An International Publishers

4th International Conference
Book of Abstracts

Innovations to Transform Agriculture, Horticulture and Allied Sectors (ITAHAS - 2023)

Organized by

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

Malla Reddy University, Hyderabad (MRUH) and Just Agriculture- the Magazine

on

21st- 23rd June, 2023

at

MRU, Hyderabad

Editors

- D. P. S. Badwal
- Mohit Bharadwaj
- Paresh P. Baviskar
- Utkarsha P. Gaware
- A. Raja Reddy

VITAL BIOTECH PUBLICATION

Innovations to Transform Agriculture, Horticulture and Allied Sectors (ITAHAS- 2023)

4th International Conference
Book of Abstracts

Organized by
Indian Society of Agriculture & Horticulture Research Development, (ISAHRD) Chandigarh
Malla Reddy University, Hyderabad (MRUH) and
Just Agriculture- the Magazine
on
21st- 23rd June, 2023
at
MRU, Hyderabad

Editors
D. P. S. Badwal
Mohit Bharadwaj
Paresh P. Baviskar
Utkarsha P. Gaware
A. Raja Reddy

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

Published by Vital Biotech Publication
First Edition: 2023

Product Form:
Digital download, online and Paperback

Edition:
ISBN: 978-93-92953-91-0

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

Product Manager
Dr. K.S Nama

Graphic Designer
Mukesh Kumar

Office Address:

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

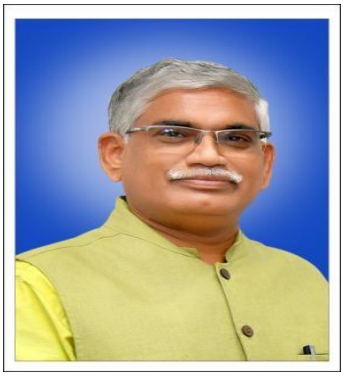
Printed at: Vinayak Printers, Kota

BOOK OF ABSTRACTS

4th International Conference on Innovations to Transform Agriculture, Horticulture and Allied Sectors (ITAHAS- 2023)

21st- 23rd June, 2023

Co-editors
Dr. Piyush Choudhary
Pavithra S
Patibandla Lakshmipriya



Dr. T. JANAKIRAM
Vice-Chancellor

MESSAGE

Universities are platforms where new ideas can sprout and grow into innovations for the benefit of society. Every attempt that advances the cognitive process of thinking and dialogue should be made, encouraged, and recognized. The efforts of this institute are commendable in organizing an international conference on “Innovation to Transform Agriculture, Horticulture and Allied Industries (ITAHAS-2023” from 21-23 June 2023 at Malla Reddy University, Hyderabad.

I'm glad that the **School of Agricultural Sciences, MRUH, ISAHRD, Chandigarh**, and **Just Agriculture Education Group** have taken on the responsibility of organizing this International conference with a goal to have a discussion on the crucial issues of organic farming, climate change resilient agriculture, dairy and veterinary sector towards Sustainable Development Goals, role of agrochemicals, biological and technological interventions, Integrated Crop management. With the confluence of professionals from around the world, I am convinced that this conference will improve our understanding. This international conference attracted more than 1000 attendees from 11 nations. I'm hoping the participants will get the most out of this conference to exchange their ideas and develop new vistas for their future endeavors.

I applaud the efforts of the organizing committee for putting their best in making the arrangements for this conference. I wish you a successful hosting of this conference

KODAGU UNIVERSITY

Jnana Kaveri Campus, Chikka Aluvara, Kushalnagar Taluk,

Kodagu District, Karnataka State, India-571232

FOREWORD

I am extremely pleased to be part of 4th International Conference on **"Innovations to Transform Agriculture, Horticulture and Allied Sectors (ITAHAS-2023)"** jointly organized by Just Agriculture Education Group, AISAHRD, Chandigarh and Malla Reddy University from June 21 to 23, 2023 at School of Agricultural Sciences, Malla Reddy University, Hyderabad.

Agriculture has not only been a topic of sustenance but is now being considered from the commercial point of view as a profitable business proposition. Adoption of innovative and modern technologies in various sectors of agriculture have come handy in addressing the constraints and thus have helped in reducing the cost of cultivation and enhancing productivity and quality of produce.

The international conference facilitated in-depth deliberation by the experts on different topics which provided new insights to the farmers, entrepreneurs, researchers and policy makers. The conference also provided platform for exchange of new research findings and experiences among the delegates which will go a long way in the promotion of new innovative technologies on the farmers fields. I am very much confident that the meaningful discussions and deliberations made on various innovative approaches, emerging technologies and sustainable practices have greater impact on farmers to revolutionize the agriculture sector and create a positive impact on our environment and economy.

The efforts of the organizers to bring the entire deliberations of the conference in the form of a document are laudable. I congratulate the organizers of the conference for selecting a need based and challenging issues in farming sector. I wish that the farmers, participants , readers and the scholars will be benefited from the knowledge, skill and experience spread through this conference.

Dr. Ashok S Alur

Vice Chancellor

MALLA REDDY UNIVERSITY
(Telangana State Private Universities Act No.13 of 2020 &
G.O.Ms. No.14, Higher Education (UE) Department)

Maisammaguda, Kompally,
Medchal - Malkajgiri District
Hyderabad - 500100, Telangana State.
mruh@mallareddyuniversity.ac.in
www.mallareddyuniversity.ac.in

Dr. VSK Reddy
Vice Chancellor,
Malla Reddy University,
Hyderabad.

MESSAGE

Universities are platforms where new ideas can germinate and blossom into innovations for the betterment of society. Every attempt that advances the cognitive process of thinking and dialogue should be made, encouraged, and recognized. Malla Reddy University, School of Agricultural Sciences, Hyderabad has established such a platform and leading the way in carrying on the tradition. The institute successfully organized 4th international conference on "Innovations to Transform Agriculture, Horticulture and Allied Sectors (ITAHAS-2023)" from June 21st – 23rd, 2023 at Malla Reddy University, Hyderabad.

I am very glad that the School of Agricultural Sciences, MRUH, ISAHRD, Chandigarh & Just Agriculture Education Group have taken on the task of organizing this International Conference with a goal to have a discussion on the important issues of Organic Farming, climate change resilient Agriculture, Dairy and Veterinary Sector towards Sustainable Development Goals, Role of Agrochemicals, biological and technological interventions, integrated nutrient, weed, diseases and pest management towards safe food and nutritional security. This international conference provided a platform to the scholars and other academicians across the globe to put their ideas in front of the world.

I applaud the efforts made by the organizing committee and successful conduct of this conference.

(Dr. VSK Reddy)

भाकृअनुप - राष्ट्रीय कृषि अनुसंधान प्रबंध अकादमी
राजेन्द्रनगर, हैदराबाद-५०००३०, तेलंगाणा, भारत
ICAR-National Academy of Agricultural Research Management
(ISO 9001:2015 Certified)
Rajendranagar, Hyderabad-500030, Telangana, India
https://naarm.org.in
Director Office: (O) +91-40-24581322; Fax: 24015912; E-mail: chsrao_director@naarm.org.in

डॉ.सीएच.श्रीनिवास राव
निदेशक
Dr. CH. SRINIVASA RAO, FNASc, FNAAS, FISSS, FISPRD
DIRECTOR

MESSAGE

Universities are platforms where new ideas can germinate and blossom into innovations for the betterment of society. Every attempt that advances the cognitive process of thinking and dialogue should be made, encouraged, and recognised. Malla Reddy University, Hyderabad (MRUH) has established such a platform, and its School of Agriculture Sciences is leading the way in carrying on the tradition. The efforts of this institute are commendable for organizing an International Conference on **"Innovations to Transform Agriculture, Horticulture and Allied Sectors (ITAHAS-2023)"** from **June 21 to 23, 2023** at Malla Reddy University, Hyderabad.

I am very glad that the **School of Agricultural Sciences, MRUH; ISAHRD, Chandigarh** & **Just Agriculture Education Group** have taken on the task of organizing this International Conference with a goal to have a discussion on the important issues of Organic Farming, Climate change resilient agriculture, Dairy and Veterinary Sector towards Sustainable Development Goals, Role of Agrochemicals, Biological and Technological interventions, Integrated nutrient, weed, diseases and pest management towards safe food and nutritional security, application of biotechnology, Genetic engineering for the development of science and technology. It is my firm belief that this conference will certainly enhance our knowledge with the convergence of experts around the globe. More than 1000 participants across 11 countries joined this International Conference. I hope that the participants will make best use of this conference to exchange their ideas and develop new vistas for their future endeavors in the field of agriculture and allied sciences.

I appreciate the efforts of the organizing committee for putting their best efforts in making the arrangements for this conference. I convey my good wishes for the successful organization of this conference.

(**Ch. Srinivasa Rao**)

July 20, 2023

भाकृअनुप-राष्ट्रीय अजैविक स्ट्रैस प्रबंधन संस्थान
ICAR-NATIONAL INSTITUTE OF ABIOTIC STRESS MANAGEMENT
समतुल्य विश्वविद्यालय/Deemed to be University
भारतीय कृषि अनुसंधान परिषद्, कृषि अनुसंधान एवं शिक्षा विभाग
Indian Council of Agricultural Research, Department of Agricultural Research & Education
कृषि एवं किसान कल्याण मंत्रालय, भारत सरकार
MINISTRY OF AGRICULTURE & FARMERS WELFARE, GOVERNMENT OF INDIA
मालेगाँव, बारामती, पुणे, महाराष्ट्र ४१३ ११५, भारत
Malegaon, Baramati, Pune, Maharashtra 413 115, India
ISO Certified 9001:2015
भाकृअनुप ICAR
राअस्ट्रैप्रसं NIASM

Dr. K. Sammi Reddy FNAAS, FISSS
Director

Date: 9th Aug 2023

MESSAGE

I am delighted to be a part of the 4th International Conference on Innovations to Transform Agriculture, Horticulture and Allied Sectors (ITAHAS- 2023) which held at Malla Reddy University, Hyderabad during 21- 23 June, 2023 organized by Just Agriculture Education Group, Malla Reddy University, Hyderabad and ISAHRD, Chandigarh as a Keynote Speaker. Like other sectors of the economy, disruptive transformation through innovations are occurring in agriculture sectors too. Innovations in agriculture are crucial to improve efficiency, food security, economic growth, sustainable and climate adaptation. Therefore, organizing such a conference is the need of hour. This conference acted as a platform for researchers, scientists, scholars, academicians and industry leaders to present their research findings, innovative ideas, and novel technologies to a broader audience. More than 1000 participants across 11 countries joined this conference, as informed by the organizers. I hope that the participants will make best use of it to exchange ideas and develop new vistas for their future endeavors in the field of agriculture and allied sectors.

I appreciate the efforts of the organizers for putting their best efforts in making the arrangements for this conference. I convey my good wishes for their successful organization of the Conference.

K. Sammi Reddy
Director

Phone : 02112-254055
Fax : 02112-254056
Website : www.niam.res.in,
Email : director.niasm@icar.gov.in

डॉ. सरवणन राज
निदेशक (कृषि विस्तार)

Dr. Saravanan Raj
Director (Agricultural Extension)

MESSAGE

Universities are platforms where new ideas can germinate and blossom into innovations for the betterment of society. Every attempt that advances the cognitive process of thinking and dialogue should be made, encouraged, and recognised.

