fixing nutrients, thus preventing them from leaching out. Effective PGPR have a substantial role in biotic and abiotic stresses management, reduce chemical fertilizers and increase the yield of plant cultivars by affecting elemental cycling and nutrient management. This study will focus on screening of PGPRs which are capable of rapidly colonizing rhizosphere and help plant in mitigating drought and salt stress.

Keywords: *Bacteria, PGPR, Rhizosphere, Plant, Biofertilizers, Agriculture, Sustainable*

IAAHAS/AB/2023/113

Studies on Phenolic compound in Ready to Serve Powder from Amla with Herbs

Mrs. S.R Popale[1]., Prof. (Dr.) Broadway A.A[2], Dr. V. P. Kad[3]
[1]Ph.D. scholar, [2]Director of Extension,
Sam Higginbottom University of Agriculture Technology & Science Prayagraj, India
[3]Associate Prof. Agril. Process Engg. Mahatma Phule Krishi Vidyapeeth Rahuri, India

Fruit and Herbs has an important therapeutic role in the Ayurvedic and Unani systems of medicine. Fruits of *Emblica officinalis* are rich in Vitamin C, phenolic compounds, gallic acid, tannins, flavonoids, pectin, and quercetin and also contains various polyphenolic compounds. Herbs have medicinal, aromatic, phototherapeutic properties. It is rich source of micro nutrient and phenolic compounds. Now a day's people are suffering from number of diseases like diabetic, Blood Pressure, cancer, obesity etc. due to their life style and food habits. Ready to serve beverages has made a place in the diet of people especially in today's world of, fast pace living. Ready to serve juices provides instant and quick serving beverages, which is hassle free, easy and quick to serve, as it overcome to strenuous method of preparing fresh juice. Understanding the benefits of Amla, Ginger, Tulsi and Mint which is having antibacterial, anticarcinogenic, antiemetic, antiviral, antitumor, anti-cardiotoxic properties which officious for treatment of diabetes, cancer arthrosclerosis, liver etc. It is rich source of micro nutrient and phenolic compounds. During the storage study after the six month the RTS Powder having minor changes in phenolic compound and increases the acidity. On the basis of results and the sensory evaluation revealed in the present study it can be concluded that this formulation can satisfy consumer taste and preferences.

Keywords: *Polyphenolic, anticarcinogenic, antiemetic.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/114

Effect of Processing on Retention of Antioxidant Components in Value Added Aonla Products - A review

Alkesh Yadav[1], Akshay Mehta[2]
[1]Department of Horticulture, CCS Haryana Agricultural University, Hisar
[2]Department of Horticulture, Maharana Pratap Horticultural University, Karnal

Aonla (*Emblica officinalis*) is an important crop indigenous to Indian subcontinent which is used in alternative medicine, health foods and herbal products. It is also found to be a rich source of ascorbic acid and other bioactive substances as compared to any other fruits. Effect of processing on retention of antioxidant components in value added aonla products like aonla juice, aonla ready to serve (RTS) beverage, aonla squash and aonla candy were prepared by following standard procedures as by the FPO specifications of Indian standards. Among the processed aonla products the antioxidant components were found maximum in juice followed by candy, squash and RTS. Ascorbic acid content (456.2 mg/100g), total poly phenols (2207.0 mg GAE/100g), total flavonoids (268.41QE/100g), tannins (1.81g TAE/100g) and total antioxidant activity (2239.37mg/100g) were analysed in the prepared products immediately after the preparation and the results were taken for comparison with fresh aonla towards finding out the retention of the antioxidant components during processing. Sensory qualities of the prepared products were evaluated. Aonla squash scored highest (8.65) for overall acceptability followed by RTS (8.51), candy (8.07) and juice (7.31). Aonla being rich in antioxidants should be minimally processed to retain its bioactive components.

Keywords: *Aonla, Ascorbic acid, Poly phenols, Flavonoids, Antioxidant Activity.*

IAAHAS/AB/2023/115

Effect of nitrogen and sulphur levels on yield, Sulphur fractions of safflower (*Carthamustinctorius* L.) crop

Dr. U.K. Patel*, Dr. S.K. Thapak* and Dr. Anurag**
*SMS, Krishi Vigan Kendra, Anjora Durg
**Dean, College of Agriculture and Research Centre, Mahasamund

The experiment was carried out during *rabi* season during years 2019-20 and 2020-21 at the Research cum Instructional Farm of Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. The experiment was laid out in factorial randomized block design with four nitrogen levels (N_0, N_{45}, N_{90} and N_{135} kg N ha^{-1}) and four sulphur levels (S_0, S_{15}, S_{30} and S_{45} kg S ha^{-1}) comprising sixteen treatment combinations with three replications. The soil of the experimental site found neutral to alkaline in reaction (pH 7.13), non-saline (0.21 dS m^{-1}) in nature, medium in organic carbon (5.13 g kg^{-1}), low inavailable nitrogen (224 kg N ha^{-1}), medium in phosphorus (13.26 kg $P_2O_5ha^{-1}$), high in available potassium (345.19 kg K_2O ha^{-1}), medium available sulphur (21.35 kg S ha^{-1}) and clayey in texture. Applied treatments nitrogen and sulphur levels highest seed yield, stover yield, were recordedwith135kg N ha^{-1}&45kg S ha^{-1} and in lowest was found under control. The nitrogen and sulphur applied @ 135 kg ha^{-1} and @ 45 kg ha^{-1} showed significantly highest total sulphur, organic sulphur, sulphate sulphur, heat soluble sulphur, water soluble sulphur and non-sulphate sulphur over 45 kg N ha^{-1} and 15 kg S ha^{-1}, respectively and lowest in control.

Keywords: *Safflower Sulphur fraction, Safflower productivity.*

Characterization of chrysanthemum (*Dendranthema grandiflora* Tzvelev) genotypes for growth, flowering characters and yield

Sonia Singh
Assistant Professor (FLA)
Maharana Pratap Horticultural University, Karnal, India

Diversification of agriculture have been emphasized, floriculture as an enterprise to supplement the farmers income as PM had launched program to double the farmers income. Floriculture would ensure the higher returns per unit area for the poor peasants. Flower industry has tremendous potential not only in country besides vast scope in world market. Globally, chrysanthemum occupied the top positions among the cut flowers and traded second most after cut rose flowers. Chrysanthemum is very attractive and beautiful flowering plant, having many varieties in the world. Looking at the importance and commercial potential there is an urgent need to conserve and characterize the available variability, its evolution and to identify potential genotypes for further improvement as per end users. The study was carried out on thirty genotypes of Chrysanthemum at CCS Haryana Agricultural University, Hisar during 2019 and 2020 to characterize for growth, flowering characters and yield. The results revealed that maximum days to first flower bud were recorded in genotype Bicolor Aruba (62.1 and 62.2) and minimum in Orange Dazzle (51.5 and 50.7 days). Minimum days to first flower opening were recorded in Pusa Sona (68.6 and 63.8) while maximum in Star white (94.9 and 95.3 days). Maximum duration of flowering was observed in Star Yellow (84.0 and 82.9) while minimum in Pusa Aditya (25.0 and 24.9). Pusa Chitraksha recorded maximum (189.3 and 186.76) number of buds per plant and minimum in Orange Dazzle (14.7 and 13.6). Number of flowers per plant was recorded maximum in Pusa Chitraksha (174.8 and 172.5) and minimum in Golden Beauty (10.1 and 10.4). Size of flower was exhibited maximum in Star White (11.1 and 11.2) and minimum in Green Button Lorenzo (3.2 and 3.0). Flower yield/plant was found maximum in Pusa Guldata (311.7 and 289.3g) and minimum in Bicolor Aruba (12.0 and 10.9g). Flower yield was found

maximum in Pusa Guldata (25.98 and 24.11 t ha$^{-1)}$) and minimum in Bicolor Aruba (10.03 and 9.04 t ha$^{-1)}$ during 2019 and 2020 respectively. Pusa Guldata genotype performed best in respect of flower yield.

IAAHAS/AB/2023/117

Genetics of Inheritance of grain yield and its attributing traits in Sorghum (*Sorghum bicolor* (L.) Moench)

Ambika More, D.B. Deosarkar and D.K. Zate

[1]Department of Agricultural Botany,

[2]Directorate of Extension,

Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (MS)

Experiment on generation mean analysis was carried out at Sorghum Research Station, VNMKV., Parbhani to investigate the nature, magnitude of gene action and inheritance involved in grain yield and yield contributing parameters during 2018-19. Experimental material for generation mean analysis comprised of six generations *viz.,* P_1, P_2, F_1, F_2, BC_1 and BC_2 of each of the three crosses; MS 104B x Bmr 7-4, Parbhani Moti x Bmr 7-1-3 and CSV 29R x Bmr 7-4-1. The mean of six generations from each of the three cross combinations were analysed as per the digenic epistasis (6 parameter model) given by Mather (1949) and Hayman and Mather (1958) for twenty four characters. Significance of one or more scaling tests and joint scaling test for earliness, yield and yield contributing parameters in all three crosses revealed the presence of non-allelic gene interactions indicating the complex nature of inheritance of the quantitative traits.

For days to 50 per cent flowering both dominance [h] and additive [d] gene effects played significant role, along with the importance of dominance x dominance [l] epistasis and duplicate type of gene interaction, which may restrict the scope for improvement through direct selection. Grain yield and most of the grain yield contributing traits viz., panicle length, panicle breadth, number of primaries per panicle and grain yield per plant were controlled by positively significant dominant [h] gene effects in two of the three crosses indicating the dominance nature of inheritance of these traits. However, 100 seed weight and harvest index were controlled by negative dominance effects

indicating the traits are under recessive inheritance. Among digenic interactions, both dominance x dominance [l] and additive x additive [i] gene effects were found prevalent in the inheritance of grain yield and its contributing traits. Duplicate type of epistasis for remaining traits in all three crosses may reduce the scope of direct utilization of heterosis through hybridization. In such situation, selfing in early segregating generations may be advocated to accumulate desirable genes followed by selection to stabilize positive effects.

Keywords*: Genetics, Inheritance, Scaling test, sorghum.*

IAAHAS/AB/2023/118

Effect of foliar application of micronutrients and plant growth regulators on growth, seed index and yield of phalsa - A review

Akshay Mehta[1], Alkesh Yadav[2], Aman Kumar[2] and Kuldeep Kumar[2]
[1]Department of Horticulture, Maharana Pratap Horticultural University, Karnal
[2]Department of Horticulture, CCS Haryana Agricultural University, Hisar

Phalsa (*Grewia subinaequalis*), which is also known as star apple is a subtropical fruit of India. It belongs to the family "Tiliaceae". It is mostly distributed in the tropical and subtropical region of the world. Foliar application of micronutrients viz. Zinc, Boron and Iron can improve the ripening as well as shelf life of phalsa fruit. Zinc is one eight essential elements responsible for the production of RNA polymerase, synthesis of IAA and nutrient uptake. Boron is essential micronutrient required for translocation of sugar which improves growth and development of fruits. Iron acts mainly in the synthesis of chlorophyll which is pre-requisite for photosynthesis and healthy plant and better quality of fruit. Application of 0.4% zinc sulphate + 0.2% Borax + 0.4% Ferrous sulphate resulted in maximum number of shoots per plant (56.33), shoot length (249.33 cm), number of leaves per shoot (86.00), inter-nodal length (6.77cm), number of fruiting nodes (11.93) and

number of fruits per node (8.85). Another study concluded that the combined effect of 40 ppm boron + 30 ppm GA_3 resulted in the maximum seed index (59.82 g) and maximum fruit yield 6.01 kg /plant and maximum fruit yield 82.57 q/ha.

Keywords: *Phalsa, Micronutrients, IAA, Seed index, Yield.*

IAAHAS/AB/2023/119

Evaluation of parched grain sorghum (*Sorghum bicolor* (L.) Moench) for tender grain yield and parched grain contributing traits

A.W. More[1]*, L.N. Jawale [2] and K.R. Kambale[2]

[1]Department of Agril. Botany, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani

[2]Director of Extension, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani

Nine parched grain sorghum genotypes along with three checks Phule Madhur, PKV Ashwini and SGS 8-4 were evaluated at Sorghum Research Station, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani during rabi 2020-21. The experiment was conducted in three replications in randomized block design. Plant to plant and row to row distance was maintained at 45 cm x 15 cm. All the recommended agronomical practices were followed. Observations were recorded on randomly selected 5 five plants in each replication for grain yield and its contributing characters. Results evidenced that on the basis of mean performance over four locations, among checks Phule Madhur recorded highest tender grain yield (30.56). Among test entries, PVRSG 101 (34.76) recorded highest tender grain yield followed by PVRSG 102 (30.40). Phule Madhur (123.3) recorded highest fodder yield. Among test entries, PVRSG 101 (134.8), PVRSG 103 (127.90) and PVR SG 104 (127.8) recorded highest Fodder yield over best check Phule Madhur. Days to 50 % flowering ranged from 71 (PKV Ashwini) to 77 (Phule Madhur) with the mean of 73 days. No significant differences were observed to days to flowering among genotypes. Harvesting of parched grain is done at dough stage as the

grains are soft, sweet and fragrant at this stage and suitable for eating as table purpose snack food. Hence, days to harvest in parched grain sorghum is important character. Sorghum genotypes showed a range of 93 (PKV Ashwini) to 102 (PVR SG 104) days to harvest with the mean of 99 days. Highest 100 tender grain weight (3.64 g) was exhibited by PVR SG 101 and lowest by check SGS 8-4 (3.30 g). highest threshability at dough stage is important for highest recovery of grain numbers and tender grain yield in parched grain sorghum. Significantly highest threshability % was observed in PVR SG 101 (94.30) and lowest in check SGS 8-4 (83.20%). Hence PVR SG 101 showing highest tender grain yield, green fodder yield along with highest threshability % and sweet grain taste is found most suitable for *hurda* purpose (parched grain).

Keywords*: Parched grain sorghum, Grain yield, Threshability.*

IAAHAS/AB/2023/120

Detection and diagnosis techniques for seed borne plant pathogens

Pooja Upadhyay
SGT University, Gurugram, Haryana

Seed is considered as major potential source for any variety which is responsible to determine the production and productivity of any crop grown in any cropping system. But these seeds are affected by a number of diseases and pest which affect their production and productivity. Thus, in recent years farmers, growers, traders and consumers all have become aware about the seed health as use of disease-free healthy seed is the first line of management for sustainable production. For the methods starting from visual observation to PCR based molecular methods of seed health, timely detection and diagnosis is the need of the hour for the management of seed borne pathogens. According to the guidelines of ISTA various pathogen identifying methods have been developed and modified for the detection seed borne pathogens. These methods may start from visually identifying the pathogen up to molecular methods which are based on PCR analysis. As identifying the correct pathogen

at right time is the first and most crucial step for the management of any pathogen so some novel methods Hence novel methods of pathogen identification along with methods of seed testing seem to be essential tools to avoid the shortcomings in the bulk production of seeds. So that a cost effective and impressive management strategy can be developed for the management of seed borne pathogens.

Key words: *Detection and diagnosis, seed borne pathogen, seed health, ISTA*

IAAHAS/AB/2023/121

Effect of plant growth regulators and micro-nutrients on growth and yield of high density planted Bt cotton (*Gossypium hirsutum* L.)

Shaikh Wasim Chand[1], P.N. Karanjikar[2], Mirza I.A.B[3] and D.N. Gokhale[4]

[1]Ph.D Scholar, Department of Agronomy, VNMKV, Parbhani-431 402

[2]Professor (CAS), Collage of Agriculture, Latur, VNMKV, Parbhani-431 402

[3]Assistant Professor, Department of Agronomy, VNMKV, Parbhani-431 402

[4]Director of Instruction & Dean (F/A), VNMKV, Parbhani-431 402

The experiment was carried out at Research Farm, Department of Agronomy, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani during *kharif* seasons of 2018-19 and 2019-20 on clayey soil. The investigation was consists of twelve treatment combinations comprising of three plant growth regulators treatment in main plot (**G_1-** NATCA @ 5%, **G_2-** Brassinosteroids @ 0.01% and **G_3-** Mepiquat chloride @ 50 g a.i ha^{-1}) and four micro-nutrients treatment in sub plot (M_1- Soil application of $ZnSO_4$ @ 20 kg + $MgSO_4$ @ 20 kg + $FeSO_4$ @ 20 kg + B @ 10 kg ha^{-1}, M_2- Foliar spray at square formation of 0.5% $ZnSO_4$ + 0.5% $MgSO_4$ + 0.5% $FeSO_4$ + 0.2% B and M_3- Foliar spray at square formation and at flowering of 0.5% $ZnSO_4$ + 0.5% $MgSO_4$ + 0.5% $FeSO_4$ + 0.2% B and M_4- Foliar spray of Grade II micro-nutrient at square formation and at flowering). During both the years of study, among application of plant growth regulators, Brassinosteroids @ 0.01% recorded significantly higher growth,

yield and yield attributes over Mepiquat chloride @ 50 g a.i ha^{-1} and NATCA @ 5%. Among application of micro-nutrients, Foliar spray at square formation and at flowering of 0.5% $ZnSO_4$ + 0.5% $MgSO_4$ + 0.5% $FeSO_4$ + 0.2% B recorded significantly higher growth, yield and yield attributes, but it was at par with Foliar spray of Grade II micro-nutrient at square formation and at flowering during both the years of study. These applications were significantly superior over, Foliar spray at square formation of 0.5% $ZnSO_4$ + 0.5% $MgSO_4$ + 0.5% $FeSO_4$ + 0.2% B and Soil application of $ZnSO_4$ @ 20 kg + $MgSO_4$ @ 20 kg + $FeSO_4$ @ 20 kg + B @ 10 kg ha^{-1}. Application of Brassinosteroids @ 0.01% with Foliar spray at square formation and at flowering of 0.5% $ZnSO_4$ + 0.5% $MgSO_4$ + 0.5% $FeSO_4$ + 0.2% B was found productive and profitable during both the years of study.

Keywords: *Growth regulators, micro-nutrients, High density planting, Bt cotton.*

IAAHAS/AB/2023/122

Supply chain integration: supply chain management practices and firm's performance

Himanshi Verma[1*], Niyati Thakur[2], Vishakha Chauhan[1], Anshuman Klate[1] and Ankita Chauhan[3]

[1]Department of Business Management, College of Horticulture, Dr. Yashwant Singh Parmar University of Horticulture and Forestry Nauni, Solan (H.P) (173230)

[2]Department of Social Sciences, College of Forestry, Dr. Yashwant Singh Parmar University of Horticulture and Forestry Nauni, Solan (H.P) (173230)

[3]Department of Plant Pathology, College of Horticulture, Dr. Yashwant Singh Parmar University of Horticulture and Forestry Nauni, Solan (H.P) (173230)

With the growth of agro-based industries, the creation of employment, and the generation of income, agribusiness plays a significant role in the economic transition. In order to combine their supply chain as a whole and increase long-term performance, organizations might use supply chain integration (SCI) to reorganize their resources and capabilities both internally and externally. The importance of SCI in obtaining performance and

competitive advantages is widely recognized. SCI's impact on performance diminished as product turbulence and demand volatility combined to grow. The external environment or product features have received more attention recently in the SCI literature as contingent factors. It is argued that supply chain management methods should be in line with business strategy in the context of the supply chain. Internal and procedural integration can boost businesses operational efficiency. Integration of both internal processes and products benefits financial performance. Process integration can greatly improve operational performance, indicating that producers should have a long-term and strategic plan when establishing and adopting SCI practises rather than focusing on the short-term or financial goal. To improve financial performance, manufacturers with cost leadership strategies should use internal integration, while those with differentiation strategies should heavily employ process integration. No of the type of competitive strategy chosen, product integration can only be put into practice when producers show improved financial success. We created a comprehensive understanding of the relationship between competitive strategies, SCI practises, and corporate performance by concentrating on different sectors, company sizes, and geographies.

Isolation, Identification & Diesel Oil Degradation Potential of Native Bacterial Strain Isolated from Contaminated Soils

Diksha Sah[1] and Ankita Ghosh[1]
[1]Department of Environmental Sciences, G. B. Pant University of Agriculture & Technology, Pantnagar-263145, Uttarakhand (India)

Environmental contamination caused by petroleum products such as diesel, gasoline, and crude oil has gained ecological attention. Such pollution is caused by various activities, including industrial runoffs, effluent release, offshore & onshore petroleum industry operations, and accidental spills. Petroleum hydrocarbons are neurotoxic and carcinogenic organic pollutants, extremely harmful to human and environmental health. Traditional treatment methods for removing hydrocarbons from polluted areas, including various mechanical and chemical strategies, are ineffective and costly. However, many indigenous microorganisms in soil and water can utilize hydrocarbon compounds as sources of carbon and energy and hence, can be employed to degrade hydrocarbon contaminants. Therefore, bioremediation using bacteria that degrade petroleum hydrocarbons is commonly viewed as an environmentally acceptable and effective method. In the light of the above, the present study attempts to determine the petroleum hydrocarbon degrading potential of indigenous bacteria strain designated as D-10,isolated from diesel oil contaminated soils collected from automobile workshops in Haldwani (29.2183° N, 79.5130° E) & Lalkuan (29.0676° N, 79.5182 ° E), Uttarakhand. According to the 16SrRNA sequences analysis, isolated strain D-10 was identified as *Brevundimonas vancanneytii*. In order to study the diesel oil degradation potential, isolated strain D-10 was inoculated into the nutrient broth medium supplemented with 1% (v/v) diesel oil and incubated at 30°C & 120 rpm for 7 days in rotary shaker incubator. This was followed by determining the growth of bacteria spectrophotometrically by taking OD at 600 nm & its diesel oil degradation potential by gravimetric analysis. FTIR analysis of fresh & biodegraded diesel oil were also performed to determine the change in the composition of diesel oil after being subjected to bacterial degradation.

Keywords: *Diesel oil, Bioremediation, Soil Contamination, Indigenous bacteria*

IAAHAS/AB/2023/124

Effect of different sowing dates on yield parameters of pearl millet (*Pennisetum glaucum* L.) crop in arid climate

Pooja Yadav[1*] and C.S. Dagar[2]

[1]Research Scholar, Department of Agrometeorology, G.B. Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar, Uttarakhand 263145

[2]Assistant Scientist, Department of Agricultural Meteorology, Chaudhary Charan Singh Haryana Agricultural University, Hisar (Haryana), 125004

Extreme weather events induced by global warming and climate changes created imbalances in the natural ecosystems and hydrological cycle. With global climate change and uncertainties in precipitation patterns, food security may become more vulnerable than in the past. Sowing time is the most important non-monetary input influencing crop yield. Sowing at an optimum time improves productivity by providing a suitable environment at all growth stages. A field experiment was conducted at Research Farm, Dept. of Agricultural Meteorology, Chaudhary Charan Singh Haryana Agricultural University, Hisar (Haryana) on pearl millet to identify the effect of different dates of sowing and varieties on yield parameters of pearl millet crop. The highest test weight (8.5 g), harvest index (23.9%), grain yield (3589.3 kg ha^{-1}), stover (11386.8 kg ha^{-1}), and biological yield (14976.1 kg ha^{-1}) were recorded by the 30th June sown crop. Among the varieties, the harvest index and grain yield of GHB-558 were the highest followed by HHB-272 and HHB-67 Improved at crop harvest. The test weight was highest in GHB-558 (8.2 g) because of its bold seed character.

IAAHAS/AB/2023/125

Study of genetic variability in green gram genotypes [*Vigna radiata* (L.) Wilczek] based on qualitative and quantitative characters

Prachi Mahla
Ph.D. Research Scholar, Department of Genetics and Plant Breeding, Maharana Pratap University of Agriculture and Technology, Udaipur

Forty four green gram genotypes were evaluated to assess nature and magnitude of genetic variability for both qualitative and quantitative characters during Kharif 2020 at SKNAU, Jobner. Analysis of variance revealed significant variation for all the characters under study. The phenotypic coefficient of variation (PCV) was greater than genotypic coefficient of variation (GCV) for all the characters studied indicating the influence of environmental effects on the expression of characters. Maximum GCV and PCV were observed for clusters per plant, pods per plant and seed yield per plant (g). High heritability in broad sense was recorded for 1000-seed weight (g), clusters per plant, pods per plant and seeds per pod. Genetic advance as percentage of mean was found higher for clusters per plant, pods per plant and seed yield per plant (g). The genotypes were evaluated for morphological characterization using DUS descriptors issued by PPV&FRA (2007). The characterization studies revealed that variability was present for all the characters except stem pubescence, leaflet lobes and leaf shape. This suggests that classification of genotypes should be done only on the basis of variable characters.

Keywords: *Genetic variability, characterization, heritability, genetic advance*

IAAHAS/AB/2023/126

Bio-efficacy and Residue of different insecticides against leaf miner, *Phyllocnistis citrella* Stainton and citrus butterfly, *Papilio demoleus* Linnaeus in/on Kinnow mandarin

Meenakshi Devi, R.S. Jaglan and S.S. Yadav
Faculty of Agricultural Sciences, SGT University, Gurugram, India, 122505

The bio-efficacy of different insecticides against leaf miner, *Phyllocnistis citrella* Stainton indicated that the lowest leaf damage percentage was observed in the treatment of spinosad 45 SC followed by imidacloprid 17.8 SL and thiamethoxam 25 WG, *i.e.*, 5.46 to 4.78%, 7.73 to 5.35% and 8.28 to 6.23% after first and second spray.The treatments of chlorpyriphos 20 EC, quinalphos 25 EC and nimbecidine 0.03% as mediocre, whereas malathion 50 EC and *Bacillus thuringiensis* var. kurstaki found the least effective. The lowest larval population of *P. demoleus* was found in quinalphos 25EC @ 175 g a.i/ha followed by chlorpyriphos 20EC @ 350 g a.i/ha, *i.e.*, 5.50 to 1.83 larvae/plant and 6.42 to 3.42 larvae/plant, while maximum larval population was recorded in nimbecidine 0.03% @ 3 ml/l but better than control during both the season. The residues of malathion (625 and 1250 g a.i. ha^{-1}), imidacloprid (17.8 and 35.6 g a.i. ha^{-1}) and thiamethoxam (25 and 50 g a.i. ha^{-1}) in Kinnow juice were determined at different time intervals, *i.e.*, 0 (two hour after spray), 1, 3, 5, 7, 10, 15 and 30 days after first and second spray. The average residues of malathion (0.012 and 0.025 µg g^{-1}), imidacloprid (0.12 and 0.19 µg g^{-1}) and thiamethoxam (0.07 and 0.1 µg g^{-1}) at both doses in Kinnow juice found below MRL on 0 day. The half-life values at single and double doses were 4.2 and 5.2 days for malathion, 3.47 and 3.71 days for imidacloprid and 3.6 and 4.2 days for thiamethoxam.

Keywords: *Citrus buttrerfly, insecticides, Kinnow, leaf miner, residue.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/127

In vitro evaluation of different crop residue-based complete feed pellets

P. V. Patil*, M. K. Gendley, A. P. Dhok and Roshan Verulkar
College of Veterinary Science and Animal Husbandry, Anjora, Durg, Chhattisgarh

The present research was conducted to evaluate the different crop residue-based complete feed pellets for *in vitro* dry matter digestibility, *in vitro* crude protein digestibility, *in vitro* neutral detergent fibre digestibility and *in vitro* gas production. Total of 16 types of complete feed pellets were prepared by replacing paddy straw @ 50%, 75% and 100% with wheat straw, soybean straw, gram straw, arhar straw and groundnut straw by maintaining a 70:30 roughage to concentrate ratio. *In vitro* digestibility was evaluated by incubating the samples added with strained rumen liquor and buffer anaerobically at 39^0C. Estimated the DM, CP and NDF in residue after digestion and digestibility was calculated considering the difference in DM, CP and NDF in samples and residue left over after digestion. Oven-dried feed samples of about 200 ± 5 mg will be weighed in triplicate into 100 ml glass syringes with pistons that were lubricated with vaseline. The syringes with feed samples, rumen liquor and buffer were incubated in a water bath at 39°C for 24 hrs and gas production on 2, 4, 8, 12 and 24 hr of incubation was recorded. Overall, significantly higher ($P < 0.01$) IVDMD % was found for the complete feed pellets containing gram straw followed by arhar straw, soybean straw, groundnut straw and wheat straw and paddy straw-based complete feed pellets. Significantly higher ($P < 0.01$) IVCPD% was found for gram straw-based complete feed pellets followed by arhar straw/soybean straw, groundnut straw, wheat straw and paddy straw-based complete feed pellets. However, there was a non-significant difference in IVCPD% of arhar straw and soybean straw-based complete feed pellets. However, significantly higher ($P < 0.01$) IVNDFD% was found for arhar straw-based complete feed pellets followed by gram straw, soybean straw, wheat straw, paddy straw and groundnut straw-based complete feed pellets. The groundnut straw-based complete feed pellets have significantly higher ($P < 0.01$) IVGP (ml/200mg) at 2, 4, 8,12 and 24 hr of incubation followed by soybean straw, gram straw, wheat straw and arhar straw-based complete feed pellets. Significantly higher ($P < 0.01$) IVGP (ml/200mg) was observed at 12-24 hr period followed by 8-12 hr, 4-8 hr, 2-4 hr and 0-2 hr of incubation. In

conclusion, gram straw-based complete feed pellets have higher *in vitro* dry matter and crude protein degradability, whereas arhar straw-based complete feed pellets have higher IVNDFD. The groundnut straw has higher IVGP means have higher fermentable sugars than other feed pellets.

Keywords*: Crop residue, complete feed pellets, in vitro crude protein digestibility, in vitro dry matter digestibility, in vitro gas production and in vitro neutral detergent fibre digestibility*

IAAHAS/AB/2023/128

Impact of Chemical Fertilizer, Biodynamic and Organic Manure on Growth and Yield, Quality and Profitability of Late Kharif Onion (*Allium cepa* L.)

Nivrutti Baburao Patil[1*], Rupesh Sharma[2] and Bhagyashree N. Patil[3]
[1&2]OPJS University, Churu, Rajasthan
[3]Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola

A field experiment was conducted at the instructional farm, Krishi Vigyan Kendra, Karda, Washim during the late kharif season of 2020-21 and 2021-22 to study the effect of integrated use of inorganic fertilizer with FYM on yield, uptake of nutrients and economics of onion (Allium cepa L.). The experiment was laid out in randomized block design with thirteen treatments and three replications. The results revealed that the maximum bulb diameter (5.45 cm), weight of bulb (77.35g), bulb yield per ha. (294.81q), N, P and K uptake (35.40, 12.82 and 25.20 kg/ha), highest micronutrient content (zinc 25.61 mg/kg, iron 76.70 mg/kg, copper 21.25 mg/kg, manganese 57.18 mg/kg was found in T_9 i.e. 50%RDN through FYM (q ha^{-1}) + 50% RDN through Vermicompost (q ha^{-1}) +Azatobactor (kg ha^{-1}) + PSB (kg ha^{-1}) (T^9). In T_9 treatment the maximum cost benefit ratio was found to be 10.90.

Keywords: *Economics, Integrated nutrient management, Nutrient uptake, Onion, Yield*

IAAHAS/AB/2023/129

Effect of Plant Defense Inducers on Powdery Mildew and Necrosis Disease of Sunflower

PN Mane[1], Manjusha Gaikwad[2], Santosh Gahukar[3]
Oilseeds Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola

An investigation was carried out under field condition during *Rabi* 2020-21 at Oilseeds Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola to know the effect of salicylic acid as a plant defense inducer in the management of sunflower necrosis and powdery mildew disease. Statistically non-significant difference was observed among the treatments towards germination. Seed treatment with salicylic acid@100 ppm and foliar spray with salicylic acid @100 ppm at 30days and 45 DAS recorded minimum i.e 1.4 percent and 1.9 percent necrosis respectively, at one and two month after germination. Seed treatment with salicylic acid@ 50 ppm and foliar spray with salicylic acid @ 50 ppm at 30 days and 45 DAS (1.9%) and Seed treatment with salicylic acid@ 50 ppm and foliar spray with Mono potassium phosphate (1%) i.e. 1.9 percent and 2.4 percent respectively and were found at par with each other and significantly superior over untreated control towards necrosis disease one month after sowing of Sunflower. Minimum powdery mildew intensity was recorded by Seed treatment with salicylic acid@100 ppm and foliar spray with salicylic acid @100 ppm at 30days and 45 DAS i.e. 6 percent and 10.3 percent at one and two month after sowing. Seed treatment with salicylic acid@100 ppm and foliar spray with salicylic acid @100 ppm at 30days and 45 DAS recorded higher seed yield 1884 kg/ha followed by Seed treatment with salicylic acid@ 50 ppm and foliar spray with salicylic acid @ 50 ppm at 30days and 45 DAS 1856 kg/ha. The control plot recorded lowest yield

of 1102 kg/ha and highest disease incidence i.e. 7.7 and 8.7 percent of powdery mildew and 36.7 and 39.7 per cent of necrosis at one and two month after germination, respectively. Seed treatment and foliar application salicylic acid could protect the crop and minimize yield loss of sunflower due to necrosis and powdery mildew disease.

IAAHAS/AB/2023/130

Dehydration suitability of onion genotype and effect of packaging material on quality

Sajeel Ahamad*, Ganesh Kumar Choupdar, Vivek Saurabh, Nirmal Kumar Meena

Division of Food Science and Postharvest Technology, ICAR-Indian Agricultural Research Institute, New Delhi 110012, India

Onion is a widely consumed commodity worldwide but the availability of suitable genotypes for dehydration purpose is very less. In this study, eight genotypes of onion namely, Pusa Shobha, Pusa Sona, Pusa Riddhi, ORVA 19-03, ORVA 19-05, ORVA 19-07, ORVA 19-14, ORVA 19-16 were evaluated for their physico-chemical constituents and their dehydration suitability. On the basis of physico-chemical parameters and dehydration characteristics, Pusa Shobha found most suitable for dehydration purpose as it retains higher pungency, total phenolic content, antioxidant activity, retained high dry matter and was less susceptible to browning. With regards the treatments and drying temperature, the maximum retention of ascorbic acid, antioxidant activity, total phenols, pungency, better rehydration ratio and low non-enzymatic browning was found in the onion treated with 5% NaCl and dried at 60°C. Out of different packaging material, 200 g HDPE pouches found most suitable for packaging. Sliced onion stored at low temperature retained higher physico-chemical characteristics than samples stored at ambient condition up to four months. Dehydration of onion reduces its weight and volume to a safe level without destroying its colour, flavour and nutritive value and therefore decreases its transportation and storage costs and could be one of the feasible

methods for preservation of surplus produce for us and minimizing the fluctuation in the market price.

Keywords: *Dehydration, Onion Genotypes, Pungency, Packaging material, HDPE.*

IAAHAS/AB/2023/131

Homestead integrated aquaculture through participation of rural women

Tanuja S., Sarkar, A., Moharana, G. and Mhatre, C.S
ICAR- Central Institute for Women in Agriculture, Plot no 50-51, Mouza Jokalandi, Baramunda Post, Bhubaneswar

Homestead integrated aquaculture has immense potential towards alleviating poverty and undernourishment. In order to have sustainable and equitable impacts through small holder aquaculture innovations, a focus on gender being included at the very start of the design and dissemination is required. The present case study showcases the impact of gender inclusive interventions in improving the participation of women in homestead aquaculture thereby improving the household fish and vegetable availability and income. A SWOT analysis of homestead integrated aquaculture was carried out to study the potential use of homestead ponds in improving women's participation in aquaculture thereby enhancing family nutrition and income. The participation of women and their knowledge on the various aquaculture activities was studied with survey using semi structured questionnaires. A gender inclusive approach was adopted in the capacity building of women on scientific aquaculture management practices. Twenty-four homestead ponds covering a total area of 4 Ha from four villages in Puri District, Odisha were selected to undertake participatory action research. The ponds were stocked with Indian Major Carps and Small indigenous fishes in the ratio 1: 2.5. Several women friendly interventions like passive fishing gears and vertical vegetable gardening were introduced in the villages with an aim to improve the participation of women in homestead integrated aquaculture. As a result of the interventions the fish production from homestead ponds increased by 230%. The involvement of women in harvesting of small fish using passive gear like gill nets and traps resulted in regular fortnightly availability of around 750g of

small micronutrient rich fish to rural families. The utilisation of pond bund for growing vegetables following the cropping calendar resulted in production around 790kg vegetables from per hectare pond area. The study showed that gender sensitive interventions can immensely contribute to improve women's participation in homestead aquaculture thereby increasing family income and improving family nutrition.

Keywords: *Homestead, integrated aquaculture, women*

IAAHAS/AB/2023/132

Impact of Crop Residue Management Practices on Growth in Wheat (*Triticum aestivum* L.) Under Conservation Agriculture

A. J. Rathod[1]*, S. S. Kinge [2], P. P. Shinde[3], M. P. Jagtap[4]

[1]Ph.D.(scholar) Department of Agronomy, PGI, Mahatma Phule Krishi Vidyapeeth Rahuri.

[2]Ph.D.(scholar) Department of Agronomy,

Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth Dapoli.

[3]Ph.D.(scholar) Department of Agronomy,

[4]Assistant Professor, Department of Agronomy

Vasantrao naik Marathwada Krushi Vidyapeeth, Parbhani.

An experiment carried out at Department of Agronomy, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, on impact of crop residue management practices on growth in wheat (*Triticum aestivum* L.) under conservation Agriculture. The experimental plot was laid out in split plot design of fifteen treatment combinations replicated thrice. Where in main plot consist of three tillage practices viz., Zero tillage (T_1), Reduced tillage (T_2) and Conventional tillage (T_3) and sub plot to five crop residue management practices viz., crop residue @ 2.5 t/ha (R_1), crop residue @ 5t/ha (R_2), crop residue @ 2.5t/ha + consortia @ 5kg/ha (R_3), crop residue @ 5t/ha + consortia @ 5kg/ha (R_4) and without crop residue (R_5). Residue management practices influenced significantly on the important growth characters of wheat. The growth of wheat in terms of plant height, number of leaves plant^{-1}, leaf area plant^{-1}, number of tillers plant^{-1} and dry matter accumulation^{-1} were

significantly higher in application of crop residue @ 5t/ha + consortia @ 5kg/ha i.e., R_4 over rest of the treatments.

Key words: *Crop residue Management Practices, Conservation agriculture*

IAAHAS/AB/2023/133

Effect of Seed Treatment in Quality and Storability of Wheat

Joginder Saini and Khushboo Chandra
Faculty of Agricultural Sciences, SGT University, Gurugram

Wheat is grown in *Rabi* season as a worldwide staple cereal crop which is continually spoiled by frequent soil, seed and air borne diseases eventually affects qualitative yield losses. Quality seed, being the basic input in agriculture, plays an important role in realizing optimal yield and productivity of any crop. Seed with high quality and vigour will not only help in achieving optimum plant population in the field but also result in vigorous seedling, which can surpass the initial abiotic and biotic stresses to significant extent. Deterioration of seed during storage is inevitable and leads to different changes at various levels viz., impairment or shift in metabolic activity, compositional changes, decline or change in enzyme activities, phenotypic, cytological changes apart from quantitative losses. Seed quality is the possession of seed with required genetic and physical purity that is accompanied with physiological soundness and health status. Quality of seeds can be measured in 4 parameters- Physical, Genetic, Physiological and Seed health. Maintaining the quality of seed is dependent on many environmental factors, some of which are moisture, temperature, humidity, and storage conditions. Even though these factors are properly accounted for, seed quality may still be reduced by certain seed borne diseases or destroyed by insects and other pests. Research has shown that treating seed with one or more pesticides is the most economical and efficient way to protect seed from these pests and improve seed quality. Seed treatment can be done by Seed dressing, Seed coating and Seed pelleting. Firstly, mix the fungicide (carbedazim, mencozeb or metalaxyl @ 2 g/kg seeds) and some quantity of water can also sprinkle then dried it in the shade & then after sometime mix the insecticide (chloropyriphos,

emidachloropid @ 2 g/kg seeds) properly. After that mix the culture rhizobium, azotobactor, phosphorus solubilising bacteria (PSB) @ 10 g/kg seeds (in the form of powder) or use 5 g/kg (in the form of liquid) with seed. Seed treatment protects crop or newly born plants from diseases, crop gets nutrient, protect from insects and when there is no disease in the early stage of crop and yield also gets much more.

Keywords: *Wheat, Seed Treatment, Quality Seed, Storage,*

IAAHAS/AB/2023/134

Effect of Aloe Vera Powder (*Aloe barbadensis*) on Proximate Composition of Satpuda Poultry

N. B. Bhargande*, **S. P. Poul, D. K. Deokar**
Department of Animal Husbandry and Dairy Science,
Post graduate institute MPKV, Rahuri

The present experiment entitled "Effect of Aloe vera powder (*Aloe barbadensis*) on growth performance and meat characteristics of Satpuda poultry" was conducted at Department of Animal Husbandry and Dairy Science, College of Agriculture, Dhule, Maharashtra. One sixty, day old, Satpuda chicks were purchased from Balaji Hatcheries, Pvt. Ltd. Ahmadnagar, Maharashtra. They were randomly distributed into four groups T0, T1, T2 and T3 with 40 chicks in each group. The experimental broiler chicks were reared on deep litter system in well-ventilate shed from 0- 8 weeks. The control group (T0) was without aloe vera powder, while chicks in treatment group T1, T2 and T3 were fed basal diet with Aloe vera powder @ 0.5%, 1.0% and 1.5%, respectively. The inclusion of aloe vera powder in the Satpuda diet had non-significant effect on moisture, dry matter, nitrogen free extract, protein, fat and ash content in breast and thigh tissue. However, a higher fat content was observed in the breast meat as compared to thigh meat.

Keywords: *Satpuda, aloe vera powder, carcass characteristics*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/135

Zero tilled cowpea (*Vigna unguiculata* L.) evaluated with various inputs under Konkan region for growth, yield and economics

***M V Kamble[1] and U V Mahadkar[2]**
[1]Ph.D. Scholar, Department of Agronomy,
Punjab Agricultural University, Ludhiana, India, 141 004
[2]Department of Agronomy, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth,
Dapoli, India, 415 712

An experiment was conducted during rabi season of 2016-17 to investigate zero tilled cowpea (*Vigna unguiculata* L.) grown with various inputs under Konkan region. The treatments comprised of absolute control (T_1), weed control (T_2), weed control + RDF (T_3),weed control + RDF + bio-fertilizers (T_4), weed control + RDF + bio-fertilizers + micronutrients(T_5), weed control + RDF + bio-fertilizers + micronutrients +plant protection(T_6),Weed control + RDF + bio-fertilizers + micronutrients + plant protection + paclobutrazol (T_7)and weed control + RDF + bio–fertilizers + micronutrients + plant protection + paclobutrazol + one irrigation (T_8) which were evaluated for various growth (Plant height (cm), Number of branches per plant, Number of leaves per plant, Dry matter per plant and Plant spread), yield attributes (Number of flowers per plant, Number of pods per plant, Number of developed pods plant^{-1}, Number of grains pods^{-1}, Length of pod (cm), 100 seed weight (g), Grain yield and Stover yield (q ha^{-1}) and further evaluated for their cost of cultivation and net returns (Rs ha^{-1}). The treatment of weed control + RDF + bio-fertilizers + micronutrients + plant protection + paclobutrazol + one irrigation (T_8) found significantly superior for all the growth and yield attributing traits. This was followed by treatment (T_7) weed control + RDF + bio fertilizers + micronutrients + plant protection + paclobutrazol which was statistically at par with (T_8). In respect of economics, it was observed that, the treatment (T_8) weed control + RDF + bio-fertilizers + micronutrients + plant protection + paclobutrazol + one irrigation has given highest net returns (Rs. 21621.25 ha^{-1}) and B:C ratio (1.79).

IAAHAS/AB/2023/136

Adoption Level of Respondents about Recommended Package of Practices of Root and Tuber crops

K.L. Chaudhary, A. P. Chaudhary and D. H. Chaudhary
Navsari Agricultural University, Navsari-396 450

A study was conducted to know the adoption level of respondents about recommended package of practices of root and tuber crops. Adoption is a decision to continue full use of an innovation. The adoption process is a mental process through which an individual passes from first hearing about an innovation to its final adoption. Under this investigation Navsari district was covered. The list of root and tuber crops growers was obtained from the Research scientist, Soil and Water Management Research Unit, NAU, Navsari. In Navsari district, there are six talukas viz., Navsari, Gandevi, Chikhli, Jalalpore, Vansda and newly added Khergam. On the basis of maximum number of root and tuber crops growers, four talukas were selected for present study. List of villages was collected from respective taluka panchayat with maximum number of root and tuber crop growers. Two villages were selected randomly from the list of each taluka. Thus, eight villages were selected in all for the study. Bifurcated list was used to identify the respondents and random sampling method was followed for selection of the respondents, from each village 15 respondents were selected. In this way the sample size for the study comprised for 120 respondents. The data regarding adoption of respondents about recommended package of practices of root and tuber crops were analyzed, tabulated and presented according to level of adoption. It was found that majority (62.50 per cent) of respondents had moderate level of adoption followed by 20.83 and 16.67 per cent had lower and higher level of adoption about recommended package of practices of root and tuber crops.

IAAHAS/AB/2023/137

Land Use Planning and Management in Jamrani Dam Command

Dr. R. K. Singh* and Dr. H.C. Sharma**
*Senior Tech. Officer, SWE, College of Ag. Engg. and Tech, Dr. RPCAU Pusa Bihar
**Ex. Dean College of Technology, GBPUA&T, Pantnagar (Uttrakhand)

Present study was conducted with an aim to assess the groundwater inventory in Jamrani Dam Command situated in Uttrakhand and Uttar Pradesh. Groundwater inventory was prepared for different blocks of Udhamsingh Nagar, Rampur and Bareilly districts in Jamrani Dam Command from 1988 to 2010 at an interval of five years. Over exploitation of groundwater has created an alarming situation in few blocks of Rampur and Bareilly districts in Jamrani Dam Command. In the year 2010, Bilaspur, Baheri, Gadarpur and Rudrapur blocks of the study area were found under safe category; Swar and Meerganj blocks were found under critical category whereas Milak and Shergarh blocks were found under over exploited category. The maximum and minimum stages of development were found 109.08% and 59.31% at Shergarh and Rudrarpur blocks, respectively. The overall stage of development for the study area was 68.44% and the area as a whole may be put under semi critical category for the year 2010.

In the present study, the physico-chemical properties of groundwater of shallow aquifer and their suitability for drinking, irrigation and industrial uses were studied. The physico-chemical properties of ground water of study area were determined using standard methods of water quality analysis. Comprehensive and proper groundwater recharge plan for the identified landforms with their prevailing geomorphic features in the study area has been suggested to maintain the groundwater at a safe and desired level in future in the Jamrani Dam Command. Various water recharging structures namely: series of check dams, percolation tanks, farm ponds and nallah bunds are most possible techniques for recharging groundwater aquifer by utilizing excess water available during monsoon season in the form of runoff obtained from the land surface. Geographic information System (GIS) and Remote Sensing were applied to the study area to delineate different land uses from the satellite imageries (IRS-1D). The study area delineated from the S.O.I. toposheets was also classified into nine land use classes i.e. agricultural land, grass land, water body, scrub land and forest etc.

IAAHAS/AB/2023/138

Impact of different tillage and nutrient management practices on yield and economics of direct seeded rice

Pittala Manoj Kumar*[1], Dhirendra Kumar Roy[2]
[1]PhD scholar, Kerala Agricultural University, Thrissur, Kerala, India
[2] Professor, Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar, India

A field experiment was conducted in an ongoing long-term tillage trail that was established in 2010 under a set of tillage and nutrient management treatments with Rice-Maize cropping system at Tirhut college of agriculture, Dholi (RPCAU) during *Kharif* 2019. The experiment was laid out in 'split-plot design' with tillage practices under main plot treatments (T_1: Conventional tillage; T_2: Zero tillage and T_3: Zero tillage + Residue) and nutrient management practices as subplot treatments (N_1: Recommended Dose of Fertilizer N_2: site-specific nutrient management based on Nutrient Expert for rice N_3: 60 % N + green seeker guided N application + 100% PK of RDF). T_3 recorded statistically significant grain and straw yields over T_1 with a raise in grain yield by 14.03 % and straw yield by 9.27 % while both the yields stood on par with T_2 which could be credited to the improved soil structure for plant root proliferation resulted by less soil disruption and with constant crop residue accumulation over the years enriched the soil with organic matter and soil biota which enhances the mineralisation process thereby increasing plant nutrient availability. N_2 obtained significantly superior grain and straw yield over N_1 with increase in grain yield by 14.91 % and straw yield by 7.73 % while both the yields stood on par with N_3. This yield improvement might basically be credited to a timely and balanced nutrient application rather than increasing nutrient rates. Among tillage practices, highest net returns (₹59050/ha) and BCR (1.83) were obtained with T_3 *fb* T_2 (₹56001/ha & 1.73 respectively) while minimum net returns (₹45933/ha) and BCR (1.33) were obtained under T_1. Lower CoC incurred under conservation tillage practice along with the higher crop yields over Conventional tillage led to high net returns and BCR in T_3. Similarly, under nutrient management practices, maximum net returns (₹59313/ha) and BCR (1.86) were obtained under N_2*fb* N_3 (₹55468/ha & 1.66 respectively) while minimum net returns (₹46203/ha) and BCR (1.37) were

obtained under N_1. Large biological yields and lesser CoC under N_2 led to an increase in the net returns and BCR over N_1.

IAAHAS/AB/2023/139

Biochemical Response of Jasmonic Acid for Elimination of Abiotic Stress in Guava

Monika Devi Adhikarimayum and Vishal Johar*
Department of Horticulture, School of Agriculture,
Lovely Professional University, Phagwara (Punjab) – 144111

The study would be carried out at the research farm of Department of Horticulture, Lovely Professional University, Phagwara (Punjab). The experiment would be laid out in a Factorial Completely Randomized Block Design with three replications. During the investigation different irrigation levels *viz.* 100 per cent of field capacity, 75 per cent of field capacity and 50 per cent of field capacity would be applied to evaluate the effect of different concentrations of jasmonic acid i.e. 0, 10, 20, 40 and 80 µM to overcome the drought stress in guava seedlings. During the study various growth and physio-biochemical parameters namely plant height, shoot length, root length, number of leaves per plant, leaf area index leaf fresh weight, leaf dry weight, chlorophyll content, superoxide dismutase (SOD), peroxide activity, catalase activity, proline content etc. would be assessed to determine the performance of guava seedling towards the drought stress. The study would be beneficial to improve the yield and productivity of guava in problematic areas having less availability of irrigation water and would also help to supplement and double the farmers' income in such areas.

Keywords: *Jasmonic acid, Abiotic Stress, Irrigation and Guava*

IAAHAS/AB/2023/140

Effect of Liquid Inoculants of *Azospirillum brasilense* and Phosphate Solubilizing Bacteria on Economics of Sorghum

Mohod N.B*, Seema M. Nemade and D.K. Panda
Department of Agronomy, Dr.P.D.K.V., Akola, Maharashtra

A field experiment entitled "Effect of Liquid Inoculants of *Azospirillum brasilense* and Phosphate Solubilizing Bacteria on Growth and Yield of Sorghum" was undertaken during the *kharif* season of 2018 on clay loam soil of Sorghum Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra). An experiment was laid out in the factorial randomized block design in three replications. There were twelve treatment combinations consisting of three different levels of RDF *viz*., F_1 - 50% RDF, F_2 -75% RDF, F_3 - 100% RDF (80:40:40 kg/ha of $N:P_2O_5:K_2O$) and four seed treatments *viz*., S_1 - Control (without seed treatment and only application of fertilizer), S_2 - seed treatment with *Azospirillum brasilense* and phosphate solubilizing bacteria @ 25 g each/kg seed, S_3 - seed treatment with liquid *Azospirillum brasilense* and phosphate solubilizing bacteria @ 2 ml each/kg seed and S_4 - seed treatment with liquid *Azospirillum brasilense* and phosphate solubilizing bacteria @ 4 ml each/kg seed.

Among different levels of RDF, 100% RDF recorded significantly maximum grain yield, fodder yield, GMR, NMR and B:C ratio. Seed treatment with liquid *Azospirillum brasilense* and phosphate solubilizing bacteria @ 4 ml each/kg seed recorded significantly maximum grain yield and fodder yield, GMR, NMR and B:C ratio over other seed treatments. However, seed treatment with liquid *Azospirillum brasilense* and phosphate solubilizing bacteria @ 4 ml each/kg seed was statistically at par with seed treatment with liquid *Azospirillum brasilense* and phosphate solubilizing bacteria @ 2 ml each/kg seed in yield and economics of sorghum.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/141

Effects of Different Nutrient Solutions on Lettuce Growth and Quality in Hydroponic Systems

Dipesh, Mrityunjaya Sharma, Abhishek, Seijal
Student, Faculty of Agricultural Sciences, SGT University, Gurugram

The use of hydroponic systems for growing crops has gained popularity in recent years due to its efficiency in nutrient delivery and water usage. Among the crops grown in hydroponic systems, lettuce is particularly sensitive to the quality and availability of nutrients. The effects of various fertiliser solutions on the development and quality of lettuce in hydroponic systems are examined in this study. Nitrogen, phosphorus, and potassium are the primary macronutrients required for optimal lettuce growth, while calcium, magnesium, and iron are essential micronutrients. In addition to nutrient concentration, pH and electrical conductivity of the nutrient solution also play a critical role in lettuce growth and quality. The selection and management of the nutrient solution can optimize lettuce growth and quality in hydroponic systems.

Keywords: *Hydroponics, lettuce, nutrients, fertilizer and electrical conductivity*

IAAHAS/AB/2023/142

Antagonistic behavior of Trichoderma spp. boost the yield of rice against *Pyricularia oryzae*

Manish Kumar* and Nitesh Singh
Faculty of Agricultural Sciences, SGT University, Gurugram (Haryana)–122505

Rice (*Oryza sativa* L.) is one of the most important cereal crops belonging to the family Poaceae. It is the staple diet of about half of the world's population. The demand for rice is expected to increase further in view of expected increase in the population. Globally, it stands first in rice area and second in rice production after China. Rice is India's pre-eminent crop, and is the staple food of the people of the eastern and southern parts of the country. Blast is characteristically a leaf disease, also infect panicle and neck. Stubble that remains in soil is best source of pathogen. *Pyricularia oryzae* can attack the rice plant at any growth stage and can cause severe leaf necrosis and impede grain filling, resulting in decreased grain number and weight. *P. oryzae* damage aerial part of a rice plant, although most commonly affected parts are the leaves and panicles. When the blast node is attacked, it causes partial to complete sterility. It reduces the photosynthetic area of the plant, and panicle infection reduces the yield. Among used bioagents the minimum disease severity percent was recorded with *T. harzianum* 36.46% as compared to treated control. The second best treatment was *T. viride* (38.72%) followed by *T. hamatum* (46.24%), *T. virens* (47.52%), *T. longibrachiatum* (47.00%) respectively. The severity was found to be decreasing, while yield increased by 36- 49% compared to the treated control. *Trichoderma* spp. cause degradation of the host wall by producing lytic enzymes like chitinase, glucanases and 1, 3 β-glucosidase. The disease suppression by *Trichoderma* spp. may result from the competition between the pathogen and BCA for nutrients and space. The use of bioagents increased crop yield and growth while reducing chemical load on the environment.

Keywords: *Pyricularia oryzae, panicle, leaves, bioagents, severity, yield, Trichoderma spp*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/143

Evaluation of different IPM modules for management of major insect pests in Bell pepper, *Capsicum annuum* L.

Zahid Abass Wazir[*1], Uma Shankar[2] and Amit Kumar Singh[3]
[*1]Ph.D. Research Scholar, Division of Entomology, SKUAST, Jammu
[2]Professor, Division of Entomology, SKUAST, Jammu
[3]Professor, Division of Entomology, SKUAST, Jammu

Five different pest management modules were evaluated and further the cost benefit ratio was computed. Among these modules namely, Biointensive module (M1), Integrated pest management module(M2), Chemical module (M3), Package of practice(M4) and Control (M5), all were found significantly superior over the control in terms of insect pest management. However, Integrated pest management module (M2) which included seedling dip with Imidacloprid 17.8% SL@ 1 ml/ l of water, pheromone traps @ 20/ha, Bird perches @20/ha, Planting on a row of marigold as a trap crop(40 days old), spraying of NSKE @1500 ml/ha at 35 DAT, Ha NPV @ 250 LE/ha and spraying of Chlortraniliprole @ 0.5 ml/l at 55 was most effective in controlling the *Helicoverpa armigera* (3.06 larvae/plant) and showed least percent damage in bell pepper fruit on number basis (17.98%) and on weight basis (12.80%). The maximum fruit yield (17.99 t/ha) were obtained in Module 2 with highest cost -benefit ratio (1: 3.11) for the whole cropping period.

Keywords: *Bell pepper, Helicoverpa armigera, Pheromone traps, Marigold, IPM.*

IAAHAS/AB/2023/144

Efficacy of Different Herbicides for Weed Control in Soybean (*Glycine max* L.)

Swati A. Borje, Nihal S. Titirmare and Prasad B. Margal
Department of Agronomy, Post Graduate Institute,
Mahatma Phule Krishi Vidyapeeth, Rahuri- 413722, Maharashtra, India

A field investigation entitled "Efficacy of different herbicides for weed control in soybean (Glycine max L.)" was conducted in Kharif season of 2021-2022 at Mahatma Phule Krishi Vidyapeeth, Rahuri. The experiment consists of nine treatments viz., T_1 : Pendimethalin 30 % EC @ 1000 g ha^{-1} (PE), T_2 : Pendimethalin 30 % EC @ 1000 g ha^{-1} (PE) + 1 hoeing at 20 DAS, T_3 : Imazethapyr 10 % SL @ 100 g ha^{-1} at 20 DAS, T_4 : Propaquizafop 2.5 % + Imazethapyr 3.75 % w/w ME @ 50 + 75 g ha^{-1} at 20 DAS, T_5 : Diclosulam 84 % WDG @ 25 g ha^{-1} (PE), T_6 : Diclosulam 84 % WDG @ 25 g ha^{-1} (PE) + 1 hoeing at 20 DAS, T_7 : Imazethapyr 35 % + Imazamox 35 % WG 70 g ha^{-1} + MSO Adjuvant @ 2 ml/l of water at 20 DAS, T_8 : Weed free and T_9 : Weedy Check. The results revealed that, all the weed management treatments recorded significantly lower weed population, dry weight compared to weedy check. The lowest weed population (0.00 m^{-2}), weed dry weight (0.00 g m^{-2}) and weed index, while the highest weed control efficiency (100%) was obtained from weed free treatment, which was followed by and at par with application of diclosulam 84 % WDG @ 25 g ha-$^{-1}$ (PE) + 1 hoeing at 20 DAS and pendimethalin 30 % EC @ 1000g ha^{-1} (PE) + 1 hoeing at 20 DAS. The results showed that growth attributing characters viz., plant height (96.93 cm), plant spread (89.34 cm), number of branches (13.67), number of functional leaves (69.73), leaf area (44.21 dm^{-2}), leaf area index (19.65) and dry matter (41.25 g) were recorded significantly maximum in weed free treatment as compared to other treatments at 90 DAS. Among the herbicidal treatments application of diclosulam84 % WDG @ 25 g ha^{-1} (PE) + 1 hoeing at 20 DAS and pendimethalin 30 % EC @ 1000g ha^{-1} (PE) + 1 hoeing at 20 DAS were found at par with weed free treatment in respect of growth parameters. As regards yield attributing characters *viz*., number of pods $plant^{-1}$ (50.97), grains yield $plant^{-1}$ (14.45 g) and straw yield $plant^{-1}$ (20.56 g) were recorded significantly the highest under weed free treatment. It was followed by and at par with application of diclosulam 84 % WDG @ 25 g ha^{-1} (PE) + 1 hoeing at 20 DAS and pendimethalin 30 % EC @ 1000 g ha^{-1} (PE) + 1 hoeing at 20 DAS. Significantly

higher seed yield (2926 kg ha^{-1}), straw yield (3898 kg ha^{-1}), biological yield (6825 kg ha^{-1}) were recorded under treatment weed free than other treatments except application of diclosulam 84 % WDG @ 25 g ha^{-1} (PE) + 1 hoeing at 20 DAS which recorded seed yield (2860 kg ha^{-1}), straw yield (3820 kg ha^{-1}) and biological yield (6680 kg ha^{-1}) and pendimethalin 30 % EC @ 1000 g ha^{-1} (PE) + 1 hoeing at 20 DAS which recorded seed yield (2833 kg ha^{-1}), straw yield (3786 kg ha^{-1}) and biological yield (6619 kg ha^{-1}). While, weedy check documented the lowest figures of all growth and yield attributing characters and yield of soybean.

IAAHAS/AB/2023/145

Estimation of avoidable yield loss due to bollworms in desi cotton

Manisha*, Krishna Rolania and Dalip Kumar
Department of Entomology, College of Agriculture,
Chaudhary Charan Singh Haryana Agriculture University, Hisar 125004

Avoidable yield losses due to damage done by pink and spotted bollworms was studied on desi cotton variety HD 432 at CCS HAU Hisar. The experiment was laid out under two conditions *i.e.* protected (with insecticidal spray) and unprotected (without insecticidal spray) using randomised block design with three replication. Under protected condition alternate application of quinalphos 25EC@ 2000 ml/ha and spinosad 45EC @ 187 ml/ha were done to control the bollworms. Total seed cotton yield obtained in protected (10.50 and 9.54q/ha) and unprotected plots (7.08 and 6.59q/ha) were found significantly different during 2018 and 2019, respectively. Avoidable yield loss was recorded 32.52 and 30.91 per cent during *kharif* 2018 and 2019, respectively. Analysis of data clearly showed significant minimum green fruiting bodies damage under protected condition (2.58 and 3.20%) due to spotted bollworm. Similarly, pink bollworm damage in green bolls was significantly lower (0.67 and 1.33%) during both seasons 2018 and 2019, respectively in protected condition.

Keywords: *Cotton, spotted bollworm, pink bollworm, protected and unprotected condition, yield, per cent damage.*

The Use of Mycorrhizae to Enhance Phosphorus Uptake: A Way Out the Phosphorus Crisis

Sushanta Sarkar
Technical Officer, GKMS Project, Bihar Agricultural College, Sabour,
Bhagalpur 813210, Bihar, India

Phosphorus (P) is a major limiting nutrient for crop growth. Phosphorus is not a rare element on Earth, but it is often found in low concentrations because of its unique property to become less available to crops with slow diffusion and high fixation. Thus, the crop growth and the yield are likely to suffer adversely unless soil is endowed with adequate supply of plant available P, or else the soil receives readily available inorganic phosphatic fertilizers from outside. Phosphatic fertilizers are processed from phosphate rock, which is non-renewable natural resource. Therefore, the world could face a resource scarcity crisis that might affect global food security very soon. In order to overcome the phosphate crisis, it is critical that we adopt a holistic and comprehensive vision to the management of the phosphorus cycle, and that we integrate all the potential solutions. Arbuscular mycorrhizal fungi, which form a symbiosis with the roots of nearly all vascular plants, could play a key role in solving the phosphate shortage problem. Mycorrhizae are mutualistic symbiotic associations based on bidirectional nutrient transfer between soil fungi and the roots of vascular plants. The plant supplies the fungi with sugars produced by photosynthesis, while the hyphae network improves the capacity of plant to absorb water and nutrients from the soil. Arbuscular mycorrhizae (AM), also called endomycorrhizae, are the most common and widespread types of mycorrhizae. AM fungi form symbiosis with the roots of approximately 80% of vascular plant species, including many important crop species such as maize, wheat, rice, potato etc. By improving the efficiency of nutrients uptake, and also by increasing plant resistance to pathogens and abiotic stresses, mycorrhizal symbiosis can enhance plant growth and therefore reduce the need for Phosphate-based fertilizers.

Keywords: *Phosphorus, rock phosphate, arbuscular mycorrhizal fungi, symbiosis, biofertilizer, sustainable agriculture.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/147

Status of disease incidence and frequency of occurrence of rice root-knot, *Meloidogyne graminicola* in Uttar Pradesh

Mohd Shahid Anwar Ansari* and Mujeebur Rahman Khan
Department of Plant Protection, Faculty of Agricultural Sciences, Aligarh Muslim University, Aligarh, India

The present survey was conducted to assess the disease incidence and frequency of occurrence of rice root-knot nematode, *Meloidogyne graminicola,* in rice or paddy fields in Aligarh and Hathras districts of western Uttar Pradesh. The nematode has become a severe pest of rice (both basmati and non-basmati) for the last 2-3 decades in irrigated rice in U.P. because of intensive cultivation in the region under irrigated conditions. The nematode causes severe damage to rice in the nursery as well as the main field. The impact of *M. graminicola* on rice yield has been well established, and its attack may lead to up to 20 to 90% yield loss. More than 200 paddy fields from nine tehsils of two districts, *viz*., Aligarh and Hathras, were surveyed, where *M. graminicola* was associated with root-knot disease in paddy fields based on the symptomatology and morphological characteristics of juveniles and adults. The highest frequency of occurrence and disease incidence of rice root-knot was recorded in the tehsils of Aligarh district at the nursery (23 and 37%), vegetative (46 and 54%), and reproductive stage (48 and 58%, respectively) as compared to Hathras district. However, the disease severity in the term of root-gall index and egg mass index was recorded highest in the tehsil of Aligarh district (2.6 &1.8), (3.2 & 2.2) and (4.7 & 3.8, respectively) at the nursery, vegetative, and reproductive stage in paddy field followed by tehsils of the district Hathras. The soil population of rice root-knot nematode was also recorded highest in all tehsils of Aligarh district at the nursery (3180 J_2/kg soil), vegetative (3740 J_2/kg soil), and reproductive stage (3580 J_2/kg soil) in paddy fields and the minimum was found in the tehsils of Hathras district. The relative yield loss was recorded in Aligarh (26%) with a range of 10-40% among the tehsils in the district, followed by Hathras. The present study shows that the disease occurrence and incidence of rice root-knot was severe in Aligarh compared to the Hathras district. It is an indication of future threats to rice in this area.

Keywords*: Rice, survey, Meloidogyne graminicola, gall index, yield loss*

IAAHAS/AB/2023/148

Application of zeolite for management of purple blotch through development of disease resistance and quality yield of *kharif* Onion (*Allium cepa* L.)

R. B. Sonawane[1]*, R. M. Birade[2] and H. M. Patil[3]
[1]Asstt Prof., [2]Officer Incharge, Onion Grape Research Station,
Pimpalgaon Baswant Nashik (M.S.)
[3]Associate Director of Research, Zonal Agril.
Research Station, Igatpuri, Nashik (M.S.)

Onion (*Allium cepa* L.) is an important vegetable crop grown in Western Maharashtra. The application of different Zeolite doses was evaluated to manage purple blotch of onion through development of disease resistance and quality yield of kharif onion variety Baswant-780 during *Kharif*-2018, *Kharif*-2019, *Kharif*-2020 &*Kharif* -2021at Onion & Grape Research Station, Pimpalgaon Baswant, Nashik district in Maharashtra State. The application of different zeolite dose recorded significantly lower disease intensity of purple blotch of onion as compared to absolute control. The results indicated that 4 sprays of tebuconazole 25.9% EC @ 1 ml/l with RDF treatment recorded the minimum Per cent disease index (PDI) of purple blotch (17.69 %) which was at par with treatment i.e. Zeolite 500 kg/ha with RDF (21.88%). The application of zeolite @ 0 kg/ha without RDF i.e. absolute control recorded the maximum per cent disease index (43.49 %) than rest of the treatments. The 4 sprays of tebuconazole 25.9% EC @ 1.0 ml/l with RDF treatment recorded maximum onion yield (129.46 q/ha) which was significantly superior than all treatments of zeolite application. The application of Zeolite @ 0 kg/ha without RDF recorded lowest onion yield (84.39 q/ha) than rest of the treatments. Application of Zeolite @ 500 kg/ha along with RDF (100 kg N: 50 kg P_2O_5: 50 kg K_20)/ha at the time of transplanting is recommended for development of resistance against purple blotch and higher yield of kharif onion.

Most efficient bio-control agents against Banana wilt (*Fusarium oxysporum*) under pot conditions

B. I. Aagja[1], S. K. Chawda[2] and H. V. Patel[3]
[1]PG Student, Department of Plant Pathology, N. M. College of Agriculture,
[2]Director of Extension Education,
[3]ASPEE Shakilam Biotechnology Institute,
Navsari Agricultural University, Surat, Gujarat, India

Banana (*Musa* spp.) is one of the most important fruit crops in international trade and is commonly cultivated in all the tropical and sub-tropical regions of the world. Banana suffers from several diseases, the most famous being Fusarium wilt, which is regarded as one of the most significant threats to banana production worldwide. The pathogen is soil-borne invading the roots and obstructing the water and nutrient flow through vascular colonization. Consequently, leaves turn yellow with the oldest ones succumbing first. The plants eventually wilt and collapse, thus causing serious crop losses. The unilateral use of fungicides at present adversely affects many non-target organisms in the soil. Moreover, injudicious use of pesticides results in continuous exposure of pathogen may allow the pathogen to develop resistant strains. Thus, the development of alternative control measures that provide a more effective and environment friendly protection of crop from Fusarium wilt disease is very necessary. The pot culture experiment was conducted to assess the efficacy of most efficient bio control agent, which we get in dual culture method. The biocontrol agent was applied by root dipping for 15 minutes + soil application. *T. viride* (NAU) isolate provide maximum inhibition in dual culture methods so this biocontrol agent used in pot experiment. Among the various treatments of biocontrol agents, application of *T. viride* @ 125 gm per plant showed minimum (4.75 %) wilt incidence followed by 100 gm/plant (11.75 %), 75 gm/plant (19.50 %), 50 gm /plant (30.50 %) and 25 gm/plant (39.50 %) in combinations with root dipping for 15 minutes.

A total of seven treatments for each experiment was used for the study treatments consisting of soil application of biocontrol agents at 25, 50, 75, 100 and 125 g/plant in combination with root dip treatment for 15 minutes and in

one treatment carbendazim (0.2 %) fungicide was also applied by soil drenching method. Among the various treatments of biocontrol agents, application of *T. viride* @ 125 gm per plant (T_5) showed minimum (4.75 %) wilt incidence followed by 100 gm/plant (T_4) (11.75 %), 75 gm/plant (T_3) (19.50 %), 50 gm /plant (T_2) (30.50 %) and 25 gm/plant (T_1) (39.50 %) in combinations with root dipping for 15 minutes. The maximum wilt incidence was found in (T_1) (39.50 %).

IAAHAS/AB/2023/150

Pokkali and Kaipad traditional rice cultivation systems in Kerala: A boon to food security in the scenario of climate change

Asha Elizabeth Jose[1] and Dr. V.S. Tekale[2]
[1]Ph.D. Scholar, Dept. of Extension Education,
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola
[2]Dean, College of Agriculture, Mul., Chandrapur (dist.),
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola

Rice constitutes the principal crop of Kerala state. While low per capita land availability has led to increasing land use intensification in Kerala, abandoned farmlands are also increasing, which is paradoxical. The net result is a major decline in area and production of rice in Kerala, which has made serious inroads into the state's food production capacity. Thus, there is a requirement to study the potentiality of traditional rice cultivation systems in Kerala. Pokkali rice cultivation is a unique system of farming that has evolved through ages by the farmers of Central Kerala. This system works with the help of monsoon and sea tides. June to early November is rice cultivation period when salinity is less in the field and prawn cultivation from mid-November to mid-April in the same field. During this period, the prawn seedlings swim in from the backwaters after paddy harvest, and the residues of the paddy become feast for them. Kaipad is a unique coastal wetland rice production tract which is saline prone and naturally organic production tract of North Kerala.

Kaipad ecosystem is featured with rich biodiversity of flora and fauna, organically rich soil, mangroves, and migratory birds. The Pokkali tract of south Kerala is said to be synonymous to Kaipad tract of North Kerala. But soils of Kaipad slightly differ from that of Pokkali. Traditional rice cultivars and cultivation are on the decline in most rice-growing areas, mainly as a result of their low productivity. Today these paddy fields are under serious anthropogenic threat. If these fertile areas are utilized properly for paddy cultivation, the problem of rice shortage of the state can be solved to certain extend.

Keywords: *Pokkali, Kaipad, Food Security, Climate Change.*

IAAHAS/AB/2023/151

Studies on post-harvest changes in red and white Dragon fruit (*Hylocereus polyrhizus & Hylocereus undatus*

[1]Tanpure Pratik Sambhaji, [1]Vishal Johar*, [2]Vanita N. Salunkhe and [1]Deepak Thorat

[1]Department of Horticulture, School of Agriculture,
Lovely Professional University, Phagwara (Punjab) – 144111
[2]School of Soil Stress Management, ICAR-National Institute of Abiotic Stress Management, Baramati (Maharashtra) – 413115

The present study was carried was carried out at research area of ICAR-NIASM Baramati, to evaluate the effect of different temperature for enhancing the shelf life of red and white dragon fruit. The experiment was laid in a CRD design with four different replication and temperature condition on different physical and biochemical parameter namely fruit length, width, weight, decay loss, PLW, PLL, PLW, TSS, Phenol, Flavonoids, Ascorbic acid, Antioxidant, Total sugar, Reducing Sugar, Non-reducing sugar etc. were evaluated to determine the suitable temperature condition for storage of dragon fruit. It was observed that red coloured dragon fruit had superior shelf life as compare to white dragon fruit. When kept at different temperature condition, significantly higher PLW (13.38, 30.47) were observed in red dragon

fruit as compare to white dragon fruit. The results further, revealed that white dragon fruit having superior physical properties and red dragon fruit having higher biochemical properties such as physiological loss in length (9.59, 10.47), physiological loss in width (7.17, 8.05), decay loss (15.75, 35.75), TSS (10.69, 11.29), ascorbic acid (9.07, 9.63), total sugar (8.46, 8.92), reducing sugar (4.58, 4.67), non- reducing sugar (4.33, 3.78), Phenol (1.76, 2.96) etc. for red and white dragon fruit, respectively.

Keywords: *Dragon fruit, Shelf life, post-harvest and temperature*

IAAHAS/AB/2023/152

A Perspective on the Role of PrecisionAgriculture in Agriculture Sustainability and its Future Perspective

Preet Kaur* and Rohit Dhariwal
College of Agriculture
Chaudhary Charan Singh Haryana Agricultural University,
Hisar (125004), Haryana, India

"Precision agriculture" refers to the monitoring and control of applied agriculture, which includes site-specific input application, crop monitoring, timing of operations, the estimation of an accurate crop yield while avoiding harmful practises to a crop and using fewer inputs. Geographical information systems (GIS), geographic positioning systems (GPS), remote sensing, nutrient expert systems, SSNM (Site Specific Nutrient Management), bio-intensive farming, real-time nitrogen management, soil testing, yield monitoring and other such systemsare the main techniques used in precision agriculture. Based on these farmers receives information over all the major issues such as weather forecasts, climate changes, crop yield. However, meagre and fragmented land holding, seasonal production, climatic variations, declining productivity, high cost, reduction in farm incomes are few summonses in precision farming but few newly emerged technologies can increase agriculture productivity and profitability by making the best use of limited resources. There is a great room for increasing agricultural productivity

through precision farming system as the few steps such as Digital Agriculture Mission, AI sensors for smart farming, drones to examine crop have been taken. Better preparation of the roadmap in this sphere would be beneficial to enhance farmer's incomewith ability to produce enough food to hold up the rising population, maintaining soil health and for resource conservation thus help in achieving sustainability by increasing theefficiency of fertilizer, water, other agrochemicals and fuel usage.

IAAHAS/AB/2023/153

RNA interference-based management of insect pest: A novel technique for insect pest management

[1]Hamendra Singh, [2]Udayan Mukherjee and [3]Vijay Kumar
Department of Entomology, Post Graduate College of Agriculture,
Dr. Rajendra Prasad Central Agriculture University, Pusa, Samastipur (848125)

RNA interference (RNAi), a natural biological process in which small RNA molecules inhibit gene expression or translation, typically by binding to and targeting specific messenger RNA (mRNA) molecules for degradation or blocking their translation into protein. It has emerged as a promising tool in insect pest management, offering a targeted and environment friendly approach for controlling pests. RNAi-based insect pest management involves delivering dsRNA molecules through non-transformative techniques including microinjection, spraying, feeding targets specific genes in the pests, leading to reduced growth, development, and reproduction of insect pests. RNAi works by triggering a specific gene-silencing mechanism in the target organism, which leads to the reduction of the expression of a specific gene or a set of genes. In the context of insect pest management, RNAi technology involves designing and delivering double-stranded RNA (dsRNA) molecules that target specific genes in the insect pest. For effective RNAi in insects, the dsRNA has to function inside the cells, for that it includes two types of mechanisms to enter into the insect cells, first host induced gene silencing while, the other is spray induced gene silencing. RNAi gene silencing could be achieved by both double and single stranded RNA whereas, double stranded RNA proved to be more

outstanding in comparison to single stranded RNA. One example of the use of RNAi in insect pest management is in controlling the Western corn rootworm (WCR), a major pest of maize crops. Researchers have identified specific genes in WCR that are essential for its survival and development, such as those involved in digestion and moulting. By designing dsRNA molecules targeting these genes, researchers have been able to effectively silence them and reduce the survival, development and reproduction of WCR. It has also been used to control other insect pests, such as the Colorado potato beetle, the diamondback moth and the cotton bollworm. In addition, RNAi-based pesticides have been developed and tested in the field, showing promising results in reducing pest populations while having minimal effects on non-target organisms and the environment. While RNAi technology offers many advantages for insect pest management, there are also challenges to its effective use, such as the need for efficient delivery methods, the potential for off-target effects and the potential for pests to develop resistance. However, ongoing research and development of RNAi-based strategies are expected to overcome these challenges and improve the effectiveness of RNAi in insect pest management. In conclusion, RNAi technology has the potential to revolutionize insect pest management, providing a sustainable and targeted approach for controlling pests. As research and development efforts continue, we can expect to see more effective and environmental friendly RNAi-based strategies for controlling insect pests in the future.

Keywords: *RNA interference, Pest management, Sustainable management.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/154

Evaluation of onion genotypes for dehydration suitability and functional quality

Sajeel Ahamad*, Ganesh Kumar Choupdar, Vivek Saurabh, Nirmal Kumar Meena
Division of Food Science and Postharvest Technology, ICAR-Indian Agricultural Research Institute, New Delhi 110012, India

Onion is a widely consumed commodity worldwide but the availability of suitable genotypes for dehydration purpose is very less. In this study the eight genotypes of onion namely, Pusa Shobha, Pusa Sona, Pusa Riddhi, ORVA 19-03, ORVA 19-05, ORVA 19-07, ORVA 19-14, ORVA 19-16 was evaluated for their physico-chemical constituents' variation and their dehydration suitability. On the basis of physico-chemical constituent variations and dehydration characteristics of the genotype Pusa Shobha was found more suitable for dehydration as it retains more pungency, total phenols, antioxidant activity and high dry matter content and dehydration ratio and less browning. With regards the treatments and drying temperature the maximum retention of ascorbic acid, antioxidant activity, total phenols, pungency, better rehydration ratio and low non enzymatic browning was found in NaCl 5% and 60°C respectively. Packaging and storage temperature, the onion slices packed in 200 g HDPE pouches and stored at low temperature retain better nutritional qualities in respect of ascorbic acid, pungency, total phenol, antioxidant activity, rehydration ratio and sensory score and less moisture content and NEB during storage as compare to slices packed in 200 g LDPE stored at ambient conditions up to 4 months. Dehydration of onion reduces its weight and volume to a safe level without destroying its colour, flavour and nutritive value and therefore decreases its transportation and storage costs and could be one of the feasible methods for preservation of surplus produce for us and minimizing the fluctuation in the market price.

Key words: *Dehydration, Genotypes, Pungency, Physico-chemical and Packaging*

Forestry interventions for climate change

Piyush Saini
SGT University, Gurugram, Haryana

Forestry interventions for climate change refer to a range of practices and strategies that are aimed at mitigating the impact of climate change by reducing greenhouse gas emissions and increasing carbon sequestration in forests. These interventions play a critical role in the global effort to combat climate change, as forests are one of the most effective natural solutions for carbon sequestration.Forestry interventions for climate change involve a variety of practices such as afforestation, reforestation, sustainable forest management, forest conservation, and restoration. These practices aim to increase forest cover, enhance the quality of existing forests, and promote sustainable forest management practices that help reduce greenhouse gas emissions and increase carbon sequestration.

Afforestation refers to the process of planting trees in areas that were previously devoid of forest cover. This practice helps to create new carbon sinks, thereby reducing the amount of carbon dioxide in the atmosphere. Reforestation, on the other hand, involves the replanting of trees in areas that were previously forested but have been degraded or deforested. This practice helps to restore degraded ecosystems and enhance the capacity of forests to absorb carbon dioxide.Sustainable forest management involves the use of sustainable harvesting practices that help maintain the health and productivity of forests while minimizing negative impacts on the environment. This approach helps to reduce the amount of carbon dioxide released through unsustainable harvesting practices while maintaining the capacity of forests to sequester carbon.

The benefits of forestry interventions for climate change are numerous. Apart from their critical role in reducing greenhouse gas emissions and increasing carbon sequestration, these interventions also provide a range of social, economic, and environmental benefits. For instance, they provide habitats for wildlife, support biodiversity conservation, improve soil quality, enhance water conservation, and provide livelihoods for forest-dependent communities.In conclusion, forestry interventions for climate change are essential in the global effort to combat climate change. These interventions provide an effective and sustainable solution for reducing greenhouse gas

emissions and enhancing carbon sequestration, while also providing a range of social, economic, and environmental benefits. As such, there is a need for increased investment and support for these interventions to ensure their widespread adoption and implementation.

Keywords: *Climate change, forestry, Afforestation, greenhouse.*

IAAHAS/AB/2023/156

Role of biotechnology in maintaining soil and environment health

Karar S, Pal S, Chatterjee A, Pal S, Ray DD, Saha A K*
Surya Sekhar Karar, UG student, School of Agriculture,
Anirban Chatterjee, UG student, School of Agriculture,
Seacom Skills University, Kendradangal, WB-731236
Sneha Pal, UG student, School of Agriculture,
Debarpita Dutta Ray, Assistant professor, School of Agriculture,
Seacom Skills University, Kendradangal, WB-731236
*Arup Kumar Saha, Assistant professor, School of Agriculture,
Seacom Skills University, Kendradangal, WB-731236

Biotechnology has the potential to revolutionize agriculture and help address the global challenges of food security and climate change. One area where biotechnology can have a significant impact is soil health and environmental services. Biotechnology has already contributed to significant improvements in crop yields and quality. For example, biotechnology has enabled the development of genetically modified crops that are more resistant to pests and diseases, which has reduced the need for harmful pesticides and herbicides. In addition to crop improvements, biotechnology has the potential to improve soil health through the use of microbial-based products. These products can enhance nutrient availability and uptake, promote plant growth, and improve soil structure and stability. Microbial inoculants can increase the availability of nitrogen, phosphorus, and other essential nutrients in the soil, reducing the need for synthetic fertilizers. Biotechnology can also be used to develop biopesticides, which are derived from naturally occurring microorganisms, to control pests and diseases. However, there are also concerns about the potential risks associated with biotechnology, particularly

with genetically modified organisms (GMOs). Therefore, it is important to carefully assess the benefits and risks of biotechnology and to ensure that it is used in a responsible and sustainable manner. Another potential application of biotechnology is in the development of precision agriculture. Precision agriculture involves the use of technologies such as remote sensing, GPS mapping, and data analytics to optimize crop production and reduce inputs. Biotechnology can play a role in precision agriculture by providing insights into soil health, crop genetics, and pest and disease management. Biotechnology can be used to develop sensors that can measure soil moisture, temperature, and nutrient levels, providing farmers with real-time data to make more informed decisions about irrigation and fertilizer application. Biotechnology can also be used to develop crops that are more efficient at sequestering carbon from the atmosphere, reducing greenhouse gas emissions. In conclusion, biotechnology has the potential to enhance soil health and improve environmental services for sustainable agriculture. However, it is important to carefully assess the benefits and risks of biotechnology and to ensure that it is used in a responsible and sustainable manner.

IAAHAS/AB/2023/157

Isolation & Identification of Pathogenic Microorganisms in Shared Cosmetic Products, Delhi & Gurugram Region

Gyan Vandana Yadav[1], Dr. Sandhya Khunger[2]
Department of Allied Health Sciences, SGT University, Gurugram

Cosmetics are items that are used to enhance the appearance of skin complexion. Common cosmetics include lipstick, foundation, eyeliner, contour, skin primer, blushes, and other similar items. Cosmetics may cause allergies to the human body such as bronchial asthma, allergic rhinitis, allergic dermatitis, allergic conjunctivitis (eye inflammation), and anaphylaxis. Cosmetic allergies are becoming more common, owing to the preservatives and perfumes utilized in the goods. Microbial agents' viz. bacteria (Staphylococcus, Escherichia, Bacillus, Pseudomonas, etc.), molds, and yeasts are also associated with

cosmetics resulting in allergic contact dermatitis (ACD). Patches and skin prick tests were used to quickly identify allergies, use of plant based cosmetics are also highly recommended by the dermatologists, as plant based cosmetics have a tendency to protect the skin layer as compare to chemical based cosmetics. Once particular allergies have been discovered, patients should be educated about which drugs may be taken safely in the future. Bacterial contamination of lipsticks, foundation, blush, and mascara could become a major issue in the microbiology laboratory. The purpose of this study was to identify the different types of bacterial contamination in lipsticks, blush, foundation, and mascara. The study included 48 swab samples of foundation, lipstick, blush, and mascara from Delhi and Gurugram beauty shops (shared products). Swab samples were collected under sterile conditions and cultured on enriched Blood agar, whereas fungi identification samples were cultured on Sabouraud dextrose agar. The identification of isolated bacteria was confirmed using culture media, Gram staining, biochemical tests, and a Vitek 2GP card for species-level identification. Staphylococcus hominis was perhaps the most common bacterial isolate, followed by Staphylococcus epidermidis and Bacillus cereus, Pseudomonas aeruginosa, Streptococcus pyogenes, and Bacillus subtilis were found. Lipsticks, foundations, and blushes were more contaminated with Gram-positive and Gram-negative bacteria than the standard limit; however, mascara has less contamination than lipstick, foundation, and blush; these contaminated accessories lead to the spread of pathogenic bacteria, which can cause a variety of diseases in humans.

IAAHAS/AB/2023/158

Southern Rice Black-Streaked Dwarf Virus - An emerging threat to rice cultivation

Garima, N.K. Yadav, V.K. Malik, Deepak Kumari and Niharika Sheoran
Department of Plant Pathology, CCS Haryana Agricultural University, Hisar, Haryana

India is the second largest producer and the first largest exporter of rice globally. North India particularly, Indo Gangetic plains is known for growing rice and is India's major basmati producing pocket. Several biotic stresses affect rice cultivation in India among which Southern rice black-streaked dwarf virus (SRBSDV) is an emerging threat which has been reported in 2022 for the first time from different parts of Haryana and Punjab. The

disease has been threatening since last decade in rice-growing areas of northern Vietnam, southern Japan and southern, central and eastern China as the first report of black-streaked dwarf disease was in 2001 from a Chinese rice field in Guangdong, SRBSDV was only shown to be a novel fijivirus in 2008. Symptoms of SRBSDV infections include severe stunting, darkening of leaves and white waxy or black-streaked swellings along stem veins that has been reported to cause 20% reduction in rice yield losses till now in India which can reach upto 50%. The virus is transmitted by the white-backed planthopper, *Sogatella furcifera*, but is not seed transmissible. It not only infects rice but also a number of other graminaceous plants, such as sorghum and maize. The late sown crop (sown after the second week of July) has been reported to suffer less than the early sown (sown in second fortnight of June). Plants infected after the initiation of internode elongation stage do not exhibit detectable stunting symptoms. If the virus is not managed, it is likely to spread to other rice-growing areas. The use of non-target chemical pesticides by local farmers to manage outbreaks increases the resistance of rice planthoppers to the pesticides, which can lead to frequent outbreaks of the disease. Thus, the long-term effective management of SRBSDV disease and its vector, the rice planthopper is a top priority.

IAAHAS/AB/2023/159

In-vitro effectiveness of *Trichoderma* spp. against *Meloidogyne graminicola* and plant growth in rice under pot condition

Mohammad Haniph Shah and Mujeebur Rahman Khan
Department of Plant Protection, Faculty of Agricultural Sciences, Aligarh Muslim University Aligarh, India, 202002.

A detailed study was undertaken to evaluate *In-vitro* effectiveness against *M. graminicola* in the rice cultivar Samba Masuri. Indigenous strains of *Trichodermaharzianum,T. hamatum, T. koningii, T. viride,* and *T. virens* were isolated from rice fields in and around Aligarh, and their effectiveness through seed treatment, root-dip treatment and soil application was evaluated. *T. harzianum* Isolate-3 (I-3) was found highly effective against the nematode with

maximum reduction in galling (79.09%) and egg masses (74.44%) in soil application. At the same time, *T. koningii* I-1&2 was found least effective with minimum reduction in galling (48.33%) and egg masses (30.78%) in seed treatment. *T. harzianum* I-3 was also found effective in increasing plant growth of the infested plant (shoot length 25.83%, root length 29.95-%, fresh and dry weight of shoot 67.73 and 34.61%, respectively) in seed treatment. *T. koningii* I-1&2 was found less effective in increasing plant growth. In root-dip treatment, *T. harzianum* (I-3) was found less effective than seed treatment in increasing plant growth and reducing disease severity. In soil application, *T. harzianum* (I-3) was also found effective in increasing shoot length (34.77%), root length (75.79%), fresh and dry weight of shoot (79.93 and 67.58%). Overall, soil application of *T. harzianum* I-3 was highly effective in suppressing disease and increasing the plant growth of rice.

Keywords*: Trichoderma, Rice, Meloidogyne graminicla, In-vitro.*

IAAHAS/AB/2023/160

In Vitro Efficacy of bio agents and fungicides against leaf blight of chilli caused by *Alternaria alternata*

Amit Mandlik*, Meenakshi Rana
Department of Plant Pathology,
Lovely Professional University , Phagwara -144411(Punjab)

Chilli is a very important vegetable crop *(Capsicum annumL.)* belong to family Solanaceae. Chilli suffers from many pathogens consisting of fungi, bacteria, virus and nematodes. The most fungal disease, which severely damage the chilli under favourable condition are leaf blight of chilli caused by *Alternaria alternata*. leaf blight of chilli is an important disease affecting chilli production. Therefore, present study bio agent and fungicide were evaluated in laboratory condition to know their efficacy against *Alternaria alternata*. A in vitro experiment was conducted to evaluate eight fungicide and four bioagents against *Alternaria alternata*. Among bio agent tested, *Trichoderma viride* was found more effective over other bio- control agent in inhibiting the mycelial growth (70.10 per cent) of *Alternaria alternata* followed by *Trichoderma*

harzianum (67.90 per cent) and *Bacillus subtilis* inhibit mycelial growth at level of (54.90 per cent) . least mycelial inhibition (43.30 per cent) of test bacteria *Pseudomonas fluorescens*. Among eight fungicides tested, Mancozeb (75.46 percent) was the most efficient fungicide in reducing *Alternaria alternata* mycelial growth, followed by copper-oxychloride (71.95 percent) and captafol (50 percent) (65.20 percent). The fungus' mycelial growth was inhibited the least by propiconazole, followed by chlorothalonil and captan. Mancozeb at 1000 ppm inhibited growth the most (100.00%), followed by copper-oxychloride at1000 ppm (95.20%), and mancozeb at 500ppm (95.20%). (90.50 per cent). Propiconazole showed the least inhibition at 50 ppm (8.42%), followed by captan (15.50%) and chlorothalonil (15.50%). Mancozeb, followed by copper-oxychloride, and carbendazim, fully prevented the growth of *A. alternata spp.*

IAAHAS/AB/2023/161

Comparative Economics of Wheat Cultivation under Sprinkler Irrigation in Southern Haryana

[1]Indu Walia [*], [2]Sanjay Kumar

[1]Ph.D. Scholar, Department of Agricultural Economics, CCS HAU, Hisar

[2]District Extension Specialist (Farm Management), KVK Kaithal

The present study was conducted in the southern Haryana districts (Bhiwani and Rewari), selected on the basis of high rate of adoption of sprinkler irrigation system. For the selection of sample farmers, multistage random sampling technique was used. Blocks named Tosham and Loharu in Bhiwani district and Khol at Rewari, Nahar were selected for sampling. Primary data was taken from a total of 120 wheat farmers from various villages. The profitability of adopter farmers was analyzed using Benefit Cost ratio concept. Information regarding cost and returns of onion crop were gathered from sampled farmers for the year 2021-22 and the net return was worked out accordingly. The total variable cost incurred for cultivation of wheat accounted for ₹45958.36 and ₹45655.04 in Rewari and Bhiwani districts

respectively. Total cost incurred was ₹86136.85 and ₹85178.89 in Rewari and Bhiwani district respectively. Farmers got higher net returns in Rewari district (₹18665.70) as compared to Bhiwani district (₹18547.61). The B:C ratio over total cost in Rewari, Bhiwani and overall were 1.21, 1.22 and 1.21 respectively.

Keywords: *B:C ratio, economic analysis, net returns, sprinkler irrigation, wheat*

IAAHAS/AB/2023/162

Human – Animal Companionship during Covid-19

Dr. Shreyansh Hosure[1*] and Dr. Sushant Handage[2]
[1]Department of Veterinary and Animal Husbandry Extension,
College of Veterinary and Animal, Sciences, Mannuthy, Kerala-680651
[2]Department of Veterinary and Animal Husbandry Extension,
Veterinary College Gadag, Karnataka

The corona virus disease 2019 (COVID-19) pandemic presents an opportunity to explore the role of animals as sources of emotional and physical support during a period when most of the population is experiencing social and environmental challenges. The study was conducted in Bengaluru, Karnataka. The perception of animal owners on human–animal interaction on their physical and mental health during the lockdown was assessed. The result found that interactions with animals during the COVID-19 have some positive and negative impact on animal owners. Positive impacts where it keeps animals owners away from depression and anxiety, boosting their mood, mental well-being, peace of mind, reduction of loneliness, facilitation of social support and encouragement of physical activity. Negative impact was concerns over animals that carrying the COVID-19 causing Virus, animals potential separation-related problems and returning to work after the COVID-19 lockdown, grief and loss of an animal during the COVID-19 lockdown and general animal welfare worries. Thus, to conclude result that there were positive and negative impact of human animal interaction during COVID-19 and most of the respondents has perceived being with an animal has increased their survival rates and helps in improving the mental health and quality of life of persons.

Keywords*: Animal, Companionship, COVID and Human*

IAAHAS/AB/2023/163

Perception and constraints perceived by the livestock farmers dependent on KVK

Dr. Shreyansh Hosure[1*], Dr. Rajeev, T.S.[2] and Dr. Sushant Handage[3]

[1 &2]Department of Veterinary and Animal Husbandry Extension,
College of Veterinary and Animal Sciences, Mannuthy, Kerala-680651

[3] Department of Veterinary and Animal Husbandry Extension,
Veterinary College Gadag, Karnataka

The present study was undertaken to analyse the perception of livestock farmers towards service provided by the Krishi Vigyan Kendras of Kerala State and constraints perceived by them. An expost-facto research design was adopted for the study. A total of 30 veterinarians working in KVK and 30 livestock farmers dependent on KVK from Kerala were selected using simple random sampling method. The result found that majority of the veterinarians perceived on farm trails (50.00%), front line demonstrations (60.00%), capacity development activities (50.00%), data documentation (40.00%), training programme (50.00%) and extension activities (50.00%) as average services provided by them. With respect to farmers perception towards service delivered by KVK, majority of them perceived the services provided by KVK as average and most of them were not satisfied with these services. Regarding perception statements majority of them ranked first for KVK deals more with advisory services than curative services. The major constraints perceived by them were lack of timely availability of services. In the light of findings from the study, it is concluded that there is a lot of scope for improvement of services of KVK in the state through suitable policy interventions.

Keywords: *Farmers, KVK, Perception and Services*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/164

Screening of different *Brassica* species and *Brassica napus* derived recombinant inbred lines (RILs) for black rot resistance

Sikha Manoharan[1]*, Brij Bihari Sharma[2]
[1] Ph.D. Research Scholar, [2] Scientist (Senior scale)
Division of Vegetable Science, ICAR-Indian Agricultural Research Institute,
New Delhi 110012

Black rot disease caused by *Xanthomonas campestris* pv. *campestris* (Pam.) Dowson (*Xcc*) is one of the most devastating and pervasive seed-borne bacterial disease in Vegetable Brassica. The disease is characterised by typical ''V ''shaped chlorotic lesion and darkened veins resulting from the bacterial movement in vascular system. Among the 11 pathogenic races of *Xcc* identified so far, the most detrimental races are *Xcc* 1 and 4. Hence, 123 genotypes (85 recombinant inbred lines, and 38 germplasm comprising 19 *Brassica napus* genotypes, 12 *Brassica rapa* genotypes, three *Brassica carinata* genotypes, two *Brassica oleracea* genotypes and one each of *Brassica macrocarpa* and *Brassica juncea*) were screened against *Xcc* race -1 and 4. Based on the analysis of disease severity of different genotypes, 30 days after the artificial inoculation of *Xcc* cultures, it was observed that among 85 recombinant inbred lines, 32 lines where showing significant resistance to black rot disease. In *Brassica napus* 17 genotypes were recorded as resistant to *Xcc* race-1 and 4. Five genotypes of *Brassica rapa* (EC426401, Shalini, YID-1, IC0623820, and Tobin 1), two genotypes of *Brassica carinata* (NPC-9 and DBC-1), one genotype of *Brassica macrocarpa* (BMR-1) and one genotype of *Brassica juncea* (PVDH-01) also showed resistance to both the races throughout the growing condition. The newly obtained resistant sources could be used in race specific and region specific breeding programme of Vegetable Brassicas for the introgression of genes of resistance for long-term disease control.

Key words: *Brassica, Screening, Disease resistance, Xanthomonas campestris*

IAAHAS/AB/2023/165

Effect of nutrient management practices on growth, yield and economics of rice varieties in coastal lowland ecosystem

Priyanka Das [1*], A.K Barik[1], P. K Roul[2] and Sarthak Pattanayak[2]

[1]Department of Agronomy, Palli Siksha Bhavana (Institute of Agriculture), Visva-Bharati Sriniketan, West Bengal, India, 731204.

[2]Department of Agronomy, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar, Odisha, India, 751003.

A field experiment was conducted at farmer's field of Niali, Cuttack, Odisha during *kharif* 2019-20 and 2020-21 to study the "Effect of nutrient management practices on growth, yield and economics of rice varieties in coastal lowland ecosystem". The field experiment was carried out in split plot design with four rice varieties in main plot (viz. CR 1009 sub-1, CR 1018, Pooja and Upahar) and six nutrient management practices in sub plot (viz. Control, 100% Recommended dose of fertilisers (RDF: 80-40-40 kg N, P_2O_5, K_2O ha^{-1}), 50% RDF from chemical fertilisers + FYM (@ 8t ha^{-1}), 50% RDF from chemical fertilisers + Sesbania green manuring (@ 1.5t ha^{-1}), Rice crop manager (115.5 - 32.7-52.8- 25.0 Kg N, P_2O_5, K_2O, $ZnSO_4$ ha^{-1} + FYM@ 3t ha^{-1}), Real time nitrogen management (RDF + customised leaf colour chart (CLCC)) and each treatment was replicated thrice. Among different rice varieties taken, cv. Upahar recorded highest growth attributes, yield components like panicle length (26.3cm), nos. of filled grain panicle^{-1} (116), test weight (23.7g), grain yield (5.51 t ha^{-1}), straw yield (6.21 t ha^{-1}), gross return (₹ 107719 ha$^{-1)}$, net return (₹ 57311 ha^{-1}) and return per rupee invested (₹2.12). Among different nutrient management practices, nutrient management as per rice crop manager achieved highest growth attributes, yield components like no. of panicle m^{-2} (435), panicle length (26.5 cm), no. of filled grain panicle^{-1} (121), 1000 grain weight (24.2g), grain yield (5.98 t ha^{-1}), straw yield (6. 34 t ha^{-1}) and highest gross return (₹ 116463 ha^{-1}), while, highest net return was recorded with application of 50% RDF + sesbania green manuring 1.5 t ha^{-1} (₹ 60735 ha^{-1}) and treatment with real time nitrogen management recorded highest return per rupee invested (₹2.22).

IAAHAS/AB/2023/166

Forest intervention: An effective strategy to mitigate the negative impacts of climate change

Surender[1]*, Monika[2], Shivam Kumar[3]

[1,2]CCS Haryana Agricultural University, Hisar-125004, Haryana, India

[3]Western Sydney University, Sydney, Australia

Climate has been changing since decades and posing serious threat to environment and life on Earth. Trees play an essential role in reducing atmospheric carbon dioxide, which is the primary cause of global warming. Forests absorb and store carbon, reducing the amount of greenhouse gases in the atmosphere, and release oxygen through photosynthesis. However, deforestation and forest degradation continue to be significant sources of carbon emissions, contributing to climate change. To address this issue, various forestry interventions have been developed to promote forest conservation and increase the capacity of forests to absorb carbondioxide. These interventions include forest restoration, afforestation, and reforestation. Forest restoration involves restoring degraded forest ecosystems to their former condition by controlling invasive species, reducing erosion, and planting native tree species. These have the potential to mitigate climate change by sequestering carbon dioxide and reducing greenhouse gas emissions. According to the Intergovernmental Panel on Climate Change (IPCC), increasing forest cover and improving forest management practices could provide up to 30% of the climate change mitigation needed to limit global warming to 1.5°C. Other benefits of forestry interventions include enhancing biodiversity, providing habitats for wildlife, improving water quality, and providing livelihood for local communities. Sustainable forest management practices, such as agroforestry and community-based forest management, canal so provide additional economic and social benefits while reducing deforestation and forest degradation. However, forestry interventions also face challenges, such as lack of funding, limited political support, and insufficient technical capacity. Additionally, the effectiveness of forestry interventions in mitigating climate change depends on the type of forest, the location, and the management practices used. It is crucial to ensure that

forestry interventions are implemented with adequate safeguards to avoid unintended negative impacts on ecosystem. To conclude, forestry interventions are a critical component to mitigate climate change. However, addressing the challenges and ensuring that these interventions are implemented effectively and sustainably is critical to achieve their full potential.