I am very glad that the School of Agricultural Sciences, Malla Reddy University, Hyderabad (MRUH), ISAHRD, Chandigarh & Just Agriculture Education Group have taken on the task of organizing an international conference on **"Innovations to Transform Agriculture, Horticulture and Allied Sectors (ITAHAS-20223)"** from **June 21 to 23, 2023** with a goal to have a discussion on the important issues of Organic Farming, climate change resilient Agriculture, Dairy and Veterinary Sector towards Sustainable Development Goals, Role of Agrochemicals, biological and technological interventions, integrated nutrient, weed, diseases and pest management towards safe food and nutritional security, Aapplication of biotechnology, genetic engineering for the development of science and technology. It is my firm belief that this conference will certainly enhance our knowledge with the convergence of experts around the globe. I hope that the conference participants will make best use of this conference to exchange their ideas and develop new vistas for their future endeavors in the field of agriculture and allied sciences.

I appreciate the efforts of the organizing committee for putting their best efforts in making the arrangements for this conference. I convey my good wishes for the successful organization of this conference.

August 2, 2023
Hyderabad

(Saravanan Raj)

राष्ट्रीय कृषि विस्तार प्रबंध संस्थान (मैनेज)
(कृषि एवं किसान कल्याण मंत्रालय, भारत सरकार का संगठन, राजेन्द्रनगर, हैदराबाद - 500 030. टी.एस. भारत)
NATIONAL INSTITUTE OF AGRICULTURAL EXTENSION MANAGEMENT (MANAGE)
(An organization of Ministry of Agriculture and Farmers Welfare, Government of India)
Rajendranagar, Hyderabad – 500 030, Telangana, INDIA
Ph. : +91-40-24016693, Mobile : +91-8465007799
saravanan.raj@manage.gov.in / saravananraj@hotmail.com
www.manage.gov.in

डॉ. विनीता कुमारी
उप निदेशक (जेंडर स्टडीज) एवं
प्रधान समन्वयक (पी.जी.डी.ए.इ.एम)

Dr. VEENITA KUMARI
Deputy Director (Gender Studies) &
Principal Coordinator (PGDAEM)

MESSAGE

Agriculture & allied sectors, since decades remain to be the backbone of Indian economy. Innovations, technology and improved practices are being introduced in agriculture sector at a fast pace. This calls for all the stakeholders, be it scientists, academicians, scholars, policy makers, farmers, extension functionaries to keep themselves updated with knowledge and skill relevant to the present context in agriculture sector.

The recent technologies relevant to agriculture sector like 'Artificial Intelligence', 'Digital Agriculture', 'Drone Application', 'Precision Farming', 'Mobile Apps' etc. are the future of agriculture & allied sectors. These technology revolution will give a new dimension to agriculture sector. I believe that much effort is required for equipping our farmers with such knowledge and skill, so as to facilitate them in reaping the benefits of such technologies and innovations.

The International Conference on ""**Innovations to Transform Agriculture, Horticulture and Allied Sectors (ITAHAS-20223"** from **June 21 to 23, 2023** at Malla Reddy University, Hyderabad was organized at the right time. Such academic activities provides the much needed platform for knowledge sharing, leading to cross learnings, amongst the stake holders.

I appreciate the initiatives and the efforts of **School of Agricultural Sciences, MRUH, ISAHRD, Chandigarh** & **Just Agriculture Education Group** for thinking of such relevant theme for the conference and bringing academicians from varied disciplines for such a fruitful discussion. The conference was successful in bringing large number of academicians for sharing their research studies relevant to the theme of the conference.

I wholeheartedly applaud the initiative taken by **School of Agricultural Sciences, MRUH, ISAHRD, Chandigarh** & **Just Agriculture Education Group,** its partner institutions and all those who had contributed in organizing this conference and making it fruitful for all. I convey my best wishes to all of you.

Date: 19th July 2023

(Veenita Kumari)

राष्ट्रीय कृषि विस्तार प्रबंध संस्थान (मैनेज)
(कृषि एवं किसान कल्याण मंत्रालय, भारत सरकार का एक स्वायत्त संगठन, राजेन्द्रनगर, हैदराबाद - 500 030. तेलंगाना, भारत.)
NATIONAL INSTITUTE OF AGRICULTURAL EXTENSION MANAGEMENT (MANAGE)
(An Autonomous Organization of Ministry of Agriculture and Farmers Welfare, Government of India)
Rajendranagar, Hyderabad - 500 030. Telangana State. INDIA
Telephone : +91 040-2459 4596/97, Fax : +91 (040) 24015388
E-mail : directoraem@manage.gov.in, Web : www.manage.gov.in

Dr. Suhas P. Wani,
Former Director of Research Program Asia, ICRISAT, and
International Consultant for ADB, IFAD, FAO.

Temples of knowledge and education play an important role in the development of the nation and currently, the New Education Policy of the government of India strongly believes in developing citizens of the country to meet the sustainable development goals not only for the country but can also support and help the smaller countries in the region. In this context, International Conferences, Workshops, and meetings play an important role in the exchange of ideas, and knowledge and also in building human capital particularly those who are engaged in education, learning, and research.

I am to note that Just Agriculture Education Group and AEEFWS, Punjab organized a 4th International Conference on "Innovations to Transform Agriculture, Horticulture and Allied Sectors" (ITAHAS- 2023)" organized by Just Agriculture Education Group, Malla Reddy University, Hyderabad and ISAHRD, Chandigarh, India. Considering the need to ensure food security for an ever-growing population with increasing incomes and associated changes in diets and the impacts of climate change there is an urgent need to transform Indian Agriculture to meet the sustainable development goals, particularly of Zero hunger, good health, and wellbeing, Climate action and wellbeing, and climate-smart agriculture, clean water, and sanitation, etc. Indian economy is largely agrarian economy as 65% of the total population is rural. The rural-urban divide is so prominent that rural income per capita per year is Rs 40,925 less than half of the urban counterpart (Rs 98,435). The agricultural sector's contribution to the national gross domestic product (GDP) value is 20.2 percent in the year 2020-21 and 18.8 percent in 2021-22 as compared to 41% in 1960. The market outlook depends on the performance of agriculture and mainly the performance of Monsoon rains. India has the largest arable land supporting 58% of the population as the primary source of livelihood. Considering the predominance of agriculture/rural areas in driving the Indian economy, rural transformation is a must to make *Atmanirbhar Bharat.* The new science tools and technologies such as remote sensing (RS), digital agriculture (DA), internet of things (IoT), artificial intelligence (AI0, Cloud computing, block chains, and machine learning (ML) will be very much needed to be harnessed to benefit small farm holders. To harness new technologies start-ups and microenterprises will help a lot to generate employment as well as to reach 147 million small farm holders to enhance the adoption of climate resilient interventions to transform agriculture in India.

I am confident that this international Training Course cum Workshop will benefit directly all the participants and all learners through the quality material available through the Workshop.

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

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

Date: 07.08.2023

Sir / Madam

I congratulate the team for successful conduct of 4th International Conference on "Innovations to Transform Agriculture, Horticulture and Allied Sectors (ITAHAS- 2023)" from 21st to 23rd June, 2023 organized by Just Agriculture Education Group, Malla Reddy University, Hyderabad & ISAHRD, Chandigarh as Keynote Speaker. The conduct of conference like this is very helpful to the farming community.

I am thankful for giving me opportunity to join the event as keynote speaker and present lead paper on technological innovation in Hi - tech Horticulture and Precision farming and hope that the lead paper presented may be useful to the farmers doing precision farming in horticulture crops

Thanking you

With regards,

7/8/23

(P. IRENE VETHAMONI)

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

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 4th International Conference on "Innovative to Transform Agriculture, Horticulture & allied Sciences (ITAHAS- 2023)" was planned by Just Agriculture Education Group, & ISAHRD, Chandigarh in collaboration with Malla Reddy University, Hyderabad during 21st to 23rd June, 2023. The conference was embellished by the presence of Chief Guest, Dr. Ashok Alur, Vice-Chancellor, Kodagu University, Karnataka and Guests of Honour Dr. Kuldep Singh, Head Genebank, Dy. Program Director, ACI-ICRISAT, Dr. K. Sammi Reddy Director, ICAR-NIASM, Baramati, Dr. Veenita Kumari, Dy. Director, Gender Studies, MANAGE, Hyderabad, Prof. M. S. Reddy, Founder & Chairman, Asian PGPR Society, Consultant& Entrepreneur, Auburn University, Auburn, AL, USA, Dr. Ravindra Chandra Joshi, Senior Consultant, Rice Research Institute, Philippines & Rao Uppalapati, Corteva Agriscience, USA. The grand success of this event was due to the joint efforts of Dr. VSK Reddy (Hon'ble Vice-Chancellor, MRU, Hyderabad), Dr. M. Anjaneyulu (Hon'ble Registrar, MRU, Hyderabad), Dr. A. Raja Reddy (Dean Scool of Agricultural Sciences, MRU, Hyderabad), other faculty members of MRU, Hyderabad 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

MESSAGE FROM ORGANIZING SECRETARY

I am very glad that Just Agriculture Education Group and ISAHRD, Chandigarh in collaboration with Malla Reddy University, Hyderabad has successfully organized three days international conference on "Innovations to Transform Agriculture, Horticulture and Allied Sectors (ITAHAS- 2023)" from 21st to 23rd June, 2023 at Malla Reddy University, Hyderabad. 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 am delighted to announce that **Just Agriculture Education Group, ISAHRD, Chandigarh** in collaboration with **Malla Reddy University, Hyderabad** has successfully organized the 4th International Conference on **"Innovations to Transform Agriculture, Horticulture and Allied Sectors (ITAHAS- 2023)"** at Malla Reddy University, Hyderabad during 21st to 23rd June, 2023. The conference witnessed an impressive gathering of delegates, researchers and practitioners from across the globe, actively engaging in diverse discussion and presentations aligned with the conference theme. The keynote speakers delivered outstanding and thought-provoking speeches, inspiring attendees and sparking new ideas. The presentations were both informative and engaging, fostering lively discussions and constructive debates. Delegates had valuable networking opportunities, forging connections with colleagues from diverse geographical backgrounds, exchanging innovative ideas and exploring potential avenues for collaboration.

The organizing committee deserves tremendous praise for orchestrating a flawlessly organized and impactful event. Their exemplary efforts in planning, coordinating, and executing the conference ensured seamless operations from start to finish. In conclusion, the conference achieved remarkable success, leaving us eagerly anticipating the next edition in the future. We extend our heartfelt gratitude to all those who contributed to making this event possible and for their unwavering dedication and enthusiasm, ensuring a resounding triumph.

Dr. Paresh P. Baviskar
Vice- President (Branding & Marketing)
Just Agriculture Education Group

MESSAGE FROM CHIEF ORGANIZING SECRETARY

It gives me immense pleasure to share that **ISAHRD, Chandigarh** and Just Agriculture **Education Group** in collaboration with **Malla Reddy University, Hyderabad** have successfully organized the 4th International Conference on **Innovations to Transform Agriculture, Horticulture and Allied Sectors (ITAHAS- 2023)** at **Malla Reddy University, Hyderabad** during 21st to 23rd June, 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 4th International Conference (ITAHAS- 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

SCHOOL OF AGRICULTURAL SCIENCES
MALLA REDDY UNIVERSITY

Maisammaguda, Kompally,
Medchal - Malkajgiri District
Hyderabad - 500100, Telangana State.
dean.agriculture@mallareddyuniversity.ac.in

Dr. A. Raja Reddy

Dean, School of Agricultural Sciences,

Malla Reddy University,

Hyderabad.

Message

It is my immense pleasure to announce that the School of Agricultural Sciences, Malla Reddy University & AISAHRD, Chandigarh and Just Agriculture Education Group have successfully organized 4th International Conference on **"Innovations to transform Agriculture, Horticulture and Allied Sectors" (ITAHAS-2023)** from 21st – 23rd June, 2023 with focus on recent researches conducted in agriculture and allied fields.

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.

It is noteworthy to mention that there was an overwhelming response to the conference. More than 1000 participants across the country and from abroad has participated in this conference. 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. 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.

I deeply acknowledge my gratitude to Sri. Ch. Malla Reddy (Founder Chairman & Minister, Govt. of Telangana), Vice-Chancellor - Dr. VSK Reddy, Registrar - Dr. M. Anjaneyulu for their support.

I am very much grateful to our management and to all my staff members for their endless help in organizing this mega event.

(Dr. A. Raja Reddy)

TABLE OF CONTENT

ITAHAS/LP/2023/001

Underexploited Ethnic Cucurbitaceous Vegetable Crops-Sweet Bitter Gourd, Karuvachakka, Karchikai and Chow Chow

P. Syam Sundar Reddy[1], Syed Sadarunnisa[2], P. Sudheer Kumar Reddy[3], Naveen Yadav Bairagani[4], Subhash Ramadugu[5]

[1]Associate Professor Department of Vegetable Science, College of Horticulture, Dr. YSR Horticultural University, Anantharajupeta, Annamayya Dist. 516105

[2]Professor Department of Vegetable Science, College of Horticulture, Dr. YSR Horticultural University, Anantharajupeta, Annamayya Dist. 516105

[3,4&5]Research Scholar, Department of Vegetable Science, College of Horticulture, Dr. YSR Horticultural University, Anantharajupeta, Annamayya Dist. 516105

Population explosion has led to the increase in a demand for food including vegetables. The underutilized or minor vegetables include those vegetable crops which are not grown commercially on wider range as compared to the major vegetable crops. Under such circumstances utilization of underexploited vegetables holds a great potential in maintaining the nutritional security of the nation. Because of its low-calorie content, chuchekarela is thought to aid in blood cholesterol reduction, fat metabolism regulation, and weight loss. *S. amplexicaullis* is widely recognised for its pharmacological activities due to a variety of bioactive chemicals such as terpenes, triazines, alcohols, esters, alkanes, hydrocarbons, aldehydes, amides, and others, which validates its historic use as an antidiabetic and antibacterial agent. The Karchikai (*Momordicacymbalaria*) plant's fruit is utilized as a tonic with stomachic, stimulant, and laxative qualities. This fruit possesses hypoglycaemia (anti-diabetic) characteristics in animals and people, and its juice is used to treat gout, rheumatism, and subacute spleen and liver problems. Because they are highly suited to present as well as bad environmental circumstances and are typically resistant to insect-pests and illnesses, underutilised cucurbitaceous crops offer enormous potential in food production. As a result, promotion of these vegetables is critical for their use in breeding programmes to generate biotic and abiotic stress resistant/tolerant types.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
Keywords: *Terpenes, Laxative properties, Hypoglycaemic, Chuchekarela, Cymbalaria*

INTRODUCTION

Cucurbits are vegetable crops belonging to family Cucurbitaceae, which primarily comprises 118 genera and 825 species. In India, 37 genera and about 100 species of cucurbits, including wild and cultivated, have been reported. About 60 cucurbit crops are grown in India and half of these are indigenous to India or Indian subcontinent. As a result, only 33 crops (10 main and 23 minor) of this enormous family are consumed as vegetable or salad crops globally or regionally.

Cucurbits share 5% of the total vegetable production in India which includes indigenous cucurbits. Being the largest group of vegetables, cucurbits provide better scope to enhance overall productivity and production of vegetable to meet the challenges. The important indigenous cucurbit crops grown in India are cucumber, bitter gourd, ridge gourd, sponge gourd, pointed gourd, ash gourd, snake gourd, ivy gourd, long melon, round melon, snap melon and spine gourd. Though cucurbits are occupying a major place in vegetable crops and rich source of dietary fibre, vitamins and minerals, but proportionally very few crops of this family are known for medicinal properties in ethnic uses like *Citrulluscolocynthis* L. for reducing the mean levels of HbA1c and fasting blood sugar (FBS) among the type IIdiabetes patients.

1. Sweet bitter gourd or pChucheKarela (*Cyclantherapedate)*

Chuchekarela (*Cyclantherapedata)* also known as slipper gourd and more frequently used as stuffed cucumber, is a cucurbitaceous vegetable crop growing in the hills of West Bengal and Sikkim. It is an annual, monoecious, viny vegetable crop that is related to bitter gourd and cucumber. This crop is reputed to be bitter-free. Crop also has various therapeutic characteristics that can be used to cure significant health concerns. Chuchekarela is a staple in practically everyone's kitchen garden in the region, and it's eaten in a variety of ways, including some unique traditional meals. Young sweet bitter gourd fruits are cooked as vegetables or eaten raw as salad. It has a cucumber flavour. Fruits are frequently filled with materials similar to stuffed peppers after the seeds and pulp have been removed. It has anti-inflammatory, hypocholesterolemic and hypoglycemic effects.

Nutritive value

It contains 94.1 g of water, 4.0 g carbohydrates, 14 mg Vit C, 0.6 g proteins, 0.1 g fats, 0.7 g fibre, 0.7 g ash, and 0.04 mg Vit B_1 per 100 g edible portion. Sweet bitter gourd provides17 Kcal of total energy.

Medicinal Significance

According to Rivas *et al*. (2013), Cyclantherapedata extract can be beneficial in decreasing the effect of LOX activity (tumour production and cancer spread). Because of its low in calories content in fruits, Chuchekarela has also been discovered to be effective in lowering blood cholesterol, regulating fat metabolism, and weight reduction (Sukorno*et al*., 2019). *Cyclantherapedata* is utilised in South America for its anti-inflammatory, hypoglycaemic, and hypocholesterolaemia effects (Montoro*et al*., 2005).

Origin & Distribution

Sweet bitter gourd is thought to have originated in the Caribbean area. It is now grown from Mexico to Peru and Ecuador, as well as in the old world tropics (India, Nepal, Malaysia, and Taiwan). Its cultivation in India is restricted to the highlands of the Western Himalayan areas of Himachal Pradesh and Uttaranchal.

Botany

Cylantherapedata shares a genus with *Cylantherabrachystachia*. It is also edible and neutralised in the same locations as sweet bitter gourd. Plant is a robust annual vine up to 4-5 m tall, branching at the lower nodes, with leaves 8-18 cm wide and generally 5 lobed. For support, vines have forked tendrils. It is a monoecious perennial with a climbing habit that may also be cultivated as an annual. Fruit is pepo in shape, tapering flattened, obliquely oval, 10-15 cm long, 5-10 cm wide, and 2-3 cm thick. Fruit skin can have scant spines at times. The fruit cavity is hollow, the fleshy peel is 3-4mm thick, and the interior tissue is a white spongy pulp with black-brown seeds.


Cultivation Aspects

Fig 1: Flowering and fruiting in ChucheKarela (*Cylantherapedata*)

Chuchekarela is primarily propagated by seeds. Seeds can be grown in the hills of West Bengal from March to April, and the fruits can be harvested beginning in September and continuing until November. Chuchekarela requires warm, sunny weather and sandy-loamy soil to grow and flourish well. Because the crop belongs to the cucurbitaceous vegetable group, it has a viny growth pattern for which trellises made of bamboos are used to offer support to the vines in order to produce a decent yield. In general, in the hills of West Bengal and Sikkim, the topmost sections of bamboos are employed to offer support to vines, which replaces trellises and their building costs, which are fairly costly in that location.

Importance

Chuchekarela is consumed in many kinds of ways in the hills of West Bengal and Sikkim, including cooked, fried, pickled, and so on. Chuchekarela's traditional use as a vegetable cooked with dried meat or fish has its own significance in the local region's social structure. Fruits are also sun dried after being sliced into pieces, allowing for further crop utilisation during the off season. Crop is very important in meeting the local people's veggie demands. It has also been noticed that production of such crop is advantageous in enhancing the income of certain local producers since the immature fruits are traded at a decent price in local marketplaces. Due to its nutritional and medicinal properties most of the local people prefers to consume it as a healthy vegetable once or twice in a week during its time in a year as *'SamayKoFal'* in local language.

2. Karuvachakkaor Gandhi (*Solenaamplexicaulis*)

Karuvachakkaor**Gandhi** (*Solenaamplexicaulis*) is a versatile minor cucurbit found in biodiversity hotspots of the Asian subcontinent, and the majority of the plant components are utilised in traditional medicine. It is a wild-gathered vegetable of drier tracts of Western ghats. Tender fruits are eaten as salad and are crisp and tasty. Propagation is through seeds and it perennates through underground tubers enabling ratooning.

Botany

This is a perennial deciduous plant that grows in the foothills and is dioecious, with a rare occurrence of monoecious. Nonsegmented polymorphic leaves (6-10 cm in length), hairless, oval, angled, and cordate. Female flowers have petite, single (rarely grouped) triangular petals that are white or yellowish white. Male flowers are umbellate or sub-umbellate, with a small flower stem. Fruits are ellipsoid and ridged or smooth, with white pulp when young and crimson with red pulp when ripe, and are apically beaked. The fruits often contain 14-18 large seeds. At the immature stage, the seed coat is white and pulpy; at the dried stage, it is spherical in shape and brownish in colour. Spindle-shaped tuberous roots with a girth of 2.5-3 cm (diameter) and root zone growth of 25-30 cm diameter in soil.

Fig 2: Spindle shaped tuberous roots in Gandhi (*Solenaamplexicaulis*)

Fig 3: Immature fruits in Gandhi (*Solenaamplexicaulis*)

Nutrition content

Solenaamplexicaulis fruit pulp contains 13.14% total soluble sugar, 7.05 mg/g reducing sugar, 0.40 mg/g total phenol content, and 0.85 g/100 g protein. The medium proportion of these components clearly makes this crop appropriate for ingestion. However, the low protein content is comparable to that of other cucurbits such as *M. charantia* L. (0.97 g/100 g) and *M. dioica*Roxb (1.11 g/100 g). Furthermore, antioxidants like as catalase (0.84 lM/min/g), peroxidase (2.96 lM/min/g), and polyphenol oxidase (0.45 lM/min/g) contribute considerably to its nutritional properties. So yet, no antioxidant action has been documented for small cucurbits.

Flowering

It starts during August which is approx. 40–50 daysafter seed germination and lasts upto Nov-Dec.

Fig 4: Flowering pattern in Gandhi (*Solenaamplexicaulis*)

Economic uses

Solenaamplexicaulis is widely recognised for its pharmacological activities due to a variety of bioactive chemicals such as terpenes, triazines, esters, alkanes, alcohols, hydrocarbons, aldehydes, amides, and so on, which validates its traditional use as an anti-diabetic and antibacterial agent. However, it is worth noting that phytochemicals are found in practically every plant portion, including the leaf, stem, tuber, and fruits. Furthermore, because of its culinary characteristics, nutritional value, and delightful flavour of fresh fruits, it is appropriate for consumption as a vegetable crop. As a result, Solena is vital in terms of nutritional and economic value, as well as broadening our vegetable basket.

3. Karchikai (*Momordicacymbalaria*)

In India, *M. cymbalaria* is known by the vernacular names Karchikai and Madagalikai in Kannada in Karnataka, Athalakkai in Tamil in Tamil Nadu, and Kasarakayee in Telugu in Andhra Pradesh and Telangana. The Karchikai (*Momordicacymbalaria*) is a small and underutilised tuber-forming cucurbit member of the Cucurbitaceae family native to India's Western and Eastern Ghats. Tribal farmers utilised the fruits and tubers in traditional medicine as well as vegetable food. Farmers in the home province are preserving this species for ethnic use as traditional knowledge.