Keywords: *Forest Management, Climate change, Greenhouse gases, Reforestation.*

IAAHAS/AB/2023/167

Understanding the Perception of Stakeholders of Mango (*Mangifera indica*) Value Chain in Malda District

Swagata Ghoshal[1*], Swarna Sekhar Kumar[2]

[1]PhD Research Fellow, [2]PhD, Department of Agricultural Extension, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal -741252

Mango is one of the most important crops in India. The area and production of mango has been almost continuously increasing over the years. But complex supply and value chain are main barriers to development of the Indian mango industry. Malda, being the area with the highest production of mango in West Bengal and also the district, with the largest area dedicated to mango cultivation, was the most obvious choice for the study. Altogether 100 mango producers were selected by applying simple random sampling method. This study deals with identifying the stakeholders of the project, stakeholder analysis, problems related to production, marketing and techniques for modern mango growers, services needed by the stakeholders of the value chain for problem management. Proper management of the stakeholders in the value chain can make a better market system where farmers can get right price of their produces and the middle men can also earn their livelihood without extra price barrier to the consumers. The stakeholders of the mango value chain are not getting enough support and services to make an efficient market channel for mango. Mango growers are not getting proper extension management regarding production issues and the other stakeholders are out of the reach of

the services and supports needed for a well-managed marketing system. Extension education and extension services can be a useful tool to solve these problems. All the stakeholders should be taken under extension services as all of them are equally important to make an efficient mango marketing system.

IAAHAS/AB/2023/168

Screening of rice genotypes for resistance against white backed plant hopper, *Sogatella furcifera* (Horvath) under screen house conditions

Rajan Kamboj*[1], Maha Singh Jaglan[2] and S. S. Yadav[3]

*[1]Ph.D. Scholar, Department of Entomology, [3]Assistant Director (Plant Protection), Directorate of Research, CCS Haryana Agricultural University, Hisar, Haryana, India – 125004

[2]Coordinator, CCS Haryana Agricultural University, Krishi Vigyan Kendra, Uchani, Karnal, Haryana, India – 132001

Rice (*Oryza sativa* L.) is an important cereal crop serving as staple food for more than half of the world's population. Plant hoppers are the most destructive pests of rice which causes significant yield losses worldwide. Identification of sources of resistant is very important as earlier released rice varieties are showing susceptibility to these pests. Therefore, an experiment was carried out at Regional Research Station, Uchani, Karnal in which fifty-eight rice genotypes were screened against white backed plant hopper (WBPH), *Sogatella furcifera* (Horvath) during *Kharif*, 2020. Each entry was rated on the basis of 0-9 scale as per Standard Evaluation System for rice (IRRI, 2013). Of the 58 selected genotypes, twenty-three genotypes *viz*., Gontra Dhan, Govind, HKR 03-1, HKR 05-22, HKR 06-59, HKR 08-27, HKR 08-67, HKR 08-92, HKR 9-104, HKR 12-411, HKR 46, HKR 48, HKR 127, HKR 2012-2, IR 91326-19-2-1-2, IR 91648-B-59-B-1-1, IR 91648-B-89-B-5-2, IR 91648-B-238-13-1-2, IR 99784-11-8-1-2, IR 99784-255-9-1-1-5, PB 1121, QM 6377 and Taraori Basmati with a damage score of 3 (range 3.30 to 4.94) exhibited a moderately resistant reaction against WBPH. Twenty-five genotypes *viz*., CSR 30, HKR 2-408, HKR 03-408, HKR 05-10, HKR 06-45, HKR 06-47, HKR 07-147, HKR 07-

191, HKR 08-29, HKR 08-62, HKR 08-417, HKR 08-425, HKR 47, HKR 2012-1, IR 91648-B-89-2-1, IR 99784-255-29-1-2, NDR 359, Panth Dhan 19, PAU 121, PAU 122, PAU 123, PB 1, PR 124, Pusa 1460 and Pusa 1718-14-2-150 with a slightly higher damage score of 5 (range 5.02 to 6.98) belonged to the moderately susceptible category. Eight genotypes *viz*., DM 5240, Haryana Mehek, HKR 9-124, IET 22290, IRBB 60, PB 130, Pusa 1656-10-705 and Super Basmati were categorized as susceptible with the highest damage score of 7 (range: 7.16 to 8.36). Under screen house, the susceptible check (TN-1) with a damage score of 9 was categorized as highly susceptible to WBPH. None of the genotypes, except the resistant check (PTB 33; damage score of 1) was found resistant to WBPH infestation.

IAAHAS/AB/2023/169

Advancements in molecular markers and their applications in fisheries and aquaculture

Deepa Bhatt
Department of Aquaculture, College of Fisheries, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab – 141004, India

As aquaculture management becomes increasingly challenging as a result of overuse, pollution, and human activities that reduce resources and genetic variations, molecular technology and genome programs have created an enormous amount of information to help improve aquaculture genetically. The use of molecular markers in aquaculture has increased over the past decade due to the discovery of polymorphism at the DNA level. With the advent of DNA markers, it has been possible to confirm the hastiness with which fish germplasm has been explored. In order to select more useful markers for the successful management of aquaculture, it is necessary to carefully evaluate the different molecular markers currently available, their methods, principles, and applications. There has also been a tremendous increase in the use and potential of functional genomics techniques such as expressed sequence tags, microarrays and RNA sequencing in aquaculture. In addition, functional genome research has always been more difficult, but it is nothing compared with structural analysis. This is especially true when the number of genes under study is increased to cover various systems and pathways on a genome

scale. Genome research may allow development of more effective vaccines, including DNA vaccines and can indirectly help to find effective vaccine delivery systems. These molecular markers can prove fruitful in fields like fish nutrition and disease management programmes.

Keywords: *Aquaculture, Fisheries, Molecular markers, Mitochondrial DNA, Microarray, RNA sequence*

IAAHAS/AB/2023/170

Comparative Cost Analysis of Gerbera in Poly-house Technology

Pooja[1]* and R. Abhishek[2]
[1]Student, [2]Assistant Professor & HOS,
Department of Agricultural Engineering
Faculty of Agricultural Sciences, SGT University, Gurugram-122505

Green house technology is the technique to provide sympathetic environmental circumstances to plant and achieving the objectives like better yield, high nutritional and marketing value of plants. The agriculture in the proscribed environment is possible in all the regions irrespective of climate and weather. Growing crops in a greenhouse environment requires a substantial investment in capital and management resources. This study is chosen to illustrate several important aspects of greenhouse production, cost comparison with traditional gerbera farming and marketing that affect profitability such as market price, yield and labor. Gerbera daisies a popular and widely used decorative garden plant and also used as cut flower. The commercial value of gerbera is excellent in India. In traditional farming the estimated yield of gerbera is 130 to 160 cut flowers /square meter/year where as in green house cultivation the yield of 230 to 260 cut flowers /square meter/year can be obtained. On the basis of demand, quality and season the flower rates are fluctuating but the average price of per flower is 2 to 3 rupees. If the farm produces approximately 1,90,000 flowers/ month the cost of each flower being 2 rupees so accordingly the income is 3,80,000 rupees. After reducing the cultivation cost (which is approximately 2,70,000) the monthly

profit is nearly 1,10,000 per month. So, the Gerbera in poly-house technique's income is approximately 1,00,000 / month which is profitable for the farmer.

Keywords: *Greenhouse technology, Gerbera, Yield, Profit*

IAAHAS/AB/2023/171

Nu-Ta: An innovative Community-based Fishing Practice of Arunachal Pradesh, India

[1]Martina Meinam*, [2]Teresa Meinam and [1]Langlenbi Maibam and [3]Y. Jackie Singh

[1]Ph.D Scholar, College of Fisheries, CAU(I), Lembucherra, Tripura, 799210

[2]Ph.D Scholar, MIMS, Manipur University, 795003

[3]Assistant Professor, College of Fisheries, CAU(I), Lembucherra, Tripura, 799210

Nu-ta is an innovative passive fishing gear used to catch riverine fish in a few places of the West Kameng district of Arunachal Pradesh viz., Rupa, Sher-gaon, Ji-gaon, etc. 'Nu' refers to fish and 'ta' refers to the gear. *Nu-ta* is used to catch fishes in small streams as well as in large rivers. It is made up of bamboo, leaves, and ropes and it looks like a bridge in appearance. After selecting a suitable site for constructing the gear; a small diversion of the river is created at the side of the river so that the water gets divided into two pathways. This diversion is done by digging up and removing the stones in order to let the river flow. On the new pathway, Nu Ta is constructed. Long bamboos are placed together comprising of 8 to 10 bamboos of 5-meter length and giving the gear a width of half meter. The bamboos are then firmly tied together with the ropes. On the sideways, few bamboos are fixed perpendicular to the width of about 20 cm in height. This prevents the fishes from falling out from the structure. Nu ta is constructed with its head in the diverted water so that the water flows right into it and the tail of the nu-ta goes out of the diverted water into the bank of the river. The nu-ta is constructed in such a way that it opposes the current of the water. Construction of Nu-ta requires a group of twenty to thirty persons and the number might vary depending on the width of the river and also on the size of the gear to be constructed. Water is allowed to flow through the gear whereas the fishes get stuck in the gear. The water flows to the head of the Nu-ta but does not go all the way to the tail of the nu-ta as it

sieves down in the pathway of the diverted water due to the perforations and gaps between the bamboos. After constructing the nu-ta, supports are constructed for stability of that it does not collapse from the strength of the water current. The supports are constructed by putting large stones together and piling them up on the side of the nu-ta. These stones are held together with the help of bamboos which are used to keep the stones erect. Fishes go upstream for breeding or some other reasons during monsoon season. After monsoon, when the fishes come downstream after breeding these fishes are sieved by the gear.

Keywords: *Nu-Ta, Innovative, Community-based Fishing, Arunachal Pradesh.*

IAAHAS/AB/2023/172

Microencapsulation of Probiotic Lactic Acid Bacteria

Snigdha Mandot[1*], Kamalesh Kumar Meena[1], Rahul Singhal[3] and Deepak Meghwal

[1,2,3]Department of Dairy and Food Microbiology, College of Dairy and Food Technology, Maharana Pratap University of Agriculture and Technology, Udaipur, India

The aim of this paper is to increase the longevity and survivability of probiotic lactic acid bacteria and bifido bacteria strains in a yoghurt model by electrospinning them inside of corn starch (CS) and sodium alginate (SA) nanofiber mats. Both the probiotic nanofiber mat and the control group had negative zeta possibilities of 10.83 and 12.57 mV. The SA/CS nanofibers showed a more noteworthy defensive impact on LAB than Bifido bacteria did in an acidic climate. The quantity of LAB cells inside nanofiber mats declined by 0.19, 0.85, and 1.05 log CFU at 55, 60, and 65°C, respectively; the number of Bifido bacteria cells decreased by 0.27, 0.46, and 1.24 log CFU, which was more modest than the cell loss of free cells. 20 days of capacity decreased how much nanoencapsulated LAB and Bifido bacteria by 0.19 log CFU (97.9% endurance) and 0.28 log CFU (96.9% endurance), respectively, whereas free cells fell by 1.12 log CFU (87.7% survival) and 1.25 log CFU (86.3% survival). Real-World Instances Despite their potential to produce functional metabolites and parts

with antimicrobial, cancer prevention agent, and wellbeing advancing properties, the endurance and practicality of probiotic microorganisms during food dealing with are impacted by parts like power, pH and destructiveness, food atomic construction, and substance parts of the food network. To drag out the practicality of probiotics and guarantee their steadiness in the food lattice, nanoencapsulation methods are used to protect them from the harsh conditions caused by cooking. The chosen nanoencapsulation techniques minimise harm to the probiotic organisms. In order to create the right coating formulations for probiotics used in food items, the findings of this research will be helpful.

IAAHAS/AB/2023/173

Dissection of Stable genotypes and their adaptation for grain yield in finger millet (*Eleusine Coracana* L. Gaertn) using AMMI and GGE Analysis of GxE

S. Divya[1], K. Geetha[2], R. Siva kumar[3], A. Nirmala Kumari[4], P. T. Sharavanan[4]

[1]SRS Institute of Agriculture and Technology, Vedasandur

[2]Regional Research Station, Paiyur, Krishnagiri,

[3]Tamil Nadu Agricultural University, Coimbatore – 641 003

[4] Centre of Excellence in Millets, Athiyandal, Thiruvannamalai, Tamil Nadu Agricultural University - 606 603

To identify the stable finger millet genotypes in four locations (Paiyur (2021 & 2022), Athiyandal and Namakkal) the present investigation has been carried out using eighteen finger millet genotypes using AMMI and GGE bi-plot analyses during December 2020 to April 2022. With regard to AMMI analysis, the genotypes GPU 48 (G2) and KMR 301 (G4) are having values close to zero which indicates its stable performance. In that the genotype KMR 301 (G4) was an ideal genotype with higher mean yield and good stability. In case of GGE, the genotypes falling inside of the concentric circleare ML 365 (G5), KM 252 (G11), Venchuruttai (G13) and PR 202 (G18), which have stable performance across

location whereas the genotype PYR 2 (G8) was found highly unstable across locations. Athiyandal (E2) was depicted as most ideal environment from GGE bi-plot environment view. From the two mega envionments obtained, the genotypes KMR 301 (G4), CO 15 (G6) and PYR 2 (G8) were the best performing genotypes in mega environment 1 (Paiyur during 2021) and the genotypes GPU 28 (G1), GPU67 (G3), VL 400 (G14) & PR 1731 (G16) were found to have good performance in mega environment 2 (Athiyandal, Namakkal and Paiyur 2022).

Keywords: *Stability, genotype, genotype x environment, GGE biplot and AMMI*

IAAHAS/AB/2023/174

Fertilizer prescriptions based on soil test crop response correlation studies under integrated plant nutrition system for targeted yield of sweet corn in a *Vertisol* of Chhattisgarh

Jyoti Bala, L.K. Srivastava, V.N. Mishra
Department of Soil Science and Agricultural Chemistry,
College of Agriculture, IGKV, Raipur (C.G.)

Utilizing the inductive cum 'targeted yield approach' by Ramamoorthy, soil test crop response correlation studies under integrated plant nutrition system (STCR-IPNS) were carried out on sweet corn in a *Vertisol* of Chhattisgarh, consecutively during *Rabi* 2020-21 and 2021-2022. Three levels, each of fertilizer nitrogen (N), phosphorous (P) and potassium (K) and three levels of farmyard manure (FYM) were randomized in three fertility strips created artificially, with each strip divided into 24 plots. The fertility gradient created was reflected in the soil test P levels and the yields of fodder maize (exhaust crop). The coefficient of variation (CV) for $KMnO_4$-N, Olsen's P and ammonium acetate extractable K varied from 5.77-10.49 %, 9.99-17.52 % and 5.45-7.92 %, respectively during *Rabi* 2020-21, while it varied from 8.59-11.71 %, 20.69-28.66 % and 6.09-8.69%, respectively during *Rabi* 2021-22. This

variation in soil test values was best reflected in the green cob yields and the N, P and K uptake of sweet corn. Basic parameters were then computed on the basis of soil and plant analysis data, which indicated that for producing one quintal of green cob yield of sweet corn 0.26 kg N, 0.07 kg P and 0.30 kg K is required, and the contribution of nutrients from soil were 11.09 % N, 46.71 % P and 5.34 % K, from fertilizers it was 24.87 % N, 18.45 % P and 82.92 % K and from FYM it was 12.03 % N, 3.56 % P and 5.63 % K, respectively. By these basic parameters, fertilizer prescription equations (FPEs) were determined for sweet corn for attaining a definite yield target and ready reckoners were generated with NPK + 5 t FYM for various soil test values for the recommendation of fertilizer doses for desired yield targets. The results indicated that with the increase in soil test levels, fertilizer requirement decreased and with the increase in yield targets, the fertilizer requirements increased. Therefore, fertilizer recommendations based on targeted yield approach can help save the fertilizers and can ensure balanced fertilization to suit the situations requiring different yield targets, soil fertility and farmer's resources.

Keywords: *Targeted yield approach, Fertilizer prescription equations, Soil test crop response, soil test crop response correlation studies under integrated plant nutrition system, nutrient requirement, fertilizer recommendation.*

IAAHAS/AB/2023/175

Avifaunal community diversity along the Arpa River catchment areas, Bilaspur, Chhattisgarh

Alok Kumar Chandrakar* and S. S. Dhuria
Department of Forestry, Wildlife & Environmental Sciences,
Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh, India.

Natural riverine areas mark ecotonal habitats harbouring a characteristically diverse faunal assemblage, especially birds that also use these habitats as pathways crucial for their movement. Increasingly, riverine systems are subjected to large-scale habitat alterations due to climatic

fluctuations and anthropogenic changes. Therefore, it is important to understand broad-scale community patterns for conservation planning and prioritisation for these ecotone habitats. Arpa river is one of the major tributary of the river Mahanadi; despite its rich and diverse fauna, little is known about the bird species that inhabit this region. This study presents an extensive list of 161 bird species from 49 families, their seasonal distribution and habitat associations as recorded from field surveys along the riverine areas between January 2019 and December 2022. The present communication simultaneously discusses a few noteworthy sightings for the region and provides a baseline for future research on the distribution of birds in the central India.

Keywords: *Central India, Arpa River, riverine habitat; urban gradient, avifauna.*

IAAHAS/AB/2023/176

Bioremediation of heavy metals utilizing indigenous strain isolated from metal- contaminated soil

Ankita Ghosh[1] and Diksha Sah[2]

[1,2]Department of Environmental Sciences, G. B. Pant University of Agriculture & Technology, Pantnagar-263145, Uttarakhand (India)

Heavy metals represent a significant worldwide environmental problem due to the toxicity towards livings. Therefore, the removal of toxic metals from the environmental samples has a challenging process in recent years. The present study investigated heavy metals removal using bacteria isolated from metal-polluted soil. In this study, multi-metal resistant bacteria SMA3 was characterized for its potential application in metal treatment. SMA3 actively showed metal tolerance in screening and further used for biosorption study in lab-scale method. 16S rDNA analysis revealed that the bacteria belonged to *Brevundimonas* sp. Under the best experimental conditions (pH 8.5, culture temperature 30 °C, shaking speed 120 rpm), SMA3 resulted in removal of 85.1 % of Pb, 69.5% of Cd and 58.6 % of Hg in 72 hours from medium containing 100 ppm of Pb, Cd and Hg respectively. The AAS analysis of

both the control and treated samples revealed that the selected strain biodegraded heavy metals during enrichment. The results also revealed that the growth of SMA3 could be increased significantly by adding a small amount of carbon and nitrogen substrate to the medium. Overall, it was observed that, bacterial strain SMA3 is feasible for multi-metal removal from the metal contaminated environment.

Keywords: *Biosorption, heavy metals, soil contamination, SMA3.*

IAAHAS/AB/2023/177

Inorganic-organic fertilization on yield and nutrients uptake by rice and soil fertility after six cycles of different rice based cropping systems

SK MD Asif
Department of Agricultural Chemistry and Soil Science
Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia- 741252, West Bengal

In the investigation an attempt has been made to quantify the influence of inorganic-organic fertilization on yield and nutrients uptake by rice and soil fertility after six cycles of different rice based cropping systems. A field experiment was conducted at the Central Research Farm of Bidhan Chandra Krishi Viswavidyalaya, West Bengal under the new alluvial soil zone with three different rice based cropping systems and four combinations of fertilizers. Results showed that inclusion of legumes in the cropping systems viz., rice-wheat-maize+greengram and rice-lentil-sesame were better as compared to rice-mustard-jute in terms of rice yield, NPK uptake by rice as well as from soil fertility point of view. The highest rice yields were achieved under inorganic fertilizer treatments across the cropping systems; however, deterioration of soil chemical properties, mainly organic C occurs due to the sole application of inorganic fertilizers. Soil organic C, available N, P and K contents of the soil increased with the incorporation of BGS alone or in combination with inorganic fertilizers. Although statistically at par yields were achieved with 100% RDF

through NPK fertilizer sources as that of 75% RDF through NPK fertilizers + 25% N through BGS; the use of BGS had the added advantage of soil quality conservation. Thus, it is clear from the study that judicious application of chemical fertilizers and organic manure is necessary for increasing soil C and nutrient turnover to ensure sustainable crop productivity and soil quality in a long-term rice based cropping system. However, the capacity of BGS in improving yield of rice as well as soil fertility status needs further long-term research as nutrients are residually accumulated in the soil each year.

IAAHAS/AB/2023/178

Efficacy of Different Bio-pesticides / Insecticides against, *Plutella xylostella* (Linn.) in Cauliflower

Bharat Singh[1], Anamika Sharma[1], Neetu Singh[2], Satyandra Singh[3], Ram Sewak[1]

[1] ICAR- Krishi Vigyan Kendra, Gurugram 122004, Haryana, India

[2]Amity Institute of Organic Agriculture & Centre for Bio-control and Plant Disease Management, Amity University Uttar Pradesh (AUUP) Sec-125, Noida

[3]National Centre for Integrated Pest Management, IARI, Pusa, New Delhi-110012, India

The study was conducted during rabi season, 2018-2019 to evaluate the efficacy of different bio-pesticides/insecticides against *Plutella xylostella* (L.) in Cauliflower, *Brassica oleracea botrytis* at vegetable field of Khanpur, Pataudi block of Gururgram, Haryana. Pretreatment observations were recorded one day before treatment and post treatment after three and seven days interval of first and second spray. Six treatments viz., NSKE 5% (5ml/L.), Neem oil 300ppm (10ml/L.), Beauveria bassiana (1gm/L.), Emamectin benzoate 5%SG (0.2g/L.) & Spinosad 45% SC (0.5ml/L.) and untreated-control (water) were sprayed two times @ interval of 15 days of 1st spray. Findings of the experiment revealed that all the treatments evaluated against *P. xylostella* larve and observed that Spinosad 45% SC treated plot showed highest average reduction of *P. xylostella* (82.98%) in comparison to other treatmentsviz. NSKE 5% (63.85%), Neem oil 300ppm (67.84%), Beauveria bassiana (73.14%), and

Amamectin benzoate 5% SG (79.52%) superior over the control, to check in protecting cauliflower from DBM at five and ten days after treatments respectively.

Keywords: *Efficacy, Plutella xylostella, Beauveria bassiana, NSKE, Neem oil, Amamectin benzoate, Spinosad.*

IAAHAS/AB/2023/179

Anthocyanin mitigates Flubendamide 20% WDG induced toxicity in *Labeo rohita*

Neelanjana Choudhury[1], Jayanta Tarafdar[2], Ashis Kumar Panigrahi[3]
[1]CV Raman Global University, Bidyanagar, Mahura, Jalna, Bhubaneswar-752054
[2]Officer-in-Charge, AICRP- Tuber Crops, Kalyani Centre, Directorate of Research, Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia (West Bengal)-741235. India.
[1,3]Fishery Extension Laboratory, Department of Zoology, University of Kalyani, Kalyani, Nadia (West Bengal)-741235. India

The present study was undertaken to investigate the histological changes at sub-lethal concentrations of Flubendamide 20% WDG (Trade name Takumi) in Indian major carp *Labeo rohita*. The 96 hrs LC_{50} of Flubendamide 20% WDG estimated was 2.99ppm by Probit analysis (Version 17.0) software. Based on 96 hr LC_{50} value three sub-lethal doses 1/2, $1/4^{th}$ and $1/6^{th}$ of LC_{50} (0.498ppm, 0.747ppm and 1.495ppm) were chosen and the specimen were exposed *in vivo* to these test concentrations for 30 days, 60 days and 90 days. Overall, significant ($p<0.05$) changes were recorded due to concentration variations of fungicide and its exposure time. At the end of 90 days, the highly toxicated samples were subjected for histological studies. Damages to primary and secondary gill lamellae, liver, kidney and muscle at higher sub-lethal exposure caused extensive and severe disorganization as compared to control. The changes include due toxicity were epithelial hyperplasia with lamellar fusion, epithelial hypertrophy. Nuclear and cellular disorganization, necrosis, loss of cardiac muscle branching thus degeneration of intercalated disks was observed in heart tissue. In Liver, nuclear hypertrophy, enlarged sinusoids and atrophic areas were seen after exposure. The toxicated fish kidneys showed

renal corpuscle with glomerular expansion and absence of Bowman's space. Long term exposure caused inflammation, devascularisation and innervations of short bundles of muscle in *Labeo rohita.* Expansion of red pulp and presence of hemosiderin granules in a melanomacrophage center are important histopathological damages observed in spleen of fish. Further, It was observed that administration of anthocyanin at a dose of 5mg/ml at an interval of 15 days will mitigate the impact of the insecticide in *Labeo rohita* to remarkable level.

Keywords: *Flubendamide 20% WDG, Labeo rohita, Histology, Gill, Heart, Liver, Kidney, Muscle and Spleen*

IAAHAS/AB/2023/180

Hi-Tech Nursery Management of Horticultural Crops

Mrityunjaya Sharma, Seijal, Dipesh, Abhishek
Student, Faculty of Agricultural Sciences, SGT University, Gurugram-122505

Automation in nurseries, micro irrigation, fertilization, hi-tech plant propagation, and hi-tech greenhouse management are all included in hi-tech nursery management. High-tech nurseries improve physiological and physical processes that help plants function properly. They also raise grafting, germination percentage, and seed germination rates. Success, extending the duration of propagation, and successful propagation is feasible even in extremely severe and unfavorable climatic circumstances and with planting material free of insects. Producing the best-quality planting material for new development areas and replanting is the goal of effective nursery management. The importance of nurseries, types of nurseries, and management of nurseries, which includes various activities like potting the seedling, manuring, irrigation, plant protection measures, weed control, packing of nursery plants, sale management, and management of mother plants lies in hi-tech horticulture.

Keywords: *Greenhouse, Propagation, nursery*

IAAHAS/AB/2023/181

"rCCI"- A novel physiological trait for qualitative discrimination of N stress in Rice

Harika A[1], Dhandapani R[1]*, Sudhir K[1], Lekshmy S[2], Renu P[2], Rakesh P[2] Viswanathan C[1]

[1]Nanaji Deshmukh Plant Phenomics Center, ICAR-IARI, New Delhi
[2]Division of Plant Physiology, ICAR-IARI, New Delhi
[3]Division of Biochemistry, ICAR-IARI, New Delhi

Rice is the most important food crop produced and consumed worldwide. nitrogen is the basic nutrient input required for rice plant growth and development. However, excessive application leads to environmental concerns and production cost escalation. Conventionally, N is applied through broadcasting methods, with or without analysing the soil analysis or assessing the qualitative plant requirements. Several techniques, handheld leaf colour chart (LCC) and SPAD or CCI meters, drone imaging-based variable rate applications etc., are used for assessing plant N stress levels and calculating the dosage of N fertilizer to be supplied. In all these cases, visual colour-based indices are used for the discrimination of N stress-affected plants from non-stress (control) plants. That too mostly, leaf colour status (a proxy for leaf chlorophyll or nitrogen content) of top leaves are measured for qualitative discrimination of plant N stress level. However, it is well known that nitrogen is highly mobile within plants and typical N deficiency symptoms (such as inverted "V" shaped chlorosis from leaf tip towards the base) appears mostly in lower leaves, apart from overall full body chlorosis, stunted plant growth, reduced biomass and grain yield. In addition, the leaf colour may be affected by several factors like genotype and age; and environmental conditions like sunlight, and water stress, apart from nitrogen availability. Moreover, N stress-tolerant genotypes utilise diverse adaptive strategies like nitrogen remobilisation to achieve higher N status in top photosynthetic active leaves. With all this prior-art information, very little is known about the physiological traits suitable for qualitative discrimination of plant N stress level (plant require N or not). We hypothesised to identify the novel physiological traits that can be used for qualitative discrimination of plants grown in sufficient and deficit soil N conditions, irrespective of genotype tolerance level. Hence, a pot culture experiment was conducted with 15 rice genotypes with contrasting N stress tolerance (7 tolerant; 7 susceptible genotypes and 1 national check for higher nitrogen stress tolerance) insufficient and deficit soil N levels during the *kharif* season 2022. We measured around 140 phenotypic traits that were

grouped into three categories morphological architecture traits (comprises of leaf system architecture, root system architecture, phenology and growth, flag leaf architecture, plant architecture traits); physiological traits (comprises of chlorophyll content, colour indices, photosynthesis traits) and yield traits. These traits were measured at a multi-temporal scale for 3-time snaps starting as early as 0, 30 and 60 DAT. The statistical analysis of trait features clearly showed that there was a significant genetic, treatment and genetic x environmental interaction effect observed in 30 and 60 DAT. rCCI (relative ratio between chlorophyll content index measured in the bottom and top leaf) estimated during 30 DAT and rQY (relative ratio between quantum yield measured in the bottom and top leaf) at 60 DAT was identified as novel physiological traits for qualitative discrimination of N stress plants from non-stress rice plants. The LDA model developed was able to discriminate the rice genotype irrespective of genotypes groups as both the independent variable (rCCI & rQY) used for analysis were found to possess very high heritability, contributed highest phenotypic variance to the first linear discriminant component as it encompasses both top and bottom leaf derived constants. The linear discrimination ability of two traits viz., rCCI and QY_BL_30 was found to outperform all other traits for early stage (30 DAT) prediction.

IAAHAS/AB/2023/182

Efficient Sequential Third Order Response Surface Designs

Ankita Verma[1], Seema Jaggi[2], Eldho Varghese[3], Arpan Bhowmik[4], Cini Varghese[1] and Anindita Datta[1]

[1]ICAR-Indian Agricultural Research Institute, New Delhi - 110 012
[2]Agricultural Education Division, ICAR, New Delhi - 110 012
[3]ICAR-Central Marine Fisheries Research Institute, Kochi - 682 018
[4]ICAR-Indian Agricultural Research Institute, Assam

Sequential third-order response surface designs are advantageous when there is significance of lack of fit of a fitted second-order model while establishing the relationship between the input and response variables. The sequential experimentation approach comprises of conducting the trials one at a time, in contrast to the non-sequential experimentation strategy, which

executes the complete runs at once. The practical use of sequential experimentation is that it is more economical and uses less experimental resources. For example, in agriculture, ongoing crop cultivation may deplete previously available mineral elements, necessitating a sequential addition of the mineral elements that over time become deficient in the soil. A method of construction of sequential third order design is suggested for symmetric as well as mixed level factors that satisfy the required condition of moment matrix and ensure rotatability. Factorial points and axial points are used in the first stage of the construction method, which is then supplemented with a balanced incomplete block design to create a complete third order design. The first stage design may be utilized to fit the second order model, and with a few more runs, the third order model can be fitted without discarding the first stage design. Additionally, the proposed designs have smaller sizes, making it more cost-effective to attain the best response using the proposed design. A list of proposed class of designs has been presented along with their G-efficiency.

Keywords: *Moment matrix; Lack of fit; Response surface methodology; Rotatability; Sequential design; Third order model.*

IAAHAS/AB/2023/183

Screening and characterization of halotolerant Rhizobacterium exhibiting plant growth promoting traits to alleviate salinity stress for sustainable agriculture

Sujata and Kunal
Department of Microbiology, Faculty of Allied Health Sciences,
SGT University, Gurugram 122505, Haryana (India)

Salinity is one of the major abiotic stress in plants grown under arid and semi-arid tropics. Ionic imbalance and osmotic stress in plants under saline conditions limits the plant growth and micronutrient uptake results in low productivity and nutrient deficiency in plants leading to malnutrition in humans. Halotolerant microorganisms adapt saline habitats by exhibiting low

salt uptake mechanism, osmotic adjustment, production of salt tolerant proteins and enzymes, exopolysaccharides, etc. The present study was aimed to screen and characterize the halotolerant rhizobacteria showing plant growth-promoting traits that will be employed to mitigate salinity stress and improve the nutritional quality of crop plants. *Bacillus* sp. KG5 strain able to tolerate salinity (NaCl concentration) upto 12% was isolated from rhizospheric soil of citrus plant. Strain KG5, a Gram-positive small rod-shaped bacterium, grew well at pH value 8-9 and temperature 30-45°C. The strain showed positive test for amylase, gelatinase and catalase enzymes and utilized glucose, sucrose, fructose, maltose and lactose as carbon sources. Phenotypic characteristics of strain KG5 (NCBI accession number JQ033395) showed highest level of 16S rRNA gene sequence (1381 bp) similarity with *Bacillus* sp. JJM-1 (GU132507; 100%; isolated in Korea in 2009), *B. licheniformis* strain WGB3 (KY962347; 98.4%; isolated in China in 2018) and *B. licheniformis* strain F2 (MG650060; 98.3%; isolated in Italy in 2017). The strain KG5 exhibited phosphorus and zinc solubilization (through organic acid production) and indole acetic acid which may result in enhanced micronutrient uptake and growth in plants. Preliminary results indicated that production of extracellular enzymes and organic acid by KG5 will play a pivotal role in mitigating salinity stress in plants; improve micronutrient uptake, decomposition of organic matter and acts as biocontrol agent in soil. Further studies will be focused on the utilization of the strain KG5 in field trials for assessing the growth, productivity and micronutrient quality of plants grown under saline conditions.

Keywords: *Bacillus sp. KG5, Extracellular enzymes, Indole acetic acid, Micronutrient uptake, Organic acids*

IAAHAS/AB/2023/184

Evaluation of Native *Trichoderma* spp. against Chickpea Wilt under Field Condition

J. R. Pandya[1] and A.N. Sabalpara[2]
[1]College of Agriculture
Navsari Agricultural University, Bharuch -392012, Gujarat
[2]Ex-Director of Research and Dean PGS
Navsari Agricultural University, Navsari -396450, Gujarat

Two years multilocational field trial was conducted at Pulse Research Station, NAU, Navsari; Musa farm, Vyara and Kurshi Vigyan Kendra, Waghai using chickpea cultivar GG-2. The first year results revealed that all the treatments prove significantly superior in managing the wilt. Among them minimum wilt incidence was recorded (18.46 %) in seed treatment + soil application with *T. harzianum* after 30 days of sowing but was statistically at par with seed treatment + soil application with *T. fasciculatum* (19.14 %) and seed treatment alone (19.46 %). The rest of the treatment proved comparatively inferior in their efficacy. After 60 days of sowing, minimum will incidence (23.92 %) was recorded in seed treatment + soil application with *T. harzianum* and it was statistically at par with seed treatment + soil application (25.10 %) followed by seed treatment alone with *T. harzianum* (25.63 %), seed treatment with *T. fasciculatum* (26.86 %) and soil application alone with *T. harzianum* (27.65 %). The soil application comparatively less effective. After 90 days of sowing minimum wilt incidence was recorded in seed treatment + soil application with *T. harzianum* (28.39 %) which was statistically at par with seed treatment + soil application with *T. fasciculatum* (30.02%). Second year results revealed that Minimum wilt incidence after 30 days of sowing in seed treatment + soil application with *T. harzianum* (19.06 %) which was statistically at par with seed treatment + soil application with *T. fasciculatum* (19.66 %), followed by seed treatment alone with *T. harzianum* (20.01 %). The rest of the treatments proved less effective. The same trend was observed after 60 days of sowing. After 90 days of sowing, the minimum wilt incidence was recorded in seed treatment + soil application with *T. harzianum* (29.63 %) but was statistically at par with seed treatment + soil application with *T. fasciculatum* (30.45 %), seed treatment alone with *T. harzianum* (32.44 %)

followed by seed treatment with *T. harzianum* (30.69 %) and soil application with *T. harzianum* (34.19 %). Soil application with *T. fasciculatum* proved comparatively less effective. Overall results clearly indicate that seed treatment @ 5 g/kg seed along with soil application @ 100 g/m^2 of *T. harzianum* and *T. fasciculatum* found very effective in managing the wilt of chickpea.

IAAHAS/AB/2023/185

Evaluation of foliar application of nano-fertilizers (nitrogen, zinc, copper) on growth and yield of rice (*Oryza sativa* L.) in *kharif* season

Sruba Saha[1], Sushil Kumar Kothari[2]

[1]Assistant Professor, Department of Genetics and Plant Breeding, School of Agriculture and Allied Sciences (SAAS), The Neotia University, Sarisha, Jhinga - 743368, South 24 Parganas, West Bengal.

[2]Dean, School of Agriculture and Allied Sciences (SAAS), The Neotia University, Sarisha, Jhinga - 743368, South 24 Parganas, West Bengal.

A field experiment was conducted during Kharif season of 2020-21 at the research farm of School of Agriculture and Allied Sciences (SAAS), The Neotia University. The experiment consisted 5 treatments of foliar spray *viz.* T1: Control (100% NPK 80: 40: 40) T2: Nano nitrogen, T3: Nano nitrogen + nano zinc, T4: Nano nitrogen + nano copper, T5: Nano nitrogen + nano zinc + nano copper (4ml litter^{-1}) in Randomized Block Design with 3 replications. The results of experimental revealed that the highest grain yield was recorded with T3 followed by T5 and T5 and T4. Based on all studied characters it should be concluded that T3 *i.e* nano nitrogen combined with nano zinc is the best treatment followed by T5 (Nano nitrogen + nano zinc + nano copper) and T2 (nano nitrogen) among the applied treatments. Furthermore, it must have said

the findings will also be beneficial for other studies related to nanotechnology in agriculture.

Keywords: *Growth parameters, nano-fertilizers, foliar spray, grain yield, rice.*

IAAHAS/AB/2023/186

Application of GIS in Land Use Mapping of SGT Campus

Abhishek Sharma, Mrityunjaya Sharma, Dipesh, Seijal
Student, Faculty of Agricultural Sciences, SGT University, Gurugram-122505

Geographic Information Systems (GIS) technology has revolutionized the field of land use mapping, providing an effective tool for data collection, management, analysis, and visualization. The application of GIS in land use mapping involves the creation of spatial databases that integrate various types of data such as topography, soil characteristics, vegetation cover, and human activities. The use of GIS enables the production of accurate and up-to-date land use maps that can be used for various purposes, such as urban planning, environmental monitoring, resource management, and risk assessment. GIS can also help identify changes in land use patterns over time, providing insights into the impacts of human activities on the environment. With the help of QGIS and Google Earth Pro Software, we mapped out the SGT University. QGIS is a package of software that can be used to assess the effectiveness of land use. This study is chosen to illustrate that SGT University main campus in Gurugram has a total land area of 70 acres, of which 40% is used for smart buildings, 30% for agricultural research, 15% for sports and recreational regarding, and the remaining 15% is used for transportation and green spaces.

Keywords: *QGIS, Land use, Geo-referencing, Mapping, transportation.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/187

Morphological and cultural characterization of *Exserohilum turcicum* isolates collected from different parts of Karnataka

K. S. Iliger[1], S. I. Harlapur[1], I. K. Kalappanavar[1], S. R. Salakinkop[1], J. S. Bhat[2]and P. S. Tippannavar[1]
[1]University of Agricultural Sciences, Dharwad, [2]ICAR-IARI,
Regional Research Centre, Dharwad

Turcicum leaf blight of maize is an economically significant foliar disease of maize that causes significant yield losses and is extensively distributed around the world. It is caused by *Exserohilum turcicum* (Pass.) Leonard and Suggs. The fifteen diseased samples were collected from ten districts of Karnataka *viz*., Belagavi, Ballari, Bagalkot, Chitradurga, Dharwad, Davangere, Gadag, Raichur, Shivamogga and Uttar Kannada. To examine the morphological and cultural variations, these samples were isolated and purified using the single spore technique. The *Exserohilum turcicum* isolates revealed significant differences in colony colour, margin type, texture, number of septa, sporulation, and radial growth on potato dextrose agar medium. The radial growth of the pathogen ranged from 27.67 to 88.00 mm, and its colour ranged from milky white to black. The average conidial length varied from 6.77 to 12.65 µm and its breadth from 2.3 to 3.13 µm. The isolates from Arabhavi and Navalgund showed excellent sporulation, while Chitradurga and Gadag showed the lowest levels of sporulation. Therefore, changes in morphological and cultural variances may be attributed to environmental factors and geographical locations.

Keywords*: Cultural variability, Exserhilum turcicum, Maize, morphological variability, turcicum leaf blight.*

IAAHAS/AB/2023/188

Characterizing blast disease severity levels in rice using vegetation indices through hyperspectral remote sensing

Nandita Mandal*, Sujan Adak, D.K. Das, R.N. Sahoo, A. Kumar, C. Viswanathan, J. Mukherjee, H. Rajashekara, and Shalini Gakhar
Division of Agricultural Physics, ICAR-Indian Agricultural Research Institute, New Delhi-110012, India

Rice being the staple food of more than half of the population of world and India as well, any form of crop loss poses a real threat of starvation. One of the major constraints in rice production is frequent occurrence of pest and disease and most common one causing yield loss varying from 10 to 30% is the rice blast disease (causal organism: *Pyricularia oryzae L.*). Determination of the disease by conventional method involves an investment of time, money, and manpower. On the other hand, remote sensing techniques are becoming very popular for real-time analysis of stress assessment. Keeping this view, a field experiment was conducted at ICAR-VPKAS, Almora to study the possibility of hyperspectral vegetation indices to assess the blast disease with ten rice genotypes each for upland and irrigated conditions. The extent of disease severity was rated 0-9 based on the extent of the host organ covered by symptoms or lesions and spectral signatures were collected from each severity levels. Fifteen different vegetation indices having a higher correlation coefficient (>0.8) with disease severity were calculated. The linear regression models were developed between these indices and disease severity scores. Results showed that severely infected plant (score 9) have higher reflectance at visible region and lower reflectance at NIR region. Change in the reflectance for the infected plant as compare to the healthy plant was more pronounced in the VNIR, 550 to 760 nm and 1140 and 1300 nm having correlation coefficient above 0.6. Among the hyperspectral vegetation indices, triangular vegetation index (TVI) and perpendicular vegetation index (PVI) based models performed best for blast disease severity assessment having R^2 and RPD values more than 0.86, 0.83, and 2.68, 2.41, respectively. So TVI and PVI based models and greenness index value can be used for detecting rice blast, which could be utilized to scan satellite data for regional mapping of blast-affected rice cropping regions.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/189

Hydrologic Design of Soil and Water Conservation Structures Using Probability Analysis and Machine Learning Techniques

Pandya P. A.[1] *, S. H. Bhojani[2], Parmar S. H.[1], Prajapati G. V.[1] and Vadaliya D. D.[1]

[1]Centre of Excellence on Soil and Water Management, Research Training and Testing Centre, Junagadh Agriculture University, Junagadh

[2]Directorate of Information Technology, Anand Agricultural University, Anand, Gujarat

The soil and water conservation structures are constructed to overcome water scarcity as a result of interannual rainfall variability and paucity of the perennial source of water. A study was conducted to estimate the design runoff for the efficient hydrologic design of various soil and water conservation structures using Annual One Day Maximum Rainfall (ADMR) for the Saurashtra Region of Gujarat, India. The design rainfall at various return periods was predicted using three technics *i.e.* probability distribution fitting, Artificial Neural Network (ANN) and Gaussian Process Regression (GPR) for 11 stations. Various goodness of fit tests revealed that ADMR was efficiently predicted by log-logistic (3P) distribution for six stations, generalized extreme value distribution for two stations and lognormal (3P), gamma (3P) and lognormal distribution for one station each. Among ANN and GPR, the performance indicators revealed that GPR has shown a higher capability to predict ADMR as compared to ANN with correlation coefficient ranging from 0.97 to 0.99, mean absolute error from 15 mm to 411 mm and root mean squared error from 40 mm to 494 mm for various stations. The design runoff estimation was demonstrated based on predicted ADMR for various soil and water conservation structures using SCS-Curve Number method for curve number 70 and 85. The study is useful for researchers, planners and engineers to implement the economical, efficient and safe design of various soil and water conservation structures.

Keywords: *Annual one-day maximum rainfall; Artificial Neural Network; Gaussian Process; Probability distribution; Runoff estimation*

IAAHAS/AB/2023/190

Precision agriculture and its relevance to Indian agriculture

Anchal Sharma
Ph.D. Schloar, Department of Agronomy, CSK HPKV Palampur, Himachal Pradesh

According to FAO, the world population will be 9.7 billion by 2050, with food consumption expected to increase by 70%. In contrast, the agriculture input equation is changing due to a decrease in agricultural labour, shrinking agricultural productive land, rising temperatures, and shifting weather patterns. With these challenges, increasing agricultural productivity to feed the world can be accomplished through a regenerative agricultural and food production system. To meet future demand, we must shift our focus to new technologies such as precision farming in order to revolutionise agricultural productivity and make better use of agricultural inputs. Precision agriculture is a relatively new and largely technologically driven approach. It aims to maximise profitability while also protecting the environment by making efficient use of inputs based on temporal and spatial variability of soils and crops. It involves the use of agricultural technology such as remote sensing, GPS and GIS, control systems, sensors, robotics, drones, autonomous vehicles, variable rate technology, GPS-based soil sampling, automated hardware, and software. Precision farming has the potential to provide economic and environmental benefits by reducing the use of water, fertilisers, herbicides, and pesticides in addition to farm equipment. Precision agriculture has already seen unprecedented growth in developed countries. Asia's developing countries have been relatively slow to understand, develop, and adopt precision agricultural practises. Furthermore, precision agriculture is frequently misunderstood in the developed world as a complex technological intervention designed for large crop fields. This is a myth about precision agriculture, and there is no documentation about the 'scale' or 'size' requirement for precision farming. There is an urgent need to incorporate precision agricultural technologies into Indian agriculture, and the country has a good scope for many precision technologies to be implemented. Precision technologies have the potential to significantly improve farmer livelihoods despite small landholding and low income levels. For potential applications, location specific effectiveness and feasibility needs to be realised on experimental farms.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/191

Impact of Farmer Producer Company on Grape Farmers – A Case Study

Vaishali Hadawale* and Manish Sinha**
*Research Scholar, Symbiosis International (Deemed University), Pune
**Symbiosis Center for Management and Human Resource Development, Symbiosis International (Deemed University), Pune

To study the impact of farmer producer company on grape cost of farming in Pune district with Shivtej Farmer Producer Company. The sample of 30 grape cultivators comprising 15 member and 15 nonmembers in same locality were selected purposively. The cost concept (CACP approach) was used to work out cost of cultivation and "t" statistic was used for testing their statistical significance. The analysis revealed that the per hector cost of cultivation (Cost C) was lower to FPC member farmers (₹ 793830) when compared to the non-member farmers (₹ 878216) due to the bulk purchase of inputs such as fertilizers, agro chemicals and micronutrients. The average yield of grapes was higher of member farmers (22630 kg) than non-member farmers (21679 kg). This might be due to the expert's field visits and recommended scientific practices as per specified by farmer producer company. The average price received by the farmers was higher for member farmers (₹ 69 /kg) when compared to the non-contract farms (₹ 65/kg). The net returns received over cost B was higher for member farms (₹ 819850 /ha) when compared to non-member farms (₹ 591135 /ha). Cost of production was lower on the member farms (₹ 35/kg) as compared to non-member farms (₹ 41/kg). The yield uncertainty ratio was lower on the member farms (0.31) than non-member farms (0.46). Similarly, the price uncertainty ratio was lower on member farms (0.20) than the non-member farms (0.29). In nutshell, these results clearly revealed that the member farmers of farmer producer company in grapes was economically more profitable and less risky when compared to the non-member farming.

Keywords: *Cost of cultivation, member farmers, farmer producer company, price uncertainty, yield uncertainty.*

IAAHAS/AB/2023/192

Effect of different sources of organic nutrient on growth, yield and quality of beetroot (*Beta vulgaris* L.)

V. S. Ingole.
Department of Horticulture, Dr. PDKV, Akola. (M.S.)

The present investigation entitled was carried out during *rabi* season of year 2016-2017 at Department of Horticulture, Dr. PDKV, Akola. The experiment was laid out in RBD with 3 replications and 10 treatments comprises 100 % RDF, FYM, vermicompost, neem cake alone and in combination with *azatobacter*, PSB, VAM as soil treatment. The treatment combination of organic nutrient sources T_6 i.e. vermicompost @ 9.2 tha^{-1} + *azatobacter* (10 kg ha^{-1}) + PSB (10 kg ha^{-1}) + VAM (40 kg ha^{-1}) as soil treatment was found to be significantly superior for growth viz., plant height (28.85 cm), leaves per plant (14.27), total chlorophyll (1.33 mgg-1), leaf area (107.60 cm^2) and minimum days for harvesting (78.33) and yield attributes i.e. root circumference (20.83 cm), root length (8.03 cm), root diameter (6.27 cm), average root weight (158.33 g), root yield per plot (4.75 kg) and root yield per hectare (q) of beetroot. As regards to qualitative parameters viz., total soluble solid (14.03 ^{0}B), reducing sugar (5.12%), non-reducing sugar (2.25%) and total sugar (7.37) found to be significantly superior for treatment T_6 i.e. vermicompost @ 9.2 t ha^{-1} + azatobacter (10 kg ha^{-1}) + PSB (10 kg ha^{-1}) + VAM (40 kg ha^{-1}) which was at par with treatment T_7 i.e. neem cake @ 2.5 tha^{-1} + azatobacter (10 kg ha^{-1}) + PSB (10 kg ha^{-1}) + VAM (40 kg ha^{-1}) as soil treatment except moisture content, fibre content and total phenolic content of beetroot.

Keywords: *Beetroot, organic nutrients, soil treatment and yield.*

IAAHAS/AB/2023/193

Standardization of drying techniques for tinted Chrysanthemum

Harpreet Kaur, Jujhar Singh and Prabhjot Saini
Department of Agriculture, Mata Gujri College, Fatehgarh Sahib

An investigation was conducted for "Standardization of different drying techniques for tinted chrysanthemum (*Dendranthema grandiflorum*) flowers at Mata Gujri College, Fatehgarh Sahib during the educational year 2022-2023. In this experiment, three distinct drying methods viz. hot air oven, microwave oven and solar drier with six different embedded media for drying chrysanthemum i.e., sand, borax, silica gel, sand+borax (1:1v/v), sand+silica gel (1:1v/v), borax+silica gel (1:1v/v) were used. The data recorded on different parameters like percent moisture loss and sensory parameters were subjected to analysis with Factorial CRD. Results indicate that among different methods of drying in solar drier registered the maximum moisture loss (91%) with embedded in sand: silica gel (1+1 v/v)) after 7 days of drying whereas microwave oven registered the minimum moisture loss (31.85%) when embedded with sand: borax (1:1 v/v) when placed for 3.30 min in the microwave oven as compared to other methods.

IAAHAS/AB/2023/194

Pollen Collection and Brood Production by Honeybees (*Apis mellifera* L.)

Shiva Ayush Raturi and Shalu
Student, Faculty of Agricultural Sciences, SGT University, Gurugram

According to various studies the pollen collection, storage, and its effects on the production of *Aphis mellifera* L. brood throughout the year was depend upon the different seasons. There were substantial seasonal variations in the number of pollen foragers, the amount of pollen stored as beebread, and the amount of brood in the colony. Number of pollen foragers (117.5 bees/ hive/ 5 min) and amount of pollen as beebread (2439.0 gm/hive) and number

of brood (14787.2 brood cells/hive) were the highest during spring season, while the lowest number of pollen foragers (38.1 bees/ hive/5 min.) stored the lowest amount of beebread or pollen store (152.5 gm /hive) and produced the lowest number of brood (3811.7 brood cells/ hive) and bees in rainy season. The seasons of autumn, winter, and summer were typical for pollen gathering and brood production, whereas the rainy season's severe pollen shortage was the primary factor in the bee population's decline or failure before the honey flow season. As a result, providing bees with a sufficient supply of nutrient-rich pollen during the rainy season is crucial for preserving a robust bee colony that can produce more honey and other hive products.

Keywords: *Honeybees, foraging, pollen, brood, Apis mellifera.*

IAAHAS/AB/2023/195

Indian Silk Industry in the Global Scenario

Dinesh Pradhan
Student, SGT University, Gurugram

The three different types of silk, tasar, muga, and mulberry, are only produced in India. India is the second-largest producer of silk after China and holds a dominant position in the world. Though Indian silk industry occupies a predominant position in the world, its production is only 15% of total world production and more than 80% of production is contributed by China. India's export has advanced appropriately over the course of the study period, with both the volume and value of exports exhibiting strong and noticeable development. This increased growth is also followed by higher volatility. Recently, the Central Silk Board has been able to develop and popularize Bivoltine silkworm races, which can produce raw silk of world standards. With these races, we can expect reforms in the marketing and processing of cocoons, India can hope to develop its sale of domestic raw silk beyond its own borders.

Keywords: *Bivoltine, Cocoons, Export, Import, Problems, Production, Silk, Strengths.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/196

Mulching: A New Dimension of an Irrigation Water Management Strategy for Enhancing the Water Productivity of Crop Production - A Review

P H Rank[1], R J Patel[1], K C Patel[1], H H Mashu[1], P B Vekariya[1], B B Limbasiya[2], R M Satasiya[2]

[1]College of Agricultural Engineering & Technology, JAU, Junagadh, Gujarat, India
[2]Ploytecnic in Agricultural Engineering, JAU, Targhadia, (Rajkot)

The organic mulches are increasing yield, saving water, cost effective, maintaining soil fertility, and environment friendly and locally available at field level but less effective for increasing yield, reducing irrigation water applications, maintaining required optimum root environment and controlling weeds. The plastic mulch is most effective for all the purposes but its disposal is the great issue being soil pollutant. The selective colored plastic mulch can be used for the different crops and desired purposes. The effects of mulch types and its color on yield, insect/pest control and water saving were found varied for different crops, soil and climates. The biodegradable plastic mulch can be the best hope for the future. The intensive research efforts are required to produce cost effective biodegradable plastic mulch from biomass and its effects on enhancing the water productivities for different crops, soil types and climates.

Keywords: *Mulch, water conservation, microorganism, root zone, temperature.*

IAAHAS/AB/2023/197

Awareness and Perception of Farmers towards Agri-Tourism in South Gujarat

Swati Sharma
Assistant Professor, ASPEE Agribusiness Management Institute,
Navsari Agricultural University, Navsari

Agriculture is the main sector of Indian Economy. At present Indian agriculture is facing many challenges leading to poor remuneration to farmers. So, providing additional income generating activities to existing agriculture sector would help the farmers to fetch better remuneration and improve their standard of living. Agri-Tourism is the latest concept in the Indian Tourism industry which could serve this purpose. Gujarat is leading state in tourism with ample opportunity for future growth. The main objective of the study was to assess the awareness and perception level of farmers on agri tourism. 100 farmers from two districts of South Gujarat were selected purposively. Data were collected with structured questionnaire and analysed using descriptive analysis. Results showed that the majority of farmers were aware of the concept of agri-tourism and they got awareness through sources like newspapers, television, radio, fellow farmers, agri department officials. The respondents generally agreed that the existence of agri tourism in their area brings in many benefits to locals as a whole. However, farmers in the rural areas considered that only the experienced indirect benefits. The farmers in the study area considered having enough capital for infrastructure, operation and marketing, obtaining finance, meeting state and municipal regulations, obtaining required permits or licenses, liability issues etc. as the major constraints related to agri-tourism business in the study area. In this regard, the support of the local government and entrepreneurs are required for the development of agri-tourism business in the study area because the small communities need assistance in knowledge and expertise regarding aspects like financing, planning and management, marketing etc. to prosper in this business.

Keywords: *Agri-tourism, awareness, perception, constraints.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/198

Studies on Diversity and Distribution of Avifauna in Sethu Bhaskara Agricultural College and Research Foundation, Karaikudi, Tamil Nadu

Mathialagan Mariyappan[1*], Keerthika Murugan[2], Logadharsini Vijayendran[2], Lusiya Mary Thangaraj[2] and Meena Rajendran[1]

[1]Assistant Professor, Sethu Bhaskara Agricultural College and Research Foundation, Karaikudi-630 306, Tamil Nadu

[2]UG Students, Sethu Bhaskara Agricultural College and Research Foundation, Karaikudi-630 306, Tamil Nadu

A total number of 80 species belonging to 39 families and 17 orders has been recorded in the survey carried out from April 2022 to July 2022. Among the 17 orders Passeriformes (35.8 %) is a dominant group. Another two dominant orders are Coraciiformes, Charadriiformes consists of 14 species followed by Pelecaniformes, Galliformes, Cuculiformes, Piciformes, Suliformes consists of two family and the least represented orders are Colmbiformes, Anseriformes, Accipitriformes, Psittaciformes, Apodiformes, Gruiformes, Strigiformes, Bucerotiformes and Ciconiiformes with minimum of one family that are totally 22 bird species. Among the 39 families 19 families are represented by one species i.e., Psittacidae, Apodidae, Strigidae, Upupidae, Ciconiidae, Phalacrocoracidae, Anhingidae Indicatoridae, Picidae, Recurvirostridae, Centropodidae, Numididae, Coraciidae, Turdidae, Dicruridae, Ploceidae, Timallidae, Artamidae, Pycnonotidae and five families are represented by two species i.e., Sturnidae, Alaudidae, Muscicapidae, Motacillidae, Meropidae and nine families are represented three species are Corvidae, Nectariniidae, Estrildidae, Threskiornithidae, Alcedinidae, Cuculidae, Scolopacidae, Anatidae, Rallidae and five families are represented by four species Cisticolidae, Ardeidae, Phasianidae, Charadriidae, Accipitridae and only one family is represented by seven species i.e., Columbidae. The results of Relative diversity (RD) index showed that Columbidae (RD-8.75 %) was the dominant family in the area. Among the feeding guild, Insectivorous dominate in species strength (40.0 %) followed by Omnivorous (21.25 %), Carnivorous (13.75 %), Granivorous (10 %), Frugivorous (6.25 %), Nectarivorous (3.75 %)

and Piscivorous (5.0 %). Based on migratory status among the 80 bird species 56 species (13.75 %) belong to resident (R), 11 species (70.0 %) belong to resident (local) migrant (RM), 13 species (16.25 %) belong to migrant (M). Based on conservational status data results revealed that 75 species (93.75 %) were belong to least concern (LC). Among 80 bird species 43 bird species were documented in the month of June (51.8 %). Block-wise birds per centage distribution results were revealed that Laboratory block shows highest per centage (23.75 %). The calculated diversity indices among habitat types revealed that laboratory block has the highest value of Shannon-Wiener index (H') = 0.341 and the least value of H is calculated in B1, College entrance and undergraduate area (H' = 0.1231).

IAAHAS/AB/2023/199

Effect of nitrogen and sulphur levels on yield, nutrient use efficiency and economics of safflower (*Carthamus tinctorius*_L.) crop

Dr. U.K. Patel *, Dr. S.K. Thapak* and Dr. Anurag**
*SMS, Krishi Vigan Kendra, Anjora Durg
**Dean, college of agriculture and research Centre Mahasamund

The experiment was carried out during *rabi* season during years 2019-20 and 2020-21 at the Research cum Instructional Farm of Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. The experiment was laid out in factorial randomized block design with four nitrogen levels (N_0, N_{45}, N_{90} and N_{135} kg N ha^{-1}) and four sulphur levels (S_0, S_{15},S_{30} and S_{45} kg S ha^{-1}) comprising sixteen treatment combinations with three replications. The soil of the experimental site found neutral to alkaline in reaction (pH 7.13), non-saline (0.21 dS m^{-1}) in nature, medium in organic carbon (5.13 g kg^{-1}), low inavailable nitrogen (224 kg N ha^{-1}), medium in phosphorus (13.26 kg P2O5ha^{-1}), high in available potassium (345.19 kg K2O ha^{-1}), medium available sulphur (21.35 kg S ha^{-1}) and clayey in texture. Applied treatments nitrogen and sulphur levels highest seed yield, stover yield, B:C ratio were recordedwith135kg N ha^{-1}&45kg S ha^{-1}. In applied N and S levels highest nitrogen use efficiency 45kg N ha^{-1}&45kg S ha-

[1] and sulphur use efficiency 90kg N ha^{-1}&15kg S ha^{-1} and in lowest was found under control treatments.

Keywords: *Safflower nitrogen and sulphur, use efficiency, Safflower economics, Safflower productivity*

IAAHAS/AB/2023/200

Studies on the effect of plant growth regulators on flowering, fruit retention, fruit drop and yield of sapota [*Manilkara achras* (Mill.) Forsberg] *cv.* Cricket Ball under Agro-climatic condition of Chhattisgarh Plains

Roshan Lal Sahu*, Prabhakar Singh and Gangaram Rana****
*KVK, Anjora (Durg), ** Department of Fruit Science, IGKV Raipur,(C.G.)

The present investigation was undertaken during the year 2020-21 and 2021-22 at experimental field of Horticulture instructional Farm, Department of Fruit Science College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). The experiment was conducted on twenty years old trees of sapota *cv.* Cricket Ball with foliar spray of different concentrations of plant growth regulators applied at 50 per cent flowering and pea stage of fruit growth. The experiment was laid out in Randomized Block Design having twenty five treatments, which replicates thrice. It was observed that the plant growth regulators significantly impacted on flowering and fruiting characteristics of sapota *cv.* Cricket Ball. NAA was found most effective to reduce the fruit drop and increased the fruit retention percentages during whole investigation period. The maximum number of flowers per shoot (11.08), number of fruits per shoot (4.78), fruit set (43.13%), fruit retention (21.25%) and as regard yield, the treatment NAA 200 ppm, when applied at 50 per cent flowering and pea stage of fruit development produced significantly more number of fruits (189.16) as well as yield (22.72 kg/tree), whereas, a reduction in fruit drop per cent (74.13) was observed by the application of

same treatment as compared to water spray (control). As far as ripening advancement characters is concerned, application of ethrel @ 1000 ppm at 50 per cent flowering + pea stage (T_{18}) significantly reduced the days to first harvest (211.50), days to last harvest (231.66) and length of harvest period (20.16) as compared to rest of the other treatments tested under the present investigation.

Keywords: *Sapota, CCC, NAA, GA_3, flowering, fruit retention*

IAAHAS/AB/2023/201

Climate-smart wheat in the era of climate change: A test-case from lab to the field application

Rajib Roychowdhury[1,*], Roi Ben-David [2], Yinghui Li [3,4], Tzion Fahima [3,4]

[1]Department of Plant Pathology and Weed Research, Institute of Plant Protection, Agricultural Research Organization (ARO - Volcani Center), Rishon Lezion 7505101, Israel

[2]Department of Vegetables and Field Crops, Institute of Plant Sciences, Agricultural Research Organization (ARO - Volcani Center), Rishon Lezion 7505101, Israel

[3]Institute of Evolution, University of Haifa, Mt. Carmel, Haifa 3498838, Israel

[4]The Department of Evolutionary and Environmental Biology, University of Haifa, Mt. Carmel, Haifa 3498838, Israel

Wheat crop is an indispensable component in world agriculture and their improvement is the utmost priority for sustainable farming and achieving the goal of 'zero hunger' globally. Climate change has intensified in the post-genomic 21st century, forcing a number of environmental changes as well as the emergence of new pathogens and pests of wheat genetic resources. Both abiotic stresses and disease pressure have an adverse effect resulting in reduced wheat yield and deterioration of grain nutritional attributes. Consequently, global inhabitants are suffering from food security and health issues. To make the 'climate-smart' wheat have abiotic stress tolerance and disease resistance properties, either we can use exotic wheat germplasms like

wild species (e.g. wild-emmer wheat or WEW), landraces, for future crop breeding programs, or we can utilize the genetic improvement by introducing desired beneficial genes (or alleles) through modern day's state-of-art biotechnological tools. Flowering or anthesis time is a key phenology in wheat which regulates the final yield in form of grain number (GN) and biomass. We have shown that pre-anthesis developmental phases are in connection with yield increment in semi-arid wheat growing environment terminated by severe drought as pre-anthesis mediated GN increment is basically increasing the floral fertility and spikelet number per spike in wheat. Another potent case study is based on the powdery mildew disease resistance in wheat which is much severe in the Mediterranean and semi-arid environments and responsible for drastic yield losses. We have discovered a potent resistant *R* gene (*Pm69*) prevails in WEW line from the Fertile Crescent against such biotrophic fungus *Blumeria graminis* f. sp. *tritici* (*Bgt*). We have demonstrated that reactive oxygen species (ROS) induced cell death mediated hypersensitive response is acts as a local resistant signal for wheat-*Bgt* interaction. Moreover, Oxford Nanopore Technology (ONT) based long-read genome sequencing coupled with mutRNAseq (mutant RNAseq) led us to clone the *Pm69* R-gene through marker based selection and functionally validated with transformation and virus induced gene silencing (VIGS). *Pm69* was successfully introgressed into durum and bread wheat, and a diagnostic molecular marker could be used to accelerate its deployment and pyramiding with other resistance genes.

Keywords: *Powdery mildew; Pre-anthesis; ROS; Wheat; Yield*

IAAHAS/AB/2023/202

Detection of nucleic acid of *Anaplasma marginale* and *Theileria annulata* in the bovine

Niranjan Kumar, Jayesh B. Solanki and Dharmesh C. Patel
Department of Veterinary Parasitology, College of Veterinary Science and Animal Husbandry, Navsari-396 450, Kamdhenu University, Gandhinagar-382 010, India

Anaplasmosis and theileriosis are economically important tick-borne diseases in cattle caused by *Anaplasma marginale* (rickettsia) and *Theileria annulata* (protozoa). These two haemoparasite are often found together within the blood cells of a single host. Nucleic acid-based assay like PCR is widely used for the detection of *A. marginale* and *T. annulata* in symptomatic/ asymptomatic carrier hosts with the high level of sensitivity and specificity. The amplicon size of PCR was 457 bp or 576 bp of major surface protein 5 (msp5) gene of *A. marginale* while it was 312 bp or 401 bp of cytochrome B (cytb) gene of *T. annulata*using species specific primers. There was no any crossamplification in the selected species specific PCR with the DNA originated from the blood of bovine infected with *Trypanosma evansi* and *Babesia bigemina*. The detection limit of cytb (401 bp)-PCR for *T. annulata* and msp5 (576 bp)-PCR for *A. marginale* following agarose electrophoresis was 10 parasites/µl and 20 parasites/µl of blood in the sensitivity experiment, respectively. The prevalence rate of *A. marginale* in the bovines was significantly higher ($p<0.05$) in msp5-PCR (30 out of 269,11.55%) than the Giemsa's stained blood smear (GSTBS) (14 out of 269, 5.20%). Likewise, the prevalence rate of *T. annulata* in the bovines was significantly higher ($p<0.05$) in cytochrome b-PCR (23 out of 269, 8.55%) than the GSTBS (7 out of 269, 2.6%). NCBI-BLAST results of current sequences showed 100% homology with the published Cytochrome b and msp5 gene of *T. annulata* and *A. marginale*, respectively. Phylogram of the current nucleotide sequences of the pathogens find their place in the major clade of the respective pathogens. The major surface protein and cytochrome b gene primers are useful for the specific detection of *A. marginale* and *T. annulata* in bovine in the PCR.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/203

Role of Biological Control in Insect Control

Prerna and Meenakshi Devi
Faculty of Agricultural Sciences, SGT University Gurugram, Haryana

Keeping a tab on the agricultural production systems on a maintained level is a challenge for the future as the world population is increasing at a rapid pace. While preserving food security, some agricultural productions: including crop yield, sustainable agriculture, livestock production, etc. have improved as a result of modern technology advances in agricultural systems. It is imperative to safeguard crops from plant diseases if we want to satisfy the growing demand for food, both in terms of quality and quantity. According to studies, pathogens, animals, and weeds contribute 20 to 40% of the global agricultural output destruction. The use of synthetic pesticides will need to be expanded by 15-20 times to keep up with the rising demand for food. However, excessive use of synthetic pesticides harms the ecosystem and the natural world. Additionally, it is the cause of insects developing tolerance. Therefore, it is crucial to choose biological control in order to meet the population's constantly increasing food demand and to ensure natural safety. It is imperative to switch to a safer and more environmentally friendly pest control technique, such as bio-agents or bio-pesticides. Traditional and extensive biological management strategies for controlling weeds and insect pests have made significant progress.

Keywords: *Insect, pest management, synthetic pesticides, biological management strategies and weeds*

IAAHAS/AB/2023/204

Role of weather parameters on incidence of rice yellow stem borer infesting rice as influenced by various planting methods

Sudha Rani Daneti
Senior Scientist (Entomology)
Sugarcane Research Station, Vuyyuru, Krishna District
Acharya N G Ranga Agricultural University, Lam, Guntur, Andhra Pradesh

Rice is the major staple food crop in India persuading the socio-economic standards of many people. Among the major biotic stresses of rice contributing to the yield loss, yellow stem borer is considered as the most predominant pest. A field trial was executed for four successive seasons (*kharif* 2016, *rabi* 2016-17, *kharif* 2017 and *rabi* 2017-18) in Krishna district, Andhra Pradesh to evaluate the influence of various planting methods *viz*., manual transplantation (random), manual transplantation (straight row), direct sown, drum seeder and machine transplantation (8 row) on incidence of rice yellow stem borer (YSB) and impact of weather parameters on their incidence in terms of per cent dead hearts (DH) and white ears (WE) at vegetative and maturity stage respectively. The cumulative mean incidence of YSB in descending order among various planting methods was machine planted (3.80 & 3.41 % DH; 3.65 & 4.55 % WE) > straight row planting (4.99 & 4.29 %DH; 5.93 & 7.08 % WE) > random planting (9.84 & 10.66% DH; 9.62 &13.25 %WE) > drum seeded (15.31 & 14.31 % DH; 17.12 &15.11 %WE) > direct sown (12.28 & 10.93 % DH; 18.38 &19.52) during *kharif* and *rabi* seasons, respectively. The pooled yield data for *kharif* and *rabi* seasons revealed that the machine transplanted and straight row transplanted plots have realized higher yield with 4734 & 5113 and 4500 & 4858 Kg ha^{-1}, respectively and at par to each other. The correlation between weather parameters (Tmax, Tmin, RH_1, RH_2, rainfall and bright sunshine hours) and YSB incidence in terms of per cent DH and WE were analyzed and found significant with respect to various planting methods. To understand YSB incidence on rice with respect to the environmental factors, regression analysis was made with multiple environmental factors for both dead hearts and white ears multiple linear

regression equations were developed. During *kharif* season in case of dead hearts the regression analysis elucidated 38.50 to 68.10 per cent variability due to all abiotic factors tested, while in case of white ears the variability ranged from 40.7-83.4 per cent among various methods of planting (Table 4.61). The variability in relation to per cent DH and per cent WE have ranged between 55.1-86.7 and 47.0-94.0 per cent, respectively during *rabi* seasons in various planting methods of rice highest being recorded in machine transplanted method.

IAAHAS/AB/2023/205

Zero Budget Natural Farming (ZBNF): A New Dimension of Sustainability in Agriculture Farming and Enhancing Farmer's Income

D. K. Janghel[1*], Devlina Dwivedi[1], Yuvraj Singh[1], Deepak Soni[1], Nitish Kumar[2], Pankaj[1], and Aman Kumar Dhiman[2]

[1]School of Agricultural Sciences, [2]School of Engineering Sciences, GD Goenka University, Gurgaon-122 103 (Haryana), India

In the present day, chemical-based modern agriculture practices pose a serious threat to the well-being of humans, the health of soil, and the farmers' livelihoods. Agricultural industrialization has led to alarming indebtedness among indigenous farmers due to the exorbitant costs of raw materials. Zero Budget Natural Farming (ZBNF), proposed by agriculturist & Padma Shri awardee "Subhash Palekar", is the new dimension of chemical free sustainable agriculture farming without any use of external inputs like fertilizers, pesticides, etc. The phrase "Zero Budget" refers to no use of credits on purchase of external inputs and "Natural farming" represents farming in-tune with natural environments. ZBNF is based on the four most prominent pillars i.e., Bijamrita (Seed treatment), Jivamrita (Organic manures), Acchadana (Organic soil mulching), and Whapasa (minimal watering for optimum moisture and good aeration). It eliminates farmers' dependence on farm loans

by encouraging them to use natural resources and disheartens the use of chemicals and expensive inputs. A key aspect of ZBNF farming is soil preservation, mulching, organic pesticides, organic fertilizers, crop rotation, and biological pest control and mechanical cultivation. Additionally, indigenous livestock is emphasized for its unique quality and importance, is crucial for scaling up agroecology. The ZBNF method allows farmers to assure low cost of crop production without the use of chemical while maintaining soil fertility, and increasing farmer's income. Furthermore, it has the potential to prevent straw burning repercussions by practicing organic mulching. Thus, ZBNF is a sustainable alternative approach to the rural world in which people, animals, plants, mycorrhizae, and microorganisms collaborate to boost agricultural productivity, economic development, and social wellbeing.

Keywords: ZBNF, sustainable, chemical-free, agroecology, soil fertility

IAAHAS/AB/2023/206

Establishment of correlation between ascorbic acid content and color attributes using a Feed-Forward Back Propagation ANN model in treated aonla juice

Raouf Aslam[1*] and Mohammed Shafiq Alam[1]

[1]Department of Processing and Food Engineering, Punjab Agricultural University, Ludhiana, 141 004, Punjab

A neural network model was fitted to the input data ('L', 'a', 'b' and ΔE; n=84) to find a correlation with the output variable (ascorbic acid, mg/mL) in stored aonla juice. Levenberg-Marquardt (TRAINLM) training algorithm was used to train the network as it shows better correlation and minimum mean square error as compared to other training algorithms. In the present work, the ANN model showed a good correlation coefficient and satisfactory prediction of data at 10 hidden layer neurons and two layers. This helped in the reduction of complexity of the network at a significantly lower processing time. The final

model matrix containing the topology, weights and bias for each network layer obtained. The correlation plot of the fitted model having one hidden layer of 10 neurons and trained at 70% input data highlighted that the correlation coefficient for training, validation and testing data is 0.97, 0.96 and 0.93 following the correlation coefficient order Training>Validation>Testing. The overall correlation coefficient was 0.96, suggesting a good fit of the input data. The calculated values of R^2 for the fitted model was around 0.93 with a mean square error of 0.15.

IAAHAS/AB/2023/207

Role of plant growth regulators in pollen germination and pollen tube growth

Akoijam Benjamin Singh[1] and Kewat Sanjay Kumar[1,2]

[1]Department of Forestry, Mizoram University, Aizawl – 796004 (Mizoram) India

[2]Department of Botany, University of Allahabad, Prayagraj –211002 (UP) India

Pollen is a unique plant tissue that can be used and manipulated to the geneticist's, breeder's, physiologists, or germplasm curator's advantage. Plant growth regulators (PGRs) or plant hormones are chemical compounds that have a significant impact on the growth and differentiation of various plant parts. Plant growth regulators are substances that are naturally biosynthesized in plants and have an impact on physiological processes. The activities of PGRs depends on their concentration and environmental factors affecting their absorption and plant's physiological state. Even at low concentrations, PGRs can affect cell division, cell shape, cell growth, cell function, and mediate environmental stress. The ability of pollen to germinate on artificial media is commonly employed as a viability test, particularly for bicellular pollen. This necessitates the use of a near-ideal germination medium and environment. Plant Growth regulators released as secondary metabolites by applied hormones may contribute to the growth promoting effects that enhanced early emergence of pollen tubes. One of the most essential components of pollen quality has been pollen germination and pollen tube expansion. Numerous biochemical and physiological processes involved in plant growth and

development are triggered by their synthetic analogues. Nowadays, due to changing climatic scenario, numerous factors hamper pollen germination and pollen tube growth, leading to a decline in fruit and seed formation.

Keywords: *Plant growth regulator, pollen quality, pollen germination, pollen tube, fruits.*

IAAHAS/AB/2023/208

Assessment of Sulphur Nutrient in Soybean Crop

Dr. Umesh Patel
Scientist, Krishi Vigyan Kendra
Dau Shri Vasudev Chandraker Kamdhenu Vishwavidyalaya Anjora, Durg

A field experiment was conducted during the kharif season 2014-15 at the adopted village of krishi vigyan Kendra, Anjora. The soybean is called wonder crop, poor meat and golden bean. It is a major legume crop recognized as the efficient producer of two scarce nutritional resources i.e. high quality protein (40 to 42 %) and oil 20 % which are not only the major component in the diet of vegetarian mass but also a boon to the developing countries. Soybean now has been established also as on the most important oil seed crop in the world, accounting for more than 50 percent of oilseed produced and 30 percent of the total supply of all vegetable oils. Now a day the commercial use of soybean by producing soya food like soya meal, soya slate, bakery, items pharmaceuticals, cosmetics and other industrial products like oil, paint, varnishes, linoleum, rubber etc. is also being made. The fertilizer management decisions and quite specific to the soil and growing conditions. The experimental soil had pH 7.9, electrical conductivity 0.42 d sm-1, organic carbon 0.45%, alkaline kmn04 extractable N 180 kg ha-1, and phosphorus 15.87 kg ha-1, and IN ammonium acetate extractable K 395 kg ha-1. There are two practices were adopted (farmer practices RDF) and improved practices (RDF + 20 kg Bentonite Sulphur/ha) were applied as also application. Four farmer fields were selected for the treatment. A common pest management practices was adopted for the experiment. The data revealed the significant improvement in yield i.e. 17.0 q/ha, Net return Rs. 14000/- and B:C ratio 1.7 over the former practice yield 15.0q/ha, net return Rs. 11000/- and B:C ratio

1.57Present study established the superiority of application of Nutrient Management Practices i.e20 kg Bentonite Sulphur/hain soybean crop for sustaining higher productivity and profitability.

Keywords: *Soybean, Sulphur nutrient, Economics, pest management practices, higher productivity.*

IAAHAS/AB/2023/209

Status of Micronutrients in soils of Saraswati River palaeochannels across Haryana

Sawan Kumar[1*], Dinesh Tomar[2] and Satender Kumar[3]

[1, 3]Ph.D Scholar, Department of Soil Science, [2]Junior Pedologist, Department of Soil Science, CCS Haryana Agricultural University, Hisar

Remnant of once an active river or steam, a palaeochannel is now bereft of flowing water. It may be presently filled up with loose unconsolidated sediments or be buried under the pile or sheet of the later deposited sediments. Palaeochannels are indeed parts of misfit rivers and streams representing channels abandoned by migrating rivers as they shifted their courses and carve new water courses. Twelve representative pedons from palaeochannels of Saraswati River from Haryana viz., Ranipur, Yamunanagar (P1), Mugalwali, Yamunanagar (P2), Bansewala, Yamunanagar (P3), Painsal-1 Yamunanagar (P4), Painsal-2 Yamunanagar (P5), Mustafabad, Yamunanagar (P6), Ishargarh, Kurukshetra (P7) Mangna, Kurukshetra (P8), Kaekor, Kaithal (P9), Birdhana, Fatehabad (P10), Farwai-1, Sirsa (P11), Farwai-2, Sirsa (P12) were studied for various physico-chemical parameters of soils. The DTPA extractable Zn content ranged from 0.05 to 1.61 mg kg^{-1}, Fe content varied from 1.43 to 12.58 mg kg^{-1}, Cu content varied from 0.02 to 0.81mg kg^{-1} and the DTPA extractable Mn content varied from 0.17 to 10.22 mg kg-1. It can be deduced that the soils of pedon were low in Zn content, medium to high in Fe content, medium in Cu content and medium to high in Mn content. Variation in slope, intensity of cultivation, soil drainage properties, soil type, leaching and erosion can also be responsible for the variation in soil micronutrient content. Although alluvial soils are typically thought of as fertile because they are formed by flooding, this is not always

the case. Many human activities, such as deforestation, various construction and agricultural activities, have an impact on the quantity and type of sediments that rivers carry. These human activities speed up erosion, which causes a considerable amount of sediment to be transported downstream. Sometimes the nutrients in these eroded soils are beneficial. But on occasion, these flood-depositions can contaminate the environment due to upland pollution.

***Keywords**: Palaeochannels, Saraswati, Fe, Zn, Cu, Mn, upland pollution.*

IAAHAS/AB/2023/210

Forecasting Pearl Millet (Bajra) productivity in India using state space modelling

Suman
Faculty of Agricultural Sciences, SGT University, Gurugram

India is the largest producer of Pearl Millets (Bajra) in the world and accounts for 40.51 per cent followed by Sorghum 8.09 per cent in the world production of Millets in 2020. It has become crucial to consider the prospects for Pearl Millet in India given past trends and future projections. The findings of the study are based on Millet productivity data during the years (1960-61 to 2020-21). State space (SS), a dynamic linear modelling technique, was used to model the individual univariate series of Millet productivity in India.The aim of this study was to project and forecast the Millet productivity in India for the near future. The moderately negative skewness (0.71) and the platykurtic (-0.65) nature of productivity indicates for the possible expansion of the productivity. On the basis of state space modelling, it could be forecasted that the productivity of Millet yield will reach 1506.64 kg/ha. up to 2030 form 286 kg/ha. in the year 1961. These projections will help in formation of good policies with respect to relative productivity, price structure as well as consumption of pearl millet in the country.

***Keywords:** Autocorrelation function, Skewness, Kalman filtering technique, state space modelling, Akaike's information criterion, forecast.*

Interactive effect of conservation tillage, potassium and magnesium sulphate fertilization on dry matter production, physiological and yield parameters, and yield of grain cowpea

Vandana G. Pai[1], P. Prameela[2], and Roshni Vijayan[3]
PhD scholar, Department of Agronomy, College of Agriculture, Thrissur, Kerala, India
Professor and Head (Agronomy), Department of Agronomy,
College of Agriculture, Thrissur,
Assistant Professor (Plant Breeding and Genetics) AINP Arid Legumes, Division of Pulses, Regional Agricultural Research Station - Central Zone

This study conducted in Kerala, evaluated the role of conservation tillage (zero tillage (ZT), minimum tillage (MT), and conventional tillage (CT)) with five best performing nutrient combination treatments in terms of yield, potassium (@ 12 kg/ha, 20 kg/ha, 40 kg/ha) and magnesium sulphate (@ 60 kg/ha and 80 kg/ha) on total DMP, physiology and yield of test variety *Anaswara* (cowpea). In pot culture study, application of K: $MgSO_4$ @ 10:80 kg/ha resulted in highest total chlorophyll content and @ 20:60 kg/ha, in higher chl a content, and highest Total DMP with application @ 40:100 kg/ha. Different levels of K and $MgSO_4$ nutrition positively influenced 100 seed weight and grain yield, while there found no significant difference on chl b content, days to flowering, and grains/pod with any of the treatments imposed. Higher values for test weight and grain yield were recorded with K: $MgSO_4$ @ 40:60 kg/ha. In field experiment, tillage practices failed to produce notable difference in chl a, chl b, total chlorophyll contents, chl a/b ratio, grains per pod and test weight. However, under CT, early flowering (45 DAS) and highest total DMP up to 75 DAS were recorded. ZT produced highest LAI, while highest grain yield was noted under MT practice (734.5 kg/ha). Nutrient treatments failed to produce significant differences in chl b and chl a/b ratio; however, application @ 40:80 kg/ha produced highest LAI, and higher content of chl a and total chlorophyll content (1.34 mg/g). K:$MgSO_4$ applied @ 40:60 kg/ha recorded highest grain yield of test variety. LAI recorded highest under ZT with K:$MgSO_4$

@ 40:80 kg/ha. MT + K:$MgSO_4$ @ 40:60 kg/ha reported highest chl a/b ratio (4.71). K: $MgSO_4$ applied @ 40:60 kg/ha produced highest grain yield (806 kg/ha). In interactions, MT + K: $MgSO_4$ @ 40:60 kg/ha registered highest grain yield (914.8 kg/ha). Overall, in terms of grain yield, the test crop responded well to MT with application of K: $MgSO_4$ @ 40:60 kg/ha.

IAAHAS/AB/2023/212

Effect of pre-harvest spray and post-harvest dipping of chitosan on physico-chemical quality parameters of grape (*Vitis vinifera* L.) cv. Manik Chaman

Mr. V. B. Yadav[1]*, Dr. K. H. Pujari[2] and Dr. P.P. Relekar[3]
Department of Post Harvest Management of Fruit, Vegetable And Flower Crops,
Post Graduate Institute of Post Harvest Management, Killa-Roha,
Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli

An experiment entitled,"Effect of pre-harvest spray and post-harvest dipping of chitosan on physico-chemical quality parameters of grape (*Vitis vinifera* L.) Cv. Manik Chaman" was conducted in the Department of Post-Harvest Management of Fruit, Vegetable and Flower Crops, P.G. Institute of P.H.M., Killa- Roha during the year 2017-2018.The experiment was conducted in Factorial Completely Randomized Design (FCRD) for different parameters with six main treatments *viz*. untreated fruits (control), 0.1 per cent Pre-harvest spray only, 0.1 per cent Pre-harvest spray and 0.5 per cent Post-harvest dipping, 0.1 per cent Pre-harvest spray and 1.0 per cent Post-harvest dipping, 0.1 per cent Pre-harvest spray and 1.5 per cent post-harvest dipping and 0.1 per cent pre-harvest spray and 2.0 per cent Post-harvest dipping of chitosan, with 0, 15, 30 and 45 days storage period and the grape berries were analyzed for the changes in physical parameters, PLW, chemical parameters, microbial count and sensory qualities. It was observed that the pre-harvest spray and post-harvest dipping of chitosan treatments recorded delay in increase in PLW, TSS, reducing sugars, total sugars, microbial growth of fungi and delay in decreasing colour value viz. L*, a*, b*, titratable acidity, ascorbic

acid content, sensory score of grape Cv. Manik Chaman irrespective of treatments. As regards the organoleptic evaluation, the grape clusters with 0.1 per cent pre-harvest spray and 1.0 per cent post-harvest dipping of chitosan treatment obtained highest sensory score at 45 days of storage at 0^0C temperature condition. Thus, it is suggested that 0.1 per cent pre-harvest spray and 1.0 per cent post-harvest dipping of chitosan is optimum for grape.

Keywords: *Grape, Chitosan, Physico-chemical quality parameters, dipping, temperature.*

IAAHAS/AB/2023/213

Marketing of Organic Wheat in Haryana

Heena[1], Sunita Yadav[2]

[1]Assistant Professor, SGT University, Gurugram- 122505 (Haryana), India

[2]Research Scholar, CCS Haryana Agricultural University,
Hisar- 125004 (Haryana), India

The persons involved in handling the produce from the producer to the final consumer are termed as market functionaries. The main market functionaries involved in the marketing of organic wheat were pre-harvest contractor, commission agent, wholesaler and retailer in Haryana. Item wise per quintal cost of marketing of organic wheat incurred by producer in different channels in Sonipat district was calculated and marketing efficiency of different marketing channels was worked out by using the three methods conventional method, shepherd‘s method and Acharya‘s method and the Acharya‘s method was found the ideal measure of marketing efficiency and this method takes care of the limitations of the above two methods. In this method it has been emphasized that the farmer's share in consumer's rupee is a measure of marketing efficiency. Marketing efficiency of organic wheat in Hisar, according to Acharya‘s method under different marketing channels i.e. channel-I, channel-II, channel-III and channel-IV were 3.31, 4.45, 11.87 and 35.43, respectively. While corresponding figures for Sonipat district were 3.70, 4.49, 11.81 and 35.05, respectively. From this efficiency index, it was concluded that channel-V was the most efficient among all the marketing channels in the crops.

IAAHAS/AB/2023/214

Combining Ability Analysis in Direct Crosses for Yield and Yield Related Traits among Bread Wheat (*Triticum aestivum* L.)

S. D. Tayade[1*], N. R. Potdukhe[2], Swati Bharad[3], B. K. Das[4] and R. M. Phuke[5]

[1]Ph. D. Scholar, Department of Agril. Botany, Dr. P.D.K.V., Akola-444104

[2]Senior Research Scientist (Cotton), Cotton Research Unit, Dr. P. D. K. V., Akola-444104

[3] Senior Research Scientist (Wheat), Wheat Research Unit, Dr. P.D.K.V., Akola-444104

[4]SO (G), Mutation Breeding Section, Nuclear Agriculture & Biotechnology Division (NA&BTD), (BARC), Trombay, Mumbai-400085

[5]Scientist, IARI-ICAR Sub-station (Wheat), Indore (M.P)

A diallel crosses was practiced among twelve diverse bread wheat (*Triticum aestivum* L.) cultivars. The study of only F_1 of the sixty-six direct crosses and the twelve parents were grown in a field experiment at IARI-ICAR, Sub-Station (Wheat), Indore environment in 2017-18 to estimate combining abilities. Data revealed that the mean square of genotypes, parents and crosses were significant for all studied characters. The analysis of variance for combining ability showed that mean square due to general (GCA) and specific (SCA) combining ability, were generally significant for all studied characters reflecting the importance of both additive and non- additive gene effects in the inheritance of these characters. Combining ability were lower than those of specific combining ability, consequently the GCA/SCA ratios were less than unity indicating the prevailing of non-additive gene effect which have considerable roles in the inheritance of these characters. In general, the genotype AKAW-4924 was a good combiner for early flowering and maturity, 1000 grain weight. AKAW-4925 was good combiner for number of grains per earhead and high grain yield/plot and AKW-1071 for number of effective tillers per plant. Besides K-307 was a good combiner for tall plant. These results seem to be useful for wheat breeding program in making the proper decision when initiating a crossing plan.

Keywords: *Bread wheat; Combining ability (GCA and SCA); Diallel, Additive, Non-additive.*

IAAHAS/AB/2023/215

Assessment of important phytochemical constituents, green synthesis of silver nanoparticles, and characterization of anti-microbial activity from plant extract of *Murraya koenigii*

Aditi Arya
Department of Biotechnology, Deenbandhu Chhotu Ram University of Science and Technology, Murthal (Haryana)

Ayurveda, which dates all the way back to the dawn of human civilization widely mentions the usage of plants for medicinal purposes. Asians frequently use *Murraya koenigii* (Linn.) Family Rutaceae, referred to as curry leaves, as an important spice and condiment. The leaves, which may be used fresh or dried, have a unique flavor and scent and are typically used to gravy and other dishes. The presence of the carbazole alkaloids in significant amounts is known to come from the leaves and its biological effects have been well investigated. The alkaloids are remarkable as fascinating classes of naturally occurring chemical substances with antioxidant and anti-dementia activities. Moreover, the alkaloids are traditional remedies for stomachaches, the flu, rheumatism, traumatic injuries, and diarrhea. They are also used as astringents. According to reports, the leaves have hypoglycemic and anti-diabetic, hepatoprotective, anti-cancer, anti-bacterial, antioxidant, chemo-modulatory, immune-modulatory, anti-diarrheal, and anti-inflammatory properties.

In the present investigation, the leaves of *M. koenigii* were dried, crushed into a fine powder, and then made as a crude extract using several solvents, including water, methanol, ethanol, etc. The existence of alkaloids, flavonoids, terpenoids, vitamins, tannins was discovered through the examination of a range of phytochemicals. As non-toxic, natural capping/reducing agents, phytochemicals from plants provide a viable platform for the synthesis of silver nanoparticles. This green synthesis provides a straightforward, accurate, efficient, and applicable method that is also inexpensive and simple to use in comparison to previous approaches. It was determined if plant extracts had any antibacterial effects on

microorganisms. Significant zones of inhibition in the anti-microbial action against bacteria suggest the presence of phytochemicals in plant extract which can be exploited as potential organic anti-microbial agents.

IAAHAS/AB/2023/216

Harnessing of agricultural crop residues for Hydrogen energy production: An overview

Rupal Jain, Narayan Lal Panwar
Department of Renewable Energy Engineering, Maharana Pratap University of Agriculture and Technology, Udaipur (Rajasthan) 313001 India

Due to its agrarian economy, India has a very high potential for agricultural waste biomass (about 700 metric tonnes annually). Farmers often burn agricultural wastes in open fields to clear the ground for sowing rather than utilizing them for energy recovery. As a result of the emission of particulate matter and the buildup of inorganic salts in soils, respectively, the quality of the air and soil deteriorates, having a negative impact on human health. Biomass has huge potential for energy production, and it can be converted to more suitable other energy forms through various technologies, i.e., gasification, pyrolysis, anaerobic digestion, etc. Nowadays, bio-hydrogen production is getting increased attention due to its clean burning feature and eco-friendly production process. Any kind of organic feedstock can be employed for the production of hydrogen energy. Bio-hydrogen can be produced either through a thermochemical or biochemical route. Along with the harnessing of solid organic waste, biochemical methodologies can also be employed with organic effluent streams. Consequently, along with the production of energy, efficient disposal of organic waste can be achieved through these conversion technologies.

Keywords: *Biomass, Bio-hydrogen, Thermochemical route, Biochemical route, Energy*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/217

Agri Startups -Boost Future of Agriculture in India

Lade AH[1], Ahire RD [2] and Shinde, G U[3]
[1]Ph.D. Scholar, Department of Extension Education, COA, VNMKV, Parbhani
[2]Associate Dean and Principal, College of Agriculture, Badnapur
[3]Principal Investigator, NAHEP-DFSRDA-ICAR, VNMKV, Parbhani

Agriculture is one of the important pillars of the Indian economy. According to a report from FICCI, about 54 per cent of Indian population depends directly on agriculture and it accounts for around 17.3 per cent of GDP. In the last two decades, powered by the Government policies and strong engagement of the industry and institutions, agriculture is rapidly evolving into agribusiness in terms of approach and structure. Transformation of Agriculture to Agri-business is one of the important strategies where enterprising farmers practice profitable agriculture. India has become the third largest startup ecosystem hub. India is home to highest number of unicorn startups after US and China with 26 unicorns out of 250 plus total unicorns globally. At a time where with the increasing population and demand for better quality and higher quantity of food. India currently has more than 49,000 plus startups, 1500 plus investors, 250 plus incubators, and 26 unicorns. The Indian startup ecosystem is ranked at number 37 and the global ranking of its top three cities are Bengaluru, New Delhi and Mumbai for the year 2018. In 2020, Bengaluru again continued its title "Silicon Valley of India".

In a bid to double the farmer's income by 2022, the Government of India is continuously looking for ways to boost agricultural production, food processing and marketing avenues through the integration of latest technologies and innovations; thus creating a huge scope for food and agritech startups in the country. Many agritech startups in India are mainly in marketplace segment where e-commerce companies provide fresh and organic fruits and vegetables procured directly from farmers. Very recently many startups have come up providing innovative and sustainable solutions for farmer's problems. Agri start-ups have received decent support from the government through supportive policies such as Start up India, Atal Innovation Mission, New Gen Innovation and Entrepreneurship Development Centre, the

Venture Capital Finance Assistance (VCA) Scheme promoted by the Small Farmers' Agri-Business Consortium and ASPIRE scheme.

Keywords: *Agri Sartup, Agritech, Agri-Business Consortium*

IAAHAS/AB/2023/218

Agro-tourism as a catalyst for Rural Upliftment and Sustainable Development

Aparna Jaiswal[1] and S.K. Rai[2]

[1&2]Assistant Professor, Raja Bhoj College of Agriculture, Balaghat (JNKVV, Jabalpur)

Agro-tourism refers to a type of tourism where visitors engage in activities related to farming or rural life. It is an emerging trend in the tourism industry, and it has the potential to promote sustainable development by providing economic benefits to rural communities. One of the major advantages of agro-tourism is that it allows visitors to experience a slower, more authentic way of life, and to learn about agriculture, local food, culture, and traditions. It can also provide opportunities for farmers to diversify their income streams, and for local businesses to thrive. However, there are also some challenges associated with agro-tourism, such as maintaining a balance between tourism and agriculture, ensuring that visitors respect local customs and traditions, and minimizing the negative impact on the environment. Therefore, to mitigate these problems, it is important for agro-tourism destinations to develop sustainable tourism practices. Overall, agro-tourism has the potential to offer a unique and enriching travel experience, while also supporting local communities and promoting sustainable practices.

IAAHAS/AB/2023/219

Estimation of Terrestrial Carbon Stock as Influenced by Sapota Orchard at College of Agriculture, Dhule

Amarsinh Padmakar Landge
Departmentof Soil Science and Agricultural Chemistry, College of Agriculture Dhule

The present investigation entitled as, "Estimation of terrestrial carbon stock as influenced by sapota orchard at College of Agriculture, Dhule" was conducted at Horticulture farm, College of Agriculture, Dhule. The experiment was laid out in randomized block design with nine treatments replicated thrice. Treatment T1to T8represents sapota plants selected from 42 years old sapota orchard, along with T9 as control i.e. without orchard. Soil sampling was done by digging pits on periphery of each plant. Four pits were dug on four sides of plant and soil samples were taken depth wiseat0-30cm, 30-60cmand60-90cm.Plant height and plant diameter at breast height (DBH) were recorded by using measuring tape. The tree volume, above ground biomass, below ground biomass, total plant biomass and plant carbon were computed by using standard formulae. The soilcarbonfractionsviz.totalorganiccarbon (TOC), watersolublecarbon (WSC), soilmicrobialbiomasscarbon (SMBC), particulateorganicmattercarbon (POMC), permanganateoxidizablesoilcarbon (POSC), fulvicacidandhumicacidcarbon, chemicalproperties and physical properties of soil were analyzed by using standard method at Departmentof Soil Science and Agricultural Chemistry, College of Agriculture Dhule. Thecarbonpoolindex (CPI), carbonlabilityindex (CLI), carbonmanagementindex (CMI) and soil organiccarbon stock (SOC) were computed by using standard formulae.

Among the sapota trees, T3 recorded higher tree height (731.52 cm), diameter at breast height (114.80cm), volume of tree (7728.93m2), above ground biomass(6260.44kgtree-1), below ground biomass(1627.71kgtree-1) and total plant biomass(7888.15kgtree-1) which resulted into higher accumulation of (3944.07kgtree-1).

Soil carbon fractions in sapota orchard soil decreased with increment in depth.Thetotalorganiccarbon(TOC)rangedbetween0.87-0.92%,0.75-0.86% and 0.590.68%,water soluble carbon(WSC) rangedbetween91- 109.50mgkg-1,59.50- 73.75 mg kg-1and27.25-44.83mgkg-1,soil microbial biomass

carbon(SMBC)rangedbetween349.17- 478.92 mg kg-1, 198.67- 311.83 mg kg-1and 93.58- 106.25 mg kg-1, particulate organic matter carbon (POMC) ranged between 3973.85- 6078.55 mg kg-1, 2601.43-3169.44 mg kg-1and 1563.25-2376.33 mg kg-1, permanganate oxidizable soil carbon(POSC)rangedbetween1086.58-1350.67mgkg-1,967.75-1166.33mgkg-1and624.42 731.08 mg kg-1, humic acid carbon ranged between 11.65-13.96 mg kg-1, 8.49 -11.34 mg kg-1,6.02-8.06mgkg-1,fulvic acid carbon ranged between9.75-23.05mgkg-1,7.09-21.25mg kg-1and 6.04-12.42 mg kg-1at the depth of 0-30 cm, 30-60 cm and 60-90cm, respectively.

Soil organic carbon (SOC) stock content in sapota orchard soil ranged between34.28-36.43Mgha-1,28.83-33.15Mg ha-1 and 22.43-26.50 Mg ha- 1, Carbon management index (CMI) ranged between100-227.64, 100-241.47and100-232.03, Carbon lability index (LI) ranged between1.00-1.71,1.00-1.71and1.00-1.44 and carbon pool index (CPI) ranged between1.00-1.33,1.00-1.41and1.00-1.61at the depth of 0-30 cm, 30-60 cm and 60-90 cm, respectively.

Soil texture of sapota orchard soil was clay loam. The pH, electrical conductivity, calcium carbonate content and bulk density of soil were significantly increased with increment in depth from 0 to 90 cm. However, the soil available N,P,K and DTPA-Fe, Mn, Cu and Zn decreased with increment in soil depth. Soil organic carbon stock shown significant positive correlation with soil available N, P, K, DTPA- Fe, Mn, and Cu at all the soil depth. However, it shown significant positive correlation with DTPA-Zn at the depth of 60-90 cm. On an average, 3028.25 kg tree-1i.e.302.82 t ha-1 plant carbon has been sequestered in 42 years old sapota orchard.

Keywords: *Terrestrial carbon stock, plant carbon, Soil organic carbon, carbon fractions*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/220

Late blight disease: A devastating disease of potato and its management

Lakshya Kumar[1]
SGT University, Gurugram

Potato *(Solanum tuberosum*) is one of the important crops grown worldwide, which is the basic staple food for millions of people around the world. This crop is affected by various diseases among them late blight, which is caused by fungal pathogen *Phytophtora infestans* which is one of the most dreaded diseases of potato worldwide and cause significant yield loss. In history, late blight was responsible for the most famous Irish Famine in the middle of the 19th century which affected both potato foliage in the field and tuber in the storage which absolutely destroyed the potato crop causing hunger and migration of millions of people. This pathogen *Phytophthora infestans* have different mechanisms of survival and two infection phases in its life cycle which require two mating types, A1 and A2 to produce a sexual spore known as oospore. The spores are carried by wind and rain splash to healthy plants. Different management techniques for prevention this disease have been developed which are majorly chemicals. But effective control of this disease requires implementation of an integrated disease management approach which may consist cultural control, chemical management, and advanced disease management practices. Thus, adoption of various disease management methods such as new generation fungicides, organic amendments and biological control methods will not only manage the disease effectively abut will minimize the yield losses as well if applied on time.

Keywords: *Late blight, Phytopthora infestans, potato, integrated disease management.*

Solar Tunnel Dryer and Its Applications for Drying of Vegetables and Fruits

***Swati Deswal**

Student, Faculty of Agricultural Sciences, SGT University, Gurgaon, Haryana, India

Solar energy is one of the greatest sources of renewable energy and it is referred to as the energy that comes from the sun's rays. Solar energy can be utilized in many ways including heating houses, providing electricity, distillation of seawater, etc. Recently our Honourable Prime Minister laid the foundation stone of seawater desalination plant at Dhorda in Kutch Gujrat, to provide potable water to masses. Solar water heater, solar cooker, lantern/LEDs are other gadgets which have been developed by various engineering institutes. Among the various applications, solar drying is one of the important applications, since times immemorial. In villages, it has been a common household practice to preserve vegetables like peas, potato chips, carrot, turnip, cauliflower, ginger, onion, fenugreek, chibbar/kuchri (fruit of a weed called *Cucumis sativus*), aonla, mango for Amchur Powder, pomegranate seeds for Anardana etc. through drying using sunlight. However, in this process quite good quantity of final produce is spoiled due to moulds, which develop if the sunlight is not proper due to cloudy or rainy days. Even natural colour, texture and appearance of the product is not retained. A solar tunnel dryer consists of overhead solar panel in parabolic shape supported by iron rods (6-7 ft) and the base may consist of GI sheet (3ft) whereas the side walls are made up of fiber sheet/ plexiglass. The commodities to be dried are spread on GI sheet for uniform drying. Care is taken that the temperature within tunnel remains around 60 °C so that texture and aroma of the products being dried is not lost. Solar tunnel dryers offer an improved drying method for small and medium farm holder. A typical solar tunnel dryer reduces the time required to dry the products from 1 to 5 days depending on the crop, can increase the productivity of the harvest by reducing the amount of product lost to moisture and reduces the amount of labor involved in drying products. Moreover, during the high season where the productivity level is high and the probability of decomposition is higher in which the farmers will have to sell their products at low price. The solar food dryer will decrease the financial losses as the crops

could be stored without any decomposition for a longer time after the drying process.