Medicinal properties of *Memordicacymbalaria*

Due to its lack of popularity, the nutritional and economic relevance of this species has gone neglected. Potential hepatoprotective, cardioprotective, nephroprotective, and antioxidant capabilities (Jeyadevi *et al*. 2012). Tribal practitioners in Asia and Africa have employed the Momordica species in indigenous systems of medicine. Several studies have found that Momordica reduces the incidence of lymphoid leukaemia, lymphoma, choriocarcinoma, melanoma, breast cancer, skin cancer, prostate cancer, human bladder carcinoma, and Hodgkin's disease in those who exercise frequently (Basch*et al*. 2003).

The Karchikai (*Momordicacymbalaria*) plant's fruit is utilised as a tonic with stomachic, stimulant, and laxative qualities. Diabetes, malaria, colic, sores and wounds, infections, worms and parasites, measles, hepatitis, and fevers are all treated with fruit juice and leaf tea. The anthelmintic characteristics of the fruit pulp, leaf juice, and seeds were discovered, and the root is used to cure constipation, indigestion, diabetes, diarrhoea, and rheumatism, as well as being

astringent, abortifacient, and aphrodisiac (Fernandes*et al*. 2007). Furthermore, M. cymbalaria fruits have long been used in Asian traditional medicine due to their wide range of bioactive compounds, including flavonoids, carotenoids, cucurbitanetriterpenoids, phenolic acids, and phytosterols (Jeyadevi*et al*. 2012), and tuber is used as an abortifacient medicinal property noted in ancient ethnic treatments (Nadkarni, 1994).

Botany

Momordicacymbalaria is a thin, scandent, branching, and striated climbing annual or perennial plant. Behera*et al.* (2010) describe the fruits as 20-25 mm long, pyriform, with strong ridges reduced at the apex and the base narrowing into the curving peduncle. The plants were monoecious sex form, bears white flowers, and anthesis between 11 and 12 am, had symmetrical anthers, the plant generates tuberous roots, and ribbed fruits are the economically important parts, plants were propagated by round oval seeds with hypogeal germination process and tubers were also used for plant multiplication. The Karchikai or Madagalikai earns a competitive price in the local market, resulting in a significant monetary advantage without any inputs. August and September are the peak harvest times.Harvesting does not necessitate any special abilities.While fruits that are 10–12 days old are best, olderfruits would be used through deseeding. Tendergreenfruits have a decent consistency and shelf life (Josephand Antony, 2008).

M. cymbalaria is on the verge of extinction due to anthropogenic-assisted habitat degradation, overexploitation without protection, and a lack of scientific understanding or record of development, propagation, and reproduction. As a result, significant genetic resources of *M. cymbalaria* remain untapped, necessitating the focus of researchers on critical aspects such as the characterization of local strains for breeding activities, as well as the disclosure of genotypes useful for horticultural, nutritional, and therapeutic traits for local and global trade. In light of this, a preliminary field study was carried out to identify plant morphological properties for future breeding and genetic advancement programmes, as well as chemical and nutritious features of vegetable fruit for human consumption.

Fig 5: *M. Cymabalaria* plant

Nutritional properties of *M. Cymbalaria*

Minerals found in *M. cymbalaria* include potassium (505.92 mg/100 g), calcium (73.57 mg/100 g), sodium (41.58 mg/100 g), zinc (2.76 mg/100 g), and iron (1.71 mg/100 g), as well as ascorbic acid (299.12 mg/100 g), total carotenoids (2.81 mg/100 g), and lycopene (1.86 mg/100 g).

Fig 6: Flowering and fruits of *Momordicacymbalaria*

Propagation of *M. cymbalaria*

It is primarily propagated by tuberous roots, its method of propagation is asexual. The tubers emerge once the monsoon begins and go dormant throughout the summer dry times. Because seeds are black in colour, glossy, and hard, they are normally not utilised for propagation because the rate of germination is very low or insignificant. Tissue culture methods, when combined with various explants, can be beneficial for bulk multiplication. Studies for this aim have also been carried out with success. (Aileni*et al*., 2009).

Cytological studies

According to Bharati*et al*. 2011, karyotype study, the number of chromosomes is 2n=18, which was previously reported as 2n=16, 22. *Momordicacymbalaria* chromosomes differed significantly from those of other similar species, according to a karyotype investigation. It has been stated that the chromosomes of this crop are clearly distinguishable from those of other species.

Hybridization programme in *Momordicacymbalaria*

Momordicacymbalaria has been crossed with related species such as Spine gourd, Bitter gourd, and Sweet gourd. Interspecific crosses are also made among the several cucurbit species, including Bitter gourd and Spine gourd. Seeds from these crosses are put in crops other than this one. There have been over 50 interspecific crosses tried, but no seed set in Cymbalaria. Hybridization research is currently insufficient due to crossability hurdles, a shortage of planting supplies, extremely poor seed set, or seeds that are not viable. Tubers are the sole way to proliferate. Seed viability and seed dormancy studies are also sparse.

Micro propagation

An overcoming the invitro propagation of *Momordicacymbalaria*. Leaf tips, stems, and nodal segments are utilised as explants in in vitro propagation. The use of nodal explants resulted in success. Leaf explants on MS media produced the greatest number of indirect regeneration of numerous shoots (9.0 +-0.5). Repeated subculturing of leaf callus on shoot regeneration media resulted in large scale shoot development (35+-3.4) shoots/explants. On hormone-free half-strength MS media, root induction was accomplished. Even while invitro propagation was successful, there was a poor proliferation rate in previous findings. To solve this issue, Balkhande*et al*. (2013) investigated the

effect of $Agno_3$ Silver nitrate on the regeneration ability of several plants. The nodal explants were grown on M& S medium with BAP, Kinetin, and $AgNO_3$ to induce shoot bud development and subsequent proliferation. With the BAP and $AgNO_3$ mixture, several shoots were generated. After 4 weeks of culture, an average of 14.30+- 0.34 shoots per explant were produced. In $AgNO_3$containing media, the number of shoots rose thrice.

4. Chow chow or Chayote (*Sechiumedule*)

Chow-chow is a viviparous cucurbit with a single seed. It is essential in the diet of indigenous tribes in the north-eastern area. It is a rooted perennial vine with edible fruits. In addition to the fruit, the stem, delicate leaves, and tuberous roots are consumed. The root, stem, and seed all have a high calorific and carbohydrate content. Chow-chow (*Sechiumedule*) is a member of the cucurbitaceous family and is also known as chayote and squash in North-eastern India. It is said to have originated in the chilly highlands of Central America, where the Aztecs first tamed it (Newstrom, 1991). However, the credit for popularising chow-chow in Mizoram and other regions of India goes to the Western Missionaries.

Chow-chow is grown for its fruits, tender shoots, young leaves, and tuberized roots, which are consumed as a vegetable, combined with meats, or used in soups and other dishes (Singh *et al*. 2012). Tuberous roots are utilised in the same way that potatoes are. Older leaves and broken fruits are also utilised as pig fodder. The marketing of chow-chow, particularly its export to other states, is managed by a well-organized group known as the 'Iskut Growers group' (Anonymous, 2009a). To grow and produce, chow-chow requires a medium to high altitude location (800-2000 m MSL), moderate temperature (13-21°C), high relative humidity (80-85%), well-distributed yearly rainfall (1500-2500 mm), and 12 hours of sunshine (Engles and Jaffrey, 1993).

Fig 7: Viviparous cucurbit (Chow chow) with single seed

Nutritional value

Chow-chow is high in minerals and vitamins. The fruits and seeds have increased antioxidant activity and are high in various key amino acids (aspartic acid, glutamic acid, alanine, arginine, cysteine, phenylalanine, glycine, histidine, isoleucine, leucine, methionine, proline, serine, tyrosine, threonine, and valine) (Ordonez *et al*. 2006). Because of the softness of the fruit flesh, it is ideal for adding consistency to infant meals, liquids, sauces, and pastes. Many of these nutritional properties make it appropriate for hospital meals. The low calorific content of chow-chow fruits may be an excellent supplement to potatoes, particularly for diabetic individuals. The vine stems are utilised as rope in handicrafts to produce baskets and hats because to their flexibility and strength.

Botany and growth physiology of Chow chow

Chow-chow is often propagated by planting 3-4 entire fruits in a hill, particularly sprouted ones, at 3-5 m apart around January-February. The crop producing cycle lasts roughly 5-8 years on average. Their tuber is perennial in nature, regrowing annually in spring (February-March) after mild frost kill the vines in winter. It is a cucurbitaceous plant that is herbaceous, robust climber, monoecious, viviparous, and single-seeded.

Up to 10 m long angular-grooved vines grow by adhering with tenacious tendrils and are trained on the bower system or on the trees. It has broad triangular leaves that are ovate cordate to sub-orbicular in form, as well as 10-15 cm long petioles and 3-5 split tendrils. The blooms are unisexual, pentamerous, coaxillary, and have nectaries at the calyx's base. The staminate blooms are borne in axillary racemose inflorescences that are 10-30 cm long. There are also five stamens, and the filaments are united virtually the entire length of the flower, producing a thickening column that splits at the apex into 3-5 small branches. The pistillate blooms, like the staminate flowers, are found on the same axilla; they are normally solitary but can occur in pairs.

The fruit is single or rarely appears in pairs, pear-shaped, meaty, and viviparous, which means that the seed germinates within the fruit while it is still on the vine. The flesh has a mild flavour and a texture that is characterised as a cross between a potato and a cucumber. Shape, size, colour, surface smoothness, and spine density varies amongst the fruits (Rai*et al.* 2006). Fruits are normally available in Mizoram markets from July to December, while tender shoots and leaves are accessible from June to December. Only a few veggies are available in the marketplaces later in the season. Tuberized roots

are often taken out of the old vineyard after the second year, when the vines are entirely dry (January-March).

Seed Rate: 1500 fruits/ha
Time of Sowing: Rainy season
Spacing: 2m X 3m

Training and Pruning in *S. edule*

Training

In the homestead garden, pandals or trellises are constructed at a height of two metres for the vines to trail over; the vines are also permitted to climb on small trees. The majority of trellises in northeast India are made of bamboo at around head height to allow for strolling underneath the vines for harvesting and other operations. Bowers may also be built to a height of five feet using bamboo poles and crisscross wire netting. Bower training should begin after thirty centimetres of vine height from the ground. Branches expand easily after the crop anchor because of tendrils.

Pruning

A year has two fruiting seasons, and vines are trimmed at the peak of each season, leaving just a little piece of 1.5m of stem.

Future thrust

Indigenous and minor vegetables show very substantive biodiversity, are adapted to specific marginal soil and climatic conditions, and often can be grown with minimal external inputs. Diversifying current production systems with traditional vegetables will increase their heterogeneity and will subsequently lead to better resilience to abiotic and biotic stresses. Research is needed to understand the potential opportunities and perceived constraints faced by poor smallholder farmers in cultivating indigenous vegetables to be able to devise adoption and dissemination strategies to best meet their needs. Relatively nutrient-dense indigenous vegetables have a potential role in improving human nutrition. Amongst indigenous vegetables, specifically, cucumber, snake gourd, snap melon, ridge gourd, sponge gourd, satputia, spine gourd, bitter gourd, Indian lotus, Indian bean, cluster bean and many other leafy vegetables are important indigenous vegetable in the tropics and possess good nutrient density and are a rich source of a number of antioxidant phytochemicals and other micronutrients, viz. β-carotene, vitamin C, folic acid, magnesium, phosphorus and potassium and are often used in folk medicine.

Indigenous and minor vegetables play a significant role in addressing malnutrition problems and maintaining biodiversity and ensuring incomes for poor farmers.

In the Indian desert, underutilised cucurbitaceous vegetable crops such as chuchekarela, Gandhi and Karchikai have higher nutritional and therapeutic potential. Chuchekarela and Gandhi recognise various nutritional potentials, including therapeutic advantages, to address a variety of lifestyle disorders, therefore enhancing the nation's nutritional security. Its nutritional culinary values suggest that it might be employed as a viable vegetable crop in the human vegetable diet, similar to other members of the Momordica family. Overall, there is an urgent need to gather and conserve the gene pool for improved utilisation of genetic resources due to a lack of attempts to protect *M. cymbalaria*germplasm.

REFERENCES

- Ailenia M, Kotaa SR, Kokkiralaa VR, Umatea P, Abbagania S. 2009.Efficient in vitro regeneration and micropropagation of medicinal plant *Momordicatuberosa*roxb.*J Herbs Spices Med Plants*; 15: 141-148.
- Anonymous (2009a). Mizoram: export potential and prospects (Occasional paper No.-135), ExportImport Bank of India, Centre One Building, World Trade Centre Complex, Cuffe Parade, Mumbai, 59-63.
- Balkahande S.V., Kure S.R and Surwase B.S.2013. Influence of silver nitrate on shoot regeneration from excised meristems of *Momordicacymbalaria* Hook: a diminishing species. *Research Journal of Biotechnology,*8(7): 42- 46.
- Basch E, Garbardi S, Ulbricht C (2003) Bitter melon (*Momordicacharantia* L.): a review of efficacy and safety. Am J Health Syst Pharm 60:356–359
- Behera TK, John KJ, Simon PW, Staub JE (2010) Bitter gourd: botany, horticulture, breeding. Hortic Rev 37:125–128
- Bharati2011.Cytotaxonomical analysis of *Momordica*L. (Cucurbitaceae) species of Indian occurrence.*Journal of Genetics*, Vol. 90, No. 1, April 22.
- Engels JMM, Jeffrey C (1993). *Sechiumedule*(Jacq.)Swartz.In: Siemonsma JS,Piluek K (eds) Plant resources of south-east Asia Vol.8-Vegetables. PudocScientific Publishers, Wageningen, pp 246-248. Newstrom L.E (1991). Evidence for the origin of chayote, *Sechiumedule*(Jacq.) Sw. (Cucurbitaceae). Econ Bot 45(3): 410-428.

- Fernandes N, Lagishetty CV, Panda VS, Naik SR (2007) An experimental evaluation of the antidiabetic and antilipidemic properties of a standardized *Momordicacharantia* fruit extract. BMC Complement Altern Med 7:29
- Jeyadevi RA, Sivasudha T, Rameshkumar A, Sangeetha B, Ananth DA, Aseervatham GSB (2012) Nutritional constituents and medicinal values of *Momordicacymbalaria* (Athalakkai) – a review. Asian Pac J Trop Biomed 2(1): S456–S461
- Joseph JK, Antony VT (2008) Ethnobotanical investigations in the genus *Momordica* L. in the Southern Western Ghats of India. Genet Resour Crop Evol 55:713–721
- Montoro, P., Carbone, V. and Pizza, C., 2005. Flavonoids from the leaves of *Cyclantherapedata*: Two new malonyl derivatives. *Phytochemical Analysis* 16: 210–216.
- Nadkarni KM (1994) Dr. KM Nadkarni's Indian MateriaMedica, 1:755.
- Ordonez A.A, Gomez J.D, Isla M.A (2006). Antioxidant activities of *Sechiumedule*(Jacq.) Swartz extracts. Food Chem 97: 452-58.
- Rai N, Sanwal S.K, Yadav R.K, Phukan R.M (2006). Diversity in Chow-chow in north eastern region.Indian Hort 51(2): 11-12.
- Rivas, M., Vignale, D., Ordoñez, R.M., Zampini, I. C., Alberto, M. R., Sayago, J. E. and Isla, M.I., 2013. Nutritional, antioxidant and anti-inflammatory properties of *Cyclantherapedata*, an Andinean fruit and products derived from them. *Food and Nutrition Sciences* 4: 55-61.
- Singh B.K, Pathak K.A, Ngachan S.V (2012). Exploring underutilized chow-chow in Mizoram. Indian Hort57 (5): 3-5.
- Sukorno, F.I., Islam, S. and Kabir, A.L., 2019. Phytochemicals are natural resources of food supplement for happier people. *Horticulture International Journal* 3(6): 300–305.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/LP/2023/002

Utilization of banana waste (Peel) for preparation of banana peel millet composite energy bar

Rajan Kumar[1], Annoushka pathak[1] and Anuprita A. Joshi[2]
[1]Student, College of Food Technology, VNMKV, Parbhani
[2]Asst. Professor College of Food Technology, VNMKV, Parbhani

Background:

The use of agricultural by-products as a source of functional ingredients, particularly those from crop plants, has received great interest. Banana (Musa spp.) is a common food crop worldwide, but its peel, similar to other agricultural by-products, is often discarded. Banana peel has the potential to be transformed into functional foods because it is historically consumed as food and medicine in some regions of the world.

Scope and approach:

Current studyanalyzethe nutritional characteristics and potential health-promoting properties of banana peel and its utilizationfor preparation of banana peel millet composite energy bar.

Key Findings and Conclusion:

The discoveries, particularly on the broad array of nutritional constituents in peel, seem to rationalize the proposed use of banana peel in several food industries. Banana peel is appreciated for its bioactive components, particularly the phenolic compounds. The major phenolic compounds found in the banana peel are grouped as flavonols, hydroxycinnamic acids, flavan-3-ols, and catecholamines as per previous literature. The incorporation of banana peel into food products enhanced the nutritional content, particularly the dietary fibre and the energy value to about 331.8Kcal. From this investigation, banana peel shows great potential to be developed into beneficial functional foods like energy bar as instant source of energy and nutraceuticals. However, proper regulation and legalization of bioactive enrichment of food products from the banana peel are required to ensure its safety for human consumption.

Introduction

Fruits and vegetables are an indispensible component of our diet. Fruits and vegetables ensure the supply of vitamins, minerals and essential amino acids that are required for better health. Fruit and vegetable processing is one of the major industries in today's date. According to MOFPI (2015) only 2% of the vegetables and 4% of the fruits are actually processed remaining portion is consumed fresh or are lost in between the supply chain. Fruits and vegetable owing to 20-40% loss renders huge economic loss for the farmers and the nation. A considerable portion of fresh fruits and vegetables are being processed nowadays. The industrial processing of fruits produces a considerable quantity of by-product or wastes. The wastes however is not that useful in the main scenario of processing but can be processed in many other forms as well. Few wastes can also be used for the preparation of several bioactive components and similar products. With increasing population, the production of food is needed to be increased along with a reducing cost of food. The cost reduction is to be done without compromising with the quality. One dynamic solution to reduce loss is by utilization of the waste. This would help to reduce the losses occurring during processing.

Banana is one of the most important food crops which is generally planted in tropical countries and has beneficial applications in the food industry. It is the world's largest herb, and a member of the lily family. The fruit averages 125 grams (0.28 lb), of which approximately 75% is water and 25% dry matter. Most of the edible bananas are cultivated mainly for their fruits, thus, banana farms could generate several tons of underused by-products and wastes. Banana pseudo stem, Banana fibre, Banana leaves and sheaths, Banana plant, Banana peel, Banana skin, Banana pith, Banana Male bud are mainby products of banana. Most of these by-products may serve as an undervalued commodity with a limited commercial value, application and in some cases, considered as an agricultural waste which paves the way to utilize a huge amount of untapped biomass and resolve some of the environmental issues.

Approximately 36 million tons of banana peel is produced every year, and their current endpoint is associated with adverse environmental impact and economic losses. In recent times, Banana peel has been utilized for various industrial applications including bio-fuel production, bio-sorbents, pulp and paper, cosmetics, energy related activities, organic fertilizer, environmental cleanup and biotechnology related processes (Morton, 1987; Gunaseelan, 2004; Bori et al., 2007).

The peel has long been used as a medicine to cure a variety of illnesses, including, anaemia, ulcers, diarrhea, snakebite, burns, diabetes, inflammation,

cough and excessive menstruation. Additionally, it has been shown that the substance possesses strong anti-oxidant, antimicrobial, and antibiotic capabilities. It is therefore a substance with potential for additional uses in the nutraceutical and pharmaceutical sectors [30].

The concentration of total phenolic compounds in the peels, is more than twice the amount present in edible tissue. Banana is rich catechin and gallocatechin. According to the criteria established by the National Cancer Standard Institute, banana peel extract is classified as nontoxic to normal human cells therefore it can be safely utilized as a natural source of antioxidant for value addition Someya et al. (2002). Banana peel is a reach source of Starch (3%), crude protein (6- 9%), crude fat (3.8-11%), Emaga et al. (2008), total dietryfibre (43-49.7%); which is even better than the fruitfleshitself. Fibrepromotes proper digestionandcanhelp tolower cholesterol levels and poly saturated fatty acid particularly linolic acid and á linolic acid, pectin, essential amino acid like threonine, valinephynylalanine and micro nutrients (K, P, Ca and Mg) Emaga et al. (2007). Banana peels also contain the amino acid tryptophan, which contributes to a good moodand promotes the production of serotonin. Bananas contain potassium, a mineral that is particularly recommended for people with highblood pressure, as it helps stabilize blood pressure. On average, banana peels contain 6-9% drymatter of protein and 20-30% fibre. Green plantain peels contain 40% starch that is transformedinto sugars after ripening. Green banana peels contain much less starch (about 15%) whengreenthanplantain peels, whileripe bananapeelscontain up to 30% freesugars.

The world's population is expanding quickly, and there is a trend towards using sustainable agricultural byproducts, which provides a stable foundation for the continued development of waste products and byproducts from bananas. Because of its numerous bioactive components with potential health-promoting effects, banana peel has demonstrated outstanding nutritional quality when used in a variety of food products including bread, culinary and meat products [31]. therefore the present investigation focuses on better utilization of banana peel as not waste but a base raw material for value addition into food product like energy bar which will be a good source of many phytochemicals along with carried health benefits there in.

Materials and methods

Banana peels were obtained from local area of VNMKV, Parbhani and for analysis and preparation of banana peel energy bar preparation raw materials were procured from local market Parbhani. The

research work was carried out at College of Food Technology, VasantraoNaikMarathwadaKrishiVidyapeeth, Parbhani.

BANANA PEEL: Banana peel is rich source of many nutrients like Vitamin B6, Vitamin B12, Magnesium, Potassium, Fibre, Protein.	
FOXTAIL MILLET: The United Nations has designated 2023 as the 'International Year of Millets. So we usedFoxtail millet with banana peel for energy bar preparation. Foxtail millets are rich in calories that provide energy and strength to the body to performactivities. It contains calcium and iron which is potentially advantage ous for muscle maintenance and makebonesstronger.	
DATES: Dates is used assweetener in energy bar .Dates are rich in copper, selenium and magnesium which are very important nutrients to keep your bone healthy and prevent bony related disorders. It is also rich in vitamin K which helps to regulate the coagulation of blood and helps metabolize your bones.	
HONEY: Honey is natural antioxidents and also increase the immunity of human body. It is used aspreservative in bar because of its composition and chemical properties, honey is suitable for long-termstorage, and is easily assimilated even after long preservation. Honey contains fructose and glucose whicharethesufficientsource ofquickenergy. It also increase the flavour of products.	

ALMONDS: Almonds contain nutrients that may help prevent cancer, strengthen bones, promote heart health, and more. It also gives the good flavor and taste of the products.	

Proximate analysis

Proximate analysis *i.e.*, moisture, crude protein, ash, fat and crude fibre contents of raw materials and value-added product as energy bar was determined according to standard procedure of AOAC (1990) and AOAC (2005).

Energy bars may be used as an energy source during athletic events such as marathons, triathlons and other activities which require a high energy expenditure for long periods of time. They are also commonly used as meal replacements in weight-loss programs. They may be used as a snack. Attempts were made to standardize recipe for preparation of energy bar using banana peel and other ingredients as mentioned in recipe with varying proportion of each ingredients keeping raw material banana peel as constant and the final formulated sample was selected on the basis of sensory evaluation.