Keywords: *Solar drying, solar tunnel dryer, solar water heater, drying.*

IAAHAS/AB/2023/222

Improvement of Biofortified Vegetables through Transgenic Approaches

Amit Kumar Singh and Saroj Kumar Sahu
Division of Vegetable Science
ICAR- Indian Agricultural Research Institute, New Delhi

In recent years, nutritional security has become a top priority after achieving success in addressing food security. Micronutrients and vitamins play a crucial role in human growth and development, and a lack of these nutrients can lead to "hidden hunger" and malnutrition, especially in children and women in underdeveloped countries. Biofortification is an important approach to address this issue, which involves enhancing the nutrient content of staple crops such as cereals and vegetables using conventional breeding methods, modern biotechnology, and agronomic techniques. The aim of biofortification is to increase the essential micronutrients and vitamins in vegetable varieties to improve the nutritional quality of the food supply and provide a public health benefit. This can be achieved through three major techniques: conventional breeding, agronomic approaches, and genetic engineering. Genetic engineering, particularly transgenic technology, allows for the deployment of genes of interest from primary gene pools or unrelated organisms, resulting in crops that are more productive, have a longer shelf life, higher yield, improved quality, and resistance to pests and environmental stressors such as heat, cold, and drought. Enhancing the nutritive value of crops is a key objective of any crop improvement program, and biofortification plays a critical role in achieving this goal.

IAAHAS/AB/2023/223

Quantification of Soil Carbon Pools and Carbon Sequestration rate as Influenced by Bamboo Plantation Grown on Entisol of Semiarid Climate of Maharashtra

Gaikwad A.S.*, Kale S.D. and Bhakare B.D.
Department of Soil Science and Agricultural Chemistry, Post Graduate Institute,
Mahatma Phule Krishi Vidyapeeth, Rahuri – 413 722, Maharashtra, India

A long-term field experiment "Performance of different bamboo species on growth and yield of bamboo" was initiated in the year 2018-19 at NARP, Dryland Sub-Centre (Agroforestry), MPKV, Rahuri. The same experiment was selected for conduct of present study entitled, "Quantification of soil carbon pools and carbon sequestration rate as influenced by bamboo plantation grown on entisol of semiarid climate of Maharashtra" during the year 2020-21. The field experiment was laid out in RBD comprising 3 replications and 7 treatments of bamboo species *viz., Dendrocalamus brandisii* (T_1), *Bambusa nutans* (T_2), *Bambusa balcooa* (T_3), *Dendrocalamus strictus* (T_4), *Bambusa tulda* (T_5), *Bambusa bamboos* (T_6) and *Dendrocalamus asper* (T_7). The experimental site belongs to sandy clay texture. The initial soil of experimental field was slightly alkaline in reaction (pH 8.01), had low EC (0.21 dSm^{-1}) and CaCO3 content (3.37%), was medium in SOC (6.70 g kg^{-1}), low in available N (178.70 kg ha^{-1}), very low in available P (6.10 kg ha^{-1}) and very high in available K (403.20 kg ha^{-1}) content. The average depth of experimental soil is up to 45 cm. The control plot next to the experimental field free from the effect of bamboo species had a BD of 1.51 Mg m^{-3}. After 2nd year of bamboo plantation, the soil under *B. nutans* recorded highest SOC and TOC content (8.07 and 12.9 g kg^{-1} resp.). The soil labile carbon fractions *viz.,* WSC, SMBC & POMC was recorded highest under *B. tulda* (14.08 mg C kg^{-1}, 181.7 mg C kg^{-1} and 1.90 g C kg^{-1},resp.), whereas, soil under *B. nutans* recorded highest POXC content (0.666 g C kg^{-1}) over rest of bamboo species. The highest soil total bacterial, fungi & actinomycetes population and dehydrogenase enzyme activity were recorded under *B. tulda* (11.67 cfu x 10^6 g^{-1}, 11.00 cfu x 10^4 g^{-1}& 10.67cfu x 10^5 g^{-1}, and 3.63 µg TPF g^{-1} hr^{-1}respectively) over other tested bamboo species. Slight reduction in soil pH, EC, $CaCO_3$ content and BD was recorded under the influence of different bamboo species. The soil under *B. tulda* recorded highest

available N, P and K content (191.83, 8.37 and 410.33 kg ha^{-1} resp.) over other bamboo species and its initial soil level. The *B. tulda* recorded highest number of culms per clump (59.32), culm density (49413.56 culms ha^{-1}), number of new culms per clump (13.80) and clump girth (712.27 cm) over rest of bamboo species. Whereas, *D. strictus* recorded highest culm height (6.39 m), basal diameter of culm (8.16 cm), diameter at breast height (7.13 cm), culm girth at 5^{th} internode (16.53 cm) and internodal length (27.51 cm). While, *B. bamboos* showed its superiority over other bamboo species in the case of number of internodes per culm (28.34) and average culm weight (2.31 kg). The *B. nutan* recorded highest aboveground biomass (58.43 t ha^{-1}) while, *B. tulda* recorded highest belowground (5.19 t ha^{-1}) and leaf-litter biomass (3.89 t ha^{-1}) over other bamboo species. Whereas, *B. bamboos* recorded highest biomass per culm (2.31 kg $culm^{-1}$), followed bytreatment *D. strictus* (2.24 kg $culm^{-1}$) and *B. balcooa* (1.96 kg $culm^{-1}$). In the average effect of biomass components, the highest N concentration was found in bamboo leaves (1.51%), P and K concentration in bamboo branches (0.095% and 0.64% resp.) and carbon concentration was found numerically highest in bamboo stem (43.53% C) accordingly. The *B.nutans* recorded highest N uptake (457.83 kg N ha^{-1}) while highest P and K uptake was recorded in *B. tulda* (49.70 kg P ha^{-1} and 409.77 kg K ha^{-1},respectively). After 2^{nd} year of bamboo plantation, the highest plant and soil carbon sequestration rate was observed in *B. nutans* (13.92 & 13.40 t C ha^{-1} yr^{-1} resp.). Among the studied bamboo genotypes, *B. nutans* recorded significantly highest carbon sequestration potential, closely followed by *B. tulda* (27.31 and 25.75 t C ha^{-1} yr^{-1}, respectively).

IAAHAS/AB/2023/224

Dynamics of soil microbial properties in soil under different cropping system of district Hisar, Haryana

Ankit*, Dhram Prakash and Sunita Sheoran

[1]Department of Soil Science, CCS HAU, Hisar, Haryana, India

The effect of rice-wheat, cotton-wheat, pearl millet-wheat and pearl millet-mustard cropping systems on soil microbial properties (Microbial biomass carbon and microbial biomass nitrogen) was examined in this study. The highest and lowest Microbial biomass carbon (MBC) content was observed in pearl millet-mustard and pearl millet-wheat cropping system, respectively. The MBC content in soils under rice-wheat, cotton-wheat, pearl millet-wheat and pearl millet-mustard cropping system ranged from 148.51-357.39, 153.86-273.86, 132.48-345.91 and 162.32-375.46 mg kg^{-1} with the mean value of 262.04, 220.18, 219.07 and 253.90 mg kg^{-1}, respectively. Among the different cropping systems, the MBC content in soils followed the order as: rice-wheat (262.04 mg kg^{-1})>pearl millet-mustard (253.90 mg kg^{-1})>cotton-wheat (220.18 mg kg^{-1})>pearl millet-wheat cropping system (219.07 mg kg^{-1}).The microbial biomass nitrogen (MBN) content in rice-wheat, cotton-wheat, pearl millet-wheat and pearl millet-mustard cropping system ranged from 37.24-80.45, 32.61-49.78, 32.62-63.44 and 34.12-57.51 mg kg^{-1} with the mean value of 54.73, 41.40, 46.41 and 43.48 mg kg^{-1}, respectively (Figure 4.19). The highest and lowest MBN content was observed in rice-wheat and cotton-wheat cropping system, respectively. The rice-wheat cropping system showed the significantly higher MBC content (262.04 mg kg^{-1}) as compared to cotton-wheat (220.18 mg kg^{-1}) and pearl millet-wheat (219.07 mg kg^{-1}) cropping system. The MBN content under rice-wheat cropping system significantly higher (54.73 mg kg^{-1}) as compared to pearl millet-wheat (46.41 mg kg^{-1}), pearl millet-mustard (43.48 mg kg^{-1}) and cotton-wheat (41.40 mg kg^{-1}) cropping system. The soil microbial properties significantly affected by rice-wheat, cotton-wheat, pearl millet-wheat and pearl millet-mustard cropping systems.

Keywords: *Microbial biomass carbon, microbial biomass nitrogen and cropping system.*

Integrated nutrient management prescription for late-sown wheat

A. Trivedi*[1], R. B. Meena[2], R.N. Pandey[3]
ICAR- Indian Agricultural Research Institute, New Delhi- 110 012
[1]Scientist [2]Student, [2]Principal Scientist

Integrated nutrient management prescription was developed for late-sown variety of wheat (HD 3059) through soil testbased crop response study. To develop an integrated fertilizer prescription of late-sown wheat, soil test based crop response study was undertaken. For this, field experiment was conducted for two consecutive seasons (*rabi* 2020-21, 2021-22) and the basic parameters *viz*. nutrient requirement (NR), percentage contribution of nutrients from soil (CS); fertilizer (CF) and farm yard manure (CFYM) were quantified. Fertilizer prescription equations in integration with FYM were developed from the data obtained in the study. In order to produce 100 kg of late sown wheat, the amount of major nutrients needed were 2.24 and 2.27, 0.45 and 0.47, 1.89 and 1.92 kg of nitrogen (N), phosphorus (P)and potassium (K) during 2020-21 and 2021-22, respectively. Phosphorus as soil nutrient contributed the maximum towards crop production; while the contribution of K from fertilizer (118.38 and 125.03) was highest for both seasons. Contribution of N from fertilizer (50.05, 51.38) was more than that of soil (33.81, 33.65). However, contribution of all the nutrients from FYM was lower. The equations developed were used to formulate ready reckoner for a range of soil test values to get a yield target of 55 q/ha for late-sown wheat. Nutrient management of late-sown wheat involving inorganic fertilizer in integration with FYM (10t/ha) was prescribed through the ready reckoner. The study suggests that the excessive amount of fertilizer consumption as well as the subsequent adverse effect on the environment can be curtailed if FYM is used in combination with inorganic fertilizer.

IAAHAS/AB/2023/226

Evaluation of heterosis and combining ability of CMS and Restorer lines based on *Moricandia arvensis* cytoplasm of Indian mustard [*Brassica juncea* (L.) Czern & Coss]

***Nirma Sirvi[1], R. M. Chauhan[2] K. K. Tiwari[2] and Pratibha[1]**

[1]Assistant Professor, COA, MU

[2]S.D. Agricultural University, S.K. Nagar, Banaskantha, Gujarat

The present investigation was undertaken with the objectives of study the magnitude of heterosis and combining ability effects of parents and resulting hybrids for different yield attributing characters. The experimental material comprised of fifty four genotypes consisting of five *Mori* based CMS lines and eight *Mori* based restorer lines crossed in line x tester mating design. The resultant forty hybrids along with their thirteen parents and a standard check (Kranti) were evaluated in randomized block design at Main Castor–Mustard Research Station, SDAU, Sardarkrushinagar, Gujarat. The characters which were studied are days to flowering, days to maturity, plant height (cm), number of branches per plant, number of siliquae per plant, seed yield per plant (g), 1000-seed weight (g) and oil content (%). The analysis of variance of RBD experimental design for all the characters differed significantly for majority of characters. The ANOVA for parents, hybrids and parents vs. hybrids revealed that mean sum of squares of parent vs. hybrids was found highly significant for almost all the characters except days to flowering and number of branches per plant. On the basis of *per se performance*, none of the parent was found promising for seed yield per plant over the standard check Kranti since pollen fertility restorability was not upheavling. With respect to heterosis, none of the hybrid manifested significant and positive standard heterosis for character seed yield per plant. The analysis of variance for combining ability revealed significant differences. On the basis of estimates of general combining ability effects line Mori 'A' SKM 219 and tester Mori 'R' SKM 301 was good general combiner for seed yield and yield attributing traits. With respect to specific combing ability, none of the hybrid noticed promising for all the characters under study.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/227

Impact on Farmers' Income Utilizing Modern Technology in Agroforestry

Arnab Das[1] and Surojit Kar[2]
[1]M.Sc. (Ag.) Agronomy, MCC, Midnapore; [2]M.Sc. (Ag.) Agronomy, JRU, Ranchi

Agroforestry seeks to optimize positive interactions such as mutualism and commensalism and to minimize predation on crops and livestock and competition within and between species. The use of mixed crops and trees increases soil fertility. The trees help to prevent soil erosion while providing protection for farm animals. Due to an ever-increasing population, the available agricultural land resources are gradually reducing and as an alternative utilizing forest and degraded lands through modern scientific technologies is urgently needed for providing more food, livestock, timber and other produces to generate more income to maintain the livelihood status of farmers. In general, most of the forest lands are now gradually becoming converting agroforestry to generate more income. Growing of black pepper (*Piper nigrum*) with forest plants is now adays common. Intercropping of ginger (*Zingiber officinale*), garlic (*Allium sativum*) or bee keeping / sericulture are some common examples. A decade ago, the income of the local farmers of Southern plateau and hill regions of Tamil Nadu was very less. But now with the interactions between the forest officers and local people this degraded land has been converted to agroforestry.

Local farmers not only benefitted with intensive management of *Leucaena* and *Gliricidia* but also tree fodders could potentially replace 20 and 15% of green fodder requirements of dairy cows, respectively. A net income of Rs. 67,680/ha/Year obtained on degraded lands. The apparent high potential of agroforestry systems are its applicability to control soil erosion, soil improvement and conducive microclimate for tree and reduction in the accumulation of greenhouse gases in the atmosphere. Agroforestry has generated rather high levels of enthusiasm in recent years concerning with rain fed land use and sustainable resource management system. It has the most apparent potential in resource limiting small holding farming systems where monoculture agriculture may not be the most feasible or desirable, based on the principles of self-maintenance.

Another important aspect in agroforestry adoption is to explore if agroforestry can lead greater economic returns to the farmers. In different

agro-climatic conditions, various agroforestry models have been previously developed representing different agroforestry practices. This in-turn solves not only the problems of economic theories in agroforestry but also facilitates practical implementation of these agroforestry models in farming systems. All expected costs to be paid and benefits to be received are essentials in the economics of agroforestry models.

Keywords: *Commensalism, intensive management, modern agroforestry, mutualism.*

IAAHAS/AB/2023/228

Influence of Microbial Consortia in Combination with Humic Acid on Growth and Yield of Tomato (*Lycopersicon esculentum*)

B. Bavithra[1]* and S. Sundaravarthan[2]

[1]*Assistant Professor, Department of Horticulture, Sri Manakula Vinayagar Engineering College, School of Agricultural Sciences, Puducherry, India

[2]Registrar, National Institute of Technology, Puducherry

A field experiment was conducted in the Department of Agricultural Microbiology, PAJANCOA&RI, Karaikal (U.T. of Puducherry) to study the Effect of Humic Acid & Microbial Consortia on Growth & Yield of Tomato. Excessive application of chemical fertilizers may affect soil health and sustainable productivity and has increasing concern about health associated with their extensive use. Humic Acid is a relatively stable product of organic matter decomposition and it is an alternate way of Organic crop production to yield more. We examined the effect of Humic acid @ 2ml&4ml concentration along with the combination of microbial consortia @2ml concentration (*Azospirillum*, *Pseudomonas fluorescens* & PPFM) on Tomato. Application of Humic acid @ 2ml along with the microbial consortia had more beneficial effect on shoot length, root length, biomass, plant height, LAI, and Yield in tomato. This is due to

microbial action along with the support of humus in soil which enhances the plant growth.

Keywords: *Microbial consortia, Humic Acid, Growth, Yield, Organic matter, Tomato*

IAAHAS/AB/2023/229

Rooting behaviour of rice (*Oryza sativa* L.) as influenced by the system of establishment and site-specific nitrogen management

Bhavya M R[1,2] and Dinesh Kumar M[1]
University of Agricultural and Horticultural Sciences, Shivamogga, Karnataka
University of Agricultural Sciences, Dharwad, Karnataka

The development of plant roots is known to play a very important role in the uptake of water and nutrients by rice plants. Root biology is at the forefront of progressing fields to improve agricultural productivity in different input systems. Quantitative information about root morphological characteristics is useful for understanding the relationships between morphological plasticity and environments. A different method of establishment in rice has been given serious thought in the wake of water scarcity and less availability for agriculture. System of rice intensification (SRI) and aerobic rice have emerged as alternatives for traditional transplanting (conventional) with holistic management of resources; that's why these are considered systems rather than technology. Effective management of fertilizer, particularly nitrogen, is a major challenge for researchers and producers. Hence, decisions regarding improvement in fertilizer nitrogen (N) use efficiency begin at the field scale. A new concept, called the site-specific nutrient management (SSNM) approach, provides timely application of fertilizer at optimal rates to fill the deficit between the nutrient needs of crops and nutrient supplying capacity of the soil. In the present study, an effort is made to understand the rooting in these systems with different N management approaches. A field experiment was conducted during the *Kharif* 2014 and 2015 at the College of Agriculture, Navile, Shivamogga comes under Zone-7 of

Karnataka. The experiment was laid out in a spilt-plot design with three rice systems of establishment as main plots (aerobic, SRI and conventional) and four N management approaches as subplots [Soil test and crop response (STCR), Soil test Based on lab (STL), Leaf colour chart (LCC) and Recommended fertilizers (RDF)] forming 12 treatment combinations with three replications. The variety used in the experiment was KRH-4. 12 days old single seedling hill^{-1} was carefully planted at a spacing of 25 x 25 cm in the SRI system. Two seeds were dibbled per spot at a spacing of 25 x 25 cm and depth of not more than 2 cm, accounting seed rate of 5 kg ha^{-1} and only one seedling was maintained after 10 days of sowing by removing the excess seedling and necessary gaps were filled during the time in case of an aerobic system. 21 days old one seedlings hill^{-1} was planted at a spacing of 20 x 15 cm in the conventional system. The pooled data from 2014 and 2015 revealed that the SRI system recorded significantly higher dry weight of root (12.64 and 19.30 g plant^{-1}), root length (28.93 and 30.09 cm), and root volume (40.77 and 47.05 cm^3) over aerobic and conventional systems at 60 DAS/T and at harvest, respectively. But, the specific root length was significant with the aerobic system compared to SRI and conventional at 60 DAS/T and at harvest, respectively (4.46 and 2.09 cm g^{-1}). The increase in the root characteristics under the SRI system is mainly a combination of transplanting early aged (12-14 days), single seedlings hill^{-1} followed by intermittent necessary irrigation leading to better growth, shallow depth of planting with wider spacing (25 x 25 cm) and least injury to the roots and quickly established after transplantation. Among different N management approaches, the STCR approach recorded significantly higher dry weight of root (11.16 and 17.86 g plant^{-1}), root length (27.20 and 28.81 cm), and root volume (33.04 and 39.22 cm^3) over other N management approaches. But the specific root length was significantly influenced only at 60 DAS/T. Due to no dearth of nutrients or toxicity being noticed in the rhizosphere over other approaches of N management. Interaction effects were also found significant. It is concluded that the SRI system of rice establishment with the STCR approach of N management was found best to obtain good rooting behaviour and yield in rice farming.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/230

A Green Approach to Pest Management: Using Botanicals to Tackle Pulse Beetle Infestations

Biplove Bala
MSc (Ag.) Entomology
Department of Entomology, School of Agricultural Sciences and Rural Development (SASRD), Nagaland University (NU), Medziphema (797106), Nagaland, India

Storage pests such as the pulse beetle are a significant threat to food security, and the use of chemical insecticides for their control has raised concerns about environmental contamination and human health risks. Botanicals have shown promise as effective pest control agents due to their natural origin, low toxicity, and eco-friendly nature. In addition, biopesticides derived from natural sources, including microorganisms, plants, and their extracts, are being increasingly recognized as safer and more sustainable alternatives to chemical pesticides. This focuses on the use of biopesticides for the control of pulse beetle in stored food grains. Various biopesticides, including microbial agents, botanical or plant extracts, and their formulations, have been tested and shown to exhibit potent insecticidal properties against the pulse beetle. These biopesticides act through different modes of action, including disrupting the insect's growth and development, interfering with their feeding behavior, and inhibiting their reproduction. Also highlights the potential of combining biopesticides with other pest control strategies, such as physical and cultural methods, to achieve effective pest management. The use of biopesticides in pulse beetle control could offer a sustainable and eco-friendly solution for farmers and food processors.

Keywords: *Botanicals, biopesticides, natural origin, eco-friendly, plant extracts, pulse beetle and Storage pests.*

IAAHAS/AB/2023/231

Post-Lambing behaviour of Muzzafarnagri Lamb

Birendra Singh[1], Hemant Kumar Singh[2], Aye Soe[3], Deepak Kumar Chopra[1], Pratibha Jareda[1], Manoj Kumar Singh[4], K. D. Singh[5]

[1]Ph.D. Scholar, Department of Livestock Production Management, ICAR-NDRI, Karnal

[2]Ph.D. Scholar, Department of Veterinary Parasitology, ANDUAT, Kumarganj, Ayodhya

[3]Ph.D. Scholar (International),
Division of Veterinary Gynecology and Obstetrics, ICAR-NDRI, Karnal

[4]Assistant Professor, Department of Livestock Production Management,
SVPUAT, Modipuram, Meerut.

[5] Assistant Professor, Department of Livestock Production Management,
ANDUAT, Kumarganj, Ayodhya

The post-parturient behavior of 10 Muzzafarnagri lambs was observed at the Livestock Farm Complex, A.N.D.U.A.T., Kumarganj, Ayodhya. The Muzzafarnagri sheep flock was maintained at the university livestock farm complex with the goat flock through intermixed farming. Both sheep and goats are grazed, and stall feeding is done. This exploratory behavior—the post-lambing behavior of lambs—was recorded and visualized. The lamb started attempting to stand 4.08 ± 0.34 min after birth. The lambs made 9.42 ± 0.45 numbers of attempts to stand after birth. The average time taken by lambs to first stand was 25.75 ± 0.51 min after birth. Most of the lambs (75%) showed preferences for the left teat for their first suckle, and about 25% preferred the right teat for their first suckle.

Keywords: *Post-parturient behaviour, lambing presentation, dystocia, placentophagia*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/232

Impact of climate change on Indian food security

Dr. Deshmukh P.R., A.S. Rathod., Kausadikar K.D. and Lad A.S.
Department of Agricultural Extension Education, College of Agriculture, VNMKV, Parbhani

Climate change is a serious threat to global food security, sustainable development and poverty eradication. India is among the countries which are at the greatest risk of food insecurity due to weather extreme caused by climate change. To feed the growing global population, and to provide the basis for economic growth and poverty reduction, agriculture must undergo a considerable transformation. Climate change has added to the enormity of India's food security challenges. While the relationship between climate change and food security is complex, most studies focus on one dimension of food security, i.e., food availability. This paper provides an overview of the impact of climate change on India's food security. This task will be made more difficult by climate change. More extreme weather events and an increased unpredictability of weather patterns have already made an impact on agriculture and food security, leading to production reductions and lower incomes in vulnerable areas. In spite of the considerable progress made during the last several decades in reducing hunger, as of 2015 almost 800 million people are chronically undernourished. An estimated 161 million children under five years are stunted. At the same time, 500 million people are obese. Two billion people lack the essential micronutrients they need to lead healthy lives. FAO estimates that, to satisfy the growing demand driven by population growth and dietary changes, food production will have to increase by 60 percent by 2050.

To tackle food loss and waste and manage flood and drought risks. The farmers have distribution of improved, drought-tolerant seeds, more efficient irrigation, and expanded use of forestry for farming and conservation agriculture techniques. The farmers more sustainably manage their land and brought more sustainable farming practices.

Keywords: *climate change and food security*

Effect of intercropping on soil properties and yield of cabbage with poultry excreta treatment under two different levels of mulberry spacing in phayeng, Manipur

Angom Aruna Devi[1], L. Nabachandra Singh[2] and Kalidas Upadhyaya[1]

[1]Department of Forestry, Mizoram University, Tanhril, Aizawl Mizoram-796004,

[2]Department of Agronomy, College of Agriculture,
Central Agricultural University-795004

The study was carried out at the mulberry farm of Phayeng, Manipur, to gain insight into the effect of intercropping on soil properties and yield of cabbage. The spacing of the mulberry tree was determined as 3'x4' (S_1) and 3'x8' (S_2). The distinctive crop combinations were, Mulberry + no agricultural crop+ without poultry treatment (T_1); Mulberry + no agricultural crop+ with poultry treatment (T_2); Mulberry + cabbage + without poultry treatment (T_3); Mulberry + cabbage + with poultry treatment (T_4). Physio-chemical properties of soil collected from each plot were analysed. High nutrient contents were found in soil treated with poultry manure. Significant difference was observed between soil treated with poultry manure and soil without poultry manure treatment. However, significantly higher cabbage yield parameters were found in T_4 as compared to T_3 with head weight (2.231 kg; 1.461kg), head diameter (17.944cm; 16.189cm), number of outer leaves (7.889; 7.214) and weight per leave (0.461 kg; 0.417 kg) for both the spacings, respectively. The study revealed that application of poultry manure in cabbage intercropped with mulberry can enhance the soil properties and crop yield.

Keywords: *Morus alba, intercropping, cabbage, yield, soil nutrients, poultry excreta.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/234

Effect of genotype and fertility level on plant population and mortality of pigeonpea [*Cajanus cajan* (L.) Millsp]

Kamalkant Yadav
Ph.D. Scholar (Agronomy) at G. B. Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar, Uttarakhand

The field experiment was conducted to study Effect of genotype and fertility level on plant population and mortality of pigeonpea [*Cajanus cajan* (L.) Millsp] during *Kharif* season (2018) in Pulse Agronomy Block of the Norman E. Borlaug crop research centre of G. B. Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar, Uttarakhand. The soil of experimental field was sandy loam in texture having high organic carbon (0.83 %), low available nitrogen (270.9 kg/ha), high available phosphorus (26.1 kg/ha) and medium available potassium (230 kg/ha), with slightly alkaline soil reaction (pH=7.3). The experiment was laid out in randomized block design with two factors and three replications. Treatments were consisted of three genotypes *viz.,* PA 421, PA 291 and UPAS 120 and four fertility levels *viz.,* control (no fertilizer), 75 % RDF, 100 % RDF and 125 % RDF. The fertilizer was applied as basal, using RDF (18:48:24 kg/ha N: P_2O_5: K_2O), which was fulfilled through 150 kg/ha NPK mixture (12:32:16). Other standard agronomic practices were adopted during crop cultivation.

The result apparently indicated that the genotypes had the non-significantly impact on plant population and mortality but in genotype PA 421 numerically higher plant population with PA 291 and UPAS 120. Under different fertility levels did not have a significant influence on the initial and final plant population and mortality percent.

Keywords: *RDF (Recommended dose of fertilizer), % (Percent), mortality, initial population and final population,*

Collection and evaluation of cut foliage under Shevaroys condition

M. Anand, P.R. Kamalkumaran and V.A. Sathiyamurthy
Department of Food Process Engineering, TNAU, Coimbatore

An experiment was conducted for the Collection and evaluation of cut foliage under Shevaroys condition at Horticultural Research Station, Tamil Nadu Agricultural University, Yercaud during the year 2019 - 2022. The experimental site is geographically situated between 11° 04" to 11° 05" North latitude and 78° 05" to 78° 23" East longitude and at an altitude of 1500 m above Mean Sea Level. The average maximum and minimum temperature were 31.0°C and 12.4°C. The mean annual rainfall of Yercaud was 1572.0 mm in 47 rainy days. The average relative humidity was 75 per cent. Fourteen species of foliage plants namely *Dracaena reflexa, Dracaena sanderiana, Dracaena fragrans 'Massangeana', Cordyline chocolate queen, Philodendron xanadu, Phioldendron red emerald, Hypericum, Ming fern, Ribbon fern, Blechnum Polupodiaceae, Nephrolepis Hirustuta, Rabbit foot fern, Asparagus densiflorus var. sprengeri, Asparagus densiflorus var. Mayers* planted in protected and open field condition. Five plants from each cultivar in each replication were used as tester for recording observations on characters like Plant height (cm), No of leaves, Plant spread (cm), Leaf length (cm), Leaf width (cm), Leaf production interval and longeivity in plant(days), vase life in water(days).

In protected condition among the Dracaena species the maximum leaf production was observed in *Dracaena fragrans 'Massangeana'* (87.55 numbers) and minimum in *Dracaena sanderiana* (30.50 numbers). Among the ferns maximum number of leaves was observed in *Rabbit foot fern* 64.50 numbers followed by *Ribbon fern* of 50.75 numbers under protected condition. Under open field condition highest leaf production was observed in *Dracaena fragrans 'Massangeana'* (99.80 numbers) and minimum in *Dracaena reflexa* (34.00 numbers). *Philodendron xanadu* recorded the highest plant height of 53.75 cm and maximum number of leaves of 82.50 numbers *and Phioldendron red emerald* lowest plant height of 46.50 cmand number of leaves of about *56.25* numbers*.* Among other the fillers *Philodendron xanadu and Asparagus densiflorus var. sprengeri* performed well. The leaflet production intervals was quick in *Dracaena sanderiana* and which recorded 14.09 days in protected and

11.25 days in open field condition. Among the *Philodendron species Philodendron xanadu* with 21.96 days in protected condition and 19.00 days in open field condition. *Asparagus sprengeri* production of 21.89 days was recorded in protected field condition and 19.50 days in open field condition.

IAAHAS/AB/2023/236

Antifungal activity of different *Trichoderma* spp. and plant extracts against *Sclerotinia sclerotiorum* (Lib.) de Bary causing stem rot of mustard

Md Zulkar Nain, R. U. Khan, Vaibhav Pratap Singh and Sibte Sayyeda
Department of Plant Protection, Faculty of Agricultural Sciences, Aligarh Muslim University, Aligarh, Uttar Pradesh

The present study was conducted to evaluate the bio-efficacy of different *Trichoderma* spp. and plant extracts against *Sclerotinia sclerotiorum* under laboratory conditions. All the tested *Trichoderma* spp. and plant extracts showed a significant effect on growth inhibition of test fungus over control. Among different *Trichoderma* spp., maximum growth inhibition (73.33%) was observed with *T. viride* followed by *T. harzianum* (67.77%). While as the least efficacy was found in *T. atroviride* (38.37%) against the pathogen. Of all, *Allium sativum* was proved to be most potent at all three tested concentrations (5, 10, and 15%), thereby registering 59.26, 67.41, and 100.0% growth inhibition followed by *Azadirachta indica* and *Lantana camara*, respectively. However, *Argemone maxicana* was least effective at all concentrations in this study.

Keywords: *Trichoderma spp., plant extracts, rapeseed-mustard, Sclerotinia stem rot, in vitro.*

Utilization of bioslurry for eco-friendly agriculture

Ritu Nagdev[1,2], Ambrina Sardar Khan[3], Renu Dhupper[4] and Shakeel Ahmed Khan[5]

[1]Ph.D Scholar, Amity Institute of Environmental Sciences, Amity University, Uttar Pradesh

[2]Scientist, ICAR-National Bureau of Soil Survey and Land Use Planning, RC, New Delhi

[3]Assistant Professor, Amity Institute of Environmental Sciences, Amity University, Uttar Pradesh

[4]Associate Professor, Amity Institute of Environmental Sciences, Amity University, Uttar Pradesh

[5]Principal Scientist, ICAR-Indian Agricultural Research Institute (IARI), New Delhi

The current world situation undeniably highlights the necessity to adopt eco-friendly agriculture practices for sustainable food production. In order to boost the yield of crops, the farmer must utilize both chemical and organic fertilizers can add nutrients to the soil. The production of the land will decrease if just inorganic fertilizers are consistently given to the soil without include organic manure. At present a substantial amount of biogas sludge is produced in India. Untreated discharge will cause environmental pollution and sewage disposal will be very expensive. Thus, replacing chemical fertilizers with bioslurry cannot only achieve resource utilization of bioslurry, but also reduce the amount of chemical fertilizer. Bioslurry plays a significant role in development of agriculture by incorporating plant nutrients, strengthening cation exchange capacity, improving soil aggregation, stabilising soil humic content and raising soil water holding capacity. The resource utilization of bioslurry seems to be potential and necessary. Therefore, in the present study we had made an effort to examine the effectiveness of bioslurry as a nutrient source for the eco-friendly agriculture. Thus, bioslurry samples were collected and analysed. Bioslurry consists of 88% water and 12% dry matter of which 4% was organic and 3% inorganic matter. It has been also found that the bioslurry constitutes sufficient macro nutrients *viz*., nitrogen, phosphorus, and potassium and micro nutrients *viz*., zinc (Zn), copper (Cu), iron (Fe), and manganese (Mn), etc. Experimental study has found that bioslurry promotes the establishment of healthy soil, development of agriculture and sustainable

food production and it also promising win-win opportunity as at the same time it prevents adverse environmental impacts of waste disposal.

Keywords: *Chemical fertilizer, bioslurry, environmental impact, eco-friendly agriculture and sustainable food production.*

IAAHAS/AB/2023/238

Integrated Management Strategies for Citrus Greening Disease

Y.V. Ingle and D. H. Paithankar
AICRP on Fruits, Dr. PDKV, Akola-444104 (Maharashtra) India

Citrus greening (*Candidatus liberibacter asiaticus*) is the most destructive citrus disease worldwide and is threatening the sustainability of the industry in major citrus-growing regions. The field trial was laid out with seven integrated approaches treatments at All India Research Coordinated Project on Fruits scheme, Dr. PDKV, Akola during the 2020-21. The systemic insecticide Imidacloprid 17.8 SL @0.5 ml/l water was used to control the vector citrus psylla at the time of new flush emergence. Two sprays of Tetracycline hydrochloride @ 6 g/ 10 lit of water at 45-day intervals from October to December, as well as soil applications of 50% more than the recommended dose of Phosphorus and 15 days' later zinc sulphate, ferrous sulphate (200 g/tree each), have been found to be effective in reducing disease severity, increasing canopy volume, fruit yield /kg of tree, and maximizing monetary return. For the treatment of greening disease, antibiotics and nutritional supplements have been proposed.

IAAHAS/AB/2023/239

Waste Decomposer: A Promising Tool for Agricultural Waste Management and Soil Health Restoration

Gummadala. Kasirao[1*], P. Himavarsha[1], Shivsingh Tomar[2]

The use of these wastes has become a welcome issue as agricultural waste has recently been recognized as a significant environmental problem. The most prevalent type of organic waste is lignocellulosic waste, which is also one of the most crucial ingredients in the creation of compost. Crop wastes were primarily burned in the fields. Agricultural waste biodegrades into compost and is then incorporated into the soil, which may increase nutrient recycling and soil fertility. This results in the waste of renewable organic sources in the soil and affects the C:N ratio and biota. To solve this issue, the National Centre of Organic Farming in Ghaziabad created a product called Waste Decomposer. It is a group of a few helpful microorganisms that Krishan Chandra 2004 isolated from desi cow dung. The decomposer of waste also functions as a biofertilizer, a biocontrol agent, and a restorer of soil health. Additionally, it can be used in many other ways, including in-situ composting of crop residue and seed treatment, drip irrigation, foliar spraying as a biopesticide against the majority of plant diseases for all types of agriculture and horticulture crops, and rapid composting of bio wastes. The waste decomposer bacterium creates secondary metabolites such as polyketides and alkanes, as well as primary metabolites that serve as precursors of anti-microbial chemicals. These antimicrobial byproducts help the field crop, which reduces the number of diseases. Besides this, it also produces glucanase and â-1,3glucanase enzymes which trigger defence mechanism of the plant.

Keywords: *Waste decomposer, Soil health, Biopesticide, Agricultural waste, Environment, Compost, Organic carbon.*

IAAHAS/AB/2023/240

A multi-objective behaviour of biochar to enhance soil properties

Daniel Prakash Kushwaha*, Anil Kumar
G. B. Pant University of Agriculture and Technology,
Pantnagar – 263145 (U. S. Nagar), Uttarakhand, India

In 147 Mha of land in India, out of a total area of 328 Mha, soil degradation is taking place. One of India's biggest environmental issues is the decline in soil quality caused by soil erosion and use of inappropriate soil amendments. Poor soil quality reduces crop yields because it has an impact on agricultural production, which in turn has an impact on the nation's socio-economic development. There are several soil amendments in use, but the majority of them are insufficient to stop soil deterioration issues for an extended length of time. In addition to this, many amendments are expensive, labor-intensive, or provide less benefit than desired. Long-term applications of inorganic soil supplements have a negative impact on the characteristics of the soil. One of the main environmental difficulties for researchers is to improve the soil qualities on hills and plains with the use of efficient soil amendment without harming agricultural yield. Biochar is an organic, affordable, and multi-objective soil supplement that has a favorable impact on the physical, chemical, and biological characteristics of soil by enhancing hydraulic conductivity, lowering bulk density, and changing the structure and aggregation of the soil. Seasonal soil temperature is adjusted by biochar, which also improves nutrient uptake, infiltration, and biomass growth. It also lessens runoff flow, soil erosion, and surface crusting. Unlike other soil additives, biochar lasts in the soil for thousands of years and does not need to be applied annually. In two years of experimentation, it was obtained that applying 15 t/ha of biochar reduced nitrogen loss through runoff by 81.55% and bulk density by 2.49%, enhanced hydraulic conductivity by 10.92% and above-ground biomass by 149.09% on a 12% hill slope. These results showed that biochar could be a useful soil supplement for restoring degraded soil and boosting agricultural output on plains and hills.

Keywords: *Biochar; Soil degradation; Soil properties; Soil productivity; India*

IAAHAS/AB/2023/241

Regenerative Agriculture: Improving Soil Health and Enhancing Biodiversity

Deepak[1]& Bijan Kumar Mondal[2]
[1&2]M.Sc., Division of Soil Science and Agricultural Chemistry IARI, New Delhi

Regenerative agriculture is a holistic approach to farming that focuses on restoring soil health and enhancing biodiversity. Unlike conventional agriculture, which relies heavily on synthetic inputs and intensive cultivation, it is a comprehensive method of farming that emphasizes on improving biodiversity and restoring soil health. It places an emphasis on using natural systems and processes to enhance soil health, build resilience, and support sustainable food production. At the heart of regenerative agriculture is a focus on soil health. Healthy soils are critical to supporting plant growth and biodiversity, as well as sequestering carbon from the atmosphere by using practices like cover cropping, crop rotation, and reduced tillage, regenerative farmers can improve soil structure, increase soil organic matter, and enhance soil fertility. These practices not only benefit the environment but also lead to increased yields and profitability for farmers. It also depends heavily on increasing biodiversity. By creating various habitats for plants and animals, regenerative farmers may increase the resilience of their farms and provide a range of ecosystem services. Examples include controlling pests, pollination, cycling nitrogen, and holding onto water. Regenerative farmers may improve the resilience of their farms and offer a variety of ecosystem services. They do this by creating different habitats for plants and animals. This can involve everything from nutrient cycling and water retention to insect control and pollination. Regenerative agriculture is gaining popularity worldwide, but it still has a lot of obstacles to overcome. These include restricted market access, a lack of technical expertise, and insufficient financing for Research and Development. However, as the value of sustainable agriculture and the potential of regenerative methods become more widely understood, consumers, governments, and farmers are all lending their support to this strategy. In general, regenerative agriculture offers a system that not only promotes healthy food production but also works to make the world healthier for future generations by improving biodiversity and restoring soil health.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/242

Exogenous application of $CaCl_2$ to improve the shelf life and disease resistance in dragon fruit (*Hylocereus undatus*)

[1]Deepak Thorat, [1]Vishal Johar*, [2]Vanita N. Salunkhe and [1]Tanpure Pratik Sambhaji

[1]Department of Horticulture, School of Agriculture,
Lovely Professional University, Phagwara (Punjab) – 144111
[2]School of Soil Stress Management, ICAR-National Institute of Abiotic Stress Management, Baramati (Maharashtra) – 413115

The present study entitled "Exogenous application of $CaCl_2$ to improve the shelf life and disease resistance in dragon fruit" was carried out at the research area of National Institute of Abiotic Stress Management, Baramati. The study was laid out in a completely randomized block design with three replications and five different levels of $CaCl_2$ i.e. 0, 1, 2, 3 and 4 g/L on fully matures fruits by two different methods i.e. spraying and soaking. The fruits were further inoculated with *Colletotrichum gloeosporioides* sporesuspensions to evaluate the incidence of anthracnose. The results revealed that the number and size of the lesion decreased with increasing concentration of $CaCl_2$ however, the residual effect of Calcium increased with the increasing concentration in mature fruits. However, increasing concentrations had no significant effect on various biochemical parameters namely total soluble solids, total phenol, flavonoids, sugars, antioxidants etc.

Keywords: *Exogenous, $CaCl_2$, Shelf life, Disease resistance and Dragon fruit*

IAAHAS/AB/2023/243

Development and Quality Evaluation of Black Rice Cakes

P. Vijaya Shama and G. Nirmala Devi
Department of Food Science and Nutrition, College of Community Science,
Acharya N.G. Ranga Agricultural University, Lam, Guntur, Andhra Pradesh-522034

Black rice is one of the coloured rice variants that is particularly rich in nutrients and bioactive substances with health advantages. Black rice extract is an excellent natural food colouring dye. Its pigments can generate different hues of colours from black to purple. Wheat flour cake has gained popularity in most tropically developing nations, notably among children and adolescents. The selected six black rice varieties including Burma black (control), BPT 2841, BPT 2848, BPT 3136, BPT 3137 and BPT 3145 were studied. The flour mixture of black rice and wheat flour was prepared in the following ratios of 100:0(control), 90:10(T1), 80:20(T2), 70:30(T3) and 60:40(T4). Panelists accepted cake made with 60% black rice and 40% wheat flour (T4) as the control, while T1, T2, and T3 were rejected. As a result, the T4 formulation was used for further cake preparation using selected black rice genotypes. The sensory evaluation was estimated using the Hedonic rating scale and proximate composition was estimated using AOAC, 2005 method. The results obtained for appearance, colour, flavour, texture, taste and overall acceptability indicated a significant difference ($p<0.05$) among the rice varieties. The overall acceptability was scored highest for BPT 2848 (8.92) and lowest for BPT 3136 (7.08). Regarding proximate composition, protein and fat content revealed significant differences. Burma black had the highest protein mean value (7.32%) and fat mean value (0.50%), while BPT 3137 had the lowest protein mean value (6.16%) and fat mean value (0.43%). The energy results revealed no significant differences among the rice varieties. The average energy of cake was found to be 360kcal/100g. ANOVA showed significant differences for sensory parameters and non significant differences among the rice genotypes in the proximate composition of black rice cakes. Hence, Bakery products like black rice cakes can be used as a vehicle to attain nutritional security in the country.

IAAHAS/AB/2023/244

Suitability of Cotton Relay Cropping in Banana for Sustaining Crop Productivity Under Changing Climate in Cauvery Delta Zone of Tiruchirappalli District in Tamil Nadu

V.Dhanushkodi[1], R. Nageswari[2], S. Sangeetha[3], K. Senthil[4], S. Rathika[5], T. Ramesh[6], and R. Anitha[7]

[1,2,4,5,6,7]Anbil Dharmalingam Agricultural College and Research Institute, Tiruchirappalli, Tamil Nadu, India

[3]Horticultural College and Research Institute for women, Tiruchirappalli, Tamil Nadu, India

Banana (*Musa* sp.) is the second most important fruit crop grown next to mango in India. At the global level, India is the largest producer and as well as the prime exporter of banana. Cotton-Banana (CW) is an important cropping system in the Cauvery Delta region, especially in Tiruchirappalli district in Tamil Nadu. Cotton is mostly grown in rainfed and garden land. However, In Delta region, it is growing as a relay crop in banana rather than the sole crop. However, delayed cultivation of cotton after banana is not adopted due to lack of time for the next crop rotation. Together, the late-sown cotton crop suffers from heat stress, flower and boll shedding and pest infestation. Hence, the early sowing and relay system of cotton in banana is preferred to increase the productivity of cotton by overcoming the problems. However, planting of cotton is practiced at the maturity stage of the banana in the cotton-banana cropping system. Since the residual moisture available in the land is favourable, relay intercropping of cotton in the banana crop seems a viable option for getting more income. Hence, investigations were carried out during 2019-20 & 2020-21 to evaluate the role of relay cropping of cotton in improving the productivity of the cotton banana cropping system and the income of farmers. Bananas were planted in 1.8 x 1.8 m (Nendran variety) and 2x2 m (Ranipoovan variety) for planting cotton in 0.75 m and 1.50 m rows apart. Cotton was planted in fallow land and bananas planted in 0.75 (C2) and 1.50 m (C3) rows. Land equivalent ratio in relay cropping were 1.01-1.02 in

cotton two rows in in both the variety (Ranipoovan and Nendran). Production efficiency of cotton two row as inter crop in banana by 1096.2 (Ranipoovan) and 967.7 kg ha^{-1} day^{-1} (Nendran). Moreover, net benefits from relay cropping were 2911.2 Rs. $ha^{-1}day^{-1}$in Ranipoovan and Nendran 2403.8 Rs. $ha^{-1}day^{-1}$ cotton two rows. It is concluded that cotton relay cropping (two rows) of bananas resulted in better production efficiency and the highest economic returns. Therefore, cotton relay cropping (two rows) in banana is recommended for improving the system's productivity to increase crop productivity under in a changing climate.

IAAHAS/AB/2023/245

Climate Change: Its Impact on Biodiversity, Food Safety and Food Security in India

Dibyajyoti Nath[1*], D. Selvi[2] and S. Thiyageshwari[2]

[1]Ph.D. Scholar, Department of Soil Science, Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar, India

[2]Professors, Department of Soil Science and Agricultural Chemistry, Tamil Nadu Agricultural University, Coimbatore, India

For the survival of biodiversity and the accomplishment of food safety and security in India, climate change has emerged as a significant problem. This scholarly review explores the intricate and interconnected ways that climate change has an impact on these significant sectors. Extreme weather events, rising temperatures, and changed rainfall patterns all contribute to biodiversity loss, which has serious negative effects on both ecology and human health. The availability, accessibility, and cost of safe and nourishing food for millions of people in India are jeopardized by changing climatic conditions, which also have an impact on food production and delivery. In order to give a thorough study of the effects of climate change on biodiversity and food systems in India, the review synthesizes previous studies and publications. It analyses the connections between biodiversity loss, food production, and livelihoods and draws attention to how vulnerable certain

ecosystems and places are to climate change, including the Himalayan region and coastal locations. The assessment also analyses the necessary policy responses and adaptation options, such as enhanced food system governance, climate-resilient agriculture, and biodiversity protection measures.The scientific study highlights the importance of acting quickly to decrease the consequences of climate change on India's biodiversity, food security, and safety. It calls for a comprehensive and integrated strategy that acknowledges the interconnection of ecological, social, and economic systems and places a high priority on the welfare of weaker communities and ecosystems. The review adds to the corpus of knowledge and provides guidance to practitioners, researchers, and policymakers to create a resilient and sustainable future.

Keywords: *Climate change; Food safety; Biodiversity; Food security*

IAAHAS/AB/2023/246

Seed – A Vital Input in Agriculture

Navneet Shetty and Khushboo Chandra
Faculty of Agricultural Sciences, SGT University, Gurugram

A few aspects of seed technology that are essential for increasing agricultural productivity include the introduction and evaluation of improved crop plant varieties, seed certification and quality control, seed testing and storage, marketing, distribution, seed manufacturing and processing, and seed research. Seed technology is an essential instrument for ensuring a safe food supply and an efficient carrier of cutting-edge technologies. Using less suitable producing zones is the primary tactic for assuring crop yield. One of the most important uses of seed technology in agriculture is the quick and economical delivery of high-quality seeds. A few aspects of seed technology that are essential for increasing agricultural productivity include the introduction and evaluation of improved crop plant varieties, seed certification and quality control, seed testing and storage, marketing, distribution, seed manufacturing and processing, and seed research. Improved Seed transports New Technology: When high-quality seed from new types is introduced and other inputs are

strategically mixed, the amount of yield is significantly increased. Thanks to the development of high yielding, newly created dwarf wheat varieties, Indian wheat output climbed from 12 million tonnes to become self-sufficient in ten years. The high yielding variety programme has been successfully implemented in India, which has drastically increased agricultural output and significantly lowered imports. Better Seed is a Basic Instrument for a Security Food Supply. Most crops are witnessing higher exports despite the rapid population rise. A Crucial Instrument for Ensuring Crop Yields in Unfavourable Production Conditions is Improved Seed. By using the appropriate kinds of high-quality seed, regions were able to guarantee greater agricultural outputs. During the rainy season in Jawar, the drought-resistant cultivar M-35-1 provided significant benefits to disaster-prone areas. Having access to the National Seed Reserve Stock (NSRS) during the widespread droughts and floods would be far more cost-effective for the government. Improved seed can help with quick agricultural recovery in the event of a natural disaster. NSRS has two objectives. It also supplies seed for resowing in disaster zones in addition to supplying improved seed in fruitful regions at times of need (Normally which is not available with farmer in time). The main objective of seed technology is to increase agricultural output through the spread of high-yielding, superior seed variants. A faster spread of newly established (released) plant breeder-developed varieties would boost agricultural production. To maintain their carefully planned planting schedules or harvesting windows, farmers must have access to enhanced seeds for new types well in advance. High-quality seed can be used for planning and planting. To receive the predicted benefits from employing greater verities' viewpoints, it is necessary. The average farmer should be able to afford the price of high-quality seed.

Keywords: *Seed, Environment Vagaries, Genetic Purity, Seed Health, Agriculture.*

IAAHAS/AB/2023/247

A rare case of combined hepatocellular cholangiocellular carcinoma in duck

Diksha Kandpal, Rakshita Sharma, Paras Saini, Sameer, Vishal, Deepika Lather

Department of Veterinary Pathology, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana

Combined hepatocellular cholangiocellular carcinomas are the rarest form of primary hepatic tumors in avian species. Many reports of cHCC-CCA have been reported in animals with minimum reports in avian family. The present article deals with the occurrence of cHCC-CCA in duck reported to Veterinary pathology department, LUVAS. Grossly the duck was emaciated with presence of blood in the abdominal cavity, pale enlarged liver yellow to green raised firm nodules of varying sizes. Histopathological examination confirmed mixed hepatic tumor as both hepatocellular and cholangiocellular carcinoma lesions were evident. Increased proliferation of the bile duct along with fatty change in hepatocytes with altered cytoplasm-nuclei ratio, anisokaryosis, anisocytosis, binucleation and presence of mitotic figures. Special staining revealed presence of thick fibrous capsule separating the tumor masses.

Keywords: *cHCC-CCA, duck, liver, masons trichome*

IAAHAS/AB/2023/248

IWM: A Holistic Approach of Weed Management in Millets

Diksha Sharma, Rupam Bharti, Dr. Jagdish Choudhary*

M.Sc (Ag.) Agronomy Student, *Associate Professor, MPUAT (Udaipur)

Millets (coarse cereals) are the nutri-cereals which serves traditionally as the staple food of the many dry land regions of the world. They are climate smart crops due to their climate compliant characteristics (photosensitive and drought tolerance) which can play a vital role in crop diversification, meeting

the food, fodder and nutritional security of the country with changing climatic scenario. Being a poor competitor against weeds especially during the early stages of growth due to their slow initial growth and wider spacing millets are subjected to yield losses which varies from 5 to 94 per cent depending on climatic, edaphic and biotic factors. Strategies for weed management in millets involves gaining knowledge about growth and life cycle of weeds, methods of reproduction and distribution, seed dormancy, critical period of crop weed competition, which would help us in identifying the appropriate methods for sustainable weed management. Generally, 20- 35 DAS is considered as the critical period for crop weed competition in millets. Millets suffer from weed flora consisting wide range species of grasses, sedges as well as broad leaved weeds. There are different methods of weed control which comprises of cultural, physical, mechanical, biological, allelopathic and chemical methods. Manual method is the most commonly adopted method for weed control in millet. But the non-availability of manpower and ever increasing labour wages are the constraints. The most viable method of weed control is chemical method. It is avoided due to ill effects on environment. Therefore, a system that combines herbicides with cultivation and other crop husbandry practices can be adopted. Instead of relying on any single method of weed control, all the feasible methods are to be integrated in a holistic manner for the effective and sustainable management of weeds in millets. Integrated weed management can effectively solve and overcome the dilemma of weed shift and development of weeds resistance and can reduce the weed seed bank and manage the weeds below the economic threshold level to avoid any economic losses.

IAAHAS/AB/2023/249

Nutrient management in Dill Seed (*Anethum graveolens* L.) under south Gujarat condition

[1]Vaishali H. Surve, [2]Seema Sharma, [3]D. D. Patel and [4]C. K. Patel
College of Agriculture, Navsari Agricultural University, Bharuch (Guj.)- 392012

An experiment was conducted on medium black soil of College of Agriculture, NAU, Bharuch, (South Gujarat Zone-II AES-V) Farm, during the *Rabi* season of years 2016-17, 2017-18 and 2018-19 to study on "Nutrient management in Dill Seed under south Gujarat condition" in Factorial Randomized Block Design (FRBD) with three replication replications and nine

treatment combinations comprising nitrogen and phosphorus T1 (20+0), T2 (20+20),T3 (20+30), T4 (40+0), T5 (40+20), T6 (40+30), T7 (60+0), T8 (60+20), T9 (60+30) and Gujarat dill seed 3 was used as test crop. The pooled results of all the growth and yield attributes of dill seed such as plant height, number of branches per plant, days to 50% flowering, number of umbels per plant, number of umbellate per umbel, number of seeds per umbellate and 1000- seed weight were significantly influenced by nitrogen and phosphorus management. Significantly higher values of all the above parameters were recorded with 60 N kg/ha + 30 P kg/ha (T9) which ultimately reflected in higher seed (1882 kg/ha) yield. The soils were analyzed for important soil properties (pH, EC, organic carbon content, available N and P2O5) after the harvest of dillseed. Recorded available nitrogen and phosphorus higher in 60 N kg/ha + 30 P kg/ha (T9). Application of 60-30-0 NP kg/ha (30:30:00 NP kg/ha as basal and 30:00:00 N kg/ha at 40 DAS) gave higher grain yield (1752.14 kg/ha) of dillseed and monetary return (78840 Rs/ha) under rainfed condition.

IAAHAS/AB/2023/250

Effect of inorganic fertilizers and organic manures on biological properties of soil for wheat grown on Normal and Saline Sodic Inceptisol

N.J. Ranshur[1] and. S.M. Bhaisare[2]
[1]Professor of Soil Science and Agricultural Chemistry
[2]M.Sc. (Agri.) student
Department of Soil Science and Agricultural Chemistry
Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth,
Rahuri -413722, Maharashtra (India)

The investigation was carried out on normal and saline soils at Post Graduate Institute, Research Farm of Department of Soil Science and Agricultural Chemistry, MPKV, Rahuri (MS). Both the experimental site *viz*. normal and saline sodic plot was uniform and nearly levelled, with medium deep black soil and belongs to the soil order Inceptisol. The experiment consists

of eight treatments *viz*., T_1: RDN (50%N)+50%Nthrough FYM,T_2:RDN (50%N)+50%N applied through vermicompost, T_3: RDN (50% N) + 50% Nappliedthroughpoultrymanure,T_4:(50%N)+50%Napplied through press mud compost, T_5: (50% N) + 50% N applied through goat manure, T_6: (50% N) + 50% N appliedthroughurbancompost,T_7:GRDF(120:60:40N:P_2O_5:K_2Okg ha^{-1}) + 10 t FYM ha^{-1} and T_8: absolute control. The soil of the experimental field of both the plots *viz*. normal and saline-sodic were clayey in texture, Bulk density of normal soil was 1.34 (Mg m^{-3}) and for saline-sodic soil 1.49was (Mg m^{-}. The soil was slightly alkaline in reaction having pH (8.34) in normal soil and (8.42) in saline sodic soil. The EC of normal soil 0.28 dSm^{-1} and for saline-sodic soil 1.02dSm^{-1}, organic carbon content was (0.41%) and (0.45%) respectively and $CaCO_3$ content was (6.23%) and (9.35%) respectively. The fertility status of soil initially showed low available N (184.2 and 192.1 kg ha^{-1}) for normal soil and saline-sodic soil respectively and available P for normal soil(14.28kgha^{-1}) and for saline-sodic(13.21kgha^{-1}) respectively. Whereas the soils were high in available K (387.2 kg ha^{-1}) for normal soil and (359.4 kg ha^{-1}) for saline-sodic soil. The soil was sufficient in micronutrients content (Fe, Mn, Zn and Cu). The heavy metals were in traces. Initial fungal population recorded in normal soil was 7.09 (cfu x $10^4 g^{-1}$ soil) while in saline sodic soil it was, 6.22 (cfu x 10^4 g^{-1}soil). Initial bacterial population recorded in normal soil was 10.66 (cfu x 10^7 g^{-1} soil) and in saline sodic soil it was 15.00(cfu x 10^7 g^{-1} soil). Initial actinomycetes count recorded in normal soil and saline sodic soil was 4.90 and 7.30 (cfu x $10^6 g^{-1}$soil) respectively. The data pertaining to initial and periodic analysis of biological parameters *viz*., fungi (cfu x 10^4 g^{-1} soil), bacteria (cfu x 10^7 g^{-1} soil) and actinomycetes population (cfu x 10^6 g^{-1}soil), urease (mgNH4+-N100g^{-1}), acid and alkaline phosphatase (µg PNP g^{-1} soil hr^{-1}), dehydrogenase (µg TPF g^{-1}soil hr^{-1}) and β-Glucosidase enzyme (PNP g^{-1} soil hr^{-1}), grain and straw yield (q ha^{-1}), and N, P and K (kg ha^{-1}) uptake were recorded during the experiment. Among all the organic manures, better results were observed in the treatment T_7 *i.e* GRDF (120:60:40 N:P_2O_5:K_2O kgha^{-1}) +10t FYM ha^{-1} with respect to microbial population, yield and uptake of NPK by wheat in normal and saline-sodic soil. The yield of saline-sodic soil obtained was higher compared to normal soil.

***Keywords**: Normal Soil, Saline-sodic soil, Inceptisol, FYM, vermicompost, poultry manure, press mud compost, goat manure urban compost, bacterial actinomycetes and fungi*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/251

The contribution of Biotechnology to the advancement of Scientific and Technology research

Mayank Pratap Singh Chauhan, Gaurav Bhardwaj
Department of Biotechnology, Sanskriti University, Chhata, Mathura

Development in biotechnology is defined as the advancement of technology for use in biological processes and the creation of goods with therapeutic applications. The term "biotechnology" was originally used in 1919 by Karl Ereky, a Hungarian engineer who also discussed the topic. Biotechnology, which combines technology with natural resources of organisms, is used in a variety of disciplines, including the production of plants and human medicine. All those who love bioscience have excellent employment opportunities thanks to biotechnology. In recent years, biotechnology has advanced and broadened its application in a number of scientific fields, including medicine, industry, agriculture, and environmental research. Every advancement in the biotechnological field has the potential to significantly benefit society and elevate standards of living. Biotechnology has developed and expanded recently in a number of areas that aid humanity in creating a seamless lifestyle system. The biotechnology industry can be categorised by colour and includes the bioinformatics (or gold biotechnology), biopharma (or red biotechnology), grey, green, white, blue, dark, violet, and yellow branches. Such colour allies are kept in place in biotechnology development as a result of the use of mice in several biological research with a focus on reproductive, neurological, cardiovascular, and cancer biology. By using these formats, researchers can better grasp biotechnology from a scientific perspective.

Keywords: *Technology, research, biotechnology, organism*

IAAHAS/AB/2023/252

Response of Plant Growth Regulators on Growth, Flowering, Yield and Quality of China Aster (*Callistephus chinensis* (L) Nees)

S.R. Dalal, A.D. Warade, Pravina Satpute and Yogita Sanap
Horticulture Section, College of Agriculture, Dr. PDKV, Akola (Maharashtra)

A field investigation entitled "Response of plant growth regulators on growth, flowering, yield and quality of China aster (*Callistephus chinensis* (L) Nees)" was carried out during the year 2020-21 at Department of Floriculture and Landscape Architecture, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola with the objectives to study the effect of different growth regulators on growth, flowering, yield and flower quality of China aster cv. Phule Ganesh White and to find out the suitable concentration of growth regulators for higher and quality production of China aster. The experiment was laid out in Randomized Block Design with ten (10) growth regulator treatments which were replicated thrice. The treatment comprised three levels each of GA_3 (50,100 and 150 ppm), Salicylic acid (50,100 and 150 ppm) and Triacontanol (1500, 2000 and 2500 ppm) along with control (water spray). The result of the present investigation indicated that, the growth regulator treatments significantly influenced the growth, flowering, flower yield and quality of China aster. Maximum vegetative growth of China aster plant *viz*. plant height, number of branches per plant, plant spread and leaf area were recorded with GA_3 @ 150 ppm spray. However, flowering parameters viz, minimum days for emergence of first flower bud, 50 per cent flowering and first harvesting were recorded with Triacontanol @ 1500 ppm and maximum duration of flowering was recorded with Triacontanol @ 2000 ppm spray.

In respect to yield parameters, maximum flower yield per plant, per plot and per hectare were recorded with GA_3 @ 150 ppm spray. Regarding the quality parameters, maximum diameter of fully opened flower, stalk length, stalk diameter, weight of flower was recorded with GA_3 @ 150 ppm spray. While maximum shelf and vase life of flower were recorded with Triacontanol @ 1500 ppm spray. The maximum benefit cost ratio (14.89) was recorded with Triacontanol @ 1500 ppm spray. The higher net returns and B:C ratio in the above treatment might be due to higher flower yield of good quality which fetch good market prices with minimum input cost which could have recorded maximum benefit cost ratio.

IAAHAS/AB/2023/253

Influence of weather, vector and variety on incidence of Yellow Leaf Disease in Sugarcane

Saritha R* Chandrasekhar V, Bhavani B and Visalakshi M
Regional Agricultural Research Station, Anakapalle, Visakhapatnam, Andhra Pradesh.

Yellow leaf disease of sugarcane (*Saccharum* spp.) caused by the Sugarcane yellow leaf virus (SCYLV), vectored by aphids has attained epidemic proportions causing severe yield losses, ranging from 20 to 40 % in susceptible varieties. Yellow leaf spread by aphids depends on cultivar susceptibility as well as weather parameters and thus the present studies were conceptualized. The observations on meteorological parameters were taken from the observatory at the station. The data on incidence of vector (aphids) and yellow leaf disease were recorded at weekly interval during the entire crop growth period on three sugarcane varieties viz., 2005 A 128, 2001 A 63 and 2003 V 46. The data on vector and disease incidence was correlated with weather parameters. The leaf and aphid samples were collected at peak incidence of Yellow leaf disease and were tested and found positive for presence of virus using ELISA reader at 405 nm. The aphid incidence on 2005 A 128 initiated (4.6 per leaf) at 30 SMW and gradually increased to 19.1 per leaf at 40 SMW. In the variety 2001 A 63, the aphid incidence was first observed (2.2 per leaf) at 27 SMW and reached the peak population of 19.1 per leaf at 38 SMW. The aphid incidence on 2003 V 46 initiated (2.1 per leaf) at 29 SMW and gradually increased to 18.1 per leaf at 42 SMW. With regard to yellow leaf disease the incidence was first observed (1.0 per cent) at 26 SMW and reached the peak (28.7 per cent) at 37 SMW in the variety 2005 A 128. In the variety 2001 A 63, the incidence of yellow leaf disease was 1.8 per cent at 26 SMW which later on increased up to 29.4 per cent by 46 SMW. The incidence of yellow leaf disease was 3.5 per cent at 28 SMW which later on increased up to 27.6 per cent by 44 SMW in the variety 2003 V 46. The observations on incidence of aphids and YLD in susceptible varieties revealed that aphids contribute significantly to the initial spread of YLD, from initial incidence of aphids and YLD in 29-30 SW up to 42-44 SMW when the aphids reach peak incidence and YLD also leaps to above 25 per cent. The aphid population exhibited positive correlation with maximum temperature (r^2=0.62), minimum temperature (r^2=0.55) and relative

humidity I (r^2=0.65), whereas, negative correlation with rainfall (r^2=-0.63). The yellow leaf disease exhibited positive correlation with minimum temperature (r^2=0.75) and relative humidity I (r^2=0.67), whereas, negative correlation with rainfall (r^2=-0.63).

Keywords: *Yellow leaf disease, Sugarcane, aphid, weather.*

IAAHAS/AB/2023/254

Effect of Integrated Nutrient Management on Economics in *Kharif* Sorghum (*Sorghum bicolor* L.)

[1]Sallawar S.C., [2]U.N. Alse, [3]S.G. Mane
Department of Agronomy, College of Agriculture, VNMKV,
Parbhani-431402 Maharashtra, India

The field experiment was laid out at Sorghum Research Station, VNMKV, Parbhani. Dist. Parbhani during *kharif* season of 2015 to study the "Integrated Nutrient Management in *Kharif* Sorghum (*Sorghum bicolor* L.)". The experiment was laid out in randomized block design with three replications and variety CSH -16 as test crop along with nine (09) treatment combinations. Gross and net plot size was 4.5 x 5.0 m and 3.6 x 4.4 m, respectively. The soil of the experimental plot was uniform, leveled and well drained. It was medium deep black in texture, low in available nitrogen (160.31 Kg ha^{-1}), medium in available phosphorus (15.90 Kg ha^{-1}) and high in available potassium (367.50 Kg ha^{-1}).

The quantity of organic and inorganic fertilizer dose was calculated and applied in the plots as per the treatments. Healthy and well developed seeds of sorghum were treated with insecticide (Emametctin benzoyate) and biofertilizer like PSB and *Azpspirillum*. Sowing was done on 21th June 2015 by seeds are dibbling and distance between 45cm x 15 cm. The other usual common package of practices was followed time to time and periodical growth observations were recorded at an interval of 30 days. The crop was harvested at physiological maturity and data on yield attributes and yield were recorded.

The study revealed that the application of 75% RDN through inorganic fertilizer + 25% RDN through vermicompost + seed treatment with

PSB + *Azospirillum* (T_8) gave significantly higher GMR (76,068 ₹ ha^{-1}), NMR (37,999 ₹ ha^{-1}) and B:C ratio (2.07) over rest of the treatments, however it was at par with application of 75 % RDN through inorganic fertilizer + 25% RDN through FYM + seed treatment with PSB + *Azospirillum* (T_7).

IAAHAS/AB/2023/255

Impact of Climate Change on Biodiversity, Food Security and IPR issues

Lalitha Kadiri[1*], Sireesha Yeturi[2], A. Nischala[3], Y. Deepthi Kiran[4], M. Jayaprada[5], V.V. Padmaja[6] and Dr. K. Gopal[7]

[1*, 5,6]Associate Professor, Department of Agronomy, [2,3 &4] Assistant Professor, [7] Associate Dean, Dr. YSRHU-College of Horticulture, Anantharajupeta, Dr. Y.S.R. Horticultural University, Andhra Pradesh, India

Climate change is one of the biggest challenges in the world today, and its impacts on biodiversity, food security, and intellectual property rights (IPR) are significant. Key impacts include Biodiversity: Climate change due to changes in temperature and precipitation, and more frequent natural disasters are major factors of increased biodiversity loss causing significant changes in the distribution and abundance of species, finally affecting the functioning of ecosystems. Many species are shifting their ranges to higher latitudes or elevations in response to changing temperatures, while others are experiencing changes in the timing of their life cycle events such as breeding, migration, or flowering. These changes can lead to altered species interactions, reduced ecosystem productivity and ultimately, loss of biodiversity. Food **security:** Climate change is also affecting the availability and quality of food resources. Changes in temperature and rainfall patterns can lead to crop failures and reduced yields, which can in turn affect food availability and prices. Climate change is also affecting fish populations, with warmer waters leading to reduced productivity and shifting fish distributions. This can have significant impacts on the livelihoods and food security of millions of people around the world. IPR issues: Climate change is also creating new challenges for intellectual property rights (IPR). For example, as plant breeding programs develop new varieties of crops that are adapted to changing climate conditions, there may be questions around ownership and patenting of these new varieties. Additionally, as countries develop policies to mitigate and adapt to

climate change, there may be disputes over the ownership and use of intellectual property related to technologies or practices that are seen as essential to these policies. In conclusion, the impacts of climate change on biodiversity, food security, and intellectual property rights are significant and interconnected. The co-occurrence and synergistic interaction of climate change, loss of biodiversity and effects on food production have an exponential multiplier effect on human health compared to when these conditions are experienced separately. It is important for policymakers, scientists, and communities to work together to develop strategies that can mitigate these impacts and promote sustainability and resilience in the face of changing climate.

IAAHAS/AB/2023/256

Soil Health and its Improvement through Innovative Approaches

Nikita Khoisnam*
Department of Agricultural Economics and Extension, School of Agriculture, Lovely Professional University, Phagwara, Punjab 1444112

Around 95 per cent of the world's food production depends directly or indirectly on healthy soils, hence they are essential for food production. Plants receive their nutrients, water, and mechanical support from the soil for their growth. Urbanization, population growth and use of excessive chemical fertilizers are putting more strain on agriculture, which has a negative impact on the fertility and health of the soil. Through the addition of input, the removal of nutrients, the adjustment of the water balance, and the presence of microbial life, soil is continuously manipulated in agro-ecosystems, leading to decreased ecosystem service, degraded soils, and eventually, crop failure. In the world today, there are between 1,036 and 1,470 million acres of degraded land. This demonstrates how preserving soil health is crucial, as opposed to simply increasing input to produce more crops. Some potential methods for improving soil health are discussed in this review, including the diversification of nutrient sources with a focus on organic sources, the adoption of conservation agriculture principles, the improvement of soil microbial diversity, effective resource recycling through integrated farming systems, amendment addition for correcting soil reactions, phytoremediation, Plant

Growth-Promoting Rhizobacteria (PGPR) as a bio-control agent, and grazing management. Through the influence of the trees, organic matter deposition, the presence of root exudates, and the variety of litter quality, agro-forestry on degraded land promotes soil-related microbial activity and contributes to improving the soil quality and other practices like crop diversification, soil improvement and protection, and a decrease in wind erosion, it can be a financially viable and climate-smart farming method that will assist smallholder farmers deal with the climate-related extremes of dry land areas they produce. Furthermore, the use of innovative approaches for managing soil health is emphasized rather than only applying manures and fertilizers to crops for nutrition.

Keywords: *Agriculture, Approaches, Conservation, Erosion, Soil Health.*

IAAHAS/AB/2023/257

Integrated Farming Systems for Increasing Farm Productivity and Profitability under Farmers Holdings

N. Satheeshkumar,[1] P.M. Shanmugam [2]and N. Sakthivel[3]

[1]Associate professor (Agronomy), Maize Research Station, Vagarai-624 613

[2]Professor (Agronomy), Department of Agronomy, Coimbatore- 641 003

[3]Professor and Head, Agricultural Research Station, Bhavanisagar-638 451

Farming systems field experiments were conducted during 2017-18 to 2022-23 at Agricultural Research Station, Bhavanisagar to identify the critical constraints for increasing productivity and profitability of small and marginal farmers house holdings and ensure livelihood in farmer's fields. The study was conducted in twelve small and marginal farmers' fields in three villages each of Bhavani (Jambai, Bhavani and Uratchikottai) and Perundurai (Kanjikovil, Pallapalayam and Mullampatti) blocks in Erode district of Tamil Nadu. Bench mark survey was conducted before the start of experiment to know the existing farming systems and availability farm resources of individual farm holdings. The bench mark survey noticed that crop + dairy+poulrry and crop+dairy+goat/sheep +poultry were the two farming systems existed in the study area. Major constraints observed in the existing farming systems were, water scarcity and imbalance nutrition to rice, scale insect and rhizome rot in

turmeric, lack of green fodder supply and mineral nutrition to the dairy animals, poor maintenance in goat and slow growth rate in poultry. Low cost IFS interventions implemented in the existing farming systems were adoption of SRI planting, INM and IPDM in rice and turmeric through, biofertilzers and bio-inoculants, introduction of CNH CO 5 for year round green fodder supply, supplementation of TANUVAS mineral mixture, deworming and delicking medicine introduction of dual purpose Namakkal 1 chicks, and kitchen gardening.By implementing suitable interventions in the crop + dairy+poultry farming systems, 55 % higher net income was observed in crop module as compared to bench mark year. The crop+dairy+ poultry farming systems benefitted 96 % increased annual net income of Rs 1,90,230/- due to implementation of no cost and lowcost interventions as compared to bench mark year income of Rs. 96,486/-in the marginal and small farmers holdings.

Keywords: *Integrated farming systems, mineral mixture, year round fodder supply, and kitchen garden.*

IAAHAS/AB/2023/258

Study on the Mango Pulp Processing Industrial Waste Composting Using TNAU Biomineralizer

P. Kalaiselvi, S. Paul Sebastian, E. Parameswari, V. Davamani, K. Suganya
ICAR-Krishi Vigyan Kendra, Salem-636 203, Tamil Nadu

Mango (*Mangifera indica* Linn.) is one of the most important tropical fruits in the world. About 20% of the fruits are processed for products such as puree, nectar, leather, pickles and canned slices, which have worldwide popularity. During the processing of mango, several million tons of wastes are produced annually from factories in which peel and pomace each contributes about 15 – 20% of the mango fruit. Mango waste usually creates nuisance when compared to other fruit and vegetable waste as it gives foul smell. As peel and pomace are rich in phytochemicals, fiber and vitamin C are not currently utilized for any commercial purpose and it is discarded as a waste and becoming a source of pollution. The present study investigated the feasibility of

converting the mango pulp processing wastes like mango peels and fibrous pomace into compost, a ecofriendly sustainable nutrient supplier to the crop plants. The mango pulp processing wastes were adjusted for optimum CN ratio before composting. The compost heaps were added with TNAU Biomineralizer as microbial inoculum for composting. The physicochemical properties of compost like pH, EC, carbon, nitrogen, phosphorus and potassium were observed at different time intervals. Finally, the carbon to nitrogen ratio was compared among all the five treatments to identify the best compost after 90 days of composting period. The treatment which received mango wastes along with cowdung and TNAU Biomineralizer showed the optimum CN ratio of 18 : 1 in 90 days after heap making. Hence it was concluded that, the utilization of TNAU Biomineralizer is considered to be more reliable and efficient to prepare mango processing waste compost.

Keywords: *Mango pulping, Waste, TNAU Biomineralizer, Microbial consortium, Compost.*

IAAHAS/AB/2023/259

Combining ability and heterosis for yield and its contributing traits in sesame (*Sesamum indicum* L.)

P. Vinoth * and E. Murugan

ICAR-Sugarcane Breeding Institute, Coimbatore, Tamilnadu

Department of Plant Breeding and Genetics**,** TNAU, Madurai, Tamilnadu

The present investigation was carried to study combining ability and heterosis for yield and yield component traits in sesame by utilizing 6 lines and 6 testers. The 36 F_1s along with parents were studied for 14 quantitative and qualitative traits. The ANNOVA revealed that, there were significant differencesexistamong the genotypes for all the characters. The crosses Rajeswari x ACM-14-007 and IC 199438 x Hima were superior based on combining ability and heterosis. Hence, these hybrids used in crop improvement programme to increase the yield in sesame.

Keywords: *Sorghum, Combining ability and Heterosis*

IAAHAS/AB/2023/260

Comparative studies of ready mix and sole insecticide products against major pests of Bt cotton

P. W. Nemade[1*], B. K. Phuke[2] and D. M. Panchbhai[3]

[1&3] College of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola

[2] Post Graduate Institute, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola 444104, Maharashtra, India

The present investigation "Comparative studies of ready mix and sole insecticide products against major pests of Bt cotton" was conducted during Kharif season of 2020-21. The field experiment was laid out in Randomized Block Design with seven treatments and three replications. From the present studies it was revealed that, the application of Acephate 50% + Imidacloprid 1.8% SP proved effective in minimizing the aphid, leafhopper and thrips population and this treatment was closely followed by Thiamethoxam 12.6% + Lambdacyhalothrin 9.5% ZC whereas, Thiamethoxam 25% WG Followed by Lamdacyhalothrin 5% EC proved effective in minimizing whiteflies population. Minimum green fruiting bodies damage (0.55%) was recorded in treatment Thiamethoxam 12.6% + Lambdacyhalotherin 9.5% ZC but minimum green boll damaged (8.40%) was recorded per cent in Thiamethoxam 25% WG Followed by Lamdacyhalothrin 5% EC. Minimum open boll and loculi damage at harvest was recorded in treatment Thiamethoxam 25% WG Followed by Lamdacyhalothrin 5% EC i.e.15.17 and 9.21 per cent respectively. whereas, maximum open boll and loculi damage 42.37 and 26.40 per cent was recorded in control, respectively. Similarly, the maximum cotton yield (20.26 q/ha) was also recorded in treatment Thiamethoxam 25% WG Followed by Lamdacyhalothrin 5% EC and also, the same treatment proved to be the most economically viable treatment recording 1:15.02 ICBR. Overall, it was observed that sole insecticidal sprays were more economical than the ready mix products application.

Keywords: *Thiamethoxam 12.6% + Lambdacyhalothrin 9.5% ZC, Thiamethoxam 25%, Lamdacyhalothrin 5% EC, Bt cotton.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/261

Enhancing carbon sequestration through integrated nutrient management for sustainable crop production

Ram Pagar*, Swapnil Deshmukh, Chandrashekhar Walanju, Sunil Naganur and Anand Jha
Executive Field Development, Research, Regulatory and Field Development,
UPL SAS, Aurangabad (MH)

Soil carbon sequestration is crucial for maintaining soil fertility, crop productivity and reduces carbon concentration in the atmosphere. Soil carbon sequestration is the process of transferring carbon dioxide from the atmosphere into the soil through crop residues and other organic solids and in a form that is not immediately reemitted. This transfer or sequestering of carbon helps off-set emissions from fossil fuel combustion and other carbon-emitting activities while, enhancing soil quality and long-term agronomic productivity. Soil carbon sequestration can be accomplished by management systems that add high amounts of biomass to the soil, cause minimal soil disturbance, conserve soil and water, improve soil structure and enhance soil fauna activity. Strategies to increase the soil carbon pool include soil restoration and woodland regeneration, no-till farming, cover crops, integrated nutrient management, manuring, sludge application, water conservation and harvesting, efficient irrigation. An important source of CO_2 emissions is soil organic C (SOC) decomposition through soil respiration, although other sources such as fossil fuel burning and burning of crop residues are considerable (Marek and Lal, 2003). As well as enhancing food security, carbon sequestration has the potential to offset fossil fuel emissions by 0.4 to 1.2 gigatons of carbon per year or 5 to 15% of the global fossil-fuel emissions.

Keywords: *Soil carbon sequestration, soil fertility, soil organic matter, fossil fuel emission, integrated nutrient management.*

IAAHAS/AB/2023/262

Biochemical and morphological factors imparting resistance against jassid resistance in American cotton (*Gossypium hirsutum* L.)

[1]Mudhalvan, S., [2]Sindhu, S and [1]Rabeena I

[1]Department of Agriculture, Kalasalingam School of Agriculture and Horticulture, KARE, Krishnan Koil, 626126

[2]Department of Plant Pathology, CPPS, TNAU, Coimbatore, 641003

The field experiments were conducted at department of cotton, CPBG, TNAU, Coimbatore for three consecutive years from 2015-16 to 2017-18 for studying biochemical and morphological factors responsible for resistance against jassids on cotton. Results indicated that based on infestation of jassids, biochemical and morphological traits of cotton, the hybrid CO 17 x RAHC 1040 and GJHV 534 x RAHC 1040 are recommended as resistant against jassid. Correlation studies revealed that trichome density of cotton genotype had negative direct effect (- 0.959) on jassid infestation. Thickness of leaf midrib has positive and direct effect (0.987) on jassid infestation. Thickness of leaf lamina, gossypol content and total phenols showed significant and negative (-0.954, -0.932 and -0.921) correlation with jassid incidence. The peroxidase activity and polyphenol oxidase activity was higher in CO 17 x RAHC 1040 and showed significant positive correlation with jassid incidence (0.955 and 0.927). Nitrogen and phosphorus content showed significant positive (0.854 and 0.986) correlation with jassid incidence.

Keywords: *Cotton genotypes, resistance jassid, biochemical traits, morphological traits*

IAAHAS/AB/2023/263

In-vitro Efficacy of Essential Oils against *Colletotrichum capsici*

Dr. Sandeep Lotan Badgujar[1*] and Aniket Ambadasrao Patil[2] and Dr. Dhirajkumar Kadam[3]

[1*]Associate Professor, Dept. of Plant Pathology, V.N.M.K.V., Parbhani-431402

[2]Ph.D. Scholar, Dept. of Agronomy, Dr. P.D.K.V., Akola

[3]Associate Professor Entomology and Registrar, V.N.M.K.V., Parbhani-431402

Anthracnose of chilli (*Capsicum annuum* L.), caused by *Colletotrichum capsici* (Syd.) Butler and Bisby, is one of the most devastating diseases of chilli and causes severe losses (10–60%) both in terms of yield and quality of the chilli, depending upon the varieties. Therefore, the current investigation was carried out at the department of plant pathology, V.N.M.K.V., Parbhani, during 2017–2019 to evaluate the in vitro efficacy of essential oils against *C. capsici.* The antifungal activity of 7 essential oils was evaluated in vitro (each at 500, 750, and 1000 %) against *C. capsici.* Results revealed that all seven essential oils evaluated were found to be fungistatic against *C. capsici*. In cases of radial mycelial growth at 500 ppm, 750 ppm, and 1000 ppm concentrations, all the essential oils exhibited a somewhat similar trend of mycelial growth. Contrarily, neem oil resulted in much reduced mycelial growth. This was followed by Citronella oil, Clove oil, Eucalyptus oil, Garlic oil, and Ginger oil, all of which were on par with each other. Moreover, the results showed that all the essential oils tested (at 500, 750, and 1000 ppm each) significantly inhibited mycelial growth of the test pathogen over the untreated control (0.00%). It was found that the percent mycelial growth inhibition of the test pathogen increased with an increase in the concentration of the essential oils tested. However, the highest mycelial growth inhibition was recorded with Neem oil (65.16 %) which was significantly superior to all other essential oils tested. The second and third best essential oils for significantly inhibiting mycelial growth were found to be citronella oil (58.81%) and clove oil (48.82%). This was followed by the essential oils, viz., Eucalyptus oil (42.89 %), Garlic oil (38.58 %) and Ginger oil (38.58 %) which were on par with each other and effectively reduced the mycelial growth.

IAAHAS/AB/2023/264

Comparative analysis for classification of agricultural abiotic protein sequences

Dr Bulbul Ahmed[1], Dr Sahadeva Singh[2]
[1]G D Goenka University, Sohna, Gurugram, Haryana 122103
[2]Galgotias University, Gautam Buddh Nagar, Greater Noida, Uttar Pradesh 201310

By investigating the pattern associated with protein sequences, advanced classification approaches aid in the detection of abiotic stress protein sequences in agricultural data. The machine learning-based methodologies namely, Random Forest (RF), Support Vector Machines (SVM), and deep learning (RNN-LSTM) have been applied for classifying based on the pattern studied of the associated features in salt stress protein sequences. Also, 5-fold cross-validation is applied that ensures the accuracy of the developed model. This effort will assist researchers in determining whether the protein sequence of the crop obtained straight from the sequencing laboratory is connected with the stress condition or not in a more efficient and cost-effective manner.

Keywords: *Agricultural protein sequence, Classification, Deep learning, Random forest, and SVM.*

IAAHAS/AB/2023/265

Health Benefits of Fermented Pearl Millet Weaning Foods

Raveena * and Rekha Yadav
PhD Scholar, Foods and Nutrition Department, Chaudhary Charan Singh Haryana Agriculture University, Hisar

Fermented pearl millet weaning foods are a great option for babies because they offer a range of health benefits. Fermenting pearl millet can increase the availability of nutrients such as iron, zinc, and calcium. This is

because the fermentation process breaks down phytic acid, which can bind to minerals and make them less available for absorption. Fermented pearl millet is easier to digest than unfermented pearl millet. This is because the fermentation process breaks down complex carbohydrates and proteins, making them easier for the baby's digestive system to handle. Fermentation of pearl millet can enhance the flavour of the grain, making it more appealing to babies who may be reluctant to try new foods. Fermentation can also increase the sweetness of the grain, which can help to mask bitter flavours that may be present. Fermented pearl millet contains beneficial bacteria that can help to improve gut health and boost the immune system. These bacteria can also help to prevent infections and reduce inflammation in the body. Introducing fermented pearl millet weaning foods to babies may help to reduce the risk of allergies and sensitivities to the grain. This is because the fermentation process breaks down the proteins in the grain, which can trigger allergic reactions in some individuals. Overall, fermented pearl millet weaning foods offer a range of health benefits and are a great option for babies who are just starting to eat solid foods. By incorporating fermented pearl millet into their baby's diet, parents can help to ensure that their baby is getting the nutrients they need to grow and thrive.

Keywords: *Fermented, Pearl millet, Weaning, inflammation.*

IAAHAS/AB/2023/266

Organic & Natural Farming, Food processing, value addition and post-harvest technology

Rohan Kumar Singh

Natural Husbandry is a system in which agricultural practices are guided by natural laws. This strategy works in tandem with the natural biodiversity of each farmed area, allowing the complexity of living species, both leafage, and fauna, that produce each ecosystem to thrive alongside food shops. The primary purpose of organic husbandry is to produce businesses that are both sustainable and environmentally friendly. Food processing is the

transformation of agricultural products into food, or of one form of food into other forms. Food processing includes multitudinous forms of processing foods, from grinding grain to make raw flour to home cookery to complex artificial styles used to make convenience foods. Some food processing styles play important places in reducing food waste and perfecting food preservation, thus reducing the total environmental impact of husbandry and perfecting food security. Primary food processing turns agricultural products, analogous as raw wheat kernels or beast, into commodity that can eventually be eaten. This order includes ingredients that are produced by ancient processes analogous as drying, threshing, winnowing and milling grain, shelling nuts, and butchering brutes for meat. Secondary food processing is the everyday process of creating food from ingredients that are ready to use. Baking chuck anyhow of whether it's made at home, in a small bakery, or in a large factory, is an illustration of secondary food processing. Tertiary food processing is the marketable product of what is generally called reused food. The final volume and quality of the agricultural yield only depends on the post crop operation practices being adopt by the farmers or other food preceptors at the times of crop. Some of these practices include handling, exertion, curing, growing, packaging, flash storage, transportation, distribution and also long term storage where possible. In countries like India, a significant portion of fruits, vegetables and other crop losses are reported every time due to the actuality of poor structure as well as infelicitous post crop operations.

Integrating Geostatistics and GIS tostudy spatial variability and map soil fertility properties in Farm Fields of Agricultural College

V. Arunkumar[1], M. Yuvaraj[2], K. Sakthivel,[3] E. Jamuna[4] and K. Ananthi[5]
[1]Department of Soil Science and Agricultural Chemistry,
Agricultural College and Research Institute,
[2]Agricultural College and Research Institute, [3]Agricultural College and Research Institute, [4]Agricultural College and Research Institute,
[5]Agricultural College and Research Institute,
Tamil Nadu Agricultural University, Vazhavachanur - 606 753,
Tiruvannamalai, Tamil Nadu

The spatial variability study was conducted to map the soil properties of Agricultural College & Research Institute, Killikulam, using GIS and geostatistics. Soil samples were collected at regular intervals of 200 m using Global positioning system. The samples were collected from surface (0-15 cm) layers excluding non-cultivable area and Killikulam tank. The soil samples were processed and analyzed for various chemical properties *viz.,* pH, EC, organic carbon, available N, P, K, DTPA-Fe, Mn, Cu, and Zn. Soil properties were studied using classical statistics and geostatistics. The results reveal that pH of surface soils was varying from 6.08 to 8.73 with CV of 10.21 per cent. The EC of surface soils ranged from 0.03 to 0.94 dS m^{-1} with CV of 94.00 per cent. The EC exhibited high variability. The organic carbon content was less than 10 g kg^{-1} with moderate variability. The available N, P and K values ranged from 112.0 to 448.8 kg ha^{-1}, 2.03 to 21.49 kg ha^{-1} and 125.00 to 553.00 kg ha^{-1}, respectively. The available N, P, K exhibited moderate variability with CV of 35.39, 50.50 and 37.33 per cent, respectively. All the available micronutrients showed the higher variability except DTPA-Cu which recorded moderate variability. The spatial structure of the data varied among the surface soil properties. The semivariogram of soil properties *viz*., pH, available N, K, available S, DTPA-Fe, Cu and Zn were well defined by spherical model. Soil properties such as EC and DTPA-Mn were well fitted by exponential model whereas organic carbon, available P and exchangeable Ca were fitted by gaussian model. The spatial

dependence classes were strong for EC, organic carbon and DTPA-Cu, whereas all other soil properties exhibited moderate spatial dependence. Using ArcGIS 9.3 software, soil properties were interpolated for the study area to reveal the spatial heterogeneity of soil nutrients by ordinary kriging and created spatial variability maps showing zones with the same level of nutrient content. The principal component analysis aggregated the thirteen soil properties and summarized into four principal components for surface soil and five principal components for subsurface soil. The principal components prepared can be used to delineate management zones for fertilizer management practices.

IAAHAS/AB/2023/268

Selection of Pre-breeding lines for resistant breeding against Yellow vein mosaic and Enation leaf curl viruses in Okra (*Abelmoschus esculentus* L.Moench)

Gurve V R[1]*, Swarna Priya R[1], Pugalendhi L[1], Karthikeyan G[2], Gnanam R[3] and Kalaiyarasi R[4], Manikanda Boopathi N[5]

*[1]Department of Vegetable Science, Horticultural College and Research Institute,
[2]Department of Plant Pathology, Agricultural College and Research Institute,
[3]Department of Plant Molecular Biology and Bioinformatics,
Agricultural College and Research Institute,
[4]Department of Genetics and Plant Breeding, Centre for Plant Breeding and Genetic,
Agricultural College and Research Institute,
[5]Department of Plant Biotechnology, Centre for Plant Molecular Biology and
Biotechnology, Agricultural College and Research Institute,
Tamil Nadu Agricultural University, Coimbatore-641 003, India

Okra (*Abelmoschus esculentus* L.Moench) is an economically important vegetable possessing a great potential to enhance the farm income of small and marginal holdings. Production of the crop is hampered by many viral diseases. On consideration of minimization in the usage of plant protection chemicals, the selection of pre-breeding lines and further hybridization may use in breeding of varieties with combine resistance to viral diseases. Hence, the present investigation was taken up for the identification of pre-breeding lines for resistant breeding against Yellow vein mosaic virus (YVMV) and Enation

leaf curl virus (ELCV) resistance. Seventy-four accessions were screened out of which, six elite lines *viz.,* AE-CBE-92, AE-CBE-93, AE-CBE-94, AE-CBE-921, AE-CBE-943 and AE-CBE-934 were identified as highly resistant genotypes against YVMV and ELCV. Screening was done at field, vector mediated artificial screening conditions and at molecular level (PCR test) and genotypes AE-CBE-8, AE-CBE-05 and EC 755648 has been recognised as the highly susceptible genotypes. The maximum fruit yield per plant was reported in AE-CBE-943 and the number of ridges on the fruits varies in between five to eight in different okra genotypes. Highly resistant cultivars had the highest total phenolic content, peroxidase, and polyphenol oxidase activity, whereas highly susceptible types had the lowest. On the population of whiteflies, there was a negative association between adaxial and abaxial leaf pubescence and it was peak at 55 days after sowing. Thus, the present study revealed that six accessions, AE-CBE-92, AE-CBE-93, AE-CBE-94, AE-CBE-921, AE-CBE-943, and AE-CBE-934, appeared to be very promising lines for combined resistance to YVMV and ELCV that can be used in future resistant breeding programmes.

Keywords: *Pre-breeding lines, YVMV, ELCV, Artificial screening, PCR, Bemicia tabaci.*

IAAHAS/AB/2023/269

Proximate Composition Analysis and Characterization of Elite Cowpea (V*igna unguiculata* (L.) Walp.) Genotypes

Mali V.V.[1]*, Kale V.S.[2] and Jadhav P.V.[3]

[1*]Suphala Agri Genetics Pvt. Ltd. Hyderabad, Telangana

[2]Dr. Panjabrao Deshmukh Krushi Vidyapeeth, Akola, Maharashtra

The present investigation entitled “Proximate composition analysis and characterization of elite cowpea (*Vigna unguiculata* (L.) Walp.) genotypes” was conducted during four successive seasons i.e., summer 2018, summer 2019, *kharif* 2018 and *kharif* 2019 at Department of Horticulture Dr. PDKV, Akola (MS.). Thirty elite cowpea genotypes were used for characterization based on morphological characters as per the descriptors developed for cowpea by

IBPGR, Rome, Italy. Molecular characterization was carried out using 23 SSR markers to identify the genotypes and detect molecular diversity among them. On the basis of the mean performance, AKCP-SR-3 was superior for earliness whereas the genotype AKCP-8-2-1-1 was superior for yield and yield attributing characters. Mahalanobis D^2 statistic revealed distinct clustering pattern and considerable genetic diversity within and between clusters. Based on the DUS guidelines the characters plant growth habit, flower colour, immature pod colour and seed coat colour differentiated the genotypes more prominently among qualitative characters. Proximate composition varies among genotypes in terms of moisture, protein, fat, fiber, ash and carbohydrates content. The studied genotype AKCP-SR-3 showed high pod protein whereas PDKV Rutuja showed high zinc contents. SSR markers were most useful for the discrimination of the cowpea genotypes. Using SSR markers, total 18 unique bands were observed in a set of 30 cowpea genotypes that could be utilized for the identification of genotypes. The present study indicates usefulness of assessing genetic diversity at molecular level using SSR markers and its potential to determine the similarity between genotypes more precisely as compared to morphological markers.

IAAHAS/AB/2023/270

Antifungal activity of rhizobacteria isolated from *Solanum tuberosum*

***Rishita Srivastava, Dr. Verinder Virk**

Assistant Professor at Department of Microbiology, Kanya Gurukula Campus, Gurukula Kangri (Deemed to be University) Haridwar

Plant growth promoting rhizobacteria (PGPR) are the rhizobacteria that may be utilized to augment plant growth and suppress plant diseases. On the basis of their novel PGPR attributes two rhizobacteria RB2 and RB4 selected out of over 10 isolates from the rhizosphere of *Solanum tuberosum* were identified as potential competitor for biocontrol and antifungal activity against *Alternaria solani*. The activity of both strains was evaluated *Invitro* for their efficacy against *Serratia marcescens* (ACC No. 4822) RB4 exhibited strong activity in comparison with *Bacillus flexus* (ACC No. 12841) RB2. Seed

bacterisation with both strains RB2 and RB4 was able to control fungal activity of *Serratia marcescens* on *Solanum tuberosum* in a pot trial study. Increase in root and shoot length in fresh and dry weight of root and shoot reduction over the control were attained. In overall execution, RB4 was 29% more effective than RB2, and about 30% more effective than the control (non- bacterised). The application of *Bacillus flexus* and *Serratia marcescens* control the development of *Alternaria solani* in *Solanum tuberosum* and hence they are efficient as plant growth promoters and biocontrolling agents for upraising healthy crop of *Solanum tuberosum* that can promote the growth of plants and reduce the *Alternaria Solani*.

Keywords: *Antifungal, Alternaria solani, Bacillus flexus, Serratia marcescens, Solanum tuberosum, Biocontrol agent.*

IAAHAS/AB/2023/271

Comparative performance of different Mesta based intercropping systems on Mesta Fibre Equivalent Yield and Economics in Cauvery Delta Zone

Dr. R. Nageswari[1*], Dr. K. Subrahmaniyan[1], Dr. M. Jayachandran[2], Dr. Sabyasachi Mitra[3]

[1]Tamil Nadu Rice Research Institute, Tamil Nadu Agricultural university, Aduthurai -612 101, Thanjavur District, Tamil Nadu, India

[2]Sugarcane Research Station, Cuddalore, Tamil Nadu

[3] ICAR-Central Research Institute for Jute and Allied Fibres, Barrackpore, Kolkata-700 121, India

Field investigations were carried out at Tamil Nadu Research Institute, Aduthurai, Thanjavur district during the *Kharif* (June-September), 2022 to find out evaluate the performance of different mesta based intercropping systems on mesta fibre equivalent yield and economics. The experiments were laid out in Randomized Block Design with three applications. The treatments comprised of T_1:- Sole mesta (30 cm x 10 cm), T_2- Sole Rice at a spacing of 20

cm×10 cm, T_3- Sole Ground nut sown at a spacing of 30 cm × 10 cm, T_4- Sole Mung bean sown at a spacing of 30 cm ×10 cm, T_5- Sole Urdbean sown at a spacing of 30 cm ×10 cm, T_6- Mesta + rice sown at 3:4 row ratio, T_7- Mesta + Groundnut sown at 3:4 row ratio. T_8- Mesta + Mung bean sown at 3:4 row ratio andT_9- Mesta + Urd bean sown at 3:4 row ratio. Mesta (cv.AMV 5) was sown in the first season in the Month of May, 2022 as Kharif crop. The intercrops, rice, groundnut, mung bean and urd bean were sown simultaneously. and respective sole crops were raised in same season as per the lay out. The results revealed that maximum mesta fibre equivalent yield among the intercropping systems was recorded by Mesta sole crop higher fibre equivalent yield of 2368kg/ha and net return (74525/ha) followed by mesta+ green gram with a fibre equivalent yield of 2347kg/ha and the highest B:C ratio of BCR (3.40) recorded with mesta+ green gram (2:2 ratio).

Keywords: *Mesta, intercropping, Fiber equivalent yield, economics.*

IAAHAS/AB/2023/272

Effects of Foliar Application of Zinc on Growth and Yield of Lentil (*Len culinarian L.*)

Bishwanath Sharma Aribam* and Dr. Rajeev
Department of Agronomy, School of Agriculture, Lovely Professional University, Phagwara, Punjab 144411

Lentil (*Len culinarian*) is an import cool season grain legume crop in India, which is second major winter season legume after chickpea. Lentil is mainly cultivated in rainfed farming system (90%) as well as irrigated system (10%). Lentil is valued for their high protein content and is also called as "A poor man's meat" because of concentrate content of dietary protein available cheaply in the market. It contains 23.25% protein, 59% carbohydrates, 1.8% oil and traces of iron, calcium, phosphorus and magnesium. Macronutrients as well as micronutrients play a major role in plant nutrition. Micronutrients, although they are required in minute particles, plays a major role in physiological growth and development and are not mainly focused on by

cultivators as well as researchers. Zinc (Zn) is a very important element for plant growth. Zn deficiency in the decreases yield and causes significant economic loss. Plant are adversely affected by Zn deficiency because it reduce their protein synthesis. Zn deficiency is found in 30% of the agriculture area in the world and is very common under dry climate condition and in soils that have low organic matter. Seven level of Zn, viz. T_0 control (0%), T_1 (100% RDF), T_2 (75% RDF+ Zn 0.02%), T_3 (75% RDF + Zn 0.04%), T_4 (50% RDF + Zn 0.06%), T_5 (50% RDF + Zn 0.08%), T_6 (50% RDF + Zn 0.10%) were applied foliar thrice at 30 DAS, 60 DAS, 90 DAS. This study aimed to determine the effect of different Zn levels on grain yield and some phenological characteristics of lentil cultivar to determine the most suitable Zn level for lentil for in Punjab area.

Keywords: *Foliar Application, Lentil, Micronutrient, Macronutrient, Protein synthesis, phenological.*

IAAHAS/AB/2023/273

Effect of Nanomaterials on silkworm (*Bombyx mori*)

Sujal Suhas Munj and Mandar Vijay Thakur*
Ph.D Research Scholar, Department of Agril. Entomology,
University of Agricultural Sciences, Dharwad, Karnataka, India – 580 005

India is the second-largest silk producer in the globe. In India, the sericulture industry employs about 8.7 million people in rural and semi-urban regions. A sizable portion of these employees are drawn from the monetarily underprivileged groups of society, including women. Sericulture gives valuable employment, economic growth and an increase in the quality of life for people in rural areas, and thus it plays an essential part in anti-poverty programmes that stops rural people from migrating to metropolitan areas in pursuit of work. India's traditional and culture-bound domestic market, as well as an incredible variety of silk garments that represent regional uniqueness, have aided the country's rise to the top of the silk industry. The unique characteristics of nanomaterials have the ability to advance the growth of many industries, including agribusiness, cosmetics and health. The use of

nanotechnology in sericulture enhances the grade of silk fabric while also increasing the silkworm's survival rate and stimulating their fast growth and development. Nanomaterials help the silkworm's defence mechanism. Antiviral and antibacterial characteristics in larvae are produced by nanomaterials. Despite the benefits of nanomaterials, there are some issues about how secure it is to use them in the atmosphere, on people and in experimental models. Studies have revealed that while some nanomaterials have therapeutic qualities, others are harmful to the silkworm's tissues and organs. Several studies on the impacts of nanomaterials on silkworms and how the use of nanomaterials enhances sericulture are summarized in this review.