Treatments	Bananapeel (g)	Sugar (g)	Dates (g)	Foxtail Millet(g)	Almonds (g)	Honey (g)	Salt (g)
T_0	100	40	00	20	15	20	5
T_1	100	30	20	40	15	20	5
T_2	100	20	30	60	15	20	5
T_3	100	10	40	80	15	20	5
T_4	100	00	50	100	15	20	5

Standardized recipe for banana energy bar:

Sr. no.	Ingredients	Quantity(g)
1	Bananapeel	100(3 in number)
2	Dates	50
3	Foxtail Millet	100
4	Almonds	15
5	Honey	20
6	Salt	5

RESULTSANDDISCUSSION

Nutritionalcompositionofrawmaterials:

Parameters (%)	Banana Peel	Dates	Foxtail Millet	Almonds	Honey
Moisture	18	8.68	12.8	12.1	17
Protein	8.9	3.9	11.1	30.12	0.3
Fat	2.3	1.68	3.82	25.32	--
Carbohydrates	42.6	79.12	56.23	22.53	82
crude fibre	18.5	2.91	9.56	3.06	--
Ash	8.2	0.61	3.9	4.9	0.2
Total energy(in kcal)	226.7	347.2	303.7	438.48	329.2

Nutritionalcompositionofproduct:

Sr. no.	Parameters	Content
1	Moisture content (%)	7.8
2	Protein (%)	11.2
3	Fat (%)	4.2
4	Carbohydrates (%)	62.3
5	Dietaryfibre(%)	9.6
6	Ash (%)	4.2
7	Total energy(in kcal)	331.8

CONCLUSION:

Peels from bananas are frequently discarded into the environment without any preparation. With regard to nutritional quality, banana peel has shown excellent uses in different food items such as bakery, culinary products and meat products primarily because of its various bioactive compounds with potential health-promoting effects. So banana peel waste products like energy bar prepared in the form of by product will play an important role in human life.

RECOMMANDATIONS:

- Generally, this product has no side effects. It can be eaten by anyone. It contains high amount ofenergy, so it is beneficial foreveryone.

- Children: child can eat this very happily because itis in the form bar like chocolates. It fulfills thelackof nutrients in the children body.
- Old people: It can be also a good source of nutrients for old people because it does not containsanysideeffects. Theareno anyadded sugars in this product.
- Sports person: It is an effective source of energy for the sports person. It contains sufficientamountof carbohydrateswhich gives quickenergy.
- Pregnant women: pregnant women need high amount of energy for the body. The ingredientspresent in this product are very necessary for pregnant women. There is no any effectson thebaby.
- **Note:** thisproductissuitableforeveryone.

ITAHAS/LP/2023/003

Comparative Evaluation of Low Cost Natural Farming, Organic Farming and Conventional Farming in Major Crops of Saurashtra Region-Gujarat

Hiteshvari V. Korat[1*] and Harshang G. Talaviya[2]

[1]Research Associate, Agricultural Research Station, Anand Agricultural University, Arnej -382230, Gujarat, India

[2]Agricultural Research Scientist, Central Isalnd Agricultural Research Institute, Port blair, Andaman and Nicpbar Island

Abstract

Conventional farming is always modified by good innovation in agriculture, while the holistic idea of organic farming checks the use of synthetic inputs while, on the other side, the concept of natural farming allows farming with few traditional and locally available inputs. The all three farming concepts are fundamentally different, to check them on a real field, an experiment was carried out on medium black calcareous clayey soil in Junagadh (Gujarat) to evaluate low-cost natural farming, organic farming and conventional farming in Gujarat's six major crops. The present experiment included wheat and chickpea during *Rabi* season 2019-20; groundnut and sesame during summer season 2020; and groundnut and sweet corn during *Kharif* season 2020. The experimental results revealed that conventional farming module significantly increased yields of crops as compared to organic farming and low cost natural farming. Significantly higher available nitrogen, phosphorus and potassium after harvest was found under conventional farming, while the organic farming module registered significantly higher organic carbon, heat-soluble S, DTPA-extractable Fe, Zn, Cu and Mn after harvest, which was found at par with conventional farming. Economic analysis showed that maximum net returns, gross returns and B:C ratio were observed under conventional farming module.

Keywords*: Natural farming, organic, conventional, DTPA, experimental economic.*

1. Introduction

Since human evolution, farming practices have changed with new innovations and connectivity with other continental peoples. The concept has totally changed from its core ideas, which is also favourable in terms of meeting the current demand from society. From that point of view, conventional farming walks along with innovations. During the 19th century and earlier time farmers of the thorough world were capable of meeting the demand of food by producing food in organic farming. In the current scenario, growing organic food is no longer a viable way to feed the world's population as the world's population grows. As a result, technological advancements introduced innovative, resource-efficient, and long-term productive ways to feed a population that had nearly doubled in size. Mechanized farming, fertilizers and chemical pest control systems have contributed to higher yields for a larger population. These farming methods became ingrained in what we now refer to as "conventional" farming (Melissa, 2003).[23]

The Green Revolution transformed the country from a food-deficit state to self-sufficiency during the early 1970's, but the avails of green putsch were reviewed and found that it has led to serious negative impacts on genetic diversity, incidence of pests, soil erosion, soil fertility, water shortage, micronutrient deficiencies, soil contamination and availability of nutritious food for the local population. Ultimately, the farming society of the Indian has been experiencing rural impoverishment the displacement of huge numbers of small farmers from their land and increased tensions and disputes (Sebby, 2010).[29]

After perceiving the harmful effects of chemical farming, newly introduced agriculture farming technique among the farmers is low cost natural farming means for all the crops, thereby decreasing the cost of production. The economic survey of 2018-19 made fervent appeal for adoption of low cost natural farming (LCNF) in a big way to double farmer's income and it was subsequently endorsed by the Hon'ble Finance Minister during her budget speech in the parliament. Organic farming, Biodynamic farming*, Homa Jaivik Krishi, Rishi Krishi, Panchagavya Krishi,* Natural farming, Permaculture, LEISA farming, *Natueco* farming, *Homa* farming, *Yogic* farming and other eco-friendly and farmer-friendly alternative farming systems are based on nature and implemented to protect soil and environment degradation, protection from the hazardous side effects of chemical methods, such as magnification, pollution, carcinogenic elements, food poisoning and so on.

In the current scenario, the scientific community, ecologists, policymakers and economists make special efforts to reduce the environmental

burden of agricultural production and direct it toward more sustainable practices. To serve the purpose, we have conducted comparative study between CF, OF and LCNF. This was the first study in the Indian continent to check the available resource efficiency and economic output of fundamentally different agricultural practices.

2. Materials and Methods

This experiment was conducted on a non-organic fixed plot with a large plot technique and five samples collected from each 2.7 m x 4.8 m plot. The observations were recorded on five randomly selected plants for each net plot and mean values were computed for each net plot. The mean of all the plots represent the result of each module. Some of the parameters were analysed in the field immediately after the collection of samples. Soil samples were directly taken in the lab and analysed for various soil physico-chemical parameters like bulk density, porosity, water holding capacity, organic carbon (Walkley & Black, 1934)[35], available nitrogen (Subbiah & Asija, 1956)[32], available phosphorus (Olsen *et al.*, 1954)[27], available potassium (Jackson, 1974)[13], available sulphur (Williams & Steinbergs, 1959)[36] and micronutrients (Lindsay & Norvell, 1978)[19]. The details of the farming module are presented in Table 1. The present experiment included wheat and chickpea during *Rabi* season 2019-20; groundnut and sesame during summer season 2020; and groundnut and sweet corn during *Kharif* season 2020. Only Module-I (Low cost natural farming) included intercropping of wheat and chickpea (4:1 replacement series); groundnut and sesame (3:1 replacement series); and groundnut and sweet corn (2:1 replacement series). The detailed technical program is presented in Table 2. For data analysis, the experiment has followed the large plot technique model. The benefit: cost (B:C) ratio was calculated by dividing gross returns (₹/ha) with total cost of cultivation (₹/ha).

2.1 Study area

The experiment was set up in the western state of India (Gujarat) at the Instructional Farm, Department of Agronomy, JAU, Junagadh, for the period of the agricultural year 2019-20. The land from Southern Saurashtra region of Gujarat has developed from basaltic and Gaj bed milliolitic limestone parent materials from hill slope to piedmont and alluvium in piedmont plain and coastal plain. The soils have a clay loam to clayey in texture, a moderately to strongly sub angular blocky structure and a very dark greyish to brown colour. Before starting the experiment, soil chemical parameters showed that the soil of the plot was calcareous and slightly alkaline in reaction with pH 8.34, 7.97

and 7.74 and EC 0.54, 0.50 and 0.47 dS/m in *Rabi* 2019-20, summer 2020 and *Kharif* 2020, respectively. The soil was low in available nitrogen (239.88 kg/ha, 236.39 kg/ha and 242.32 kg/ha), medium in available phosphorus (32.14 kg/ha, 32.48 kg/ha and 34.77 kg/ha) and medium in available potassium (254.06 kg/ha, 249.51 kg/ha and 254.11 kg/ha) in *Rabi* 2019-20, summer 2020 and *Kharif* 2020, respectively. This region comprises arid and semi-arid type of climate with average annual rainfall widely varied from 400-800 mm. Junagadh is located at the peripheral boundary of the south-west monsoon.

The mean maximum and minimum temperatures during *Rabi* 2019-20 ranged from 25.4 to 34.3 °C and 9.7 to 19.4 °C, respectively, during crop growth and development. During the crop period the relative humidity was in the range of 56 to 80%. There were no occurrences of winter rainfall during the life span of crops. During the crop growth and development cycle in summer 2020, the mean maximum and minimum temperatures were 31.6 to 42.4 °C and 16.9 to 27.7 °C, respectively. Average relative humidity was varied between 24.25 & 33.65% and no rainfall during the period. The meteorological parameters for the period of investigation during *Kharif* 2020 include maximum and minimum temperature range from 28.6 to 36.9 °C and 24.5 to 26.7 °C, respectively. The relative humidity ranged from 83 to 96% during the crop period. Total rainfall received during crop growing season was 60 mm. In the experiment, we have just included the major cropping system of Junagadh, Gujarat. The comparative evaluation can be strengthened by including a diverse spectrum of crops with different agro-ecological conditions.

2.2 Preparation of bio-enhancers

Beejamrut, Jeevamrut, Ghan Jeevamrut and Panchagavya used in present experiment were prepared on a farm by using following ingredients (Bisnoi & Bhati, 2017).[5] Till date, there is not standard evolution of major component for the ingredients.

2.2.1 *Beejamrut*

Beejamrut, an organic, was used to treat seeds prior to sowing in order to improve germination and protect young roots from fungi, as well as soil-borne and seed-borne diseases. Local cow dung- a powerful natural fungicide, cow urine- a potent anti-bacterial liquid, lime, water, and soil are among the ingredients.

2.2.2 *Jeevamrut*

In the plant system, *Jeevamrut,* an organic product, has the ability to promote growth and provide immunity. *Jeevamrut* is made up of four different ingredients: cow dung, cow urine, chickpea flour, and jaggery.

2.2.3 *Ghan Jeevamrut*

Ghan Jeevamrut is dry or solid *Jeevamrut* that acts as a natural fertilizer for the crop plants. *Ghan Jeevamrut* prepared from desi cow dung, cow urine, jaggery and pulse flour.