Keywords: *Silkworm, Nanomaterials, survival rate, toxicity, defence system.*

IAAHAS/AB/2023/274

Effect of Organic Nutrition on Yield and Economics of Taro and Soil Organic Carbon Buildup

N. P. Limisha[1], G. Rajasree[2], Sheeba Rebecca Isaac[3] and Shalini Pillai P[4]
College of Agriculture, Vellayani, Thiruvananthapuarm, 695522

An investigation was carried out at College of Agriculture, Vellayani, Thiruvananthapuram to study the effect of organic nutrition on yield and economics of taro and soil organic carbon buildup over two seasons during June 2019 to January 2020 and June 2020 to January 2021. The experiment was laid out in randomized block design (factorial) with three replications. The treatments comprised of six levels of organic sources (S_1- FYM + wood ash; S_2- FYM + wood ash +PGPR- I ; S_3- FYM + wood ash + PGPR- I + vermiwash; S_4- Poultry manure + wood ash ; S_5- Poultry manure + wood ash + PGPR- I ; S_6- Poultry manure + wood ash + PGPR- I + vermiwash) and two levels of *in situ* green manuring (G_1- *in situ* green manuring with cowpea; G_2- *in situ* green manuring with daincha) with three control (C_1- Nutrient management through chemical fertilizers as per KAU POP (80 : 25: 100 kg N P K ha^{-1}); C_2 - Nutrient management as per KAU organic POP (Adhoc) ; C_3 -

Absolute control). The study revealed that the best organic nutrient management for organic production of taro is the application of poultry manure, wood ash, PGPR mix I and vermiwash and *in situ* green manuring with diancha, which resulted in higher yield, net income and BCR and it was equally effective as chemical fertilizer application and superior to existing *Ad hoc* organic KAU POP and absolute control. All organic nutrition treatments were found superior to control treatments in soil organic carbon buildup. The organic sources s_5, s_3, s_6 and *in situ* green manuring $g_2$resulted in higher total organic carbon, recalcitrant carbon, labile carbon and water soluble carbon content of soil.

IAAHAS/AB/2023/275

Efficacy of Organic Mulches and Bio-fertilizer on growth and yield of Broccoli (*Brassica oleraceae var italica*)- A Review

Radhakanta Thangjam[1] and Themmeichon Chamroy[2]

[1]M.Sc. Student and [2]Assistant Professor

Department of Horticulture, School of Agriculture, Lovely Professional University, Phagwara, Punjab 144411

Broccoli is one of the important cool season vegetables in India which belong to family Brassicaceae (Cruciferae). It is low in sodium, fat, high in vitamin C, A, B2 and calcium. Per 100g of broccoli contains 34kcal, 4.3g protein, 3.2g carbohydrate, 0.6g fat, 2.5g fibre, 3150 IU vitamin A, and 104 mg vitamin C. The production of broccoli in India is 8.1 tonnes per year and 42 lakh hectares under cultivation and the yield per hectares in kilos is 19246 kg/ha. The head diameter shows significant result when subjected to different bio-fertilizers, for increasing growth. Yield mulching also plays an important role in conserving moisture in the soil, preventing soil erosion and control weed growth. In bio-fertilizer, PSB (Phosphorus Solubilizing Bacteria) and VAM (Vesicular Arbuscular Mycorrhiza) are applicable as per recommended dose and rice husk, paddy straw, saw dust are used as organic mulches. The paper aims to study the effect of different bio-fertilizer and organic mulches so as to discuss which

biofertilizer and which organic mulch suits the best for better growth and yield of the broccoli.

Keywords: *Broccoli, Bio-Fertilizer, Mulching, Organic Mulch*

IAAHAS/AB/2023/276

Elicitation: An innovative tool in stimulating secondary metabolite production

Nidhi Selwal[1], Sarvjeet Kukreja[2]

[1]School of Bioengineering and Biosciences, Department of Botany, Lovely Professional University, Phagwara, 144411, Punjab, India

[2] School of Agriculture, Department of Agronomy, Lovely Professional University, Phagwara, 144411, Punjab, India

The expensiveness and severe after-effects of man-made synthetic drugs revert the human population to medicinal plants. The innate power of medicinal plants and herbal medicines with no or very minimal side effects is an eye-catching characteristic for people to rely upon them in a much larger scale. However, the harsh environmental conditions are becoming an emerging challenge in agriculture for production of secondary metabolites. Plants have an immense potential to synthesize secondary metabolites which have applications in many pharmaceutical and therapeutic fields. The continuous supply of economically important plants is a need for the future generations. In most plants, the metabolites biosynthesized are in critically low amounts accumulating in specific organelles depending on the interaction between the plant and environment. Due to excessive demand of secondary metabolites in various fields, different strategies have been used to enhance their synthesis and accumulation. Elicitation has become popular due to its low cost and simplicity. Multiple doses of various elicitors can be applied through methods such as soil drench, hydroponics, seed preconditioning or cell cultures. Various morphological, biochemical, and physiological changes in the plant system are responsible for stimulating the production of secondary metabolites. There is an urgent need to understand the various underlying mechanisms exploited by different elicitors to raise SMs production in treated plants. Further attempts

are also required for understanding the molecular signaling pathways involved in SMs production for medical and industrial inquiries.

Keywords: *Elicitation, Secondary metabolites, Abiotic stress, Biotic stress, Elicitors.*

IAAHAS/AB/2023/277

Role of endophytic microbial consortia against soil borne diseases

Sireesha Yeturi[1]*, A. Nischala[2], Y. Deepthi Kiran[3], Lalitha Kadiri[3]and Ganesuni Lakshmi Prasanna[1]

[1]Assistant Professor, Plant Pathology, [2]Assistant Professor, Entomology, [3]Assistant Professor, Agronomy, Dr. YSRHU- College of Horticulture, Anantharajupeta-516105

With the increasing social concern in reducing the application of agrochemicals, in favour of sustainable eco-friendly alternatives, the search for beneficial microorganisms has become one of the most prominent fields of plant-microbe interactions. Bacterial and fungal endophytes ubiquitously inhabit plant tissues without causing any adverse effect. On the contrary, their presence offer benefit for the host, as they improve tolerance to abiotic adversities, enhance growth, and, relevantly, can modulate plant immune response and suppress pathogen colonization. Since endophytic microorganisms typically cover the same ecological niches occupied by fungal and bacterial phytopathogens, they have been widely proposed as biocontrol agents that could be used as an alternative to pesticides. They play a multifaceted role and are now considered crucial in the perspective of their potential use to achieve sustainable improvements in the agro-food system. Commonly, endophytic consortia induced systemic resistance is found to be associated with the up-regulation of genes involved in the pathways of jasmonic acid and ethylene. For example, host plant (tomato) established a tri-partite interaction with two different strains of the same root-invading fungus (*Fusarium oxysporum*). While pathogenic strains employed host-specific effectors to interfere with host immune signaling, co-inoculation of pathogenic Fusarium strains with endophytic Fusarium strains induced resistance responses and reduced negative disease effects. Interactions between

endophytes and their hosts is the capacity of many microorganisms to improve the plant's resistance by providing several bioactive metabolites. Researchers have identified in grapevine leaf microbiome that two *Bacillus subtilis* and *B. cereus* strains were able to inhibit the growth of *Phytophthora infestans*, putatively through the emission of volatile compounds identified among pyrazines, chalconoids and tryptophan-derivatives.

IAAHAS/AB/2023/278

Engineering Aspects of NFT Hydroponics – A Revolutionary Agriculture

Dr. B. Kailashkumar*[1], Dr. K. R. Kalphana[2] and S. Anand[3]

*[1]Assistant Professor (Farm Machinery and Power Engineering), [2]Associate Professor (Soil and Water Conservation Engineering), [3]Assistant Professor (Agricultural Extension and Rural Sociology), [1,2,3]Department of Agricultural Engineering, Mahendra Engineering College Namakkal, Tamil Nadu – 637 503

NFT (Nutrient Film Technique) hydroponics is a modern agricultural method that allows plants to grow in a nutrient-rich solution without soil. In recent years, the emergence of non-fungible tokens (NFTs) has revolutionized the art world, and now this technology is finding its way into hydroponics. NFT hydroponic systems utilize specialized channels to circulate the nutrient solution past plant roots, providing a constant supply of nutrients and oxygen. This technique maximizes plant growth and yield, making it ideal for growing a wide range of crops. By incorporating NFTs into hydroponic systems, growers can track and verify the provenance and quality of their crops, ensuring transparency and traceability throughout the supply chain. As the demand for sustainable and locally sourced produce continues to rise, NFT hydroponics is an exciting new frontier that offers endless possibilities for farmers, artists, and consumers alike. From an engineering perspective, NFT hydroponic systems involve several key components, including a reservoir, pump, tubing, and channels. The nutrient solution is pumped from the reservoir into the channels, which are tilted at a slight angle to allow gravity to pull the solution back into the reservoir. This constant circulation ensures that plants receive a steady supply of nutrients and oxygen, maximizing growth and yield. Designing an efficient and effective NFT hydroponic system requires careful

consideration of factors such as flow rate, channel dimensions, and nutrient composition. Engineers must also take into account environmental factors such as temperature and humidity, which can affect plant growth and the performance of the system. Furthermore, integrating NFT hydroponics with other emerging technologies such as blockchain and artificial intelligence can enhance the precision and sustainability of these systems. As NFT hydroponics continues to gain traction in the agricultural industry, engineers will play a crucial role in optimizing and advancing this technology to meet the growing demand for sustainable and high-yield crop production.

Keywords: *Soilless culture, hydroponics, nutrients, crops, grow tray.*

IAAHAS/AB/2023/279

Farmers' Attitude toward Intercropping in Haryana

Sahil Boora[1*], Bas Kaur[2] and Manisha[3]

[*1&3]Research Scholar, Deptt. of Sociology, CCSHAU, Hisar

[2]Assistant Professor, Deptt. of Sociology, CCSHAU, Hisar

When two or more crops are grown in close proximity to one another, it is known as intercropping. The current investigation was carried out in the dry and wet agro-climatic zones of Haryana. Karnal and Kaithal districts were randomly chosen from the rainy zone, whereas Bhiwani and Hisar districts were randomly chosen from the dry zone with the goal of evaluating farmers' attitudes about intercropping in 2022. A planned interview schedule was used to personally interview 120 respondents, 30 of whom were from each district. Results showed that more than three-fifths of respondents (50.83%) had a more favourable opinion towards the intercropping system, compared to favourable attitudes held by 36.67% and less favourable attitudes held by 12.50% of respondents. In addition, analysis of the relationship between level of attitude and profile of farmers showed that education and exposure to the media were highly significantly associated with level of attitude of farmers towards intercropping, whereas a significant association was found between level of attitude of farmers towards intercropping system and age, family type,

social expectations, and inheritance. The paper recommends training of farmers on better utilization of mass media and the training will help farmers in increase in their knowledge level by using mass media and with improved knowledge farmers will have more positive attitude towards intercropping.

Keywords: *Intercropping, Land utilization, Attitude, Farmers.*

IAAHAS/AB/2023/280

Effect of integrated nutrient management in Mustard (*Brassica Juncea* L) in North Haryana

Rohit, Hansraj Shivran and Ashish Kumar Yadav
FASC, SGT University, Gurugram, Haryana

A field experiment was carried out at SGT University Gurugram, Haryana, during *Rabi* seasons of 2022-23 to Effect of integrated nutrient management in Mustard (*Brassica Juncea* L) in North Haryana. Among the maximum growth attributes, number of pod/plant, seed, straw and biological yield was recorded with 100 % NPK + 5 t Vermicompost + 40 kg S + Azotobactor which was statistically at par with 75 % NPK + 5 t Vermicompost + 40 kg S + Azotobactor, 100 % NPK + 5 t Vermicompost + 40 kg S and 100 % NPK + 5 t Vermicompost. However, it found that 100 % NPK + 5 t Vermicompost + 40 kg S was significantly superior over 50 % NPK + 5 t Vermicompost + 40 kg S, 50 % NPK + 5 t Vermicompost + 40 kg S + Azotobactor, 75 % NPK + 5 t Vermicompost, 50 % NPK + 5 t Vermicompost, 75 % NPK, 50 % NPK and control and remained statistically at par with 100 % NPK + 5 t Vermicompost + 40 kg S + Azotobactor, 75 % NPK + 5 t Vermicompost + 40 kg S + Azotobactor, 75 % NPK + 5 t Vermicompost + 40 kg S and 100 % NPK + 5 t Vermicompost.

Keywords: *Vermicompost, FYM, Azotobactor and Mustard.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/281

Decomposition Analysis of Cotton and Soybean Crops in Amravati Division

Pardhi Priyanka*[1], Sarap S.M. [2], Singh Lovepreet [3]
[1]Ph.D Scholar, University College of Agriculture, Guru Kashi University, Talwandi Sabo
[2]Assistant Professor Dept. of Agril. Economics,
Shri. Shivaji College of Agriculture, Amravati
[3]Assistant Professor, University College of Agriculture,
Guru Kashi University, Talwandi Sabo

The study entitled "Decomposition analysis of cotton and Soybean crops in Amravati division" was undertaken to study the compound growth rate, instability and decomposition analysis of cotton and soybean in Amravati division and data pertained for the year 1983-84 to 2012-13. The study was based on secondary data on area, production, productivity and other relevant data of cotton and soybean was collected from the various Goverment publications. The study revealed that during period I, compound growth for area, production and productivity of cotton was significant in Yavatmal district i.e. 0.42 per cent, 5.28 per cent and 4.87 per cent per annum respectively. In case of production of cotton, result showed that compound growth rate of Amravati district was highest i.e. 9.88 per cent per annum and Yavatmal district showed lowest compound growth rate i.e. 4.31 per cent per annum. In case of productivity of cotton all the districts and Amravati division as a whole showed positive compound growth rate. During overall period production and productivity of cotton showed positive compound growth rates for all districts and Amravati division as a whole. The compound growth rate of production for cotton was recorded very high during period I, while the coefficient of variation and coppock's instability index with regards to area (3.55 and 9.54 per cent) was lowest in Yavatmal district among the cotton growing districts in Amravati division whereas coefficient of variation for productivity was lowest in Yavatmal district i.e. 27.40 per cent. Compound growth rate for area and production of soybean was very high during period I (1993-34 to 2002-03). Coefficient of variation and instability for area, production and productivity was high in soybean as compared to cotton at overall period. At overall period, the area effect was most stronger factor for increasing production of cotton in all the districts and division as a whole. The area effect was most responsible

factor for increasing soybean production with yield effect 70.38 per cent and interaction effect 29.05 per cent.

Keywords: *Decomposition Analysis, Compound Growth Rate, Cotton, Soybean*

IAAHAS/AB/2023/282

Effect of potassium application and inter-row spacing on Maize

Haripriya Ngairangbam, Dr. Gurpreet Singh
Department of Agronomy, School of Agriculture, Lovely Professional University, Phagwara, Punjab-144411

A field experiment was conducted at Agricultural Research Farm, School of Agriculture, Lovely Professional University, Punjab during the spring season of 2022-23 to evaluate the effect of potassium application and inter-row spacing on maize. The experiment was performed with a split-plot design with three different levels of potassium and two different row spacings. Agronomic characters such as plant height, number of leaves, leaf area, stem girth, and yield characters such as number of cobs, cob size, test weight, etc were to be recorded to determine the better treatment. Nitrogen, phosphorous, and potassium were applied at the time of land preparation in their recommended dose. The crop is planted with the inter-row distance of 45 and 60 cm as comparative factors for row spacing and potassium was applied as a basal application in formulations of control, 20 kg ha $^{-1}$ and 40 kg ha$^{-1,}$ according to the treatment requirements to its respective plots. According to the results evaluated, the effects of inter-row spacing and different levels of potassium will be determined as well as their interactive outcomes on the growth, yield as well as quality parameters of maize.

Keywords: *Maize, Zea mays, planting distance, potassium, macronutrients.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/283

Bio-efficacy of Fortenza 600 FS (Cyantraniliprole 600 G/L) against Stem Borer, *Chilo partellus* in maize

C.S. Chaudhari[1], A.S. Totre[2]*, V.S. Shinde[3], S. R. Dhonde[4]
[1,2,3,4]AICRP on Maize, MPKV Rahuri
Ahmednagar (MS), India, 413 722

Current pest management practices for stem borer in maize largely depends on foliage insecticides there is no longer insecticide available for seed treatment. Thus, additional research is needed to delay resistance development and replace products no longer available to farmers. Bio-efficacy of seed treatment of insecticide Fortenza 600 FS (Cyantraniliprole 600 G/L) was assessed against the stem borer in maize during the *Kharif* 2019 season. The present investigation carried out in Randomized Block Design with three replications along with nine treatments and untreated check. Germination percentage was recorded at 15 days after sowing (DAS) on whole plot basis by counting no of emerged plants. Crop vigour observation was taken visually based on the overall crop growth, plant height from the entire plot in comparison with the check plots. Visual assessment was taken on crop vigour assessment on whole plot basis. Untreated check was considered as 100% and then the treatment plots were assessed based on the increase and decrease in crop vigour compared to check plots. The seed treatment of Fortenza 600 FS (Cyantraniliprole 600 g/l) @ 3 ml/kg seed which was at par with Fortenza 600 FS (Cyantraniliprole 600 g/l) @ 2.5 ml/kg seed showed highest germination which is superior to the market standard Imidacloprid 48% FS @ 10 ml/kg of seed and Carbofuran 3 GR. It was observed that, all the treatments were significantly superior over untreated control in recording stem borer damage. The minimum stem borer damage was recorded in treatment T_6, Fortenza 600 FS @ 3 ml/kg of seed which was significantly superior over rest of the treatments with 0.33% damage/plot which was found at par with treatment T_5, Fortenza 600 FS @ 2.5 ml/kg of seed with 0.67% damage/plot.

Keywords: *Fortenza, seed treatment, maize, stem borer.*

IAAHAS/AB/2023/284

The effect of combined antifungal potential of organic amendments, phytoextracts and *Trichoderma* spp. in the management of cumin wilt pathogen (*Fusarium oxysporum* f. sp. *cumini*)

[1]Ganesuni Lakshmi Prasanna*, [1]Jyotika Purohit, [1]N. R. Patel and [4]Kapil K Tiwari

[1,2,3]Department of Plant Pathology, [2]Department of Biotechnology, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat- 385505

Fusarium wilt (*Fusarium oxysporum* f.sp. *cumini*) is the most devastating disease of cumin in India and it is difficult to control by using single mean of management tactics as it is a soil borne pathogen. So, the utilization of eco-biological amendments for the management of fusarium wilt pathogen has often been considered as best management strategy. The present study was carried out to evaluate the antifungal efficacy of organic amendments, phytoextracts and bioagents (*Trichoderma* spp.) in suppressing the cumin wilt caused by *Fusarium oxysporum* f. sp. *cumini*. The highly virulent pathogen from previous study was used to evaluate the organic amendments, phytoextracts and bioagents *in vitro*. Among organic amendments tested by using poison food technique, the highest radial growth inhibition was recorded by neem cake (79.43%) followed by mustard cake (74.25%), and in phytoextracts, the highest radial growth inhibition of 84.95 per cent was recorded with garlic (*Allium sativum* L.) clove extract which was followed by ginger (*Zingiber officinale*) rhizome extract (80.62%). The bioagents viz., *Trichoderma viride* and *Trichoderma harzianum* recorded a mean radial growth inhibition of 86.24% and 79.06% respectively. In a field study, soil application of *Trichoderma viride* @ 25g/100m^2 + neem cake@ 100g/m^2 and seed treatment with garlic extract@ 20% effectively enhanced the seed germination (92.66) and decreased the percent wilt incidence (18.98%), with a yield of 445 kg/ha than other treatments. The study concluded that soil application of *Trichoderma viride* @ 25g/100m^2 + neem cake@ 100g/m^2 and seed treatment

with garlic extract@ 20% can be recommended as an effective approach for the management of fusarium wilt of cumin.

Keywords: *Bio-efficacy, Fusarium wilt, Fusarium oxysporum f. sp cumini, Organic amendments, and Poisoned food technique.*

IAAHAS/AB/2023/285

Study of Genetic Divergence in Soybean (*Glycine max* (L.) Merrill) Germplasm

J.D. Khumukcham*, K. Tandekar[1]

*Ph.D. Scholar, Division of Genetics and Plant Breeding,
Indian Agricultural Research Institute, IARI, New Delhi, 110012
[1]Scientist, AICRP on MULLaRP, Department of Genetics and Plant Breeding, Indira Gandhi Krishi Vishwavidyalaya, College of Agriculture, Raipur, Chhattisgarh. 492012

Genetic divergence of 50 soybean genotypes were studied for fourteen quantitative characters using Mahalanobis D^2 statistics during *kharif*-2021 in Randomized complete block design with two replications. The genotypes were grouped into six clusters. Cluster I consist of maximum genotypes with 33 genotypes followed by cluster II with 13 genotypes and cluster III, IV, V and VI with one genotype each. Cluster II recorded the highest intra cluster distance followed by cluster I. Maximum inter cluster distance (D^2) was observed between cluster IV and II followed by IV and VI which indicated that the genotypes falling into these clusters are genetically more divergent and hybridization between these divergent clusters is likely to produce desirable segregants. The most important traits contributing maximum towards genetic divergence was seed yield per plant (18.64%) followed by harvest index (12.54%), 100 seed weight (11.04%), biological yield (10.50%), oil content (10.21%), protein content (9.21%) and number of seeds/plant (6.00%).

Keywords: *Genetic divergence, D^2 statistics, clusters, Soybean, intra and inter cluster distance.*

IAAHAS/AB/2023/286

Genetic Association and Characterization in Some Chilli (*Capsicum annuum L.*) Germplasms for Yield and its Component Characters

Ashis Bakshi[1], Sudeshna Panja*[2], C. Bhattacharya[3]
[1,2]Research Scholar, [3]Professor
Department of Genetics & Plant Breeding, Faculty of Agriculture,
Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal

To study the magnitude of variability for different morphological traits, 75 chilli genotypes were evaluated at Central Research Farm, Gayeshpur, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, India during autumn-winter season of 2018-2019. Through analysis of variance, a wide significant difference was found for almost all characters indicating a greater opportunity of exploiting variability. High GCV and PCV values were recorded for plant height, fruit length, fruit shape index, fruit: stalk length, fruits per plant, fruit weight and fruit yield per plant. Phenotypic co- efficient of variation (PCV) and Genotypic co-efficient of variation (GCV) were recorded maximum for plant height, fruit length, fruit shape index, fruit: stalk length, fruits per plant, fruit weight and fruit yield per plant. In the present study all characters showed high heritability with high genetic advance. The character fruit yield per plant was significantly and positively correlated with fruit length, stalk length, fruits per plant, fruit weight, 1000-seed weight, fruit shape index and fruit: stalk length. Path analysis showed that fruits per plant exerted highest direct positive effect on fruit yield per plant; followed by fruit weight and fruit shape index in both the years. From the association studies, the characters, *viz*., days to 50% flowering, fruits per plant, fruit weight, fruit length, 1000-seed weight, stalk length, fruit shape index and fruit: stalk length, were established as the most important yield contributing characters of chilli.

Keywords*: Chilli, correlation, genetic variability, heritability, path coefficient*

IAAHAS/AB/2023/287

Study the Effect of Grape Seed Extract on the Physico-Chemical, Sensory and Textural Profile of Goshtaba

Nazir A Bumla, Sarfaraz A Wani, Sheikh Rafeh Ahmad, Asif H. Sofi, Mir Rovida, S. A. Hussain, Tahir Nazir and Asma Irshad Qurashi

Division of Livestock Product Technology, F.V.Sc & A.H. Shuhama,
Sher-e-Kashmir University of Agricultural Sciences
and Technology of Kashmir, Shalimar, Jammu and Kashmir (India)

The level of incorporation of antioxidant grape seed extract in the functional *Goshtaba* was optimized in this experiment with following treatments; T_0- Lean meat: Grape seed extract = 80:0, T_1-Lean meat: Grape seed extract = 80:0.1%, T_2- Lean meat: Grape seed extract = 80:0.2% and T_3- Lean meat: Grape seed extract = 80:0.3. The treatments were compared among each other for their impact on the physico-chemical, compositional and sensory quality of *Goshtaba.* Results revealed that the mean scores for emulsion stability and cooking yield were highest for T_0 although the difference was found to be statistically non-significant ($p>0.05$) with T_1 and T_2 but statistically significant ($p<0.05$) with T_3. The mean pH value of T_0 was found to be lowest. The moisture and fat content of T_0 was found to have statistically non-significant ($p>0.05$) difference with T_1 but statistically significant difference ($p<0.05$) with T_2 and T_3. Statistically significant difference ($p<0.05$) in protein score was found from T_0 to T_3 with T_0 having highest protein value. Ash content revealed that scores were significantly increasing from T0 to T3. The mean DPPH-RSA and ABTS-RSA values revealed that with increasing level of grape seed extract incorporation the DPPH-RSA and ABTS-RSA scoresshowed significantly increasing trend from T_0 to T_3, T_0 was found to be non-significantly ($p>0.05$) highest in the sensory attribute scores and comparable with T_1. There after the scores decreased and were not within the acceptable limit. The textural profile scores for hardness, gumminess and chewiness were found to be in increasing trend whereas the scores for springiness and cohesiveness were found to be in decreasing order and acceptable up to T_1 treatment. It can be concluded that antioxidant (Grape seed) can be incorporated up to 0.1% to develop functional *Goshtaba,* without

affecting the sensory, physico-chemical as well as compositional quality of *Goshtaba.*

Keywords: *Goshtaba, antioxidant, grape seed, DPPH, ABTS, physico-chemical, compositional, sensory and textural profile.*

IAAHAS/AB/2023/288

An opinion: Green Manuring-Key success to Natural Farming

A.B.M. Sirisha* T. Tulasi Lakshmi, R. Saritha and V. Sujatha
Agricultural Research Station, Yellamanchili, Visakhapatnam District, Andhra Pradesh
Acharya N.G. Ranga Agricultural University

Natural farming, a sustainable farming system adopted by our ancestors. Now-a-days we are turning back to our roots. Many components are included in the natural farming to enrich the soil, plant correction, protect the seed etc. The main moto in natural farming is enrichment of organic carbon. The organic carbon content of our soils is too poor and has to be upgraded gradually. Attaining the goals of natural farming cannot be done in a day. It is a long-term process. For successful natural farming at farmers level green manuring plays a key role. Green manuring adds the biomass to the soil. Continuous green manuring will improve the soil health and improves the organic carbon gradually. The crop raised succeeding green manuring incorporation are observed with low pests and disease attack. The yield of the crops enhanced gradually after 3 years of green manuring. Generally green manure crops like sunhemp, daincha, sesbania add good organic matter content. Green manuring is the prime step for the success of natural farming. All other components like addition ghanajeevamrutam, dhravajeevamrutam etc. adds complimentary effect in addition to the green manuring process in natural farming may not result desirable significant results. Hence it is suggested to adopt green manuring as an important component for a successful natural farming. Without green manuring, natural farming would not yield successful results.

Keywords: *Green manure, natural farming, soil health, organic carbon.*

Glutaraldehyde crosslinked cellulase nanocomposites: A nanobiocatalytic system for sustainable cellulose hydrolysis

Gurkanwal Kaur[1*], Monica Sachdeva Taggar[2], Anu Kalia[3]
[1]Department of Biochemistry, Punjab Agricultural University, Ludhiana-141004, Punjab
[2]Department of Renewable Energy Engineering, Punjab Agricultural University, Ludhiana-141004, Punjab
[3]Department of Soil Science, Punjab Agricultural University, Ludhiana-141004, Punjab

Cellulase based nanobiocatalysts have been considered as useful tools for biomass hydrolysis in agro-residue management/ valorization systems. In this work, we investigated the effect of a prominent crosslinking agent, glutaraldehyde (GDA) for immobilization of cellulase on control and chitosan functionalized magnetic nanoparticles (MNP). Varying concentrations of GDA (0, 1.5, 2.5 and 3.5%) along with its reaction time with the support particles were optimized to achieve maximum enzyme immobilization. GDA concentration of 2.5% with reaction time of 2 h exhibited maximum crosslinking resulting in 67.5% and 74.06% cellulase immobilization efficiency for control and chitosan functionalized MNP, respectively. The binding of enzyme on the nanocomposites was further confirmed using fourier transform infrared spectroscopy. The enhanced thermal stability of immobilized enzyme as compared to free enzyme was depicted using thermogravimetric analysis. Specific activities of immobilized cellulase were observed as 86.89 and 169.6 nmol min^{-1} mg^{-1} of protein on control and functionalized MNP, respectively. Designing and further optimizing this GDA- crosslinked nanostructured immobilization methodology for improved catalytic activities and efficient downstream processing can prove to be an interesting frontier in the field of sustainable catalysis for agro-residue processing at industrial scale.

Keywords: *Bio-catalysis, cellulase, glutaraldehyde-activation, immobilization, nanocomposites,*

IAAHAS/AB/2023/290

Influence of Crop Establishment Methods on Weed Growth and Yield Under Rice-Rice-Blackgram Cropping System

N. Satheeshkumar[1], K.M. Sellamuthu[2], A. Valliammai[3]

[1]Associate Professor (Agronomy), Maize Research Station, TNAU, Vagarai-624 613

[2] Professor (SS &AC), Department of Soil Science & Agricultural chemistry, TNAU, Coimbatore- 641 003

[3]Professor and Head, Department of Irrigation and Drainage Engineering, Agricultural Engineering College & Research Institute, TNAU, Kumulur- 621 712

Field experiments were conducted during 2016-17 to 2018-19 at Agricultural Research Station, Bhavanisagar to study the influence of crop establishment methods in *kuruvai*, *Thaladi* and summer seasons on weed growth and yield under rice-rice-blackgram cropping systems. The experiments were conducted with various crop establishment methods *viz.,* non – puddled, dry seeded rice and puddled transplanted rice during *kuruvai*; no till and puddled transplanted rice during *Thaladi*; no till blackgram during summer seasons. Puddled transplanted rice followed by puddled transplanted rice registered lower weed density (12.1 and 22.3 no m^{-2}) and weed dry weight (15.2 and 20.1 g m^{-2}) during kuruvai and samba seasons respectively. Number of productive tillers (293 and 296 no m^{-2}) and rice grain yields (5894 and 5830 kg ha^{-1}) were increased due to puddle transplanted rice condition in both *kuruvai* and *Thaladi* seasons.During summer season, no till blackgram with puddled transplanted rice condition in *kuruvai* and *Thaladi* seasons registered higher blackgram seed yield of 953 kg ha^{-1} . The puddled transplanted rice followed by puddled transplanted rice and no till blackgram system registered higher system rice equivalent yield of 11341 kg ha^{-1} with the net return of Rs.291969 and B:C ratio of 2.58.

Keywords: *Puddled transplanted rice, weed density, weed dry eight, System yield and rice equivalent yield*

IAAHAS/AB/2023/291

RNA Interference: A prospective tool for the crop improvement

[1]H. J. Patel
[1]Dept. of Genetics and Plant breeding, COA, JAU, Junagadh

Plant biologists have extensively studied the RNA interference (RNAi) mechanism in recent years in order to better understand how it may be used to control disease, produce new plants and enhance germplasm. Host-induced gene silencing (HIGS) and the production of transgenic plants are the two main applications of RNAi-based technology. Silencing of homologous gene expression triggered by double-stranded RNA (dsRNA) is called RNA-mediated interference or RNA interference (RNAi). Introduction of long double-stranded RNA into the cells of plants, invertebrates as well as mammals leads to a sequence-specific degradation of the homologous gene transcripts. The long dsRNA molecules are cleaved by an RNase III enzyme called Dicer; this generates small 21-23 nucleotide long dsRNA molecules called small interfering RNAs (siRNAs). The siRNA molecules bind to a protein complex called RNA-induced silencing complex; this complex contains a helicase activity that unwinds the two strands of RNA molecules. The antisense RNA strands so generated pair with the target RNA molecules, and an endonuclease activity then hydrolyses the target RNA at the site where the antisense strand is bound.

Keywords: *RNA interference, HIGS, siRNAs, double-stranded RNA*

IAAHAS/AB/2023/292

Organic Farming: A technique to accelerate farmer's income

Harshit Mishra[1]*, Supriya[2], Sandeep Gautam[3] and Rohit Kumar[4]
[1,2,3] Department of Agril. Economics, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P) – 224 229
[4] Department of Post Harvest Technology, Banda University of Agriculture and Technology, Banda (U.P) – 210 001

Organic farming is a method of farming practiced in India since ancient times, with the main objective of producing sustainable agricultural products in an

ecological, unpolluted environment. Ecological farming techniques keep the environment and ecology alive and thriving by using agricultural products that are desirable for human consumption. Organic agriculture prioritizes the environment by using naturally available resources as inputs, such as organic waste (plant, animal and agricultural waste, water waste) and other biological materials, as well as beneficial microbes (bio-fertilizers/bio-pesticides) that release nutrients to crops and protect them of pests and diseases that increase agricultural production. Organic farming ensures that nature remains pure and rich. Organic farms have about 30 % more wildlife and plants than conventional farms. This is because there are no pesticides and much less fertilizer is used. The Covid-19 pandemic has changed the perception of organic food, and now the spotlight is on safe and healthy food that is nutritious and strengthens the immune system. It's time to talk about nutritional security, not just food security (which is just carbohydrates). Among healthy food choices, organic food is considered the first choice. That is why organic food has become common since the outbreak of the pandemic. Organic products usually have more antioxidants, certain trace elements, no harmful chemicals, pesticides and fertilizers, better taste and most importantly - organically grown products help maintain the sustainability and ecological balance of the earth.

Keywords: *Bio-fertilizer, ecological balance, organic farming, sustainable agriculture.*

IAAHAS/AB/2023/293

Pathogens responsible for causing rhizome rot disease of Turmeric

H.N. Markad[1], T.K. Narute[2] and A.S. Rothe[3]
Department of Plant Pathology and Agricultural Microbiology, Mahatma Phule Krishi Vidyapeeth, Rahuri, (MH)

India is considered as 'The land of spices' and enjoys since the eternity a unique position in the production and export of turmeric (*Curcuma longa* L.). Globally, India is the biggest producer in turmeric (*Curcuma longa* L.) as well as exporter, contributing almost 80 per cent of overall production and 60 per cent of exports. Turmeric also called as 'Hidden Lilly' or 'Golden spice' or 'Turmeric

of commerce' or 'Indian saffron' or 'Haldi' or 'Spice of life'. Among the major constraints liable for lower yields and reduced rhizome quality, rhizome rot disease plays a crucial role. Rhizome rot disease caused 30 to 80 per cent reduction in turmeric yield and rhizome quality. Disease produces pre-emergence rhizome rot (PERR) and post emergence seedling mortality (PESM) symptoms. Rhizome rot disease of turmeric is a one of major disease of turmeric caused by many soil born pathogen. In a present study, rhizome rot responsible pathogens were isolated in which *Pythium aphanidermatum*, *Fusarium oxysporium* and *Sclerotium* was a major pathogen isolated form infected turmeric rhizomes. Cultural and morphological characters of all pathogens were studies. Koch's postulate of all the pathogens was proved by applying sick soil method under controlled condition. In a western Maharashtra zone turmeric cultivation increased day by day. Roving survey in Western Maharashtra State recorded, *Pythium aphanidermatum* was a major pathogen responsible for causing rhizome rot in turmeric than the other pathogens. During present study, rhizome fly role for the development of rhizome rot disease was also studied. Rhizome fly play major role for development of disease by causing injury to rhizome surface.

Keywords: *Rhizome rot, Turmeric, Pathogens, Pythium aphanidermatum*

IAAHAS/AB/2023/294

Hydroponics in Vegetable production: Climate Smart Agriculture

Shubham*, Arun

*Department of Vegetable science, PG scholar, CCS Haryana Agricultural University, Hisar, Haryana 125004, India

In the current situation, India requires food security, which means that all people must have physical and economic access to safe and nutritious food to meet their dietary needs. Scarcity of useable water for agriculture leads to lower food production, which eventually leads to hunger and malnutrition for a huge number of people in our country. As a result, there is an urgent need for agricultural technology that can contribute to water conservation while also positively impacting food production and availability. 'Hydroponics' is one

such soilless growing technology, and its water consumption efficiency is substantially higher than that of a conventional system. The word 'hydroponics' is derived from two Greek words: '*hydro'* – meaning water, and '*ponos'* – meaning labour. *A system where plants are grown in growth media other than natural soil. All the nutrients are dissolved in the irrigation water and are supplied at a regular basis to plants.* Hydroponics is one of those useful techniques; in which several benefits include less time spent growing crops than conventional growing, less disease and pest incidences, elimination of weeding, spraying, and watering, and so on. Hydroponics uses nutrient film techniques (NFT) to conserve 70%-90% of the water used in the production of leafy and other vegetables. Various commercial and special crops can be grown using hydroponics including leafy vegetables, tomato, cucumber, pepper, strawberry and many more.

Produced in a climate-controlled greenhouse, the producer can supply vegetables out of season. Greenhouses protect plants against the strong UV radiation, to increase the humidity around plants, and to decrease to some extent the extreme minimum and maximum temperatures that can occur in one single day. Hence more research studies are needed on the combined approach in the hydroponics can intensify quality in vegetables.

Keywords: *Hydroponics, Vegetables, food security, efficient resource management*

IAAHAS/AB/2023/295

Seed Coating Technology and Its Impact on Seed Quality and Productivity

Pal S[1], Chatterjee A[1], Karar S[1], Ray DD[2], Saha A K[2*]

[1]School of Agriculture, Seacom Skills University, Kendradangal, WB-731236

[2*] Assistant professor, School of Agriculture, Seacom Skills University, Kendradangal, WB-731236

In the era of ever-growing population and shortage of cultivable land, it is an urgent need of increasing crop productivity for continuous supply of food to all human beings. Unsustainability of conventional agricultural practices along with future climate scenario urges for alternatives that can not only increase agricultural production but also bring environmental and economic

sustainability. Plant beneficial microbes (PBM) mainly likes plant growth-promoting bacteria, arbuscular mycorrhizal fungi, and *Trichoderma* can help in solving the problem if it can be used systemically and scientifically through seed coating. However, direct soil inoculation and plant inoculation of PBM is not economically feasible in large-scale applications due to the high amount of microbial inoculum required. Seed coating is a technique in which an active ingredient (e.g., microbial inoculant) is applied to the seed surface using a binder, sometimes a filler that can act as a carrier. The three primary kinds of seed coatings are seed dressing, film coating, and pelleting, each of which can be chosen differently depending on the application's goals, the type of seed being used, or the microbes being used. Cereals like wheat and maize, as well as fruit and vegetable crops like tomato, cucumber, and sugar beet, are the agricultural products that have been studied the most in terms of inoculation via seed coating. Pea, chickpea, and soybean are some of the oil and seed pulse products that are most frequently mentioned. Seed coating using PBM can assist plants in sustaining or enhancing output while lowering the input of agrochemicals, restoring soil fertility, and/or overcoming issues brought on by abiotic and biotic stresses Coating cowpea seeds with *P. putida* using silicon dioxide and starch significantly increased biomass and seed yield under water deficit. The use of microbial inoculants is also considered as a promising option to enhance the production of cereals under salinity stress. Depending on the growing circumstances, microbial seed coating benefits for crop yield can be temporary or non-existent. Despite having such limitations, seed coating has the potential to be a cost-competitive and time-saving approach for high crop production and protection, reducing application efforts and providing extra and desirable characteristics to the seeds.

IAAHAS/AB/2023/296

Effect of Different Mode of Pollination on Quantitative and Qualitative Parameters of Muskmelon

Gothi, H. R.*[1] and Patel, P. S.[2]

[1,2]Department of Entomology, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat

Pollinators are the prime facie to maintain the diversity in universe. Hence, research on "Studies on pollinators of muskmelon (*Cucumis melo* Linnaeus)" was carried out at Chimanbhai Patel College of Agriculture, S. D. Agricultural University, Sardarkrushinagar during summer 2021. The mode of pollination had a highly significant effect on quantitative and qualitative parameters of muskmelon. The mean per cent fruit set, weight of fruit (kg), volume of fruit (litre), length of fruit (cm), girth of fruit (cm), number of seeds per fruit and total soluble solid (%) in open and close pollination were 15.76 % and 10.52 %, 0.74 kg and 0.39 kg, 0.71 litre and 0.38 litre, 11.43 cm and 9.10 cm, 37.06 cm and 28.42 cm, 557.53 seeds and 401.30 seeds and 10.02 % and 8.66 %, respectively. These results indicated that pollinators are highly influenced the production of muskmelon.

Keywords: *Mode of pollination, Quantitative, Qualitative, Muskmelon and Cucumis melo*

IAAHAS/AB/2023/297

Evaluation of antioxidants, pectin, flavonoid activity in peel of pomegranate accessions

Shagun[1*], Anil Kumar Sangwan[1]

Department of Fruit Science, Punjab Agricultural University, Ludhiana-141004, Punjab

Owning to various health and nutritional benefits, pomegranate is named as 'Super food'. It is very much liked by consumers as it has antioxidant properties, anti-inflammatory as well as soothing effects. Improvements of nutritional profile can be done in serums, moisturizers, face oils with

incorporation of these phytochemical properties of pomegranates as they have high antioxidant, flavonoid features. This study was conducted in Regional Research Station (RRS), Abohar, outstation Punjab Agricultural University. In this work, 5-Year-old, nine US pomegranate germplasms were assessed for their biochemical properties. It was observed that the peel of 36EC676994 V. KUSUNYI accession has significantly (p≤ 0.05) maximum phytochemical component, i.e., total antioxidants of 87.6% and maximum pectin content in accession 50EC677008MYATADZHY (14.7%) followed by 8.82% in 36EC676994 V. KUSUNYI. The range of antioxidant in the peels of these nine germplasm lies between 63.4% in 61EC677021KOPETDAG to 87.7% in 36EC676994KUSUNYI. For antioxidants, the radical scavenging activity was evaluated using DPPH (2,2-diphenyl-1-picrylhydrazyl) method and for total phenols, Folin and Ciocalteau's reagent, Gallic acid standard were prepared. Total flavonoid content is reported maximum (62.5mg RE/g) in accession 61EC677021 KOPETDAG at par to 62.15mg RE/g in 59EC677019 OVANDAN, the lowest flavonoid content in peel of 56EC677016NUSAI (36.1 mg RE/g). Further optimising these phytochemicals in the accessions for improving nutritional activities and efficient peel processing can prove to be an interesting frontier in the field of Horti-residue processing.

Keywords: *Super food, pomegranate, accessions, phytochemicals, nutritional, antioxidants, flavonoids.*

IAAHAS/AB/2023/298

Improved Yield of Rice on Application of Silicate Solubilizing Bacteria along with Rice Residues

P. Kalaiselvi, S. Paul Sebastian, E. Parameswari, V. Davamani, K. Suganya
ICAR-Krishi Vigyan Kendra, Salem-636 203, Tamil Nadu

Rice is the staple food crop grown extensively all over the world and occupies a pivotal position in the food security system of India. It is a silicicolous plant and a known silicon accumulator. Silicon plays an important role in enhancing the resistance of rice to multiple stresses *i.e.* biotic and abiotic stresses. In addition, the application of silicon generally increased the uptake of phosphorus, calcium, magnesium and the formation of carbohydrate. Many soils contain an inadequate supply or naturally low in available Silica

(Si). Farmers are not replacing Si which was removed by rice. This will be a great limiting factor to sustainable rice production. Based on this background laboratory and field experiment were conducted to study the impact of application of silicate solubilizing bacteria (SSB) along with rice residues on rice crop. A laboratory study was conducted for screening the naturally occurring SSB in soil and other silicious materials. Among the isolates screened, SSB I isolated from rice husk was selected as elite one based on the silicate dissolution potential. SSB I was characterized and identified as members of the genus *Bacillus* which released the Si from silicate bearing minerals in the agricultural soils. A field experiment was also conducted at Agriculture College and Research Institute, Madurai, in the rabi season with ADT 36 rice variety and examined the influence of silicate solubilizing bacteria in rice along with application of rice residues like straw, rice husk and black ash (rice husk ash). Rice responded well to the application of organic siliceous residues like rice straw, rice husk, black ash @ 5 t/ha. The application of SSB I hastened the decomposition of these organic siliceous residues. The application of SSB I markedly influenced the crop growth, yield parameters and yield (4.9 t/ ha) of rice. It has been concluded that the application of SSB increased the grain yield of rice, mainly due to the supply of Si which might have resulted due to solubilization of soil minerals and decomposition of rice residues and liberating its nutrients to the crop. The silicate solubilizing bacteria thus gains importance in rice cultivation. Hence, sustainability in agriculture and crop production is not merely achieved by cutting down the off farm inputs like inorganic fertilizers and chemicals but also by replenishing the soil with what has been removed from it by the crop, through on farm inputs like organic manures particularly by recycling crop residues.

Keywords: *Rice, Silica, Rice residues, Silicate solubilizing bacteria*

IAAHAS/AB/2023/299

Role of Gene editing in Crop Improvement

Seijal, Mrityunjaya Sharma, Dipesh and Abhishek
Faculty of Agricultural Sciences, SGT University, Gurugram

Induced mutagenesis has been widely used to generate genetic diversity and identify the essential regulatory genes for economically significant features for crop development. Physical, chemical, and insertional mutagen treatments are just a few of the methods that can cause mutations; however, these approaches are not frequently used due to their high cost and time-consuming nature. However, in modern crop improvement programs use the versatile tools CRISPR (clustered regularly interspaced short palindromic repeats) and Cas9 (CRISPR-related quality) in gene editing on a variety of plant species. An irreversible technique called CRISPR/Cas9 allows microorganisms to become resistant to herbivores, disease vectors, phages, and plasmids. The easy design principle of the guide RNA, which directs Cas9 to the desired DNA region, as well as the high specificity and effectiveness of CRISPR/Cas9-generated DNA breaks, are the driving forces behind the CRISPR/Cas9 genome editing tool's enormous success. Although it has been compared to other cutting-edge methods like zinc finger nuclease (ZNF) Targetable DNA cleavage agents called ZFNs have become popular gene-targeting agents. ZFN-induced double-strand breaks are subject to cellular DNA repair processes that lead to both targeted mutagenesis and targeted gene replacement at remarkably high frequencies. But CRISPR/Cas9 framework has expanded in application because it needs less effort and time and performs more effectively. This ground-breaking biotechnology has been applied to a variety of crops. Recent study has given rise to optimism for therapeutic genome editing in clinics by successfully modulating disease-causing alleles in vivo in animal models and ex vivo in somatic and induced pluripotent stem cells. Genome editing can result in one of three sorts of changes: Type I involves changing a few nucleotides, Type II entails substituting an existing allele, and Type III permits the insertion of new genes in specific locations throughout the genome. Crops made through gene editing could avoid the strict regulatory processes often associated with the creation of GM crops because the majority of genome-editing techniques can leave behind evidence of DNA mutations visible in a tiny number of nucleotides. Because of this, many scientists think that plants enhanced using more exact gene editing techniques will be more popular with the general people than transgenic plants.

Keywords: *Mutagenesis, CRISPR, ZNF, Gene Editing, GM crops, Crop Improvement.*

IAAHAS/AB/2023/300

Assessment of Intercropping Indices of Mustard (*Brassica juncea* L.) with Chickpea and Field Pea Ratio

M. H. Chavda[1*], P. P. Chaudhari [2], Y. B. Vala [3] and M. G. Chaudhary [4]
Department of Agronomy, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar-385 506, Gujarat

A field experiment was carried out during the winter (*rabi*) of 2019-20 at Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar to study the effect of intercropping in mustard (*Brassica juncea* L.) nine treatment combination *viz.,* T_1 : Sole mustard, T_2 : Sole chickpea, T_3 : Sole field pea, T_4 : Mustard + chickpea (1:2), T_5 : Mustard + chickpea (1:3), T_6 : Mustard + chickpea (1:4), T_7 : Mustard + field pea (1:2), T_8 : Mustard + field pea (1:3) and T_9 : Mustard + field pea (1:4) were laid out in randomized block design replicated 3 times. Among different intercropping systems, mustard + field pea (1:4) recorded maximum aggressively, crowding coefficient and competitive ratio in mustard. While, Area time efficiency ratio, production efficiency, system profitability, value: cost ratio and relative value total maximum observed in Mustard + chick pea (1:3) ratio.

Keywords: *Mustard, Chickpea, Field pea, Ratio and Intercropping*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/301

Remote Sensing based Drought assessment using NDVI anomaly and its relation with rainfall variability across Tamil Nadu

Tarun Kshatriya. T[1*], Kumaraperumal. R[2], Pazhanivelan. S[3], Thamizh Vendan. R[4] and Mohan Kumar. S[5]

[1*]Department of SS & AC, [2]Department of RS & GIS, [3]Water Technology Centre, [4]The Registrar, TNAU, [5]Directorate of Crop Management, Tamil Nadu Agricultural University, Coimbatore – 03.

Drought is a condition of moisture deficit relative to the typical amount of water available in a specific region and season. Recently, due to climate change, variability in rainfall was observed across the worldwide. Remote sensing products such as the Normalized Difference Vegetation Index (NDVI) are widely used to assess crop growth, agriculture, land management, and crop output. It was widely used for crop growth monitoring and prediction, as well as observing changes in vegetation cover. In dry and semi-arid regions, NDVI data are used to analyze the susceptibility of vegetation growth to rainfall variability. NDVI anomaly is used to access the agricultural drought and relating it rainfall, and its variability is useful in agricultural drought management. Hence, a study was conducted for the period of 2001 to 2020 years across Tamil Nadu. MODIS NDVI data with a resolution of 500 m and CHIRPS rainfall data with 5 km resolution were used to access drought and relationship with rainfall. The result showed that mild-to-moderate drought conditions were more in normal rainfall years; however, in the case of deficient rainfall years, the percentage of area under severe and extreme drought conditions was increased, especially in the plain region (croplands) compared to forest regions. The relationship between rainfall and vegetation indices showed a positive response except for the coastal regions.

Keywords: *Drought; NDVI; Rainfall; Tamil Nadu.*

Study on optimization of ergosterol extraction from *Agaricus bisporus* and its efficacy in modulating obesity in C57BL/6 mice model

Moumita Das[1], G Suresh Kumar [1*]

[1]Department of Biochemistry, CSIR-Central Food Technological Research Institute, Mysore-570 020, India

The study aimed to optimize a method of extracting ergosterol rich concentrate (ECF) and to evaluate its significant impact on obesity in C57BL6 mice model. A comparative analysis (Soxhlet & ultra sound assisted extraction) was done to obtain the highest yield of ergosterol from *Agaricus bisporus*. The ECF was evaluated for the biological effect on 3T3-L1 preadipocytes *in vitro* and on male C57BL/6 mice model (ECF 0.5% & 1% dose) *in vivo*. Ultra sound assisted extraction method using the solvent n-hexane resulted in highest ergosterol yield (504.49±4.27 mg/100g dw). ECF treatment significantly reduced the differentiation and lipid accumulation on preadipocyte cells without any cytotoxicity in a concentration range of 6µg/ml to 18µg/ml. *In vivo* study illustrated beneficial impact on lipid metabolism by down regulating the hepatic protein expression of FAS, HMG-CoA-R and up-regulating LDL-R expression. ECF had an anti-adipogenic activity *in vivo* mainly by inhibiting the activity of PPAR-γ, C/EBP-α and SREBP-1c. The results also depicted the improvement of obesity associated insulin resistance by ECF treatment manly via decrease in plasma glucose, insulin, resistin and up regulation in skeletal GLUT4 (ECF 0.5%-1.77folds and ECF1%-1.42 folds) protein expression.

IAAHAS/AB/2023/303

Morphological and Biochemical Characterization of microbes and their Antifungal effect of Biosurfactant against *Fusarium solani*

Satyam[a] and Khem Raj Meena[b]

[a]Department of Plant Pathology and Agricultural Microbiology, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth Rahuri, Ahmednagar, Maharashtra -413722, India

[b]Department of Microbiology, Faculty of Basic sciences and Humanities, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar-848125, India

Biosurfactants are surface active secondary metabolites produced in late log or initial stationary phase of growth by bacteria, fungi, and yeast. Due to its wide application in biodegradation, inhibition of phytopathogens and low toxicity its demand increases in recent time. Bacillus spp are considered as microbial factory for the control of phytopathogens by the application of biosurfactant released by bacteria. Four unknown isolates collected from faculty of basic science and humanities, department of microbiology Dr. R.P.C.A.U, Pusa All four (T1, T2, T3 and T4) bacterial isolates were gram stained, endospored stained and biochemical tested as per previously reported methods. All bacterial strains (T1, T2, T3 and T4) after gram staining found that T1, T2, T3 were gram positive purple colour rod shaped and T4 was gram negative pink colour rod shaped bacteria. After endospore staining I found that only T4 was non endospore forming and T1, T2, T3 were endospore forming bacteria. These isolate further selected for biochemical test and found that T1 was methyl red, glucose, oxidase positive and indole, Voges proskauer, citrate utilization, adonitol, arabinose, lactose, sorbitol, manose and sucrose negative. T2 was methyl red, Voges proskauer, glucose, oxidase positive and indole, Citrate utilization, adonitol, arabinose, lactose, sorbitol, manitol, rhamnose and sucrose negative. T3 was indole, Voges proskauer, Rhamnose, sucrose positive and methyl red, Citrate utilization, glucose, adanitol, arabinose, lactose, sorbitol, manitole and oxidase negative. T4 was indole, methyl red, Citrate utilization, adonitol positive and Voges proskauer, glucose, arabinose, lactose, sorbitol, manitol, rhamnose, sucrose and oxidase negative. Out of that T3

(*Bacillus velezensis*) show maximum % inhibition 68.07% followed by T2 (*Bacillus anthracis*) 51.65%, T1 (*Bacillus cereus*) 50.70% and T4 (*Serratia marcescens*) 44.13% against *fusarium solani*.

Keywords: *Biosurfactants; metabolites; inhibition; biodegradation; low toxicity.*

IAAHAS/AB/2023/304

Concentration-dependent Efficacy of Zinc oxide nanoparticles on growth, biochemical attributes and wilt disease of *Solanum lycopersicum* L. caused by Phytopathogenic bacterium *Ralstonia solanacearum*

Aiman Parveen*
*Mayfair College, Moradabad-244001, U.P., India
(affiliated to MJP Rohilkhand University, Bareilly, U.P.)

Effect of Zinc oxide (ZnO) nanoparticles was observed on *Ralstonia solanacearum* and on the growth of tomato (*Solanum lycopersicum* L.) both *in vitro* and in pot experiment. Inhibitory effect of ZnO nps was observed on the growth of *R. solanacearum.* Application of 1000 ppm ZnO nps was found most effective against the growth of *R. solanacearum*, followed by 500 ppm and 250 ppm under *in vitro* conditions. Inoculation of the pathogencaused a significant reduction in plant length, fresh weight, dry weight, chlorophyll and carotenoid contents over uninoculated control. Seed dressing prior to planting with 250, 500 and 1000 ppm solution of ZnO nps respectively caused a significant increase in plant length, fresh weight, dry weight, chlorophyll and carotenoid contents over plants without ZnO nps pre-treatment. Seed dressing with 250,500 and 1000 ppm ZnO nps and subsequent inoculation with *R. solanacearum* caused a significant increase in plant length, fresh weight, dry weight, chlorophyll and carotenoid contents over plants inoculated without ZnO nps pre-treatment. Seed treatment of 1000 ppm ZnO nps caused a greater increase in plant length, fresh weight, dry weight, chlorophyll and carotenoid contents of pathogen inoculated as well as uninoculated control plants,

followed by 500 ppm and 250 ppm. In context with this study, concentration-dependent utilization of ZnO nps offers a potential and reliable tool for the management of *R.solanacearum* on tomato, concurrently increasing its growth.

IAAHAS/AB/2023/305

Studies on Moisture Transfer during Microwave Puffing of Soy-Fortified Green Leafy Vegetables (GLVs) and Potato Based Ready-To-Eat Snack

[1]*Shilpa Deshmukh, [2]I. L. Pardeshi

[1] Assistant Professor, Deptt. of Agriculture Engineering, College of Agriculture, Mul, Chandrapur, Dr. PDKV, Akola

[2] Professor, Deptt. of Food and Grain Process Engineering, Dr. BSKKV, Dapoli. M.S., India

Drying is one among the foremost important processes within the food industry, also together of the foremost frequently studied topics in process and food engineering. Optimizing this process will result in lower production costs and increased product quality. Moisture transfer in heterogeneous materials, like foods, may be a complex process where quite one mechanism may occur. The mechanism governing moisture transfer during drying i.e. microwave puffing is complex and is highly dependent on the food's structure, particularly its porosity, which can change as drying proceeds. In this study, microwave puffing characteristics of soy-fortified GLVs and potato based flat cold extrudate, after requisite convective drying, was investigated experimentally in microwave oven. Effect of different microwave power on total puffing time was determined. Experiment were conducted at five different microwave power i.e. 180 W, 360 W, 540 W, 720 W, 900 W (calibrated power as 140 to 700 W) and its influence on moisture content was studied. The cold extrudate in flat strip form with constant initial moisture content of 0.55 kg/kg of dry matter during convective drying and was used for experimentation with sample size of 30 g for each set of experiment. Higher microwave power

corresponds to higher drying rates and faster drying time. Drying rate is defined as function of temperature and time. The falling also as constant rate period was observed for the drying rate of RTE snack.

Keywords: *Extrudate, Microwave, Puffing, Snacks, Moisture transfer*

IAAHAS/AB/2023/306

Evaluation of Medicinal Plant Extracts against *Sarocladium* oryzae under *In Vitro* Condition

Chetankumar* and R.K. Ranjan
Department of Plant Pathology, RPCAU, Pusa, Samastipur, Bihar- 848125

Rice is one of the major important food grain crops in the India. Rice crop is affected by many diseases, Sheath rot is one among them. Sheath rot of Rice caused by *Sarocladium oryzae[(Sawada) W. Gams & D. Hawkew].* To manage a disease many fungicides are available in market but, under natural farming the management of disease is very difficult. To design a strategy for the management of sheath rot under natural farming detailed trials are investigated to establish the efficiency of various Medicinal Plant Extracts under *in vitro* condition. In the present study six Medicinal Plant Extracts were evaluated against *Sarocladium oryzae* by using poison food technique at two different concentrations (5% and 10%). Observations taken upto 15 days from the inoculation at 3 days interval. All the Extracts significantly inhibited the growth of *Sarocladium oryzae* compared to control. Out of Six Extracts tested in *in vitro,* Sadabahar Leaf (*Catharanthus roseus*) Extract found most effective in inhibiting the growth of pathogen by 100% at 10% concentration. Least inhibition is found in Pippali leaf and Mandukaparni leaf extracts at 5% and 10% concentrations.

Keywords*: Rice, Sarocladium oryzae, Natural Farming, Plant Extracts*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/307

Role of Balmithai sweet in transforming rural livelihoods: a case study of Almora District

Bhumika Giri Goswami[1] and H.N. Singh[2]
Department of Agricultural Economics
GBPUAT, Pantnagar, Udham Singh Nagar, Uttarakhand

The district of Almora in Uttarakhand is mainly an exquisite hill station, with lot of religious and scenic spots which is often visited by many national and international tourists besides this the city is famous for its local sweet named as Balmithai, the sweet is made up of pure khoya (a processed form of milk), so demand of this sweet is very high in the region, parallel to this high demand the taste and purity of khoya used in the sweet attracts everyone towards this delicacy. In the past few years, it has been observed that people from the rural belts of the district were abandoning agriculture because of inconsistent nature of returns and migrating to cities in order to seek employment despite of its quality and duration. The study highlighted that in order to generate consistency in returns, the delicacy of the district can act as a game changer, this khoya is mainly obtained from livestock farmers residing in the nearby villages of the district and for the production of 1 kg of khoya around 5 litres of milk is required and the average daily demand of this sweet is around 700-1000 kg per day, so this can act as a driving force for farmers to take up livestock as an enterprise in order to produce more raw material and meet up the higher market demand of this delicacy.

Keywords*: Balmithai, Demand, Livestock farmers, Consistent returns.*

IAAHAS/AB/2023/308

Sustainable Forestry: Exploring the Potential of Fungi-based Microbial Inoculants for Promoting Seed Germination of *Swietenia macrophylla*

Shiran K[1]., A.V. Santhoshkumar[2], Joy Michal Johnson[3], Ashwant M.N.[5] and Binu N. K.[4]

[1]Scientist, ICAR- Central Arid Zone Research Institute, Jodhpur, [2]Professor, Department of FBIT, College of Forestry, KAU, Thrissur, [3]Professor & Head, Coconut Research Station, KAU, Balaramapuram, [4]Asst. Professor, Department of FBIT, College of Forestry, KAU, Thrissur,[5]PhD. Scholar, Department of FBIT, College of Forestry, KAU, Thrissur

In nature, plants form symbiotic associations with a diverse array of root-associated fungi that have been reported to promote plant growth. Of these, arbuscular mycorrhizal fungi (AMF) and endophytic fungi are of particular interest due to their potential role in promoting growth in many agricultural species. However, the use of these fungi to promote growth in perennial forestry species remains relatively unexplored. The present study investigates the effects of AMF consortia (*Funneliformis mosseae*, *Glomus etunicatum*, and *Glomus fasciculatum*) and the endophytic fungus *Piriformospora indica* on the germination of *Swietenia macrophylla*, an industrial timber species and a highly preferred species for plantation establishment and restoration in India. The presence of the endophytic fungus *Piriformospora indica* significantly improved the germination percentage of *Swietenia macrophylla* seeds and reduced the mean germination time, which is consistent with earlier studies that have reported the potential of endophytic fungi to enhance seed germination in various plant species. The combination of AMF and endophytic fungus resulted in the highest germination rate and the shortest mean germination time, indicating that the two fungal groups may have complementary effects on seed germination. While the AMF alone did not improve the germination conditions, its synergistic effect with endophytic fungi suggests that the two groups of fungi may have a collaborative role in promoting growth in forestry species. The present findings provide a foundation for future research into the use of endophytic fungi in promoting growth and productivity in forestry species, leading to the more efficient establishment of seedlings in plantation activities. Additionally, the study

highlights the need for a better understanding of the underlying mechanisms through which endophytic fungi interact with plants, as this knowledge may lead to the development of more effective microbial inoculants for forestry and agricultural species.

IAAHAS/AB/2023/309

An Accelerated Breeding Approach in Crop Improvement- Speed Breeding

Dr. M. Jayaprada, Dr. K. Lakshmikala, Dr. V. V. Padmaja, Dr. K. Lalitha, Dr. Syed Sadarunnisa and Dr. K. Gopal
Dr. Y.S.R.H.U, College of Horticulture, Anantharajupeta, Annamayya Dt., AP, India

In plant breeding, the development of improved crop varieties is limited by different phases of crossing, selection and testing/ screening procedures involved in the production of new plant varieties, which will be further affected by duration of crops. It can take one or two decades to create a new cultivar through regular breeding methods. The rate of yield increment is also insufficient to cope with the increased food demand caused by a rapidly expanding global population. In this era of fast development and rapid growth, people prefer to consume processed foods, where nutritional quality is compromised. To satisfy the continuously increasing demand for plant-based products, the current level of annual yield enhancement in major crop species (varying from 0.8–1.2%) must be doubled. Different approaches have been used to shorten the duration of plant reproductive cycles. Novel techniques developed in this decade, such as genomic selection, high-throughput phenotyping (HTP) and modern speed breeding, have been shown to accelerate plant breeding which can be achieved by 1) Modifying the photoperiod and temperature, 2) Exerting physiological pressure, 3) Embryo rescue, 4) Increased CO_2 concentration, 5) Doubled haploid production etc. Combining speed breeding with state-of-the-art technologies for accelerating selection and establishment of future crops will strengthen the efforts to fulfil the feeding requirement of the growing population and will create a novel revolution in agriculture.

IAAHAS/AB/2023/310

Management of bud blight disease in tomato using *Ganoderma lucidum*

B. Sangeetha[1,2]*, A.S. Krishnamoorthy[a], P. Renukadevi[a], V.G. Malathi[a], D. Jeya Sundara Sharmila[b]

[a]Department of Plant Pathology, Centre for Plant Protection studies,
[b]Department of Nano science and Technology,
[1]Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu 641003, India
[2]School of Agricultural Sciences, Karunya Institute of Technology and Sciences, Coimbatore- 64114, India

Tomato (*Solanum lycopersicum* (L.) Karst.) is an important vegetable crop that belongs to the family *Solanaceae,* widely cultivated around the world due to its high nutritive value. Tomato is infected with bud blight disease caused by *Groundnut bud necrosis* (GBNV)and disease incidence was estimated up to 85%. Symptoms of bud blight disease include necrosis on the leaf, stem, petiole, flower, sepal and chlorotic lesions on the fruits. Medicinal Mushrooms are rich sources of natural antibiotics and therefore mushroom extracts have been investigated for their antiviral activity against human viruses. Medicinal mushrooms have bioactive metabolites such as polysaccharides, lectins, proteins, peptidoglycans, triterpenoids, meroterpenoids, sterols and alkaloids. Only a few research papers are available on antiviral activity against plant viruses. Hence, a study was undertaken to manage the bud necrosis disease caused by GBNV, a plant virus using culture filtrate and extracts of basidiomycetous fungi *viz*., *Coprinopsis cinerea*, *Ganoderma lucidum* and *Lentinula edodes*. The efficiency of culture filtrates was evaluated by DAC-ELISA. Reduced virus titre was obtained in cowpea and tomato plants treated with *Ganoderma lucidum* when compared to inoculated control. Also, virus copy numbers were evaluated through quantitative PCR. Real-time PCR analysis were conducted to analyse the expression defense related genes *viz*., lipoxygenase (*LOX*), pathogenesis related protein (*PR1*), Peroxidase gene (*POX*), phenylalanine ammonia lyase gene (*PAL*) in treated plants. Additionally, molecular docking methods were used to identify the compatibility between the virus and antiviral principles from *Ganoderma lucidum*.

Keywords: *Groundnut bud necrosis tospovirus, Tomato, qPCR, Molecular docking, Ganoderma lucidum.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/311

Emerging Plant Diseases due to Climate Change

***Harish Babu. S and Ramalingam K**
RVS Agricultural College, Thanjavur, Tamil Nadu, India

The main aim of agriculture is to supply food all over the world. This process gets affected due to several factors like climate change, plant pests and diseases, etc. The main factor is the climate change, as it is the way for the emergence of pest and diseases. The climate change plays a major role in plant disease emergence which is one of the major problems in modern agriculture. Emerging plant diseases like Southern rice black streaked dwarf virus, Corm rot of Banana, etc. had led to serious yield loss in cultivated areas. This is based on the principle of Boom and burst cycle. These disease-causing organisms have a greater ability to overcome the plant resistance or the ability to cause disease on another host. Based upon the prevailing climate and weather conditions, these organisms adapt themselves in order to survive. The major factors for the climate change are intensive agricultural practices, excessive use of chemicals, deforestation and industrialization. Emerging diseases and pathogen dispersion, disease spread and possible causes contributing to the emergence of pathogens are the important factors in plant disease emergence. Further study on emerging diseases as a threat to crops, identify future research areas, and encourage the establishment of research networks focused on quarantine pathogens helps us to address the problem and minimize risks. The research activities related to emerging plant diseases should be encouraged and awareness should be created among the farmers in order to control such emergence.

Keywords: *Emergence, climate change, plant diseases, pathogens, resistance.*

IAAHAS/AB/2023/312

Impact of various fertigation levels and weed management practices on yield of maize

Aniket Ambadasrao Patil[1*], Dr. Jayant. P. Deshmukh[2], Pooja.P. Mane[3] Dr. V.V. Goud[4] and Dr. A.N. Paslawar[5]

[1*]Ph.D. Scholar, Dept. of Agronomy, P.G.I., Dr. P.D.K.V., Akola-444104
[2]Chief Agronomist, I.F.S.R., Dr. P.D.K.V., Akola-444104
[3]Ph.D. Scholar, Dept. of Agronomy, Dr. P.D.K.V., Akola
[4]P.I., AICRP on Weed Management, Dr. P.D.K.V., Akola
[5]Head, Dept. of Agronomy, P.G.I., Dr. P.D.K.V., Akola

The detrimental effects of weeds on maize yields are well-documented. Weeds outcompete maize plants for resources like light, water, and nutrients, resulting in stunted crop growth and a lowers harvest yield. Maize is heavy feeder crop. It is well-known that the use of drip fertigation may improve the maize yield. Hence, Effective weed management along with optimum fertigation is crucial for better maize production. Considering this context, A field investigation entitled “Impact of various fertigation levels and weed management practices on yield of maize" was carried out at the experimental field of the AICRP on Weed Management of Department of Agronomy, Dr. P.D.K.V., Akola, to study the impact of various fertigation levels and weed management practices on yield of maize in a split plot design with four main plot fertigation levels and five sub-plot weed management treatments. The main plot treatments comprised of different levels of fertilizer in five splits at 75 per cent, 100 per cent and 125 per cent of recommended dose of N and K fertilizers given through fertigation, however P was applied as basal dose and these treatments were compared with 100 per cent recommended dose of fertilizers as soil application. Whereas, sub plot treatments comprised of five weed management practices *viz.,* W_1- Atrazine 0.75 kg /ha PE *fb* Tembotrione 0.120 kg/ha POE 20 DAS, W_2- Atrazine 0.75 kg/ha PE *fb* Topramezone 0.0252 kg/ha POE 20 DAS, W_3 - Atrazine 0.75 kg/ha PE *fb* Halosulfuron-methyl 0.052 kg/ha POE 20 DAS, W_4- Farmer practices farmers practice – 2 hoeing 15-20 days interval after sowing *fb* 2 HW and W_5 - weedy check. The recommended dose of fertilizer applied was 120:60:60 NPK kg/ha. Among all the four fertigation levels, Results clearly showed that Treatment F_4*i.e.* fertigation of 125% RDNK in 5 Splits recorded significantly higher grain yield (q ha^{-1}), straw yield (q ha^{-1}) and biological yield (q ha^{-1}) followed by treatment F_3 *i.e.*100%

RDNK in 5 Splits. However, 100% RDF through soil application (F_1) and fertigation of 75% RDNK in 5 splits (F_2) were found to be on par with each other. Among all the five weed management practises, significantly higher grain yield (q ha^{-1}), straw yield (q ha^{-1}) and biological yield (q ha^{-1}) recorded with treatment W_4*i.e.* Farmer practices-2 hoeing 15-20 Days interval after sowing *fb* 2 HW. However, among the chemical weed management practises, treatment W_2, *i.e.* Atrazine 0.75 kg/ha P.E. *fb* Topramezone 0.0252 kg/ha P.O.E. 20 DAS, showed its significance over treatment W_3, *i.e.* Atrazine 0.75 kg/ha PE fb Halosulfuron-methyl 0.052 kg/ha POE 20 DAS, and treatment W_5 *i.e.* Weedy check but closely followed by treatment W_1*i.e.* Atrazine 0.75 kg /ha PE fb Tembotrione 0.120 kg/ha POE 20 DAS. Lowest yield was recorded in the weedy check (W_5).

Keywords: *Maize, Fertigation, Weed management, Topramezone and Yield.*

IAAHAS/AB/2023/313

In vitro evaluation of efficacy of different plant extracts and chemicals against *Bipolaris sorokiniana* (Sacc.) Shoemaker causing spot blotch of Barley

Aradhna Sagwal[1], Rajender Singh[1], Sudheer Kumar[2], Ravindra Kumar[2] and Shubham Raj[2]

[1]Department of Plant Pathology, CCSHAU, Hisar, Haryana

[2]Department of Crop Protection, IIWBR, Karnal, Haryana

Spot blotch of Barley is an important disease in Indian perspective caused by hemi-biotrophic pathogen *Bipolaris sorkiniana* (Sacc.) Shoemaker. A study has been conducted at Department of Crop Protection, Indian Institute of Wheat and Barley Research, Karnal on invitro study of bioefficacy of different plant extracts and chemicals viz. Garlic clove, Onion bulbs, Eucalyptus leaves, Neem leaves, Neem seed kernel, Turmeric powder, Chrysanthemum leaves, Mustard leaves tested at 5% and 10% concentration and Propiconazole 25 % EC, Mancozeb at 100, 200, 500 and 1000 ppm respectively against Spot Blotch of Barley. Amongst the eight test botanicals, garlic clove extract @ 5% concentration showed 98% and 99% inhibition of conidial germination

observed after 12 and 24 hrs respectively and 100% inhibition at 10 % concentration followed by Onion bulbs (67%, 75%), neem seed kernel (65%, 73%) at 5% and 10% concentrations, respectively observed after 24 hrs. Chrysanthemum leaves extract was found to be least effective in conidial germination inhibition. The fungicides also showed complete inhibition of conidial germination at all the concentrations.

Keywords: *Bipolaris sorokiniana, botanicals, efficacy, garlic cloves, Propiconazole 25%EC Barley.*

IAAHAS/AB/2023/314

Integrated Disease Management of Chilli Fruit rot under greenhouse conditions

Dr. Devi shanthini V*, Dr. Theradimani M, Dr. Brindhadevi S, Bavithra B
Department of Plant Pathology, Sri Manakula Vinayaga Engineering College, School of Agriculture, Madagadipet, Puducherry-605107
Department of Plant Pathology, Agricultural College and Research Institute, Killikullam, Tamilnadu-628252
Department of Plant Pathology, JSA College of Agriculture and Technology, Avatti, Tamilnadu-606108
Department of Horticulture, Sri Manakula Vinayaga Engineering College, School of Agriculture, Madagadipet, Puducherry-605107

Chilli is the most popular solanaceae family vegetable crops grown all over the world. India produces, consumes and exports the most of the chillies in the world. Its production in India is the highest in the world, followed by China, Thailand, Ethiopia, and Indonesia. The colour and pungency levels of Indian chilli are considered to be world famous commercial features. Indian chilli exports account for more than half of all worldwide chilli trade, with 4.84 lakh tonnes exported. Various biotic and abiotic stresses have an impact on chilli production around the world. Chilli crops are frequently susceptible to a variety of biotic stressors, including diseases such as damping off, leaf curl and among them chilli anthracnose is severe disease in chilli. Generally, chilli crop is infected by several numbers of diseases. Fruit-rot incited by *Colletotrichum truncatum* is the major limiting factor hampering the production and quality of

chilli. The green house experiment revealed that combined treatment with biocontrol agents and Strobilurin fungicides and resisitance inducing chemicals recorded lowest disease incidence of 19.47 percent over control (77.47%) when compared to other treatments.

Keywords: Chilli, Fruit rot, Resistance inducing chemicals, *Colletotrichum truncatum.*

IAAHAS/AB/2023/315

Role of conservation agriculture in doubling farmer's income

Alkajyoti Sharma
Ph.D scholar, Department of Agronomy, Bihar Agricultural University Sabour, Bhagalpur Bihar-813210

Doubling Indian farmers' income by 2022-23 over the base year of 2015-16, requires annual growth of 10.41% in farmers' income (Singh 2018). This implies that the on-going and previously achieved rate of growth in farm income has to be sharply accelerated. Therefore, strong measures will be needed to devise micro-level action plans to harness all possible sources of growth in farmers' income within as well as outside agriculture sector. We must also take into cognizance that rural demand drives our economy and exports are declining in recent years. It is important to mention that there is need of paradigm shift in the approaches, strategies and technologies to transform agricultural production system at the farm level. The farmer's income can be doubled by mainly, increasing price of farm produce, value addition in farm produce. Among these ways, agronomic interventions deal with first two ways i.e. reduction in cost of production, enhancing productivity which can be achieved through efficient management natural resources. Doubling the farmers' income by 2022 is quite challenging but it is attainable by efficient and proper management of natural resources. The farmers' income can be increased by reducing cost of cultivation; increasing productivity of crops, promoting efficient management of natural resources through efficient rainwater management, CA, RCTs, sustainable agriculture management, diversification of agriculture in various aspects, IFS, efficient residue

management; use of improved post-harvest technologies and improved price realization by farmers, etc.

Conservation Agriculture (CA) facilitates good agronomy, such as timely operations, and improves overall land husbandry for rainfed and irrigated production systems. Complemented by other known good practices, including the use of quality seeds, and integrated pest, nutrient, weed and water management, etc., conservation agriculture is a base for sustainable agricultural production intensification. It opens increased options for integration of production sectors, such as crop-livestock integration and the integration of tress and pastures into agricultural landscapes. The CA along with best crop management practices will lead to improvement in input-use efficiency and greater sustainability. It is well established globally over 180 m ha area that CA helps in achieving sustainable and profitable agriculture through three principles - minimal soil disturbance, permanent soil cover and proper crop rotation. The CA based management practices also help in adapting climatic risks and in lowering environmental foot prints. CA technologies have been developed, adapted and promoted since the past two decades, primarily to conserve resources and increase farm income. The CA based management optimization in the cereal based cropping systems in South Asia has helped in increasing crop productivity, input-use efficiency with economic returns, improving soil health, increased adaptive capacity of production systems to climate risks, reducing emissions and enhancing soil carbon sequestration.

In India, while farmers are the major producers, they also constitute the largest proportion of consumers. Hence, improving small farm production and productivity, as a major development strategy, can make significant contribution towards elimination of hunger and poverty, provided farming is made efficient and remunerative. The World Development Report of the World Bank has clearly emphasized that: 'Using agriculture as the basis for economic growth in agriculture-based countries requires a productivity revolution in smallholder farming'. It is also a fact that India will remain predominantly an agricultural country during most of the 21st century. Therefore, we must have both vision and national strategy for shaping the destiny of agriculture by making it highly productive, efficient and economically attractive for the smallholder farming community.

The target of doubling farmers' income by 2022, though apparently not easy yet a very laudable goal augurs well of Government's intention to help farmers. It is also clear that if concerted efforts, as per suggested action plan,

are made in a Mission Mode, chances of making agriculture an engine of national economic growth and for smallholder farmers' respectable professions are indeed much brighter.

Keywords: *Doubling farmers' income, RCTs, Conservation agriculture.*

IAAHAS/AB/2023/316

Genetic diversity analysis in wheat (*Triticum aestivum* L.) recombinant inbred lines

Satender Yadav[a], Vikram Singh[a], Hari Kesh[a], Mukesh Kumar[a], Virender Singh Mor[b], Shikha Yashveer[c], Anu[a]

[a]Department of Genetics and Plant Breeding,
[b]Department of Seed Science and Technology,
[c]Department of Molecular Biology, Biotechnology and Bioinformatics,
CCS Haryana Agricultural University, Hisar-125004

Genetic diversity among plant species offers prospects for improving the plant characteristics. Its assessment is necessary to help tackle the threats of environmental fluctuations and for the effective exploitation of genetic resources in breeding programmes. In present study, A total of 238 progenies of F5 and F6 generations of the cross WH711/WH542 were grown in randomized block design at CCSHAU, Hisar, during Rabi 2016-17 and 2017-18 under timely and late sown conditions. The substantial amount of genetic variability was observed for all the studied traits *viz.*, days to heading, canopy temperature, chlorophyll content, days to maturity, plant height, tillers per meter, spike length, spikelets per spike, grains per spike, grain weight, 100-grain weight, seed density, grain length, grain breadth, grain yield, biological yield, and harvest index. Cluster analysis grouped the 238 progenies into nine and ten clusters in F5generation under timely and late sown conditions, respectively. F6 generation was grouped in nine clusters under both the conditions. The inter cluster genetic distance ranged from 5.00 to 8.78 and5.11 to 8.41 in F5 generation whereas, 5.25 to 8.23 and 5.05 to 7.47 in F6 generation

under timely and late sown conditions, respectively. The higher intercluster distances exhibited the presence of more diversity among the progenies grouped in different clusters. So, it is desirable to select progenies from the clusters having higher intercluster distance as they have different gene combination rather than within cluster.

IAAHAS/AB/2023/317

Achieving Sustainability using Organic Farming: Comparative Economics of Organic and Conventional Farming

Niyati Thakur*, Ravinder Sharma and Shilpa
Department of Social Sciences, College of Forestry, Dr. YSP University of Horticulture and Forestry, Nauni Solan HP (173230)

Climate change and sustainability are concerns of top priorities across the world among all the sectors of economy, including agriculture. Also, food security and global warming are the pressing challenges that need to be addressed in the modern day. Organic farming promotes the use of on-farm inputs like compost, animal manure, and nutrient recycling while utilizing low-energy, off-farm inputs and forbids the use of chemicals. In the study entitled "Achieving Sustainability using Organic Farming: Comparative Economics of Organic and Conventional Farming", data regarding economics of organic farming over conventional farming in major vegetable crops i.e. peas and potato were collected and analyzed. The costs incurred while cultivating inorganic pea and potato were Rs. 100874.50 and Rs. 112684.53 per hectare respectively, which are more than that incurred in case of the organic cultivation of peas (Rs. 94715.52/ ha) and organic potato (Rs. 106749.16/ha). The net income received from inorganic cultivation of peas (Rs. 97061.70/ha) was lower than that from organic cultivation (Rs. 150934.48/ha). Similarly, in case of potato crop, the net income received from inorganic cultivation (Rs. 110147.03/ha) was lower as compared to that of organic cultivation (Rs. 166491.84/ha). The output-to-input ratio for the cultivation of peas in inorganic and organic methods was 1.96 and 2.59, respectively. In the instance

of inorganic potato, the output-input ratio was 1.98 as opposed to organic potato (2.56), showing higher returns on investment per rupee for organic vegetable crop cultivation. The results showed that organic farming is more economical than the conventional farming in terms of cost and returns. Organic farming offers a lot of opportunity to encash its productive potential to a wider extent with greater assurance of high quality and toxin free vegetables. The low yield of vegetables in initial phase of organic farming can be compensated with higher market price for quality produce provided properly labeled products are marketed.

Keywords: *Organic Farming, Sustainability, output-input ratio, health, productive.*

IAAHAS/AB/2023/318

Evaluation of Cotton Stalk Pre-Treated with Different Substrate Based Fiber Degrading Liquid Enzymes at Varying Duration by *In Vitro* Digestibility

S. F. Nipane*, S. B. Kawitkar, A. P. Dhok, M. R. Jawale, S. V. Chopde, G. Roupesh, P. V. Patil and S. R. Lende

Department of Animal Nutrition, Nagpur Veterinary College, Nagpur 440006, Maharashtra, India

The present study was made to evaluate the effect of fiber degrading liquid enzymes solution at different dilutions and duration on *in vitro* dry matter digestibility of cotton stalk. The cotton stalk was treated with rice straw, untreated cotton stalk and ozone treated cotton stalk substrate based liquid fibrolytic enzymes with 4 lit/kg (2 lit of extracted enzyme and 2 lit of water per kg substrate) for 24, 48, 72 and 96 hr soaking period. Liquid fibrolytic enzymes extraction, purification, characterization and standardization, enzyme activity, and application dosage optimization for substrate was carried out in Department of Chemical Engineering, Visvesvaraya National Institute of Technology, Nagpur. The treated substrates with different dilutions and durations were *in vitro* incubated to ascertain their

effect on digestibility. The results revealed significant differences ($p<0.01$) *in vitro* of dry matter digestibility (%) of cotton stalk treated with ozone treated cotton stalk based followed by rice straw based liquid fibrolytic enzyme solution @ 4 lit/kg for 24 h soaking period and in untreated cotton stalk based liquid firbrolytic enzyme solution for 48 and 72 h soaking period.IVNDFD and IVADFD (%) higher in ozone treated cotton stalk based liquid fibrolytic enzyme treated cotton stalk as compare other substrate based enzymes. On conclusion, *in vitro* dry matter, neutral detergent fiber and acid detergent fiber digestibility (%) of cotton stalk treated with ozone treated cotton stalk based liquid fibrolytic enzymes were significantly higher ($p<0.01$) as compare to untreated cotton stalk and rice straw based treated cotton stalk.

Keywords: *Cotton stalk, Enzyme solution, In vitro dry matter digestibility, In vitro neutral detergent fiber digestibility, In vitro acid detergent fiber digestibility.*

IAAHAS/AB/2023/319

Extraction and Phytochemical characterization of *Aconitum heterophyllum* wall. Ex royle, a critically endangered medicinal plant of Kashmir Himalayas

Mir Muskan Un Nisa, Peerzada Ishtiyak Ahmad, T.H Masoodi, S.A Gangoo, P. A Sofi, Shakir P Sultan, Tahir Mushtaq, Talib Bashir Bhat, Ishrat Nazir, Tuybia Bilal
Sher e Kashmir University of Agricultural Sciences and Technology of Kashmir

The research was carried out in three forest divisions of north Kashmir, namely Kamraj, Langate, and Jehlum Valley Forest Division which are located in the districts of Kupwara and Baramulla. *Aconitum heterophyllum* wild populations from each forest division were investigated for morphological characteristics. Rhizospheric soil was obtained from five randomly selected plants for physicochemical property assessment, whilst roots of *Aconitum heterophyllum* plants were harvested from each location for extraction and

phytochemical characterization. *Aconitum heterophyllum* recurring populations were determined to be growing between 3200 and 3700 metres elevation across all locations in three forest divisions of North Kashmir. The findings of this study demonstrated that there is substantial intra-population variation in morphological traits of this species such as plant height, leaf, flower, and tuber characteristics. The plant height was determined to be greatest (94.60 cm) at the Haril site of Langate Forest Division (LFD) has the most leaf area (78.02) cm2, followed by JVFD (18.4) cm2. Floral axis length was greatest at LFD (20.96) cm. Rhizospheric soil investigation revealed that the KFD has the highest electrical conductivity (0.45 ds/m) and phosphorus (21.8 kg/ha), but the LFD has the most organic carbon (2.3%), nitrogen (473.81 Kg/ha), and potassium (487.46 kg/ha) with pH value (5.8). The petroleum ether extract included alkaloids and flavonoids, but the aqueous and methanol extracts of specimens obtained from all sites contained carbohydrates and saponins. The GC-MS chromatogram of a petroleum ether extract of *Aconitum heterophyllum* tubers (LFD) revealed ten peaks, suggesting the presence of a significant number of chemicals. Ethoxyisoxazol-4-carboxylic acid (19.24%) was shown to be a significant chemical. The GC-MS chromatogram of JVFD methanol extract revealed 5 peaks indicating the presence of significant chemicals. The results indicated that the most important molecule was 9,12-octadecadienoic acid (Z, Z) (alpha-linoleic acid) (28.81%). The GC-MS chromatogram of methanolic extract of *Aconitum heterophyllum* tubers (LFD) revealed four peaks. A prominent chemical was 1,2-Benzene dicarboxylic acid, bis (2-methyl propyl) ester, and the GC-MS chromatogram of methanolic extract of *Aconitum heterophyllum* tubers (KFD) showed just one peak. The main component was bis (2-methyl propyl) ester of 1,2-benzenedicarboxylicacid.

Keywords: *Aconitum heterophyllum, morphology, phytochemistry, GC-MS, Kashmir Himalayas.*

IAAHAS/AB/2023/320

Estimation of Genetic Parameters in F_2 Population of Linseed *(Linum usitatissimum* L.*)*

Prema R. Manapure, P.V. Shende, Sapana B. Baviskar Vandana S. Madke and Vandana Kalamkar

[1,2]Associate Professor, Agril. Botany Section, College of Agriculture, Nagpur

[3, 4]Assistant Professor, Agril. Botany Section, College of Agriculture, Nagpur

[5] Senior research Assistant, Agril. Botany Section, College of Agriculture, Nagpur

The measure of effectiveness with which selection can be expected to exploit the genetic variability is the measure of expected progress under selection and it depend on the magnitude of genetic variation in the population, heritability and genetic advance. Therefore, it is imperative to estimate these parameters in the segregating population to determine the progress under selection. The five F_2 populations among seven F_2 crosses viz., EC-1392 X NL-97, EC-1342 X Padmini, GS-234 X NL-97, JRF-4 X PKV NL260 and JRF-4 X Padmini were identified on the basis of high mean performance, genotypic coefficient of variation, heritability in broad sense and genetic advance for economic characters like number of capsules per plant and seed yield per plant which were subjected to individual plant selection. The percentage of individual plant selected in these five crosses were 13.50%, 13.50% ,13.00%, 14.00% and 13.50 respectively for number of capsules per plant and 13.50%, 12.50%, 9.00%, 14.00% and 13.50% respectively for seed yield per plant. The high genotypic coefficient of variation was recorded for yield per plant and number of capsules per plant. High heritability estimates were recorded for all the characters and the expected genetic advance among all the crosses indicated significant progress under selection for number of capsules which also had significant positive correlation with seed yield per plant including significance of this trait for indirect selection of high yielding crosses.

Keywords*: Linseed, F_2 Population, Genetic parameters*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/321

Integrated Weed Management: An Approach towards Sustainable Agriculture

Shweta Yadav[1]and Ram Preet Singh[2]
[1]M. Sc. Scholar, Department of Vegetable Science, College of Horticulture & Forestry, Central Agriculture University, Pasighat, Arunachal Pradesh, India
[2]Ph. D. Scholar, Department of Fruit Science, College of Horticulture & Forestry, Central Agriculture University, Pasighat, Arunachal Pradesh, India

According to reports from the United Nations Population Division data portal, the world population reached a new milestone of 8 billion on November 15, 2022. India, as a third-world, densely populated nation and the second most populous country, is constantly concerned about food scarcity and food insecurity. So, demand of more food production with less water consuming crops, better crop production techniques and better weed management approaches will be focused. Weed is a plant which grows in a place where it is not desirable. It causes 45% of economic loss to agricultural produce. The total lose caused by weed is more than the combined losses caused by insect, pest and diseases. It depleted crop's environment for nutrient, water and sunlight. Weeding practice in any crop depends on crop factors such as position in rotation, plant spacing and architecture, on field factors such as soil type and weed seed bank history, and on seasonal factors, e.g. rainfall. Crop losses can be reduced by integrated weed management. Integrated weed management, an approach that combined physical mechanical, cultural and biological practices of weed control in a planned sequence. It emphasizes the use of different techniques to anticipate and manage weed problems rather than react to them after they are present. Therefore, IWM aims at preventing seed production, reducing weed emergence, and minimizing weed/ crop competition, not predominantly complete weed control. An important objective is the integration of different weed management tactics into a long-term strategy, which supports sustainable crop production.

Keywords: *Food security, weeds, cultural practices, mechanical practices, biological practices*

IAAHAS/AB/2023/322

Jaivikkrishi Inputs for Better Agriculture

Vignesh* and Siddharth Hulmani*
Ph.D. Scholar (Agronomy), College of Agriculture, Navile, Shivamogga

The green revolution has helped to increase food production from 50.83 million tons in the 1950's to 315.72 million tons in 2021-22 through the use of HYVs and agrochemicals. Consequently, the indiscriminate use of agrochemicals has resulted in the loss of soil health, soil biodiversity, degradation of soils (salinization, acidification, *etc*.), loss of agro-ecosystem biodiversity (predators and parasites), and nutrient deficiencies. It is also affecting the nation's economy since more than 500 billion rupees worth of agricultural inputs are imported. Jaivik Krishi, also known as organic farming, is a sustainable farming approach that emphasizes the use of natural inputs and techniques for better crop production, long-term soil health, and crop productivity. Any living inputs, such as plants, animals, and microbes, or those derived from them through decomposition and fermentation, can be considered jaivikkrishi inputs, *viz*., vermicompost, biofertilizers, neem oil, green manuring and panchagavya. It prioritises the use of on-farm resources over external inputs. The use of organic manure, biofertilizers, natural pesticides, crop rotation, green manure, mulching, crop diversification, companion planting, and the use of beneficial insects and bioagents are the main concepts of Jaivikkrishi. These inputs aid in the improvement of soil fertility, water holding capacity, soil structure, nutrient availability, soil organic matter, erosion control, soil moisture conservation, pest and disease control, and weed suppression resulting in increased crop productivity and soil health. They are less damaging to the environment and leave no residue on crops. In addition, it is possible to restore agroecosystem biodiversity while decreasing reliance on synthetic agrochemical inputs.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/323

Crop Protection Plantibody Technology

***Janet Ofiliya. V and Ramalingam. K**
RVS Agricultural college, Tamil Nadu, India

Antibodies are an important class of proteins that can be used for the prevention, treatment and diagnosis of many diseases. Consequently, there is an intense and growing demand for the recombinant antibiotics, placing immense pressure on current production capacity which is based largely on microbial cultures and mammalian cells. The term “plantibodies” was created to describe the products of plants that have been genetically modified to express antibodies and antibodies fragments in plants. Plantibody is an antibody produced by plants that have, as well as the advantage, challenge, and limitation of plantibodies, with animal genes. Agricultural crops such as tobacco, tomato, potato, soya bean, alfa alfa, rice and wheat are commonly used for the production of antibody. Several plant-produced antibodies (plantibodies) are undergoing clinical trials and the first commercial approval could be only a few years away. Six plant-derived antibodies have been developed as human therapeutics, two of which have reached phase two clinical trial. The performance of the first generation of products has been very encouraging so far. In terms of products authenticity, difference, in glycosylation between plantibodies and their mammalian counterparts have been defined, and the scientific evaluation of any possible consequences is underway. These plantibodies are formed by various methods like conventional methods, cell tissues culture methods, breeding, and sexual crossing, transgenic seeds, targeting and compartmentalizing. Ongoing studies are addressing the remaining biochemical constraints, and to aim further improve production yields, homogeneity and authenticity, particularly where the antibody is intended for injection into human patients. The favourable properties of plants are likely to make the plant system a useful alternative for small, medium and large scale production throughout the development of new antibody-based pharmaceuticals.

Keywords: *Antibodies, plantibodies, transgenic plants, animal genes, clinical trials, human patients.*

IAAHAS/AB/2023/324

Financial Feasibility of Cocoon Production in Sericulture Unit

[1]Dr. Kajal V. Khandagale and [2]Shraddha Vithoba Bhagade

[1]Assistant Professor, Dept. of Agril. Marketing, College of Agriculture Business Management, Loni Ahmednagar

[2]Student, College of Agriculture Business Management, Loni Ahmednagar

Sericulture is the cultivation of Silk through rearing of Silkworm. It involves the raising of food plants for silkworm, rearing of silkworm for production of cocoons, reeling and spinning of cocoon for production of yarn etc. for value added benefits such as processing and Weaving. The Ramanagara district is the largest market for silk cocoons in India. About 57 % of the gross value of silk fabrics flows back to the cocoon growers with share of Income to different groups. Sericulture can be practiced even with very low holding of land. Farmers can earn profit ranged between Rs. 60,000 to 75,000 every 45 Days. The Main objectives of this study are to study management system and financial feasibility analysis of cocoon production in sericulture unit. This research study is based on the primary as well as secondary data. The primary data were collected by conducting personal interviews of the producer of cocoon production as well as observation method and secondary data collected from Research paper, Articles and report of sericulture unit and different web sites. It nut shell that cocoon production plays major role in sericulture unit as well as used as raw material for silk production. It observes that the efficient management system i.e housing management, fodder management, labour management, and quality management properly apply to increase the financial feasibility. It is concluded that benefit cost ratio is 1: 1.80. The payback period is 1 year and 4 months. BEP is 178 kg cocoon or Rs. 7, 56.538 is the point where sericulture project is neither in profit or nor in loss.

Keyword: *Sericulture, Financial, Cocoon, Marketing*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/325

Climate Change - Impact on Biodiversity

Y. Deepthi Kiran, Y. Sireesha, Lalitha Kadiri, S.B. Ramya Lakshmi and C. Nagamani
Dr. YSRHU-College of Horticulture, Dr. YSR Horticultural University, Anantharajupeta

Climate change is an existing and increasing global menace to biodiversity and ecosystems. Climate change affect individual species and interaction with other organisms and their habitats that alters the structure and function of ecosystems and the goods and services that natural systems provide to society. Despite the fact that rising CO_2 can encourage plant growth, it also reduces the nutritional value of the majority of food crops. Rising levels of atmospheric carbon dioxide reduce the concentrations of protein and essential minerals in most plant species. Moderate temperature and more carbon dioxide in the atmosphere may help some plants to grow faster. On the other hand, high temperatures, floods, and drought may reduce yields. This direct effect of rising CO_2 and temperature on the nutritional value of crops represents a possible threat to human health. Human health is also threatened by increased pesticide use due to increased pest pressures and reductions in the efficacy of pesticides. Livestock may be at danger, both directly from heat stress and indirectly from reduced quality of their food supply. Aquaculture will be affected by changes in water temperature that make waters more open to invasive species and modify the ranges or lifecycle timing of certain fish species. Climate change is causing large-scale shifts in species allocation, abundance, and restructuring of terrestrial and aquatic ecosystems. On the whole, climate change may possibly make it harder to grow crops, raise animals, and catch fish. Together, these impacts modify the benefits and services that natural ecosystems can offer to society. By incorporating the climate-smart farming methods like climate forecasting tools, conservation tillage, nutrient management, agroforestry, planting cover crops etc. one can manage climate-related production threats.

IAAHAS/AB/2023/326

Assessment of Fertility Status of Soil Under Chickpea in Balapur Tahsil of Akola District

Ommala D. Kuchanwar, Rushikesh Gavhale, Padmaja H. Kausadikar, Nishigandha R. Mairan, Sapna Baviskar, Shalini Badge
College of Agriculture, Nagpur

The present investigation in relation to "Assessment of fertility status of soil under chickpea in Balapur tahsil of Akola district" was undertaken during 2021-2022. Surface soil samples were collected from farmer's field. Total 50 soil samples were collected from ten villages and analysed for their chemical properties, major and micronutrient status of the soil. The correlation studies were carried out between yield and soil available nutrients. The result indicates that, all the soils of Balapur tahsil of Akola district were neutral to slightly alkaline in reaction, EC values for these soils were within the safe limit. The organic carbon content in these soils showed medium to moderate high in status. The free $CaCO_3$ content of these soils ranged from moderate to high in status. The average available major nutrient content in these soils showed low status for available N (144.14 to 286.26 kg ha^{-1}), low to moderately high status for available P (11.26-21.35 kg ha^{-1}) and moderate high to very high status for available K (256.89-510.64 kg ha^{-1}). In regards with available S having low to high in status, it varied from (8.12-20.68 mg kg^{-1}). The available zinc in Balapur tehsil was very low to medium (0.21 to 0.67 mg kg^{-1}), very low to medium for iron content (2.24 to 5.73 mg kg^{-1}). Whereas, the soils were medium to very high (1.22 to 3.12 mg kg^{-1}) for copper, low to moderate high (1.19 to 4.92 mg kg^{-1}) for manganese. The correlation study reveals that, the chickpea yield exhibited a positive and significant correlation with OC, available N, P, K, S and available Zn, Fe, Mn, Cu. Hence, crop production using an integrated nutrient management approach holds the key to sustainable soil fertility.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/327

Root characteristics influenced by various irrigation and tillage practices

Jyoti Rani[1], Sarika[2] and Sumit Kumar[3]
[1]Department of Agrometeorology, Indira Gandhi Krishi Vishwavidyalaya, Raipur, C.G.
[2]Krishi Vigyan Kendra, Jhajjar
[3]Department of Vegetable science, CCS HAU, Hisar

Wheat is a prominent cereal crop in Indian agriculture. It has a potential to recover from food crisis world is facing because of climate change. Roots are major contributor to the nutrients uptake and wholly in water uptake from soil. It is believed that micro-irrigation system like drip and sprinkler irrigation systems along with different tillage practices influence various soil parameters (bulk density, infiltration rate, soil compactness, organic carbon, mechanical impedance etc.) that can create a marked morphological alteration in root's characteristics (length, intensity, root hair, number of tips and forks). To study the above mentioned influences, a study was carried out at research farm of ICAR-CSSRI, Karnal during the *Rabi* 2021-22 on the wheat crop (*Triticum aestivum* L.). Root scanner was used to measure various parameters (total root length, projected area, surface area, diameter, and root volume, number of tips, forks and crossings). It is clear from the observed data that frequent application of irrigation via sprinklers at smaller interval helped to produce longer, denser and thicker roots with higher surface area, over heavier irrigation.

Keywords: *Roots, irrigation, wheat, tillage practices, Triticum aestivum L.*

IAAHAS/AB/2023/328

Influence of vetiver grass (*Chrysopogon zizanioides*) and organic amendments on soil enzymes of tannery effluent contaminated soil

K. Suganya[1]* R. Rizam M. Maheswari R. Anandham[2] P. Kalaiselvi E. Parameswari, S. Paul Sebastian[3]

*[1]Department of Silviculture and NRM, FC&RI, Mettupalayam, [2]Department of Agricultural Microbiology, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu [3]Agricultural College and Research Institute, Kudumiyanmalai, Pudukottai, Tamil Nadu

Environment has been drastically affected in recent times due to various environmental issues. This in turn affects the human health and disturbs the ecological chain balance. Concentration of heavy metals such as As (III), Cd (II), Cr (VI), Pb (II) have been increased in the soil, water and groundwater due to widespread industrial activities. Tanning industries are among the most polluting, generating high levels of pollutants that have significant environmental consequences for the aquatic, terrestrial, and atmospheric systems. Phytoremediation is an alternative technology that utilizes plants for the removal of pollutants from the contaminated soils and promoted as a cost effective, aesthetically appealing, and economically advantageous remedial method. Vetiver grass (*Chrysopogon zizanioides*) (Linn) is one of the most promising and fast growing with the ability to adapt and tolerate to a wide range of environmental conditions and stress in soils. The field experiment was carried out at tannery effluent contaminated site at Brahma Peria Agraharam, Erode district (11°22'14.897" N, 77°42'27.443" E) using Vetiver (*Chrysopogon zizanoides*) of variety Samridhi to evaluate its phyto-remediation potential. The field trial was subjected to application of different organic amendments *viz.,* Vermicompost (VC), Bio-compost (BC) and Farmyard Manure (FYM). The main bio-indicators used to measure soil health are soil enzymes. When compared to control, increased dehydrogenase and phosphatase activities were noticed in treatments containing VC, FYM and BC which indicated the successful establishment of vetiver in stressed soil. Initially, least dehydrogenase activity was recorded in the control (6.70 µg TPF g^{-1} of soil hr^{-1}) and later reduced to 2.90 µg TPF g^{-1} of soil hr^{-1}. The present study revealed that the soil enzyme activities were significantly improved

under vetiver grass cultivated system with organic amendments application. The level of dehydrogenase (39.58%) and phosphatase (72.22%) activities were higher inVermicompost amended soil compared to control.

Keywords: *Vetiver grass, Tannery effluent, Soil enzymes.*

IAAHAS/AB/2023/329

Importance of quality seed on production for sustainable agriculture

Kanika* and Rajesh
Department of Genetics & Plant Breeding,
CCS Haryana Agricultural University, Hisar-125 004

Seed is any plant part used for raising the crop and also the basic input for increasing crop yields per unit area input for sustainable agriculture. Seed is the cheapest input among the inputs used by the farmers. Seed technology has emerged as potent tool to achieve targeted agricultural production in the recent past. The good seed also increases the efficacy of the other factors of crop production. Agricultural production is mainly depending upon the development of improved varieties/ hybrids in various crops and also supported by efficient and cost-effective seed production technology. Without good seed, investments like fertilizer, water, pesticides and other input will not give the desired levels. Seed quality plays a major role in crop production and lack of quality seed is one of the major obstacles in bridging the yield gap. The good quality seed has high return per unit area as the genetic potentiality of the crop can be fully exploited and only seeds of assured quality can be expected to respond to fertilizer and other inputs in expected manner. It is estimated that good quality seeds of improved varieties can contribute about 20-25% increase in yield. The sustainable availability of seed and seed choice is thus an essential issue for every farmer. In India implementation of high yielding variety programme leads to increase in crop productivity significantly as a result import is substantially reduced. In majority of crops the export is increasing in spite of rapid population increase.

IAAHAS/AB/2023/330

Sugarcane Plant Growth Promoting Rhizo Bacterial Interaction for Enhanced Salinity Tolerance

Kartik Gajjar* and S. C. Mali[2]

[1]Department of Genetics and Plant Breeding, C.P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Dantiwada

[2]Main Sugarcane Research Station, Navsari Agricultural University, Navsari

The present investigation was meted out on two promising sugarcane genotypes CoN-13072 and CoN-13073, were exposed to different NaCl levels to assess rhizobacterial interaction for salinity tolerance. From the shoot apex portion of two sugarcane genotypes tissue culture plantlets were developed. From that regenerated plantlets shifted to polyhouse and exposed to different NaCl levels to assess rhizobacterial interaction for salinity tolerance. Maximum shoot length (25.40 cm) was observed in genotype CoN-13073 under rhizobacterial inoculum at 2.0% NaCl concentration and maximum root length (12.40 cm) was observed at 0.0% and 1.5% NaCl concentration under rhizobacterial inoculum in genotype CoN-13072 and CoN-13073 respectively. Maximum shoot root ratio (2.60) and (2.40) was observed at 0.0% NaCl concentration with rhizobacterial inoculum within the rooting mixture of both the genotypes CoN-13073 and CoN-13072 respectively. High chlorophyll content index (5.48) and leaf area (41.20 cm2/plant) was observed in genotype CoN-13073 at 0.0% NaCl concentration under rhizobacterial inoculum. In genotypes CoN-13073 and CoN-13072, with a rise in NaCl concentration upto 2.0% and 1.5% respectively, increase in shoot length, leaf area and chlorophyll content index were observed as a result of increase in ACC deaminase activity. ACC deaminase activity and ethylene content within the plant body are negatively correlated. Increase in ACC deaminase activity results decrease in ethylene synthesis in plant body to avoid stress. Among the 2 genotypes, CoN-13073 found to be more salt tolerant at higher NaCl levels with the exhibition of low osmotic conductance, maximum leaf area with high chlorophyll content index.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/331

Study of variation in quantitative traits of poplar (*Populus deltoides*) clones in different environments at nursery stage

Dipika Ayate*, Milan Jain[1], Sanjeev Thakur[1]& Jaipal Sharma[1]
Department of Forest Genetics & Tree Breeding, KSCSTE, Kerala Forest Research Institute, Peechi, Thrissur (Kerala), India
[1]Department of Tree Improvement and Genetic Resources, College of Forestry, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Solan (Nauni) HP, India

The present study entitled "Study of variation in quantitative traits of poplar (*Populus deltoides*) clones in different environments at nursery stage" was undertaken in the Department of Tree Improvement and Genetic Resources, Dr. Y. S. P. U. H. F., Nauni- Solan 173230 (H.P.). The three experimental sites namely 1) Dhaula kuan, RHTS, Dist. Sirmaur (H. P.), 2) Ladhowal farm, PAU, Ludhiana (Punjab) and 3) Nauni, Solan. Variations in quantitative traits significantly recorded at three locations among all clones, traits such as leaf blade length, width of leaf, midrib length, distance between petiole junction to base of leaf, plant height, basal diameter and stem volume recorded higher values at Ludhiana location follows by Dhaula kuan location. The effect of different locations significantly observed on clones of poplar (*Populus deltoides*) and the quantitative traits also makes the difference within same clone at different locations.

Keywords: *Poplar, Plant Height, Stem Volume, Basal Diameter, Clones*

IAAHAS/AB/2023/332

Livelihood Security Assessment of Farmer Producer Organization (FPO) members: A way towards addressing Food Production System and Poverty through entrepreneurship

Asha Elizabeth Jose[1], Dr. Jayalekshmi. G[2]
[1]Ph.D. Scholar, Dr. PDKV, Akola
[2]Programme Coordinator, Krishi Vigyan Kendra, Kottayam, Kerala

The study entitled "Livelihood Security Assessment of Farmer Producer Organization (FPO) members: A way towards addressing Food Production System and Poverty through entrepreneurship" was designed to assess the livelihood security of FPO members and to study the correlation between livelihood security and their entrepreneurial behaviour. Three districts of Kerala namely Wayanad district from Northern Kerala, Idukki district from Central Kerala and Trivandrum district from Southern Kerala, which were purposively selected as they had the highest number of FPOs in the state. Two functioning FPOs each were selected from each district. From each selected FPO, 20 members were randomly selected. A total of 40 farmers were surveyed from each district thus making a total of 120 farmers. Ex- post facto research design was used for the study. Entrepreneurial Behaviour and livelihood security were selected as dependent variables, which were assessed using Entrepreneurial Behaviour Index and Livelihood Security Index developed by Wankhade *et al*. (2005) and Baby (2005) respectively. Components of Entrepreneurial Behaviour were risk taking, innovativeness, manageability, self- confidence, knowledgeability, persistence, feedback usage, persuasibility, hope of success and achievement motivation. The components of livelihood security were food security, occupational security, habitat security, educational security, social security and health security. The results obtained reflected that almost two third of the respondents (65.83%) had medium secure livelihood followed by18.33and15.83percentofrespondentswithhighandlowsecure livelihood respectively. However, all the six components of livelihood security together have a direct reflection towards medium livelihood security. Correlation between Entrepreneurial Behaviour and livelihood security of FPO

members resulted that Entrepreneurial Behaviour had positive and significant correlation with food security, habitat security, educational security, social security, occupational security and livelihood security. Entrepreneurial Behaviour had non-significant correlation with health security.

Keywords: *Farmer Producer Organization, Livelihood Security, Entrepreneurial Behaviour.*

IAAHAS/AB/2023/333

Export Performance of Indian Maize

Priyanka Agam, Paresh Baviskar , Kaveri Sonawane
[1]Research Scholar, [2]Research Scholar, [3]Research Scholar,
Department of Agricultural Economics, V.N.M.K.V, Parbhani, India

Maize or corn (*Zea mays*) is cultivated globally being one of the most important cereal crops Worldwide. Maize accounts for one-third of total cereal trade in the world. The harmonized system (HS) code for maize is “1005. Maize the food of the gods that created the earth is a cereal crop which is cultivated throughout the world. RCA values of maize 0.07, 0.80, 0.76 and 0.55 during periods I, II, III and overall period, respectively. Negative values of RSCA gave a clear indication of comparative disadvantage of Indian maize, which was increased over the period of time. India was not competitive in maize export throughout the study period. The Indian maize export was less comparative due to the low production and less productivity of seed variety over last three decade. Indian maize became non-competitive in the international market due to relatively weak international prices. the NPC values of maize was observed to be 0.76 during the overall period which implied that, maize was moderately competitive in global market as farmers received less price in domestic market (867.14 Rs/Qtl) than the global price (1135.37 Rs/Qtl). It indicated that, Indian maize trade was advantageous.

Keywords: *Export Performance Ratio, Nominal Protection Coefficient, Revealed Comparative Advantage.*

IAAHAS/AB/2023/334

Management of post-harvest diseases and fruitfly of mango using hot water treatment

P.R. Patel, V.P. Prajapati* and Hemant Sharma
*Assistant Professor, Department of Plant Protection,
ASPEE College of Horticulture, Navsari Agricultural University, Navsari

The present investigation was undertaken to study the management of post-harvest diseases and fruitfly of mango using hot water treatment. For this purpose, the mango cultivars Alphanso, Totapuri, Kesar, Sonpari and Langra fruits were harvested at proper stage of maturity and given hot water treatment. The mango fruits were then packed in corrugated fibre board box and then stored in room temperature. It was observed that among various treatments, hot water dip at 50°C for 20 min, hot water dip at 48°C for 60 min and hot water dip at 52°C for 10 min found effective for management of post harvest diseases and fruit fly in mango. The untreated (control) fruits were found to have infected with stem end rot, anthracnose and fruitfly.

IAAHAS/AB/2023/335

Biofortification in Millets to Enrich Nutrition in Agriculture

Kobaagapu Mani Ratnam
Sam Higginbottom University of Agriculture, Techonology & Sciences,
Prayagraj – 211007

India is the leading producer of millets accounting for about 80% of the global millet production. Nutritional insecurity is a major threat to the world's population that is highly dependent on cereals-based diet, deficient in micronutrients. Next to cereals, millets are the primary sources of energy in the semi-arid tropics and drought-prone regions of Asia and Africa. Millets are nutritionally superior as their grains contain high amount of proteins, essential

amino acids, minerals, and vitamins. Biofortification of staple crops is proved to be an economically feasible approach to combat micronutrient malnutrition. Millets are commonly referred as "small seeded grasses" which include pearl millet [Pennisetum glaucum (L.)], finger millet [Eleusine coracana (L.)], foxtail millet [*Setaria italica* (L.)], proso millet (*Panicum miliaceum* L.), barnyard millet (*Echinochloa* spp.), kodo millet (*Paspalum scrobiculatum*), and little millet (*Panicum sumatrense*). HarvestPlus group realized the importance of millet biofortification and released conventionally bred high iron pearl millet in India to tackle iron deficiency. Molecular basis of waxy starch has been identified in foxtail millet, proso millet, and barnyard millet to facilitate their use in infant foods. With close genetic-relatedness to cereals, comparative genomics has helped in deciphering quantitative trait loci and genes linked to protein quality in finger millet. Bio fortification in millets can be achieved through two strategies: (1) by enhancing the accumulation of nutrients in milled grains and (2) by reducing the antinutrients to increase the bioavailability of minerals. The ingestion of micronutrients in low-income rural families of millet-growing areas is less as compared to recommended diet intake. Any increase in quality of millets might have significant role in combating micronutrient malnutrition for human health over the world. Biofortified millets have a great potential to reduce micronutrient deficiency in the developing countries. The work done on biofortification of millets is still not much. Even after nutrient richness of millets, there is a need to work for more production with quality addition in millets to change the billions of people from nutrient insufficiency to nutrient adequacy.

Keywords: *Millets, biofortification, macronutrients, micronutrients, nutritional security.*

Genetic analysis and protein expression patterns revealed Digenic inheritance and PPIase as the key factor responsible for Sclerotinia stem rot resistance in Indian mustard

Manjeet Singh and Ram Avtar

Oilseeds Section, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar (Haryana)-125004 (India)

Indian mustard [*Brassica juncea* (L.) Czern & Coss.] an allotetraploid (2n = 4x = 36, AABB), is the most predominantly cultivated crop occupying approximately 90% of the total area under brassica oilseeds cultivation in India. Sclerotinia stem rot [caused by *Sclerotinia sclerotiorum* (Lib.) de Bary] are the major factors influencing crop productivity in Indian mustard. Host genetic resistance is the most convenient, economic, and eco-friendly approach for the effective control of this devastating pathogen. Hence, the present study was conducted to study the genetic and proteomic basis of Sclerotinia stem rot resistance in Indian mustard. Crosses have been made between Sclerotinia stem rot resistant genotype RH 1222-28 and susceptible genotypes viz. EC 766300 and EC 766123 for the development of six basic generations (i.e. P1, P2, F1, F2, BC1P1 & BC1P2) to perform generation mean analysis. All six generations of both the populations were raised in Compact Family Block Design (CFBD) with three replications during Rabi season, 2019–2020. Five-day-old pure culture of *S. sclerotiorum* was used for disease inoculation and resistance assessment. For SDS-PAGE, leaf tissues were ground to powder in liquid nitrogen and melted in ice-cold extraction buffer and SDS-PAGE was performed in a 4% polyacrylamide (w/v) stacking gel and a 10% polyacrylamide (w/v) resolving gel. At the end of the electrophoresis, the polypeptide bands were visualized by staining with Coomassie brilliant blue R-250 (CBB). The results showed that significant individual and joint scaling test for mean lesion length in both populations indicate that resistance/susceptibility did not follow the simple Mendelian pattern of inheritance. This indicates the role of epistasis in the genetic control of

resistance/susceptibility. Among six genetic components, our results signify the role of five genetic components in the genetic control of lesion length development, except additive × dominance (j) type of epistasis, which was non-significant in both populations. In both populations, estimates of dominance-by-dominance effects (l) were significant and opposite in sign to those of dominance effects alone (h), indicating the role of duplicate epistasis in resistance expression. The protein expression study revealed the involvement of peptidyl-prolylcis/trans-isomerases (PPIases or immunophilins) in resistance against *S. sclerotiorum*. We observed a rapid accumulation of PPIase with a molecular weight of 18.4 kDa in the resistance genotype during early infection stage (6th day after infection). In contrast, in the susceptible genotypes, it appeared late (12th and 18th day after infection). The present study suggested that this PPIase has a definite role in resistance and implicates the corresponding protein as a biomarker for separating susceptible and resistant genotypes during the early stages of plant development. Oxalic acid is a chief virulence factor without oxalic acid, *S. sclerotiorum* loses its pathogenicity and becomes non-pathogenic/avirulent. Oxalic acid creates an acidic environment inside the invaded host tissue to cause direct toxicity to living cells, suppresses the host antioxidant defense system, consequently escalating the activities of various cell wall-degrading enzymes to disturb host cell wall integrity. To overcome the adverse effects of oxalic acids, PPIase may act as intracellular pH homeostatic machinery and refold several stress-related proteins to activate H+ extrusion and restore intra-cellular pH of the *S. sclerotiorum* invaded host tissue. Therefore, the present study, apart from being an initial step for further investigation towards the molecular basis of Sclerotinia stem rot resistance, could be beneficial for designing operative breeding programs that might lead to Indian mustard cultivars resistant to this economically important disease.

Keywords: *Sclerotinia stem rot; pathogen resistance; Inheritance, protein expression analysis*

Screening of Wheat RILs under terminal heat stress conditions with the help of third and fourth degree statistics

Mandeep Redhu[1&2], Vikram Singh[2], Sonu Langaya[2] Rutuparna Pati[2] and Rajesh Vekariya[3]

[1]Department of Plant, Soil and Agricultural Systems, College of Agricultural, Life and Physical Sciences, Southern Illinois University, Carbondale, IL (62901)

[2]Department of Genetics and Plant Breeding, College of Agriculture, CCS Haryana Agricultural University, Hisar, India (125004)

[3]Department of Genetics and Plant Breeding, Wheat Research Station, Navsari Agricultural University, Navsari, Gujrat, India (396450)

This study was conducted to screen out wheat recombinant inbred lines (RILs) for terminal heat stress utilizing the third and fourth degree statistics. The objective was to determine if the RILs exhibited any significant differences in third- and fourth-degree statistics under different sowing conditions, and whether these differences had an impact on their tolerance to terminal heat stress. Two hundred RILs were obtained from a cross between two wheat genotypes, WH711 and WH1021 and were characterised for 31 heat stress adaptive traits by growing in a randomized complete block design at CCSHAU, Hisar, during Rabi season 2018-2019 under timely and late sown conditions and evaluated for various third- and fourth-degree statistics, including skewness and kurtosis. The results showed significant differences in third and fourth degree statistics between the RILs grown under the two sowing conditions. The timely sown RILs exhibited higher skewness and kurtosis values for number of effective tillers per meter, spike length, seed density, total antioxidant activity and stomatal conductance, whereas, transpiration rate, photosynthetic rate, carboxylation capacity and water use efficiency showed opposite trend. Number of effective tillers per meter, spike length, number of grains per spike, grain yield per plot, biological yield per plot, SPAD 1, malondialdehyde content, total antioxidant activity, transpiration rate and stomatal conductance showed positively skewed platykurtic distribution indicating that traits were governed by dominant and dominant based complementary epistasis, whereas, negatively skewed leptokurtic distribution was observed for plant height, number of spikelets per spike,

thousand grain weight, 100 grain volume, NDVI 1, NDVI 2, CTD 1, CTD 2 and SPAD 2 under both conditions, suggesting that these traits were governed by large number of genes, which exhibited dominant and dominant based duplicate epistasis. These differences were found enough significant to distinguish between heat tolerant and susceptible lines which could be potentially exploited for further developing heat tolerant wheat genotypes.

Keywords*: Wheat, RILs, Platykurtic, Duplicate Dominate Epistasis, Skewness and Kurtosis*

IAAHAS/AB/2023/338

Organic Farming: The Return to Nature

Shubhangi Pandey and Khushboo Chandra
Faculty of Agricultural Sciences, SGT University, Gurugram, Haryana

Fresh, natural farm goods are provided to us via organic farming, which is a contemporary and sustainable style of agriculture. Instead of working against nature, it does it in a balanced way. The major goal is to increase agricultural productivity without endangering the environment or the people who live and work there. Also, it benefits soil, flora, animals, birds, insects, and other creatures. In recent decades, organic farming has drawn a lot of attention as a means of sustaining agricultural output. In addition, it has been crucial in addressing the environmental damage caused by conventional farming practices. Organic farming not only yields high-quality, nutritious foods but also enhances the soil's fertility and quality. Compared to labor-intensive organic farming, conventional farming requires more cash, manufactured inputs, and energy. Organic farming provides the community with job opportunities and economic advantages while producing food items that are affordable and free of synthetic pesticides and fertilisers. While expensive, organic agricultural techniques are ultimately more cost-effective. As a source of nutrients, organic crops are superior than conventional ones. Plants with a long shelf life benefit from improved immunity and increased disease resistance provided by organic systems. Organic foods include more micronutrients, which improve human health and reduce the risk of non-communicable illnesses. Modernism, tradition, and science are combined in organic agriculture to manage the

common environment and promote equitable relationships and good quality of life for all parties. Farmers worldwide may avert a global catastrophe by adapting to organic farming practices since it releases more greenhouse gases into the earth.

Keywords: *Organic Farming, Natural Farming, Employment, Soil fertility, Micro Nutrient.*

IAAHAS/AB/2023/339

Role of organic farming in pulses production

M. G. Chaudhary*, C. K. Patel, Y. B. Vala and M. H. Chavda
*Department of Agronomy, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar-385506, Gujarat

Pulse crops play an important role in Indian agriculture and India is the largest Producer and consumer of pulses in the world. Pulses contain high percentage of Quality protein nearly three times as much as cereals. Thus, they are cheaper source of protein to overcome malnutrition among human beings. For Vegetarian diet, pulses form the major source of protein. Infact, lysine is the most Limiting essential amino acid in cereals, which is very well supplemented by the pulse Protein. Pulses are known to improve the physical characteristics of soil through tap Root system, which opens the soil into deeper layers and their ability to use atmospheric Nitrogen through biological nitrogen fixation that is economically sound and environmentally acceptable. In addition, they also provide nutritious fodder and feed for livestock. Pulses are drought tolerant and prevent soil erosion due to their deep root and good ground cover, because of these good characters, pulses are called as “Marvel of Nature”. Organic farming has been aimed at conserving and optimizing the utilization of all natural resources for a higher profitability keeping a certain threshold of profit from the farming. All the farming practices have to be redesigned to undo ill effects that have crept in the current agricultural scenario. The crop productivity under organic production system can be enhanced through optimizing the nutrient requirement of crop at different stages. It can be achieved through integrated organic nutrition by using different sources of nutrients, which have different nutrient release pattern and efficiency. Combined application of organic manures mainly compost,

vermicompost and castor cake produced higher yield apart from improving soil health. Further, the Bioenhancers meet the nutrient requirement of crops with greater nutrient use Efficiency and correct the deficiency as and when noticed under organic Production system. Greengram being legume derives its greater nitrogen requirement through biological nitrogen fixation, which can be harnessed by providing good soil Physical and chemical condition. Studies have shown that the legume crop Productivity can be enhanced and sustained under organic production system.

Keywords: *Pulses, organic farming, vermicompost, Bioenhancers and greengram.*

IAAHAS/AB/2023/340

Trend Assessment of Finger Millets in Karnataka: Non-parametric Approach

Nidhi
Deptt. of BS&L, RPCAU, Pusa, Samastipur

Post green revolution, the focus of agricultural research, development and policies have largely been on three main staple crops (rice, wheat and maize). Other crops like millets have suffered institutional neglect in terms of public and private investment (Pingali, 2015). With increasing public awareness about the health benefits of a millet-based diet—high fibre, low carbohydrate, protein-rich and gluten-free, there is a growing realization that millets are better suitable to combat the ill-effects of climate change and have a high nutritional value would be an important tool to fight global malnutrition. Millets can grow in poor soil conditions with less water, fertilizer and pesticides. They can withstand higher temperatures, making them the perfect choice as 'climate-smart' cereals. As against the requirement of 5,000 litres of water to grow one kilogram of rice, millets need hardly 250-300 litres. Thus, given the combined potential of finger millets as climate change resilient crop and its nutritional benefits, it is imperative to understand the fluctuations in its production based on the growth trends in area, production and yield in Karnataka. The data has been obtained for the period of 1950-51 to 2017-18 from www.indiastat.com. This study aims at investigating the trend in area, production and yield of finger millets in Karnataka. LOWESS (locally weighted

scatterplot smoothing) regression curve has been used to identify general patterns over time. Area under finger millets is observed to be increasing initially followed by stagnation till late 1970s and afterwards it exhibited continuous declining trend whereas production exhibited an increasing trend up to initial part of 1990s followed by continuous decline during rest of the study period. Productivity of crop showed a gradual rise up to the year 1980 followed by sharp increase afterwards. Since the time series data for area, production and productivity were observed to deviate from the normality, hence non-parametric Mann Kendall test for the presence of trend has been performed to test the significance of trend. Area under finger millet showed significant decreasing trend whereas its production and productivity exhibited a significant increasing trend.

***Keywords**: Finger millet, trend analysis, non-parametric, LOWESS*

IAAHAS/AB/2023/341

Effect of lambda- cyhalothrin on colony performance of *Apis mellifera* under field and semi-field conditions in onion (*Allium cepa* L.)

[1]Mohammad Abdul Waseem*, [2]Meena Thakur

[1]Project Coordinator (IBDC), Department of Natural Resource Management & Conservation Forest College and Research Institute, Mulugu, Telangana- 502279

[2]Senior Scientist, Division of Entomology, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni - (173230), Himachal Pradesh, India

The present investigation "Effect of lambda-cyhalothrin on colony performance of *Apis mellifera* under field and semi-field conditions in onion (*Allium cepa* L.)" was conducted during the period 2020-2021. The effect of spray (Karate 5% E.C @ 0.85g/l) on onion bloom, was evaluated on foraging activity, mortality and colony performance *viz.,* brood area, nectar stores, and pollen stores of *A. mellifera* under field and semi-field (cage) conditions. Under semi-field conditions, the foraging activity of *A. mellifera* significantly reduced to 1.55 bees/m^2/2 min on the day of spray and significant recovery was

recorded on 6th day (12.66 bees). In comparison to the colony parameters, one day before introduction of the colonies, significant reduction in brood (823.16, 639.00 cm^2) and pollen area (108.83, 93.33 cm^2) is observed on 7th and 14th day, respectively whereas nectar stores reduced significantly on 7th day (148.33 cm^2). Overall, comparison of brood area, pollen and nectar among the treatments indicated significant reduction over control. The mortality of bees became statistically equal to pre-count on day 6 (13.33 bees/day). Overall, average bee mortality was significantly higher (18.30 bees/day) in lambda-cyhalothrin followed by control (6.94 bees/day). Under field conditions, the activity of *A. mellifera* remained statistically low up to 6th day (32.33 bees) after spray, which thereafter became normal and statistically same with pre-count and control (33.27 bees). The overall brood and pollen area was found to be highest (2225.83, 565.60 cm^2) in controlled conditions followed by lambda-cyhalothrin (1691.53, 330.83 cm^2). The mortality of bees exposed to lambda-cyhalothrin treated crop became statistically equal to the pre-count (12.66) on 6th day (14.16 bees/day) after that decrease in dead bee counts could be observed.

Keywords*: Lambda-cyhalothrin, Foraging activity, Honey bee, brood area, Mortality.*

IAAHAS/AB/2023/342

Prevalence and Morphometric Identification of *Eimeria species* in faecal samples of buffalo calves

Savleen Kour*[1], Abha Tikoo[1], Rajesh Agrawal[1] and Anish Yadav[2]
Division of Veterinary Medicine[1], F.V.Sc & AH, SKUAST-Jammu, R.S. Pura,181102
Division of Veterinary Parasitology[2], F.V.Sc & AH, SKUAST-Jammu, R.S. Pura,181102

Coccidiosis is caused by protozoan belongs to genus *Eimeria* spp. which parasitizes the epithelial lining of alimentary canal and is an important causative agent of diarrhea in livestock worldwide (Dubey *et al.,* 2018). The presence of *Eimeria* in livestock farms implies significant economic losses, comprising the welfare and animal health of affected bovines. It is also considered as chief cause of morbidity and mortality in calves suffering from

diarrhoea. The objective of the study was morphometric identification of different species of *Eimeria* found in the faecal samples (n=50) of buffalo calves (<6 months). Faecal floatation method and purification of oocysts from positive samples were done with saturated salt solution. Unsporulated *Eimeria* oocysts were identified morphometrically before sporulation. These harvested oocysts were then subjected to sporulation with 2.5% potassium dichromate in petri dishes at room temperature with regular aeration. Completion of sporulation of oocysts with 4 sporocysts each containing 2 sporozoites was confirmed after an interval of 48-72 hours microscopically. The overall prevalence of *Eimeria species* was (n=23) 46%. The highest percentage of species found in buffalo calves were *E. bareillyi* (n=9)*, E. zuernii* (n=4), *E. subspherica* (n=3), *E. Canadensis* (n=2), *E. auburnensis* (n=2) *and E. alabamensis* (n=2) and single faecal samples with *E. pellita.* The shape index of occysts of *E. bareillyi* (27.07–35.22um; 15.3–25.65 um), *E. subspherica* (11.09-16.38um; 12.8-15.37um), *E. Canadensis* (28.21–32.2um; 20.2–22.38um), *E. auburnensis* (21.05–25.37um; 19.2–38.03um), *E. alabamensis* (11.03–16.77um; 13.11–24.57um) and *E. pellita* (25.8–30.27um; 35.49–39.06um) were recorded.

IAAHAS/AB/2023/343

Effect of bio-enhancers on vegetative growth and yield of broccoli (*Brassica oleracea* L. var. *italica*)

Kakarla Mounika, Dr.Devraj Singh*and Dr. Sharvan Kumar Yadav*
*Assistant Professor
Invertis University, Bareilly 243123

Present investigation entitled Effect of bio-enhancers on vegetative growth and yield of broccoli (*Brassica oleracea L. var. italica*) Eastern magic was carried out in the research field Rama University, Kanpur during 2020-21. Liquid Bio-enhancers are fermented preparation obtained by active fermentation of plants and animal residues over specific duration. Bio-enhancers play an important role in organic vegetable production. *Panchgavya, Jivamrita* and Vermiwash are some of the important bio-enhancers used as the treatments. Investigation was statistically analysed in Simple Randomised

Design (RBD) and replicated thrice. Different combinations of theses Liquid Bio-enhancers *viz*. *Panchagavya* (4%), *Jivamrita* (20%), Vermiwash (1:5 times dilution), *Panchgavya* (4%) +*Jivamrita* (20%), *Panchagavya* (4%) + Vermiwash (1:5 times dilution), *Jivamrita* (20%) + Vermiwash (1:5 times dilution), RDF(120:80:80::N:P_2O_5:K_2O) with control. Observations were taken on vegetative and yield parameters and highest values found in plant height, leaf length, leaf width, number of leaf per plant,whole plant weight, leaf weight , number of secondary head per plant, head weight, head length, head diameter, stem weight with the plants treated with recommended dose of fertilizers. Close findings were obtained from the treatments *Panchagavya* (4%) + Vermiwash (1:5 times dilution) such as plant height, leaf length, leaf width, number of leaf per plant, whole plant weight, leaf weight, number of secondary head per plant, head weight, head length, head diameter, stem weight and yield. It can be concluded with the finding of this investigation that Bio-enhancers are the potential tools for growing organic broccoli, it is beneficial for human, environment and soil health.

Keywords: *Broccoli, liquid bio-enhancers, growth, yield.*

IAAHAS/AB/2023/344

Multivariate Analysis in the Pearl Millet [*Pennisetum glaucum* (L.) R. Br.] Genotypes for Yield and its Attributing Traits under Rainfed Conditions

Vinay Kumar[1*], Ashok Kumar Dehinwal[2], Dev Vart[1] and Kavita[1]
Department of Genetics and Plant Breeding,
[1]CCS Haryana Agricultural University, Hisar-125 004 (Haryana), India
[2]CCS Haryana Agricultural University RRS Bawal-123 501, Rewari (Haryana), India

Pearl millet is highly cross pollinated, climate resilient C_4 plant with high photosynthetic efficiency and biomass productivity. Pearl millet being a climate-resilient crop is important to minimize the adverse effects of climate change and has the potential to mitigate malnutrition. Present investigation

was carried out with 47 pearl millet genotypes containing R lines and B lines at Regional Research Station, Bawal, CCS Haryana Agricultural University, Hisar, Haryana during Kharif season of 2020. Only the first three of the eight principal components (PCs) generated—whose eigen values were greater than one and explained 74.35% of the total variability among the 47 genotypes (comprising of designated B and R lines) of pearl millet genotypes. Mahalanobi's D^2 cluster analysis resulted in six clusters with the highest inter cluster distance observed between cluster II and cluster VI. The Genotype-trait biplot based on two principal components were also generated to depict the two-dimensional view of accession scores. The first group was composed of panicle length, panicle diameter, plant height, and 1000 seed weight which showed positive association with the first two PCs. The second group was negatively correlated with PC2 and comprised productive tillers, grain yield and dry fodder yield. However, days to 50% flowering was negatively associated with grain yield/plant and dry fodder yield/plant, as depicted by the obtuse angle between them. All multivariate analyses revealed considerable divergence in the experimental material as well as a comparable type of clustering in the diversity of R line and B line and hence can be used in future breeding programmes.

IAAHAS/AB/2023/345

Effects of Partial Replacement of NaCl with KCl on the Physico-Chemical, Compositional, Sensory and Textural Profile of *Goshtaba* Meat Ball

Nazir A Bumla, Sarfaraz A Wani, Asif H. Sofi, Sheikh Rafeh Ahmad, Mir Rovida, Asma Irshad Qurashi, Tahir Nazir, S. A. Hussain & A.H. Shuhama

Division of Livestock Product Technology, F.V.Sc
Sher-e-Kashmir University of Agricultural Sciences
and Technology of Kashmir, Shalimar, Jammu and Kashmir (India)

Goshtaba is an inseparable component of '*Wazwan*', prepared traditionally in Jammu and Kashmir. The reduction or replacement of salt is an important goal of meat industry due to changing behavior of consumers

toward healthier meat products. Keeping in view the health hazards of high salt content of *Goshtaba*, the present study was carried out to develop healthier *Goshtaba* by replacement of NaCl with KCL. The treatments included; $T_{0:}$ NaCl:KCl=100:0 (2.5g:0g), T_1; NaCl:KCl=100:10 (2.25g:0.25g) T_2; NaCl:KCl=80:20(2.0g:0.5g) and T_3; NaCl:KCl=70:30 (1.75g:0.75g). The treatments were compared among each other in term of physico chemical, compositional, sensory and textural profile. The scores for emulsion stability, cooking yield and pH were highest in T_0. In the treated groups, scores were found to be within the acceptable limit upto T_2 and thereafter the scores decreased significantly in T_3. Moisture and fat scores were found to be non-significantly ($p>0.05$) higher in T_0 and thereafter decreased and were found to be comparable with T_2. Protein and ash scores were found to be non-significantly ($p>0.05$) higher in T_2 and comparable to T_0. The scores of all the sensory parameters were found to be comparable between T_0 and T_2 in low salt *Goshtaba*. As far as textural property was concerned, hardness and chewiness were found to show an increasing trend. Springiness, cohesiveness, gumminess and resilience were found to show decreasing trend. The scores were found to be acceptable up to T_2. It was concluded that KCl can replace 20% of NaCl to develop low sodium *Goshtaba* of acceptable quality to cater modern consumers, demanding low sodium foods.

Keywords: *Wazwan, Goshtaba, sodium chloride, potassium chloride, physico-chemical, compositional, sensory and textural profile.*

IAAHAS/AB/2023/346

Biofortification of vegetables crops

N. V. Mane[1*], V. S. Jagtap[2]

[1]Ph.D. Student, Department of Horticulture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (MS)

[2]Associate Professor, Department of Horticulture, College of Agriculture, Latur

By 2050, 9.8 billion people are expected to live on the planet. The present global challenges, including climate change and the COVID-19 pandemic, are most likely to affect the agricultural production and supply chain. The epidemic poses a threat to human life and health worldwide, and it is aggravating the problems with global food security by causing a worsening of hunger and malnutrition due to the disruption of the food supply chain, primarily in poorer nations. Despite eating a diet high in carbohydrates, the issue of hidden hunger still exists since we cannot meet our needs for certain micronutrients. Most illnesses brought on by micronutrient deficit are reversible with the right diet, but some, like iodine deficiency in early pregnancy, which results in intellectual disability in offspring, have permanent effects. Eliminating malnutrition is the only long-term strategy to creating a healthy planet, given the severity of its effects. Agronomic techniques, conventional breeding, or biotechnology technologies can all be used to increase the nutrient content or bioavailability of staple food crops, a process known as biofortification. This cutting-edge method uses the addition of desired minerals to enhance the quality of crops to combat hidden hunger. Higher mineral content, greater vitamin content, higher amounts of important amino acids, better fatty acid compositions, and higher antioxidant levels in crops are among the nutritional aims for biofortification. A low-cost method of reaching populations with limited access to formal systems of education and healthcare is through biofortified crops. Even though biofortified staple foods may not be able to provide the same amount of daily minerals and vitamins as supplemental or industrially fortified food products, they do help to improve the daily adequacy of micronutrient consumption among people throughout their lives.

Nanotechnology: A new frontier in Agriculture

Kumaresh Dasgupta
Uttar Banga Krishi Viswavidyalaya, Pundibari, Coochbehar, West Bengal, 736165

Ensuring food security in developing countries is highly challenging due to low productivity of the agriculture sector, degradation of natural resources, high post farming losses, less or no value addition, and high population growth. Researchers are striving to adopt newer technologies to enhance supply to narrow the food demand gap. Nanotechnology is one of the promising technologies that could improve agricultural productivity via nano fertilizers, use of efficient herbicides and pesticides, soil feature regulation, wastewater management, and pathogen detection. Nanotechnology is science of manipulating materials at nano-scale. Among the latest technological advancements, nanotechnology occupies a central position. It has many applications in all stages of production, processing, storing, packaging and transport of agricultural products. The reduced use of herbicides, pesticides and fertilizers with increased efficiency, controlled release and targeted delivery will lead to precision farming. Dream of automated, centrally controlled agriculture can become reality now. Modern agriculture is need of hour because conventional agricultural will not be able to feed an ever-increasing population with changing climate, depleting resources and shrinking landscape. It is equally beneficial for industrial food processing with enhanced food production with excellent market value, elevated nutritional and sensing property, improved safety, and better antimicrobial protection. Nanotechnology can also reduce post-farming losses by increasing the shelf life with the aid of nanoparticles. But at the same time application of nano-materials in agri-food sector has to be evaluated for public acceptance so it does not come across a scenario as faced by GMOs in past. This article provides an overview of current and potential applications of nanotechnology in agriculture and food sector. However, further investigation is required to solve the safety and health risks associated with the technology.

Keywords: *Nanotechnology, Nano fertilizers, GMOs, Nanoparticles, Conventional agriculture.*

IAAHAS/AB/2023/348

Natural Farming: A boon to Sustainable Agriculture

N.B. Chanu
SMS Horticulture, KVK, Piprakothi, Dr. RPCAU, Pusa, Bihar

With rapid growth in agriculture after green revolution towards fulfilling the human hunger through improved crop production by utilizing several agrochemicals has rapidly affected soil and human health thus failing the sustainability approach of crop production. Such approach has excelled in production as well as productivity yet in the long run has imparted negative impact on the soil, human and animal health. India is a well fed country however, in order to meet the upcoming exploding population, now is the right time to shift any agricultural system towards a sustainable and environment friendly system. Such approach can be fulfilled by many systems, one among which is 'Natural Farming'. Natural farming system firmly believes in enhancing country's economy by doubling farmers' income thus by reducing/nullyfing the input cost incurred in any crop production. The GAPs in such system exploits cow refuge and home derived concoctions viz. cow urine, Bheejamrutha, Jeevamrutha, Panchagavya, Ghanajeevamrutha, Neemastra, Bhramshtra, Agniastra etc. such concoctions not only supply nutrient/insecticidal property to the crop but too provides improment in soil flora and fauna, thus ultimately improving carbon deposit to the earth. Hence, an earth rich in organic carbon holds the potential to produce crop exponentially without having it to depend on any agro fertilizers. Consequently, agriculture in recent upcoming years must adopt sustainable practices before the conversion of arable soils to non-arable forms. Hence, replenishment of resources for future generations can be achieved upon longterm practice of such agricultural reforms. Further, the future lies in policy makers, bureaucrats and scientific community to enhance such systems, for instance natural farming produce can fetch premium market price like that in organic produce upon certification, thus encouraging many to adopt and reform current system into more sustainable and reliable form.

Keywords: *Sustainability, natural farming, jeevamrutha, certification, soil fauna.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/349

Analysis of Ergonomic Risk Factors among Manual Load Lifting Workers Involved in Stone Masonry Work

Neha Arya* and Promila Sharma
*Ph.D. Research Scholar and Professor
Dept. of Family Resource Management, College of Home Science
G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India

Ergonomic risk factors refer to factors that can contribute to discomfort or injury in the musculoskeletal system that includes muscles, ligaments, nerves, and bones. In stone masonry work, manual load lifting is a high-risk task, as it requires physical exertion, forceful motion, and strength. It involves moving or handling objects by lifting, carrying, holding, and dropping. If performed incorrectly, all activities could lead to inflammation in the muscles and nerves and end in severe musculoskeletal disorders. Objective -Therefore the present study was planned to analyze the ergonomic risk factors associated with load lifting tasks in stone masonry work. A total of 49 male load lifting workers were selected. Methodology- Nordic musculoskeletal questionnaire and Rapid Upper Limb Assessment tools were used for assessing the ergonomic risk factors at work. Results- Some of the major ergonomic risk factors include forceful exertion, musculoskeletal discomfort, awkward postures, and repetitive motion was reported in the study. These factors cause strain, pain, and fatigue in the body of the workers. The results revealed that 67 % of the workers carrying a heavy load on their heads, followed by 16.32 % carried loads on their shoulders, and 2% of the workers used to put a heavy load on their backs and neck and complained about pain or discomfort. On the bases of the RULA score, about 61.29 percent of the workers were at high risk of musculoskeletal discomfort. Workers got high scores in the upper arm, neck and trunk portion. About 63.26 % of the workers had lower back pain, 67% of the workers complained about pain in the head, followed by 60% and 57 % of the workers suffered from shoulder and neck pain respectively. Conclusion- ergonomic sound trolleys and personal protective equipments must be introduced for workers to minimize the risk of injuries and discomfort at work.

Keywords: *Ergonomic risk factors, load lifting, injuries, pain, RULA.*

IAAHAS/AB/2023/350

Effect of different LED lights and water spray on growth parameters of *Nerium oleander*

M. Velmurugan*, M. Anand and P.R. Kamalkumaran
Tamil Nadu Agricultural University, Tapioca and Castor Research Station, Yethapur

Nerium oleander L. is an evergreen shrub belongs to the family Apocynaceae grows to 2-6 meter tall with erect stems that splay outward as they mature. The flowers grow in clusters at the end of each branch in current season growth and it is well acclaimed as ornamental due to its abundant and long lasting flowering habit and for its heat, salinity and drought tolerance. In India Nerium is distributed throughout the country but the commercial cultivation takes place in Tamil Nadu only. In Tamil Nadu, Nerium is cultivated in Nilakottai, Trichy, Madurai and Salem districts. Nerium is growing in an area of 1408 ha with a production of 33780 MT accounting to 24% of productivity. Light is one of the most important environmental factors, performing on plants as a single source of energy, affecting its growth and development. Different kinds of lights play a vital role in modifying the growth and flowering pattern in array of horticultural crops. Plants are grown with various photoreceptors that control various responses to light parameters, such as spectra, intensity, direction, duration, *etc.* Different LED lights viz., blue, red and white lights was compared with water spray in the form of fog. The results of the experiment revealed that the maximum plant height (294.00 cm) and plant spread N-S direction (145.0 cm) and E-W direction (140.5 cm) was recorded in the treatment Blue light for overnight (T_1). The water spray (fog) does not have any profound influence on growth parameters of Nerium when compared to different LED light sources.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/351

Effect on Primary Post-Harvest Processing Technologies for Minor Millets

Manoher Saryam[1] and Pooja Jena[2*]
[1]Assistant Professor, Faculty of Agriculture, Rabindranath Tagore University, Raisen, Bhopal
[*2]M.Sc. (Ag) Scholar, College of Agriculture, JNKVV, Jabalpur

The pressing need is to improve livelihoods and well-being through improved use of biodiversity. Thus, focus in India is to be on small-grain cereals, notably millets. Millets are also more reliable and produce a harvest even under adverse growing conditions. Millets can be used for traditional as well as novel foods. The richness of starch, protein and fibre, niacin, magnesium, phosphorus, manganese, iron, potassium, essential amino acids and vitamin E make millets an important nutritional bio-source. Millets are good source of carbohydrates, energy and protein, fat iron, calcium and dietary fiber, which helps to prevent from many diseases like diabetes, cataract genesis and cardiovascular diseases. The environmental changes, water shortage, population increment, decreasing yields of major cereals, present a challenge to nutritionists and researchers to examine the potentials of production, processing and using another prospective food sources to end the poverty and hunger. Thus, in dry regions, processing facilities are particularly vital to the future of local millet farming. Thus, millets are so compelling to agree the needs and to educate consumers on health benefits and to encourage increased consumption.

Keywords: *Post-harvest, millets, processing and Food safety.*

IAAHAS/AB/2023/352

Impact on Seed Germination and Seedling Growth of Kagzi Lime under Different Concentrations of Gibberellic Acid and Naphthalene Acetic Acid and Different Soaking Time in Garhwal region of Uttarakhand

Vivek Panwar[1], Gargi Goswami[2*], Manju[3], K.C. Singh[2] and Tejas A. Bhosale[2]

[1]M.Sc. Student, [2]Assistant Professor, Department of Natural Resource Management, VCSG UUHF, Bharsar, Pauri Garhwal, U.K.

[3]Assistant Professor, [1] M.Sc. Student, Department of Fruit Science, VCSG, UUHF, Bharsar, Pauri Garhwal, U.K

A field experiment was carried out in ventilated poly house condition at fruit block of VCSG UUHF Bharsar (U.K.) during the year 2021. The experiment was conducted with14 different treatment combinations of GA_3, NAA and soaking time (12 hrs. and 24 hrs.) in three replications under a Factorial Randomized Complete Block Design. The findings of the investigation indicated that the treatment combination S_2G_4 (seed soaked for 24 hours + GA_3 @150 ppm) resulted in minimum days taken for initial germination (26.00 days), maximum germination per cent (60.53 %), survival per cent (80.43%), plant height (18.80 cm), shoot diameter (2.02 mm), number of leaves (24.86), shoot fresh biomass (2.53 g) and shoot dry biomass (1.23 g). While, the maximum root length (13.32 cm), root diameter (2.51 mm), root fresh biomass (2.61 g), root dry biomass (1.40 g), total fresh biomass (3.71 g) and total dry biomass of seedling (2.18 g) was found superior in treatment combination S_2G_7 (seed soaked for 24 hours + NAA @150 ppm). Therefore, it can be concluded that seed soaked for 24 hours + GA_3 @150 ppm was found best treatment combination for vegetative growth while soaked for 24 hours + NAA @150 ppm resulted in better root growth.

Keywords: *Kagzi lime, gibberellic acid, Naphthalene acetic acid and soaking time.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/353

How diversified is Assam's Horticulture: A Zonal Level Analysis

[1]Nidhishree R, [2]Dr. (Mrs.) Nivedita Deka
[1] Ph.D. Research Scholar Department of Agricultural Economics, NAU, Navsari, India
[2]Professor and Head of the Department, Department of Agricultural Economics and Farm Management, AAU, Jorhat, India

Assam, the doorway toward North East India is one of the biggest State in the North East and is lining seven states viz. Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and West Bengal and two nations viz. Bangladesh and Bhutan. The concentration and variation of the horticulture was found by analyzing both temporally and spatially. To study the diversification of the state as a wholesome, five major horticulture sector such as fruits, vegetables, spices, plantations and tubers were considered. The diversification of the horticultural sector of Assam for the period of 10 years was calculated using various diversification Indices. We have found that the diversification from the year 2009-10 to the recent years 2019-20 which was more or less constant, according to the index value. The values were quite compromising to the range of the index, which means the diversification of the horticulture sector of Assam was found to be high. To understand the pattern of diversification in a more detailed way, the diversification of different agro climatic zones was also calculated using different crop diversification indices. Nearly 11 major crops which are cultivated in almost all the districts of Assam were considered for the study. Out of these six zones, hills zone was found to have comparatively more diversification while North Bank Plain Zone recorded the lowest. In this Hills Zone, due to predominance of jhum cultivation, more crops were found to be grown by the farmers.

IAAHAS/AB/2023/354

Niger – Golden Flower Oilseed

S. P. Deshmukh*, P. M. Mistry and P. K. Jagtap
Niger Research Station, Navsari Agricultural University, Vanarasi – 396580 (Gujarat)

World is focusing over the minor or underutilized nutritious crops, that remained minor in cultivation. Niger (*Guizotia abyssinica*) is one amongst them considered as minor oilseed crop. Niger is commonly known as *ramtil*, *noog*, *valisalu*, *uchellu* or *karal*. Niger seeds resemble sunflower seeds in shape, but are smaller in size and black. Niger has 32 to 40% content of quality oil with 18 to 24% protein in the seed. It is used as a substitute for olive oil, can be added with rapeseed, sesame and linseed oil. The oil from the seed is used to treat burns and in the treatment of scabies. Niger oil has good keeping quality and has < 70% unsaturated fatty acids free from toxins. Niger oil cake is a feed rich in protein, oil and fibre, free from any toxic substance and suited to all classes of livestock that can digest fibrous feeds. The flowers are bright yellow becoming golden yellow as they mature and attract lots of honeybees during flowering season. This makes it highly suitable for Integrated Farming System approaches. Out of total oilseed area of 29 m ha, niger is covering the least approximately 0.3 mha in India. In Gujarat, niger is grown in tribal belt of Valsad, The Dangs and Navsari districts as main crop. In Ethiopia, niger is a major source of edible oil and provides about 50% of the country's oilseed production. Average productivity of niger in India is 300-400 kg/ha, although in some areas 750 kg/ha productivity is also observed.

IAAHAS/AB/2023/355

Pongamia pinnata (L.): Constituents and agricultural benefits

Nishita, Vishal Johar*, Vikram Singh and Nirmal Patil
Department of Horticulture, School of Agriculture, Lovely Professional University, Phagwara (Punjab) – 144111

A multipurpose leguminous tree with non-edible oil, Karanj (*Pongamia pinnata*), grows all over India. Karanj cakes include secondary metabolites in addition to a wealth of minerals and amino acids. As an important source of manure, *Pongamia pinnata* has a high nutritional value with macro and micronutrients including nitrogen, phosphorus, potassium, calcium, magnesium, zinc, copper, and iron. The versatile species bears a long history of use in Indian sub-continent and is known great as a source of

traditional medicines used for the treatments of common cold, leprosy, diarrhoea, and ulcers. The species is also known for its fodder and feed, green leaf manure, lumber, fish poison, soil binder, and for soil reclamation. The soil fertility is enhanced by the good source of nutrients found in pongamia cake. Pongamia oil is derived from the seeds and utilized in biofuel, medicine, and agriculture. It works against a variety of pests and insects and has similar insecticidal characteristics to neem oil. The primary active component in Karanj is karanjin. While the cake, a byproduct of oil extraction, was discovered to be rich in all plant nutrients used as a source of plant nourishment, it also functions as an acaricide and pesticide.

Keywords: *Karanj, manure, bio fuel, benefits and nutrients*

IAAHAS/AB/2023/356

Teratoma in Nondiscript Buffalo: A case report

Hemant Kumar Singh[1], Dharam Prkash Shrivastava[2], Amit Singh[1], V. K. Pal[1]

Department of Veterinary Parasitology[1], Department of Veterinary Pathology[2], College of Veterinary Science and Animal Husbandry, ANDUAT, Kumarganj, Ayodhya

Teratomas are embryonal neoplasms consisting of tissues from at least two of the three germ layers. Teratomas can occur in almost any region of the body and in any organ, but they are most commonly observed in the paraxial and midline locations. Excluding teratomas of the testes, 75% to 80% of teratomas occur in females. Approximately 80% are benign and 20% are malignant. The presenting location of teratomas correlates with patient age. Teratoma was confirmed in a nondescript female buffalo 12 year age came in Ayodhya, having history of a large growth on ear pinnae (upper surface) of right side ear. Initially growth is small and animal having normal appetite but later on growth is enlarge with reduce appetite. No significant change notice in body parameter. This growth was surgically remove animal survive normaly. Later stageg animal is sevearly dehydrated. On histopathological examination of enlarge mass teratoma was confirmed. No occurance of disease occure in animal on later stage.

IAAHAS/AB/2023/357

Gross Morphological Studies on Mammary Gland of Barbari Goat

Nripendra Singh[1], Mukesh Kumar[2], Krishna Nand Singh[2]

[1]Ph.D. Scholar, Department of Veterinary Anatomy & Histology, College of Veterinary Science & Animal Husbandry, O.U.A.T, Bhubaneswar, Odisha, 751003

[2]Assistant Professor, Department of Veterinary Anatomy & Histology, College of Veterinary Science & Animal Husbandry, ANDUAT, Kumarganj, Ayodhya 224229

Present study was designated to study the gross morphological studies on mammary gland of barbari goats. A total Twenty four mammary gland were collected. Udder was located in the inguinal region. It composed of two gland each drained with single teat canal and posses single teat teat orifice. The average length of udder was 14.07 ± 0.24 cm, with the range of 12.30 to 16.22 cm. The average depth of udder in Barbari goat recorded was 8.59 ± 0.12 cm. The average width of udder in Barbari goat was 13.63 ± 0.38 cm which ranged from 15.75 to 10.50 cm. The left teat length in Barbari goat ranged from 1.88 to 3.75 cm and the average of it was 2.86 ± 0.13 cm. The right teat length in Barbari goat ranged from 1.96 to 3.76 cm and the average of it was 3.06 ± 0.19 cm. The left teat diameter in Barbari goat ranged from 0.74 ± 3.75 cm and the average of it was 2.24 ± 0.25 cm respectively. The right teat diameter in Barbari goat ranged from 0.74 ± 3.76 cm and the average of it was 2.50 ± 0.25 cm respectively. The distance between the teats in Barbari goat ranged from 3.55 to 8.00 cm and the average of it was 5.59 ± 0.29 cm respectively.

IAAHAS/AB/2023/358

Influence of organic residues and silicon solubilising bacteria on availability of nutrients under*Pongamia pinnata* (Karanj)

Padmaja H. Kausadikar, Ommala D. Kuchanwar, Shubhangi G. Parshuramkar, Shanti Patil, Nisha R. Mairan, Shalini Badge, Sapna Baviskar, Rohini Temburkar

College of Agriculture, Nagpur

The present investigation entitled "influence of organic residues and silicon solubilising bacteria on availability of nutrients under *Pongamia pinnata* (Karanj)" was carried at Agroforestry Research Farm, College of Agriculture, Nagpur. The layout of experiment at field was laid out in randomized block design with nine different treatments which were replicated thrice. Different organic residues viz., FYM, VC, bamboo litter, teak litter, CDS and compost were selected as silicon sources. The treatments were T_1- absolute control, T_2- 5 ml lit^{-1} $tree^{-1}$ SSB, T_3- 5 ml SSB + 200 g N $tree^{-1}$, T_4- 5 ml SSB + 200 g N from FYM $tree^{-1}$, T_5- 5 ml SSB + 200 g N from VC $tree^{-1}$, T_6- 5 ml SSB + 200 g N from bamboo litter $tree^{-1}$, T_7- 5 ml SSB + 200 g N from teak litter $tree^{-1}$, T_8- 5 ml SSB + 200 g N from CDS litter $tree^{-1}$ and T_9- 5 ml SSB + 200 g N from compost $tree^{-1}$. The samples organic sources of were then analyzed for nutrient content. As per treatments the organic residues were applied in the soil. Nitrogen is the pre-requisite and most important nutrient for growth of *Pongamia pinnata*. It is needed in adequate amounts especially at initial growth stage. Significantly highest soil available nitrogen was299.54 kg ha^{-1} observed in treatment T_5 receiving 5ml SSB along with 200 g N from VC $tree^{-1}$, followed by treatment T_9 277.22 kg ha^{-1} with application of 5 ml SSB along with 200g N from composttree^{-1}. While, treatment T_7 ranked third by recording 259.68 kg ha^{-1} available nitrogen which was at par with treatment T_6 and T_4. There was positive impact of SSB and organic residues on availability of phosphorus in soil. The significantly highest soil available phosphorus (17.15 kg ha^{-1}) was observed in treatment T_7 with application of 5 ml SSB and 200g N from teak litter $tree^{-1}$ and the second next highest treatment T_5 recorded 15.64 kg ha^{-1} available phosphorus which received 5 ml SSB and 200 g N from VC $tree^{-1}$. Treatment T_7 was found significantly superior over other treatments. It recorded 27.98 per cent and 27.87 per cent more available phosphorous than

found in initial soil and control plot. The effect of SSB along with different organic residues had significantly influenced the availability of potassium in soil. The significantly superior available potassium (356.77 kg ha^{-1}) was recorded in treatment T_5 which received 5 ml SSB + 200 g N from VC from $tree^{-1}$ as soil application. While, the lowest available potassium was recorded in treatment T_1 without any external inputs (327.10 kg ha^{-1}). From the present finding, it was found that, the application SSB along with different organic inputs influenced available nutrient status under *Pongamia pinnata* (Karanj) cultivation. It can be concluded that, the application of 5ml SSB along with 200gm N from Vermicompost $tree^{-1}$ improving the soil health by improving the soil physico-chemical properties and plant growth parameters.

IAAHAS/AB/2023/359

Impact of Climate Change on Biodiversity, Food Security and IPR issues

Sourabh Sharma
SGT University, Gurugram, Haryana

Biodiversity loss and climate change are the biggest environmental problem we face moment. The diversity of life on Earth is essential to the health of our earth and to our good as mortal beings. But nature is under pressure as no way ahead. Our requirements for food, water and land, and our demands for energy and further and further stuff are destroying territories, contaminating our air and water, and driving species of creatures and shops to extermination. We're now losing biodiversity up to ten thousand times faster than it was fading 100 times agone. Climate change will worsen the living conditions of farmers, fishers and timber-dependent people who are formerly vulnerable and food insecure. Hunger and malnutrition will increase. pastoral communities, particularly those living in formerly fragile surroundings, face an immediate and ever- growing trouble of increased crop failure, loss of beast, and reduced vacuity of marine, monoculture and timber products. Agriculture, still, can also contribute to reducing hothouse feasts emigrations and their impacts through managing ecosystem services, reduction of land use change and related deforestation, more effective crop kinds, better control of backfires, bettered nutrition for ruminant beast, more effective operation of beast waste,

organic soil operation, conservation husbandry and agroforestry systems. Climate change can include global warming, extreme cold surge, downfall, wind, it includes everything, which moves down from the normal climatic conditions which is suitable to the biodiversity. Intellectual Property is simply the product of a person's mind and labour, which needs to be defended. For addressing the issues of Climate change, we can emphasis more on the Green Technology, where its new forms evolved in multitudinous advanced countries and for guarding this new technology they took help Intellectual Property Rights. So, the Green Technology defended by Patents is called Green Patents. The new technology patented and defended, which serves the terrain with numerous benefits

Keywords: *Climate, Environment, Technology, Biodiversity.*

IAAHAS/AB/2023/360

Economic Benefit from Nutrigarden to farmwomen of Wanaparthy District, Telangana

Gottemukkula Bhavani[1*], Rondla Anitha[2] and Syed Shakir Ali[3]
Subject Matter Specialist (Agricultural Extension), Subject Matter Specialist (Home Science) and Senior Scientist and Head
ICAR- Krishi Vigyan Kendra, Mahabubnagar-I
Madanapuram Mandal and Wanaparthy District 509110

Nutri-garden is an important concept that helps to combat malnutrition by producing diverse kinds of vegetables for rural families. KVK, Mahabubnagar-I demonstrated the Nutrigarden concept amongst 100 families of three mandals namely Madanapuram Kothkota and Wanaparthy of Wanaparthy district. The present study was taken-up to analyze the economic impact of the Nutrigarden along with perceived constraints faced by the farmwomen. The demonstrations on Nutrigarden improved their understanding in successful adoption of the concept. The results revealed that there was total income of Rs. 30592.09/- from kharif vegetables and Rs. 26604.78/- from rabi vegetables. The total vegetable income was Rs. 57196.87/- from an area of 1000Sq.feet in both the seasons. Besides, there are

few perceived constraints in successful adoption of Nutrigarden. Overall analysis revealed that Time consuming, lack of backyard and front yard space availability for Nutrigarden, Unaware of the economic advantage of Nutrigarden and lack of knowledge on pest and disease management were amongst the major constraints as perceived by farmwomen.

Keywords: *Nutrigarden, Demonstration, Economic analysis, Income increase, Constraints.*

IAAHAS/AB/2023/361

Assessment of Soil Fertility Status Under Cotton Growing Soils of Uppununthala Tehsil of Nagarkurnool District of Telangana

Ommala D. Kuchanwar, Nirmitha Reddy, Padmaja H. Kausadikar, Nishigandha R. Mairan, Sapna Baviskar, Shalini Badge
College of Agriculture, Nagpur

The present investigation in relation to "assessment of soil fertility status under cotton growing soils of Uppununthala tehsil of Nagarkurnool district of Telangana" was undertaken during 2021-22, total of 50 geo referenced surface soil samples were collected from ten villages and analysed for their physical properties, chemical properties, major and micronutrient status of the soil. The correlation studies were carried out between yield and soil available nutrients. The results revealed that, the bulk density of the soils under study were ranged from 1.34 to 1.51 Mg m^{-3}. The porosity ranged from 40.32 to 49.26 per cent and the hydraulic conductivity of the selected soil samples ranged from 0.72 to 0.96 cm hr^{-1}. The study area was neutral to slightly alkaline in reaction (7.14-8.30), non-saline (0.14-0.55 dS m^{-1}), low to moderately high in organic carbon (1.9-7.9 g kg^{-1}) and soils were moderate in calcareousness (0.85 – 2.10 %). The macronutrient content in these soils ranged from very low to medium (125.44 - 291.64 kg ha^{-1}) for available nitrogen, and low to moderately high (9.7 to 26.2 kg ha^{-1}) for available phosphorus, low to high (123 to 360 kg ha^{-1}) for available potassium and medium to high (10.56 – 20.62 mg kg^{-1}) in available sulphur content. According to Soil Nutrient Index, available nitrogen was low, available phosphorus, potassium and sulphur were moderate. Among the micronutrients, the available zinc was very low to medium (0.29 to 0.83 mg kg^{-1}), low to

moderately high for iron content (3.80 to 9.70 mg kg^{-1}), medium to very high (0.29 to 0.83 mg kg^{-1}) for copper, low to moderately high (1.50 to 5.50 mg kg^{-1}) for manganese. According to Soil Nutrient Index, available Zn was low, Fe and Mn were moderate and Cu was moderately high. The correlation study revealed that, the crop yield exhibited positive correlation with BD, porosity, OC, available N, P, K, S, Zn, Fe, Cu and Mn. Whereas, yield was negatively correlated with pH, EC and calcium carbonate.

IAAHAS/AB/2023/362

Effect of different nitrogen levels on growth, yield and quality of wheat (*Triticum aestivum* L.)

Harmanpreet Kaur Gill

Ph.D. Scholar, Department of Agronomy, School of Agriculture, Lovely Professional University, Phagwara (Punjab)

Wheat is one of the most important cereal crops and is used as staple food in the world. The various factors like weed, insect-pest, diseases, biotic and abiotic etc. affect the growth and development of crops. Apart from these, fertilizers are also important for enhancing the growth of crops and it is helpful for metabolic activities of plants. Nitrogen is one of major from all nutrients and it is constituent of protoplasm, amino acids, proteins, nucleotide and nucleic acid. It gives green colour to plants and increases the vegetative growth of crops. It not only increases growth of crops but also increases all growth, yield and quality parameters. It increases growth parameters like tiller count, plant height, crop dry matter accumulation, yield parameters like effective tillers, number of ears, number of grains/ears, ear length, test weight, grain yield, straw yield, biological yield, harvesting index in wheat crop and quality parameters like protein, chlorophyll index in wheat, also increase the farmer income. Many researchers founded that the all growth, yield and quality parameters increased with optimum nitrogen levels from 80-130 kg/ha. Application of nitrogen in a sufficient amount is said to be the secret to success in order to achieve the highest yield of wheat. The need to increase wheat yields has spurred forward-thinking farmers to work diligently on farm management tasks.

Keywords: *Wheat, Nitrogen, Yield, Protein, Quality.*

High-tech Agriculture in Jharkhand – An Overview

Pallabi Patra[1] and Surojit Kar[2]

M.Sc. (Ag) Agronomy, Jharkhand Rai University, Ranchi

Jharkhand's agricultural sector relies heavily on rain-fed agriculture, which suffers from low productivity and a lack of infrastructure. The state government has recognized the potential of high-tech agriculture and has implemented various initiatives to promote it. High-tech agriculture refers to the use of modern science and technology in agriculture to increase productivity with efficiency, and crop quality. In recent years, India has placed increasing emphasis on adopting high-tech agriculture in different states. In Jharkhand, precision farming techniques have been used to increase crop yields, reduce water consumption, and use of chemical fertilizers and pesticides. For example, a farmer in Jhalakdih village in Giridh reported that his income increased efficiently with the use of drip irrigation. Initiatives are taken by Agricultural Incubation Centres to provide training and technical support to implement modern technology.

Another area of high-tech agriculture that is gaining popularity in Jharkhand is vertical farming, which involves growing crops in stacked layers using artificial lighting and air conditioning systems. Vertical farming has several advantages over conventional farming, including higher yields, less water consumption, and the ability to grow crops year-round. In Jharkhand, vertical farming is used to grow high-value crops such as strawberries, lettuce, and herbs. Hydroponics is practiced in parts of Palamu, Kunti, Simdega, and East Singhbhum. Apart from these technologies, different seminars and conferences in KVKs and agricultural institutes have been held to promote high-tech agriculture which involves the use of mobile applications, remote sensing, and big data analytics to optimize crop growth and increase efficiency. In 2018, 26 farmers from Jharkhand were sent to Israel for training in advanced technologies to overcome the difficulties faced due to irrigation like the Israel farmers. In conclusion, advanced agriculture has the potential to transform Jharkhand's agricultural sector by increasing productivity, increasing efficiency, and improving crop quality. With the support of the state government and the adoption of modern technologies, farmers in Jharkhand can benefit from high-tech agriculture and improve their livelihoods.

Keywords*: Drip irrigation, Hydroponics, Remote sensing, Vertical farming.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/364

Effect of Salicylic acid and Humic acid on growth of Chrysanthemum cv. Pandhari Rewadi

Warkade Pallavi*[1], Dr. Hemlata Khobragade[2], Pratik Raut[3]
[1]M.Sc. Scholar, Department of Horticulture, [2]Asst. Professor, Department of Horticulture, College of Agriculture, Nagpur, Maharashtra, India
[3]Ph.D. Scholar, Department of Horticulture, Dr. P. D. K. V, Akola, Maharashtra, India

A field experiment was conducted during *kharif* season 2020-2021 at the Department of Horticulture, College of Agriculture, Nagpur, to study the "Effect of Salicylic acid and Humic acid on growth of Chrysanthemum cv. Pandhari Rewadi". The topography of experimental field was fairly uniform in texture with gentle slope. The soil of the experimental site was medium black with good drainage. The experiment was laid out in Randomised Block Design with nine treatment. The treatments were T_1- Control (Water spray), T_2- Humic acid 1000 ppm, T_3- Humic acid 2000 ppm, T_4- Humic acid 3000 ppm, T_5- Humic acid 4000 ppm, T_6- Salicylic acid 100 ppm, T_7- Salicylic acid 200 ppm, T_8- Salicylic acid 300 ppm and T_9- Salicylic acid 400 ppm. The solution of salicylic acid and humic acid of different concentrations were applied as a foliar spray at 30 DAT, 60 DAT, 90 DAT in Chrysanthemum. The application of salicylic acid sprayed with 200 ppm (T_7) recorded higher growth attributing characters *viz.,* maximum plant height, number of branches, stem diameter and leaf area were influence significantly due to different treatments. Maximum plant height, number of branches, stem diameter and leaf area which was at par with the application of humic acid sprayed with 1000 ppm and found significantly superior over rest of the treatment.

IAAHAS/AB/2023/365

Yield Evaluation and Quality Analysis of Paneer from Cow and Buffalo Milk

Bibek Bahadur Shrestha[1] and Sawant Sanket R[2]

[1 2] Assistant Professor, Vignan's foundation for Science, Technology and Research, Vadlamudi-Andhra Pradesh 52213

In the present study different combinations of cow and buffalo milk was taken to prepare paneer. At first milk combination was heated to coagulation temperature of 75°C, 80°C and 85°C and was coagulated with 1% citric acid. After that chemical analysis of paneer was done to evaluate its moisture content, protein content and fat content. The maximum yield of 163.955 g paneer was observed for 700:300 (buffalo:cow), 85°C coagulating temperature and 1% citric acid solution with a desirability value of 0.781. The maximum fat content of 61.0863% from paneer was observed for 740:260 (buffalo:cow), 83.88°C coagulating temperature and 1% citric acid solution with a desirability value of 0.794. The maximum protein content of 18.7148% from paneer was observed for 700:300 (buffalo:cow), 85°C coagulating temperature and 1% citric acid solution with a desirability value of 0.908. The study concluded that 700:300 (buffalo milk: cow milk) combination along with 80.73°C coagulating temperature and with 1% citric acid solution as coagulating agent given maximum yield of 165.642 g paneer with 18.28% protein and 58.21% fat content

Keywords: *Paneer, coagulation, chemical analysis*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/366

Role of Earthworms in Soil Health and Variables Influencing their Population Dynamic: A Review

Pankaj Yadav
Department of Soil Science & Agriculture Chemistry, School of Agriculture, Lovely Professional University, Phagwara, Punjab 1444112

Earthworms combine the various soil layers and add organic material to the soil. This combination increases the fertility of the soil by allowing organic matter to spread throughout the soil and allowing plants to access the nutrients which are stored. The earthworm works as soil conditioners by enhancing the soil biological, chemical, and physical properties. They accomplish this through a variety of processes, including aeration, soil organic matter breakdown, the release of plant nutrients, and their part in the accelerated uptake of nitrogen as a result of plant growth hormone secretion. The population of the soil is affected by a wide range of soil and environmental conditions. In addition, it is still unknown how soil worms alter the makeup of soil microbial communities and how they affect the microbial activity of the soil. Earthworms lower microbe activity and abundance by consuming microorganisms or by choosing and promoting particular microbial groupings. Although primarily mediated by indirect microbial community change, earthworms have a direct impact on the plant's development and recycling of nutrients. The decrease in soil earthworms is partly a result of agricultural activities, especially the usage of pesticides. There are no established links between the prevalence of earthworms, crop productivity, and opposing effects on yield. Hormone-like compounds found in earthworms support plant development and health. This review discusses how earthworms interact with soil fertility and various agricultural techniques, including variables affecting earthworm population dynamics in all situations that allow the adoption of environmentally friendly and earthworm-friendly farming techniques for an ideal earthworm, productive, and fertile soil behaviour.

Keywords: *Earthworms, population dynamics, soil health, organic matter.*

IAAHAS/AB/2023/367

Long-term integrated nutrient management improves potassium stock in soil: A case study from an Inceptisol

ParamitaDeb[1,3*], Anupam Das[1,2], SidhuMurmu[3], Biswapati Mandal[3]

[1]Department of Soil Science, GD Goenka University, Sohna, Haryana, India

[2]Department of Soil Science and Agricultural Chemistry, Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India Mohanpur, Nadia

[3]Department of Agricultural Chemistryand Soil Science,Bidhan ChandraKrishi Viswavidyalaya, Mohanpur,Nadia, West Bengal, India

Potassium (K) is one of the major nutrients for maintaining production sustainability. Potassium dynamics and its depth distribution (stock) are very important for plant nutrition. However, the long-term impact of different nutrient management e.g. mineral fertilization, integrated nutrient management and organic farming together is scanty. Thus, a long-term fertility experiment in an inceptisol was consider for the study. Five treatments viz. Control-no fertilizer (T_1), 100% NPK (T_2), 50% N+100% (PK) + green manure (GM) (11.25 t ha^{-1}) (T_3), - 50%N+100% PK+ farm yard manure (FYM) (7.5 t ha^{-1}) (T_4) and FYM (7.5 t ha^{-1}) + Bio-fertilizer (BF) (*Azospirillum* and Phosphobacteria) (T_5) were categorized into four nutrient management strategies namely imbalanced (T_1), Balanced (T_2), Integrated (T_3 and T_4) and sole organic (T_5) nutrient management under rice-mustard-sesame cropping system. After 19 cycles of the experiment, it was found that differentformsofpotassiumviz.watersoluble,exchangeable, non-exchangeable and lattice K were varied from 0.08%, 0.34%, 2.37% and 97.32 % of the total K respectively. Total potassium in the whole profile (0-45cm) was 112.82, 126.28, 100.98 and 75.406 Mg ha^{-1} under four nutrient management respectively. The results pertaining to apparent K balance revealed that the highest negative balance of K was recorded with the application of BF+FYM@11.25 t ha^{-1} (1144 kg ha^{-1}) Lowest negative balance was observed in the treatments receiving 50% N+PK+FYM (158 kg ha^{-1}). It could be concluded that conjoint application of NPK along with FYM or Biofertilizer or green manure improve all the fractions of potassium, yield and uptake of potassium as compared to balanced application of NPK and imbalanced application of fertilizer and irrespective of nutrient management practices, the apparent K balance were negative.

Keywords: *Potassium, Apparent potassium balance, Integrated nutrient management*

IAAHAS/AB/2023/368

Changes in plant nitrogen under elevated CO_2 and temperature interaction in rice crop

Partha Pratim Maity[1]*, B Chakrabarti[1], A Bhatia[1], S Naresh Kumar[1], TJ Purakayastha[2], D Chakraborty[3], A Sharma[1], S Kannojiya[1]

[1]Division of Environment Science, ICAR-
Indian Agricultural Research Institute, New Delhi
[2]Division of SSAC, ICAR-Indian Agricultural Research Institute, New Delhi
[3]Division of Agricultural Physics, ICAR-Indian Agricultural Research Institute, New Delhi

The global climate is changing at an alarming rate due to the increasing emission of greenhouse gases (GHGs) such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Crop production and productivity are anticipated to be impacted by climate change due to its effects on crop physiology, water and nutrient availability, insect-pest infestation. Rice (*Oryza sativa* L.) is the second-most significant staple food crop in the world. Besides crop growth, plant nitrogen is also expected to get altered under elevated CO_2 and temperature condition. To study this a field experiment was carried out during the *kharif* season inside open top chambers (OTC) at Genetic-H field of IARI, New Delhi to study the changes in plant nitrogen as well as crop growth under elevated CO_2 and high temperature in rice crop. Pusa Basmati 1509 variety of rice was grown in ambient (410 ppm) and elevated CO_2 (550 ± 25 ppm) concentration along with two temperature levels: ambient and elevated (+2.7 °C). Under elevated CO_2 treatment plant nitrogen concentration decreased. The above ground N uptake was also reduced to 498 mg N $hill^{-1}$ under elevated CO_2 level from 523 mg N $hill^{-1}$ in chamber control due to lower plant nitrogen concentration in elevated CO_2 treatment. Above ground biomass of rice increased under elevated CO_2 concentration although there was no significant difference under elevated CO_2 plus high temperature interaction as compared to the chamber control. This shows that elevated CO_2 may able to reduce the negative effect in rice yield and biomass due to temperature rise but quality of rice in terms of plant N might get affected in elevated CO_2 and temperature condition.

Perception on Climate Change of Agriculture and Animal Husbandry Enterprise owners of South Gujarat Region

Radhika Tanwar, Payal H. Viharia and Dr. R. D. Pandya
Navsari Agricultural University, Navsari

Climate change is a global phenomenon that has the potential to impact on various aspects of life, including agriculture and animal husbandry. Enterprise owners in South Gujarat, like those in other parts of the world, are likely to be affected by changes in temperature, rainfall patterns and extreme weather events, which could affect crop yields and productivity. They have reported changes in rainfall patterns, which have impacted their crop yields, milk production and overall farming practices. However, the study also found that many farmers lacked awareness and understanding of the underlying causes of these changes, including climate change.

In general, farmers' perceptions of climate change can be influenced by a variety of factors, including their level of education, access to information, and personal experiences with weather and environmental changes. In South Gujarat enterprise owners have varying opinions and beliefs about climate change, depending on these factors and other contextual factors specific to their region. Majority (60.00%) of the agriculture and animal husbandry enterprise owners had adequate perception regarding rainfall. Nearly three fifth (58.93%) of the agriculture and animal husbandry enterprise owners had adequate general perception regarding climate change and 57.50% of them had adequate knowledge about climate change.

Overall, it is important to continue to raise awareness and provide education on the impacts of climate change on agriculture & animal husbandy enterprises and other aspects of life, to help individuals and communities better adapt and prepare for the future.

Keywords*: Climate Change, Perception, Agriculture, Animal husbandry, Enterprise.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/370

Emerging threats to apiculture: Causes and Remedies

Vipul
Research scholar, Department of Entomology, College of Agriculture, CCS Haryana Agricultural University, Hisar-125004, Haryana, India

Apiculture (also known as bee keeping) is an integral part of human life since time immemorial. Honey bees play a vital role in the pollination of plants and conservation of floral diversity. Important bee species include giant honey bee (*Apis dorsata* F.), little or dwarf honey bee (*Apis florea* F.), Indian hive bee (*Apis cerana indica* F.) and european honey bee (*Apis mellifera* L.). Beekeeping plays a key role in the development of rural areas, aids ecosystem and contributes to boost agricultural production. Currently, managed and natural ecosystems are threatened by large-scale declines in honey bee populations. The most pressing threats to beekeeping are habitat loss, climate change, pesticides, parasitic mites, pathogens, invasive plants and insects. Changes in land use and agriculture, including urbanisation, intensive farming, adoption of monoculture and increased use of pesticides caused significant losses to pollinator-friendly habitats. Ectoparasitic mite, *Varroa destructor* is the world's most devastating honey bee pest. Varroa mites feed on the haemolymph of adult honey bees as well as larvae and pupae. American foulbrood (AFB) is a severe bacterial brood disease caused by the Gram-positive bacterium, *Paenibacillus larvae*. Shaking is a non-chemial and ecofriendly management technique for AFB, in which infected nesting comb is destroyed and the adult honey bees are transferred onto uncontaminated nesting material. Greater wax moth, *Galleria mellonella* is another serious threat for apiculture. Threats to honey bees are diverse and with continued pressure from habitat loss and pathogens, there is a continued need to improve our understanding of the nature, causes and consequences of declines at local, national, continental and global scales. Developing mitigation options such as crop diversification, protected application of agro-chemicals and improved bee pest management techniques are essential to ensure sustainable pollination in the changing world.

IAAHAS/AB/2023/371

Pharmacokinetics of Cefquinome and Cefquinome Concentration in Various Biological Fluids by Intravenous Administration in Marathwadi Buffaloes

M.K. Patil, A.P. Somkuwar and P.V. Patil

Department of Veterinary Pharmacology and Toxicology, College of Veterinary and Animal Sciences, Udgir Distt. Latur Maharashtra-413517, India

An experiment was performed on six healthy Marathwadi buffaloes to study the different pharmacokinetic parameters and cefquinome concentration in various biological fluids after single intravenous administration @ 1 mg/kg body weight by microbiological assay technique. The cefquinome concentration in saliva, nasal secretion, urine and milk was recorded as 0.121 ± 0.00, 0.26 ± 0.03, 4.97 ± 0.36 and 0.15 -0.13 ± 0.01 mcg/ml respectively at twelve hours, however at the same time cefquinome concentration in serum could not be detected. The peak serum concentration, distribution half life, elimination half life, volume of distribution, total body clearance, AUC, AUMC, MRT and bioavailability values of cefquinome after intravenous administration found were 11.33 ± 2.31 mcg/ml, 0.08 ± 0.02h, 1.97 ± 0.14 h, 0.28±0.03 L/kg ($Vd_{(B)}$) and 0.23±0.03 L/kg (Vd_{ss}),0.09 ± 0.01 L/kg.h^{-1},11.59±1.01µg/ml.hr, 29.92± 3.04µg /ml.hr^2, 2.59± 0.18 h and100 %, respectively. It may be concluded that Cefquinome persists for 10 hours in buffaloes with the peak concentrations 0.0416 h (2.5 min) after IV administration. The elimination half life of cefquinome was 1.97 h in buffaloes indicating the repeating of doses at 12 to 15 h intervals in buffaloes. The loading dose would be double than the maintenance dose of cefquinome after intravenous administration. It is also inferred that cefquinome has extremely poor protein binding (<10%) in buffaloes and urinary route is the major route of cefquinome excretion.

Keywords: *Pharmacokinetics, cefquinome, buffaloes, intravenous, biological fluids.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/372

Study of efficacy of different herbicides for weed management in Lawn

Savita, B.S. Beniwal, Sonu Sheoran and Deepak Kumar
Department of Horticulture, CCS Haryana Agricultural University,
Hisar, Haryana-125004

An investigation was carried out to study the "efficacy of different herbicides for weed management in lawn" at Landscape Area, CCS Haryana Agricultural University, Hisar (Haryana) during 2022. There were eight treatments in this experiment (T_1: 2, 4-D amine (580.00 g/ ha), T_2: Metsulfuron methyl + Chlorimuron ethyl (4.00 g/ ha), T_3: Halosulfuron (67.50 g /ha), T_4: Halosulfuron (67.50 g /ha), T_5: Carfentrazone ethyl (20.00 g /ha), T_6: Metsulfuron methyl + Carfentrazone ethyl (20.00 g/ ha), T_7: Hand weeding (15 days interval) and T_8: Unweeded check) and four phases (P_1 : March – April, P_2: March – April, P_3: July – August and P_4: September – October). The experiment was laid out in randomized block design with three replications. The analysis of above said results revealed that the weed control efficiency recorded highest in hand weeding at every 15 days interval. Among the herbicide treatments, highest weed control efficiency was recorded in 2, 4 – D amine at 580.00 g ha^{-1} in spite of other herbicide treatments in case of broadleaf weeds in all the phases. As concern with sedge, halosulfuron at 67.50 g ha^{-1} was recorded highest weed control as compared to other herbicide treatments during all the phases.

Keywords: *Lawn, herbicides, efficiency, weeds.*

IAAHAS/AB/2023/373

Eight Guiding Principles of Integrated Pest Management

Yash Tewatia
Student of Faculty of Agricultural Sciences, SGT University, Gurugram

By using pesticides, cropping systems could be made simpler, yields could be raised, and more intricate crop protection techniques could be avoided. However, an excessive dependence on chemical control is linked to ecosystem contaminating and unfavorable health effects. The emergence of pest resistance and the dwindling supply of active ingredients are now additional threats to crop production. Therefore, cropping methods need to be created that are less reliant on synthetic pesticides. So as to work within sustainable farm management, the European Union mandates the application of eight IPM principles (P). Here, we offer farmers, advisors, and researchers a dynamic and adaptable strategy that takes into consideration the variety of farming circumstances and the complexity of agro ecosystems and can increase cropping systems' resilience and our ability to customize crop protection to local conditions. For each principle (P), we suggest that (P1) the design of inherently robust cropping systems using a combination of agronomic levers is key to prevention. (P2) Local availability of monitoring, warning, and forecasting systems is a reality to contend with. (P3) The decision-making process can integrate cropping system factors to develop longer-term strategies. (P4) The combination of non-chemical methods that may be individually less efficient than pesticides can generate valuable synergies. (P5) Development of new biological agents and products and the use of existing databases offer options for the selection of products minimizing impact on health, the environment, and biological regulation of pests. (P6) Reduced pesticide use can be effectively combined with other tactics. (P7) Addressing the root causes of pesticide resistance is the best way to find sustainable crop protection solutions. And (P8) integration of multi-season effects and trade-offs in evaluation criteria will help develop sustainable solutions.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/374

Post Harvest Technologies to minimize Losses of Fruits and Vegetables in India

Nitu Kumari[1*] and Ajay Kumar[2]
[1*&2]Ph.D. Scholar, Department of Agricultural Economics
Bihar Agricultural University, Sabour, Bhagalpur (Bihar)-India

India contributes roughly 11.90% and 10.90%, respectively, to global vegetable and fruit output with its respective production of 111.77 million MT of vegetables and 57.73 million MT of fruits. In both categories, India is ranked second worldwide. Due to the high perishability of fruits and vegetables, effective post-harvest management has become crucial. Post-harvest losses of fruits and vegetables in India are equal to the country's annual consumption of the UK. Currently, 70 to 80 percent of our produce is lost, mostly during transportation and storage. The stage at which the fruits and vegetables should be harvested is very important in determining the market life, storage, transport, eating and processing quality. Globally, the use of post-harvest technology for example, the use of ethylene, 1-methylcyclopropene (1-MCP) and temperature control have proven to reduce the loss of post-harvest fruits and vegetables. In order to manage rot and harmful germs, both chemical and non-chemical treatments are effective, particularly for food and vegetable products. Heat treatment is one of the most efficient physical techniques for extending the shelf life of fruits and vegetables by preventing pests and infections. Moreover, the heat treatment leaves no toxic residues and is an environmentally friendly process. They are also useful at controlling the physiology of fresh goods. Reduce post-harvest losses of fruits and vegetables, improve food security and nutrition, and reduce poverty with the help of post-harvest technologies like controlled ripening, nutritional coverage, temperature control and chemical treatments. To ensure the ultimate safety of consumers, it is also important to avoid using ineffective cleaning agents and pesticides. Strategies those are affordable or low-cost for managing fruits and vegetables after harvest to delay senescence and microbial contamination as well as extend shelf life and preserve the quality of horticulture products for improved health.

Keywords: *Fruits, Chemical treatments, Post harvest technologies, Shelf-life and Temperature control*

IAAHAS/AB/2023/375

Views on Forestry interference on Climate and other resources

Prabhat
College of Agriculture, Chaudhary Charan Singh Haryana Agricultural University
Hisar (125004), Haryana, India

Forest is an ecosystem that regulates carbon sequestration, other geochemical cycles, home to diversity of organisms playing important role in climatic equilibrium maintenance. Increasing deforestation in last few decades has paved the way for major disturbances in climate like global warming by imbalance in atmospheric carbon dioxide and other gas levels, increased frequency of natural calamities, rising ocean levels, melting glaciers. These problems need to be addressed. It can be done by reducing deforestation, degradation of forests mainly in primary biodiversity centres. The changes can be mitigated by forest restoration at destructed sites, waste lands. Involvement of local communities in forest resource conservation can reduce illegal, unrighteous and unsustainable activities in the forest and its premises. Awareness can be increased about ecosystem services provided by forests so that more people adopt deforestation supply chains. All these forest related practices can improve the condition of deteriorating climate.

IAAHAS/AB/2023/376

Correlations Among Yield and its Component Traits in *Brassica rapa* var. yellow sarson

Preeti Lohani*[1], Usha Pant[2], Anu Singh[3], A.S. Jeena[4]
[1] Ph.D. Research Scholar, GBPUA&T, Pantnagar, U.S. Nagar, Uttarakhand
[2] Associate Professor, GBPUA&T, Pantnagar, U.S. Nagar, Uttarakhand
[3] Ph.D. Research Scholar, GBPUA&T, Pantnagar, U.S. Nagar, Uttarakhand
[4] Professor, GBPUA&T, Pantnagar, U.S. Nagar, Uttarakhand

The ever-increasing demand of the ever-growing population has made us to think about more innovative ways to increase the food security of our nation and worldwide. This starts with improving the existing genotypes and obviously making new varieties with desirable characters. Same goes with the

oilseeds crops among which *Brassica* is one of the important players. More precisely, talking about the rape seed i.e., *Brassica rapa*, it is one of the six commercially important species of Brassica and is very well known for its oil content and quality traits. The present investigation involved *Brassica rapa* var yellow sarson which is one of three variants of rape seed. Yellow sarson is famous for its yellow seed coat colour and the clear oil texture, which is one of the most desirable traits. Even after having desirable qualities, the crop still faces problems in production for which it needs to be further improved. The present study comprises of forty-one genotypes of yellow sarson, including five checks, grown in Randomized Block Design with three replications, for consecutive three years. These genotypes were studied for estimating the correlation among the eleven yield and yield attributing traits taken into consideration. The data for all the eleven traits was collected for all the genotypes and was analysed using appropriate statistical techniques. The results of analysis of variance revealed highly significant mean sum of squares for all the genotypes and the components of genetic variability revealed the presence of sufficient amount of variability among the genotypes. Among the eleven traits taken into consideration seed yield per plot was the dependent character. Seed yield per plot was found to have highly significant and positive, genotypic and phenotypic correlations with almost all the characters in all the years except for traits viz., siliquae density and siliqua length. Thousand seed weight on the other hand was found to have highly significant and positive correlations with length of main raceme and number of seeds per siliqua. Siliqua length was highly significantly and positively correlated, genotypically as well as phenotypically with plant height. Number of primary branches per plant had highly significant and positive association with traits viz., days to maturity, siliquae on main raceme and siliqua density. The estimates of genotypic correlations were higher than that of the corresponding phenotypic correlations, for all the years, indicating less amount of environmental impact on these associations. The results of the present investigation give us a glimpse of the characters that needs to be improved in long run to increase the yield of the crop.

Keywords: *Brassica rapa var. yellow sarson, Genetic Variability, Correlations*

IAAHAS/AB/2023/377

Protein Intake of Tribal Adolescent Girls of Gadchiroli District of Maharashtra

Dr. Yogita K. Sanap Dr. S. R., Dalal, Dr. Atul Warade, Dr. Pravina Satpute
Horticulture Section, College of Agriculture, Akola.

The term 'adolescence' represents a hyper anabolic phase of growth, mediated by hormonal factors and characterised by peak velocities of growth. It is also a crucial phase of growth since it offers the second and last chance for the catch up with the growth in the life cycle of girls. Tribal population constitutes about 8% of the total population of India. They are at higher risk of under nutrition because of their dependence on primitive agriculture practices and uncertainty of food supply. The Madia of Gadchiroli in Maharashtra district is found in the same localities as Gond proper and their dialects are almost identical. Nutritional pattern in these years may be considered to be significant as it influences growth and reproductive maturation. The majority of girls selected in the study were 16 years old. The study was carried out in the area of Protein intake; significantly high percentage (49.8%) of adolescent girls from the Gond-Madia community was underweight. The protein intake of adolescent girls was 40.9gm/d significantly lower than the RDA for protein; howe ver, after providing the nutrition related training, the girls indicated remarkable improvement by consuming more protein. Significantly high percentage of the people from Gond-Madia tribe is illiterate. After imparting nutrition education and supplementation there is remarkable change in their nutrient intake.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/378

Effect of Pomegranate Seed Powder on the Quality and Storage Stability of Vanaraja Spent Hen Meat

Mir Rovida[1]*, Sarfaraz A. Wani[2], Sheikh Rafeh Ahmad[3] and Asif H. Sofi[4]
[1]*Contractual Lecturer, Division of Livestock products technology SKUAST-K [2]Director Research and HOD, Division of Livestock products technology SKUAST-K
[3]Assistant Professor, Division of Livestock products technology SKUAST-K
[4]Associate professor, Division of Livestock products technology SKUAST-K

The thigh portions from the carcass of Vanaraja spent hens were subjected to different concentration of pomegranate seed powder (2%, 4% and 6%) and compared with naive control (without any treatment) and 0.2% papain (positive control). The treated thigh samples were kept for 24 hours at 4±1°C to allow pomegranate seed powder act on them. After 24 hrs, the samples were divided into two groups. First group was analysed to evaluate the tenderizing effect of pomegranate seed powder. The results revealed that with increasing pomegranate seed powder level, there was a decrease in pH, moisture content, water holding capacity, hydroxyproline content, collagen content and muscle fibre diameter and improvement in sensory parameters like appearance, colour and tenderness, thereby confirming the tenderness of spent hen meat. The other group of samples was cooked for 35 minutes in 1.5 % sodium chloride solution. Decreased product yield, pH, moisture content, shear force value and improved sensory scores in cooked samples was observed; more so in 6% pomegranate seed powder treatment. To evaluate the storage stability of raw and cooked samples treated with 6% pomegranate seed powder (selected as optimum), the samples packed in LDPE bags at 4±1°C were evaluated for microbiological and other quality parameters for 21 days. The microbiological quality (total plate counts, coliform counts and yeast and mold counts) was better in pomegranate seed powder treated samples on all days of storage and the microbial counts were within acceptable limits. The sensory quality was also acceptable throughout the storage period. It was therefore, concluded that pomegranate seed powder has a tenderizing as well as antimicrobial action in Vanaraja spent hen meat during its refrigerated storage.

***Key words**: Microbiological, pomegranate, refrigerated storage, tenderizing, spent hen thigh and Vanaraja*

IAAHAS/AB/2023/379

Cultural Morphological and Pathogenic variability of *Psuedocercospora musae*

Khaire Pravin, Narute Tanaji and Mane Someshree
Department of Plant Pathology and Agricultural Microbiology, PGI, MPKV, Rahuri

One of the fruits with the highest global production is the banana. The culture is afflicted by a number of diseases, the most significant of which being yellow sigatoka. More than 50% of the world's banana production is reportedly affected by yellow sigatoka. A total of 80 leaf samples obtained from the study area. The isolated fungal growth was examined under a microscope but there was no sporulation was observed but infected tissue section found conidia and conidiophores, all of which resembled the morphology of *Pseudocercospora musae*. The slightly variation was observed in case of cultural growth of all isolates. The study of the different isolates of *Psuedocercospora musae* overall reactions to the cv. Grand Naine reveals that all isolates were consistently virulent to cv. Grand Naine. In case of *Pseudocercospora musae* among all isolates high virulence was observed in PM-8, PM- 10 and PM-11. Whereas PM-2 and PM-3 were noticed avirulent, thereby showing highly susceptible and highly resistant reactions in host respectively.

Keywords: *Banana, Musa acuminata, Psuedocercospora musae, Morphological traits, pathogenic reactions.*

Isolation and Identification of Fungal Pathogens on Banana Trees (*Musa acuminata* L.) in India

Khaire Pravin, Narute Tanaji and Mane Someshree
Department of Plant Pathology and Agricultural Microbiology, PGI, MPKV, Rahuri

One of the most significant fruit crops in India is the banana, which covers approximately 466.2 ha. The banana tree (Musa acuminata L.) was found to have fungal infections in the Maharashtra region of India between 2019 and 2021. Following the identification of trees exhibiting disease symptoms, samples of infected tissue were obtained and cultured. Little sections of sick leaf, corm, pseudostem, and fruit were used to isolate fungi, which were then cultivated on a potato dextrose agar (PDA) medium containing lactic acid after the tissue surface had been disinfected with 5% hypochlorite sodium. By using hyphal tip and single spore techniques, fungus colonies that were growing were purified. Growing colonies of fungi were purified by single spore and hyphal tip methods. Based on the morphological characters and pathogenicity tests, fungal species were identified as follows: *Fuasarium oxysporum* that caused wilting; *Cercospora musae*, *Colletotrichum musae*, *Aspergillus carnenus*, *Acremonium* sp., *F. verticillioides*, *F. semitectum*, *F. subglutinans*, *F. sambucinum*, *F. moniliforme* and *Musicillium theobromae* that caused diseased fruit; *Cylidrocarpon* sp and *Rhizoctonia solani* caused corm and root disease; and species *Alternaria alternata*, *Drechslera gigantean* and *F. proliferatum* that caused leaf disease. This was the first report of occurrences of these fungi in banana trees in India.

Keywords: *Identification, fungal, pathogen, banana, Musa acuminata, India*

Effect of different rate of sewage sludge application on nitrogen, phosphorus and potassium uptake by grain and straw of mung bean

Rachna*, Rohtas Kumar
Department of Soil Science, CCSHAU, Hisar, Haryana, India

The impact of sewage sludge on available nitrogen, phosphorus and potassium content of the soil was studied in the mung bean crop. The N uptake by grains and straw increased significantly in all the treatments over control. The highest N uptake by grain (189.91 mg pot^{-1}) and straw (69.53 mg pot^{-1}) was recorded in treatment T_7. The P uptake by grains also increased significantly in all the treatments over control. While in case of straw, P uptake increased significantly in all the treatments over control. The highest uptake of phosphorus by grain (17.34 mg pot^{-1}) and straw (16.81m g pot^{-1}) was recorded in treatment T_7. The potassium uptake by grains and straw increased significantly in all the treatments over control. The highest K uptake by grain (23.12 mg pot^{-1}) and straw (28.40 mg pot^{-1}) was recorded in treatment T_7 receiving sewage sludge @ 20.0 t ha^{-1}. The application of sewage sludge had significant impact on nitrogen, phosphorus and potassium uptake by grain and straw of mung bean.

Keywords: *Sewage sludge, mung bean, nitrogen, phosphorus, potassium and Uptake.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/382

Impact of Front-Line Demonstration on Pulses Productivity and Profitability in Farmers Fields

S.A. Borde [1*], U.U. Rajput[2], R.V. Zanzad [3], P.P. Gawande[4], and T.H. Rathod[5]

[1*]SMS (Ext. Educ.): KVK, Warwat bakal road, Jalgaon (Jamod) Dist. Buldana-443402 (Maharashtra)

[2]Agriculture Assistant: Central Demonstration Farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola-444104 (Maharashtra)

[3]Assistant Professor & Junior Breeder: QSPU, Central Demonstration Farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Wani-Rambhapur, District Akola 444102 (Maharashtra)

[4]Assistant Professor & Senior Breeder: QSPU, Central Demonstration Farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Wani-Rambhapur, District Akola 444102 (Maharashtra)

[5]Professor & Chief Seed Production Officer: Central Demonstration Farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Wani-Rambhapur, District Akola 444102 (Maharashtra)

Front-Line Demonstration (FLD) is the long-term educational activity carried out systematically by agricultural experts in the field of farmers to demonstrate the value of new practices/technology in the micro-agriculture situation. The aim of FLD was to demonstrate the improved technologies of pulses for production potential. The improved technologies consist using of improved varieties, seed treatment with Rhizobium and PSB culture, sowing method, balanced fertilizer application and improved pest control techniques. The results of pulses harvest crop in 2021-2022 showed that improved varieties with improved practice package recorded a higher yield compared to farmers' practice. The improved technologies saw yield increases of 26.33 percent, 24.63 percent, 23.41 percent and 22.83 percent yield increase over farmer practices in Green gram, Chick pea, Pigeon pea and Black gram respectively. The average percentage yield increased over farmers' practices of farmers was 24.30 percent. The mean technological yield gap was highest for Chick pea (3.47 q/ha) followed by Pigeon pea (1.36 q/ha) and Green gram (1.34 q/ha) while for Black gram (1.26 q/ha) was the lowest. The maximum mean extension yield gap in the study was recorded in Pigeon pea at 11.83 q/ha followed by Black gram (5.22 q/ha) and Green gram (3.57 q/ha) while the lowest extension yield gap was in Chick pea (2.44 q/ha) was recorded. The

technology index varied between 7.16 and 17.35% while the lowest (7.16) was recorded with Pigeon pea**.** The highest gross return (Rs. 81,654/ha), net return (Rs. 56,370/ha) and benefit-to-cost ratio (3.23) was recorded with chickpea demonstration followed by Black gram and green gram while lowest gross return (Rs. 44,848/ha), net return (Rs.24,634 /ha) and benefit cost ratio (2.22) which was markedly higher compared to gross return (Rs. 36,342/ha), net return (Rs.16,430/ha) and benefit cost ratio (1.83) in farmers practice. The improved technologies yielded a higher gross return, net return with a higher benefit-to-cost ratio compared to farmers' practices.

Keywords: *Pulses, Yield, Technology Gap, Extension Gap, Technology Index and Economic Returns and FLDs*

IAAHAS/AB/2023/383

Organic Approaches to Manage Coconut Sooty Mould

Rathinakumar G[1], Elangovan M[2], Gopinath V[3]

[1] Department of Plant Pathology, Sethu Bhaskara Agricultural College and Research Foundation, karaikudi, Tamilnadu

[2]Division of Plant Pathology, ICAR – I.A.R.I., New Delhi

[3]Department of Plant Pathology,

Dr. Rajendra Prasad Central Agricultural University, Bihar

The coconut palm (*Cocos nucifera* L.) is a commercial crop in the Indian economy and produce a share of 19.20% in the world and it is 3rd largest commercially produced crop in the world. In India, the coconut has been cultivated in 19 states and 3 union territories with 1.94 million ha of land and has average productivity about 44.27 nuts / palm / year. In coconut spiralling whitefly is an invasive polyphagous pest with more than 200 hosts especially affect coconut and guava. In South India such as Pollachi in Tamil Nadu and Palakkad in Kerala are majorly affected by this pest and this is a main cause of sooty mould disease. The affected coconut palm appears black encrustation on the upper surface of the leaf and whitefly infestation seen on the lower surface of the leaf. The rugose spiralling whitefly (RSW) and sooty mould does not affect the host plant directly through hyphal penetration. The sooty mould

covers entire leaves, so there is lack of photosynthesis activity in host plant and results in various metabolic activities and it leads to biotic stress. It can be managed by spraying of various organic approaches to coconut trees. We followed seven different organic approaches such as; neem oil 0.5%, starch 1% + neem oil 0.5%, household bleach 1% + neem oil 0.5%, maida 2.5% + neem oil 0.5%, horticultural soap 250g + neem oil 0.5%, rice gruel 10 % + neem oil 0.5% and strong stream of water. Among the treatments household bleach @ 1% + neem oil @ 0.5% showed minimum PDI (30.1 %) followed by rice gruel 10% + Neem oil 0.5% (33.6%) and horticultural soap 1.25% + neem oil 0.5% (38.2%).

Keywords: *Coconut, Sooty mould, Rugose spiralling whitefly, Organic approaches*

IAAHAS/AB/2023/384

Bioactive compounds and Antioxidant capacity from different fruit extracts of Aonla (*Emblica officinalis*)

Shubham Singh Rathour[1]*, P. K. S. Gurjar[2], Sushma Tiwari[3] and M. K. Tripathi[4]

[1,2 & 5] Department of Horticulture,

[3 & 4] Department of Plant Molecular Biology and Biotechnology

Rajmata Vijayaraje Scindia Agricultural University Gwalior-474001, Madhya Pradesh, India

Aonla (*Emblica officinalis* Geartn.) possess significant nutraceutical properties which is distributed throughout the semi-arid region of northern Madhya Pradesh, Rajasthan, plains of Uttar Pradesh, valley of Himalayas and tropical southern part of India. Aonla is also called as Indian Gooseberry which is nutraceutical rich and also utilized in ayurvedic preparations. The study has been done to access the nutraceutical potential of Aonla from different extracts of fruit pulp powder of a local cultivar. Different extracts of fruit pulp powder *i.e.,* in pure methanol, 80 % ethanol and Ethanol: Ethyl Acetate: Water (4:3:3) were prepared and analyzed for their bioactive compounds and antioxidant capacities. The local cultivar contains a good amount of bioactive compounds

and exhibit better antioxidant capacities. Results show that extraction yield (1.82 %) and tannin content (243 mg/100g) was maximum with pure methanol followed by Ethanol: Ethyl Acetate: Water (4:3:3). However, highest amount of total phenols (587.5 GAE mg/100g), total flavonoids (73.43 QE mg/100g), alkaloids (3.25 AE m/100g) and ascorbic acid (392.7 mg/100g) was found with extract of Ethanol: Ethyl Acetate: Water (4:3:3) followed by 80 % ethanol except for alkaloids which was in pure methanol. DPPH radical scavenging activity (91.2%) and FRAP antioxidant assay (92.7%) were also maximum with Ethanol: Ethyl Acetate: Water (4:3:3) followed by 80% ethanol.