2.2.4 *Panchagavya*

Panchagavya is a Sanskrit word that means "five cow items." The fermentation process uses five cow products, as well as a few other natural ingredients, as the name implies. It is important to note that all cow products must come from a desi cow. Cow dung, cow urine, milk, curd, jaggery, ghee, ripe banana, tender coconut and water were used in the experiment to make *Panchagavya.*

Table 1: Package of various treatments of different farming systems

Treatments	Module details
Module-I	**Low cost natural farming (LCNF)** • Intercropping of crops • Seed treatment with *Beejamrut* by spraying on seed, mix well and dry before sowing • Soil application of *Ghan Jeevamrut* @ 250 kg/ha along with FYM @ 250 kg/ha at sowing as well as soil application of *Jeevamrut* with irrigation at sowing, 30, 60 & 90 DAS • *Achhadan*: Wheat straw mulch @ 5 t/ha • Plant protection: *Agniastra*, *Brahmastra, Neemastra*, *etc.,* if required
Module-II	**Organic farming (OF)** • Sole cropping of crops as per area covered in LCNF • Seed treatment with biofertilizer by spraying on seed, respectively; mix well and dry before sowing • Soil application of vermicompost @ 2 t/ha, FYM and foliar application of *Panchagavya* at 30, 45 and 60 DAS • Plant protection: Pheromone trap, *Trichoderma*, *Beauveria*, *Metarhizium*, NPV, *etc*., if required
Module-III	**Conventional farming (CF)** • Sole cropping of crops as per area covered in LCNF • Seed treated with recommended fungicide before sowing of seed • Soil application of recommended dose of mineral fertilizer (Urea and DAP) and manures (Farmyard Manures) • Plant protection: Recommended fungicides, insecticides and herbicides, if required

Table 2: Technical programme of present experimentation

Season-1	***Rabi***	
Crop and variety	Wheat, GJW 496 (Wheat Research Station, Junagadh)	Chickpea, GG 5 (Main Pulse Research Station, Junagadh)
Spacing	22.5 cm	45 cm × 10 cm
Seed rate	100 kg/ha	60 kg/ha
Manures and fertilizers	FYM 10 t/ha 120-60-60 kg N-P-K/ha	FYM 5 t/ha 20-40-0 kg N-P-K/ha
Season-2	**Summer**	
Crop and variety	Groundnut, GJG 31 (Oil Seed Research Station, Junagadh)	Sesame, GJT 5 (Oil Seed Research Station, Junagadh)
Spacing	30 cm × 10 cm	30 cm × 10 cm
Seed rate	100 kg/ha	3 kg/ha
Manures and fertilizers	FYM 10 t/ha 25-50-50 kg N-P-K/ha	FYM 5 t/ha 50-25-40 kg N-P-K/ha
Season-3	***Kharif***	
Crop and variety	Groundnut, GJG 22 (Oil Seed Research Station, Junagadh)	Sweet corn, Sugar 75 (Collected from private vendors of seeds, "Syngenta")
Spacing	60 cm × 15 cm	60 cm × 20 cm
Seed rate	120 kg/ha	12 kg/ha
Manures and fertilizers	FYM 7.5 t/ha 12.5-25-25 kg N-P-K/ha	FYM 5 t/ha 120-60-60 kg N-P-K/ha

FYM - Farmyard Manure

3. Results and Discussion

3.1 Yields

In the comparative evaluation, in the *Rabi* season, results showed that various farming modules manifested considerable influence on crop yields (Table 3). Remarkably higher grain yield (4930 kg/ha) and straw yield (6704 kg/ha) of wheat were recorded under conventional farming in comparison to organic farming and significantly the lowest wheat yields were recorded under low cost natural farming. The result was supported by long term experiment study as well as diverse cultivars of wheat in all wheat growing continent under the similar treatment condition (Mäder *et al*., 2007; Kitchen *et al*., 2003; Van Stappen *et al*., 2015; De Ponti *et al*., 2012 and Fagnano *et al*., 2012).[21, 17, 34, 9, 11] In the case of chickpea, the data revealed that different farming modules had a substantial impact on yields (Table 3). Conventional farming recorded higher chickpea seed yield (2415 kg/ha) and stover yield (3609 kg/ha), which was statistically at par to the organic farming module. On the contrary, Module-I (LCNF) recorded the lowest seed yield (1737 kg/ha) and stover yield (2794 kg/ha) of chickpea, which is supported by De santis (2021).[10]

In the time of summer, a glimpse of the data on groundnut yields differed significantly among different modules (Table 6). Impressively, the highest pod yield (3027 kg/ha) and haulm yield (3837 kg/ha) were recorded in CF, which was found at par with the OF to the tune of 2830 and 3586 kg/ha, respectively and the LCNF recorded significantly lowest yields of groundnut. The data presented in Table 6 revealed that CF significantly promoted the seed yield (1233 kg/ha) and stalk yield (1898 kg/ha) of sesame, followed by module OF and then LCNF.

In the *Kharif* season, the concerned data (Table 9) indicated that different farming modules significantly influenced the haulm yield and pod yield during the research year. A critical scanning of the data showed that strikingly higher pod yield (1759 kg/ha) and haulm yield (2415 kg/ha) was recorded with whole package of conventional farming practices (CF), which was found statistically at per with to 100% nutrition through bio fertilizers, vermicompost, FYM and *Panchagavya* as well as biopesticides (OF) and *Beejamrut*, *Jeevamrut*, *Ghan Jeevamrut,* FYM, *Achhadan, Agniastra*, *Brahmastra* and *Neemastra* (LCNF) recorded significantly lowest pod yield of (1298 kg/ha) and haulm yield (1821 kg/ha) of groundnut. The data about yields of sweet corn are presented in Table 9 revealed that impressively maximum green cob yield (6802 kg/ha) and green fodder yield (18143 kg/ha) was recorded under Module-III that included supply of mineral fertilizers along with FYM and pesticides (CF), followed by organic farming (OF) and significantly the lowest yields was analyzed under the module that included growing of crops with cow based bioenhancers, botanicals and FYM (LCNF).

Yield potential is a complicated function of biochemical and metabolic processes occurring in a plant system, which can be influenced by the environment and appropriate crop cultivation practices. The highest grain yield of a crop was recorded with the supply of inorganic sources of nutrients due to the availability of nutrients and immediate release as compared to organic sources of nutrients, which release the nutrients slowly (Banik & Sharma, 2009).[2] Therefore, the combined use of inorganic and organic sources of nutrients could result from the better synchrony of nutrient availability (Mwale *et al*., 1997)[25], which would be reflected in higher total yield and nutrient use efficiency. Higher yield of chickpea and groundnut was due to beneficial effect of conjunctive use of organic and inorganic supplements which increased the availability of nutrients considerably resulting in improvement of nodule development, energy transformation, metabolic process and root growth causing more dry matter production and number of nodule (Chaturvedi *et al*., 2010).[7] These results are in accordance with the findings of Chaurasia *et*

al. (2014)[8], Manjunatha *et al*. (2009)[22], Jat *et al*. (2013)[15], Baskar *et al.* (2017)[3], Pradeep *et al*. (2018)[28] and Sikka *et al.* (2018).[30]

During the early 1970's, the Green Revolution transformed the country from a food-deficit state to one of self-sufficiency. The Green Revolution technology aimed to boost agriculture production by replacing conventional hardy crop varieties with high response varieties and hybrids, increasing fertilizer and plant protection chemical use, putting more cultivated land under irrigation, particularly through large investments in major irrigation systems, and consolidating land holdings to make agriculture amenable to mechanization. The initial response to these technological innovations was very dramatic, and it resulted in a quantum jump in agricultural production.

3.2 Post-harvest soil status

By just seeing the yield results of a single year, we cannot conclude the whole farming system's potential. Another dimension we have evaluated is the major element of an agricultural production system in the form of post harvest soil status. During the *Rabi* season, the data in Table 4 refer to the effect of various modules on the physical properties of soil. When looking at different modules, none of them exerted a significant impact on the bulk density, porosity and water holding capacity of the soil after the harvest of crops. An assessment of the data (Table 4) mentioned that different crop growing modules taken under experimentation exerted considerable influence on soil available nutrients after harvest of the crops. Appreciably the highest available N, P and K after harvest of wheat and chickpea were recorded under the conventional farming module (CF), while, module-II that included application vermicompost, FYM and *Panchagavya* (OF) significantly increased organic carbon, heat soluble S, DTPA-extractable Fe, Zn, Cu and Mn, which was statistically comparable to application of 100% RDF through fertilizers along with FYM (CF). Nevertheless, significantly the lowest available micro, macro nutrients and organic carbon after harvest of wheat intercropped with chickpea was recorded under the LCNF.

During the summer season, the critical scanning of the data presented in Table 7 indicated that various farming modules like low cost natural farming, organic farming and conventional farming had no significant impact on porosity, water holding capacity and bulk density after the harvest of groundnut and sesame. A close look at the data on post-harvest chemical properties in Table 7 indicated that considerably the highest available nitrogen, phosphorus and potassium were reported with approved doses of chemicals for plant nutrition and management of weeds, insect-pests and

diseases (CF). Module-II that included treatment of biofertilizer, vermicompost, FYM, *Panchagavya* and biopesticides (OF) had the highest organic carbon (0.611%), S (19.606 mg/kg), Fe (5.429 mg/kg), Zn (0.635 mg/kg), Cu (0.287 mg/kg) and Mn (13.530 mg/kg), which were statistically followed by conventional farming (CF) and notably the lowest organic carbon and available nutrients was recorded with the natural farming module (LCNF).

The data furnished in Table 10 revealed that the effect of varied modules on porosity, bulk density and water holding capacity later in the harvest of the crop was significant during the study due to the residual effect of previous season. It is explicit from the data that significantly the lowest bulk density after harvest (1.334 Mg/m^3); and maximum porosity (48.989%) and water holding capacity (44.586%) was recorded with organic farming (OF), which was found at par with conventional farming (CF). An evaluation of the data (Table 10) mentioned that different crop growing modules taken under experimentation exerted serious influence on post-harvest available nutrients in soil. Significantly the highest available N (140.17 mg/kg), P (23.47 mg/kg) and K (147.40 mg/kg) after harvest was recorded with use of 100% RDF + FYM and pesticides (CF). OF recorded significantly highest organic carbon, S, DTPA-extractable Fe, Zn, Cu and Mn, which was found at par with CF. Nevertheless, notably the lowest organic carbon and available nutrients after harvest was observed when crops grown under the LCNF.

The results showed that during the first and second season of experiment, non-significant improvement in porosity, bulk density and water holding capacity. But continuous supply of FYM in Module-III and vermicompost along with FYM in Module-II improved physical properties of soil. This was possible because of enrichment of soil organic matter resulting in aggregation of soil particles and good pore geometry in soil, reduced bulk density; increased porosity and water holding capacity. The findings confirm the reports of Brar *et al.* (2015).[6]

Organic additives, such as FYM and vermicompost, control soil fertility in agricultural systems. The addition of organic manures to agricultural soil has a number of effects on enzyme activity, which are critical for nutrient mineralization (Gopinath *et al*., 2008).[12] The higher available nutrients and organic carbon in soil after harvest in the CF and the OF are due to the addition of more organic matter and the production of organic acids and carbon dioxide released during the process of decomposition of FYM which improve the availability of nutrients from native supplied with the help of fertilizers during crop cycles (Mere *et al*., 2013).[24] Vermicompost itself contains more quantity of micronutrients and also increase available cationic micronutrient

concentration in soil solution by soil microbes. Poorer results under natural farming might be due to the addition of smaller quantities of supplements. Similar results were also reported by Katkar *et al.* (2011)[16], Sudhakaran *et al*. (2013)[33], Arbad *et al.* (2014)[1], Nagar (2017)[26], Sikka *et al.* (2018)[30], Jadhao *et al*. (2019)[14] and Kumar *et al*. (2020).[18] Many experts in the field of agriculture have voiced concern that any more efforts to persist with this model of chemical agriculture will only prove counterproductive in the long run and cause irreparable damage to soil health and the environment. Restoring soil health by reverting to non-chemical agriculture has assumed great importance to attain sustainability in production.