Keywords: *DPPH, FRAP, fruit extracts, Indian Gooseberry, nutraceutical, Phyllanthus emblica*

IAAHAS/AB/2023/385

Effect of Integrated Nutrient Management on Physicochemical Parameter of Custard Apple

Raut H. S[1]*, Zanzad R.V. [2], Tayade S. A.[3], Raut U. A. [4], Rajput U. U.[5] and T.H. Rathod[6]

[1*]Agriculture Assistant: Central Demonstration Farm,
[2]Assistant Professor: Central Demonstration Farm,
[3]Ph.D. Schollar, Raja Kinhi, Tal- Malegoan, Dist- Washim (Maharashtra)
[4]Associate Professor: Dept. of Horticulture,
[5]Agriculture Assistant: Central Demonstration Farm,
[6]Professor & Chief Seed Production Officer: Central Demonstration Farm,
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Wani-Rambhapur,
District Akola 444102 (Maharashtra)

A field experiment was conducted at Shivar Block, Central Fruit Research Station, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during 2016 and 2017 to study the effect of organic and inorganic fertilizers on growth and yield parameter of custard apple. The experiment was laid out in randomized complete block design with 5 treatments and four replications with the objectives to find out the suitable doses of integrated nutrients for

obtaining higher yield and quality of custard apple. Significantly higher values of physicochemical parameter were recorded in fruit weight (183.63 gm), fruit length (7.05 cm), fruit diameter (7.33 cm) was found better in the plants treated with T5 75% RDF (188:94:94 NPK) + 250 g AM + 100 g Azotobacter + 100 g PSB + 1 kg Vermicompost + 0.75 kg Neem cake/plant. Highest total soluble solids (22.56 B^o) and total sugars content (14.14 %) were observed under T3 75% RDF (188:94:94 NPK) + 2 kg Vermicompost + 100 g Azotobacter + 100 g PSB + 250 g AM/plant. Highest benefit cost ratio was found in treatment T5 (2.12) with application of 75% RDF (188:94:94 NPK) + 250 g AM + 100 g Azotobacter + 100 g PSB + 1 kg Vermicompost + 0.75 kg Neem cake/plant

Keywords: *Custard Apple, Integrated Nutrient Management, Organic & inorganic fertilizer, Yield, and Economic Returns*

IAAHAS/AB/2023/386

To Study the Impact of Strategic Role of Human Resource Development in Central India

Ravindra Dohley[1]*, Dr. S.P. Singh[2], Nitin Dohley[3]

[1*]Tehsil Representative, AICL. District Chhindwara- 480001 (M.P.)

[2]Assistant Professor, Department of Agriculture Extension Education, JNKVV. College of Agriculture, Tikamgarh – 472001(M.P.)

[3]Assistant Technology Manager, ATMA. District Chhindwara -480001(M.P.)

This paper awakened the Human Resource study in strategic aimed to understand SHRD practices country like India. Needs Make a good thing of giant HR to its best. Human Resource Development Include conducting job analyses, planning personnel needs, recruiting the right people for the job, orienting and training, providing benefits and incentives, evaluating performance, resolving disputes and communicating with all employees at all levels. It is only by understanding the complexities of change that SHRD professionals can be effectives in organizations. It may be that the characteristic that distinguishes SHRD from training is that HRD focuses on the change as well as learning. The strategic roles fictitious by HRD functions that

offer a latchkey contribution to their organizations- the development of employee expertness that is vital to optimal business performance. HRD has been traditionally relied upon to serve in roles that are supportive of the strategies chosen to guide organizations. HRD can offer even greater strategic value as a key determinant of business strategy. The centrality of information technology to business success and the potential for sustainable competitive advantage through employee expertness have underscored the increasing strategic value of HRD. HRD has been a latchkey enabling force in strategies based on product innovation, quality and cost leadership, customized service, and strategies for global relocation based on workforce skills. HRD that seeks to deliver employee expertise of genuine strategic value to the organization must adopt a systemic perspective of its role.

IAAHAS/AB/2023/387

Wild edible plants to meet the needs of future generation for sustainability

Nitesh Singh*
Department of Plant Pathology, Faculty of Agriculture Sciences, SGT University, Gurugram, India

Despite actual knowledge of measuring ecosystem services, the importance of biodiversity in sustaining such services in diverse landscapes and how indigenous cultures exploit, consume, and conserve plant resources in a biocultural regime received little attention. Malnutrition, food insecurity, a lack of sources of food, and famines are all problems that the world is facing due to poor crop yields, shortages, and increased rates of healthy food consumption. Reports of a potential from wild edible plants (WEPs) are primarily anecdotal, with minor and frequently incoherent science to back them up. Still, nowadays, day by day, many reports are published encouraged by findings in scientific journals that continually emphasize the wild edible plants' great nutritional value. It is suggested that limited resources strengthen these priority WEPs, as they have the best chance of success. Currently,

production is limited because of a lack of intensification of WEP farming, a lack of genetic tools for trait development, and the need to optimize storage and supply linkages. These ideas will aid in the fight against hunger and malnutrition, while also benefiting farmers and other stakeholders involved in the agriculture process financially. This chapter discusses the conservation of WEPs utilized by local indigenous communities for sustainable utilization and forest management because it can encourage multifunctional forestry.

Keywords: *Wild edible plants, Ecosystem services, Food composition, Food security, Biodiversity.*

IAAHAS/AB/2023/388

Effect of ethanol on quality of grapes cv. Red Globe

P. H. Nikumbhe, A. S. Thutte, A. S. Jadhav and N. A. Deshmukh
ICAR-National Research Centre for Grapes, Pune; Maharashtra State, India

Red Globe is one of the important seeded, bold berries and late ripening table grapes cultivar. Due to change in temperature during maturity stages of berries causes insufficient colour development in grapes. Colour of berries is very relevant aspect in Red Globe grapes so, the study was conducted at the instructional cum research farm, ICAR- National Research Centre for Grapes, in order to determine the effect of pre-harvest spray of different concentration of ethanol (0%, 10%, 20%, 30%) on the berry quality, biochemical content, and shelf life of Red Globe grapes. Ethanol shows positive effect on color intensity and anthocyanin content as well as physical parameters including average bunch weight, berry weight, and diameter. Ethanol extends the shelf life of grapes when stored at room temperature. Grapes treated with ethanol (20%) recorded lowest rate of fallen berry and ethanol 30 % treatments decreases rate of rotten berry, PLW % and rate rachis browning at 1st, 3rd and 5th day of shelf life as compare to control.

IAAHAS/AB/2023/389

Reduction in Wheat Yields due to Climate Change in the Current Scenario

Dhruvendra Singh Sachan[1]and Pradeep Kumar[2]

[1,2]Research Scholar, Department of Agronomy, CSAUAT, Kanpur, Uttar Pradesh, India
Chandra Shekhar Azad University of Agriculture and Technology, Kanpur- 208002

Wheat is the staple food crop of the world but severe weather impacts on crops are critical for ensuring food security, particularly in India's rice-wheat cropping system. Wheat output must expand by 60% by 2050 to fulfil the rising demand of the world's exploding population. Wheat yields are now limited as a result of environmental challenges, the most significant of which is high temperature stress. Climate change is being witnessed in India in the form of shorter winters and the start of summer much earlier than usual. The closeness of the equator, along with late wheat sowing (due to late rice harvesting), exposes the wheat crop to severe temperature stress during the grain filling stage, resulting in terminal heat stress and lower yield. North India receive precipitation from western disturbances from December to April, which are responsible for the majority of winter precipitation, which is critical for producing wheat. The heatwave arrived earlier than usual in this year, 2023. In March and April, around 10-30% of wheat output was affected. This is when wheat harvests are expected to mature the maximum. Grain quality was negatively impacted. This does not imply that all of the grain will degrade but some of the grain may have not mature well. For wheat growth and development optimum temperature lies in between 18° to 24 °C. Climate change caused by increased CO2 levels in the atmosphere will boost biomass output in crops, particularly C3 crops like wheat. Yet, rising heat stress owing to high temperatures and the resulting moisture stress will diminish crop output. Every 1°C increase above a mean temperature of 23°C decreases wheat yield by about 10 per cent. High temperature affects wheat yield either through chronic stress by prolonged, moderately high temperatures up to 32°C or through heat-shock, which is sudden, but comparatively brief exposure to 33°C and above. The impact of high temperature stress on crop depends up on intensity, rate of increase, duration of stress and stage of crop development. Photosynthetic rates exhibit a sharp decline when wheat plant is exposed to high temperature stress during vegetative or reproductive phase.

Temperatures above 31°C just before anthesis cause reduction in grain number due to pollen sterility. Temperature exposures above 30 °C are associated with large wheat yield reductions and contribute substantially to overall negative warming impacts. In India, March 2022 was the warmest month since records began 122 years ago. Crop yields in Punjab, Haryana, and Uttar Pradesh have been reduced by 10%-35% as a result. These states are together regarded as India's "wheat bowl" due to their great wheat output. In the state of Uttar Pradesh at the City of Kanpur, the February, 2023 month temperature reached up to 32°C which is abnormal and record breaking. As such, wheat yield decline could present major challenges to producers and those who rely on regional wheat production for food security.

Keywords*: Heat wave, stress, anthesis*

IAAHAS/AB/2023/390

Effect of Soil Test Crop Response Approach to Quality Attributes of *Rabi* Safflower Under Rainfed Condition

S. D. Hiwale*[1], S. S. Thakare [2], S. M. Ambhore[3]
Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth,
Akola (MS) 444104, India

A field experiment was conducted at Research farm of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola on a medium deep black with two consecutive years 2017-18 and 2018-19during *rabi* season, to find out the quality attributes of *rabi* safflower based on soil test crop response approach under *rainfed* condition. The experiment was laid out in factorial randomized block design with fifteen treatments combination *viz.,* Factor A comprises three treatments M_0**-** No manure, M_1**-**5 t FYM ha^{-1} and M_2 - greengram residue incorporation likewise Factor B consisted of five nutrient management treatments *i.e.,* F_0- control (no fertilizer), F_1- Recommended NPK, F_2- SSNM (STCR equation), F_3- SSNM (STCR equation + $ZnSO_4$ @ 25 kg ha^{-1} + S @ 10 kg ha^{-1}) and F_4 - SSNM (NPK) (deficient + 25% rec.; medium: rec.; high: - 25 %

rec.). Experimental results revealed that, During the year of 2017-18, 2018-19 indicated that the quality parameter of safflower crop i.e.oil content (28.16 and 29.84 %) and protein content (12.82 and 13.22 %) were recorded significantly higher with application 5 t FYM ha^{-1} (M_1) over no manure (M_0) and residue incorporation of greengram crop (M_2), respectively. Lowest oil content (25.33 and 26.77 %) and protein content (12.18 and 12.23 %) were noticed under the no manure (M_0) treatment, respectively. Similarly, nutrient management practices the treatment of SSNM (STCR equation + $ZnSO_4$ @ 25 kg ha^{-1} + S @ 10 kg ha^{-1}) (F_3) registered highest oil content (29.49 and 31.07 %) andprotein content (13.11 and 13.39 %) of safflower, being comparable with the treatment SSNM STCR equation (F_2) and significantly superior over rest of other nutrient treatments during the second year of experiment, except during first year of experiment. During the year of investigation, the treatment no manure (F_0) resulted lowest oil content (23.68 and 24.82 %) and protein content (12.04 and 12.21 %), respectively.

Keywords: *SSNM, FYM, RDF, Rabi Safflower, STCR and Nutrient Management.*

IAAHAS/AB/2023/391

Efficient Nutrient Management in Indian Mustard (*Brassica juncea L.*): A Review

Sushma Konjengbam[1], Sandeep Menon[1] and Nikita Khoisnam[2]*

[1]Department of Agronomy, School of Agriculture,

[2]Department of Agricultural Economics and Extension, School of Agriculture,

Lovely Professional University, Phagwara, Punjab 1444112

India has the fourth-largest economy in the world for oilseeds. Rapeseed-mustard is the second most important crop in India's economy, behind groundnut, which accounts for 27.8% of the country's total production of edible oilseeds. It is regarded as a fundamental oilseed crop that provides vital nutrients to people. However, effective nutrient management is essential to its production, and there is an issue with the ongoing loss of nutrients and degradation of natural soil fertility brought on by the overuse of synthetic or inorganic fertilizers, both of which have an impact on plant productivity. On this aspect, implementing sustainable integrated nutrient management is

crucial since it has a major positive influence on reducing environmental impact and increasing resource use efficiency. The production of food grains is significantly improved, soil fertility is maintained, and farmer income is increased by the integrated use of inorganic fertilizers, organic manures, and bio-fertilizers. Additionally, using Nano fertilizers as foliar applications for various crops, including oilseed crops like rapeseed and mustard, might lessen the need for chemical fertilizers and increase plant production and development. To meet the nation's rising demand for oil, the review aims to investigate the efficiency of nutrient management on plant development and productivity in mustard and other crops.

Keywords: *Nutrient management, Mustard, Nano fertilizers, Foliar application, Organic manures, Biofertilizers.*

IAAHAS/AB/2023/392

Effect of Malting on Physico-chemical and Antinutritional Properties of Quinoa (*Chenopodium quinoa* Willd.) grains

Rishabh Thakur[1*], Adesh Nirgude[2], Neha Goyal[4], Pratibha Zalte[3]

[1]Sant Longowal Institute of Engineering and Technology (Deemed-to-be-University) Under Ministry of Education (Govt. of India) Longowal- 148106, Sangrur (Punjab)

[2]Shramshakti College of Food Technology, Maldad-422608, Maharashtra, India

[3]Sudeep Nutrition Pvt. Ltd., Vadodara, Gujarat, India

[4]Shoolini University, Solan, Himachal Pradesh, India

Cereal grains have been a ubiquitous part of human diet. However, pseudocereals like quinoa are nowdays gaining popularity among researchers and industries due to their nutritional properties and gluten-free nature. Major problem associated with use of quinoa is presence of anti-nutrients causing bitterness and reduced nutrient bioavailability or absorption. Traditional treatments including soaking, fermentation, germination, and malting are known to effectively enhance the nutritional values of grains by reducing the

anti-nutrients with increase in bioactive compounds and antioxidant activity. Objective of present study was to evaluate effect of malting on nutritional properties of quinoa seeds to enhance their applicability. Grains were cleaned, washed, and steeped (5 hours) prior to germination (12 hours). Further, grains were germinated at three different temperatures (25, 35, and 45°C) followed by drying 45±2°C, milling, and packaging into air-tight containers. Based on literature maximum germination temperature was kept 45°C beyond which detrimental effect of temperature are prevalent. Increase in temperature enhanced the rate of germination and activity of hydrolytic enzymes directly affecting the quality of final product. Malting significantly reduced the content of saponin, phytic acid, and oxalates by 95.3, 65.4 and 55% respectively. However, an increase in values of protein (13.4-14.5%), ash (1.6-1.9%), fiber (3.8-4.3%) and % DPPH activity (40.6-70.3%) with a decrease in fat content (5.2-3.2%) was noticed after malting. It can be concluded that malting is effective in reducing anti-nutrients, increasing the bioavailability of nutrients which widens the application of quinoa grains in different food application.

***Keywords**: Malting, pseudocereal, quinoa, anti-nutrients, physico-chemical.*

IAAHAS/AB/2023/393

RNA Interference: A Potential Strategy to Fight Plant Viruses

Kishor Kumar C[1*], Sakthi Priya P[2]

[1]Center for Plant Protection Studies, Department of Plant Pathology, Tamil Nadu Agricultural University -641003, Coimbatore, Tamil Nadu, India

[2]School of Crop Protection, College of Post Graduate Studies in Agriculture Sciences, Central Agricultural University, Umiam -793103, Meghalaya, India

The impact of plant viruses on crop yield and quality can be extremely harmful. In response, plants have developed various mechanisms to defend against viral infection. Among these mechanisms, gene silencing/RNA interference plays a crucial role by hindering the multiplication and virulence of pathogens. The typical RNAi mechanism encompasses several steps: (i) the dsRNA is transcribed and cut into smaller RNA molecules, including miRNA and siRNA, (ii) the siRNA/miRNA is loaded into the RISC, an RNA Induced Silencing Complex, (iii) the siRNA/miRNA matches with the targeted gene through complementary base pairing, and (iv) an Argonaute protein cleaves or

represses the targeted gene. The innate RNAi pathway may use transgenes aimed at diverse viral genes to prompt gene silencing. Various RNAi pathways are available for the deliberate suppression of viral genes, such as HIGS, VIGS, and SIGS. However, HIGS and VIGS have major drawbacks such as being laborious and time-consuming, producing off-target effects, and raising public apprehension about genetically modified (GM) plants but the efficient SIGS technique can induce RNAi resistance against targeted genes without resorting to genetically modified transgenic plants.

Keywords: Gene silencing; RNA interference (RNAi); host-induced gene silencing (HIGS); virus-induced gene silencing (VIGS); spray-induced gene silencing (SIGS)

IAAHAS/AB/2023/394

Role of Ethylene inhibitors and Salicylic acid in re-establishing the Cellular Homeostasis in *Solanum lycopersicum L.* cv. Pusa Ruby by modulating the Gene expression of ethylene biosynthesis and SOS pathways under salinity stress

Yalaga Rama Rao[1], Mohammad Wahid Ansari[1], Priya Yadav[2], Uma Devi Pongiya[3]

[1]Yoshe Clinical Operations limited, London, United Kingdom,

[1&2]Zakir Husain Delhi College, New Delhi,

[3]Dhanalakshmi College of Arts and Science, Preambular, Tamilnadu

Considering the threat of salinity stress on food security worldwide, there is an urgent need to develop the climate resilient plant varieties using biotechnological approaches. The high salt concentration substantially affects Na+/K+ ratio, antioxidants system, photosynthetic machinery, growth parameters and thus crop productivity. Out of them, Tomato is one of the

model crops to be examined for stress related issues as it's yielding is severely affected due to challenging environment. The pivotal role of the phytohormones in making the plants to sustain with salt stress is well known. However, the salt tolerance in *Solanum lycopersicum. L* through the involvement of ethylene inhibitors and salicylic acid in relation to plant hormones ethylene has not been studied in detail so far. The study is aimed to know the modulating effect of HKT1, SOS1, ACS2 and NHX1 genes in maintaining the homeostasis for effective metabolic process in the tomato plants under salinity stress. The leaf samples of tomato plant which are given treatment with 0 mM NaCl, 250 mM NaCl, 5 mM ethrel treated, 250 mM NaCl and 100 µM $AgNo_3$, 250 mM NaCl andµM $CoCl_2$ followed by 250 mM and 100µM Salicylic acid subjected invitro produced tomato plants and wild type are collected for q-RT polymerase chain reaction. Poly-A RNA are isolated in trizol H reagent. This poly-A RNA is used for the construction of c DNA with the help of Reverse H aid minus set. The gene expression levels of the transcripts related to HKT*1;2, NHX1, ACS2*, *sos1* in the control plant and treated by using the 2–ΔΔCt method with the help of 3 independent experiments. Our study indicates that ethylene inhibitors and salicylic acid play a significant role in downgrading the expression of *ACS 2* which might limit the production of ethylene that will help the tomato plant *cv. Pusa Ruby* to sustain with salt tolerance and negative effects of ethylene production as ACS gene controls or limits the production of ethylene. Conversely, the over expression of *SOS1, NHX1, HKT1,2*indicate the significant role in SOS path way. *SOS 1* may be working on plasma by causing the efflux of Na^+ ions and influx of H+ ions whereas the NHX1 might be driving the excess amount Na^+ ions into the tonoplast as they function in the cytosol. Similarly, HKT;1,2 genes might be expelling the Na^+ ions from xylem vessels and increasing the influx of K^+ ions into the cytosol. Hence, it is in turn useful to maintain the Na+/K+ ion homeostasis in the cytosol, leading to improved antioxidants system, photosynthetic machinery and growth parameters which confer the salinity stress tolerance in *Solanum lycopersicum L.* cv.Pusa Ruby. The present findings suggest new insight in salinity stress tolerance mechanism of tomato for sustainable crop production in changing environment.

***Keywords**: Antioxidants, ACS2, ethylene inhibitors, HKT1,2, NHX1, photosynthesis, salicylic acid, salinity stress, SOS1*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/395

Role of Mangrove Ecosystem in Carbon Sequestration

Suryawanshi Umesh[1*] and Aitwar Vaijnath[2]
[1]Maharashtra Animal and Fishery Sciences University, Nagpur
Assistant Professor, Department of Fisheries Resource Management, College of Fishery Science, Nagpur (44007)
[2]Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar,
PhD Scholar, Department of Aquatic Environment Management, College of Fisheries, Mangaluru (575 002)

Mangroves are tropical forests that are significant both environmentally and commercially. These are extremely productive ecosystems with primary production rates comparable to coral reefs and tropical wet evergreen forests. Experts say mangrove forests make up less than 1% of the world's forest acreage. As a comparison to terrestrial plants, mangroves distribute proportionally higher carbon and have greater below- to above-ground carbon mass ratios. Based on a carbon budget for global mangrove forests, air to air respiration is the largest respiratory flux, followed by subsurface respiration. The most of mangrove carbon is held in pools of carbon sinks and dead roots. Mangroves are one of the most carbon-dense biomes, with an average carbon content of 937 tonnes C ha^{-1}. Moreover, they encourage carbon burial and sediment accretion at quick rates (5 mm $year^{-1}$) (174 gm C m^{-2} $year^{-1}$). Mangroves provide for the entry into tropical coastal oceans of about 60% of the DIC and 27% of the DOC discharged from low-latitude rivers globally. Sediment carbon and nitrogen cycling are just a couple of the effects that the loss of mangrove ecosystems has on coastal and estuarine ecology. Mangrove carbon reserves may be disturbed, which could lead to significant gas releases.

Keywords: *Mangrove ecosystem, Carbon sequestration, Sedimentation, Wetland.*

IAAHAS/AB/2023/396

Climate Smart Agriculture: A need and deed towards future

Arun*, Anu[1], Shubham[2]
*Dept. of Agronomy, PG Scholar, CCS, Haryana Agricultural University, Hisar, Haryana 125004, India
[1]Dept. Of Agronomy, Ph.D Scholar, CCS, Haryana Agricultural University, Hisar,
[2]Dept. Of Vegetable sciences, PG Scholar, CCS, Haryana Agricultural University, Hisar

Climate change and its variability are emerging as the major challenges in agricultural development, with the most severe consequences falling on developing countries and the poor. The severity of climate change impacts is more intense on agricultural sector than the rest. Rice-wheat systems provide the staple grain supply for world population, making these systems critically important from food security point of view. Recent studies indicate a slowdown in the productivity of growth in the rice-wheat systems of India due to climate change. Therefore, the urging need is to slow down the rate of change and to make the system tolerable to already occurred changes. Adaptation is the most promising tool to withstand the damages due to climate change. For a tolerant ecosystem, adaptation and mitigation should go hand in hand. Climate smart agriculture is the incorporation of adaptation, mitigation and other practices in agriculture which increases the capacity of the system to respond to various climate related disturbances by resisting damage and recovering quickly. The climate smart village is a community based approach to limit the effects of climate change through engagement with stakeholders on the best interventions that fit the local context. In view, present study made an attempt to investigate the socio-economic and technological impact of these interventions based on ex-post facto research design. If the farmer is more shifted towards climate smart agricultural technologies his risk level will be reduced with increased expected income. The study throws some light on policy matters to reproduce CSV models to other villages and to redesign the already implemented interventions in a way which ensures a higher adoption by managing the constraints. Hence more research studies are needed on the combined approach in the CSA.

Keywords: *CSA, CSV, adaptation, mitigation.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/397

Role of Nanotechnology: A tool for Crop Improvement

Sachin Kumar*[1], Naveen Kamboj[1]
Department of Agronomy, Chaudhary Charan Singh Haryana Agricultural University, Hisar

Nanotechnology has the potential ability to revolutionize agricultural systems enabling slow and controlled release of nutrient for the plants benefit and ultimately increasing crop production and productivity without causing hazardous effects on environmental. Nano materials have replaced conventional agricultural practices and are found equally effective and efficient for plant nutrition which increases the agricultural production and enhances fodder quality. Nano fertilizers have potential role in increasing crop yields, enhancing nutrient use efficiency, and reducing excessive use of chemical fertilizers. IFFCO conducted 730 on-farm trials conducted on 12 important crops grown during winter season of 2019-20 and revealed that the use of nano-nitrogen (Nano-N), the quantity of urea being applied by the farmers to supply nitrogen to their crops can be successfully reduced to half. The yields obtained with 50% less nitrogen as compared to the N applied under farmers fertilizer practice (FFP) and applying 2 sprays of Nano-N in standing crops gave yields higher than FFP in most of the crops. Various researchers reported the positive effect of nano fertilizers in terms of increasing good crop yield as well as reducing environmental pollution. It was reported that nano porous zeolite used on N fertilizer might be used as alternate strategy to enhance the effectiveness of N in crop production system. A pot culture experiment was conducted which revealed that the application of 2.5 times reduction of recommended dose of nitrogen through nano fertilizer significantly increased growth indices, yields and quality parameters of sorghum crop. The significant increase in content and uptake of nutrients was also observed. It was observed that under non-stress conditions, there was no variation in nano fertilizer and chemical fertilizer treatments in respect of nutrient uptake (P and Ca), crop yield, and seed protein content. Hence, it can be concluded that nano technology has great importance in crop production and more effective results can be obtained from fertile research in future.

Keywords: *Nanotechnology, Nutrient Use Efficiency (NUE), FFP.*

IAAHAS/AB/2023/398

Aquatic Vegetables: Different Cropping Systems for Nutritional and Economic Security

Yogananda M [1], Sushmitha L C[2] and Vinod B R[3]
ICAR-IARI, Division of Vegetable Science, New Delhi

Six percent of the earth's surface is covered by aquatic ecosystems, which are home to forty percent of all flora and fauna species. India has aproximately 757.06 thousand wetlands, covering 4.7% of the country's land area. Several aquatic and swamp-adapted vegetable species appear to have originated in southern and southeastern Asia, and the majority have evolved in tropical and semitropical conditions. Major aquatic vegetables found in India are *Nelumbo nucifera* (lotus), *Euryale ferox* (Gorgon fruit), *Trapa bispinosa* (water chestnut), *Ipomoea aquatica* (water spinach), *Talinum triangulare* (ceylon spinach), *Alternanthera sessilis* (sessile joy weed), *Zizania latifolia* (manchurian rice) etc. Among them, water chestnut (730 Kcal/100g) and lotus seeds (598 Kcal/100g) have high energy values, while gorgon seeds (76.9 g/100g), and lotus seeds (64.4 g/100g) are good sources of carbohydrates. Lotus seeds (15.4 g/100g) and wasabi roots (5.1 g/100g) have fair protein contents. The majority of aquatic vegetables naturally inhabit areas with many water bodies, such as lakes, lagoons, ponds, ditches, and marshy wet areas. The commonly practiced cropping systems in aquatic ecosystem are monocropping, intercropping (Lotus + Water chestnut; Gorgon nut + water chestnut), mixed cropping (Lotus + fish culture; Gorgon nut + fish culture), crop rotation (Lotus – Rice - terricolous vegetable) and integrated farming system (Lotus + Aquatic animals + Water chestnut; Gorgon nut +Water-Chestnut + Fish culture). Integrated farming and mixed cropping systems perform better in terms of financial stability (B:C ratio) for farmers.

Keywords: *Aquatic Vegetables, Cropping system, Hunger index, Nutritional security, B:C ratio.*

IAAHAS/AB/2023/399

Delineation of Seedling Traits and Understanding the plasticity in Root Anatomy Under Osmolyte Driven Water Deficient Stress in Maize (*Zea mays* L) through Scanning Electron Microscopy

Wajhat-Un-Nisa[1], Surinder Sandhu[1], Rumesh Ranjan[1] and Rakesh Sharda[2]
[1]Maize Section, Department of Plant Breeding and Genetics, Punjab Agricultural University, Ludhiana- 141004, [2] Department of Soil and Water Engineering, Punjab Agricultural University, Ludhiana- 141004

In India, 80% of maize areas are rain-fed, erratic behaviour of rains during wet season is affecting the productivity. The rationale behind our study (conducted during 2021-22) was to decipher the variability of root and shoot traits for water use efficiency (WUE) using a less labour intensive and less destructive method of hydroponics and understanding the changes at anatomical level under osmolyte driven conditions. 71 maize inbred lines comprising of indigenous, CIMMYT maize inbreds and semi-exotic lines maintained at PAU, Ludhiana were used for study. The water stress was created using an osmolyte PEG 6000 (10%). The lines showed differential response under osmolyte for ten important traits viz; fresh root and shoot weight, dry root and shoot weight, chlorophyll , vigour, root length (total), number of root tips, forks and Avg. root diameter. These traits were weaned out after principle component analysis and image analysis through root scanner (Biovis PSM- R2000). Based on drought tolerances indices (DTI) and cluster analysis a core set 20 lines which were evaluated at higher concentration of PEG (15% and 20%) vs. control in pot culture. LM22, CML 574, PML 98 and LM26 showed higher performance in both evaluation methods. Two extreme lines LM22 (highly tolerant in the entire set of 71 inbreds) and CML494 (susceptible) were selected based on DTI values for studying the anatomical alterations at 20% concentration of PEG by Scanning electron microscopy (SEM) (JSM-7610FPLUS:JOEL). Among the secondary tissues the effect was profound on number and diameter of meta xylem and

xylem which was reduced in CML494 but least affected the tolerant genotype: LM22. The study has recommended that the seedling traits and root anatomical features *viz,* number and diameter of meta xylem and xylem can serve as excellent reliable selection criteria to identify donor lines to breed for WUE in maize.

Keywords: *Maize, WUE, SEM.*

IAAHAS/AB/2023/400

Insect as a food and nutrition for a sustainable future

M.N. Rudra Gouda[1] and Yogananda M[2]
ICAR-IARI, Division of Entomology, New Delhi

According to the current scenario, there would be an extra 2.5 billion people and a 70% rise in food demand by 2050. The world's agriculture is dealing with a number of significant problems, and crop yields are not increasing quickly enough to meet demand on a global scale. In order to address the future and current need for food, insects may be a healthy alternative. Over 1,900 bug species are eaten worldwide, with the majority consumed in underdeveloped nations. They produce high-quality food and feed that has a high feed conversion ratio and emits less greenhouse gas. There are currently 255 species of edible insects in India, with the north-eastern part of the country seeing the majority of these practices. The majority of edible insect species, or 34%, are coleopteran species. Orthoptera (24%), Hemiptera (17%), Hymenoptera (10%), Odonata (8%), Lepidoptera (4%), Isoptera (2%), and Ephemeroptera (1%), therefore, follow. Several communities members eat edible insects in accordance with their cultural values, personal preferences, and seasonal and geographical availability. Among them majorly eaten insects in India are *Cybister confuses, Hydrophilus olivaceus, Anoplophora glabripennis, Acisoma panorpoides, Belostoma indica, Oecophylla smaragdina, Laccotrephes maculatus, Oxya hyla hyla, Odentotermies sp, Bombyx mori.* In order to improve human health by using insect as a nutritious food, countries like India can explore ways to sustainably utilize this enormous natural resource in insect farming and achieve sustainability in food and nutritional security. As a result,

studying edible and therapeutically important insect species can have economic repercussions.

Keywords: *Nutrition, food, Insect, India*

IAAHAS/AB/2023/401

Innovative approaches for integrated nutrient management in minor millets

Rupam Bharti, Diksha Sharma, Dr. Jagdish Choudhary*
M.Sc. (Ag) Agronomy Student, *Associate Professor, MPUAT (Udaipur)

Millets are the group of cereals that have been cultivated since the dawn of the civilization. The role of millets as smart food is inevitable as it helps in combating with issues like climate change, hunger, malnutrition etc. Various types of minor millets which is usually cultivated are finger millet, foxtail millet, proso millet, barnyard millet, kodo millet and little millet. These are also considered as smart food as it contains micronutrients like Mg, Ca, Mn, Fe, K, Zn, tryptophan, phosphorus fibre and vitamins. The continous application of high analysis chemical fertilizers without organic manures resulted in reduced water holding capacity, emergence of multi-nutrient deficiencies and consequently lower yields. So, we must focus on strategies of nutrient management which increases the production of millets without deteriorating its quality. Integrated approach which combines various methods of nutrient management is one of the best approaches. It combines the use of manures, chemical fertilizers, biofertilizers etc. Precise management of individual nutrient helps in to reduce the gap between potential and actual yield of millets. It is evident that most of the soils under millets growing areas are low in nitrogen. Thus, nitrogen management should orient towards higher nitrogen fertilizer recovery, improved nitrogen use efficiency, use of modern gadgets for precise nitrogen management like green seeker, chlorophyll meter (SPAD). Organic manures such as vermicompost, poultry manure, FYM, composts etc may be used which also supply minor nutrients along with major nutrients. Different microbial bio-fertilizer can be used in millets such as *Azospirillum*, Phosphate solubilizing bacteria (PSB), *Trichoderma, Bacillus* arbuscular mycorrhizal fungi (AMF), and plant growth promoting rhizobacteria

(PGPR). Cultivation of legume crops as green manure crop could also be done which reduces the use of inorganic fertilizer and adds organic matter to the soil. Thus, the use of integrated approach of nutrient management in millets enhances the availability of applied as well as native soil nutrients. It also provides balanced nutrition to crop and sustains the physical, chemical and biological functioning of soil.

IAAHAS/AB/2023/402

Innovation in Agriculture: Livestock Farming Technology

Sandeep Gautam[1], Supriya[2], Harshit Mishra[3] and Rohit Kumar[4]

[1,2,3]Department of Agril. Economics, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P)-224229

[4] Department of Post Harvest Technology, Banda University of Agriculture and Technology, Banda (U.P)-210001

In modern agriculture, innovation is more crucial than ever. The sector as a whole is facing enormous problems, including growing supply prices, a workforce scarcity, and changes in customer demands for transparency and sustainability. Agriculture firms are increasingly aware that answers to these problems are required. Indoor vertical farming, automation and robotics, livestock technology, current greenhouse methods, precision agriculture, and artificial intelligence, among other sectors, have seen significant technological advancements. The traditional cattle business is generally disregarded and underserved, while being possibly the most important. Cattle supplies vital renewable natural resources on which humans rely every day. Traditionally, livestock management has been defined as the operation of poultry farms, dairy farms, cattle ranches, or other livestock-related agribusinesses. Livestock managers must keep correct financial records, monitor employees, and ensure adequate animal care and feeding. Yet, current developments show that technology is transforming the field of cattle management. In the last 8-10 years, new advancements have brought significant changes to the sector, making tracking and controlling cattle much easier and data-driven. Nutritional technologies, genetics, digital technology, and other forms of technology may be used. Livestock technology can improve animal and cattle

productivity, welfare, and management. Individual wearable sensors placed on cattle may monitor daily activity and health concerns while offering data-driven insights for the entire herd. All of this data is being transformed into useful, actionable insights that producers can use to make timely management choices. Sensor and data technology have significant implications for the present cattle sector. It can increase cattle output and welfare by detecting unwell animals and intelligently identifying areas for improvement. Computer vision enables us to collect unbiased data that can be summarized into useful, actionable insights. Data-driven decision making results in better, more efficient, and quicker decisions that increase animal herd production.

Keywords: *Agriculture, Livestock Farming Technology, Nutritional Technologies, Sensor, Renewable*

IAAHAS/AB/2023/403

Assessment of wheat varieties and herbicide mixtures in context to leaf area and dry matter partitioning

Sarita Rani*, Suresh Kumar, V.S. Hooda and Jagdish Parshad
CCS Haryana Agricultural University, Hisar, Haryana-125004

A field experiment was conducted during 2014-15 and 2015-16 at Research Farm of Department of Agronomy, CCSHAU, Hisar. The experiment comprising of five wheat varieties (WH 1105, HD 2967, DPW 621-50, WH 1124 and DBW 17) in main plots and six weed management practices *viz.,* metribuzin (210g/ha), metribuzin + fenoxaprop (150 + 100g/ha), metribuzin + pinoxaden (150 + 40g/ha) metribuzin + clodinafop (150 + 45g/ha), weed free and weedy check in sub-plots was conducted in split-plot design with three replications. At 60, 90 and 120 DAS, variety WH 1105 recorded highest leaf area and yield, which was statistically at par with varieties HD 2967 and DPW 621-50, but was significantly higher than varieties WH 1124 and DBW 17 during both years. At 60, 90 and 120 DAS, maximum leaf area was recorded in weed free plots (511.2, 860.7 and 735.0 cm^2 $plant^{-1}$ and 440.0, 791.2 and 657.7

cm^{2}plant $^{-1}$ at respective stages during 2014-15 and 2015-16), which was significantly higher than that from weedy check, metribuzin alone and metribuzin + clodinafop, but was statistically similar to metribuzin + fenoxaprop and metribuzin + pinoxaden at above three crop stages during both the years. Weedy plots resulted in minimum leaf area. Total dry matter was the result of contribution from leaf and stem at 30 and 60 DAS. Highest leaf dry matter was observed in wheat variety WH 1105 at harvest being at par with varieties HD 2967 and DPW 621-50 which differed significantly with variety WH 1124. Lowest dry matter of leaf was found in wheat variety WH 1124 which was at par with variety DBW 17. At 90, 120 DAS and at harvest, spike also contributed in total dry matter and share of leaf decreased during both the years. The maximum values of dry matter in leaf, stem and spike were recorded from weed free followed by combination of metribuzin + fenoxaprop, metribuzin + pinoxaden and metribuzin + clodinafop during both the years. Metribuzin + fenoxaprop remained superior with 44.26 & 46.83 per cent higher grain yield than weedy check.

Keywords: *Wheat, Metribuzin, Clodinafop, Fenoxaprop, Pinoxaden, Leaf area.*

IAAHAS/AB/2023/404

Modern Rice Milling Technology – A Financial Performance Analysis

S. Selvanayaki[1], N. Deepa[2], K. Divya[3] and M. Malarkodi[4]

[1]Associate Professor (ARM), Forest College and Research Institute, TNAU, Mettupalayam

[2,3&4]Associate Professor (ARM), Tamil Nadu Agricultural University, Coimbatore

The financial characteristics of partially and fully modernised rice milling firms were evaluated to analyse their variances. The financial data were obtained from the records maintained by the partially and fully modernised rice milling firms. Financial performance was analysed using ratios under three sub sections namely short term financial position, long-term financial position and asset management. Multivariate Analysis of Variance was carried out to analyse the variances among the fully modernised and partially modernised rice milling firms. The population for the study comprised of the modern rice

milling firms that were located in Kangayam taluk of Tirupur district of Tamil Nadu. The list of modern rice milling firms operating in Kangayam was obtained from the Kangayam Taluk Arisi Aalai Urimaiyalargal Sangam (Kangayam Taluk Rice Mill Owners' Association). Among the modern rice milling firms, it was observed that there existed two distinct groups/ categories of firms in terms of the technology adopted by these firms. First category of firms had partial modernization wherein some aspects of the process like soaking, testing the moisture content at different stages, movement of materials, packing etc., were done manually. Second category of firms were fully modernized and the entire processing activity was completely mechanized. In order to have a representative sample from both the categories, quota sampling method was adopted. Accordingly, 25 firms under partially modernized category and 15 firms under fully modernized category were selected for the study. The samples were chosen such that the status quo of all partially modernized firms and fully modernized firms in terms of the technology and capacity remained the same during the study period. The fully modernised firms adopted parboiling technology apart from the single boiling technology for which the raw material storage period was less resulting in higher inventory turnover in comparison to that of the partially modernised firms. Univariate F-value test statistics revealed that the financial characteristics of partially modernised and fully modernised firms were significantly different in terms of most financial ratios.

IAAHAS/AB/2023/405

Sensory and Physico-chemical Properties of custard apple (*Annona squamosa* L.) Enriched *Shrikhand* by Using Stevia as a Natural Sweetener

Kamble Kalyani Baburao[1], Kamble Dinkar Keshav[2]

[1]Ph.D. Scholar, Department of Animal Husbandry and Dairy science, Mahatma Phule Krishi Vidyapeeth, Rahuri-413722, Maharashtra, India

[2]Head, Department of Animal Husbandry and Dairy science, Mahatma Phule Krishi Vidyapeeth, Rahuri-413722, Maharashtra, India

Shrikhand is a popular fermented dish consumed by Indians which is prepared by blending *chakka* with sugar and is preferred due to its pleasant flavour and aroma. Fruit pulps can be used in dairy products as a suitable substrate, these are inherently healthy, pleasant in taste, refreshing and contains lots of beneficial nutrients. Because of the change in the economic

status and food habit of consumers the other varieties of *shrikhand* such as fruit *shrikhand* are also in great demand. Accordingly, the demand for low energy products is also increasing. The use of natural sweetener instead of sugar is one of the most used methods in the production of low energy products.

Custard apple is a well-known fruit for its nutritional composition as well as for its medicinal properties. Custard apple is full of vitamin C (anti-oxidants), which helps to combat many diseases and also enhances the immune system. It is an abundant source of fiber, contains low fat levels and is an excellent source of Iron.

Stevia, a natural sweetener plant having medicinal and commercial importance is being used all over the world. Stevia, which plays an important role as a non-nutritive natural sweetener, emerged as a safe sugar substitute that does not pose any threat to human health. Stevia's leaf is estimated to be 150 to 300 times sweeter than refined sugar. It is observed that as other number of milk products, *shrikhand* is also lacking in fiber, vitamin C and iron content. Due to growing health awareness, there has been a huge demand for natural sugar substitutes which provides lesser or no calories. Considering the nutritional importance of custard apple pulp and consumer demand towards natural sweetener stevia, the effort has been made to prepare *shrikhand* by using custard apple pulp and stevia.

During the phage of investigation, optimization of ingredients viz. selection of level of custard apple pulp, selection of form of stevia and selection of level of readymade market stevia leaf extract for *shrikhand* preparation were carried out. In the optimization of ingredients for *shrikhand* preparation, Custard apple pulp was added @ 5, 10, 15 and 20 per cent of *chakka*, while sugar was kept constant at 40 per cent of *chakka* and these products were compared with control (C_0) i.e. sample without custard apple pulp but with sugar. On the basis of sensory evaluation, it was observed that the 10 per cent custard apple pulp showed maximum overall acceptability.

After selecting the custard apple pulp level, stevia was added in powder form @ 1, 2 and 3 per cent, laboratory made stevia leaf extract (LMSLE) form @ 5, 10 and 15 per cent and readymade market stevia leaf extract (RMSLE) form @ 1, 1.5 and 2 per cent of *chakka*. In all the treatments custard apple pulp was kept constant at 10 per cent of *chakka* for *shrikhand* preparation. The results showed that the maximum overall acceptability of *shrikhand* came from using stevia in readymade market stevia leaf extract form. In final stage, the selection of level of readymade market stevia leaf extract was carried out for that the RMSLE was added @ 1 (T_1), 1.5 (T_2) and 2 (T_3) of *chakka* (W/V) and

the custard apple pulp was kept constant @ 10 per cent of *chakka* and these products were compared with control (T_0) i.e. sample without readymade market stevia leaf extract and custard apple pulp but with sugar. Addition of 1.5 per cent RMSLE and 10 per cent custard apple pulp were most optimum to prepare the best quality of custard apple enriched *shrikhand*.

The standardized formulated (10 per cent custard apple pulp and 1.5 per cent (W/V) readymade market stevia leaf extract of *chakka*) custard apple enriched *shrikhand* by using stevia had 56.94±0.01 per cent moisture, 43.06±0.01 per cent total solid, 22.85±0.01 per cent fat, 13.36±0.01 per cent protein, 5.50±0.01 per cent reducing sugar, 0.14±0.01 per cent non-reducing sugar, 5.64±0.01 per cent total sugar, 0.99±0.01 per cent acidity (%LA), 4.14±0.01 pH, 1.21±0.01 per cent ash, 0.09±0.02 per cent vitamin C, 0.31±0.01 per cent fiber, viscosity 233±1.50 mPa*s, calcium 116.2±1.35, 106.6±1.24 phosphorous, 45.60±0.67 magnesium and iron 10.38±0.13 (mg/100 g).

Keywords: *Custard apple, Stevia, sensory evaluation, Physico-chemical constituents.*

IAAHAS/AB/2023/406

Consumer preference and buying behaviour towards exotic vegetables in Ahmedabad city

Paulomee Dhimar* and Swati Sharma**

*MBA (ABM) Scholar, **Assistant Professor

ASPEE Agribusiness Management Institute, Navsari Agricultural University, Navsari

Globalization has brought in many changes in developing nations such as changing lifestyle and living standards. Exotics market is still at a nascent stage in India as compared to international markets. Demand for exotics is estimated to be around INR 6500 cr in 2017 and has been growing at a CARG of 25.7% since the last 5 years and is expected to grow at 15% CAGR in the next 3-5 years. There is very high demand for the imported varieties of exotic vegetables. In this regard, this paper intends to study the consumer preference and buying behaviour towards exotic vegetables in Ahmedabad city. For the fulfilment of the study, 150 respondents were selected as sample size and data

were collected through structured questionnaire from both primary and secondary sources. The major findings of the study were that majority of respondents were in 25-40 years of age group and had 3 to 5 members in their family and majority of respondents were employee in public or any private organization and had above 40,000 income per month. Majority of respondents liked to purchase exotic vegetables from supermarket and hypermarket on weekly basis due to better nutrition and healthy in dietary. The constraints faced by the consumers while buying exotic vegetables in present scenario where they don't know how to make different recipes from exotic vegetables and exotic vegetables available in the market are not fresh or poor in quality. The overall study suggests that there is need to improve the packaging of exotic vegetables to maintain its shelf life, the company should focus on more promotional activities to attract all the consumers through social media platforms and company can collaborate with other organizations like supermarket, hypermarket to increasing their joint venture for enhancing the availability of exotic veggies.

Keywords: *Exotic vegetables, buying behaviour, constraints*

IAAHAS/AB/2023/407

Optimizing sowing time for higher productivity and profitability in sesamum

V Sujatha[1*], R Saritha[2] & ABM Sirisha[3]

Agricultural Research Station, Peddapuram- 533 437[1*], Regional Agricultural Research Station, Anakapalle-531001[2], Agricultural Research Station, Yellamanchili – 531 055[3]
Acharya N.G. Ranga Agricultural University (ANGRAU), Guntur,
Andhra Pradesh, India – 531001

In the context of optimizing sowing dates for realizing higher productivity and profitability for sesamum an experiment with varying sowing dates was executed at Agricultural Research Station, Yellamanchili, Andhra Pradesh during *rabi-summer & kharif*, 2015-16 & 2016-17. The experiment consisted of twelve sowing dates *viz*., from 2nd fortnight of December to 1st

fortnight of June at 15 days interval to verify the optimum time of sowing for sesamum. The experiment was laid out in a randomized block design with three replications. The experimental findings reveal that during *rabi –summer*, sesamum crop sown on second & first fortnight of January recorded highest seed yield (541 & 509 kg ha^{-1}), oil content (46.33 & 46.20 %), net returns (Rs.29878 ha^{-1}& Rs 27330 ha^{-1}) and BC ratio (2.23 & 2.04) over other sowing dates. During *kharif*, crop sown on second fortnight of May and first fortnight of June produced significantly higher seed yield (323.7 & 258.4 kg ha^{-1}), oil content (45.98 & 45.88 %), (net returns (Rs.14886 ha^{-1}& Rs 9658 ha^{-1}) and BC ratio (1.36 & 0.88) than rest of sowing dates. Delay in sowing after first fortnight of February gradually decreased the seed yield of sesamum. Significantly lowest seed yield (70.4 & 87.0 kg ha^{-1} respectively) and negative net returns were obtained when crops were sown on first & second fortnight of April.

IAAHAS/AB/2023/408

Genetic estimates and divergence studies in sesame (*Sesamum indicum* L.)

P. K. Jagtap[1] and R. I. Gohil

[1]Asstt. Res. Scientist, Niger Research Station, NAU

The present experiment was carried out at Niger Research Station, Navsari Agricultural University, Vanarasi, (Vansda) during *summer* 2019. The analysis of variance for all the characters revealed highly significant differences among the genotypes indicating sufficient amount of variability present among studied genotypes of sesame. High to moderate genotypic and phenotypic coefficient of variation found for the traits *viz*., branches per plant, capsules per plant, capsule width, leaf area, seeds per capsule, 1000 seed weight, harvest index and seed yield per plant. The results indicated the presence of wide variation for these characters under study to allow further improvement by selection of these individual traits. High heritability coupled with high genetic advance was observed for the traits viz., branches per plant, capsules per plant, capsule width, leaf area, harvest index and seed yield per plant. High genotypic coefficient of variation coupled with high heritability as well as genetic advance were observed for the same traits indicating that these traits were governed by

additive genes and phenotypic selection would be effective for genetic improvement in these traits. The D^2 analysis indicated presence of ample genetic diversity among the genotypes studied, which were grouped into six clusters through Mahalanobis D^2 statistics. The maximum inter cluster distance was observed between cluster I and V (127.21). The maximum intra-cluster distance was observed within cluster V (D = 37.56) which included three genotypes followed by cluster I (D = 25.10) which included twenty-two genotypes.

Keywords: *Sesame, D^2, Genetic estimates, Diversity*

IAAHAS/AB/2023/409

Development of yardstick of CV% for mango

A. P. Chaudhary[1]; D. J. Chaudhari[1]; K. L. Chaudhary[2] and D. H. Chaudhari[3]; Y. A. Garde[4]

[1]Dept. of Social Science, ASPEE College of Horticulture, NAU, Navsari
[2] Dept. of Agricultural Extension Education & Communication, NMCA, NAU, Navsari
[3] Office of Directorate of Research & Dean PG Studies, NAU, Navsari
[4] Dept. of Agricultural Statistics, NMCA, NAU, Navsari

Mango (*Mangifera indica* L.) belonging to Family Anacardiaceae and it is the most important commercially grown fruit crop of the country. It is called as king of fruits. There are large number of experiments conducted every year at different locations. This study was carried out to develop the yard stick of CV% for accepting the results of mango crop experiment utilizing the secondary data on yield of 158 field experiments conducted at various research stations of South Gujarat region of last 15 years. The yardstick of CV for field experiments was worked out by using average upper fiducial limit of CV for each of the 158 experiments were worked out separately and then average of these upper fiducial limits was computed. The upper fiducial limit of 95% and 99% worked out by using the theory of truncated t-distribution as described by (Johnson and Welch, 1939). The results implied that most of the experiments were conducted in single factor Randomized Block Design.

Number of treatments between 6-10 showed lower CV% as compared to overall average CV%. The experiments conducted with 3, 4 and 5 replications provide lower CV%. The experiments conducted at RHRS, Navsari had less CV% as compared to AES, Paria. Higher CV% in experiments reduces the power of F-test. The yardstick of CV% for accepting the results of mango experiments in South Gujarat region should be less than 29 per cent for yield character.

Keywords: *Coefficient of variation, yardstick, mango.*

IAAHAS/AB/2023/410

Response of soil microbial parameters during various developmental stages of rice and wheat irrigated with alkali water

Kirti Yadav[1,2], Awtar Singh[2], Neeraj K. Aggarwal[1], Gajender Yadav[2]

[1]Department of Microbiology, Kurukshetra University, Kurukshetra, 136119, Haryana, India

[2]ICAR–Central Soil Salinity Research Institute, Kachhwa road, Karnal 132001, Haryana, India

Soil sodification results from the use of alkali groundwater for irrigation, particularly in dry and semiarid regions, are serious threat to the soil microbial activities and agricultural production. An experimental study was carried out to monitor the activity of soil microbes in a rice-wheat cropping system (2021–2022) under a semi-controlled lysimeter. Since 2004, different cropping system was followed and different treatments have been used to irrigate the lysimeters. Treatments included using good quality water (T1), two types of alkali waters with different residual sodium carbonate levels RSC 5 meL^{-1} (T2), and 10 me L^{-1} (T3) and improving the latter to neutralize RSC comparable to 5 meL^{-1} with gypsum (T4) and sulfuric acid (T5). Soil samples were collected at three growth stages (during tillering, anthesis, and harvesting stages) under two rice varieties (CSR60 and PR126) as well as under two wheat varieties (HD3226 and KRL210). The microbiological activities

(dehydrogenase, alkaline phosphatase, acidic phosphatase, and urease) were significantly reduced with application of alkali water in long term. Moreover, T4 and T5 have shown some capacity to partially restore soil microbial activity, although not to the level of T1. Most of the soil microbial indicators decreased significantly at the reproductive stage compared to the tillering stage. Moreover, at the harvesting stage microbial activities further reduced compared to reproductive stage. Most of the microbial activities in the soil had the same pattern under both varieties of rice and wheat. The study's findings led to the conclusion that continuous applications of alkali water drastically degrade soil microbial activities throughout the crucial development stages of rice-wheat system. The soil microbial activity could not be sustained over the long term with partial neutralization of alkali water. Therefore, it is suggested that rate of amendments for neutralization of alkali water should be revised for altering microbial activities degradation.

Keywords: *Rice, wheat, soil microbial activity, soil sodification, alkali water irrigation.*

IAAHAS/AB/2023/411

Bitter Gourd Tea: Determination of nutritional quality and sensorial quality of the bitter gourd tea

Snehal D. Bhise, Abhijit A. Gatade and Akshaya K. Sahoo
Department of Food science and Technology, Shivaji University,
Kolhapur -416004, Maharashtra

India is the second largest producer of tea in the world after China including the famous Assam tea and Darjeeling tea. Tea is the 'State Drink' of Assam. Deputy Chairman, Montek Singh Ahluwalia had plans to officially recognize tea as the Indian "National Drink" in 2013. According to the ASSOCHAM report released in December 2011, India is the world's largest consumer of tea, consuming nearly 30% of global output. India is also the second-largest exporter of tea, after China Tea is the dried leaf of a bush and

contains theine and when added to boiling water along with milk and sugar, it gives an aromatic and stimulating drink. Tea is one of the most important beverage crops in India. bitter gourd is very good for the human body due to its hypoglycaemic action. Bitter gourd makes an excellent remedy for diabetes. An attempt has been made for diabetes patients to relish the normal tea flavour to them and fulfil their desire to test and also their flavour of the tea.

Keywords: *Tea, diabetes, flavour, stimulating drink.*

IAAHAS/AB/2023/412

Impact of different agro-chemicals on various growth parameters of mungbean (*Vigna radiata* L.)

Pardeep Phogat*, Amarjeet, Ravi and O P Lathwal
Department of Agronomy, CCSHAU, Hisar, Haryana, India

An experiment was carried out to understand the impact of different agro-chemicals on various growth parameters of mungbean in randomized block design (RBD) consisting of ten treatments and with three replications. The location of experiment was at Regional Research Station (rainfed farming), Bawal, Rewari of CCS Haryana Agricultural University, Hisar (Haryana) during *Kharif* 2021. The higher plant population was recorded under treatments having soil application of gond-katira @ 5.0 kg ha^{-1} as compared to the other treatments. At 45 DAS and harvesting stage, foliar application of KNO_3 @ 1% at flowering and pod initiation, alone or in combination with soil application of gond-katira @ 2.5 or 5.0 kg ha^{-1}, produced significantly higher plant height and dry weight per plant as compared to rest of the treatments and were statistically at par with each other. The maximum (60.1 cm) and minimum (49.8 cm) plant height was observed in soil application of gond-katira @ 5.0 kg ha^{-1} + foliar application of KNO_3 @ 1% at flowering and pod initiation and control, respectively. Dry weight per plant (g) at harvest increased from 14.3 in control to 20.6 (44 % higher than control) in soil application of gond-katira @ 5.0 kg ha^{-1} + foliar application of KNO_3 @ 1% at flowering and pod initiation.

The application of different agro-chemicals at various stages of crop significantly affected the growth parameters of mungbean.

Keywords: *Mungbean, gond-katira, salicylic acid and KNO_3.*

IAAHAS/AB/2023/413

Insecticides and biopesticides efficacy against aphid, *Myzus persicae* (Sulzer) infesting spinach (*Spinacia oleracea*)

SS. Shinde[1], CS. Patil[2] and SA. Pawar[3]

[1]Ph.D. Scholar, Dept. of Agril. Entomology, MPKV, Rahuri-413722, (MH), India
[2]Head, Department of Agril. Entomology, MPKV, Rahuri-413722, (MH), India
[3]Entomologist, AICRP (VC), Dept. of Horticulture, MPKV, Rahuri-413722, (MH), India

The most prevalent sucking pests on spinach are green peach aphids. During *rabi* 2020-2021, studies were conducted to assess the bio-efficacy of insecticides and biopesticides at the Vegetables Research Farm, MPKV, Rahuri. The treatment imidacloprid @ 30 g a.i. ha^{-1}, was shown to be the most effective in reducing green peach aphid populations followed by thiamethoxam @ 25 g a.i. ha^{-1} and dimethoate @ 300 g a.i. ha^{-1}. Amongst biopesticides azadirachtin 1% @ 2 ml/l was found best reducing aphid population. The plots treated with imidacloprid at 30 g a.i. ha^{-1} and thiamethoxam at 25 g a.i. ha^{-1} produced the largest yields of 16.11 t ha^{-1} and 15.22 t ha^{-1}, respectively. The greatest ICBR was seen in imidacloprid (1:76.49) and thiamethoxam treatments (1:61.91).

Keywords*: Green peach aphids, Myzus persicae (Sulzer), Spinach (Spinacia oleracea), Imidacloprid, Azadirachtin and Thiamethoxam.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/414

Agronomic bio-fortification: Step towards nourishing future

Dikshant Sheoran*, Arun[1]
*Dept. of Soil Science, PG scholar,
[1]Dept. of Agronomy, PG scholar,
CCS, Haryana Agricultural University, Hisar, Haryana 125004, India

Iron and zinc deficiencies in human nutrition are widespread in developing Asian and African countries where cereal grains are the staple food. Human micronutrient deficiencies are a widespread problem worldwide and mainly concern people whose diet consists of insufficient amounts of critical vitamins and minerals. Low levels of micronutrients in plants disturb the proper growth and development of plants. Agronomic biofortification of crops is a very promising way to improve the concentration of micronutrients in edible parts of crops without compromising yield and is recognized as the cheapest strategy to alleviate hidden hunger worldwide. Now a days in pearlmillet, some of the hybrids and varieties rich in Fe and Zn content are released. Biofortified hybrids and varieties of pearlmillet contain higher amount of Fe and Zn as compared to popular hybrids and varieties grown by the farmers. The review is focused on the factors influencing the effectiveness of biofortified pearlmillet (a type of application, form, and a dose of applied microelement, biofertilizers). Also, the accumulation of zinc, and iron in edible parts of crops, their effects on metabolism, morphological and yield parameters, and an impact on plants' defense mechanisms against abiotic stress like salt, high/low temperature and heavy metal was discussed. Finally, the directions of future agronomic biofortification studies are proposed.

Keywords: *Pearlmillet, Zinc, Iron, Bio-fortification.*

IAAHAS/AB/2023/415

Significance of plant canopy in crop yield: A review

Seema Dahiya[1], Mk Rana[2], Ankur Chaudhary[1] and Rajbir Singh Khedwal[1]
[1]Department of Agronomy and [2]Department of Vegetable Science
CCS Haryana Agricultural University, Hisar-125004, India

The yield of any crop depends on the capacity of a plant canopy to intercept and efficiently use the sunlight, which is dependent on canopy architecture of a plant *viz.,* leaf size, shape and angle, number of leaves and branches, and a crop geometry *viz.,* row orientation, row spacing, plant geometry, plant density, *etc*. The amount and distribution of leaf area in a crop canopy determine the way by which the photosynthetic active radiation is intercepted and consequently it influences the canopy photosynthesis and yield. Geometry of a plant affects the radiation use efficiency, intercepted photosynthetic active radiation (IPAR) and thereby the biological and economical yield of a crop. Optimum plant density and a planting pattern with adequate spatial arrangement are important cultural factors that increase radiation interception and yield production.

Keywords: *Plant canopy, row spacing, row orientation, plant density, plant architecture, radiation use, light interception*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/416

Constraints in Adoption of Integrated Nutrients Management Practices

Mohit*[1], Satpal Singh[2], Joginder Singh Malik[3]
[1]Ph.D. Scholar, Department of Extension Education
[2]DES (Extension Education), Krishi Vigyan Kendra, Panipat
[3]Professor, Department of Extension Education
CCS Haryana Agricultural University, Hisar, Haryana-125004

INM involves use of organic manure, crop residue management, green manuring and use of bio-fertilizers with balanced use of fertilizers on basis of soil testing. Apart from reducing cost of cultivation, INM increases soil productivity, water holding capacity and fertilizer use efficiency. The study was conducted with objective to assess the awareness, knowledge and adoption of INM practices in rice-wheat cropping system. A total sample of 120 respondents who had adopted the RCWS was selected at random from Panipat, Karnal and Kurukshetra districts of Haryana. The findings revealed that "lack of technical guidance about use of bio fertilizers" was ranked first out of total 30 constraints followed by "organic manures are bulky to handle and require more labour at peak time" as ranked second and "lack of knowledge about SHC" ranked third in overall constraint faced by farmers. It was also found that rank correlation coefficient between marginal & small farmers and medium category farmers was found highly positively significant at 0.01 level of significance while rankings of medium with large category and marginal & small farmers with large category farmers were found positively significant at same level of significance.

Keywords: *INM, SHC, RWCS, Haryana.*

IAAHAS/AB/2023/417

Analysing Spatial Variations in NDVI and its Association with Land Surface Temperature and Rainfall in Urban Area

Saloni[1], Renu Dhupper [2], and Deepak Kumar [3]

[1] Amity Institute of Environmental Sciences, Amity University, Noida, India

[2] Amity Institute of Environmental Sciences, Amity University, Noida

[3] Amity Institute of Geoinformatics & Remote Sensing (AIGIRS),
Amity University, Sector-125, NOIDA-201313, G.B. Nagar, Uttar Pradesh (India)

NDVI (Normalized Difference Vegetation Index) is a commonly used index to quantify the amount of vegetation cover in an area. It is derived from satellite imagery and provides information on the health and density of vegetation in each region. NDVI values range from -1 to 1, with higher values indicating greater vegetation cover. Land Surface Temperature (LST) is a measure of the temperature of the Earth's surface as measured from space. It is influenced by factors such as solar radiation, cloud cover, and the thermal properties of the Earth's surface. In urban areas, LST is often higher than in surrounding rural areas due to the urban heat island effect. Rainfall is an important environmental factor that influences vegetation growth and land surface temperature. Higher rainfall generally leads to greater vegetation growth and lower land surface temperatures. To analyse spatial variations in NDVI and its association with land surface temperature and rainfall in urban areas. Many studies have used NDVI to examine the temporal response of vegetation to climatic variations, but only a few have looked at spatial patterns of NDVI as they relate to climate change. Precipitation and temperature, among another climatic factors, have a substantial influence on both the temporal and spatial patterns of NDVI. The current study uses remote sensing to evaluate the relationship of the Normalized Difference of Vegetation Index (NDVI) with Land Surface Temperature (LST) and rainfall over Bangalore from 2000 to 2021. The goals of this project are to retrieve the LST and rainfall and explore their relationship. Lastly, the regression technique is employed to determine the relationship between LST and NDVI as well as rainfall and NDVI. The spatial variation demonstrating this association is also included in the paper. Rainfall and LST have a high spatial and temporal association with NDVI. As a result, NDVI is a critical variable for agronomical and climate applications. This

work is an attempt to analyse and monitor the interactions between vegetation, rainfall, and land surface temperature, which can be regarded as an important step towards the study of climatic variability-vegetation dynamics in urban areas.

Keywords: *Normalized Difference of Vegetation Index (NDVI), land Surface Temperature (LST), Rainfall, Correlation analysis, Spatial variations.*

IAAHAS/AB/2023/418

Genome wide association mapping reveals novel genomic loci governing tolerance responses for anaerobic germination stress in rice

Shanmugam Aravindan[1*], Manivelan Kalaiarasan[1], Suresh Ramalingam[2], Pushpa Raman[1] and Sassikumar Datchinamoorthy[3]

[1]Tamil Nadu Rice Research Institute, Aduthurai, Thanjavur – 612101, Tamil Nadu

[2]Department of Rice, Tamil Nadu Agricultural University, Coimbatore – 641003, Tamil Nadu

[3]Sugarcane Research Station, Cuddalore – 607001, Tamil Nadu

Direct Seeded Rice (DSR) is a promising alternative to the traditional puddled rice system. It has become more popular among rice growers as a result of socio-economic shift and global climate change. Although DSR offers advantages, rice plants experience greater anaerobic stress at sowing from unpredicted rainfall. Rice is unique among other cereals which is having the ability to germinate under anaerobiosis. The coleoptile of rice rapidly elongates above the water surface to obtain more oxygen and enhance vigorous seedling growth. A panel of 120 landraces and four check varieties (FR 13A, IR 42, CO 43 and CO 43 Sub1) were subjected to anaerobic stress with a water level of 10 cm for up to 15 days for two seasons. Present study observed ample variation for anaerobic germination percentage (AGP) (10 to 100%) and anaerobic vigour index (AVI) (150 to 4433). Landraces ADT-LR-13, 35, 52, 55, 73 and 98 were identified as genotypes tolerant to early water submergence. Genome wide

association mapping was carried out for the anaerobic germination tolerance (AGT) associated ten traits using 174 simple sequence repeat (SSR) markers. The entire population was categorized into two sub-populations through STRUCTURE analysis. With the use of MLM (Q+K) model, 67 and 61 significant marker-trait association were found for the AGT associated traits in 2021 and 2022 respectively. Explained percentage of the total variation for 2021 and 2022 ranged from 3.35 (RM 3826) to 32.53 % (RM 32) and 3.34 (RM 277) to 29.31 % (RM 342) correspondingly. Nine marker-trait association was identified as consistent on both years. RM 566 had R^2 value of >10 % on both years. Thus, molecular markers linked to the targeted traits need to be further validated and can be utilized for MAS for development of anaerobic germination tolerant varieties.

Keywords: *Anaerobic germination tolerance, association mapping, genetic diversity, population structure, SSR markers.*

IAAHAS/AB/2023/419

Assessment of fish species biodiversity in Yamuna River (Haryana): A post-COVID-19 Analysis

Shri Ram Yadav[1*], Ravikant[2], Rohitash Yadav[3], Mahendra Kumar Yadav[4], Nitesh Kumar Yadav[5]

[1]Department of Fisheries Resource Management, COFS,
CCS HAU Haryana Agricultural University, Hisar
[2]Department of Zoology, COBS&H, CCS HAU Haryana Agricultural University, Hisar
[3]Department of Aquaculture, COFS, Birsa Agriculture University, Ranchi, Jharkhand
[4]Department of Aquaculture, COFS, Govind Ballabh Pant University, Pantnagar
[5]Department of Aquaculture, COFS, Central Agriculture University, Imphal, Tripura

A post-COVID-19 has potential benefits to biodiversity and the environment, yet others have suggested both benefits and detriments. The present study was intended to record the fish biodiversity of the selected riverine area of Yamuna River (Yamunanagar, Panipat, Faridabad) Haryana from September 2021 to April 2022. A total of sixty-four fish species have been

recorded from three sites which belong to 9 orders, 15 families and 64 species. The maximum number of species was recorded from 3 sites during the study time, 56 species from Yamunanagar, 52 from Panipat and 27 species recorded from Faridabad. The minimum number of species reported was 44 from Yamunanagar, 42 from Panipat and four from Faridabad. The most dominating order was Cypriniformes, Siluriformes, Anabentiformes and Synbranchiformes. *Cyprinus carpio, Labeo rohita, Ompak bimaculatus* and *Parambassis ranga* were recorded from Yamunanagar, and *L. rohita* was the only species recorded during all months. *Puntius sophore, P. chola,* and *Pethia ticto* were recorded from the most dominating family Cyprinidae from the Faridabad area. The temperature of river water range from 8.38±0.08 –21.33±0.13 °C, pH range from 6.00±0.11 - 8.03±0.11, DO from 1.68±0.06 – 8.10±0.007mg/l, total alkalinity from 83.25±0.48 – 351.75±11.89mg/l and total hardness 121.75±1.93 – 279.25±6.29mg/l.

Keywords: *Fish, diversity, Yamuna, riverine area.*

IAAHAS/AB/2023/420

An aspect over the effect of change in Climate and its future consequences

Smile Balda* and Kirti
College of Agriculture, Chaudhary Charan Singh Haryana Agriculture University, Hisar (125004), Haryana, India

Climate has been changing since last few years due to natural as well as anthropogenic actions. The endemic species are more prone to extinction. In modern times the impact of change in climate is being prioritized. Therefore, the aim of this abstract is to identify the link between climate change, Biodiversity and food security. In present scenario, the species are moving towards higher elevations in order to reduce their extinction. Because of changing microclimate, species are not able to adapt due to slow evolutionary process leading to their extinction. The changing climate affects mostly the rainfed areas. To provide food security to such a large population along with conservation of biodiversity, the only solution is to increase the agricultural

productivity. So, lesser the food wastage, providing balanced food to food insecure people, complete ecological information that may decrease our reliance on limited resources, so that we can at least conserve present resources. It needs some technical advancements in fields like Medicine, Agroforestry, silvipastoral systems along with efficient resource utilization, land restoration practices.

IAAHAS/AB/2023/421

Innovative Approaches in Soil Health

Nisha chouhan [1], Dilip Kumar Solanki [2], Rohitash[3]
Department of Agriculture, Jodhpur Rajasthan

Soil health is the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals and humans, and connects agricultural and soil science to policy, stakeholder needs and sustainable supply-chain management. Historically, soil assessments focused on crop production, but, today, soil health also includes the role of soil in water quality, climate change and human health. However, quantifying soil health is still dominated by chemical indicators, despite growing appreciation of the importance of soil biodiversity, owing to limited functional knowledge and lack of effective methods. As Franklin Delano Roosevelt once said, "The nation that destroys its soil, destroys itself". Soil health is an integrative property that reflects the capacity of soil to respond to agricultural intervention, so that it continues to support both agricultural production and the provision of other ecosystem services. Maintaining the physical, chemical, and biological properties of soil is needed to keep it healthy, and this is possible through the adoption of different agronomic approaches like Reducing tillage, Avoiding soil compaction, Growing cover crops, Better crop rotations, Organic and Inorganic amendments. The diversification of nutrient sources with emphasis on organic sources, adoption of principles of conservation agriculture, enhancement of soil microbial diversity, efficient resource recycling through the integrated farming system, and amendment addition for correcting soil reactions, Feed the soil regularly, through plants and organic inputs, Apply nutrients (right amounts, in the right place, at the right time), Know soil textures and understand limits to workability and traffic ability, Optimize water balance, through drainage (if necessary)are potential options for improving soil health.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/422

Solar powered weeder a boon for increasing efficiencies in agricultural and horticultural crops: A review

Golmei Langangmeilu[1] and Golmei Jenlu[2]
[1]Research Scholar, Department of Agronomy, College of Agriculture, IGKV, Raipur, Chhattisgarh
[2]Research Scholar, Department of Horticulture, Sikkim University, Sikkim

Weeds are harmful to crops and hence should be removed. Weeding and intercultural are critical management practices for agriculture and horticulture crops that significantly affect soil moisture conservation, nutrient loss, and crop yield. Horticultural crops such as fruits, vegetables, medical, aromatic and ornamental plants requiring wider row spacing have a large area accessible for weeds to grow. Most agricultural crops such as cereal, pulses, maize, potato, sugarcane, etc required frequent weeding and intercultural operations. They are carried out by manual forces, bullock drawn and mechanical weeder but the availability, efficiency and prevailing operational charges which intern increases the cost of cultivation discourages the farmers to adopt these methods. Most people in India use fossil fuels to run IC or external combustion engines. The current issue of global warming limits the use of machines based on fossil fuels since it emits harmful gases. The availability of renewable solar energy is very high and it can be easily taped through solar panels which is an alternate source to meet the energy demands of the present and future and it also reduces the emission of greenhouse gases. A solar power cum electric operated weeder comprises of solar photovoltaic panels, a weeder and the stored electrical energy in the battery was used to run the DC motor which in turn runs the adjustable rotor shafts. The results showed weeding efficiency of above 80%. Similarly, a solar energy-operated two-row weeder for weeding in wetland paddy comprising solar photovoltaic panels which can supply power to do weeding continuously for 2 hours with weeding wheels and a float resulted in weeding with weeding efficiency, field efficiency and plant damage of 83.3 %, 83 % and 2-3 %, respectively. The cost of weeding was 41.2 % inferior compared to cono weeder due to higher field capacity and fewer labor requirements. Hence, Solar powered weeder is a boon for increasing efficiencies in agricultural and horticultural crops.

IAAHAS/AB/2023/423

Studies on development of paneer by using raw turmeric extract (*Curcuma longa* L.)

Khobragade S. P.[1], Kubade K. B.[2] and Kamble K. B.[3]

[1,2 & 3] Ph.D Scholar, Department of Animal Husbandry and Dairy Science, Mahatma Phule Krishi Vidyapeeth, Rahuri- 41372

Raw turmeric extract added *paneer* was prepared from different proportions of rawturmeric extract 0.0%, 5%, 10% and 15% for treatments T1, T2, T3, and T4. The product obtained was subjected for textural analysis and organoleptic evaluation by panel of semi expert judges. On an average the acidity content of raw turmeric extract added *paneer* was found. The hardiness for the treated samples was 6.97kg, 6.75kg, 6.65kg and 6.59kg. Cohesiveness 0.15, 0.16, 0.17 and 0.18; Elasticity 1.02cm, 1.13cm, 1.27cmand 1.35cm; Gumminess 1.04kg/N, 1.08kg/N, 1.13kg/N and 1.18kg/N; Chewiness1.06kg/cm, 1.22kg/cm, 1.43kg/cm and 1.53kg/cm for control T1and treated samples T2, T3, and T4, respectively. In all the textural parameters i.e. hardness, cohesiveness, elasticity, gumminess and chewiness these values were found to be significantly differed over control and between each other also excluding gumminess. The mean value of yeast and mould count of *paneer* samples was observed as 1.00, 0.00, 0.00 and 0.00 cfu/gm for T1, T2, T3 and T4, respectively. The yeast and mould were found incontrol treatment 1.00 cfu/g. The fresh raw turmeric extract added *paneer* was blank for yeast and mould. The coliform was not found in all treatment. The raw turmeric extract added *paneer* was blank for coli form count. The sensory parameters i.e. colour and appearance, flavour, body and texture, mouthfeel/smoothness were slowly down for sensory test in turmeric extract added *paneer* samples as compared to control samples. Contol *paneer* was found fit for consumption up to two days only whereas developed *paneer* was safe up to 3 days at room temperature. All treatments were found acceptable up to 12th days of storage at refrigerated condition. The raw turmeric extract added *paneer* was found acceptable up to 12th days of its storage period at refrigerator temperature (5°C) secured overall acceptability score betweenthe ranges of 6.0 to 7.0. The per kg cost of

preparation of *paneer* under treatments T_1, T_2, T_3 and T_4 were Rs 339.62, Rs 336.85, Rs 333.00 and Rs 327.45, respectively.

Keywords: *Turmeric, Paneer, Microbial qualities, Sensory evaluation, texture.*

IAAHAS/AB/2023/424

Study of stability analysis in Ashwagandha [*Withania somnifera* (L.) Dunal]

K. K. Chandel and R. M. Chauhan

Department of Genetics and Plant Breeding, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar - 385 506

The present investigation entitled, "Study of stability analysis in Ashwagandha [*Withania somnifera* (L.) Dunal]" was carried out to elicit information of genetic diversity based on morphological analysis. Genotype × Environment interaction and stability parameters were carried out for dry root yield and other quantitative characters in three different locations *viz*., E1 - Seed Spices Research Station, S. D. Agricultural University, Jagudan (Dist-Mehsana), E2 - Seed Technology, S. D. Agricultural University, Sardarkrushinagar (Dist-Banaskantha) and E3 - Cotton Research Station, S. D. Agricultural University, Talod (Dist-Sabarkantha) during *rabi* 2015-16. The experimental material comprised of 24 diverse genotypes of ashwagandha procured from Department of Genetics and Plant Breeding, SDAU, Sardarkrushinagar. Genotypes were evaluated in Randomized Block Design (RBD) with three replications. The genotypes evaluated were done based on ten quantitative characters *viz*., days to flowering, plant height (cm), number of primary branches per plant, number of secondary branches per plant, root length (cm), root diameter (mm), fresh root yield per plant (g), biological yield per plant (g), harvest index (%) and dry root yield per plant (g). G × E interaction and stability parameters were studied for identifying stable genotypes for various characters under three different environmental conditions.

The joint regression analysis revealed that Genotype × Environment interactions was significant for all characters except for number of primary branches per plant, number of secondary branches per plant, root length (cm),

root diameter (mm) and harvest index (%) which showed differential response of the genotypes to varying environments. Hence, evaluation of breeding material in different environmental conditions appeared essential. Environmental index revealed the suitability of an environment based on the positive values. E1 environment was found to be most favourable location for days to flowering, number of secondary branches per plant, root length, root diameter and harvest index. E2 environment was found the most favourable location for days to flowering, plant height, number of secondary branches per plant, root length, root diameter, fresh root yield per plant, dry root yield per plant and biological yield per plant. E3 environment was found the most favourable for number of primary branches per plant, dry root yield per plant and harvest index. The stability parameters were worked out and interpreted only for five characters, days to flowering, plant height (cm), fresh root yield per plant (g), dry root yield per plant (g) and biological yield per plant (g); as G × E linear component was significantly higher than its counterpart G × E non-linear component for the above characters. However, for remaining characters, non-linear component was higher than linear component, which made them unpredictable. Bartlett's test was performed to study the homogeneity for error variances. The $\chi 2$ values were non-significant and also the coefficient of variations was low for all characters except days to flowering and number of secondary branches per plant.

IAAHAS/AB/2023/425

Status of Agricultural Diversification in Uttarakhand

Somya Misra[1], H.N. Singh[2] and Deepali[3]

[1]Research Scholar, [2]Professor,

G.B. Pant University of Agriculture and Technology, Pantnagar-263145, Uttarakhand

[3]Assistant Professor, Guru Kashi University, Talwandi Sabo, Bathinda-151001, Punjab

Agricultural diversification is one of the most likely avenues to promote the development of agriculture. It is one of the important strategies suggested by Doubling Farmers' Income Committee of Government of India to raise farmers' income. Basically, agricultural diversification includes the adjustment of farming as per the climatic suitability of the region, which combines various

complimentary agricultural activities and shifting the agricultural resources from low to higher value crop like from cereal to pulses to horticultural crops such as fruits, vegetable and spices etc. This also includes the integration of various allied activities such as livestock, mushroom farming, bee keeping, processing and value addition of horticultural produce, etc. The twin objectives of agricultural diversification are sufficiency in household food and income security by means of providing sustained income throughout the year for smooth consumption by the farmers. The present study was conducted in the state of Uttarakhand where the average size of land holding is very small. Simpson's index of Diversification (SID) was modified and used to determine the extent and nature of agricultural diversification in the study area so as to examine the status of income diversification from different sources. The study revealed that farm income of farmers in the study area was a composition of various diversified sources of income. Out of which, crop production holds the major share of followed by livestock and orchards while allied activities such as apiculture and mushroom farming have the remaining share in their income. The selection of crops and enterprise greatly depended upon the area as well as on the institutional support and trainings organized in order to boost the interest of farmers and create their inclination towards these activities. But, it was also seen that across the farm categories no significant difference was observed in terms of adoption of any crop/ enterprise. It was also observed that higher diversification on their farms led to better risk management and diffusion of risk for the farmers which ultimately led to their income stabilization.

Keywords: *Agricultural diversification, Simpson's index of Diversification (SID), farm income.*

IAAHAS/AB/2023/426

Study on importance of seedling vigour tests in quality seed production in Rice (*Oryza sativa*. L)

P. Sadhana[1] and K. Bhargava[1]

[1]Genetics and Plant Breeding, PJTSAU, Rajendranagar, Hyderabad, Telangana, India

Rice is one of the most important crops providing staple food for half of the global population. Seed is an agricultural key input playing fundamental role in meeting challenges like quality seed supply and sustainable crop production. Quality seed refers to the one which is pure having good germination percentage, vigorous growth, tolerance to adversity and free from pests and diseases with good stand establishment. Seed with high vigour and viability can boost seed germination speed and uniformity, as well as the ultimate percentage of germination, resulting in flawless field emergence, crop performance, and even high yield under various conditions. Information on ability of seeds to germinate, emerge and develop into seedling can be obtained by carrying out germination tests and percentage of normal, abnormal and dead/ non germinated seeds can also be obtained. Satisfactory performance of seedling can be known by studying root and shoot system and classified as strong if root and shoot are developed free from defects and seedlings with deficiencies are classified as weak. At the end quality seed is characterized by uniform emergence of seed under field conditions and giving high yields. Based on the importance of seed quality in sustainable crop production, present study was carried out to evaluate seed vigour by carrying out germination test, length of seedling(cm), length of root (cm), length of shoot (cm), dry weight of seedling (mg), Seedling vigour index-I, Seedling vigour index-II, Field emergence and grain yield per plant (g).

IAAHAS/AB/2023/427

Study the inheritance pattern of aroma in rice genotypes (*Oryza sativa* L.) of Chhattisgarh

Khemlata Thakur, Dr. Abhinav Sao and Krishna Tandekar
Department of Genetics and Plant Breeding, I.G.K.V, Raipur (C.G.)

One of the most important characteristics of aromatic rice is its aroma, which fetches a higher price than non-aromatic rice on both national and international markets. 2-acetyl-1-pyrroline (2-AP) has been recognized as the important biochemical compound that underlies aroma. A systematic breeding programme is necessary for improving the quality of rice and understanding the nature of inheritance. An experiment was conducted during *kharif*, 2021-22 at the research cum Instructional farm of Department of Genetics and Plant Breeding, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh with the investigation focussed on inheritance of aroma in rice, attempted four crosses between aromatic and non-aromatic parents. The inheritance pattern of aroma in rice was carried out between three non-aromatic cultivars *viz*., PKV HMT, HMT Sona and Improved Samba Mahsuri and two aromatic parents, TCDM-1 and Badshahbhog Sel-1. The F_1 plants of all the four crosses were non-scented indicating that the aroma controlling gene was recessive in the parent. But inheritance pattern of aroma was reflected in the F_2 population of two crosses involving Badshahbhog Sel-1 as aromatic and PKV HMT and HMT Sona as non-aromatic parents. In the cross PKV HMT/Badshahbhog Sel-1, all F_1 plants were non-aromatic indicating that the aroma controlling gene was recessive in the parent, while in the F_2 generation, segregation of non-aromatic and aromatic plants occurred. The ratio was 15:1. This reflects the presence of duplicated gene action and indicates the involvement of two major genes for non-aromatic nature of rice genotypes. In the cross HMT Sona/Badshahbhog Sel-1, all the F_1 hybrids of the cross were non-aromatic indicating that the aroma controlling gene was recessive in the donor parent. Plants in the F_2 generation were segregated at a ratio of 3:1 for non-aromatic and aromatic plants, suggesting a monogenic inheritance pattern for aroma and governed by a single recessive nuclear gene. This implies that

success in aroma selection through pedigree breeding is quite possible in the early generations of F_2.

Keywords: *Aroma, Monogenic inheritance, nuclear gene, Segregation*

IAAHAS/AB/2023/428

Effect of Conservation Tillage and Integrated Nitrogen Management on Yield, Quality and Economics of *Bt* Cotton

S. M. Ambhore*[1], A. N. Paslawar [2] and S. D. Hiwale[3]
Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth,
Akola (MS) 444104, India

A field investigation entitled "Effect of conservation tillage and integrated nitrogen management on growth and yield of rainfed *Bt* cotton" was conducted at Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra) during *kharif* season 2015-16 on medium deep black soil. The experiment was laid out in factorial randomized block design with three replications consisting two tillage practices, conventional tillage and minimum tillage and four levels of integrated nitrogen management N_1- Control (only shed biomass), N_2- 50 % nitrogen through vermicompost, N_3- 50 % nitrogen through vermicompost + 50 % nitrogen through urea, N_4-100 % nitrogen through urea. Cotton crop variety (Ajeet- 155) was sown on June 22, 2015 and two picking were done in Oct. and Nov 2016. Experimental results revealed that the seed cotton yield, stalk yield, biological yield, harvest index and seed index were highest in conventional tillage than minimum tillage. Higher GMR was obtained from conventional tillage whereas higher NMR and B:C ratio was obtained in minimum tillage than conventional tillage. Fibre quality parameters were not influence with tillage practices. Soil microbial biomass carbon, soil microbial biomass nitrogen and dehydrogenase activity were highest in minimum tillage. Seed cotton yield, stalk yield, biological yield, harvest index and seed index were highest in 100 % nitrogen with shed

biomass of previous cropping system. GMR and NMR were highest with 100 % N and shed biomass, however maximum B: C was in control where N was not applied only with shed biomass. Fibre quality parameters were not influenced due to various integrated nitrogen management practices. Along with 30:30 P and K kg $ha^{-1}$and shed biomass of pigeon pea + sunhemp previous year cropping system was found better for getting maximum economic returns and shed biomass + application of 50 % N through urea + 50 N through Vermicompost to Bt cotton for soil health improvement.

Keywords: *Yield, quality, economics, Bt cotton and conservation tillage*

IAAHAS/AB/2023/429

Studies on Growth, Yield and Quality of Sesame (*Sesamum indicum* L.) as influenced by Chemical Fertilizers and Liquid Biofertilizers

[1*]Mane S.G, [2]Aglave B.N, [3]Sallawar S.C.
Department of Agronomy, College of Agriculture Latur, VNMKV,
Parbhani-431402 Maharashtra, India

A field experiment was conducted during *kharif* season of 2018 at the Experimental farm, College of Agricultural Latur to studies on growth, yield and quality of sesame (*Sesamum indicum* L.) as influenced by chemical fertilizers and liquid biofertilizers. The soil of the experimental site was medium, black in colour with good drainage. The soil was clayey in texture, low in available nitrogen, medium in available phosphorus, medium in available potassium and alkaline (PH 8.04) in reaction. The experiment was laid out in randomized block design with three replications and the treatment were consisting of seven with chemical fertilizers and liquid biofertilizers. The treatments were, T_1- 20:40:00 Kg NPK ha^{-1}, T_2**-** 25:50:00 kg NPK ha^{-1}, T_3 - 30:60:00 kg NPK ha^{-1}, T_4 - *Azotobacter* + PSB, T_5 – 20:40:00 kg NPK ha^{-1} + *Azotobacter* + PSB, T_6- 25:50:00 kg NPK ha^{-1} *+ Azotobacter* + PSB, T_7- 30:60:00 kg NPK ha^{-1} + *Azotobacter* + PSB. The results of the field study indicated that the yield attributes and yield of sesame were significantly influenced by

different treatments The significantly higher number seed capsule^{-1} (64.00), seed yield plant^{-1} (7.29 g), seed yield ha^{-1} (779 kg ha^{-1}) and straw yield (3089 kg ha^{-1}) was obtained with the application of 30:60:00 kg NPK ha^{-1} + *Azotobacter* + PSB (T_7),The higher values of yield attributes and yield of sesame was observed with the application of 30:60:00 kg NPK ha^{-1} + *Azotobacter* + PSB (T_7) where as it was at par with the 30:60:00 kg NPK ha^{-1} (T_3) and 25:50:00 kg NPK ha^{-1} + *Azotobacter* + PSB.(T_6)

IAAHAS/AB/2023/430

Interactive effect of tillage, residue, and water management on water use efficiency, radiation interception, and radiation use efficiency of winter wheat in semi-arid climate

Sujan Adak*, K.K. Bandyopadhyay, Nandita Mandal, R.N. Sahoo, P. Krishnan, V.K. Sehgal, and A. Sarangi

Division of Agricultural Physics, Indian Agricultural Research Institute, New Delhi- 110 012

Wheat (*Triticum aestivum* L.), a staple crop, provides 20% of the world's population's total caloric intake, contributing significantly to social-economic growth and global food security. Water, nutrients, and energy are the three main inputs in wheat production and recently there has been a drop in the factor productivity of these inputs because of their improper management and deterioration of soil health. Wheat is primarily grown in India's semiarid and arid regions throughout the winter, which is typically dry. To maximize agricultural productivity while lowering strain on natural resources, the best synergistic combinations of tillage, residue and water management should be identified for improving resource use efficiency in agriculture. In light of this, observations were made during the 2019–20 and 2020-21 wheat growing season in a long-term field experiment being carried out in a Typic Haplustept

at the Indian Agricultural Research Institute, New Delhi, since 2014 for water use efficiency, total intercepted photosynthetically active radiation, and radiation use efficiency of wheat (cv HD 2967). The experiment was laid out in split-split plot design with two levels of tillage (Conventional tillage (CT) and No tillage (NT)) as main plot factors, two levels of mulching (with or without crop residue mulch @ 5t ha^{-1}) as sub plot factors and two levels of irrigation (full irrigation and deficit irrigation) as subplot factors. During both the years, it was observed that grain yield; water use efficiency (WUE), total intercepted photosynthetically active radiation (TIPAR), and radiation use efficiency (RUE) of wheat was not significantly influenced by tillage treatments. Application of crop residue mulch significantly influenced the grain yield, WUE, TIPAR and RUE. Under full irrigation, grain yield, TIPAR and RUE of wheat increased significantly but WUE decreased significantly over deficit irrigation level. Thus, from this study it may be concluded that wheat may be grown under no tillage with crop residue mulch @5t ha^{-1} with deficit irrigation to obtain higher water use efficiency but with full irrigation to obtain higher yield, TIPAR and RUE in semiarid climate of India.

IAAHAS/AB/2023/431

Sustainable Livelihood Promotion in Jharkhand

Mr. Surojit Kar[1] and Ms. Pallabi Patra[2]
M.Sc. (Ag.) Agronomy, Jharkhand Rai University, Ranchi

A large part of the population in Jharkhand lives in villages and depend on agriculture activities for their food and nutrition security, employment, and income. This important sector of Jharkhand has many issues like supply of proper good quality seed, high dependency on monsoon as irrigation facility is still developing, low productivity and poor marketing facility etc. With conventional method of cultivation now a days sustainable agriculture is also getting attention in Jharkhand. The major problems of sustainable agriculture are lack of proper knowledge, skill, technology, processing, marketing & transport. Most of the farmers are forced to sell their produce at low cost due to a variety of reasons. Therefore, unable to get adequate profit from their quality products.

According to an article by Hindustan Times, a tomato farmer from Huddu village in Lohardaga district, dumped three quintals of the vegetable after he was forced to sell the produce at Rs. 50/quintal. He said that he had spent Rs. 20 on transportation and Rs. 20 on meals, but the poor return on the vegetable was only around 10% of the production cost. Jharkhand is agricultural state, agriculture forms an economic foundation which helps in creating employment opportunities and reducing poverty. With huge opportunities and possibilities of experimentation, strategies, plans and programs yet the state agricultural growth and development seems beaten up. The national policy for farmers calls for a paradigm shift from a purely commodity centered approach to a human centered (like training, technical support etc.) approach for agriculture development. This requires improving economic viability of farming by substantially increasing the net income of the farmers. Given this scenario, if the state can develop better agricultural infrastructure, capacity building measures and streamlined and sufficient flow of credit, it can overcome the challenge it faces in the current circumstances.

The next question which arises is how can this be achieved? This can work out if agro-ecological specific agricultural projects are clearly formulated to form policies with realistic objectives with effective planning. This would grease the wheels of sustainable livelihood development and would also help to meet the agricultural challenges. To make the agriculture sector profitable as well as sustainable, an alteration in agriculture planning is the need of the hour.

Keywords: *Capacity building, employment opportunities, human centered, sustainable agriculture.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/432

Changing Scenario of Sustainable Pest Management in India

Gyan Prakash Morya
Department of Entomology, C.C.S.P.G. College, Bardari, Barabanki, U.P., India
(Dr. R.M.L. Awadh University, Ayodhya)

Changing scenario was undertaken to review the current status of sustainable pest management in India**.** Insect pest management is the key input in sustainable crop production. Sustainable agriculture is a holistic approach of eco-friendly agricultural technologies. The role of pesticides in crop production to augment output has been well perceived and these have been considered essential inputs in crop production. But meanwhile, they are obviously biocides having ability to cause toxic to all living organisms. The indiscriminate use of pesticides has led to serious consequences like, harmful residues in the produce, pesticide resistance and outbreaks of secondary pests. This has brought a complete change in strategy of insect pest management. This pest management motivated agricultural scientists, administrators and leaders to promote Integrated pest management (IPM). It is an eco-friendly approach of pest management, that is practical, economical, effective and protective to both public health and environment. So, the integrated pest management is generally termed eco-friendly pest management. There are varieties of techniques for pest management have been practicing since traditional to modern. The modern approach of pest management has been paradigm shifting to sustainable pest management. During the past four decades, efforts have been made to reduce the risk of harmful exposure to non-target organisms of insecticides. There have been developed many newer insecticides, which are more selective than conventional insecticides. Biointensive IPM, Ecological engineering, and Ecofriendly insecticide toxicology has been found major current advances in innovative approach for sustainable pest management.

Keywords: *Sustainable pest management, Integrated pest management, Changing scenario, India.*

IAAHAS/AB/2023/433

Symptomatology of Blast Disease of Pearl Millet caused by *Pyricularia grisea*

[1]Dinesh H. Chaudhary, [2]R. S. Jaiman and [3]M. G. Chaudhari
Directorate of Research, Navsari Agricultural University, Navsari, Gujarat, India[1],
[2 and 3]S. D. Agricultural University, Gujarat, India

Pearl millet [*Pennisetum glaucum* (L.) R. Br.] is an important cereal crop belong to Poaceae family. It is the excel crop among all other cereals. Pearl millet suffers from many diseases among them blast is one of the major foliar diseases and it affects fodder quality and production of pearl millet. The infection of blast disease started from lower leaves and then progress upward. Initially the lesion spots appear as minute circular to slightly dark brown specks of pin head size on leaf surface. Later gradually enlarge into spindle shaped spots and become elliptical to irregular. The neck portion initially turns to brown, later dark brown which resulted in breaking at the infected area.

Effect of organic and inorganic nutrient management on productivity, cost economics and energy use efficiency in sesame

V Sujatha[1*], R Saritha[2] & A B M Sirisha[3]
Agricultural Research Station, Peddapuram- 533 437[1*], Regional Agricultural Research Station, Anakapalle-531001[2], Agricultural Research Station, Yellamanchili – 531 055[3]
Acharya N.G. Ranga Agricultural University (ANGRAU), Guntur,
Andhra Pradesh, India – 531001

Field experiments were carried out to assess the soil physicochemical properties, yield, quality, energy use and profit analysis of sesame and under organic *vis-à-vis* conventional production systems for three consecutive seasons. The soil organic C, available N, P, K and micronutrients recorded a slight rise in the organic production system over three seasons. The mean total energy input expended in the production of sesame using organic inputs was much lower (3,586.9 MJ ha^{-1}) compared to that with inorganic fertilizers (5,156.3 MJ ha^{-1}). Manures/Fertilizers and diesel inputs dominated the total energy inputs for both the production systems. However, the energy output obtained was higher in the inorganic production system (12,000 MJ) than in organic production system (9,375 MJ). The cost of cultivation of sesame was Rs. 12807 ha^{-1} and Rs. 16413 ha^{-1} under inorganic and organic farming, respectively. Organic sesame yield was about 22 per cent less compared to inorganic production system. At least 40% price premium for organic sesame may be required to offset the higher cost of cultivation and lowyieldsunderorganicproductionsystemcomparedwithinorganicproductionsystemespeciallyduringinitialyears. Renewable energy input utilization was higher (66 %) in organic than in inorganic production systems (13%). Energy efficiency and productivity was higher inorganic than inorganic sesame production systemby12 per cent and10 per cent, respectively. Since, the organic production system is more energy efficient and it is recommended that sesame production under organic farming should be encouraged for environmental and economic sustainability.

The Food and Climate Paradox

T. Tamil Arasu

Adhiparasakthi Agricultural College, G.B Pantnagar, Kalavai, Tamil Nadu 632506

'1.5 C' –Nearly 200 countries shaped their development plans around this number, a target set nearly 7 years ago, which has probably slipped away certainly from our reach. It was decided in the landmark 'Paris climate agreement to control the average rise in temperature under 1.5 C. So, what role does agriculture play specifically in this context? But examining along this context alone would provide us with a parti-pris perspective. The paradox studied here sheds light on the dynamic cause and effect relationship and the delicate interwinding of both agriculture and climate change. Science and Data holds both domains equally responsible for ravaging effects on each other. For example, articles published by FAO states that the global agricultural supply alone is solely responsible for 20 to 30 % of global greenhouse gas emission. But articles from journals such as *Science* states otherwise, ranging from increasing Co2 levels rendering crops with less nutrition thus worsening the already existing plethora of problems regarding 'Nutrient Deficiency' across the globe. Adding to this myriad of problems is high intake of poisonous elements such as Arsenic and Selenium by major crops such as paddy and wheat. From the data gathered so far one could say with conviction the more we intensify agriculture by conventional means the more it is going to backfire the operation itself, just like a 'Paradox'.

***Keywords**: Global Warming, Greenhouse gas emission, Agricultural supply chain, Nutrient Deficiency.*

Availability and accessibility of Science Laboratories, Computer and Internet Facilities in High Schools- An Analytical Study in Samastipur District of Bihar

Asha Rani*, Dr Arunima Kumari
Department of Extension Education and communication Management, Dr Rajendra Prashad Central Agricultural University, Pusa, Bihar-848125

The study was conducted in purposively selected in Samastipur district as it is near by Dr Rajendra prashad central agriculture university. There are 20 blocks in Samastipur district, out of which two block's were selected randomly for the study namely; Pusa and Kalyanpur. From Pusa block, two school's were selected so total 60 respondent's were selected and from Kalyanpur, total 30 respondents were selected by stratified random sampling technique. The total sample comprised of 90 respondents which included 75 students and 15 teachers. Data was collected through teachers and students by well structured interview method and "Semi-Structure interview method"; schedule from the 90 respondents. Smart phone was used by 6.7% (5) of the students. All the teachers used laptop, smart phone, Google meet and power point respectively. 84% (63) of the students were having experience in computer and internet. 73.3% (11) of the teachers were having experience in computer and internet. More than 6 months of ICT training was acquired by 38.7% and 20% of the students and teachers respectively. Positive and uncertain attitude towards internet was reported among 93.3% and 6.7% of the teachers respectively. The most important constraint was lack of time for usage of lab as well as more students &less labs followed by access to labs for limited time as well as access to computer & internet for limited time. The most common reason for constraint among teachers was lack of awareness among teachers about benefits of laboratories as well as lack of awareness among teachers about benefits of computer & internet usage facilities. Age, family income, facilities in school and experience in computer & internet were found to be negatively correlated with constraints faced during usage of ICT tools.

Once the staff and students are able to use ICT technologies effectively, the teaching, learning and research activities in the university and college will be made easier for the university and college community. ICT usage will facilitate development since there will be free flow of information.

IAAHAS/AB/2023/437

Evaluation of the fungal activity of *Beauveria bassiana* against root-knot nematode, *Meloidogyne incognita*

Gunjan[1], Neeta Gaur[2], Renu Pandey[3] and Satya Kumar[4]

[1,2,3] Department of Entomology, College of Agriculture, G. B Pant University of Agriculture and Technology, Pantnagar- 263145 (U. S. Nagar, Uttarakhand)

[4] Department of Plant Pathology, College of Agriculture, G. B Pant University of Agriculture and Technology, Pantnagar- 263145 (U. S. Nagar, Uttarakhand)

Root-knot nematodes (*Meloidogyne* spp.) are sedentary endoparasites that cause severe economic losses to agricultural and *horticultural plant* globally. This study was conducted to determine the nematicidal potential of *Beauveria bassiana* against *M. incognita*. In this study, nematicidal activity of *B. bassiana* was investigated on survival of second stage juveniles of*M. incognita* using four culture filtrate concentrations (0.5%, 1%, 2% and 3%). In the treatments, 1 ml of culture filtrate mixed and 1ml of nematode suspension (100 juvenile) were transferred to 6 mm petri dishes. The dead nematodes were counted under a light microscope after 24 to 72 hour and their mortality rate (%) were calculated. The per cent mortality was proportional to the concentration of culture filtrate and the duration of exposure period. It was determined that the higher concentration of culture filtrate of *B. bassiana* reached 85% mortality rate on *M. incognita* after 72 hours. Finally, it is concluded that the results demonstrate the potential of the *B. bassiana* as biocontrol agents against the root-knot nematode *M. incognita.*

Keywords: *Beauveria bassiana, Meloidogyne incognita, Nematicidal activity and Juveniles.*

Harnessing seed priming technique to alleviate heat stress impacts on seedling stage of lentil

S Poomani, Sangita Yadav, Shiv Kumar Yadav
Division of Seed Science and Technology, ICAR-IARI, New Delhi – 110012

Climate change is anticipated to significantly contribute to food insecurity in the upcoming years, by placing numerous stresses on agricultural production. The global average temperature gradually increases year by year that disrupt plant growth and development process. Seedling stage is susceptible to any kind of stress as it is young and delicate. Being rabi season pulse crop, lentil is vulnerable to alarming heat stress. Due to the fact that heat stress hinders seed germination and retards seedling growth, there is a necessity of resilient technique to counteract the negative impacts. Beat the heat by the heat – is an interesting idea where temperature treatment is practiced to mitigate the detrimental consequences wrought by heat stress. In this investigation, how thermo priming of lentil seeds alleviate heat stress impacts is studied. For this, two lentil varieties namely IPL 316 and L 4147 were used. Thermo priming was practiced by incubating lentil seeds at 32^{o}C for the duration of 24 h. Heat stress induced by keeping the seeds at 30^{o}C for 16 h and 20^{o}C for 8 h alternatively during germination phase. Manifestly, heat stress severely narrowed down lentil seed germination and affected the seedling development. Impacts were more in L 4147 as compared to IPL 316 variety. Heat stress caused notable reduction in germination, seedling length, seedling dry weight, seedling vigour, membrane stability index and chlorophyll content. However, thermo primed seeds registered improvement in those attributes over unprimed seeds even under heat stress. Reactive oxygen species and malondialdehyde were accumulated more in heat stress affected lentil seedlings. Thermo priming upregulated antioxidant activities which ultimately diminished the reactive oxygen species and lipid peroxidation thereby improved the membrane integrity of seedlings. Altogether, seedlings produced from thermo primed seeds performed well than stressed seedlings. Therefore, thermo priming of seeds can be utilized as a new technique to cope the ill effects caused by heat stress at seedling phase of lentil.

IAAHAS/AB/2023/439

Toxicity and Fumigant Effect of Various Phytochemicals at Different Heights against Cigarette Beetle, *Lasioderma serricorne* (Fabricius) (Coleoptera: Anobiidae)

Nischala. A[1], S. Jeyarajan Nelson[2], V. Balasubramani[3], V. P. Sathanakrishnan[4], A. Lakshmanan[5] and K. Rajamani[6]

[1]Research Scholar, [2]Professor,
Department of Agricultural Entomology, TNAU, Coimbatore - 641003, India
[3]Professor (Agrl. Entomology), Dept. of Plant Biotechnology,
[4]Assistant Professor (Organic Chemistry), Dept. of Plant Biotechnology,
[5]Professor and Head, Dept. of Nano Science and Technology,
[6]Professor and Head, Dept. of Floriculture and Landscaping,
TNAU, Coimbatore - 641 003, India

Experiments were conducted to study the toxicity and fumigant effect of various phytochemicals *viz.*, citral, β-citronellol, trans-cinnamaldehyde, eucalyptol, geraniol, β-myrecene and thymol for the sustainable management of cigarette beetle, *Lasioderma serricorne* (Fabricius) (Coleoptera: Anobiidae). The contact and fumigant toxicity of different phytochemicals against the cigarette beetle, in terms of survival of grubs and adults of *L. serricorne* was concentration dependent. The egg stage was the most tolerant stage with no mortality when tested for both contact and fumigant toxicity of phytochemicals. Topical application of trans-cinnamaldehyde exhibited least LC_{50} value, 0.87 nL/adult while citral exhibited highest LC_{50} value, 1.45 nL/adult. Toxicity assays with trans-cinnamaldehyde on 90-mm-diameter Pertidishes showed least LC_{50} value, 9.15 µl/cm^2 and β-myrecene exhibited highest LC_{50} value, 40.68 µl/cm^2 when tested against the adults of cigarette beetle within 48 h assay period. Fumigant effect of trans-cinnamaldehyde was more with least LC_{50} value, 8.28 µl/500 ml of air and highest LC_{50} value, 64.31 µl/500 ml of air was exhibited by geraniol when tested against adults of cigarette beetle. The fumigant effect of different phytochemicals at 5 per cent

concentration at two different heights (5 cm and 15 cm) against cigarette beetle adults was studied. Results revealed that trans-cinnamaldehyde exhibited highest mortality (56.67%) followed by β-myrecene (30%) at 5 cm for 48 h of exposure but showed very less mortality (11.67% and 6.67% respectively) at 15 cm height when the phytochemicals were impregnated on a filter paper disc and placed at the bottom of the jar. But interestingly, trans-cinnamaldehyde exhibited strong fumigant toxicity with 68.33 and 61.67 per cent mortality followed by β– myrecene with 45.00 and 55.00 per cent mortality at 5 cm and 15 cm height, respectively when treatments imposed on 7 cm diameter filter paper discs and placed at the top of the jar under the cap exposed for 48 h which revealed the gravitropic dispersion of phytochemicals due to their high densities and molecular weights.

Keywords: *Contact toxicity, Fumigant toxicity, Toxicity assays, Cigarette beetle, Phytochemicals, citral, β-citronellol, trans-cinnamaldehyde, eucalyptol, geraniol, β-myrecene and thymol.*

IAAHAS/AB/2023/440

Tropicalization of cool season vegetable crop

Yogananda M[1] and M N Rudra Gouda[2]

[1]PhD Scholar, Division of Vegetable Science, ICAR-IARI, New Delhi-110012

The importance of vegetable in human's diet is well known since time immemorial as they supply all main components of human diet. India is second largest producer of vegetable in the world after China with production of 204.61 MT (GOI, 2020-22). The major share area and production is contributed by tropical vegetables. Cool season vegetables are temperature sensitive and cultivation of these crops in India are restricted to temperate regions like hilly tracts. Nowadays popularity and demand of cool season vegetables are increasing due to its nutritive values. This leads to extension of cultivation of these vegetables to plain areas also. The temperature experienced in the plains are not suitable for cultivation of cool season vegetables and this leads to many physiological disorders. So, tropicalization of cool season vegetables is indeed,

it has three main stages i.e., development of heat tolerant varieties and hybrids, standardization of cultivation practices and popularization. To develop heat tolerant varieties adoption of efficient screening procedures, identification of key traits in diverse donor or tolerant lines and understanding their inheritance and molecular genetics is important. Heat tolerance is a quantitative trait use of appropriate breeding methods is critically important. Both conventional and biotechnological approaches can be applied effectively to develop stable tropical variety or hybrid from genetic stock. Different agronomic practices like seed rate, space planting, time of sowing, rate of nutrient application, irrigation scheduling etc. need to be standardized for different agroclimatic zones of India. Finally, popularization of variety/hybrids can be done via different central and state government programmes. Cultivation of thermotolerant, high yielding and biofortified cool season vegetables eventually double the farmers income and improves the nutritional security of our country.

Keywords: *Heat tolerance, quantitative trait, breeding methods, biotechnological approaches, nutritional security*

IAAHAS/AB/2023/441

DUS-based morphological characterization of fruit characters in several watermelon genotypes

Uday Singh and Sanjay Kumar
Department of Vegetable Science, Chaudhary Charan Singh Haryana Agricultural University, Hisar (Haryana)

The research involved twenty-one watermelon genotypes in a randomized block design with three replications at the Research Farm of the Department of Vegetable Science, Chaudhary Charan Singh Haryana Agricultural University, Hisar during the *summer*, 2021. Considerable genetic variation for several morphological and fruit characteristics has been documented in various parts of India. Morphological characteristics are important for characterizing genotypes against highly heritable and stable

traits. The morphological characterization was done as per DUS guidelines developed for watermelon. The objective of germplasm characterization was to check the occurrence of qualitative characters, which assist in the identification of a particular genotype, then that particular genotype can be used in improvement programme. Data were collected on morphological characters of watermelon which include fruit shape, fruit rind color, fruit grooves, fruit stripes and fruit flesh color. The results revealed that the vast variation was observed in fruit characters especially fruit rind color, fruit stripes, fruit shape and fruit flesh color among the genotypes for various characters studied.

Keywords: *Morphological characters, DUS, watermelon, fruit*

IAAHAS/AB/2023/442

Value Addition of Fruit Crops

Rohit Kumar[1], Sandeep Gautam[2] and Harshit Mishra[3]

[1]Research Scholar, Post Harvest Technology, Banda University of Agriculture & Technology, Banda (U.P.), India-210001

[2,3] Department of Agri. Economics, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P)-224229

Fruits are the main food of human diet, the changing weather conditions of the country create a suitable environment for the cultivation of various fruits, as its production is increasing all over the world. Nutritionists recommend that fruits should be an important part of the daily diet. The colour, versatile aroma and taste of different fruits make them delicious and refresh the mind and body. A significant portion of the fruit produced is lost or wasted due to poor post-harvest handling. Although the fruit is known for its high nutritional value, it is underutilized and only available for a short time. Therefore, processing fruits into value-added products is one of the strategies to reduce postharvest losses and promote fruit consumption. In this business of processing fruit crops into various products, consumer demand is good because of their nutritional and medicinal value; a longer shelf life allows consumers to enjoy them year-round across the country. Increasing the value of the initial crop helps the farmer not only to overcome damage and losses, but also to obtain high profits thanks to the newly added technology. It

provides consumers with easy-to-use and safe food and promotes diversification and marketing of agriculture by creating an effective link between consumers and farmers, as well as making agricultural products more exportable and providing job opportunities to the rural masses, increases value. Increased export demand. Products and help grow the country's economy.

Keywords: *Fruit crops, post-harvest management, processing, Value addition, shelf life.*

IAAHAS/AB/2023/443

Phytoremediation-A sustainable approach to clean the contaminated environment

Vani D[a], Dinesh VP[a]

[a] School of Agricultural Science, Department of Agricultural Nanotechnology, Dhanalakshmi Srinivasan University, Tiruchirappalli,621112, India

Sustainable remediation of environmental pollution has led to the search in many countries. Contaminant can spread in the environment via air, water and soil. Natural resources facing a major challenge in current situation. Natural resource is an indispensable part of the all living ecosystem. Environment contamination occurs mainly due to industrialisation, urbanisation, intensive agriculture, heavy metals and house hold waste water. A definite need to develop an economic and green technology to remediate polluted environment. Phytoremediation is an eco-friendly and green remediation technology to clean the pollutant. The phytoremediation is a natural process of plants through translocation, evapotranspiration and bio accumulation thus degrading pollutant to clean the contaminated water. The plants used for phytoremediation process are selected based on the growth rate, biomass, their ability to tolerant in contaminated environment. Plants like ornamental plant, artimoney plant, giant cane, broadleaf cattail, vetiver, water hyacinth, water lettuce, duck weed etc., were clean the contaminant like nitrate, arcenic, lead and other pollutant from contaminated environment. The

uptake, accumulation and degradation of contaminants vary from plant to plant. This mini review of phytoremediation process achieves the goal of remediation of contaminated environment. To know, Phyto remediation metabolic process methods need further research. Plants especially different species of wild aquatic weeds are found more tolerant and they can used for phytoremediation process and to stop the entry of contaminants in to the food web.

Keywords: *Phytoremediation, Tollerance, uptake, aquatic weed, Eco-friendly*

IAAHAS/AB/2023/444

PLINAZOLIN® Technology - A Novel Chemistry for Crop Pest Management

Nawab Ali[1], Pazhanisamy N[2], Vinod Shivrain[3] and Alexandre Silva[4]

[1]Head Technical Support India, Syngenta India Pvt Ltd, Pune,

[2]Insecticide Lead, Product Biology, APAC, Syngenta India Pvt Ltd, Pune

[3]Head India CP Development, Syngenta India Pvt Ltd, Pune

[4]Head, Technical Support APAC, Syngenta Asia Pacific Pte Ltd, Singapore

PLINAZOLIN® technology is a novel proprietary isoxazoline insecticide belonging to the newly identified IRAC mode of action Group 30. It offers broad spectrum control of insect and mite pests, to increase crop productivity in an environmentally sustainable and responsible way. Key features of the compound are its excellent rain-resistant formulations and good UV stability which contribute to a reliable residual effect on crop pests. PLINAZOLIN® technology works in the insect nervous system to block an important mechanism for controlling nerve to muscle communication. The target site in the nervous system is in the GABA receptor (GABA stands for Gamma-aminobutyric acid). These receptors control how easily electrical signals can pass from one nerve cell to another. When PLINAZOLIN® technology stops them from working, the activity in the nervous system goes into overload and this results in muscular cramps and paralysis of the insect pest, so that it cannot move or feed properly. Eventually, the insect will die in this state.

Pests and diseases are a continually evolving threat, and the changing environment makes it even harder for farmers to grow their crops. Novel mode of Action (new IRAC Group 30), Long residual effect, Broad spectrum on pests,

Reliable and high level of pest control, Weather resistant formulations (both UV stability and resists washing off from rain are the key features of the PLINAZOLIN® technology that will be a right solution to the hard to manage insect pests. PLINAZOLIN® technology will deliver unprecedented insect control on over 60 pest species such as stinkbugs, mites, thrips, caterpillars, flies, and beetles. It will be commercialized in more than 40 countries and in over 100 crops, including soybean, corn, rice, coffee, cotton, and a wide range of fruits and vegetables. The technology also has the potential to be used in forestry and professional pest management programs, as well, as a seed treatment application. It is a step-change on insect control. Bottom line, the key benefits of PLINAZOLIN® technology are performance, flexibility, and innovation.

IAAHAS/AB/2023/445

Transcriptome and Pheno-Biochemical Profiling Reveals Differential Responses of Rice Cultivars at Panicle initiation Stage Heat Stress

Pooja Kathare
Ph.D. Research scholar, Indira Gandhi Krishi Vishwavidyalaya, Raipur

Heat stress severely affects the growth and development of rice, especially at the reproductive stage, which results in disturbed metabolic processes, reduced seed-set/grain filling, deteriorated grain quality, declined productivity, and lower yield. Despite the recent advances in understanding the responses of rice to heat stress, there is a need to comprehensively integrate the morpho-pheno-biochemical studies with the molecular responses/differential expression of genes and decipher the underlying pathways that regulate the adaptability of rice at various heat-sensitive growth stages. Our comparative analysis of immature panicle from a heat-tolerant (Nagina 22) and a heat-sensitive (MTU-1010) rice cultivar grown under control and heat stress (treatment, imposed upto 42^0 C at the panicle initiation stage) conditions unraveled some novel stress-responsive genes/pathways

responsible for panicle initiation stage heat stress tolerance. The results revealed a more important role of upregulated six genes in the panicle and flag leaves of almost all the ten genotypes. We observed almost all the six genes to be upregulated in the panicle and flag leaves of IG-333 over N 22 under the stress which is found to be in correlation with pheno-biochemical (MSI, pollen fertility, spikelet fertility, MDA, Proline) profiling. In addition, Semi-quantitative RT-PCR analysis confirmed differential expression patterns of the DEGs. These genes/pathways associated with the panicle initiation-stage heat tolerance might provide an important source of molecular markers for genetic manipulation of rice for enhanced heat tolerance.

IAAHAS/AB/2023/446

Panchagavya: A Boon for Organic Farming

P. Himavarsha[1*], Gummadala.Kasirao[1], Shivsingh Tomar[2]

[1*]Teaching Associate, GD Goenka University, Sohna

Panchagavya is a natural compound made from five different cow by-products, including cow dung, cow urine, cow milk, cow ghee, and cow curd. It may play a function in fostering growth and supplying immunity to the plant system, conferring resistance to pests and diseases. Panchagavya contains a variety of nutrients, including macronutrients like N, P, and K and micronutrients like various amino acids, vitamins, and growth regulators like Auxins and Gibberellins, as well as advantageous microorganisms like pseudomonas, azatobacter, and phosphor bacteria, among others, that are necessary for plant growth and development. Growing interest in crop production using environmentally friendly products that are quickly biodegradable, do not leave any detrimental toxic residues, and conserve nature has been sparked by both the increased concern for environmental safety and the global demand for pesticide residue-free food. In order to grow food crops free of chemical residue, it is therefore vital to employ natural materials like Panchagavya. As a result, Panchagavya can be very important in organic farming.

Keywords: *Organic farming, Soil health, Environmental friendly, Foliar nutrition, Microbial activity.*

Pre-treatment of Cotton (*Gossypium sp.*) fibres in Textile industry

Abhimanyu Kumar[1*], Srijeeta Majumder[1], and D.K. Janghel[1]

[1]School of Agricultural Sciences, GD Goenka University, Gurgaon-122103, Haryana, India

Cotton is the most widely used natural cellulosic fibre in the textile industry. Cotton fibres gets impure in natural growth conditions, during transportation and processing in the spinning and weaving industry, as a result it becomes difficult in the chemical processing of cotton fibres. The purpose of pre-treatment is to remove added and natural impurities from the fabric depends on the nature of the fibre. The added impurities present in the cotton fabric are dust, oil stains and size. The fabric obtained after weaving is known as grey fabric, contains both natural as well as added impurities. In order to make the fabric suitable for dyeing and printing it is essential to remove the impurities present in grey fabric. The processes involved in the removal of these impurities are known as preparatory processes or fabric pre-treatment. The preparatory processes, include singeing, de-sizing, scouring, bleaching, mercerization, and biopolishing, are necessary for their diverse uses and importance's in subsequent processes. Conventional preparatory processes utilize higher consumption of energy, water, and chemicals, affecting the environment and increasing the cost of manufacturing. Therefore, alternative processes of cleaner production such as enzymatic treatments, integrated processing, electrochemical processes, and plasma technology, are getting more attention to conserve water, and energy, and reduce chemical usage to decrease the effluent load. However, only a few of them, such as enzymatic processes, have been widely accepted at an industrial scale. Therefore, based on the chemical nature of added and natural impurities in cotton fibres are pre-treated with efficient pre-treatment methods to use the fibres in block printing, which is thoroughly discussed along with the chemistry involved in the removal of these impurities

Keywords: *Cotton, Pre-treatment, Preparatory, Enzymatic processes, De-sizing, Plasma*

Bacopa monnieri (L.) Wettst: A Study of its Therapeutic Properties, Applications, and Biological Activity

***Chhaya Singh, Dr. Rishi Kumar Saxena, Dr. Pawan Tripathi**
Research Scholar, Department of Life Science, Singhania University,
Pacheri Bari, Jhunjhunu, Rajasthan
Associate Professor (Microbiology), Department of microbiology and biochemistry,
Bundelkhand University, Jhansi, Uttar Pradesh,
Associate Professor, Singhania University, Pacheribari, Jhunjhunu, Rajasthan, India

Bacopa monnieri (BM), a member of the family Scrophulariaceae, is a perennial creeping plant that thrives in moist, shady places in India. The Ayurveda literature makes special reference to BM, also known as Brahmi, for its usage in a variety of mental ailments, including poor cognitive ability, depression, lack of concentration and anxiety. The warm and damp places of the planet were where you could get *Bacopa monniera.* There is evidence that it could be used to treat mental disease and epilepsy, according to studies. In traditional medicine, it was commonly used to alleviate a wide range of symptoms. Herpestine (an alkaloid), bacosides, nicotinine, brahmine, triterpenoid saponins, betulinic acid, pseudojujubogenin glycoside, saponins A, B, and C, stigmastanol (a sterol), D-mannitol (a sugar), stigmasterol (a sterol), and -sitosterol were all found in *Bacopa monniera.* Several pharmacological properties, such as antioxidant, antibacterial, central nervous system effects, endocrine, cardiovascular, anti-inflammatory, gastrointestinal, analgesic, and smooth muscle relaxant, have been attributed to *Bacopa monniera* in scientific investigations. These herbs improve memory and learning by activating different pathways, which may help alleviate Alzheimer's disease symptoms and in the early stages of the disease. In this overview, we looked at the chemical make-up, applications, and pharmacological effects of *Bacopa monniera*.

Keywords: *Bacopa monnieri, Alzheimer's disease, dementia, Phytochemistry, Bacosides.*

IAAHAS/AB/2023/449

Characterization of rhizobia isolated from soybean, identifying and evaluating the effectiveness of isolated rhizobia for inoculants preparation by checking its PGPR activities

Anisha Shrivastava* and Diptimayee Dash
Department of Agricultural Microbiology, College of Agriculture,
Indira Gandhi Krishi VishwaVidyalaya, Raipur Chhattisgarh-492012

A study was conducted to evaluate rhizobia isolated from soybean *Glycine max* (L.). Its identification, morphological, physiological and biochemical characterization is done for developing inoculants for increasing PGPR activities of crop. Total 15 soil samples are taken and used for isolation of rhizobium in which 12 are fast growing isolates. Soil samples were collected from Department of Genetics and Plant Breeding, IGKV, Raipur. In Gram staining reaction all the 15 isolates were found Gram-negative and circular shaped. Biochemical characterization of rhizobium strains showed that all the 15 isolates have positive reaction with urease test, Starch utilization test was negative with all isolates except for NRC-138, MACS-1493, RSC-1103, PS1611, RSC-1107. Catalase test was found positive for all isolates except NRC-138, PS1611, samec as oxidase test also found positive for all except NRC-138, MACS-1493, NRC-137. Stress tolerance test was conducted, isolates NRCSL-1, RKS-18 show fast growth in high temperature rest show moderate to low growth. In ph test rhizobium isolates show positive result in low ph are NRC-138, RSC-1107, NRC-137 NRC-130, NRCSL-1, JS-9752, SKFPS-11 and salt test RKS-18 show the best growth NRCSL-1, JS-9752, SKFPS-11, NRC-136 show high to moderate growth. Screened down isolates were forwarded for drought and salinity tolerance test.

IAAHAS/AB/2023/450

Detection of Seed Borne Fungi of Isabgol (*Plantago ovata)* by standard blotter methods

Sajjan Choudhary[1*] and R. P. Ghasolia[1]
Department of Plant Pathology, SKN College of Agriculture, Jobner (Raj.)

The experiments were conducted at Department of Plant Pathology, S.K.N. College of Agriculture, Jobner (Rajasthan). Five samples of blonde psyllium seeds were collected from Barmer, Nagaur, Pali, Jodhpur and Jalore districts of Rajasthan and tested for seed borne fungi. Both Blotter and Agar Plate methods were used to detect the maximum number of control and external seed borne fungi. A total of 5 species of fungi were identified using the two selective methods. The pathogencity of *Alternaria alternata* was studied on psyllium seeds and seedlings.

IAAHAS/AB/2023/451

HEMP: A Potential Crop for Higher Income Generation for Farmers

Nidhi Parmar
PhD Scholar, Department of Family Resource Management, College of Home Science, GBPUAT, Pantnagar Uttarakhand (263145)

Hemp is an extraordinary crop, with enormous social and economic value and contains THC (Tetra Hydro Cannabinol) less than 0.03 percent. *THC* is the primary psychoactive cannabinoid extracted from the cannabis plant and responsible for the *high sensation*. It is used to produce food, textiles, clothing, biodegradable plastics, paper, paint, biofuel, and animal feed, as well as lighting oil. Hemp seeds can be eaten raw, ground into hemp meal, sprouted or made into dried sprout powder. A 100-gram portion of hulled hemp seeds supplies 2,451 kilojoules (586 kilocalories) of food energy. They contain 5 percent

water, 5 percent carbohydrates, 49 percent total fat, and 31 percent protein. The bast fibers can be used to make textiles that are 100 percent hemp and the word "canvas" is derived from the word cannabis. Today hemp is used in a number of consumer goods, including clothing, shoes, accessories, dog collars, and home wares. Hemp also makes for ecofriendly construction when mixed with lime by providing thermal comfort in buildings and thus making buildings energy efficient. Hemp is traditionally grown in hilly region of Uttarakhand, primarily for production of seed and fiber. Uttarakhand is a state where there is scarcity of agricultural land and the land where agriculture activity is done, the crop is majorly destroyed by the wild animals such as wild pigs and monkeys etc. The result is that the land is left barren. So growing Hemp commercially becomes solution for the problem but there is taboo attached to it. For promoting industrial hemp in the state, In December, 2016 Uttarakhand developed a policy under Section 14 of the NDPS (Narcotic Drugs and Psychotropic Substances) Act,1985 for allowing Industrial or horticulture cultivation of the Hemp plant. And in India it is the first state to do so. Due to the absence of indigenous hemp with a THC content of less than 0.3%, production and regulation of Indian hemp are the main problems. Hemp-related misconceptions and a lack of awareness are further obstacles. More research should be encouraged in this direction to make it potential crop for higher income generation for farmers.

IAAHAS/AB/2023/452

Accelerating Crop Improvement *via* Speed Breeding

Nayan Deep*, Devinder Kumar Mehta and Suraj Bhan
Department of Vegetable Science, Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan, HP, India, 173 230

Global food security has become a major issue in the current times, as the human population is growing unceasingly along with the drastic environmental changes, the current rate of improvement of several important crops stands deficient to meet the future food demands. Crop plants in general have extended generation times, which contributes to the slow rate of progress

in the alteration of their genetic structures. Conventional breeding methods require considerable time, space, inputs for selection, and subsequent crossing of desirable plants, which make these methods more cumbersome and time demanding. The duration of the seed-to-seed cycle is one of the crucial bottlenecks in the progress of plant research and breeding. In this context, speed breeding which relies mainly on photoperiod extension, temperature control, and early seed harvest, has the potential to shorten the generation time and attain greater genetic gains, thereby can accelerate the rate of plant improvement. The speed breeding protocols well demonstrated in the case of long-day plants are also being extended to short-day plants to reduce the generation interval time. Flexibility in these protocols allows them to align and integrate with diverse research purposes including population development, genomic selection, phenotyping, and genomic editing. Numerous speed breeding methodologies and their applications have been devised to hasten future crop plant improvement. Though speed breeding has been widely used in plant phenotyping and the pyramiding of multiple traits for the development of new crop varieties, certain challenges and limitations hamper its widespread application across diverse crops. Although, the existing constraints can be resolved by further optimization of the speed breeding protocols for critical food crops and their resourceful integration in plant breeding pipelines.

Keywords: *Speed Breeding, Generation time, Photoperiod, Temperature and Genetic gain*

IAAHAS/AB/2023/453

Agronomic Bio-fortification of Iron and Zinc in Wheat

Dhruvendra Singh Sachan[1], *Shivendra Singh[2] and Bhanu Singh[3]
[1,2]Research Scholar, Dept. of Agronomy,
CSA University of Agriculture and Tech., Kanpur
[3]Research Scholar, Department of Agriculture, Integral University, Lucknow, U.P.

Wheat, like many other cereal grains, is deficient in the critical minerals iron and zinc. Iron and zinc deficiencies affect up to two billion people globally, with the majority of them living in cereal-based countries. Although wheat flour is widely fortified during processing, biofortification is a more appealing and sustainable approach that needs the development of new wheat varieties with innately increased iron and zinc content in their grains. The large difference between the available Zn concentration in wheat grain (20-35 mg kg^{-1}) and the needed Zn concentration for human health (45 mg kg^{-1}) emphasizes the necessity for biofortification. Although there are bottlenecks at the root-shoot barrier and in grain filling, agronomic biofortification is a feasible and cost-effective intervention strategy for mitigating Zn deficiency or malnutrition by increasing Zn concentration and bioavailability in edible parts of cereals with increased yield. Wheat agronomic biofortification using Zinc Foliar or soil + foliar application of Zn salts can enhance Zn content in whole wheat grain by 60 mg kg^{-1}. The Zn-nanocarrier (Zn-Nanoparticles) is more efficient at using Zn than zinc sulphate. Zn remobilization from shoots and continued absorption during wheat grain filling govern grain Zn accumulation. Early foliar Zn treatment enhances Zn transport in the endosperm, which is the major edible grain component. Similarly, through nano iron, Fe content can also be increased. Micronutrient fertilization works best when combined with NPK, organic fertilizers, and better crop types, emphasizing the necessity of integrated soil fertility management. Although genetic biofortification may be more cost efficient in the long term, agronomic biofortification is a quick and effective way to boost micronutrient concentrations in edible agricultural products. Agronomic biofortification of wheat is a very promising way to improve the concentration of micronutrients like iron and zinc in edible parts of crops without compromising yield and is recognized as the cheapest strategy to alleviate hidden hunger worldwide.

Keywords: *Biofortification, foliar, hidden hunger*

Effects of Microplastics on Germination and Growth of Rice Seeds: Ultrastructure, OCT-based and Molecular Biological Characterization

Aradhya Vats, Dr Raju Poddar, Dr Kunal Mukhopadhyay
Department of Bioengineering and Biotechnology,
Birla Institute of Technology, Mesra, Jharkha

It is well known fact that, Microplastics (MPs) are found in every single corner of the earth. However, the impact of microplastics on germination and growth of terrestrial plants is poorly understand. Depending on the components of the growing medium, the presence of MPs in the environment may have a variety of effects on plant growth. This study investigates the effects of different concentrations of PVA (Polyvinyl Alcohol) and PVC (Polyvinyl Chloride) on rice seedling, antioxidant enzyme activity and seed germination using Biospeckle Optical Coherence Tomography (bOCT), a technique that uses to visualize the internal activity of plants. The Presence of MPs significantly reduced the initial stages of internal activity, which was visualised using bOCT. Henceforth, hydroponic experiment was performed to see the effects of different concentrations (50mg, 200mg, 500mg) of MPs on seed germination. As a result, MPs had no significant effect on rice seed germination. However, MPs significantly increased shoot and root length while decreasing antioxidant enzyme activity. The accumulation of both nano and MPs in roots, stems and leaves of rice seedling were detected using FESEM (Field Emission Scanning Electron Microscopy). In conclusion, MPs can be absorbed by rice roots and translocated to aerial parts, and potentially transferring the accumulated MPs to higher trophic levels through the food chain.

IAAHAS/AB/2023/455

Functional response of lady bird beetle *Cheilomenes sexmaculata* (Coleoptera: Coccinellidae) larvae to okra Aphid *Aphis gossypii* of okra in Laboratory condition

S.G. Lonagre*, A.V.Kolhe, and D. B. Undirwade
PhD Scholar, Associate Director Research Zonal Agricultural Research Station,
Professor Head Department of Entomology Dr. PDKV Akola
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola 444104 Maharashtra

The present investigation entitled "Functional response of lady bird beetle *Cheilomenes sexmaculata* (Coleoptera: Coccinellidae) larvae to okra Aphid *Aphis gossypii* of okra in Laboratory condition" conducted during *kharif* season of 2015-16 and 2016-17 at Experimental laboratory of Department of Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The culture of predator and host was collected from the okra as and when required from the experimental field. Study was conducted at constant temperature of 25±1^{0}c with 16L: 8D photoperiod in incubator with 60±5% RH maintained using saturated salt solution of $MgNO_3$. based on Holling's disk equation Predators as above was collected from host crop and starved for 24hrs at 25^{0}c in the incubator in order to standardize their appropriate appetite and their weighed by using microbalance to record initial fresh body weights prior to being introduced individually into 9 to 12 cm diameter petridishes together with 5, 10,20,40,80,120,240 and 360 various aphid densities on excised okra leaves stuck to agar medium. Medium size aphids were selected. One of every two petridishes was placed in large transparent box with saturated salt solution with $MgNO_3$ in small cup. Larvae of lady bird beetle were randomly assigned to various aphid density treatments as above. At each aphid density 5 to 8 replicates was used. At aphid densities of 360 for lady bird beetle larvae was weighed using a micro-balance (accurate to 0.001 mg) to record their initial fresh body weights prior to being introduced into the feeding arenas. Thereafter, the petridishes was checked every 3 hrs after releasing the predator into the petri dishes for up to 24 hrs and the number of aphids

consumed was noted, but the aphids consumed was not replace during the feeding time. *Cheilomenes sexmaculata* shows type II functional response to increasing densities of prey i.e. *Aphis gossypii* at cumulative exposure of 12 and 24 hours to it's prey. The attack rate or searching efficiency for *C. sexmaculata* against *Aphis gossypii* was found to be higher at 12 hrs (0.08) than at 24 hrs (0.06) of exposure as against it at 12 hrs handling time was found to be shorter (0.03) than 24 hrs (0.05) respectively.

IAAHAS/AB/2023/456

Effect of zinc application on yield and other growth parameters in Summer Rice (*Oryza sativa L.*)

Jhutan Debnath
Ph.D. Scholar, Department of Soil Science and Agricultural Chemistry,
Uttar Banga Krishi Vishwavidyalya, Pundibari, Cooch Behar, West Bengal, India

Rice (Oryza sativa L.) is grain of life for more than seventy per cent of the Asian population and the principal food crop for world's poorest and densely populated regions. Zinc is considered as the fourth important yield limiting nutrient in India after nitrogen, phosphorus and potassium respectively. A great number of studies are available in literature on the role of soil and foliar application of Zn fertilizers for correction of Zn deficiency and increasing plant growth and yield. Soils of the Terai alluvial zone are typically deficient in some plant nutrients (B, Zn, P). Keeping above information in view, present investigation was carried out to study the performance of summer rice influenced by zinc nutrition in terai zone of West Bengal during boro season of 2018-2019 and 2019-2020 at Central Research Farm of Uttar Banga Krishi Viswavidyalaya, Pundibari in Cooch Behar district of West Bengal. The experiment was laid out in a randomized block design. All the 14 treatment combinations were replicated thrice. The duration of the variety was 120-125 days. Results revealed that the rice grain yield was significantly higher with T_{10} (100% NPK of RDF + 25 kg ha^{-1} $ZnSO_4$ +ZSB + VAM) which is followed by T_{11} (100%NPK of RDF + 25 kg ha^{-1} $ZnSO_4$ + foliar spray of Zn at maximum tillering and booting stage). Among the nutrient levels tried, treatment receiving 100% NPK of RDF + 25 kg ha^{-1} $ZnSO_4$ +ZSB + VAM recorded highest harvest index and

other growth parameters and treatment receiving 0% N and 100% PK of RDF+ No zinc (control) recorded lowest harvest index and other growth parameters. There was significant variation in yield attributing characteristics of rice under different treatments and such variation was always higher when compared with control treatment.

Keywords: *Rice ecosystems, Zn deficiency, VAM, food security*

IAAHAS/AB/2023/457

Growth-impeding constraints for Farmer Producer Organizations in Rajasthan

Sunita Tevatiya[1]Chubamenla Jamir[2] Sapna Narula[3]

[1] PhD. Scholar at TERI School of Advanced Studies, New Delhi, India

[2] Kanoi Foundation, New Delhi.

[3] School of Management Studies, Nalanda, Bihar

In India, the main challenges in improving the livelihoods of the rural population lie in the declining profitability and risks associated with agriculture and allied activities. The majority of agricultural land holding is owned by small and marginal farmers (85%) with land holding less than 2 Hectares. Ergo, they lose individual bargaining power in the market for their small produce; also farmers are confronted with problems like limited access to services and inputs leading to an increase in transaction cost and reduced participation in the market. In such a conundrum situation agglomeration of their produce on a mass scale could be a solution. Hence, the Government of India introduced the Farmer Producer Organization (FPO) which has emerged as a new agri-business model benefiting farmers across India. FPOs have significantly increased in number in India but only 20 to 30% are functioning well. Thus, this study was carried out to identify the growth impeding critical factors for the FPOs in Rajasthan, one of the states with a large number of FPOs. The data were collected from 300 randomly selected members of three FPOs of the Sriganganagar, Bikaner, and Hanumangarh districts of Rajasthan through personal interviews and focus group discussions. Garrett's ranking method was used for identifying hindering factors for the growth of FPOs. It was found that FPOs were facing both off-farm and on-farm constraints

related to operational, technical, competition, conflict, marketing, supporting institutions, and also labour and economic. Thus, it's important to manage these limitations so that the organizations are not adversely impacted and the FPO may grow sustainably and reach its full potential. For up scaling and smooth functioning of FPO it is essential to take into account these barriers at a priority level by the Government officials and policy makers.

IAAHAS/AB/2023/458

Relationship between Knowledge, Adoption and Attitude of Farmers towards Oilseed Production Technology with their Personal Attributes

Amit Kumar[1] and L.S. Bareth[2]

[1]Assistant Prof., Faculty of Agricultural Sciences, SGT University, Gurugram, India

[2]Retd. Prof. (Ext. Edu.), SKRAU, Bikaner, Rajasthan, India

National Mission on Oilseed and Oil palm (NMOOP) for oilseeds & oil palm development program in India was started in July 2014 for increase in production and productivity of oilseed crops and oil palm through bringing in fallow areas under oilseed crops and diversification of area from low yielding cereals. It aims to augment the availability of vegetable oils and to reduce the import of edible oils by increasing the production and productivity of oilseeds from average production of 29.79 million tonnes and productivity of 1122 kg/ha during 12th plan period to 36.10 million tonnes and 1290 kg/ha, respectively by end of 2019-20. The present study was conducted in the Bikaner district of Rajasthan. Bikaner district has been selected purposely because of Bikaner district has highest production of oilseeds (472026 tones) among all districts of the state. Further, four panchayat samities namely Lunkaransar, Khajuwala, Bikaner and Sri Dungargarh were selected based on highest area and production of oilseed crops and NMOOP scheme was also operated in these panchayat samities. Two villages from each selected panchayat samiti were selected randomly where NMOOP activities have been

conducted. From each village 20 beneficiaries and the equal number of non-beneficiary farmers were selected randomly. In total there were 160 beneficiary and 160 non-beneficiary oilseed growers, Hence, a total of 320 oilseed growers. Data were collected from selected respondents by employing a personal interview technique. To arrive at specific inferences, the Multiple Linear Regression (MLR) is a method used to model the linear relationship between a dependent variable and one or more independent variables. It was found that personal attributes *viz.,* education, size of land holding and social participation were found positively and significantly associated with the knowledge, adoption and attitude about oilseed interventions by the respondents. However, age, caste, family type and family size were found non-significantly associated with the knowledge, adoption and attitude of oilseed interventions by the respondents.

Keywords: *Adoption, attitude, oilseed, technology, knowledge*

IAAHAS/AB/2023/459

Influence of Microbial Consortia in Combination with Humic Acid on Growth and Yield of Tomato (*Lycopersicon esculentum*)

B. Bavithra[1]* and S. Sundaravarthan[2]

[1]*Assistant Professor, Department of Horticulture, Sri Manakula Vinayagar Engineering College, School of Agricultural Sciences, Puducherry, India

[2]Registrar, National Institute of Technology, Puducherry

A field experiment was conducted in the Department of Agricultural Microbiology, PAJANCOA&RI, Karaikal (U.T. of Puducherry) to study the Effect of Humic Acid & Microbial Consortia on Growth & Yield of Tomato. Excessive application of chemical fertilizers may affect soil health and sustainable productivity and has increasing concern about health associated with their

extensive use. Humic Acid is a relatively stable product of organic matter decomposition and it is an alternate way of Organic crop production to yield more. We examined the effect of Humic acid @ 2ml&4ml concentration along with the combination of microbial consortia @2ml concentration (Azospirillum, *Pseudomonas fluorescens* & PPFM) on Tomato. Application of Humic acid@2ml along with the microbial consortia had more beneficial effect on shoot length, root length, biomass, plant height, LAI, and Yield in tomato. This is due to microbial action along with the support of humus in soil which enhances the plant growth.

Keywords: *Microbial consortia, Humic Acid, Growth, Yield, Organic matter, Tomato*

IAAHAS/AB/2023/460

Effect of Nutrient Management on plant growth and canopy spread in pomegranate cv. Bhagwa

[1]*Santosh Kumari, [2]Satpal Baloda, [1]Rajesh Mor, [2]M. L. Jat

[1]Department of Horticulture, College of Horticulture, Maharana Pratap Horticultural University, Karnal-132001, Haryana, India

[2]Department of Horticulture, College of Agriculture, Chaudhary Charan Singh Haryana Agricultural University, Hisar- 125004, Haryana, India

A field experiment was conducted at experimental site of Department of Horticulture, Chaudhary Charan Singh Haryana Agricultural University, Hisar during the year 2020-21 and 2021-22 to scrutinize the effect of nutrient management on plant growth and canopy spread in pomegranate. A randomised complete block strategy was used to maintain 22 treatments with 3 replications. The results showed that almost all treatment combinations that included the recommended dose of fertiliser (RDF), such as 1 kg of urea, 1.5 kg of SSP, and 400 g of potash plant, along with the application of both organic and inorganic sources of nutrients, had a significant impact on the plant growth and canopy spread to control (T1). T21-RDF 100% + FYM + Azotobacter + PSB application significantly increased plant growth and canopy spread compared

to other treatments. Therefore, soil application of RDF 100% + FYM (30kg/tree) + *Azotobacter* (150ml/l/plant) + PSB (150ml/l/plant) can obtain the best results in terms of better plant growth and canopy spread.

Keywords: *RDF, FYM, pomegranate, biofertilizer, Azotobacter*

IAAHAS/AB/2023/461

Farmers' perception and factors influencing climate change adaptation strategies: Evidence from Himachal Pradesh

Deepali Chadha[1], Sanjai Kumar Srivastava[2] and Somya Misra[3]
[1]Assistant Professor, Guru Kashi University, Talwandi Sabo, Bathinda-151001, Punjab
[2]Professor, G B Pant University of Agriculture and Technology, Pantnagar-263145, Uttarakhand
[3]Research Scholar, G B Pant University of Agriculture and Technology, Pantnagar-263145, Uttarakhand

Climate change is expected to have a major impact on agricultural conditions, food security, and food supply. Because of the rise in global temperatures, climate change has affected rainfall patterns and season timings in recent years. Successful adaptations may be viewed as the actions that decrease vulnerability and increase resilience in response to a range of immediate needs, risks, and aspirations. Farmers, at their own level, employ different strategies to combat the adverse effects of climate change. The indigenous knowledge of the farmers is borne out of continuous experimentation, innovation, and adaptation, blending many knowledge systems to solve local problems. Hence, a better understanding of their perceptions and ongoing adaptation measures and the factors influencing their adoption is highly important in crafting policies and programs. The present study involves the identification of different management strategies employed by the farmers across different altitudes by recording multiple responses per head. Further, a logistic regression model has been employed to identify the different factors influencing the adoption of climate change strategies in the study area. Overall, it has been observed that crop diversification is the most widely used farm management strategy in the state, with the highest percentage of farmers practising it in the high hills. On the other hand,

liquidating the accumulated savings is the primary income management strategy followed by the majority of the farmers in the study area. However, age of the respondent, farming experience, family size, total owned land holding, livestock owned, and availability of irrigation facilities are identified as the major factors influencing the adoption of climate change strategies in the study area.

Keywords: *Climate change, adaptation strategies, farmers.*

IAAHAS/AB/2023/462

Evaluation of the effects of edible coatings on the quality and shelf life of strawberry (*Fragaria* x *ananassa*) stored at room temperature

Vishal Vijayvargiya[1] and Gurpreet Singh[2*]
[1]Research Scholar in Horticulture, [2*]Associate Professor
Department of Horticulture, School of Agriculture,
Lovely Professional University, Phagwara

The current study, titled "Impact of edible coatings for extending shelf life and quality in strawberry (*Fragaria* x *ananassa*) under ambient storage circumstances," was done at the School of Agriculture, Lovely Professional University, Punjab, from 2022 to 2023. To determine the effect of edible coatings on the shelf life of strawberry (*Fragaria* x *ananassa*), an experiment was organized using a Completely Randomized Design with three replicates and nine edible coating treatments, including Aloe vera gel (50 %, 100 %), Calcium chloride (2% 4%), Chitosan (1%, 2%), Guar gum (1%, 2 %), and Control (untreated) stored at room temperature. At two-day intervals, physical and quality parameter data were evaluated. On the fourth day, at the end of storage, fruits treated with 2% Guar gum had significantly lower PLW (7.17%), fruit firmness (1.53 kg cm-2), spoilage (16.57%), minimum TSS (6.36 °Brix), total sugars (4.93%), pH (3.70), optimum titratable acidity (1.07%), and ascorbic acid content (28.74 mg 100g-1 pulp). Also having the longest shelf life

(4.62 days) were fruits treated with 2% Guar gum and 1% Chitosan (4.34 days). In India, strawberries are an early and lucrative fruit crop. Using coating technology to preserve the quality of selected strawberries and extend their shelf life has shown to be a good strategy for increasing strawberry cultivation and yield in India.

Keywords: *Strawberry, edible coating, Cacl2, Chitosan, Aloe vera gel, and Guar gum.*

IAAHAS/AB/2023/463

Custom Hiring Center: A sustainable approach of farm mechanization to enhance productivity and income

[1]Mhatre C.S., [2]Nayak J., [3]Pati M., [4]Rout P.K. and [5]Saha G.
[1]Scientist, [2]Pr. Scientist, [3]SRF, [4]Sr. Technical Assistant, [5]Technical Officer
ICAR-Central Institute for Women in Agriculture, Bhubaneswar Odisha India- 751003

Rural women are an integral part of Indian agriculture and allied sector. But women have lower level in adoption of technological innovations and still work with indigenous technology. A study was conducted to document the involvement of women in farming activities in Puri, district of Odisha. It showed that though there were few tractors and advance machinery available in the village, still major agricultural operations were also performed by manual tools such as spade, fowda, khurpi, desi plough, sickle etc., as the machinery was limited in number. Maximum numbers of respondent farmers (men & women) were in landless, marginal, categories of land holdings; hence they were not able to afford machines of their own, leading to heavy losses, especially during the short harvesting window in the face of changing climate. But it is known that women farmers, marginal and small farmers even if they couldn't afford machines themselves, could not avoid its usage for certain agricultural operations. The custom hiring centers (CHC) make farm machinery available to women, small and marginal farmers at affordable rent. It adheres to timeliness of the operations through matching machinery. Thus, leads to increased productivity and cropping intensity by making ample power

available at farm level. The CHC spread the ownership cost over larger area, thus making purchase viable for the farmers. Better matching equipments are made available to the farmers. Women can reap benefits of mechanization by establishing CHC in Women Self Help Group (WSHG) mode. As the SHG is already registered group, hence simple to manage decision making is harmonious, granting of loan, renting a place is comparatively easy. A CHC will not only reduce drudgery and save time but also generate an alternate source of income of women in SHG. A CHC in SHG mode is sustainable because a part of income generated through CHC will be reinvested for repair and maintenance of existing tools and purchase of new need-based tools. Thus, custom hiring center in SHG mode is an innovative sustainable approach to address the poverty and enhance productivity.

IAAHAS/AB/2023/464

Technological Advancement in Agriculture

Gourav Beniwal
College of Agriculture, CCS Haryana Agricultural University,
Hisar- 125 004 (Haryana, India)

Technology has a major role in farming and agriculture practices; and with the advent of digital technology, the scope has widened. Innovation in agriculture is leading an evolution in agricultural practices, thereby reducing losses and increasing efficiency. Mechanization has led to efficient tilling, harvesting, and a reduction in manual labor. Irrigation methods and transportation systems have improved, processing machinery has reduced wastage, etc., and the effect is visible in all areas. New-age technologies focus on robotics, precision agriculture, artificial intelligence, blockchain technology, and more. Drones, remote sensors, and satellites gather 24/7 data on weather patterns in and around the fields, providing farmers with vital information on temperature, rainfall, soil, humidity, etc. Water, fertilizer, pesticides, and other inputs are no longer applied “by eye” or uniformly across the field by large agricultural producers. The use of advanced agriculture technologies allows for the precise application of only what is required in each location, as well as the careful tailoring of treatment for each plant. Vertical farming involves growing crops in vertically stacked layers using artificial lighting and controlled environments. This method of farming can significantly increase crop yields and reduce the amount of land required for farming. Hydroponics is a method

of growing plants without soil, using nutrient-rich water instead. Smart greenhouses use advanced technologies such as sensors, automation, and AI to control the environment in which plants are grown. This helps to optimize growth conditions and reduce the risk of crop diseases. The use of chips and body sensors can help prevent disease outbreaks and are crucial in large-scale livestock management. Mobile technology has also been playing a significant role in monitoring and controlling crop irrigation systems. Technologies can enable the transition of modern agriculture in the field. While some technologies have transformed the way we operate, there is a need for spreading technological advancements in agriculture, like artificial intelligence and machine vision.

Keywords: Artificial Intelligence, Vertical Farming, Hydroponics, Smart Greenhouse

IAAHAS/AB/2023/465

Adoption of Clean Milk Production Practices by the Dairy Farmers of North Gujarat

N. H. Usadadiya*, R. R. Prajapati, K. M. Bera
*Anand Agricultural University, Anand-388110, Gujarat

Clean milk production does not mean making the milk free from extraneous matters like dust, dirt, flies etc. by passing it through sieve or muslin cloth. It actually means the raw milk that has been produced in the udder of healthy dairy animals, handled under hygienic conditions and contains only allowed quantity of bacteria and chemical residues. Clean milk can be defined as milk coming from healthy milch animal, possessing normal flavor, devoid of dirt and filth, containing permissible limit of bacteria and essentially free from adulterants, pathogens, various toxins, abnormal residues, pollutants and metabolites. The present investigation was carried out in North Gujarat. Three districts of North Gujarat viz., Banaskantha, Sabarkantha and Mehsana were purposively selected for the study. From each selected district,

three talukas and two villages from each selected taluka were randomly selected for the study. Thus, eighteen villages were selected from the nine selected talukas. For selection of the respondents from the villages, a village wise list of dairy farmers was prepared based on farmers having two animals of which one animal in milking stage. From each village, ten dairy farmers were randomly selected as respondents. Thus, total 180 respondents were selected for the study.

Keywords: *Adoption, Clean milk production, Dairy farmers*

IAAHAS/AB/2023/466

Life table studies of *Chrysoperla carnea* Stephen (Neuroptera: Chrysopidae) on two different hosts

V. Sreemohan Reddy, G. Sarada*, Lalitha[1]. K and V.V. Padmaja[2]

***** Department of Entomology, College of Horticulture,
Dr. YSR Horticultural University

[1,] Department of Agronomy, [2]Department of Plant Physiology of College of Horticulture,
Dr YSR Horticultural University, Anantharajupeta, Andhra Pradesh

Biological control is the natural control of crop pests which involves their natural enemies. Since the chemical control has become predominant in the present agricultural and horticultural ecosystems, the natural enemies affected from these chemicals should be protected and allowed to multiply. Indiscriminate pesticide application should be minimised and generalist predators like green lacewing, *Chrysoperla carnea* should be conserved in the crop ecosystems. *C. carnea* has wide adaptability to a broad range of environmental conditions as well as prey diversity. It can survive by feeding on a wide range of insect pests, mainly soft bodied insects like aphids, mealybugs, whiteflies and some larvae like cotton bollworm larvae etc. The present investigation was conducted on life table studies of *Chrysoperla carnea* Stephens (Neuroptera: Chrysopidae) on two different hosts *viz.,* aphids and mealybugs during 2021-2022 at College of Horticulture, Anantharajupeta. The predator (*C. carnea*) was reared under laboratory conditions at temperature of 28±2^{0}C and 65-70% relative humidity. The life tables of predator *C. carnea*

were studied cowpea aphid, *Aphis craccivora* and guava mealybug, *Planococcus citri*. The gross reproductive rate, net reproductive rate (R_0), true intrinsic rate of increase (r_m), innate capacity of natural increase (r_c), approximate generation time (T_c) and true generation time (T) were recorded as 77 female eggs per adult female, 38.23 female eggs per female, 0.1044, 0.1033, 40.48 days and 34.90 days respectively when reared on aphids and the corresponding values on mealybugs were 44 female eggs per adult female, 21.73 female eggs per female, 0.1033, 0.1048, 40.55 days and 29.37 days respectively.

Keywords: *Chrysoperla carnea, aphids, mealybugs, life table studies, Planococcus citri.*

IAAHAS/AB/2023/467

Agro Tourism: A Sustainable Development for Rural Area

Aparna Gogoi[1] and Dr. Sangita Borah[2]

[1]MBA Agribusiness, [2]Assistant Professor, Department of Agricultural Economics and Farm Management, Assam Agricultural University, Jorhat-785013, India

Agriculture is the backbone of Indian economy and majority of the population resides in rural communities. More than a profession or a business, agriculture is India's culture but, today it becomes unprofitable due to irregular monsoon, prices fluctuations of Agro Products and some internal weakness of the agriculture sector. Hence, there is need to do some innovative and by adding additional income generating activities to existing would certainly increase contribution of agriculture in national GDP in the agriculture, which will help the farmers, and rural people. Tourism is one of the main sources of foreign exchange income and helps in creating direct and indirect employment opportunities. Agro- Tourism is a new approach towards entrepreneurship and also one of the forms of tourism which capitalizes the rural culture as a tourist destination. Agro tourism involves various agricultural activities, farm stay, animal rides, traditional foods, and hands on experience with natural and rural environment. Agro-Tourism

activity is considered as sustainable because this form of tourism can contribute to several activities (agriculture, tourism, crafts etc.) Young people in rural areas can start an Agri-tourism enterprise in their farmland which will be their main income source. On the other hand, Agricultural co-operatives institute, Agricultural Universities, Krishi Vigyan Kendra, Gram Panchayats can also start Agro-Tourism. This paper analyses the resources available in certain areas in Assam engaged in Agro-Tourism and the potential for further development of Agritourism, as well as agribusiness opportunities. The paper focuses on the hypothetical Agro Tourism business model for a rural area. A further goal of the paper is to develop a strategic analysis of Agro-Tourism, studying the economic, environmental and social benefits, creating opportunities for integrated and sustainable rural development and to boost the Agri-Tourism business.

Keywords: *Agro-Tourism, rural development, sustainable, entrepreneurship, employment*

IAAHAS/AB/2023/468

Integrated Management of Root Rot of Pea

Yogita Nain[1] & Nitin Chawla[2]

[1]RARI, Durgapura, Jaipur, Department- Plant Pathology, SKNAU, Jobner

[2]RARI, Durgapura, Jaipur, Assistant Professor,
Department- Plant Pathology, SKNAU, Jobner

In present investigation the fungicides, phytoextracts, oil cakes and biocontrol agents found effective *in vitro*, were further evaluated in field for two consecutive seasons as seed treatment individually as well as in different combinations for suppression of root rot of pea. It was found that combined treatments were superior in terms of better germination, lower mortality and higher yield as compared to individual treatments. The most effective treatment with ST Tebuconazole+ Trifloxystrobin + Neem cake followed by seed treatment with ST with Trichoderma harzianum @10g/kg seed + Neem

cake as compared to control as well as other treatments. *T. harzianum* applied as seed treatment effectively established in pea rhizosphere and reached high population densities, at 90 DAS while the population of the pathogen was low in the rhizosphere as significant disease suppression was recorded.

Keywords: *Fungicides, phytoextracts, oil cakes and biocontrol agents, root rot*

IAAHAS/AB/2023/469

Edible Coating Formulation to Preserve Avocado

T. Anitha
Assistant Professor (Biochemistry),
Horticultural College and Research Institute,
Tamil Nadu Agricultural University, Periyakulam

Aloe vera gel's film-forming abilities, antimicrobial effects, biodegradability, and biochemical properties have made it one of the best edibles and biologically safe preservative coatings for various kinds of foods. It is primarily made up of polysaccharides and functions as a natural barrier to oxygen and moisture, which are the primary factors in fruit and vegetable deterioration. This research was designed to look into how the aloe gel coating affects the avocado fruit's post-harvest quality, shelf life, sugar content, and antioxidant levels. Two replications of the experiment were set up in a fully randomised design. The outcome showed that all physico-chemical fruit quality parameters, including weight loss, vitamin C, chlorophyll, carotenoids, titrable acidity, and reducing sugar contents during postharvest storage of avocado fruit samples, were significantly different between the control and aloe gel treated groups. It was shown that ascorbic acid content increased in the control group during avocado fruit ripening after harvest, but there was no statistically significant variation in ascorbic acid content between treatments.

SGT University, Gurugram and Just Agriculture Education Group

During the postharvest maturation of avocado fruits, carotenoid and reducing sugar contents rose while weight loss, chlorophyll, and vitamin C contents fell. The control group had the greatest mean vitamin C, carotenoid, and sugar contents demonstrating that aloe gel treatment can postpone the ripening of avocado fruit.

Keywords: *Aloe vera, Avocado fruit, weight loss and carotenoid.*

IAAHAS/AB/2023/470

Effect of integrated nutrient management on fruit yield of aonla (*Emblica officinalis* Gaertn.) cv. Gujarat Aonla -1

J. M. Aal, K. M. Patel and Pavan K. Patel
Department of Horticulture, B. A. College of Agriculture,
Anand Agricultural University, Anand 388110, Gujarat, India

An experiment was carried out to study the "Effect of integrated nutrient management on fruit yield of aonla (*Emblica officinalis* Gaertn.) cv. Gujarat Aonla - 1" at Horticultural Research Farm and P.G. Laboratory, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand during *Kharif-Rabi* season of the year 2018-19. The experiment was laid out in completely randomized design with three repetitions. Among all the treatments, T_9 (50 % RDF through chemical fertilizer + 25 % RDN through vermicompost + 10 ml Anubhav Bio NPK Consortium/tree) treatment was found most effective treatment and recorded significantly maximum fruit length, fruit diameter, fruit weight, fruit volume, number of fruits/tree, Grade A, B and C fruit yield and total fruit yield.

Keywords: *Aonla, INM, vermicompost and Yield.*

IAAHAS/AB/2023/471

Micro/Nano encapsulated Phase Change Materials in Food Industry

Aiman Farooq, Syed Zameer Hussain, Aabida Jabeen, Tahiya Qadri, Nazrana Rafique and Bazila Naseer

Division of Food Science and Technology, Sher-e-Kashmir University of Agricultural Sciences and Technology, Kashmir

As a material's state changes owing to a change in temperature, phase change materials (PCMs) absorb or release the most heat. The energy is released and stored through chemical bonds. As a substance transforms from a solid to a liquid or from a liquid to a solid, thermal energy is transferred. Energy-saving technologies and materials are currently a popular subject in many industries, including the food sector. The creation and use of phase transition materials can be used for thermal energy storage (PCMs). The efficient way for enhancing the thermal conductivity of PCMs is micro/nano encapsulation. This technique also prevents leaks during the melting process, which leads to an increase in the thermal efficiency of the system. It is possible to store and release energy through the formulation and usage of PCMs for thermal energy storage. Because of the solid-liquid phase shifts, it is important to encapsulate PCMs before using them in the final process or product in order to apply them more effectively. Examples of this include adding PCMs to refrigeration equipment and packaging structures. Additionally, there are three categories of micro/nano encapsulation techniques for PCMs: chemical (including suspension polymerization, emulsion polymerization, mini-emulsion polymerization, in situ polymerization, interfacial polymerization, etc.), physicochemical (including co-acervation, sol-gel encapsulation, etc.), and physico-mechanical (including spray drying, electro-hydrodynamic processes, etc.). Moreover, PCMs-assisted packaging is a cutting-edge area of research for energy storage/release systems to suitably coat or manage temperature-sensitive food goods in a variety of situations, and might be employed in smart food packaging or pharmaceutical packaging.

Keywords: Phase change materials, Encapsulation, Thermal energy storage and Food packaging

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/472

To study the stability analysis for yield and quality traits in wheat (*Triticum species*) genotypes

S.R. Kashte and L.N. Jawale
Post Graduate Student and Assistant Professor
Department of Agricultural Botany, Vasantrao Naik Marathwada
Krishi Vidyapeeth, Parbhani

The present investigation was under taken to study stability analysis for yield and quality traits in wheat (*Triticum species*) genotypes. The experimental material comprised of thirteen genotypes and four checks. The experiment was conducted in randomized block design with three replications with three environments viz., E_1 (15 Nov., 2011), E_2 (1st Dec., 2011) and E_3 (16 Dec., 2011) at experimental form of Department of Agril. Botany, College of Agriculture, VNMKV, Parbhani during rabi 2011-12 and quality parameter were estimated at Department of Soil Science and Agricultural Chemistry, VNMKV, Parbhani. Observations were recorded on seventeen characters *viz*., plant height, days to heading, days to 50 per cent flowering, days to maturity, number of tillers per plant, length of panicle, number of spikelets per panicle, number of grains per spikelets, number of grains per panicle, 1000 grain weight, yield per plant, yield per plot, yield per hectare, harvest index, protein content, gluten content and polshenke value. The data was collected and analyzed for analysis of variance, stability analysis, correlation and path analysis. Analysis of variance for all genotype and all character for all three environments were found to be significant. In present investigation large amount of variation was noticed for all the characters including quality parameters. The genotypes under study responded differently for stability performance for different environments. The genotypes MP 3302, K 0820, MP 4080 and RAJ 4210 were found to be more stable genotypes for grain yield quintals per hectare. However, the genotypes PBW 343, NIAW 917 and HI 8680 had below average stability and these genotypes could be exploited for favourable conditions. The genotypes NIAW 1548, NIAW 301 and HD 2189 had above average stability. These genotypes may perform well under adverse conditions. The genotypes PBW 343, MP 4080, PBW 343, NIAW 917 and NIAW

301 showed better performance for plant height, number of tillers per plant, number of grains per panicle and grain yield. The genotypes HI 8680 giving highest yield. The characters number of tillers per plant, grains per panicle, number of spikelets per panicle, yield per plot, harvest index were most important characters for effective selection of superior genotypes of wheat. They expressed more stable for all kind of environment and significant positive correlation as well as positive direct and indirect effect on grain yield per hectare.

IAAHAS/AB/2023/473

Basmati rice exports from India: Towards global food security

Neha Joshi, Dr. Anil Kumar
Ph.D. Scholar, Professor
Department of Agricultural Economics,
G. B. Pant University of Agriculture and Technology, Pantnagar

Around 80 percent of the basmati rice produced in India is exported, accomplishing the position of largest exporter. Under this perspective, the study aimed at the estimation of crucial turning points in the export volume of Basmati rice and evaluating the growth and instability in its export during the period of 1980-81 to 2021-22 in the global market. Structural breaks during the study period were computed endogenously using Bai-perrons test to reveal the impact of any policy or economic intervention. The growth and instability have been evaluated for different periods attained from the structural break analysis during the study period. Bai perrons test revealed three significant structural breaks for volume of basmati rice exports dividing the time period into four periods viz I (1980-81 to 2004-05), II (2005-06 to 2010-11), III (2011-12 to 2016-17) and IV (2017-18 to 2021-22). The compound annual growth rate calculated for volume of basmati rice exports varied from -0.06 percent to 17.98 per cent per annum for different periods. This could be seen as the consequence of the liberalization policies adopted in early 1990s. Instability computed employing Cuddy De Valle index was also reported higher with a value of 38.97. This instability could be the result from the volatile changes in exchange rate. Instability was revealed to suffer a downfall during

the subsequent subperiods from 35.97 to 3.4 in the third subperiod. The growth rate and instability were reported statistically non-significant during the last subperiod. Since, Basmati rice is strategic export commodity from India, policy interventions for reducing the variability in its exports is recommended to ensure regular supply in the global market.

IAAHAS/AB/2023/474

Perception of Farmers about Climate Change in Udaipur District of Rajasthan

[1]Sumit Kumar Yadav and [2]Dr. S. S. Sisodia

[1]Ph. D Research Scholar and [2]Professsor and Head

Department of Extension Education, Rajasthan College of Agriculture, (MPUAT), Udaipur, Rajasthan 313001

The present study was undertaken in Udaipur district of Rajasthan in order to identify the constraints faced by the farmers to mitigate the adverse effect of climate change. A sample of 120 respondents from two tehsils (Girwa & Kotra) and eight villages (Alsigarh, Karget, Pai, Panduna, Mamer, Asawara, Samoli and Ghata) were selected on the basis of random sampling technique. The result reveled that Regular training programme should be organized for disaster management, Good quality of agricultural inputs should be made available on subsidized rate in proper time, Efforts should be made to create awareness among the farmers about the effect of climate change, Need based water supply in canal should be ensured, Location specific water storage structure should be developed for effective utilization of rain water, Govt. policies should be made to support the farmers during natural calamities and Effective extension services must be available to the farmers are most suggestion of the farmers in Udaipur district.

Keywords: *Climate, Adaptation, Suggestion, Agriculture.*

IAAHAS/AB/2023/475

Influence of Zinc nanoparticle on seed quality of okra *cv*. Hisar Naveen

Monika Yadav[1*] and S. K. Dhankhar[2]
Department of Vegetable Science, CCS HAU, Hisar

Nanoparticles of different metal oxides play an important role in promoting growth, yield and seed quality parameters in crop plant. Zinc is considered one of the most important micronutrients for plants. Considering the relatively high solubility of ZnO nanoparticle and also the ability of plants to uptake and accumulate these nanoparticles in their biomass. Okra is one of the most important vegetable crops grown throughout the world in tropical and subtropical region. It is used as margarine because it is good source of oil. Foliar application of zinc nanoparticle at the rate of 30, 40, 50 and 60 mg/L was given at 20, 40 and 60 days old okra crop during rainy season of 2021 and 2022 at Vegetable Research Farm, CCS Haryana Agricultural University, Hisar. The seed quality parameters *viz*. test weight (g), standard germination % and oil content of seeds (%) was determined. Significant increase in test weight (12.12%), standard germination % (8.86%) and oil content (16.35%) was observed when 50mg/L zinc oxide was applied over recommended dose of fertilizer (control).
Keywords: ZnO nanoparticle, foliar spray, seed quality, okra.

Potency of Lactobacillus species against Urinary Tract Infection (UTI) & Gastrointestinal Tract Infection (GTI) of Dehradun Region in Uttarakhand

Rohit Kamal[1] and DR. Deepak Som[2]
Research Scholar[1] and Associate Professor[2], Department of Microbiology, SGRR School of Basic & Applied Sciences, SGRR University Dehradun- 248001

Ecologically, the habitat of lactic acid bacteria has changed over time from soil and plant habitats to mammals' guts. These bacteria have been proven to play a multifaceted role in the agricultural, food and clinical sectors. Lactic acid bacteria (LABs) are important microorganisms that mainly produce lactic acid as a by-product during metabolic activities. The advent of functional food or the concept of nutraceuticals places a greater emphasis on purposefully exploring alternatives to limit the use of drugs, thereby promoting the regular consumption of fermented foods. There is no side effect on human health, so they can be used as probiotics. Lactic acid bacteria are a ubiquitous group of bacteria found in abundance in nature in dairy, vegetable origin and meat, gastrointestinal and urogenital tracts of animals, and soil and water. From 5 different dairies of Dehradun, 5 samples of curd and cheese were collected, after that the sample was placed in a broth by sterile loop and incubated for 24 hours at 37^0C and when turbidity comes this media then this is used for further isolation. Curd and chees samples were inoculated in lactobacillus selection broth (MRS) for 48 hours at 37^0C for enrichment. Enriched sample were streaked by calibrated loop and incubated 37^0C on MRS agar media for 48 hours for recovery of isolated lactobacillus species. Isolated lactobacillus was purified by streaking and re-streaking. The stocks were preserved in refrigerator and maintained for one month at 4^oC.Cell Morphology and Morphological Characteristics of recovered isolated colony were studied by gram staining procedure. Biochemical tests (Catalase, Nitrate reduction, sugar fermentation) were performed for the identification.

Keywords: *Lactic acid bacteria; health benefits; bio-preservation; probiotics.*

IAAHAS/AB/2023/477

Role of Natural Farming-Based Inputs in Nutrient Management under Forage Production Systems

Sachin Saharan*, Kunal Narwal and Rahul Sharma
PhD Scholar, Department of Agronomy, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Himachal Pradesh 176062, India

With the world's largest livestock population, India has a significant demand for fodder and feed. The country currently has a net deficit of 44% in concentrate feed ingredients, 35.6% in green fodder, and 10.95% in dry crop leftovers. The obvious cause of such a production lag behind demand is low productivity of fodder production systems. Most fodder production ecosystems lack nutrition sources since most of the sources are diverted to agricultural areas. Such condition of fodder farms demand for low cost or farm generated inputs for nutrient application especially under Indian conditions. Natural Farming based nutrient inputs as such can play a vital role in sustaining nutrient demand of fodder crops by optimizing soil properties and enhancing efficiency of soil microbes within soil ecosystem for greater nutrient availability. Natural farming-based inputs such as *Beejamrita*, *Jeevamrita* and *Ghanajeevamrita* are generated on farm using farm wastes or household inputs i.e., at meagre costs. Such nutrient applications can have boosting effects especially on fodder legumes wherein due to enhanced *Rhizobium* activity a large requirement of nitrogen is fulfilled from atmosphere whereas with the activity of Phosphorus Solubilizing Bacteria (PSBs) and other microbes' availability of phosphorus, potassium and micronutrients is also increased. Hence, Natural Farming input-based application and enhanced microbial activity will help in boosting the fodder productivity under Indian conditions.

Keywords: *Natural farming, fodder, nutrient management and Rhizobium.*

IAAHAS/AB/2023/478

Speed Breeding: The Most Potent Technique to Accelerate Crop Improvement Programmes

Devlina Dwivedi[1*] and D.K. Janghel[1]
[1]School of Agricultural Sciences, GD Goenka University,
Gurgaon-122103, Haryana, India

In today's day and age, overpopulation, poverty, climate change and food scarcity are the four most pressing challenges shadowing the world. It is therefore crucial to redesign crops for long-term production, food & nutritional security, and climate resistance. Despite the current trend of crop improvement, our food security is insufficient to meet the demands of the ever-rising population. The current breeding techniques require a prolonged generation time of at least 8-10 years for agricultural crop improvement programmes. This significantly consumes more time for cultivar development and slows down the rate of crop genetic enhancement and timely release of varieties for farmers. Speed breeding is an exemplary tool, revolutionizing the breeding cycle by shortening the generation period with the utilization of high-intensity light-emitting diode (LED) lights primarily, allowing a 22-hour photoperiod. In contrast to conventional breeding, speed breeding produces 3 to 9 generations yearly by manipulating the photoperiod, humidity, and temperature. Speed breeding was first developed by NASA for growing wheat in space with extended photoperiods and controlled temperatures to accelerate plant growth, this endeavour was pioneered by Dr. Lee Hickey and his team at the University of Queensland. Various modern plant breeding techniques such as single seed descent (SSD), single pod descent (SPD), single plant selection (SPS), clonal selection, and marker-assisted selection (MAS) etc. can be incorporated into speed breeding to minimize crop breeding cycles and maximize efficient utilization of resources. Thus, speed breeding is one of the most potent techniques to accelerate crop improvement programmes for breeding new varieties of wheat, barley, chickpea, and other crops, as well as ornamental plants in a time-based manner.

Keywords: *Speed breeding, crop improvement, breeding cycle, photoperiod, food security.*

IAAHAS/AB/2023/479

Enhancing the cane yield in novel sugarcane (*Saccharum officinarum* L.) through various water saving strategies under rain fed conditions

Khauhelo Patricia Sekopo, G.H. Owen and D.K. Janghel[1]
[1]School of Agricultural Sciences, GD Goenka University, Gurugram-122103, (Haryana)

Currently, global water scarcity, erratic rainfall, and recurrent droughts have severely impacted novel sugarcane farming in tropical regions. Sugarcane (Saccharum officinarum L.), a member of the andropogoneae tribe of the poaceae (grass) family, is a strong-growing potent bioenergy crop species. It thrives well in a frost-free tropical climate and in proper drainable fertile soils with high solar radiation, high temperature, and a long photoperiod. Sugarcane is the most water-demanding crop, requires ample amounts of water (at least 1500 mm of rain in a year) for maximum sugarcane production, especially at tillering and grand growth stages. Optimal watering at these crucial stages could enhance the cane yield and ratoon life. In addition to these, better agronomic practices, an effective irrigation system, and accurate irrigation scheduling strategies like skip or alternate skip irrigation could be used to curb the maximum water demand in sugarcane and to enhance WUE (water use efficiency) by using soil moisture sensors. This is simply achieved by estimation of crop evapotranspiration demand i.e., the product of crop coefficient (Kc) X evapotranspiration (ET0). The impacts of irrigation water on potential crop yield can be assessed by using crop simulation models in the most realistic way. Thus, considering water security, various water saving strategies are used to enhance the cane yield in novel sugarcane in a sustainable manner for maximizing the economic benefits and equitable social welfare at local as well as national levels

Keywords: *Sugarcane, Saccharum, WUE, irrigation, sensors, simulation*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/480

Effect of Phosphorous Levels and Varieties on Growth, Yield and Quality of Pigeon Pea (*Cajanus cajan* L.)

Tarsan Kumar Yadav*, Akanksha Shukla and Prachi Awadhiya
Department of Agronomy, AKS University Satna, M.P.-485001

Impact of Sulphur and Phosphorus on yield and seed production, nutrient status of soil and their contents in Pigeon Pea (*Cajanus cajan* L.). Five treatments like plant growth, height, dry weight fresh weight, and branch, were studied in Factorial Randomized Block Design with three replications. The treatment combinations were derived from three levels of sulphur (0, 20 and 40 kg S ha^{-1}) and four levels of phosphorus (0, 20, 40 and 75 kg ha^{-1}). The experimental soil data and soil testing in the lab practical work soil was medium black, slightly calcareous, clay in texture and slightly alkaline in reaction. The results indicated a significant increase in grain yield (14.81 q ha^{-1}) and straw yield (36.20 q ha^{-1}) of Pigeon Pea after 18 kg S ha^{-1}) and 45 kg P_2O_5 ha^{-1}) treatment with common dose of nitrogen @ 25 kg ha^{-1}). The increase in grain and straw yield was 97.42 and 48.71% as compare to higher over control. Maximum number of pods plant ($^{-1}$), maximum number of grains pod and test weight by this treatment was also observed as compared to control. Application of S and P improved soil fertility status and S alone did not influence P. Hence, in order to maintain the fertility status of the soil at high level, combine application of 20 kg S (ha^{-1}) with 45 kg P2O5 (ha^{-1}) is essential. The residual fertility status of soil is advocated for rainfed Pigeon Pea crop grown on vertisol in Vidarbha region.

Keywords: *Pigeon Pea, Soil, Sulphur and Phosphorus.*

IAAHAS/AB/2023/481

Study on agrienterprises promoted among the tribal youth under KVKs in southern Rajasthan

Vandana[1], Dr. Dhriti Solanki[2]

Research Scholar[1], College of Community & Applied Sciences, MPUAT, Udaipur

Professor[2], Department of Extension Education and Communication Management, CCAS, MPUAT, Udaipur

Youth are expected to play a vital role in the much-anticipated transformation of agriculture in India. Because young people bring energy, vitality and innovation into the work force and when their willingness to contribute is matched with opportunity; they can have a transformative impact on economic growth and social development. India has one of the largest concentrations of tribal population in the world. Tribal communities live in about 15 per cent of the country's areas and government has identified more than 697 tribal communities in various ecological and geo climatic condition ranging from plains, forests, hills and inaccessible area. Rajasthan has been home to numerous tribal and nomadic communities, the tribes of Rajasthan constitute approximately 13.5 per cent of state population. Each of these tribes can be identified by their own culture, customs, trades, fairs & festivals. Bhils & Minas constitute the majority of population of the tribes of Rajasthan. In this context, Krishi Vigyan Kendra (KVK) is one of the leading institutions devoted to the welfare of the farming community. The Krishi Vigyan Kendra has been a milestone in bringing development in villages by imparting training to tribal youth, which functions on the principles of collaborative participation of scientists, subject matter specialists, extension workers, and farmers. The main purpose of KVK is imparting learning through work experience to those who are engaged in farming. The Southern Rajasthan includes seven districts of the state i.e. Udaipur, Rajsamand, Sirohi, Chittorgarh, Banswara, Pratapgarh and Dungarpur. KVK Banswara, MPUAT, Udaipur and KVK Badgaon, Vidya Bhawan Society Udaipur both the districts are considered for the study. Both the districts are tribal dominated districts and the beneficiaries are also tribal youth. Krishi Vigyan Kendra's Banswara & Udaipur they have promoted main enterprises among the tribal youth and these were goat farming, poultry farming and nursery management. There are 200 beneficiaries selected for present study, 100 tribal youth at each KVKs. Out of these enterprises

promoting among tribal youth 85 youth were undertaking in goatry, 88 in poultry and 27 in nursery management.
Keywords: Entrepreneurial development, Tribal youth, Agriculture.

IAAHAS/AB/2023/482

Determinants of Farmers Choice to Participate in Output Marketing Channels of Pea (*Pisum sativum*) in High Hills Region of Himachal Pradesh, India

Pankaj Thakur[1,2] and Piyush Mehta[1]

[1]Department of Business Management, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni-Solan, Himachal Pradesh-173230, India

[2]Department of Agribusiness Management, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj-Ayodhya, Uttar Pradesh- 224229, India

The choice of a marketing channel is one of most important aspects of successful marketing of agricultural output. At the same time marketing channel choice is one of the most complex decisions that is faced by farmers. This is due to the fact that different channels have varied profitability and costs. Thus, determinants of market channel choice are the contributing issues which has impact on production and sales. Despite their importance, yet adequate research has not been carried out on it, particularly in hill regions of India. Consequently, this research assessed the determinants of farmers choices of output marketing channel utilized by pea farmers in Himachal Pradesh, India. The survey was conducted on a sample of 200 farmers through field interviews based on a self-structured questionnaire. The finding of this paper reveals that there are five output marketing channels used by farmers in the study area, (1) producer-consumer, (2) producer-retailer-consumer, (3) producer-commission agent-retailer-consumer, (4) producer-local trader-wholesaler-retailer-consumer, (5) producer-wholesaler-retailer-consumer. It has been observed that producer-consumer (84.54%) was most efficient channel among all five output marketing channels. Since, farmers larger focus on the production thereby in spite of having this channel a higher market efficiency, the farmers may not able to use this channel on account of lacking of requisite market infrastructure and required marketing awareness. Further,

this paper investigates the factors affecting the choice of output marketing channels utilized by farmers using the Multinomial Logistic Regression model. The empirical results show that factors like distance to market, payment at the time of sale, slow sale and market information through government department was found to be positively significant at 1% significant level in determining farmers' preferences to sell pea produce through output marketing channel namely producer-commission agent-retailer-consumer. Whereas other factors like farming experience was positively significant at 5% significant level in choosing agricultural output marketing channels through commission agents and producer-wholesaler-retailer-consumer. The findings also revealed that production and sales factors such as farming experience, distance to market, financial urgency, payment in advance are the factors that influence farmers choice to participate in wholesale channel. This research concluded with the policy implications for improving the vegetable output marketing performance in India.

Keywords: Market efficiency, choice, determinants, agricultural output marketing channels, multinomial logistic regression

IAAHAS/AB/2023/483

Studies on Genetic Diversity for Yield and Yield Contributing Characters in Sesame

Dr. Srikanth Thippani, B. Swapna, D. Padmaja, S. Srinivas Nayak
Agricultural college, Polasa, Jagtial, PJTSAU, Hyderabad

Sesame (*Sesamum indicum* L.) (2n = 26), also known as Til or Gingelly, it is one of the most important oilseed crops of tropical and temperate regions. It is commonly known as "Queen of oilseeds" due to its resistance to oxidation and rancidity, also it plays an important role as an industrial food crop because of its high nutritional value. The seeds of sesame contain 40 to 63 per cent oil, which contains significant amount of oleic and linoleic acids. Globally, sesame is produced over an area of 8.8 mha and annual production around 2.8 mt with average productivity of 382 kg/ha. India is still leading country with maximum (25.8 %) production from the largest (29.8 %) area and highest export (40 %) in the world. It is grown in India with an area of 15.80 lakh ha, 1.74 lakh tonnes production and 478 kg ha^{-1} productivity (www.indiastat.com, 2018-19). Sesame occupies an area of 21,000 ha with production and productivity of

15,000 tonnes and 714 kg ha^{-1} respectively in Telangana (www.indiastat.com, 2018-19). It is grown as summer crop in Northern Telangana districts *viz.,* Adilabad, Jagtial, Karimnagar and Nizamabad. However, the development of improved plant cultivars and increasing the production is restricted mainly due to narrow genetic pool, which results in limited possibility to restructure the sesame crop. Selection is the basis for crop improvement and efficiency of selection depends on the amount of variability present in germplasm of crop. Genetic improvement of seed yield alone is not possible through phenotypic selection, because it is a complex character which is governed by polygenes and highly influenced by several quantitative traits. Application of biometrical techniques in plant breeding has led to the greater understanding of genetics of quantitative characters and proved to be extremely useful to the plant breeder for systematic genetic analysis.

In the present investigation, sixty-eight genotypes including three checks at RARS, Jagtial were evaluated for genetic diversity for selection of diverse parents. Various genetic parameters for different yield and yield contributing traits along with the interrelationship of yield and yield traits with seed yield. The experiment was laid out in a randomized block design with two replications at Regional Agricultural Research Station, Polasa, Jagtial, during *summer,* 2020. Analysis of variance indicated the existence of significant genotypic differences among the genotypes for yield and its components. Phenotypic coefficient of variation (PCV) and Genotypic coefficient of variation (GCV) were high for characters number of branches per plant, number of capsules per plant and seed yield per plant. High heritability coupled with high genetic advance as per cent of mean was observed for number of branches per plant, number of capsules per plant, number of seeds per capsule, seed yield per plant and 1000 seed weight suggesting that, these characters were controlled by additive gene action indicating as such these traits can be improved through simple selection. The genotypes with highest means for these characters can be used in breeding programmes to develop high yielding cultivars with capsule borer resistance. Divergence studies through D^2 statistic indicated the presence of substantial diversity by forming large number of clusters with wide range of inter-cluster distance. The 68 genotypes were distributed into eight clusters based on the D^2 values. Among the eight clusters, cluster I was the largest comprising of 30 genotypes followed by cluster II with 22 genotypes and Cluster III and V with six genotypes in each cluster remaining clusters IV, VI, VII, VIII were solitary.

The data on character means for eight clusters indicated that, cluster III was having highest mean value for number of capsules per plant, capsule length, capsule width, number of seeds per capsule, seed yield per plant and 1000 seed weight. cluster VIII for days to 50% flowering, plant height, days to maturity and number of branches per plant. The genotypes JCS 2611, JCS 2454 and JCS 3599 from these clusters having high mean values may be directly used for adaptation or may be used as parents in future hybridization programme. The per cent contribution towards genetic divergence by all the yield and yield contributing traits. The maximum contribution towards genetic divergence was by days to 50 % flowering (27.30 per cent), number of capsules per plant (22.78 per cent), number of seeds per capsule (14.04 per cent), number of branches per plant (14.04 per cent) seed yield per plant (10.49 percent), capsule width (4.82 per cent), 1000 seed weight (3.81 per cent), days to maturity (2.45 per cent), capsule length (0.08 perc ent) and plant height (0.13 per cent).

IAAHAS/AB/2023/484

Dashparni Ark: A Liquid Bio-Pesticide

Devanand Kusumbe[1] and Mohini Punse[2]

Assistant Professor of Agronomy, College of Agriculture, Pimpalkhuta (Dr. P.D.K.V. Akola)

Ancient India's farmer's evolved nature friendly farming systems and practices. Agricultural activities were designed to ensure ecological sustainability. India developed its own holistic scientific knowledge. Dashparni ark is an excellent organic liquid bio-pesticide. It is useful against all types of pests and diseases observed in crop plants. Even for juice sucking insects such as aphids and jassids. It develops immunity in plants and also shows antiviral, antibacterial and antifungal effect. The word Dashparni Ark contains two different words: "Dasha' means "ten' and 'parana' means 'the plant or tree leaf'. 'Extracts' means to remove the 'juice'. In most of the leaves of Neem, Castor, Rui, Papaya, Karanj, Kanher, Custard apple, Nirgudi, Lantana, Dhatura leaves have been used. A major phyto-chemicals investigated in Dashparniark (Ten plants leaves) like saponin, proteins, phenol, steroid, phytosterol and chemical like anthocyanin, phlobatannins are absent. So, they indicate that plant leaves contain a number of important chemical compounds which has different protection/repellent properties. It is a natural pesticide, which can be used on any crop and

vegetable plants or fruit trees. Due to the high amount of urea in dashparni ark, worm and insects do not attack crops, plants and buds. Due to nectar and aroma, Worm and insects are attracted to plants, they are away from plants due to the scorching and bad odour of dashparni ark and by which plants can be protected. Benefits of Dashparni Ark is a natural pesticide which can be used on any crop and vegetable plants or fruit trees. reduction in cost of plant protection measures. It is easy to prepare and use as foliar spray which is 100% natural bio-insecticide for crops.

Keywords: Dashparni, Bio-pesticide, Leaves, Farming.

IAAHAS/AB/2023/485

Impact of Foliar Application of Zinc Based Nanofertilizer and Varying Fertility Levels on various Diseases of Maize (*Zea mays* L.) in Southern Rajasthan

Piyush Choudhary[1*], D. Singh[2], M. K. Kaushik[3], S. S. Sharma[4], H. K. Jain[5], V. Saharan[6], D. P. Singh[7], R. K. Sharma[8], D. Chouhan[9] and Manish Bera[1]

[1*] Ph.D. Research scholar, Department of Agronomy, Rajasthan College of Agriculture, MPUAT, Udaipur

[2] Professor, Department of Agronomy and Dean Rajasthan College of Agriculture, MPUAT, Udaipur

[3] Professor and Head, Department of Agronomy, Rajasthan College of Agriculture, MPUAT, Udaipur

[4] Professor, Department of Plant Pathology, Rajasthan College of Agriculture, MPUAT, Udaipur

[5] Professor, Department of Statistics, Rajasthan College of Agriculture, MPUAT, Udaipur

[6]Associate Professor, Department of MBBT, Rajasthan College of Agriculture, MPUAT, Udaipur

[7]Assistant Professor, Department of Soil Science and Agricultural Chemistry, Rajasthan College of Agriculture, MPUAT, Udaipur

[8]Assistant Professor, Department of Soil Science and Agricultural Chemistry, COA, Bhilwara, MPUAT, Udaipur

[9]Department of Genetics and Plant Breeding, Rajasthan College of Agriculture, MPUAT, Udaipur

In the present study, a field experiment was conducted for two consecutive years i.e. *kharif* 2020 and *kharif* 2021 at Instructional Farm, Department of Agronomy, Rajasthan College of Agriculture, MPUAT, Udaipur in a FRBD with three replications comprising four foliar application of zinc based nanofertilizer (N_1: Control; N_2: at knee high stage; N_3: at 50% tasseling stage and N_4: both at knee high stage + at 50% tasseling stage) and four fertility levels (F_1: 100% RDF; F_2: 90% RDF; F_3:80% RDF & F_4: control) to study the effect of foliar application of zinc based nanofertilizer and varying fertility levels on incidence of three major diseases of maize in southern Rajasthan *i.e.* Curvularia leaf spot, Maydis leaf blight and Post flowering stalk rot. During both the years the number of plants affected in net plot area in each experimental unit were counted at physiological maturity and expressed in '000 ha^{-1}.It was concluded that application of nanofertilizer at both knee-high stage and at 50 per cent tasseling stage significantly reduced the incidence of Maydis leaf blight, curvularia leaf spot and post flowering stalk rot. At the same time single application of nanofertilizer at knee high stage also reduced the incidence of post flowering stalk significantly as compared to control. However, advancing fertility level from control to 100 per cent RDF did not record any significant variation in infection of curvularia leaf spot, maydis leaf blight and post flowering stalk diseases of maize.

Keywords: - *Nanofertilizer, Zinc, Disease, Leaf Blight, Maize.*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/486

Application of Artificial Intelligence in Drones for the analysis of Agricultural Land Use in the Mining Lease

Hitanshu Kaushal* and Dr. Anupam Bhatnagar **
*Ph.D. Research Scholar, College of Technology & Engineering, MPUAT, Udaipur
** Professor & Head, Department of Mining Engineering, College of Technology & Engineering, MPUAT, Udaipur

Artificial intelligence can be used to automate the control of drones, including their navigation and movement. This can be done using a variety of methods, including GPS tracking, computer vision, and machine learning algorithms. Drones offer a unique combination of resolution and spatial coverage which makes them invaluable for land survey & mapping. In addition, by using multiple ground-control points, they could achieve high geo-referenced accuracy for the Orthomosaic product. Combined with field observations, Drones offer a way to get a quick and accurate record of revealed land data and its land use. Drone survey & mapping was carried out of mining lease near village Kanthariya, tehsil & district Chittorgarh for the analysis of agricultural land use in the mining lease of 64.75 hectares.

Keywords*: Mining, Agriculture, Environment, Innovation, Land Resources, Land Use, Artificial Intelligence, Drones, Photogrammetery, GIS, Exploration, Minerals, Conservation, Sustainability.*

Climate Change, Agriculture and Food Security

Chetana Sharma*, Anshul Sharma, Garima Tak and Dr. Piyush Chaudhary

*Ph.D. Research Scholar, Agronomy, SKRAU, Bikaner

Climate change is described as the change in the climate of an area as a result of anthropogenic and natural disorders such as the depletion of the ozone layer, and greenhouse effects. It may result from factors such as changes in solar emission, long-term changes in the earth's orbital elements, natural processes and human forcing on the planet. The three main variables of climate change (elevated CO_2, altered rainfall patterns, and temperature ranges) aggravate seawater rise; drought, heatwaves, wildfires, storms, and floods. Climate change can affect all four dimensions of food security: food production, food availability, food accessibility, food utilization and food systems stability. Food production can be affected due to increase in maximum and minimum temperature in many regions of the country, drought, increase in seasonal rainfall in some regions, delay and unseasonal rainfall in some regions and increase in extreme weather events. Excessive heat or shortage of water can impede crop growth, reduce yields, and influence irrigation, soil quality, and the ecosystem on which agriculture depends. At national level, exposure to climate risks can trigger shocks on agricultural production and food availability, with risks of market disruptions, effects on supply and storage systems, as well as increases in agricultural commodity prices, impacting accessibility and stability of food supplies for the entire population. This triggers macro-economic effects for countries for which agriculture is an important part of GDP or constitutes an important source of employment. Climatic risks can also hinder agricultural development by discouraging investments. Agriculture need transition to systems that are more productive, use inputs more efficiently, have less variability and greater stability in their outputs, and are more resilient to risks, shocks and long-term climate variability. This transformation must be accomplished without depleting the natural resource base. It will also have to entail a decrease of greenhouse gas emissions and an increase of carbon sinks, which will contribute significantly to the mitigation of climate change.

Keywords: Anthropogenic, green house effect, heat wave, drought, food availability.

IAAHAS/AB/2023/488

Impact of Climate Change on Agriculture

Rashmi Durgapal
Research Scholar, Department of Extension Education and Community Management,
College of Community and Applied Sciences, MPUAT, Udaipur (Rajasthan)

The global community and the ecosystem face an unprecedented threat from climate change. The term 'climate change' indicates any change that occurs in climate over time, whether due to natural variability or as an anthropogenic cause. Agriculture is highly susceptible to climate change. The climate change can have an impact on agricultural productivity in two different ways: first, directly, as a result of changes in temperature, precipitation, and/or CO_2 levels; and second, indirectly, as a result of changes in soil, distribution, and frequency of pest, insect, disease, or weed infestation. Changes in the viability of crops and livestock: Producers select crop kinds and animal breeds that are compatible with the local environment. Many farmers may be compelled to reconsider some of their decisions when those conditions rapidly change over the ensuing decades; this may entail making new financial investments, discovering new markets, and learning new practices. Floods: The Brahmaputra and Ganga River basins in the Indo- Gangetic- Brahmaputra plains in North and Northeast India, which carry 60 per cent of the nation's total river flow, are most flood-prone areas in India. The frequency and severity of floods on farms in coastal areas are also increasing as a result of sea level rise. These catastrophic floods destroy crops and livestock, increase soil erosion, pollute water supplies, and damage schools, bridges, highways, and other infrastructure. Droughts: Groundwater levels have fallen as a result of climate change and global warming, causing the soil to become drier and lose moisture. Besides that, careless actions like deforestation, pollution, etc. have increased the frequency of droughts. Issues with new pests, weed and diseases: Tropical locations would experience the highest levels of pest and disease occurrence because of the favorable climate and weather, multiple cropping, and availability of alternative pests throughout the year. Tropical and subtropical weed species are likely to spread into temperate areas as a result of climate change. In order to avert the adverse impacts of climate change, more consideration must be given to resources and technologies. To combat the effects of climate change on agriculture, adaptation strategies may include the sowing of short-duration crops, changes in cropping patterns, pest- and heat-resistant, salt-tolerant, and pest-resistant varieties, water control mechanisms, livestock diversification, and shifting sowing and harvesting timing, etc.

Keywords: Climate change, global warming, agriculture, flood, drought, crop, livestock

IAAHAS/AB/2023/489

Management of Chickpea in NPK Deficit Soils of South East Rajasthan

***[1]Piyush Prasad Jani, [2]Anshul Sharma, [3]Manish Kumar Duria and [4]Garima Tak**

[1]Professor, Department of Agronomy, Shrinathji College of Agriculture, Nathdwara
[2]M.Sc. Research Scholar Agronomy, Rajasthan College of Agriculture, Udaipur
[3]Assistant Professor Livestock Production and Management, Shrinathji College of Agriculture, Nathdwara
[4]Assistant Professor, Department of Entomology, Shrinathji College of Agriculture, Nathdwara

Chickpea is the most important rabi pulse crop grown in Rajasthan and is primarily grown on marginal soils with low soil fertility. Lack of a balanced application of nutrients, improper management, and other factors may be to blame for low chickpea output. Although chickpea can fix N, but low organic carbon &soil phosphorus (P) deficiency in crop growing areas is a major limiting factor for chickpea production. Looking to this an investigation was carried out on Instructional Farm of Shrinathji College of Agriculture, Nathdwara during the year 2022-23 with purpose to chalk out management practices to sustain yield of chick pea. Soil test of the research site revealed low organic carbon (0.42%), phosphorus (24.6%) and potassium (273%). The experiment was laid out in randomized complete block design having three replications. The treatments comprised five treatments (T1:No Basal Dose, T2:Basal Dose (DAP),T3:Basal Dose+ Seed treatment with Rhizobium culture+PSB,, T4:T3+NPK spray at 45 DAS,T5 :T3+2 NPK Spray at 25 & 45 DAS Crop was managed and irrigated as per recommended practices of the zone.

Chickpea grown under prevailing farming practices (T1& T2) resulted in poor growth which ultimately resulted in low yield components and yield against the crop fertilized with basal dose, inoculation and NPK foliar spray. Chickpea crop under treatment (T5) resulted in highest yield (19.2q/ha) and was found significantly superior to treatments T1, T2 & T3 by 53.6%,36%25% respectively. Inoculated chickpea followed by basal dose and one foliar NPK

spray resulted in highest additional returns of Rs 18000/-over no basal dose and Rs 14200 over basal dose of DAP.

IAAHAS/AB/2023/490

Tobacco Ark

Devanand Kusumbe[1] and Mohini Punse[2]
Assistant Professor of Agronomy, College of Agriculture, Pimpalkhuta (Dr. P.D.K.V. Akola)

Organic pesticides have the essential role to exterminate pest without contaminating the environment and plant itself. Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity, and this is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs. From an environmental standpoint, organic farming is the preferred method for pest and disease control in agriculture. It is considered to be non-toxic, has less input requirements and greatly enhances the ecological balance while promoting biological diversity and protects the environment. Organic products (inputs) increase agricultural productivity while maintain soil health & environmental safety. It prevents pollution & environment degradation by proper conversion & utilization of organic waste. Tobacco ark is used on a small scale as a natural organic pesticide for hundreds of years, is getting new scientific attention as a potential mass-produced alternative to traditional commercial pesticides. One potential use is as a natural pesticide, due to tobacco's content of toxic nicotine. Tobacco ark made up of 5 kg Tobacco Leaves, 50 lit Cow Urine and 50 lit Water. Benefits of Tobacco Ark is use against various insects like bugs, aphids & caterpillar. It is natural pesticide and insecticide. It reduces the costs of chemical pesticide and 100% natural bio-insecticide for crops.

Keywords: Organic, Tobacco Ark, Bio-insecticide.

IAAHAS/AB/2023/491

Integrated Weed Management in Maize

Anshul Sharma*[1], Dr. S.K. Sharma[2], Dr. Piyush Choudhary[3], Garima Tak[4]

*[1]M.Sc. Research Scholar Agronomy, Rajasthan College of Agriculture, Udaipur

[2]ADG (HRM) ICAR, New Delhi

[3]Assistant Professor Agronomy, B. N. College of Agriculture, Udaipur

[4]Assistant Professor, Department of Entomology, Shrinathji College of Agriculture, Nathdwara

Maize (*Zea mays*) is the second most important cereal crop in the world in terms of production. Because of having the highest genetic yield potential, this crop is known as queen of cereals. In India, it is the third most important food crop after rice and wheat. There has long been a relationship between corn production and weed concentration. For the nutrition, room, light, and water necessary for their growth and development, the corn cereal plant and weed species engage in fierce competition. Weeds are responsible for a significant percentage reduction in worldwide total maize output. Weeds are pervasive and capable of vying for resources with cultivated crops, which can hinder crop development and output. Around 37% of the world's total losses in maize output are attributed to weed infestation, according to studies. Examples of common weed species in maize are *Echinochloa colona (L.)*, *Echinochloa crus-galli*, *Panicum javanicum*, *Cynodon dactylon*, *Parthenium hysterophorus* etc. An integrated weed management combines the use of complementary weed control methods such as grazing, herbicide application, land fallowing, and biological control. The resulting combinations provide the best possible solutions to weed problems. Although each weed control technique has advantages and disadvantages, chemical weeding is becoming more and more popular as a result of the labor-intensive nature of manual weeding. However, the uncontrolled use of chemicals has resulted in harsh environmental conditions that have reduced agricultural output and land fertility. Since no one weed control method can offer the full answer, integrated weed management, when applied systemically, can optimize economic gains and weed control. Cultural control like two manual hoeing at 15 and 30 DAS; Inter-cropping of one or two rows of fodder cowpea in between maize rows reduces weed problem considerably. Chemical control like Pre-emergence atrazine application followed by one hand weeding at 35-40 days gives good weed control.

Keywords: Maize, weed control, integrated weed management, herbicide, atrazine

IAAHAS/AB/2023/492

Quality Evaluation of Indigenous Cereal-based Food Products of Tribal Farmers of Udaipur Region

Deepak Meghwal[1*], Kamalesh Kumar Meena[1], and Rahul Singhal[3]

[1,2,3]Department of Dairy and Food Microbiology, College of Dairy and Food Technology, Maharana Pratap University of Agriculture and Technology, Udaipur, India

There are numerous cereal-based fermented food products which are manufactured throughout the world using cereals, and indigenous lactic cultures having area-specific local variations of composition and process of manufacturing. These fermented foods are produced by spontaneous fermentation, and the quality of the finished product depends on initial counts of microbes and raw ingredients. In the present study, 22 samples from different locations of Udaipur region of Rajasthan, India were collected and evaluated for microbial quality. Different groups of microorganisms such as Gram-negative and Gram-positive bacteria, lactic acid bacteria, total bacterial count and coliform count were performed. Accordingly, the viable counts (Log10 cfu/ml) enumerated as Gram-negative bacterial count ranged between 6.21-6.75, Gram positive bacterial count ranged between 5.42-7.78, total lactic acid bacterial numbers from 6.18-6.98 at 30°C and 6.12-6.49 at 37°C after 24 h incubation. The Total Viable Count (TVC) was in the range of 8.04-8.62 at 30°C and 8.16-8.62 at 37°C, while the presence and population of coliforms was tested at two different incubation temperatures viz., 37°C and 44°C for 24 - 48 hours. Among these, 23% of total samples were found having presence of coliforms with the range of 2.26-3.51 at 37°C, however no coliforms were found at 44°C. The number of viable Gram negative and coliform organisms was observed very high, indicating unhygienic practices being followed during handling and processing, concerning health hazards of consumers. Therefore, it is advisable that proper control measures have to be implemented during product manufacturing.

IAAHAS/AB/2023/493

Mental Well-Being of Working Couples of Udaipur City

Supriya Ramani*and Dr. Suman Audichya**

*Research Scholar, Department of Human Development and Family Studies, College of Community and Applied Sciences, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, Zip code- 313001

**Professor, Department of Human Development and Family Studies, College of Community and Applied Sciences, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, Zip code- 313001

Mental well-being is a state that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community. It is an integral part of health and well-being that underpins individual and collective abilities to make decisions, build relationships and shape the world in which people live. Mental well-being is a basic human right and it is crucial to personal, community and socio-economic development. Mental well-being is more than the absence of mental disorders. It exists on a complex continuum, which is experienced differently from one person to the next, with varying degrees of difficulty and distress and potentially very different social and clinical outcomes. People with mental health conditions are more likely to experience lower levels of mental well-being, but this is not always or necessarily the case. Mental health is essential to overall well-being and as important as physical health. When individual feel mentally well, can work productively, enjoy leisure time, and contribute actively to communities. This paper assessed the mental well-being of working couples who were from Udaipur city (Rajasthan). A total of 200 working couples have participated in the study. To measure mental well-being of working couples a standardized tool was used which were self-structured by the investigator. The findings revealed that working couples experienced moderate to high level of mental well-being. it can be concluded that the majority of working couples had experienced moderate level of mental well-being.

Keywords: *Mental well-being, working couples, Udaipur city*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/494

Cultural Method: An Easy and Safe Component of IPM

Garima Tak[1*], Dr. Piyush Choudhary[2], Dr. Piyush Prasad Jani[3], Anshul Sharma[4]

[1*]Assistant Professor, Department of Entomology, Shrinathji College of Agriculture, Nathdwara

[2]Assistant Professor Agronomy, B. N. College of Agriculture, Udaipur

[3]Professor, Department of Agronomy, Shrinathji College of Agriculture, Nathdwara

[4]M.Sc. Research Scholar Agronomy, Rajasthan College of Agriculture, Udaipur

The purpose of cultural management is to lessen the crop's suitability as a habitat for insect pests. Cultural control is typically used as a protective strategy. The management methods prevent or reduce the effect of the pest on the crop by foreseeing insect issues before they arise. When the target insect pests have few appropriate host plants, do not spread widely or frequently, and/or have complicated nutritional or environmental needs throughout their life cycle, cultural control methods are most effective. Understanding the field's natural setting is crucial when using cultural control methods. For each crop/pest complex, the temperature and nearby ecosystem must be taken into consideration, along with production effectiveness, yields, land protection, and natural enemy home. IPM cultural methods include the following field management techniques: soil treatment; selection of suitable plants; crop rotation; interplanting or strip cropping; choice of planting dates; weed control; use of trap plants etc. Due to the fact that they typically only call for changes to standard manufacturing procedures, cultural controls are typically the least expensive of all control measures. Sometimes all that is needed is cautious preparation instead of additional labor. For large areas of low-value products, they are frequently the only effective control methods. Cultural restraints are reliable and typically precise. The absence of some of the negative side effects of pesticides, such as the development of tolerance to pesticides, unwanted residues in food, feed products, and the environment, and the eradication of non-target species, is of utmost importance.

Keywords: Cultural control, insect pest, cultural management, IPM

IAAHAS/AB/2023/495

Residue dynamics of a combination product of flubendiamide and deltamethrin on okra fruits and soil

Himani Gautam, Sapna Katna, Jatiender Kumar Dubey, Gaganpreet Singh Brar, Shubhra Singh, Nisha Devi, Hema Prashad, Arvind Kumar

Department of Entomology

Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan (HP)

The study aimed to assess the persistence of a combination product of flubendiamide + deltamethrin on okra fruits and soil. The study comprised of treatments *viz.,* flubendiamide + deltamethrin 480 SC @ 36 + 24 g a.i./ha and flubendiamide + deltamethrin 480 SC 72 + 48 g a.i./ha. After third application of combination product, initial deposits of 0.535 and 0.920 mg/kg of flubendiamide and 0.404 and 0.820 mg/kg of deltamethrin were recorded at the standard and double dose. Flubendiamide residues persisted upto 10 days at both the doses whereas residues of deltamethrin persisted upto 5 and 7 days at standard and double dose, respectively in okra fruits. The residues of both flubendiamide and deltamethrin in fruits reduced to half in less than 4 days. Flubendiamide and deltamethrin residues were below determination level (0.05 mg/kg) in okra field soil at 20th day after last application of both the doses. Des-iodo flubendiamide was not detected in okra fruits and soil at any time during the study period. From the consumer safety point of view, the safe waiting period of 9 days was suggested for the combination product of flubendiamide and deltamethrin on okra.

Keywords: Persistence, initial deposits, residues, Des-iodo flubendiamide, safe waiting period, below determination level.

IAAHAS/AB/2023/496

Organic farming Need for Future Generation

Mohini Punse and Devanand Kusumbe

Assistant Professor of Agronomy, College of Agriculture, Mul (Dr. P.D.K.V Akola)

Organic farming refers to the agricultural systems used to produce food and fiber. Organic Farming offers an alternative to more widespread, high input farming practices that use synthetic fertilizers, fungicides and pesticides. Organic farming is acknowledged as crop production system which can sustain health of soils, ecosystems and people by combining tradition, innovation and improved farm technology. It is based on the idea that the soil is a living system so these synthetic products are largely excluded from organic farms. Organic agriculture relies on crop rotation, manure /compost, vermicompost, crop residues, green manures, biofertilizers, crop diversification, organically grown plants are more resistant to disease and pest and the biological control of pests and diseases to maintain soil health and productivity. Due to diversification of crop there is more secured income. Minimizes pollution due to conversion of waste material into valuable compost. Organic crops are often of higher value than conventional ones and the volume of organic crops shows a continually increasing production trend. The sale of crops labeled as organic or biological is highly regulated in most advanced markets. The environmental impact of organic farming is low and can be seen as a way of cleaning up and improving degraded agricultural land. Organic farming may help in providing people with foods and food products without chemicals and toxins. It also provides employment opportunities and economic benefits to local communities. Optimum utilization of resources for short term benefits and conserve them for future generation.

Keywords: Organic farming, Biological pest control, plant pathogenic fungi.

Climate Resilient Agriculture for Sustainable Production

Vishal Gupta, Anshul Sharma, Chetana Sharma, Garima Tak

M.Sc Scholar, Department of Soil Science, College of Agriculture, Indore, RVSKVV, Gawalior

Climate Resilient Agriculture (CRA) is an approach that includes sustainably using existing natural resources through crop and livestock production systems to achieve long-term higher productivity and farm incomes under climate variabilities. This practice reduces hunger and poverty in the face of climate change for forthcoming generations. CRA practices can alter the current situation and sustain agricultural production from the local to the global level, especially in a sustainable manner. Improved access and utilisation of technology, transparent trade regimes, increased use of resources conservation technologies, an increased adaptation of crops and livestock to climatic stress are the outcomes from climate-resilient practices. Most countries have been facing crises due to disasters and conflicts; food security, however, is adversely affected by inadequate food stocks, basic food price fluctuations, high demand for agro-fuels, and abrupt weather changes. Objectives of CRA includes: Sustainably increasing agricultural productivity and incomes, Adapting and building resilience to climate change and reducing and/or removing greenhouse gas emissions, where possible. Climate change can reduce agricultural income by 15-25 per cent; it is high time that rationale of climate-resilient agriculture (CRA) is valued and implemented more rigorously. Following are crucial to address the climate change and achieve sustainable development goals (SDG) in India are Adaptation of appropriate mitigation technologies such as the cultivation of tolerant breeds to overcome the climate stress, Water and nutrient management for efficient productivity and resource utilisation, Agro-advisories for timely crop monitoring, Conservation agricultural practices to build soil organic carbon and to build congenial environment for plant growth, manure management.

Keywords: Resilient, Sustainable, Conservation, variabilities.

SGT University, Gurugram and Just Agriculture Education Group

IAAHAS/AB/2023/498

Therapeutic Properties of Bottle Gourd (*Lagenaria Siceraria*)

Shalini Shukla[1*], Parimita[2*], Suhani Agarwal[3]**

[123]Warner College of Dairy Technology,
Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, 211007

Cucurbitaceae family is utilised as remedial option in medicine. Lagenaria siceraria is also known as calabash or white flowered gourd. Lagenaria Siceraria is widely grown in most of countries. Cucurbitaceae family has around 130 genera and 800 species. It comes in different shapes and sizes but round ones and long ones are most common. It is rich source of ascorbic acid, β carotene and a good source of vitamin B complex. Seed contains iron, lignin, protein and amino acid. Leaves contain polysterols, phenolic compound, saponins, carbohydrate, protein, amino acid and phytosterols. Seed oil is used as remedy to migraine since it has cooling effect. Juice when consumed empty stomach help cure heart disease, liver disease, depression and urinary problem. Fruits of Lagenaria Siceraria is remedy to inflammation in liver. Juice help modify the concentration of urea and uric acid in kidney. It is also used for treatment of ulcer, hypertension, jaundice, piles, and heart disease. Bottle gourd if utilised properly can prove to be boon to mankind. The purpose of the review is to present an insight on therapeutic properties of bottle gourd and its chemical composition.

Keywords: Therapeutic, Bottle Gourd, Medicinal, Nutrients, Inflammatory

IAAHAS/AB/2023/499

Response of Maize under Foliar Application of Zinc Based Nanofertilizer and Varying Fertility Levels on Quality, Yield and Economics

Piyush Choudhary[1*], D. Singh[2], M. K. Kaushik[3], S. S. Sharma[4], H. K. Jain[5], V. Saharan[6], D. P. Singh[7], D. Chouhan[8], H. K. Sumeriya[9] and Manish Bera[10]

[1*,2, 3,9, 10] Department of Agronomy, Rajasthan College of Agriculture, MPUAT, Udaipur

[4]Department of Plant Pathology, Rajasthan College of Agriculture, MPUAT, Udaipur

[5]Department of Statistics, Rajasthan College of Agriculture, MPUAT, Udaipur

[6]Department of MBBT, Rajasthan College of Agriculture, MPUAT, Udaipur

[7]Department of Soil Science and Agricultural Chemistry, Rajasthan College of Agriculture, MPUAT, Udaipur

[8]Department of Genetics and Plant Breeding, Rajasthan College of Agriculture, MPUAT, Udaipur

The present study was carried out during two consecutive *Kharif,* seasons of 2020 & 2021 at Instructional Farm, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture & Technology, Udaipur, Rajasthan to assess the response of maize crop under foliar application of zinc based nanofertilizer and varying fertility levels on quality, yield and economics in Southern Rajasthan. The experiment was laid out in a factorial randomized design with three replications comprising four foliar applications of nanofertilizer (Control, at knee high stage, at 50% tasseling stage and both at knee high stage and at 50% tasseling stage) and four fertility levels (100% RDF, 90% RDF, 80% RDF and control). Significantly highest protein content of maize (11.13 % and 10.97 %) was found in with dual foliar application of nanofertilizer and 90 per cent RDF, respectively. The significantly highest net return and B:C ratio were found under dual foliar application of nanofertilizer 82956 and 3.04) and soil application of 90 per cent RDF (Rs. 86112 and 3.15) in tested maize crop.

Keywords: - Nanofertilizer, Foliar Zinc, Quality, Economics, maize

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/500

Decontamination processing of tebuconazole and combination of fipronil and imidacloprid residues in chilli fruits

Sonali Sharma, Jatiender Kumar Dubey, Sapna Katna, Ajay Sharma, Shivani Bhartiya
Department of Entomology
Dr. Yashwant Singh Parmar, University of Horticulture and Forestry, Nauni, Solan (H.P.)

Field and laboratory experiments were carried out to investigate the effect of different decontamination processes on reduction of tebuconazole, fipronil (including its metabolites viz., fipronil desulfinyl, fipronil sulfide and fipronil sulfone) and imidacloprid (including its metabolite, 6- chloronicotinic acid) residues in chilli fruits like tap water washing, lukewarm water washing, saline water washing, vinegar water washing, open pan cooking and microwave cooking after application of tebuconazole and a pre-mix formulation Lesenta 80 WG (fipronil 40% + imidacloprid 40%) on the crop. Tebuconazole and combination of fipronil + imidacloprid in chilli fruits were applied following the application @ 215 and 50 + 50 g a.i. ha^{-1} after spray, respectively. Chilli fruits were collected at 1, 3 and 5 days interval after the last spray and subjected to decontamination processes. Washing of contaminated chilli samples provided 22.63-24.87, 20.33-24.33 and 22.22-25.76 % relief from tebuconazole, ∑fipronil and imidacloprid residues, respectively from 1 to 5 days chilli fruits. Lukewarm water washing provided 32.66-34.50, 31.01-33.72 and 35.18-37.62 % relief from tebuconazole, ∑fipronil and imidacloprid residues, respectively. Saline water washing removed tebuconazole, ∑fipronil and imidacloprid residues up to 43.50-48.95, 42.94- 44.91 and 45.37- 47.45 %, respectively. Dipping of chilli fruits in 5 per cent acetic acid for 5 minutes provided relief from tebuconazole, ∑fipronil and imidacloprid residues in the range of 62.50-64.88, 55.60- 57.21 and 63.72-100.00 %, respectively. Open pan cooking reduced tebuconazole, ∑fipronil and imidacloprid residues up to 81.37-100.00, 83.95-100.00 and 82.03-100.00 %, respectively. Microwave cooking when cooked at 800W output in microwave for 5 minutes leads to reduction of tebuconazole, ∑fipronil and imidacloprid residues in the range of 93.62-100.00, 98.12-100.00 and 100.00 % from 1-5 days contaminated chilli fruits, respectively. Decontamination of sprayed chilli fruits revealed that microwave cooking was most effective followed by open pan cooking and vinegar water washing.

IAAHAS/AB/2023/501

Influence of different organics on microbial status of soil under organic farming

Y. B. Vala*[1], C. K. Patel[2], M. H. Chavda[3] and M. G. Chaudhary[4]

*[1]Krishi Vigyan Kendra, Sardarkrushinagar Dantiwada Agricultural University, Deesa-385535, Banaskantha-1, Gujarat

A field experiment on "Effect of different sources of organic manures on green pod yield of summer cowpea (*Vigna Unguiculata* L.) under organic farming" was carried out at Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar during summer 2020. The soil of the experimental field was loamy sand in texture, with low in organic carbon (0.30%) and available nitrogen (148.20 kg/ha), medium in available P_2O_5 (46.0 kg/ha) and available K_2O (251.6 kg/ha) with soil pH of 7.5. The experiment comprised of ten treatments of different organic sources. Treatment T_7 (castor cake @ 0.75 t/ha + *panchagavya* spray @ 4% at branching and flowering) recorded significantly higher uptake of organic carbon (%), available N, P_2O_5 and K_2O in soil after harvest of crop. Microbial population viz., *Rhizobium* and PSB were found significant by different sources of organic manures. Significantly the higher *Rhizobium* (236 CFU × 10^4/g soil) and PSB (263 CFU × 10^4/g soil) count were recorded in treatment T_7 (castor cake @ 0.75 t/ha + *panchagavya* spray @ 4% at branching and flowering). Vegetable cowpea grown under organic farming should be fertilized with castor cake @ 0.75 t/ha along with foliar spray of 4.0% *panchagavya* at branching and flowering stage for maintaining soil health and obtaining higher green pod yield under North Gujarat Agro-climatic condition.

Keywords: *Microbial, Soil health, Organic, castor cake, Panchagavya and Cowpea*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/502

Role of Nutrition Sensitive Agriculture Among Adolescent School Students in Rural Communities

Deepa Amgoth[1] and Dr. B. Jamuna Rani[2]

[1]Ph.D. Scholar, Department of Extension Education and Communication Management, College of Community Science, Professor Jayashankar Telangana State Agricultural University, Hyderabad, 500030, Telangana

[2]Director, International Programmes, Admin Block, Professor Jayashankar Telangana State Agricultural University, Hyderabad, 500004, Telangana

Traditionally, agriculture, nutrition, and health have been treated as separate areas, controlled by different Ministries at the state and central level. Although food availability has improved through increased agricultural productivity, a significant proportion of the population in India remains malnourished, as demonstrated by the country's 107th rank out of 121 nations in the 2022 Global Hunger Index. Nutrition-sensitive agriculture (NSA) is an approach to farming that prioritizes both food production and nutrition outcomes. This approach recognizes that food security and good nutrition is not the same thing, and that agriculture has an important role to play in addressing malnutrition. Rural communities, where agriculture is a mainstay of livelihoods, stand to benefit significantly from NSA. To explore the knowledge and attitudes of school students towards Nutrition Sensitive Agriculture (NSA), an experimental study was conducted among rural schools in Telangana State. An intervention module was developed to educate school students on agriculture, nutrition, and health, and frequencies and percentages were used to analyze the results. The study's findings could be valuable in identifying knowledge that support the integration of nutrition-sensitive agricultural among school students and in improving their nutritional status.

Keywords: Adolescents, Agriculture, Intervention, Knowledge, Nutrition garden and Nutrition Sensitive

IAAHAS/AB/2023/503

Standardization of media for propagation of Bougainvillea (*Bougainvillea comm*. Ex Juss.)

Shashi Kiran Minj[1] and Pooja Gupta[2]

[1]Department of Floriculture and landscape Architecture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India 492001

[2]Asstt. Professor, Dept. of floriculture and landscape Architecture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India 492001

The present experiment entitled "Standardization of media for propagation of Bougainvillea (Bougainvillea comm. Ex Juss.)" was carried out at Horticultural nursery, College of Agriculture, IGKV, Raipur, (C.G) during the year 2019-20 and the experiment was conducted in Completely Randomized Design (CRD) with 16 treatments and 5 replications comprising of soilless media and biofertilizer *Azotobacter*. All the media treatments studied recorded superior vegetative and rooting attributes over control. Among the media treatments studied soil + sand + cocopeat recorded maximum sprouting percentage and survival percentage. All other vegetative attributes viz. shoot length (74.00 cm), number of branches (4.80), number of leaves (80.00) and plant height (78.80 cm) found optimistic in media containing cocopeat with soil and sand. The findings revealed that all increasing media treatments had a significant effect on all characters relevant to shoot growth and also the development of Bougainvillea. The findings revealed that all the characters linked to shoot growth were greatly affected by all the growing media treatments and also the development of Bougainvillea. The maximum overall production cost has been seen in T6 (Soil + Sand + Cocopeat) and the least production cost in T13 (Soil + *Azotobacter*). Combination of rooting media has been beneficial to significantly increase the vegetative growth parameters and economics as compared to control in Bougainvillea.

Keywords: *Azotobacter,* cocopeat, Bougainvillea.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/504

Development and Standardization of Anxiety Assessment Scale in Juvenile Delinquents

Renu Joshi* and C.K. Singh
Department of Human Development and Family Studies, CCS Haryana Agricultural University, Hisar-125 004, Haryana, India

The anxiety Assessment Scale, consisting of 10 items scored on a 5-point Likert scale, was developed and standardized in the current study to measure the anxiety level of juvenile offenders between the ages of 15 and 18. Anxiety is an unpleasant state of constant, intense, and excessive worry and fears about ordinary events and it is one of the causes of juvenile delinquency. A score between 1 and 5 was assigned to each item, and the scores were then divided into low, moderate, and high categories. The level of anxiety will rise as an item's score increases. The anxiety assessment scale, which initially had 15 items, was later reviewed, analyzed, and reduced to 10 items to examine the level of anxiety among juvenile offenders. The scale was developed over some steps, including the creation of the questionnaire, expert review, calculation of the content validity ratio, difficulty index and discrimination level, item rejection, and creation of the final tool. The CVR ratio of 10 items was 0.83 ($P \leq 0.05$), the overall difficulty index value was 0.60 and the overall discrimination index value was 0.62. Four observation homes in the state of Haryana were chosen using the purposive sampling technique to scale standardization. The sample consisted of 240 juvenile offenders from every district of Haryana state. To standardize the scale, test-retest reliability, and cross-validity analysis were computed. The overall test-retest reliability coefficient for the anxiety assessment scale was 0.78 ($P \leq 0.05$) and analysis of variance (ANOVA) found non-significant at a 5% level of significance for the anxiety assessment scale across age - $F(2,237) = 0.36$ ($P \leq 0.05$), gender - $F(2,237) = 1.04$ ($P \leq 0.05$) and locality - $F(2,237) = 0.44$ ($P \leq 0.05$). This scale could be applied for further research in the scaling of anxiety levels among delinquents as well as non-delinquents.

Keywords: Anxiety, Juvenile Delinquent, offenders, Observation homes, Likert scale, CVR, DL, DI.

IAAHAS/AB/2023/505

Effect of Inorganic Fertilizers and Organic Manures on Chemical Properties of Soil for Wheat Grown on Saline Sodic Inceptisol

Nihal S. Titirmare, Nitinkumar J. Ranshur, Bhushan S. Lahole and Prasad B. Margal

Department of Soil Science and Agricultural Chemistry, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri- 413722, Maharashtra, India

The present study entitled "Effect of inorganic fertilizers and organic manures on chemical properties of soil for wheat grown on saline sodic Inceptisol" was conducted at PGI Research farm, Department of Soil Science and Agriculture Chemistry, Post Graduate Institute, M.P.K.V., Rahuri during 2021-2022. The experiment consists of eight treatments viz., T_1: RDN (50% N) + 50% N through FYM, T_2: RDN (50% N) + 50% N through vermicompost, T_3: RDN (50% N) + 50% N through poultry manure, T_4: (50% N) + 50% N through press mud compost, T_5: (50% N) + 50% N through goat manure, T_6: (50% N) + 50% N through urban compost T_7: GRDF (120:60:40 N: P_2O_5:K_2O kg ha^{-1}) + 10 t FYM ha^{-1} and T_8: absolute control. These treatments replicated thrice in randomized block design. The soil plots were applied with different inorganic fertlizers and organic manures viz., FYM, vermicompost, poultry manure, goat manure, press mud compost and urban compost and the soil samples were analyzed at Initial, 30, 60 DAS and at harvest for soil chemical properties. Also, the plant analysis for the uptake of N, P, K was carried out after harvesting of wheat crop. The analysis of organic manures revealed that among all the applied sources of organic manures, poultry manure recorded the higher content of total N, P and K. The higher organic carbon was observed in press mud compost. The heavy metals were below permissible limit in all the sources of organic manures. The highest available nitrogen, phosphorus, potassium, organic carbon, highest chlorides, bicarbonates and sodium in saturation paste extract, was recorded in treatment T_7 i.e application of GRDF (120:60:40 N: P_2O_5: K_2O kg ha^{-1}) + 10 t FYM ha^{-1}. The highest calcium was recorded in treatment T_2 i.e RDN (50% N) + 50% N applied through Vermicompost, whereas, the highest potassium was recorded for treatment T_1 i.e RDN (50% N) + 50% N applied through FYM in the saturation paste extract of saline-sodic soil. The yield and uptake of NPK by wheat was enhanced by the application of inorganic and organic sources and significantly the highest grain yield, straw yield with highest uptake of nitrogen, phosphorus and potassium were

recorded in treatment T_7 i.e application of GRDF (120:60:40 N: P_2O_5: K_2O kg ha^{-1}) + 10 t FYM ha^{-1}.

IAAHAS/AB/2023/506

Carbon Pool and Extracellular Enzymes as Influenced by Organic Amendments in Vertisols

Prasad B. Margal, Aniket B. Sarnaik, Ritu S. Thakare and Bhimrao M. Kamble

Department of Soil Science and Agricultural Chemistry, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri- 413722, Maharashtra, India.

The present incubation study entitled, "Carbon pool and extracellular enzymes as influenced by organic amendments in Vertisols" was carried out at Department of Soil Science and Agricultural Chemistry, College of Agriculture, Dhule during 2019. This pot culture incubation study of 90 days was laid out in completely randomized design with ten treatments and replicated in thrice. The treatment consists of control, NPK @ 50:50:50 kg ha^{-1}, FYM, Vermicompost, Cassia phosphocompost, Parthenium phosphocompost @ 5 t ha^{-1} as a organic amendments alone and with NPK @ 50:50:50 kg ha^{-1}. The results revealed that the total organic C, Walkley-Black soil organic C, particulate organic matter C, humic acid-C and fulvic acid-C contents were found to be decreased gradually after 15 days after incubation (DAI). However, water soluble C, soil microbial biomass C and permanganate oxidizable soil C were significantly increased from 15 to 45 DAI, there after it decreases up to 90 DAI in all organic amendments. However, at 90 DAI, significantly highest particulate organic matter C (765.91 mg kg^{-1}), humic acid-C (45.12 %) and fulvic acid-C (40.23 %) contents were found in treatment of NPK @ 50:50:50 kg ha^{-1} with Parthenium phosphocompost @ 5 t ha^{-1} followed by NPK @ 50:50:50 kg ha^{-1}. + Cassia phosphocompost @ 5 t ha^{-1}. All enzyme activities are found highest at 15 DAI and thereafter gradually declined up to the end of incubation period. At the end of incubation (90 DAI), significantly highest acid phosphatase activity (15.47 µg PNP g^{-1} soil hr^{-1}), alkaline phosphatase enzymes activity (28.54 µg PNP g^{-1} soil hr^{-1}), β-glucosidase activity (24.20 mg PNP g^{-1} soil

hr^{-1}), urease activity (36.47 mg NH_4-N g^{-1} soil hr^{-1}) and arylsulphatase activity (35.65 µg PNP g^{-1} soil hr^{-1}) was recorded with NPK @ 50:50:50 kg ha^{-1} along with Cassia phosphocompost @ 5 t ha^{-1}. However, the organic amendments and inorganic fertilizer alone treatments significantly increased all enzyme activities during all stages of incubation over control.

IAAHAS/AB/2023/507

Insights of mutation breeding as a tool for improving plant traits in vegetable crops

Krutika Shriram Dhondge and Dr. N. M. Maske
Department IBT, MGM University, Aurangabad

Vegetable breeding is divided into three sub types as a mutation breeding, recombination breeding and transgenic breeding. Vegetables are important constituent of balanced human diet and health. Utilization or employment of induced mutation for crop improvement is known as mutation breeding. Hugo de Vries in 1900 used the term mutation to describe phenotypic changes and that are the inheritable. Spontaneous mutation is very rare and random in terms of time of occurrence, which makes them more difficult to use in plant breeding. Mutation breeding involves the development of new varieties through chemical and physical mutagenesis. Mutation breeding is now the pillar of present time plant breeding. Mutation breeding mentioned or called as variation breeding. Plants created using mutagenesis are sometimes called mutagenic plant. Mutagens may be of physical, chemical and biological in nature. They will act directly on the DNA, causing direct damage to the DNA, and most regularly result in replication error. Any agents that alter or transmute the information encoded in the nucleotides of DNA or RNA and thus increases the frequency of mutation is considered mutagens. The process of identifying individuals with a target mutant phenotypic characters; this includes two major steps: mutant screening and mutant confirmation. Conventional method of breeding takes extensive time to improve a crop variety due to a very moderate increase in genetic variation. To overcome this induced mutation, play a crucial role which helps in creation of genetic variation in a shorter time of period. Plant breeders are aware of a necessitate for a large and diverse pool of variability to meet up with the needs of current and future plant-breeding objectives. For instance, plant breeder could have

genetic improvements or advancement in numerous qualitative and quantitative traits, such as plant height, leaf color, flower color, leaf shape and high yield.

Keywords: Chemical mutagens, Physical mutagens, Mutation breeding, Variation breeding, Qualitative, Quantitative Mutant selection, Crop improvement.

IAAHAS/AB/2023/508

Techniques and tactics for ensuring the quality and supply of the seeds used in field crops in India

Vishakha Chauhan[1]*, Ankita Chauhan[2], Niyati Thakur[3] and Himanshi Verma[1]

[1]Department of Business Management, Dr. YSPUHF, Nauni, Solan HP 173230

[2] Department of Plant Pathology, Dr. YSPUHF, Nauni, Solan HP 173230

[3] Department of Social Sciences, Dr. YSPUHF, Nauni, Solan HP 173230

To address the difficulties of an ever-growing population and food security, quality seeds are unavoidable. Due to its role as a technological carrier, seed throughout time changed into a commodity used in commerce. As the fifth-largest player in the global seed market and producing a wide variety of crop seeds under various agro-climatic conditions, India has the potential to increase its earnings through seed export. The International Seed Testing Association (ISTA) methodology of seed testing and the Organization for Economic Cooperation and Development (OECD) standards govern the global seed quality assurance system for export. In India, seed quality assurance is governed by the Seeds Act 1966, which stipulates that quality seed must meet the requirements of the Indian Minimum Seed Certification Standards (IMSCS). The current study examines the key differences between the IMSCS's standard operating procedures/methodologies for seed quality assurance and the ISTA's international seed testing regulations and the OECD seed scheme. For Indian seeds to carve out a unique place in the global seed market and to facilitate international seed trade, it is necessary to align the country's current quality assurance system with OECD and ISTA standards. In the current paper, an

effort has also been made to clarify the problems that arise in seed production, with a focus on breeder seed production, regular erratic spans caused by disruptive climate, and methods for reviving high-quality seed production in field crops by producing in off-season or alternative locations.

IAAHAS/AB/2023/509

Role of Indigenous Knowledge in Sustainable Agriculture

Era Lamba

Ph.D. Scholar, Department of Sociology, College of Basic Sciences and Humanities, CCSHAU, Hisar

Indigenous Knowledge refers to the understandings, skills and philosophies developed by societies with a history of interaction in their native environment. This local knowledge is crucial for conserving both the cultural and biological diversity of the world which is imperative for locally suitable sustainable development. Indigenous knowledge is essential for achieving agricultural sustainability in all its ramifications, as it offers new paradigms for development that are both ecologically and socially sound. In the context of sustainable agriculture Indigenous knowledge systems are vital for the following: (i) increasing productivity per unit area; (ii) boosting soil fertility ; (iii) reducing crop loss due to insect and pest assaults; (iv) increasing productivity per unit area; (v) ensuring food diversity; (vi) preventing soil erosion; and (vii) providing insurance against complete crop failure . The yield plateau of crops especially in the core Green Revolution belt, suggests that there is a disruption in natural resource management practices, and that current practises are not favourable for sustainable agriculture leading to loss of genetic diversity of important HYV crops. Here, applying a well-known method of IKS *i.e.* reverting from ‘scientific' monoculture to 'non-scientific' polyculture (mixed cropping, intercropping, and multiple cropping) could be beneficial. Many sustainable traits of polyculture include diet variety, diversified revenue generation, production stability, risk minimization, low insect and disease prevalence, efficient labour and resource usage, with less degradation of natural resources. Traditional ways of life have a connection to biocultural dynamics and cultural traditions, and they can revitalise local food

systems while boosting resilience and sustainability in the social and environmental spheres. The application of traditional knowledge in areas such as ecosystem and landscape management, water management, soil conservation, biological pest and disease control, nutrient management, ecological agricultural and livestock techniques, improves food security and alleviates poverty, thus, making the development process just, equitable, and sustainable.

Keywords: IKS; traditional knowledge; sustainable agriculture; sustainable development; biodiversity conservation; and polyculture.

IAAHAS/AB/2023/510

Novel Breeding Strategies for Improvement of Coarse Cereals

Aakash Kaushal and Aakanksha Kaushal
M.Sc (Ag.) Genetics and Plant Breeding student, CSKHPKV, Palampur (Himachal Pradesh)

With the burgeoning human population, the demand for food has put a lot of pressure on our agricultural system. Coarse grains have good prospects of penetrating the food baskets of a wider range of consumers. Agricultural researchers are still using conventional breeding methods for improvement in millets which take 8-10 years to develop a new variety. To improve traits associated with yield, quality, and resistance to biotic and abiotic stresses in crop plants, several conventional and molecular approaches have been used, including genetic selection, mutagenic breeding, somaclonal variations, whole-genome sequence-based approaches, physical maps, and functional genomics tools. Molecular marker-assisted selection is widely used to map and select commercially important agricultural traits. Plant transformation, also called genetic engineering, exploits recombinant DNA technology to expand gene pool available to plant breeders. For the past three decades, transgenic techniques have been used to understand basic plant biology and also used for crop improvement. In keeping with the currently prevailing problems, the plant breeding paradigm has shifted and now aims to combine both conventional and novel genome editing tools to increase the production of crops in a short period by reducing the selection cycles and increasing the genetic diversity. Currently, numerous genome-editing techniques have been adopted such as

engineered endonucleases/meganucleases (EMNs), zinc-finger nucleases (ZFNs), TAL effector nucleases (TALENs), and clustered regularly interspaced short palindromic repeats (CRISPR), are important tools in plant research, as they allow the re-modelling of future crops. The novel GETs can be coupled with an advanced breeding method called "speed breeding" which uses regulated environmental conditions and prolonged photoperiods to achieve between 4 -5 generations/ year of long duration. The future prospects of novel breeding strategies for the improvement of coarse cereals are promising. These strategies have the potential to address some of the major challenges facing agriculture today and contribute to global food security. However, their adoption and deployment should be done ethically, sustainably, and equitably to ensure that they benefit all stakeholders.

IAAHAS/AB/2023/511

Effect of Different Location on Germination Percentage of Varied Doses of Gamma Rays on Seeds of Various Cultivars of China Aster in Raipur District of Chhattisgarh

Shashi Kiran Minj*, Anjali Verma, Dayanand Sai Painkra, Sourav Sharma

*Department of Floriculture and Landscape Architecture, College of Agriculture, IGKV, Raipur, India

Department of Agricultural Economics, College of Agriculture, IGKV, Raipur, India

Department of Forestry, College of Agriculture, IGKV, Raipur, India

Department of Floriculture and Landscape Architecture, College of Agriculture, IGKV, Raipur, India

The present investigation was conducted to study about the seed germination of various cultivars *i.e.* Arka kamini, Namdhari pink (single), Miraj local, AAC-1 of China aster in different location *i.e.* under polyhouse, open condition and laboratory condition at College of Agriculture, IGKV, Raipur, (C.G). The seeds are irridiated at a varied doses *i.e.* 03 Gy, 06 Gy, 09 Gy, 12 Gy and control (0 Gy). They were sown in the plot, protrays and petri dish in open condition, polyhouse and laboratory condition respectively. Among the various locations and doses, seeds in laboratory condition shows faster germination rate (3 days). Highest seed germination in Arka kamini (134.00), Namdhari pink

(single) (119.00), Miraj local (181.00), AAC-1 (147.00) in 12 Gy, 09 Gy, 03 Gy and 09 Gy respectively under Laboratory condition has been reported. Thus, it was concluded that high doses of gamma rays decrease the germination percentage of various cultivars of china aster under varied locations.

Keywords: Gamma rays, germination, cultivars

IAAHAS/AB/2023/512

Increased Incidence of Emerging and Re-emerging Diseases

Ankita Chauhan[1], Aravinthkumar A[2], Vishakha Chauhan[3] and Niyati Thakur[4]

[1]Department of Plant Pathology, College of Horticulture, Dr. YSP UHF, Nauni, Solan, Himachal Pradesh-173230

[2]Division of Plant Pathology, IARI, New Delhi-110012

[3]Department of Business Management, College of Horticulture, Dr. YSP UHF, Nauni, Solan, Himachal Pradesh-173230

[4]Department of Social Sciences, College of Forestry, Dr. YSP UHF, Nauni, Solan, Himachal Pradesh-173230

Plant disease is a deterioration of a plant's healthy condition that alters the plant's essential functions. A disease is considered to be emerging if it has shown a recent rise in incidence, geographic spread, or host range and may continue to do so in the future, possibly leading to an epidemic. Although a re-emerging disease is one that was once managed by a variety of management methods, it has since developed resistance and caused epidemics. Numerous variables, including interactions between different pathogenic organisms, plant-pathogen interactions, plant insect-pathogen interactions, and unfavorable environmental circumstances, can contribute to the emergence of diseases. Climatic variables are to blame for altering the nature of microorganisms to make them useful pathogens. Given that some pathogens and/or vectors will have better conditions due to climate change, disease is likely to develop. Bakanae disease has been linked to incidents in India, especially among varieties of basmati rice. The False Smut disease of rice has also been documented in more than 40 different nations. For the first time, the Wheat Blast illness has appeared in Bangladesh. Brazil was affected by the Asian Soybean Rust in 2002–2003,

which caused damages assessed to be very high. To prevent disease emergence in the future, strict quarantine laws and monitoring are required; experts must work harder to inform the public about the rise of plant diseases.

Keywords: Emerging, Re-emerging, diseases.

IAAHAS/AB/2023/513

Role of Bioherbicide in Weed Management

Mohini Punse and Devanand Kusumbe

Assistant Professor of Agronomy, College of Agriculture, Mul (Dr. P.D.K.V Akola)

In recent years, synthetic herbicides intense and disordered use has triggered severe contamination of soils and water bodies, causing damage to living organisms, including vegetal herbicide-resistance. Bioherbicide is an emerging weed control strategy towards sustainable agriculture. Biological control of weeds is the deliberate use of natural enemies to suppress the growth or reduce the population of a problem weed species. Augmentation of indigenous fungal plant pathogens (bio herbicides) is a bio control strategy which involves the application of living inoculum of an endemic plant pathogen, generally a fungus, in a manner very similar to that of a chemical herbicide. Bioherbicides have many advantages such as clearly defined for target weeds, no side effect on beneficial plants or human health, a lack of pesticide residue build-up in the environment and effectiveness for control of some herbicide-resistant weed biotypes. Biological control is usually limited to one or a few closely related species and as such cannot presently be considered as an alternative to broad spectrum chemical herbicides and other weed control tactics, but should be considered as a complementary strategy in integrated weed management systems. Based on the current status of bioherbicide use, strategies for widening host ranges, improving formulations for practical use, and improving techniques for enhancement of weed-suppressive activity in conventional and sustainable agricultural systems are needed if bioherbicides are to make significant contributions to nonchemical weed management.

Keywords: Bio herbicide, Biological weed control, plant pathogenic fungi

Zero Budget Natural Farming (ZBNF): A New Dimension of Sustainability in Agriculture Farming and Enhancing Farmer's Income

D. K. Janghel[1*], Devlina Dwivedi[1], Yuvraj Singh[1], Deepak Soni[1], Nitish Kumar[2], Pankaj[1], and Aman Kumar Dhiman[2]

[1]School of Agricultural Sciences, GD Goenka University, Gurgaon-122 103 (Haryana), India

[2]School of Engineering Sciences, GD Goenka University, Gurgaon-122 103 (Haryana), India

In the present day, chemical-based modern agriculture practices pose a serious threat to the well-being of humans, the health of soil, and the farmers' livelihoods. Agricultural industrialization has led to alarming indebtedness among indigenous farmers due to the exorbitant costs of raw materials. Zero Budget Natural Farming (ZBNF), proposed by agriculturist & Padma Shri awardee "Subhash Palekar", is the new dimension of chemical free sustainable agriculture farming without any use of external inputs like fertilizers, pesticides, etc. The phrase "Zero Budget" refers to no use of credits on purchase of external inputs and "Natural farming" represents farming in-tune with natural environments. ZBNF is based on the four most prominent pillars i.e., Bijamrita (Seed treatment), Jivamrita (Organic manures), Acchadana (Organic soil mulching), and Whapasa (minimal watering for optimum moisture and good aeration). It eliminates farmers' dependence on farm loans by encouraging them to use natural resources and disheartens the use of chemicals and expensive inputs. A key aspect of ZBNF farming is soil preservation, mulching, organic pesticides, organic fertilizers, crop rotation, and biological pest control and mechanical cultivation. Additionally, indigenous livestock is emphasized for its unique quality and importance, is crucial for scaling up agroecology. The ZBNF method allows farmers to assure low cost of crop production without the use of chemical while maintaining soil fertility, and increasing farmer's income. Furthermore, it has the potential to prevent straw burning repercussions by practicing organic mulching. Thus, ZBNF is a sustainable alternative approach to the rural world in which people, animals, plants, mycorrhizae, and microorganisms collaborate to boost

agricultural productivity, economic development, and social wellbeing.

Keywords**:** ZBNF, sustainable, chemical-free, agroecology, soil fertility

IAAHAS/AB/2023/515

Development and Standardization of Impulsivity Assessment Scale in Juvenile Delinquents

Renu Joshi and C.K. Singh

Department of Human Development and Family Studies, CCS Haryana Agricultural University, Hisar-125 004, Haryana, India

In the present study, Impulsivity Assessment Scale was developed and standardized to assess the impulsive behavior of juvenile delinquents at the age group of 15 to 18 years which consisted of 12 items scored by using 5-point Likert scale. The impulsive behaviour, act of hastily without conscious thought, is a major contributor to delinquency among juveniles. Each item received a score between 1 and 5, which was then divided into low, moderate, and high categories. The level of impulsive behaviour will increase as an item's score increases. The Impulsivity Assessment Scale originally had 20 items, but it was later reviewed, analysed, and condensed to 12 items for studying impulsive behavior of juvenile delinquents. The scale was developed by going through a number of stages, including questionnaire development, expert review, calculation of content validity ratio (CVR), difficulty index (DI) and discrimination level (DL), item rejection, and development of final tool. The CVR ratio of 12 items was 0.84 (P≤ 0.05), overall difficulty index value was 0.61 and the overall discrimination index value was 0.54. The study was carried out in four observation homes in Haryana state (India) using the purposive sampling technique in order to scale standardisation. The sample consisted of 240 juvenile offenders from all districts of Haryana state. Test-retest reliability and cross validity analysis were computed for standardization of the scale. The overall test-retest reliability coefficient for the impulsivity assessment scale was 0.77 (P≤ 0.05) and analysis of variance (ANOVA) found non-significant at a 5% level of significance for impulsivity assessment scale across age - F (2,237) = 0.41 (P≤ 0.05), gender - F (2,237) = 1.23 (P≤ 0.05) and locality - F (2,237) = 0.49 (P≤ 0.05). This novel scale could be used for further research in the scaling of impulsivity among delinquents.

Keywords: Impulsivity, Juvenile Delinquent, Observation homes, Likert scale, CVR, DI, DL.

IAAHAS/AB/2023/516

Characterization and evaluation of ber (*Ziziphus mauritiana*) growing soils of Rewari district, Haryana

Sumantra Arya[1]*, Rameshwar Singh[2], Dinesh[3]
[1*]Department of Soil science, CCS HAU Hisar- 125004
[2]Assistant Scientist, RRS Bawal, CCS HAU Hisar- 123501
[3]Junior Pedologist, COA, CCSHAU Hisar - 125004

The eight soil profiles from selected orchards viz., Bhurthla (P1), Zahidpur (P2), Boriya Kamalpur (P3), Lodhana (P4), Khaliawas (P5), Jiwra (P6), Rajawas (P7), and RRS Bawal (P8) of Rewari district were exposed and their morphological, physico-chemical characteristics were studied and classified as per Soil Taxonomy and land capability classification and suitability of soils. The colour of soil pedons found yellowish brown with dominant hue to 10YR. The structure of pedons were weak, coarse to medium, single grained to sub angular blocky. The consistency of different pedons varied from non-sticky non-plastic to slight sticky The texture of soil pedons varied from sandy loam, sandy and loam sand with sand proportion higher than clay in all the pedons. Bulk density and and particle density of all the pedons varied from 1.33 to 1.59 Mg m^{-3} to 2.22 to 2.63 Mg m^{-3} respectively. Soil reaction of the pedons varied from neutral to moderately alkaline (pH - 7.93 to 9.23) and soil were non-saline with EC varying from 0.07 to 1.13 ds m^{-1}. The exchangeable cations, Na+, Mg^{2+}, Ca^{2+}, K^{+}, and varied from 0.4 to 5.6, 0.2 to 3.12, 0.1 to 1.56 and 0.01 to 0.1 (cmol (P^{+}) kg^{-1}), with sodium and magnesium being the dominant cations. The organic carbon varied from 0.09 to 0.78 % and available nitrogen was found low in all pedons and and 33.6 to 126 kg ha^{-1} respectively. While available phosphorus and potassium were low to medium and varied from 2 to 29.50 kg ha^{-1} and 75.75 to 150.25 kg ha^{-1}.The soils of the area were classified according to Soil Taxonomy as Sandy, Mixed, Hyperthermic, Typic Ustipsamments (Pedon 1,2,3,6,7,8), and Sandy mixed (Calcareous) hyperthermic Typic Ustorthents (Pedon-4) and Coarse Sandy mixed (Calcareous) hyperthermic Typic

Ustipsamments (Pedon-5). According to Land Capability Classification, the soils of pedons were classified, LCC II (Pedon-1,8) and LCC IIIe (Pedon-2) and LCC IIIs (Pedon-7) and LCC III (Pedon-3,4,6) and LCC IVes (Pedon-5). According to soil suitability criteria soils of Pedon-1, 2, 3, 4, 6 and 7 were classified as moderately suitable (S2), pedon 5 was classified as and marginally suitable and Pedon-8 was highly suitable.

Keywords*: Characterization, classification, suitability, capability, ber.*

IAAHAS/AB/2023/517

A Review: Advances, Scope and different Perspectives in Apiculture

Jyoti Indora*[1], Sunidhi Pilania[2], Abaker M. Malik[3] and Akash Saharan[4]

[1,2,4]Department of Entomology, CCS Haryana Agricultural University, Hisar, Haryana

[3]Plant protection directorate, Gezira, Sudan

Apiculture is an eco-friendly act of rearing honeybees, converting the flower nectar into honey and stored in the combs of bee's hive. Beekeeping is the science of upraising honey bees in place to harvest the honey; the main product obtained from apiculture which India is one of the most leading manufacturer and exporter of honey among the world that provides the direct food to many peoples. It is not bounded only to honey production but having an important role in pollination services, other useful products such as, beeswax, propolis, pollen, bee venom and royal jelly (bee milk) and also supporting the biodiversity. Honey is a mixture of sugars such as rich of fructose (38.5%), glucose (31%), sucrose (1.9%) and maltose (7.1%). Honey, bee wax and propolis are usually source of apiculture used as medicine, health food, cosmetic soaps and traditional crafts (candle making). Copious researchers observed that, apiculture can contribute significantly to *livelihood* security. Over a view, apiculture contributes directly in food security, poverty reduction, employment creation and income generation for different poor farmers and also contributing indirectly by means in water shed-management, forest conservation and crop pollination.

Keywords: Honey bees, pollination, beekeeping, employment creation.

SGT University, Gurugram and Just Agriculture Education Group

IAAHAS/AB/2023/518

Millets: A Blessed Gift of God to Agriculture

Y. B. Vala[*1], C. K. Patel[2], M. H. Chavda[3] and M. G. Chaudhary[4]

[*1]Krishi Vigyan Kendra, Sardarkrushinagar Dantiwada Agricultural University, Deesa-385535, Banaskantha-1, Gujarat

The United Nations has designated 2023 as the **"International Year of Millets"**. The Government of India suggested this. Millets are in the news these days because of their high nutritional value and other health benefits. In light of this, the Indian government suggested that 2023 be designated as the International Year of Millets. It was endorsed by Members of FAO Governing Bodies and at the 75th Session of the UN General Assembly (UNGA). More than 70 nations voted in favor of the resolution creating the International Year of Millets. IYM 2023 will be an opportunity to raise awareness of, and direct policy attention to the nutritional and health benefits of millets and their suitability for cultivation under adverse and changing climatic conditions. Due to their high nutritional value, millets are referred to as "nutri-cereals" and Shree-Anna (श्री अन्न). It also wants International Year of Millets 2023 to be transformed into a 'people's movement'. The Central Government is constantly making efforts to popularize Shree Anna. Whether it is a food festival or a conclave, efforts are being made to attract foreigners and promote exports from the products made from Shree Anna. Whether it is lunch organized for MPs or G20 meeting in Delhi, Shree Anna dishes are being served prominently in all. Efforts are being made to revive the forgotten glory of **'Miracle Millets'** through the **International Year of Millets (IYM) – 2023**. Millets are an excellent source of plant-based nutrition and are a great option for those looking for a nutritious and filling meal that is easy to prepare. They can be eaten as a cereal, as a soup, or as a side dish. The seeds of millets are an excellent source of dietary fiber, protein, and several vitamins and minerals. They are also a good source of magnesium, phosphorous, and potassium. In finally yet importantly, Millets are the **"Grain of God for Goodness".**

Keywords: *International Year of Millets, Agriculture, Shree-Anna, United Nations, nutri-cereals and Millets*

IAAHAS/AB/2023/519

Growing Ever Bearing Fruit Crops for More Income and Livelihood Securities

Ananda Kumar Mandal[1], Shuvadeep Halder [2] and Bharat Chandra Saha[3]

[1]Associate Professor, Department of Horticulture

[2]Teaching Associate, Horticulture

[3]Professor, Genetics and Plant Breeding

School of Agriculture and Allied Sciences, The Neotia University,

Diamond Harbour Road, South 24 Parganas, West Bengal, India-743368

This is an approach to grow different types of ever-bearing fruit crops by any fruit grower to fetch more income from the same tree under West Bengal climatic condition. These crops include mainly Mango (*Mangifera indica*), Jack fruit (*Artocarpus heterophylla*), Citrus (*Citrus* sp.), Sapota (*Acras zapota*), Guava (*Psidium guajava*), Ber (*Zizyphus mauritiana*) etc. Some of these fruit crops can be consumed, round the year, either as ripe fruits or as green vegetables or as value added product like jam, jelly, marmalade, squash, nectar, cordials pickles etc. As the juvenile phase for most of the fruit crops is longer it may be advised to grow intercrops for initial income generation with shade loving and short duration vegetables viz. cabbage, cauliflower, beet root, radish, carrot, amaranthus, coriander, fenugreek, spinach etc. This practice will generate more employment and livelihood of unemployed youths because these fruit crops being perennial will help the growers to engage them throughout the year and use the resources and assets that are otherwise used in general annual crops. These fruits will also play an important role in human diet because they are healthy, contain vitamins, minerals and other nutrients to protect us against a number of diseases. Fruit crops also contain several health-promoting components, like vitamins, essential oils, antioxidants and fiber. As, the demand of good quality fruits is increasing in the domestic and foreign markets, there will be a great scope to earn more income and foreign exchange. This approach will also be a source of inspiration to the students of agriculture and horticulture to use their local germplasms. And conserve them. Additionally, it has been emphasized, to grow /popularize seedless lemon and lime for salad and other purposes.

Satellite-based Soil Moisture Assessment for Spatio-Temporal Comparison of Agricultural Drought

Shalwee[1], Anil K. Gupta [2], Renu Dhupper [1], and Deepak Kumar [3]
[1] Amity Institute of Environmental Sciences (AIES),
Amity University, Sector-125, NOIDA-201313, G.B. Nagar, Uttar Pradesh, India.
[2] National Institute of Disaster Management (NIDM),
Sector-29, Rohini, New Delhi -110042, India.
[3] Amity Institute of Geoinformatics & Remote Sensing (AIGIRS),
Amity University, Sector-125, NOIDA-201313, G.B. Nagar, Uttar Pradesh, India.

Satellite-based soil moisture assessment can provide useful information for spatio-temporal comparison of agricultural drought. Soil moisture is a key variable that affects crop growth, and its availability is critical for agricultural productivity. Satellite-based soil moisture data can be used to monitor and predict drought conditions and to identify areas where drought is likely to have a significant impact on crop yields. Several satellite-based sensors can be used for soil moisture assessment, including the Soil Moisture Active Passive (SMAP) and the European Space Agency's (ESA) Soil Moisture and Ocean Salinity (SMOS) missions. Extreme events like agricultural drought result from the hydrological and meteorological processes. There can be many parameters involved in this. This makes the prediction of drought occurrence difficult. It is complex to assess its extent, intensity, and duration. It requires a combination of the study of parameters like rainfall, temperature, soil moisture and vegetation. Many agricultural drought indices have been developed using these indicators. These sensors use microwave frequencies to measure soil moisture and can provide data at high spatial and temporal resolutions. By using satellite-based soil moisture data, it is possible to monitor changes in soil moisture over time and compare these changes across different regions. This can help to identify areas that are experiencing drought conditions and to assess the severity of the drought. It can also provide information on the effectiveness of drought mitigation measures, such as irrigation or crop management practices. In addition, satellite-based soil moisture data can be combined with other data sources, such as climate models and precipitation data, to provide a more comprehensive picture of drought conditions. This study presents the work of spaceborne soil moisture data as an efficient indicator of drought. The study uses soil moisture datasets of Ranchi,

Jharkhand (India) from October to May (i.e. for Rabi's agricultural season). Soil moisture and vegetation extend combined information on temperature, precipitation, and evapotranspiration. Thus soil moisture results in a direct indicator of available moisture for plant growth and vegetative productivity. As a result, soil moisture plays an important role in the drought monitoring of an area. This can help to improve drought prediction and management efforts and to minimize the impact of drought on agricultural productivity. A satellite-based soil moisture assessment is a valuable tool for spatio-temporal comparison of agricultural drought and can provide useful information for drought prediction and management.

Keywords: *Spatial Resolution, Temporal Resolution, Drought, Mitigation, Climate Models, Precipitation Data, Drought Management*

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/521

Awareness and Perception of Farmers Towards Agri-Tourism in South Gujarat

Swati Sharma*
*Assistant Professor
ASPEE Agribusiness Management Institute, Navsari Agricultural University, Navsari

Agriculture is the main sector of the Indian Economy. At present Indian agriculture is facing many challenges leading to poor remuneration to farmers. So providing additional income generating activities to existing agriculture sector would help the farmers to fetch better remuneration and improve their standard of living. Agri-Tourism is the latest concept in the Indian Tourism industry which could serve this purpose. Gujarat is leading state in tourism with ample opportunity for future growth. The main objective of the study was to assess the awareness and perception level of farmers on agri tourism. 100 farmers from two districts of South Gujarat were selected purposively. Data were collected with structured questionnaire and analysed using descriptive analysis. Results showed that the majority of farmers were aware of the concept of agri-tourism and they got awareness through sources like newspapers, television, radio, fellow farmers, agri department officials. The respondents generally agreed that the existence of agri tourism in their area brings in many benefits to locals as a whole. However, farmers in the rural areas considered that only the experienced indirect benefits. The farmers in the study area considered having enough capital for infrastructure, operation and marketing, obtaining finance, meeting state and municipal regulations, obtaining required permits or licenses, liability issues etc. as the major constraints related to agri-tourism business in the study area. In this regard, the support of the local government and entrepreneurs are required for the development of agri-tourism business in the study area because the small communities need assistance in knowledge and expertise regarding aspects like financing, planning and management, marketing etc. to prosper in this business.

Keywords: Agri-tourism, awareness, perception, constraints.

IAAHAS/AB/2023/522

Effect of crop residue management on soil fertility status in soybean based cropping system in Western Vidarbha region

K.R. Chavhan, C.P. Jaybhaye and M.D. Giri

Agriculture Research Station, Buldana, -443 001

Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra), India

A field experiment was carried out during kharif and rabi 2003-04 to 2013-14 at Agriculture Research Station, Buldana, (Maharashtra) to study the effect of recycling of soybean crop residue on the yield of succeeding *rabi* crops and on soil health. The main plot treatments comprised four crop residue management, *viz.* wheat with residue incorporation, wheat with no residue incorporation, chickpea with residue incorporation, chickpea with no residue incorporation and sub-plot treatment were fertilizers i.e.50,75 and 100 per cent recommended dose of fertilizers for rabi crops were arranged in a split–plot design with three replications. Soybean '***JS-335***' was sown in kharif season with all recommended package of practices for soybean residue only. After harvesting crop well dried soybean crop residue (SCR) was applied on each residue incorporation plot @ 3.90 kg per plot (2.0 t/ha.) The harrowing was undertaken to incorporate the residue in the soil. The seed–bed was prepared; the plots were irrigated prior to cultivation of both rabi crops. Wheat 'AKW-1071' and Chickpea 'JAKI-9218' were sown in row space 22.5 cm and 30 cm respectively in the last week of November and harvested in end of March to middle of April during every year. As per treatments recommended dose of fertilizer for wheat 120:60:60 kg NPK/ha. and chickpea 25:50:00 kg NPK/ha were applied to crop and data on yield and economics were recorded. From this experiment it was concluded that, application of soybean crop residue (2.0 t/ha.) along with 100 percent recommended dose of fertilizer to wheat and chickpea was recorded maximum grain yield, gross and net monetary return, improve the organic carbon content in soil.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/523

Feeding potential of *Coccinella septempunctata* Linn. on mustard aphid, *Lipaphis erysimi* Kalt.

Arvind*, B. L. Jat
Dept. of Entomology, S.K.N. College of Agriculture, Jobner
Sri Karan Narendra Agriculture University, Jobner- 303328

Mustard is an important *Rabi* season oilseed crop. In India, mustard is one of the most important oil seed crops after groundnut. The oil content in mustard seed ranges from 32 - 40 per cent. On the basis of economic losses, mustard aphid is considered to be a key pest The exploitation of biocontrol agents is considered as a suitable alternative to the use of chemical pesticides. Coccinellid beetles, among the various predators, play a crucial role in controlling harmful insect pests in the natural environment. A widely distributed species of coccinellid beetle, Coccinella septempunctata, has been found to be highly effective in combating different insect pests. The feeding potential of mustard aphid predator, *C. septempunctata* was studied in ambient conditions by ensuring food supply to them in form of varying number of aphids, *i.e.,* 50 to I instar, 75 to II instar, 100 to III instar, 125 to IV instar and 150 to adult daily in morning hours (8-10 AM). The observations on number of aphids consumed were recorded after 24 hours of food provided to the predator. A separate jar containing 100 aphids without predator was kept as control. The first instar larva (grub) of *C. septempunctata* consumed 20.30 aphids, second instar 31.10 aphids, third instar 84.20 aphids and fourth instar 119.30 aphids per day ranging from 20 - 28, 25 - 35, 43 - 159, 112 - 133 aphids per day, respectively. The highest number of aphids per day was consumed by fourth instar grub *i.e*., 119.30 aphids/ day. During the total grub period a single grub consumed on an average of 254.90 mustard aphids. The non-starved adult of *C. septempunctata* consumed 94.20 aphids and 24 hours starved adult consumed 110.20 aphids in 24 hours ranging from 90 - 101 and 99 - 118, respectively.

IAAHAS/AB/2023/524

Effect of Different Land Use Systems on Soil Health

Nongmaithem Shitaljit Singh, Thounaojam Thomas Mectei and Yumnam Bijilaxmi Devi

Department of Soil Science and Agricultural Chemistry, Lovely Professional University, Jalandhar, Punjab, India

Having a good soil quality and soil health is an important factor. Enhancing soil health helps in improving physical, chemical and biological components of the soil. But cropping and non-cropping land area has different soil health and quality, with SOM (biological components) plays an important role in indicating the fertility of the soul. While coming to the farming system the Modern farming, which is chemically practice farming system, has made the soils to land degradation and deterioration of soil health but with the implementation of biological components (SOM) it helps in reclaiming the soil health with good productivity and good income for the farmers with a good soil structure. Practicing like Organic farming has a huge impact factor in developing and sustaining the soil quality and soil health. Adopting agroforestry (rich in nutrient content) plays and important role in having the good soil quality and soil health also achieved sustainable agriculture. Therefore, the way to achieved good soil health and soil quality and sustainable agriculture is to maintained the biological components of the soil and choosing suitable practicing methods.

Keywords: Soil health, Soil quality, Land use system, Soil organic matter, Sustainable agriculture

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/525

Effect of integrated nutrient management on yield of niger (*Guizotia abyssinica* L.)

B. K. Choudhari[1], B. N. Aglave[2], M. J. Patange[3] and **P.N. Karanjikar[4]**
Department of Agronomy, College of Agriculture, Latur (MS)
Vasantrao Naik Marathwada Agricultural University, Parbhani 431402 (India)

The field experiment was conducted during *Kharif* season of 2021 at Experimental of Farm Agronomy Section, College of Agriculture, Latur to analysis the effect of integrated nutrient management on growth and yield of niger (*Guizotia abyssinica* L.)The soil of experimental plot was clayey in texture, moderatelyalkaline in reaction having pH (7.03) with chemical composition is available nitrogen (227 kg ha^{-1}), very low in available phosphorous (16.90 kg ha^{-1}) and very high in available potassium (434 kg ha^{-1}). It was well drained which was favorable for optimum growth.

The experiment was laid out in Randomized Block Design. The nine treatments were replicated thrice. The treatments were T_1: Control, T_2: 50%RDF + *Azotobacter* + PSB, T_3: 75%RDF + *Azotobacter* + PSB**,** T_4: 50%RDF + Vermicompost + PSB**,** T_5: 75%RDF + Vermicompost + PSB**,** T_6 **:** 50%RDF + Vermicompost + *Azotobacter* + PSB**,** T_7 **:** 75%RDF + Vermicompost + *Azotobacter* + PSB**,** T_8 **:** 50%RDF + Neem seed cake + *Azotobacter* + PSB, T_9 **:** 75%RDF + Neem seed cake + *Azotobacter* + PSB. The gross and net plot size of each experimental unit was 5.4 m x 4.5 m and 4.5 m x 3.9 m, respectively. Sowing was done on 17th July 2021 by dibbling method by using seed rate 5 kg ha^{-1}. The recommended dose of fertilizer for niger crop was 40: 20: 00: kg NPK ha^{-1}.

The result showed that the application 75% RDF + Vermicompost + *Azotobacter* + PSB (T_7) recorded significantly yield attributes and seed yield (527 kg ha^{-1}), Stalk Yield (465 kg ha^{-1}) and oil content (38.69 %) in niger followed by the application of 75% RDF + Neem seed cake + *Azotobacter* + PSB (T_9) and 75% RDF + Vermicompost + PSB (T_5) are significantly superior over rest of the treatments under study. But as economically, significantly highest net monitory return (₹ 31525 ha^{-1}) and benefit cost ratio (2.13) was recorded with application of 75% RDF + Neem seed cake + *Azotobacter* + PSB (T_9). The next best treatment was application of 75% RDF + *Azotobacter* + PSB (T_3).

Keywords: Niger, RDF, PSB, *Azotobacter*, Neem seed cake, Integrate INM

IAAHAS/AB/2023/526

Adoption of Conservation Agriculture and its impact on income security among farmers in Bihar

Nitu Kumari[1*] and Ajay Kumar[2]

[1&2]Ph.D. Scholar, Department of Agricultural Economics*

Bihar Agricultural University, Sabour, Bhagalpur (Bihar)-India

Conservation Agriculture is a resource-efficient agricultural crop production system encompassing the facets of no tillage or Zero Tillage (ZT), adequate-if possible, complete and continuous coverage of the soil surface throughout the year, crop diversification and crop rotations to produce marketable incomes together with high and sustained production levels while also protecting the environment. In India, Conservation Agriculture adoption is still in its infancy. For the past few years, zero tillage and Conservation Agriculture have been implemented on about 1.5 million hectares. Although conservation agriculture practices have been used and promoted in India for more than ten years, it has only been in the last eight to ten years that farmers have really embraced and adopted the technologies. In the Indo-Gangetic plains (IGP), zero-till (ZT) wheat in the rice-wheat (RW) system is the most widely employed Conservation Agriculture based technology. The study was carried out using the simple random sampling without replacement technique on 100 farmers of Bihar. The main objectives were to examine the level of technology adoption and compare the profitability of conservation agriculture. It was found that about 37 per cent of farmers used conservation agriculture technology, with the lowest adoption rates among marginal and small farmers, followed by semi-medium farmers. Due to lower explicit cultivation costs (hired labour, irrigation, seeds, etc.), conservation agriculture adopters on average earned 49 paisa, 51 paisa, and 75 paisa more than conventional farmers over each rupee invested in paddy, wheat, and maize, respectively. This was because conservation agriculture technology reduced average total costs by 19% in paddy, 16% in wheat and 15% in maize respectively, as compared to conventional method of cultivation. The adoption of conservation agricultural technology can undoubtedly lower the farmer's cultivation costs, enhance the farmer's net income and thus improve living standards.

Keywords: *Adoption, conservation agriculture, paddy, profitability, zero-tillage.*

IAAHAS/AB/2023/527

Field Screening of Garlic Genotypes for Identification of Resistant Sources against Purple Blotch Disease

Vijaykumar KN[1], Shripad Kulkarni[2], Kambrekar DN[3], Shashidhar TR[4] and S. M. Hiremath[4]

[1]Department of Plant Pathology, University of Agricultural Sciences, Dharwad 580005, Karnataka, India

[2]Department of Plant Pathology, University of Agricultural Sciences, Dharwad 580005, Karnataka, India

[3]Department of Agricultural Entomology, University of Agricultural Sciences, Dharwad 580005, Karnataka, India

[4]Department of Horticulture, University of Agricultural Sciences, Dharwad 580005, Karnataka, India

The garlic (*Allium sativum* L.) plant is one of the oldest cultivated plants in the world and belongs to the Amaryllidaceae family. Purple blotch caused by *Alternaria porri* (Ellis) Ciferri is one such disease which causes huge loss to the garlic growers. The best approach to manage the disease is by adopting resistant genotypes for cultivation which is highly necessary in the regions with high purple blotch incidence. Hence, 37 genotypes were field screened at AINRPOG (All India Network Research Project on Onion and Garlic), MARS (Main Agricultural Research Station), Dharwad against purple blotch under artificial epiphytotic conditions during *Rabi,* 2019 and 2020 to identify the resistant sources. The combined results from two years revealed that none of the genotypes were found to be immune to purple blotch. Five genotypes *viz*., G50, Bhima Purple, DOGR426, DOGR543 and DOGR569 were found to be resistant (1-10% infection) and seventeen genotypes were moderately resistant (11-20%) however, four genotypes were found moderately susceptible (21-40%) in reaction. Only one genotype (HRG Local) showed susceptible (41-75%) in reaction with a maximum grade of 4 on (0-5) scale. The remaining genotypes showed varied disease reaction in both the years. The resistant genotypes can be utilized by breeders to develop high yielding varieties that are resistant to purple blotch.

IAAHAS/AB/2023/528

Role of Liquid Organic Formulations in Soil Health and Crop Production

Kishan Kumar
PhD Research Scholar, RCA, MPUAT, Udaipur

The demand for organic food is increasing day by day. To achieve the organic goals and sustainability, the use of organic liquid formulations is seen as one of the alternatives as it avoids the use of synthetic and inorganic chemicals in agriculture. The improved performance of liquid organic manures either applied alone or in combination with the bulky organic manures or chemical fertilizers was noticed in all the studies with respect to growth, yield, quality and nutrient uptake of different agriculture and horticulture crops. Also, these liquid organic manures play an important role in sustaining the soil health through improved soil available nutrients and increased beneficial microbial population. Thus, use of liquid organic manures helps to avoid the dependency of farmers on chemical fertilizers and provide a way for sustaining the crop productivity in agriculture. These organic formulations are prepared from the raw materials obtained from the plants, animals, and their waste materials such as cow dung, cow urine, cow milk, cow curd, honey, jaggery etc. Amritpani, Bijamrut, Jivamrut, Sanjivak, kunapajala and Panchagavya are some of the organic liquid formulations that are in practice from ancient times. These formulations can either be given as individual doses or as combination of two or more. Amritpani, Bijamrut and Jivamrut helps in the enrichment and revitalization of soil contributing to the better yields. Panchagavya enhances the growth, development, quality, yield, and yield attributes of crops. These organic formulations are easily available, easy to prepare, eco-friendly and cost saving when compared with other chemical inputs like fertilizers and pesticides.

Keywords: Organic farming, Amritpani, Bijamrut, Jivamrut, Sanjivak, Panchagavya and Soil health.

IAAHAS/AB/2023/529

Value Addition in Existing Turmeric Harvester for GroundnutDigging Operation

Dr. Priyanka Rajkumar Khole[1] and Dr. Madhuri Sudhakarrao Revanwar[2]
Scientist-Agriculture Engineering
Scientist-Home Science
Sanskriti Samvardhan Mandal's Krishi Vigyan Kendra, Sagroli, Nanded

Abstract: Agriculture is the main sector in the economy of the Marathwada region of Maharashtra. Which is mainly dependent on monsoon rainfall. Among the oilseed crops grown in Marathwada, groundnut holds the first place. The annual production of groundnuts of Marathwada region is around 30858 tonnes approximately and 7 districts of Marathwada. Among the all district from Marathwada region, Nanded holds first place in groundnut production and area of cultivation both. Nanded are considered to contribute more than 16413 tonnes a year. In spite of the large scale mechanization of agriculture in Maharashtra. Most of the agricultural operations are carried on by human hand using simple and conventional tools and implements like groundnut digging operation. Manual groundnut digging is labour and time-consuming operation. Keeping in view the above problems, value addition in the existing turmeric digger was done at Custom Hiring Centre, KVK Sagroli. The necessary modifications were incorporated to improve the existing turmeric digger for groundnut digging operation. The machine is converted into a tractor-driven groundnut pod digger.

Modification: During field testing, the existing machine for groundnut digging was found unsatisfactory performance. Because the soil volume blocking the inlet of conveyor and dug soil along with the Groundnut plants was obstructing the conveyor inlet due to low clearance between upper frame bars and existing curved iron pipes (of 10 cm length) of the conveyor. To minimize the above problem, existing iron pipes were removed. Also during experiment, the action of the blade performance was found poor. The modifications were made to adjust the digging blade according to the requirement for the satisfactory performance of digging blade simultaneously did the Proper adjustment of multi V shape blade of the digger with maintain the blade angle between 10 to 25 Degree.

Result: Finally, the field test was conducted at the farmer's field in sagroli Nanded for the machine evaluation. Field performance of the digger was observed and evaluated at 2km/h forward speed of tractor. The machine performance data regarding fuel consumption, groundnut digging depth,

digging efficiency, pod breakage/damage percentage etc were recorded. The experimental results showed the digging efficiency (i.e. 100%) and pod damage percentage (i.e. 0%) were observed at 2 km/h forward speed of tractor the depth. Not a single pod remains in the soil, 100% pods were harvested from the black cotton soil. The field capacity of modified digger was recorded as 0.3 ha per hour.

Keywords: Value addition, Digging, groundnut, turmeric digger

IAAHAS/AB/2023/530

Effect of Aerosol Concentration in Upper Part of Troposphere

C. Navin Kumar[1*], S. Panneerselvam[2], SP. Ramanathan[3], R. Ajaykumar[4]

[1]Assistant professor (Agricultural Meteorology), Vanavarayar Institute of Agriculture, Coimbatore, Tamil Nadu, India.

[1] Professor and Head (Agronomy), Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India.

[1] Professor and Head (Agro Climate Research Centre), Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

[1]Assistant professor (Agronomy), Vanavarayar Institute of Agriculture, Coimbatore, Tamil Nadu, India

Aerosol are the micro particles (<0.1 μ) present in the air formed by emission of soot particles (burning of fossil fuels). These particles deposit in the upper layer *i.e.,* troposphere causing irradiation in intensity in solar radiation. Atmospheric aerosol, termed particulate matter (PM), is critically important because of its impact on climate, visibility, biogeochemical cycling, atmospheric reactivity, and human health. PM diameter ranges from several nanometers to several micrometers; larger particles settle by gravity too rapidly to be considered aerosol. The presence of particles in the atmosphere also affects chemical processes that can occur. For example, in an urban area into which marine air is transported, HNO_3 displaces chloride from sea salt, leading to the liberation of chlorine and the formation of sodium nitrate. The primary motivation behind the establishment by the United States Environmental Protection Agency (USEPA) of National Ambient Air Quality Standards (NAAQS) for both PM 2.5 and PM 10 (based on mass of particles per volume of air) is the human health consequences suffered by the exposed population. A

positive correlation between statistical rates of morbidity and mortality and ambient PM mass concentrations exists.

Keywords: Aerosol, Particulate matter, Climate visibility, Sea salt, Chemical process.

IAAHAS/AB/2023/531

Evaluation of Subsurface Drainage system in context with Spatio-temporal Variability in Soil Salinity

R. Abhishek[1], Aditya Kapoor[2], Sandeep Kaur[1], Satyendra Kumar[3], SK Kamra[3]

Faculty of Agricultural Sciences, SGT University, Gurugram, Haryana
CUIET, Department of Civil Engineering, Rajpura, Punjab
ICAR-Central Soil Salinity Research Institute, Karnal, Haryana

Soil salinity is one of the main constraints for agricultural food production. Inadequate or overuse of fertilization and irrigation practices in the extreme limit can be directly co-correlated with soil salinisation, waterlogging and shallow groundwater. The objective of this study was to illustrate spatio-temporal variability of soil salinisation and to assess the performance of a subsurface drainage system installed in Mokrakhri, Dist. Rohtak, Haryana in 2017. Electromagnetic (EM) measurements provide a rapid method to study the spatial variability and regional distribution of soil salinity over large areas. An EM induction survey was conducted in subsurface drainage project area. The area gets waterlogged in rainy season and has a very shallow and saline ground water. The ground water table depth during the month of May ranged from 0-1.2 m. EM-38 horizontal and vertical survey observation on a 100 x 100 m grid spacing were made over 30 ha area. Thirty optimal sampling locations were identified in the field, based on the EM horizontal and vertical survey data and soil samples were collected at 15 cm depth increment upto 60cm depth (i.e., 0–15, 15–30, 30 –45 and 45 –60 cm). The soil samples were analyzed for EC of saturated extract (ECe), pH, cations (Ca^{2+}, $Mg^{2+}$and Na^{+1}), anions ($CO3^{2-}$, HCO^{2-}, Cl^{-1}) and sodium adsorption ratio (SAR) using standard analytical procedure. A Geostatistical based krigging approach was applied to analyze

EM-38 observation for producing maps using SURFER software. In the field, apparent conductivity in the horizontal ECa (H) and vertical ECa (V) mode ranged from 14-95 dS/m and 20-72 dS/m with median value of 70 and 50 dS/m respectively. Correlations analysis between ECa (V), ECa (H) and ECe for different soil layers (i.e., 0–15, 0-30, 0-45 and 0–60 cm) showed highest correlation observed in composite depth increment of 0–60 cm. The correlation coefficients (r^2) of ECa (V) and ECa (H) were 0.69 and 0.74 with ECe and 0.58 and 0.84 with SAR of 0-60 cm soil respectively. The result suggests a high degree of reliability of EM-38 observation for detecting ECe in field. Due to shallow and saline ground water table, salts tend rise upward through capillarity and accumulate in the root zone during the dry season, resulting high soil salinity. Without drainage, secondary soil salinisation will occur and adversely affect the crop production in the area.

Keywords: Depth to water level, Soil salinity, EM-38 Probe.

IAAHAS/AB/2023/532

Formulation of Soil and Foliar Grades of Micronutrients and their Response to Soybean-Wheat and Maize-Onion Cropping Sequences

M. A. Ajabe

Department of Soil Science and Agri. Chemistry,
Mahatma Phule Krishi Vidyapeeth., Rahuri- 413 722 (M.S.)

A field experiment was conducted on "Formulation of soil and foliar grades of micronutrients and their response to soybean-wheat and maize-onion cropping sequences" at Post Graduate Institute Research Farm, Department of Soil Science and Agricultural Chemistry, MPKV, Rahuri during *Kharif* and *rabi* seasons 2018-19 with ten treatments replicated thrice in randomized block design. The treatments were comprised of T_1- Absolute control, T_2- GRDF (As per crop), T_3- GRDF + Phule Grade-I (a) @ 25 kg ha^{-1} (Gypsum based), T_4- GRDF + Phule Grade-I (b) @ 25 kg ha^{-1} (Bentonite based), T_5- GRDF + Grade-I (c) @ 25 kg ha^{-1} (Gypsum based), T_6- GRDF + Phule micro Grade-II (a) @ 0.5 & 1 % (Chelation with EDTA),T_7- GRDF + Phule micro Grade-II (b) @ 0.5 & 1 % (Chelation with glycine), T_8- GRDF + Phule micro Grade-II (c) @ 0.5 & 1 % (Chelation with EDTA), T_9- GRDF + Phule micro Grade-II (d) @ 0.5 & 1 % (Chelation with citric Acid), T_{10}- GRDF + Govt. notified Grade-II (e) @ 0.5 & 1 % (Chelation with EDTA). The soil belonged to order Inceptisol (*Vertic Haplustept*). The experimental soils were moderately alkaline in nature and low in soluble salt content. Medium in $CaCO_3$, moderately high in organic carbon, low in available N and P and very high in K. The available Zn and Fe were deficient and available Mn, Cu, Mo, and B were sufficient.

Source of boron as borax was not suitable for foliar liquid micronutrient formulations Phule Grade-II (a). Rests of formulations were successful and not any precipitation occurred. The significantly the highest total chlorophyll content in fresh tissue of soybean at flowering stage (1.74 mg g^{-1}), maize at vegetative and flowering stage (1.56 and 1.82 mg g^{-1}) and onion flag leaf and bulb formation (0.53 and 0.56 mg g^{-1}) were obtained in the application of GRDF + Phule Grade I (a) @ 25 kg ha^{-1} (Gypsum based).

The significantly highest number of nodule $plant^{-1}$ (42.17), number of pods $plant^{-1}$ (40.20) in soybean, number of grains $spike^{-1}$ (64.07) in wheat, number of cob $plant^{-1}$ (2.67) in maize was observed in application of GRDF + Phule

Grade-I (a) @ 25 kg ha^{-1} (Gypsum based). Significantly the highest grain yield of soybean (31.15 q ha^{-1}), maize (41.09 q ha^{-1}), wheat (69.70 q ha^{-1}), onion bulb (23.78 t ha^{-1}), soybean equivalent yield (20.91 q ha^{-1}) and maize equivalent yield (222.50 q ha^{-1}) were observed with the application of GRDF + Phule Grade-I (a) @ 25 kg ha^{-1} (Gypsum based). The significantly highest stover yield of soybean (47.13 q ha^{-1}) and maize (88.90 q ha^{-1}) were obtained by the application of GRDF + Govt. notified Grade-I (c) @ 25 kg ha^{-1} (Gypsum based). Significantly the highest straw yield of wheat (84.03 q ha^{-1}) and onion (19.20 q ha^{-1}) was obtained by the application of GRDF + Phule Grade-I (a) @ 25 kg ha^{-1} (Gypsum based). The application of GRDF + Phule Grade-I (a) @ 25 kg ha^{-1} (Gypsum based) significantly increased protein yield (1247.25 kg ha^{-1}), oil content (20.94 %) and oil yield (652.28 kg ha^{-1}) in soybean and starch (67.20 %) in maize.

The highest gross and net monetary returns (R.s. 180540 and 71411 R.s. ha^{-1}) with benefit : cost ratio 1.65 were obtained from soybean-wheat cropping sequences in treatment GRDF + Phule Grade-I (a) @ 25 kg ha^{-1} (Gypsum based) followed by treatment GRDF + Govt. notified Grade-I (c) (a) @ 25 kg ha^{-1} (Gypsum based) which recorded the highest gross and net monetary returns (R.s. 174085 and 66956 R.s. ha^{-1}) with benefit cost ratio 1.62. The highest gross and net monetary returns (R.s. 501185 and 271952 R.s. ha^{-1}) with benefit : cost ratio 2.19 were obtained from maize-onion cropping sequences in treatment GRDF + Phule Grade-I (a) @ 25 kg ha^{-1} (Gypsum based) followed by treatment GRDF + Govt. notified Grade-I (c) @ 25 kg ha^{-1} (Gypsum based) and GRDF + Phule Grade II (d) (Chelation with citric acid) which recorded the highest gross monetary returns (R.s. 496865 and 478049 R.s. ha^{-1}) and net monetary returns (R.s. 269632 and 251214 R.s. ha^{-1}) with benefit : cost ratio 2.19 and 2.11.

Thus, it can be concluded that, soil application of Phule grade I (Gypsum based: Zn 5%, Fe 5%, Mn 1%, Cu 0.5% and B 1 %) or Govt. notified grade-I (Gypsum based: Zn 5%, Fe 2%, Mn 1%, Cu 0.5% and B 1 %) along with general recommended dose of fertilizer to soybean-wheat and maize-onion crop sequence were found beneficial for yield of soybean, wheat, maize and onion, availability of micronutrient in soil and increase in uptake of nutrients grown on Fe and Zn deficient medium deep black soils (Inceptisol).

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/533

Evaluation of Seed Priming on Growth and Yield of Chickpea (*Cicer arietinum* L.)

R.V. Zanzad[1*], U.U. Rajput[2], P.P. Gawande[3], T.H. Rathod[4] and P.P. Chavan[5]

[1]Assistant Professor & Junior Breeder: QSPU, Central Demonstration Farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Wani-Rambhapur, District Akola 444 102 (Maharashtra)

[2]Agriculture Assistant: Central Demonstration Farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Wani-Rambhapur, District Akola 444 102 (Maharashtra)

[3]Assistant Professor & Senior Breeder: QSPU, Central Demonstration Farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Wani-Rambhapur, District Akola 444 102 (Maharashtra)

[4]Professor & Chief Seed Production Officer: Central Demonstration Farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Wani-Rambhapur, District Akola 444 102 (Maharashtra)

[5]Associate Professor: Central Demonstration Farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Wani-Rambhapur, District Akola 444 102 (Maharashtra)

The present experiment entitled “Evaluation of seed priming on growth and yield of chickpea (*Cicer arietinum* L.)” was conducted during Rabi 2019 at the experimental field of Pulses Research unit, Dr. PDKV, Akola to assess the suitable priming treatment for chickpea crop (variety: JAKI-9218). The experiment was laid out in randomized block design in three replications. The morpho-physiological traits viz. germination %, plant height, number branches, dry matter content, number of days required to 50% flowering were taken. The morpho-physiological i.e. plant height, number of branches, dry matter content, and germination % showed a significant increase in chickpea crop when seed priming was carried out with potassium nitrate for 4 hours. The number of days required for 50% flowering was recorded least in seed priming GA3 for 4 hours. Protein content also recorded significantly higher in seed priming with potassium nitrate for 4 hours. Yield and yield attributes were also significantly increased in seed priming with potassium nitrate for 4 hours. It is concluded that seed priming with potassium nitrate for 4 hours recorded higher morpho-physiological characters over priming treatment and control.

Keywords*: Seed priming, Germination, Growth parameters. GA3, Potassium nitrate*.

IAAHAS/AB/2023/534

GIS -Based Evaluation of Soil Irrigability and Land Capability for Agricultural Sustainability Affected by Fly Ash

Dr. Subhas Adak

Agricultural Training Centre & State Agricultural Management and Extension Training Institute, Ramakrishna Mission, Narendrapur, Kolkata-700103, West Bengal, India

Silt is found more in the adjacent area (<4km) of coal based Kolaghat thermal power plant whereas clay is rich for the rest of study area. Water holding capacity is little bit higher (54.4%) in the site close to power plant than the remaining area (53.02%). Calcium carbonate content (1.06%), electric conductivity (0.26 dSm^{-1}) and exchangeable sodium percentage (3.98%) are also influenced by fly ash while these are 0.88%, 0.124 dSm^{-1} and 3.37% respectively for the area (>4km) outside of impact zone. Gypsum status (1.59%) and infiltration rate (0.316 $cm.h^{-1}$) in further location (>4km) compared to the nearer area (0.4% and 0.3 $cm.h^{-1}$ respectively). Cation exchange capacity (16.46$cmol.kg^{-1}$), base saturation (89.3%) are found more in the surrounding area (<4km) whereas these are 13.17$cmol.kg^{-1}$ and 85.23% respectively for the rest of area. Organic carbon is comparatively less (0.49%) in the plant site. The land near to thermal power plant is moderately suitable for irrigation with limitation of organic carbon (<0.75) and alkalinity (pH>7) while the drainage is the limiting factor for the remaining area. The surrounding land is capable for moderately good for cultivation with limitation of soil and climate. This evaluation precisely designed by GIS technology suggests the best alternative uses of land for environmental and agricultural sustainability as well as the improvement of socio-economic profile of the agrariancommunity.

Keywords: Fly ash, Land capability, Soil properties, Soil irrigability, GIS technology.

IAAHAS/AB/2023/535

Development of Microencapsulated Probiotic Chocolate

R. Kavya, P. Jayamma, K. Visishta, Shaik Mohammad Ali, Kummari Sirisha, C. Jagadish

Department of Food Safety and Quality Assurance, College of Food Science and Technology, ANGRAU, Pulivendula, A.P.

Probiotics are defined as essential live microorganisms that, when administered in adequate amounts, confer a health benefit on the host. The sources of probiotics for lactose intolerant people are very limited. A total of 15 isolates were isolated from yogurt, among the 15 isolates, five isolates (LC1, LC2, LC3, LC4 and LC5) were identified as Lactobacillus spp. from biochemical tests and sugar fermentation test. These isolates were screened for their potential probiotic properties under different pH levels (2 to 7) and NaCl concentrations (2%,4%,6% and 8%). The pH for the optimum growth was found to be pH 6. In NaCl tolerance test, LC1 isolate showed maximum growth at all concentrations. Further, antimicrobial activity test was performed by well diffusion method and antibiotic susceptibility test was performed by disc diffusion method. The isolates LC1, LC2 and LC3 have shown antimicrobial activity with zone of inhibition 3mm, 1.6mm and 1.2mm, respectively. The zone of inhibition against the eight antibiotics showed that among all the isolates LC1 has minimum zone of inhibition to antibiotics. It was observed that isolate LC1 has shown potential probiotic properties and was used in the preparation of encapsulated beads. These probiotic beads were incorporated into chocolate before freezing (2 to 3°C). The results from texture analysis indicated that the hardness of prepared chocolate was found to be slightly greater than normal dairy free chocolate.

Keywords: Bacterial isolates, probiotic beads, encapsulation, texture analysis.

IAAHAS/AB/2023/536

Influence of Safflower Varieties under Different Sowing Dates on Growth, Yield and Economics

S. L. Bankar, R.D. Damdar and S.S. Prachand

Department of Agronomy

Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola- 444 104

A field experiment entitled "Performance of safflower varieties under different sowing dates for Vidarbha region" was carried out at Agronomy farm, Dr. P.D.K.V., Akola during *rabi* season of 2012-13 on clayey soil. The experiment was laid in factorial randomized block design with twelve treatment combinations comprised of three sowing dates viz., sowing in 37 th MW (D 1), 39 th MW (D 2) and 41st MW (D 3) and four varieties viz. Bhima (V 1), 14 AKS-207 (V 2), PKV-Pink (V 3) and AKS-325 (V 4) with three replications. The gross and net plot size were 3.6 x 4.5 m 2 and 2.7 x 3.6 m 2 respectively. Experimental results revealed that all the growth attributes viz., plant height, number of branches plant $^{-1}$, number of leaves plant $^{-1}$, leaf area plant^{-1}, leaf area index and dry matter accumulation plant $^{-1}$ and yield attributes such as number of capitula plant^{-1}, capitula weight plant^{-1}, number of seed capitula^{-1}, seed weight plant^{-1} as well as seed, straw and biological yield were significantly influenced by sowing dates. Highest values of the growth attributes, yield attributes and seed yield were recorded with sowing in 41st MW (D 3). Sowing in 41st MW (D 3) also recorded maximum protein yield (kg ha^{-1}) and oil yield (kg ha^{-1}). The significantly higher nitrogen and phosphorous uptake by the crop were recorded with sowing of safflower in 41st MW (D 3) over rest of the sowing dates. At harvest available nitrogen, Phosphorous and potassium content in soil was not significantly influenced by sowing dates. Sowing in 41st MW (D 3) recorded significantly higher Gross monetary returns, Net monetary returns and Benefit cost ratio over rest of the sowing dates. Growth attributes viz., plant height, number of branches plant^{-1} , number of leaves plant^{-1}, leaf area plant^{-1} , leaf area index and dry matter accumulation plant^{-1} , and yields attributes viz., numbers of capitula plant $^{-1}$, capitula weight plant^{-1}, seed weight plant^{-1} as well as seed, straw and biological yield were significantly influenced among the varieties. Highest values of growth attributes and yield attributes were recorded in variety Bhima (V 1). Maximum protein yield (kg ha^{-1}) and oil yield (kg ha^{-1}) was also recorded by variety Bhima (V 1). Bhima (V 1) recorded

significantly higher Gross monetary returns, Net monetary returns and Benefit cost ratio over rest of the varieties.

IAAHAS/AB/2023/537

Performance and Evaluation of Power Weeder-A Review

Suvain K. K [a], Selvakumar P[b], Thillaiarasan S[b], Elankeeran V[b], Elango k[b]

[a]Assistant Professor, Department of Agriculture Engineering, Nandha Engineering College, Erode – 638052, India

[b]UG. Students, Department of Agriculture Engineering, Nandha Engineering College, Erode – 638052, India

India plays vital role in agriculture. The weed is a plant that is not valued where it is growing and is usually of vigorous growth. The increase in weed population paves way for high crop weed competition for light, space and nutrients etc cause reduction in yield. Thus, proper weed management particles to be adopted. Farmers invest and perform his major role in controlling these weeds at all the crop growth stages. This operation becomes more laborious and labour consuming. Thus, the chemical method weed control becomes more popular among the farming community. This leads to high toxicity both to the environment and also to human beings. Mechanical weed control is considered as the highly efficient method in controlling weeds to a longer period and also helpful in intercultural operation simultaneously. Hence the weeder is developed to be used by farmers to replace manual labour, which is more time consuming, stressful, and costly. This weeder will reduce the cost of weeding operation and eliminate the environmental damage caused by herbicides in controlling weeds in farming and increases organically grown agricultural products as rise in the market needs. This is majorly performed through the power weeder. The use of weeder result in lesser labour force, minimum time consuming, easy to operate and high weeding efficiency.

Keywords: *Weed control measure, herbicide, manual labor, power weeder.*

Factors for resistance in Pigeonpea seeds against *Callosobruchus chinensis*

Mounika Jarpla[1], Suresh M. Nebapure[2] and Anil kumar ST[3]

Division of Entomology, ICAR-Indian Agricultural Research Institute, New Delhi-110012

Seeds of the plants have evolved several mechanisms, either morphological or biochemical, to defend the granivory insects. Identification of these mechanisms helps indeveloping breeding strategies to develop new varieties with novel traits for management of these pests. The seeds of fifty pigeonpea, *Cajanus cajan* genotypes were evaluated against pulse beetle, *Callosobruchus chinensis*. The genotype with low susceptibility or growth index of pulse beetle found highly resistant, although no genotypewas found completely resistant or susceptible. Two genotypes *viz.,* IPAB 18-21 and Pusa Arhar-16, found resistant to *C. chinensis* with low adult emergence (57 and 52.35 % respectively), longer developmental period (21.67 and 21.96 days, respectively) and low growth index (GI) (0.412 and 0.398, respectively). The genotypes *viz*., ICPP171112 and PA 663, found to be moderately susceptible with high adult emergence (95.13 and 91.43%, respectively), short development period (17.16 and 17.13 days, respectively) and higher growth index (0.744 and 0.727 respectively). Genotype IPAB 18-21 had more seed hardness (507.67 N) and seed coat hardness (63.6 g) and it was less preferred by *C. chinensis* for oviposition. Variety Pusa arhar-16 had more anti-nutritional factors like phenols (35.18 mg/g), tannins (367.76 mg/g), α-amylase inhibitor (3.06 %), trypsin inhibitor (39.22%). Correlation analysis of GI with Developmental, physical and biochemical parameters of all genotypes showed positive correlation with adult emergence, oviposition, seed index, seed diameter, protein content and significant negative correlation with Mean development period, seed hardness, seed coat hardness, phenols, tannins, flavonoids, α-amylase inhibitor and trypsin inhibitor. Our studies concluded that the resistance of pigeonpea genotypes against *C. chinensis* was mainly associated with anti-nutritional factors of seed. Genotypes having one of the parents from *C. platycarpus* (Introgression lines) and advanced lines (IPAB 18-21) showed promising resistance against *C. chinensis*.

Keywords: *Callosobruchus chinensis*, pigeonpea, resistance, introgression lines, advanced lines.

SGT University, Gurugram and Just Agriculture Education Group
IAAHAS/AB/2023/539

Enhancing the soil health by innovative soil remediation or decontamination techniques – Review

T. Suseela[1] and K. Karthik[2]

[1]Professor, Dept of Floriculture and Landscaping, College of Horticulture, Dr. YSR Horticultural University, Venkataramannagudem, Andhra Pradesh

[2]Ph.D Scholar, Dr. YSR Horticultural University, Venkataramannagudem, Andhra Pradesh

Soil plays a crucial role in supporting various ecological functions and ecosystem services, making it a valuable resource. Unfortunately, our soils have become contaminated with a range of harmful inorganic and organic compounds due to numerous unsustainable human activities. The traditional physicochemical methods employed for soil remediation often rely on economically unviable and environmentally harmful techniques, which is a matter of concern. As a result, researchers have been focusing on developing more sustainable and innovative biological approaches known as "gentle remediation options." These methods aim to achieve efficient removal of soil contaminants, reduce soil ecotoxicity, comply with legal and ethical requirements for minimizing risks to both the environment and human health, and simultaneously restore soil health and associated ecosystem services. An ideal soil remediation method should not only bring the concentration of contaminants below regulatory limits but also promote soil health and provide essential ecosystem services. Importantly, all these goals should be pursued while adhering to environmental regulations and implementing economically feasible (preferably profitable) strategies for soil remediation. The number of reviews revealed that ornamental flower crops responded well to the above decontamination techniques and recorded good quality and yield.

Keywords: Soil decontamination, soil health, ornamental crops.

IAAHAS/AB/2023/540

Influence of different temperature regimes and culture media on the growth and sporulation of *Alternaria brassicae* causing Alternaria blight of mustard

Hemalatha S, R. U. Khan, Sibte Sayyeda and Vaibhav Pratap Singh
Department of Plant Protection, Faculty of Agricultural Sciences, Aligarh Muslim University, Aligarh, Uttar Pradesh, India-202002

Mustard (*Brassica juncea* L.) is the second most important oilseed commodity in India. Alternaria blight (*Alternaria brassicae*) is one of the devastating fungal pathogens, resulting severe yield losses to the crop. The present work was undertaken to study the effect of various temperature regimes and culture media on the mycelial growth and sporulation of *A. brassicae*. It is clearly evident from the results that all the tested temperature regimes and culture media showed variation in the colony diameter and other cultural characters. The temperature 25°C significantly encouraged the mycelial growth (85.00 mm) and exhibited excellent sporulation of *A. brassicae* compared to 15 and 35°C. In case of culture media, Potato Dextrose Agar found to be significantly superior over the other media and registered maximum mycelial growth (82.00 mm) with excellent sporulation. However, Oat Meal Agar supported the minimum mycelial growth (45.00 mm) with fair sporulation. The variation in cultural characteristics (colony color, growth, appearance, and shape etc.) was also observed with various culture media.

Keywords: Alternaria blight, temperature, culture media, rapeseed-mustard, *A. brassicae*

IAAHAS/AB/2023/541

Studies on Preparation of Aonla Wine

S.R. Dalal, A.D. Warade, Pravina Satpute and Yogita Sanap

Horticulture Section,

College of Agriculture, Dr. PDKV, Akola (Maharashtra)

An experiment entitled "Studies on preparation of aonla wine" was carried out during the year 2020-21 at Post Harvest Technology Laboratory, Section of Horticulture, College of Agriculture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola with the objectives to study the effect of different levels of yeast and TSS on chemical and sensory quality of aonla wine and to find out the suitable combination of yeast and TSS levels to obtain superior quality of aonla wine. The experiment was laid out in Factorial Completely Randomized Design (FCRD) with two factors, as factor 'A' constitutes levels of yeast *viz.,* Y_1.- *Sacharomyces cerevisiae var. ellipsodeus* innoculum of 15ml per litre, Y_2- *Sacharomyces cerevisiae var. ellipsodeus* innoculum of 20ml per litre, Y_3- *Sacharomyces cerevisiae var. ellipsodeus* innoculum of 25ml per litre and factor 'B' levels of TSS *viz.,* T_1 (24^0B), T_2 (26^0B), T_3 (28^0B), T_4 (30^0B) with twelve treatment combinations and replicated thrice. The observations in respect of chemical and sensory evaluation were recorded from freshly prepared wine and thereafter periodically at 60, 90, to 120 days of maturation of wine. From the findings it was observed that, the level of yeast, *Saccharomyces cerevsiae var. ellipsoideus* inoculated at 15 ml/litre for fresh, 60, 90 and 120 days matured aonla wine was found significantly superior for total soluble solids, pH, total sugars, reducing sugars, non-reducing sugars, antioxidant, titratable acidity, ascorbic acid and ethanol content. Regarding the different TSS levels, 24^0B TSS of must was found suitable for preparation of wine with respect to TSS, pH, total sugars, reducing sugars, non- reducing sugars, antioxidant, titratable acidity, ascorbic acid and ethanol content of wine. No traces of methanol were found in any treatment of wine at different stages of maturation. Further, the taste, aroma, colour, appearance, astringency and overall acceptability scores were increased continuously during maturation with advancement of time. The treatment combination Yeast 15 ml with 24^0B TSS was found superior for preparation of wine from aonla.

IAAHAS/AB/2023/542

Evaluation of sweet potato lines for yield and quality

Kamalkumaran, P.R.*, M. Velmurugan and M. Anand
Agricultural College and Research Institute, TNAU, Keezhvelur, Nagapattinam

Sweet potato are most valuable food security and climate resilient crops that sustain many livelihoods in the tropics and subtropics. The main objective of the study was to evaluate superior sweet potato entries for yield, cooking quality and weevil resistance. The experiment was conducted for two consecutive years 2017 and 2018 in randomized block design with ten sweet potato entries and three replications at Horticultural College and Research Institute, TNAU, Coimbatore. The sweet potao variety CO5 was used as local check. Out of these local check CO 5 recorded significantly highest yield (28.88t ha[1]) which is onpar with TSp 16-2 (27.25 t ha^{-1}), TSp 16-6 (27.55 t ha^{-1}), TSp 16-7 (26.84 t ha^{-1}), TSp 16-9 (26.66 t ha^{-1}) and TSp 16-10 (27.88 t ha^{-1}). The marketable tuber yield was significantly highest in CO5 (20.94 t ha^{-1}) which was onpar with TSp 16-10 (19.88 t ha^{-1}) TSp 16-10 (19.88 t ha^{-1}). Significantly maximum drymatter content (27.28 %), starch content (20.03 %) were recorded in TSp16-7 and sugar content (2.74 %) in TSp-16-3. Among the entries TSp16-6 recorded highest organoleptic score (8.13), TSp16-4 recorded lowest weevil incidence (28.34 %) and TSp 16-7 recorded highest carotene content (8.62 mg $100g^{-1}$)

Keywords: Sweet potato- Evaluation- Superior lines- Yield - Cooking quality.

IAAHAS/AB/2023/543

Seasonal incidence of major insect pest of brinjal and its relation with weather parameters

H. G. Patel[1], H. V. Patel[2] and S. K. Chawda[3]

[1]PG Student, Department of Entomology, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat, India

[2]ASPEE Shakilam Biotechnology Institute, Navsari Agricultural University, Surat, Gujarat, India

[3]Educationist, Director of Extension Education, Navsari Agricultural University, Navsari, Gujarat, India

A field experiment was carried out at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari to study the seasonal incidence of major insect pests of brinjal and their correlation with weather parameters during summer. The infestation of shoot borer was commenced from second week of March (11th SMW) and continued up to fourth week of May (21st SMW) with maximum in third week of April (13.33%). The incidence on fruit was noticed at first picking of the brinjal fruit in the first week of April (14th SMW) with maximum (33.24%) in fourth week of May (21st SMW). The population of whitefly was started from second week after transplanting (9th SMW) with 0.93 whitefly per leaf and increased gradually to reach its peak in the last week of April *i.e.* 17th SMW (15.95 whiteflies/leaf). The jassid population was started from first week of March *i.e.* 10th SMW (0.34 jassids/leaf) and reached to its peak level (11.89 jassids/leaf) at fourth week of April (17th SMW). The population of aphid was started from the first week of March (10th SMW) with a minimum level of 0.60 aphid per leaf and reached to its peak level (5.04 aphids/leaf) at third week of April (16th SMW). Positive and significant correlation was found between shoot borer and maximum temperature (r= 0.8062). Moreover, maximum temperature (r= 0.7207) and minimum temperature (r= 0.5712) had positive influence on incidence of fruit borer. The maximum temperature had significant correlation with the population of sucking pests.

IAAHAS/AB/2023/544

Value addition of Mushroom by Advanced Food Processing Technology

Ramyashree, S.R. and M.L. Revanna

Dept. of Food Science and Nutrition, University of Agricultural Sciences, GKVK, Bangalore

Professor, Dept. of Food Science and Nutrition, University of Agricultural Sciences, GKVK, Bangalore

The study value addition of mushroom by advanced food processing technology was carried out at the Dept. of Food Science and Nutrition in GKVK. Mushrooms have been used throughout the world for many centuries. They are considered to be good sources of crude proteins, carbohydrates, lipids, and dietary fibre. Frying in vacuum condition is a new technology used in the study to improve the quality of fried foods because it is working in low temperatures and use the minimum oxygen content. Fresh mushrooms were washed and air dried for about 5 min to drain the water completely and cut in to 4 slices horizontally. Then subjected into vacuum fryer for the processing to get mushroom fries with addition of 5ml oil at 160°C for 20min. After completion, the product was removed and added salt and pepper for taste. Mushroom fries prepared by using vacuum fryer is low in fat and was accepted well by all panelists and the scores obtained as 7.47, 7.75, 7.98, 8.19, 8.33 and 8.19 for appearance, colour, aroma, texture, taste and overall acceptability. The developed mushroom fries were kept for storage for 1 month, at 5 days interval packed in LDPE pouches. Moisture content of the product and sensory parameters didn't differ significantly in the period of 30 days storage.

Keywords: Mushroom, nutrition, vacuum frying, sensory evaluation, shelf life.

IAAHAS/AB/2023/545

Effect of fertigation and plastic mulching on marigold (*Tagetes erecta* L.)

V. Priyadarshini, V.K. Rao, B.D. Bhuj, D.C. Dimri, S.K. Guru and K.P. Raverkar

Department of Horticulture, College of Agriculture, G.B.P.U.A.&T., Pantnagar U.S. Nagar- 263145 (Uttarakhand), India

African marigold (*Tagetes erecta* L.) is an important traditional flower crop and constitutes one of the five most commonly cultivated and used flowers in urban and rural India. Marigold flowers are extensively used for making garlands, beautification, religious offerings, social functions and other purposes such as pigment and oil extraction and therapeutic uses. Apart from these uses, marigold is widely grown in gardens and pots for display purpose. It is highly suitable bedding plant and also ideal for newly planted shrubberies to provide colour and to fill space. It has a great economic potential in loose flower trade. The proposed study "Effect of fertigation and plastic mulch on growth, yield and quality of marigold flowers (*Tagetes erecta* L.)" was carried out at Model Floriculture Centre (MFC), Department of Horticulture, G. B. Pant University of Agriculture and Technology, Pantnagar, District-Udham Singh Nagar, Uttarakhand, during the winter season of 2018-2019 and 2019-2020. Among different growth parameters plant height, number of branches, plant spread, stem girth and total chlorophyll content found significant in different stages of plant growth.

IAAHAS/AB/2023/546

Impact of biofortification of zinc and iron on growth parameters and yields of chickpea (*Cicer arietinum* L.) through agronomic intervention in Chhattisgarh plains

Hema Deshlahare
Research Scholar, Department of Agronomy, College of Agriculture, IGKV, Raipur Chhattisgarh

A field experiment was carried out during the Rabi season in 2018-19 at Instructional Cum Research Farm of IGKV, Raipur (Chattisgarh). To study the "Impact of biofortification of zinc and iron on growth parameters and yields of chickpea (*Cicer arietinum* L.) through agronomic intervention in Chhattisgarh plains" The experiment was laid out in Split Plot Design with four replications. The experiment consists of two varieties viz., Vaibhav and Indira chana-1 and nutrient levels of different zinc and iron treatment combination. A significant variation was found in chickpea varieties and nutrient levels of different zinc and iron treatment combinations. The maximum plant growth parameters viz., plant height, dry matter accumulation, number of branches recorded under variety Indira chana-1. In case of different Zn and Fe treatment combinations, the treatment RDF+ Soil application of $ZnSO_4$ @ 25 kg ha^{-1} at basal recorded maximum plant growth parameter viz., plant height, dry matter accumulation, number of branches at 30 DAS and later stage of crop growth treatment RDF+ $ZnSO_4$ and $FeSO_4$ through foliar application at pre-flowering and pod formation stage" at 60 DAS, 90 DAS and at harvest. The maximum seed yield, stover yield and harvest index observed under variety Indira chana-1 as compared to variety Vaibhav. In case of nutrient levels of different Zn and Fe treatment combinations, the treatment RDF+ $ZnSO_4$ and $FeSO_4$ through foliar application at pre-flowering and pod formation stage recorded maximum seed yield, stover yield and harvest index.

Dr. Utkarsha Pramod Gaware has completed her Doctorate in the discipline of Agricultural Economics from Dr. Rajendra Prasad Central Agricultural University, Pusa (Bihar). During her doctoral degree program she was awarded with Senior Research Fellowship (SRF) from ICAR. She is the Vice- President of India's most rising Agriculture Magazine, Just Agriculture- the Magazine and also an executive member of AEEFWS Foundation, Punjab. Her publications include 23 research papers, 06 abstracts and numerous popular/ technical articles. She has participated and presented (Oral & Poster) her work in nearly 10 national and international conferences. She has also attended various National International events.

Dr. Davinder Pal Singh Badwal is CEO & Founder of Just Agriculture Magazine & Newsletter, President Of Agro Environmental Educational Society (Red.), Social activist, Agripreneur, Speaker. He has also received Young Professional Award. He has organized numerous national and International events under his organizations viz., trainings, workshops, expos and conferences in collaboration with ICAR, NAHEP, ICRISAT, NÄARM, NIPHM, MANAGE, IRRI, PJTSAU, MPUAT and many more. Apart from being an Organizer of many International & National Events, Dr. Badwal has attended more than 55 National and International Conferences. His publications include more than 56 popular articles, 33 Research and Review Papers, 20 Book Chapters and 15 Books. With his dedication and passion, Just Agriculture is now among the top 3 Agriculture Magazines in India with a readership of more than 8 lakh readers.

Mr. Mohit Bharadwaj is currently Pursuing his Doctoral Research from College of Veterinary and Animal Sciences, GBPUAT, Pantnagar. He did his Graduation in Animal Husbandry & Dairying and completed his Master Degree in Animal Nutrition, both from SHUATS University Prayagraj, Uttar Pradesh. He is also editor in chief of Just Agriculture magazine and Newsletter which is the one of the top leading agriculture magazine of India. In View of Publications, He has Published 5 research & review paper in national and international reputed journals and he has published 8 book chapters, 2 lead papers, 40 popular article and 4 technical articles in National and International Magazines. He has presented various oral and poster presentation. He has also attended various National and International conferences, trainings, workshops and symposium. He is life member of various scientific societies.

Ms. Himani Gautam is currently pursuing Ph.D. in the discipline of Entomology from Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan (HP). Ms. Himani is Executive Vice-President of India's most rising agriculture magazine, "Just Agriculture- the magazine". She is also the executive member of AEEFWS Foundation, Punjab. Besides this Ms. Gautam has numerous publications including research papers, book chapters and popular & technical articles. She has attended about ten national and international conferences, trainings and workshops. She has experience in the field of research and teaching. Her research areas include entomology and toxicology.

Dr. Meenakshi Devi is currently working as HOS & Assistant Professor at SGT University, Gurugram. She has completed her B.Sc. (Hons.) Agriculture, M.Sc. Entomology and Ph.D Entomology from CCS HAU,Hisar. She has published 13 research papers out of which 4 are in more than 6 NAAS ratings, 6 book chapters and 10 popular Articles. Dr. Meenakshi has attended 3 national and 8 international conferences. She has also qualified ASRB NET IN 2015. Dr. Meenakshi has 4 years and 8 months experience of teaching and research.

ISBN: 978-93-92953-79-8

Price: ₹ 1050.00

VITAL BIOTECH PUBLICATION

www.vitalbiotech.org | +91-9784677044 | Kota, Rajasthan, India