3.3 Economics

As earlier mentioned, the experiment was conducted in a conventional farming plot, that's why we haven't considered the premier price for LCNF and OF, but after the conversion period, production form OF and LCNF should get higher prices. The findings of *Rabi* season presented in Table 5 shows that maximum gross returns (USD 1354.33/ha), net returns (USD 781.79/ha) and B:C ratio (2.37) were accrued with conventional (CF) due to sufficiently supply of essential nutrients and proper pest and disease control helps get higher output as compared to organic (OF) and cow based supplements (LCNF). However, the net returns, minimum gross returns and B:C ratio were achieved with Module-I (LCNF).

During summer, an evaluation of the data (Table 8) showed that maximum gross returns (USD 1928.04/ha) and net realization (USD 1381.76/ha) were obtained under the growing of chemically treated sole groundnut and sesame (CF), followed by Module-II, which included biofertilizer, vermicompost, FYM, *Panchagavya* and biopesticides (OF). Whereas, the lowest gross returns and net returns (USD 1341.04/ha and USD 843.87/ha) were observed with crops grown under the low cost natural farming (LCNF).

In the course of the *Kharif* season, the findings (Table 11) demonstrated that module-III that involved application of industrial chemicals like NPK fertilizers, fungicides, insecticides and herbicides (CF) resulted in higher gross returns (USD 2395.97/ha), net returns (USD 1782.27/ha) and B:C ratio (3.90), followed by the application of biofertilizer, *Panchagavya*, FYM, vermicompost and biopesticides (OF) and application of cow based bioenhancers and botanicals (LCNF).

Maximum gross and net returns were obtained under the CF. This might be attributed to the higher economical and biological yield of crops with

comparatively less cost than additional income under this module. The minimum gross returns and net returns were achieved under the LCNF, which might be due to variation in the economical and biological yields of crops. These results are similar to those of Chaurasia *et al.* (2014)[8], Behera & Rautaray (2010)[4], Singh *et al.* (2018)[31] and Lyngdoh *et al.* (2019).[20]

Table 3: Yields of wheat and chickpea under low cost natural farming, organic farming and conventional farming (Rabi)

Particulars	LCNF	OF	CF	S.Em.±	C. D. at 5%	C.V.%
Wheat						
Grain yield (kg/ha)	3123	3983	4930	96	296	11.98
Straw yield (kg/ha)	4453	5481	6704	140	433	12.66
Chickpea						
Seed yield (kg/ha)	1737	2257	2415	54	166	12.58
Stover yield (kg/ha)	2794	3377	3609	86	266	13.26

LCNF - Low cost natural farming; OF - Organic Farming; CF - Conventional Farming

Table 4: Physical and chemical properties of soil under low cost natural farming, organic farming and conventional farming (Rabi)

Particulars	LCNF	OF	CF	S.Em.±	C. D. at 5%	C.V.%
Bulk density (Mg/m^3)	1.474	1.451	1.464	0.016	NS	5.48
Porosity (%)	44.494	45.115	44.656	0.495	NS	5.53
Water holding capacity (%)	41.128	41.453	41.361	0.485	NS	5.87
Organic carbon (%)	0.485	0.547	0.529	0.007	0.021	6.60
Available N (mg/kg)	114.94	118.34	130.38	3.586	11.05	7.59
Available P (mg/kg)	14.73	16.34	18.89	0.570	1.76	8.78
Available K (mg/kg)	121.25	124.88	137.72	3.827	11.79	7.67
Available S (mg/kg)	16.120	18.275	17.982	0.265	0.817	7.59
Available Fe (mg/kg)	4.503	5.124	5.031	0.075	0.232	7.71
Available Zn (mg/kg)	0.506	0.586	0.558	0.009	0.028	8.31
Available Cu (mg/kg)	0.218	0.258	0.253	0.004	0.014	9.19
Available Mn (mg/kg)	10.939	12.645	12.167	0.200	0.615	8.37

N - Nitrogen; P - Phosphorus; K - Potassium; S - Sulphur; Fe - Iron; Zn - Zinc; Cu - Copper; Mn - Manganese

Table 5: Economics of crops grown under low cost natural farming, organic farming and conventional farming (Rabi)

Particular	LCNF	OF	CF	S.Em.±	C.D. at 5%	C.V. %
Gross returns (USD/ha)	886.73	1133.97	1354.33	1680	5176	9.61
Cost of cultivation (USD/ha)	472.21	681.55	572.54	-	-	-
Net returns (USD/ha)	414.52	452.42	781.79	1680	5176	19.68
B:C ratio	1.88	1.66	2.37	-	-	-

Table 6: Yield of groundnut and sesame under low cost natural farming, organic farming and conventional farming (Summer)

Particulars	LCNF	OF	CF	S.Em.±	C. D. at 5%	C.V.%
Groundnut						
Pod yield (kg/ha)	2137	2830	3027	71	219	13.34
Haulm yield (kg/ha)	2789	3586	3837	92	284	13.52
Sesame						
Seed yield (kg/ha)	769	1008	1233	25	77	12.48
Stalk yield (kg/ha)	1197	1558	1898	42	131	13.67

Table 7: Physical and chemical properties of soil under low cost natural farming, organic farming and conventional farming (Summer)

Particulars	LCNF	OF	CF	S.Em.±	C. D. at 5%	C.V.%
Bulk density (Mg/m^3)	1.463	1.406	1.433	0.016	NS	5.49
Porosity (%)	44.854	46.629	45.742	0.555	NS	6.07
Water holding capacity (%)	41.240	42.842	42.081	0.406	NS	4.83
Organic carbon (%)	0.506	0.611	0.584	0.009	0.028	8.12
Available N (mg/kg)	116.34	120.57	135.88	4.144	12.77	8.55
Available P (mg/kg)	15.30	17.22	20.97	0.606	1.868	8.72
Available K (mg/kg)	122.03	126.60	142.31	4.545	14.01	8.94
Available S (mg/kg)	16.647	19.606	19.057	0.329	1.013	8.92
Available Fe (mg/kg)	4.605	5.429	5.246	0.083	0.257	8.19
Available Zn (mg/kg)	0.519	0.635	0.603	0.011	0.033	9.18
Available Cu (mg/kg)	0.227	0.287	0.274	0.005	0.016	10.09
Available Mn (mg/kg)	11.416	13.530	13.286	0.230	0.709	9.02

Table 8: Economics of crops grown under low cost natural farming, organic farming and conventional farming (Summer)

Particular	LCNF	OF	CF	S.Em.±	C.D. at 5%	C.V.%
Gross returns (USD/ha)	1341.04	1770.21	1928.04	2879	8870	11.03
Cost of cultivation (USD/ha)	497.17	694.03	546.28	-	-	-
Net returns (USD/ha)	843.87	1076.18	1381.76	2879	8870	16.84
B:C ratio	2.70	2.55	3.53	-	-	-

Table 9: Yield of groundnut and sweet corn under low cost natural farming, organic farming and conventional farming (Kharif)

Particulars	LCNF	OF	CF	S.Em.±	C. D. at 5%	C.V.%
Groundnut						
Pod yield (kg/ha)	1298	1647	1759	40	125	12.89
Haulm yield (kg/ha)	1821	2273	2415	60	185	13.81
Sweet corn						
Green cob yield (kg/ha)	4543	5651	6802	147	451	12.93
Green fodder yield (kg/ha)	12578	15402	18143	418	1287	13.58

Table 10: Physical and chemical properties of soil under low cost natural farming, organic farming and conventional farming (Kharif)

Particulars	LCNF	OF	CF	S.Em.±	C. D. at 5%	C.V.%
Bulk density (Mg/m^3)	1.454	1.334	1.375	0.014	0.042	4.87
Porosity (%)	45.230	48.989	47.916	0.434	1.337	4.58
Water holding capacity (%)	41.355	44.586	43.644	0.371	1.142	4.29
Organic carbon (%)	0.533	0.689	0.658	0.010	0.031	8.02
Available N (mg/kg)	117.07	122.39	140.17	4.397	13.550	8.91
Available P (mg/kg)	16.09	18.17	23.47	0.752	2.316	10.02
Available K (mg/kg)	123.14	128.66	147.40	4.323	13.320	8.33
Available S (mg/kg)	17.240	20.937	20.124	0.356	1.097	9.16
Available Fe (mg/kg)	4.849	5.930	5.665	0.095	0.294	8.69
Available Zn (mg/kg)	0.539	0.694	0.663	0.011	0.035	9.05
Available Cu (mg/kg)	0.243	0.329	0.312	0.006	0.019	10.54
Available Mn (mg/kg)	11.757	14.807	14.291	0.281	0.866	10.32

Table 11: Economics of crops grown under low cost natural farming, organic farming and conventional farming (Kharif)

Particular	LCNF	OF	CF	S.Em.±	C.D. at 5%	C.V. %
Gross returns (USD/ha)	1663.16	2082.72	2395.97	2793	8607	8.78
Cost of cultivation (USD/ha)	606.74	749.83	613.70	-	-	-
Net returns (USD/ha)	1056.42	1332.89	1782.27	2793	8607	12.93
B:C ratio	2.74	2.78	3.90	-	-	-

4. Conclusion

With the evident of three-season field experimentation, it may be finalized that conventional farming system comprised of mineral fertilizers, FYM and pesticides was found superior as compared to organic farming and low cost natural farming for obtaining higher yields of major field crops along with higher net returns shows slight improvement in soil physical and chemical properties although it was just one year experiment which was conducted under medium black calcareous clayey soil of South Saurashtra Agro-climatic Zone of Gujarat.

References

- Arbad, B. K., Ismail, S. and Dhawan, A. S. (2014). Influence of long term use of farmyard manure and inorganic fertilizer on grain yield and nutrient availability in *Vertisols* under soybean-safflower sequence cropping. *Legume Research*, vol. 37(6), pp. 600-606.
- Banik, P. and Sharma, R. C. (2009). Effect of organic and inorganic sources of nutrients on the winter crops-rice cropping system in sub-humid tropics of India. *Archives of Agronomy and Soil Science*, vol. 55(3), pp. 285-294.
- Baskar, M., Solaimalai, A., Kumar. A. and Palanisamy, A. (2017). Residual effect of fly ash, farmyard manure and fertilizers applied to groundnut on growth parameters, nutrient uptake, yield of sesame and post-harvest soil available fertility status in groundnut-sesame cropping system in northeastern zone of Tamil Nadu. *International Journal of Current Microbiology and Applied Sciences*, vol. 6(6), pp. 2917-2923.
- Behera, U. K. and Rautaray, S. K. (2010). Effect of biofertilizers and chemical fertilizers on productivity and quality parameters of durum wheat (*Triticum turgidum*) on a *Vertisols* of Central India. *Archives of Agronomy and Soil Science*, vol. 56(1), pp. 65-72.

- Bisnoi, R. and Bhati, A. (2017). An overview: Zero budget natural farming. *Trends in Biosciences*, vol. 10(46), pp. 9314-9316.
- Brar, B. S., Singh, J., Singh, G. and Kaur, G. (2015). Effects of long term application of inorganic and organic fertilizers on soil organic carbon and physical properties in maize-wheat rotation. *Agronomy*, vol. 5(2), pp. 220-238.
- Chaturvedi, S., Chandel, A. S., Dhyani, V. C. and Singh, A, P. (2010). Productivity, profitability and quality of soybean (*Glycine max*) and residual soil fertility as influenced by integrated nutrient management. *Indian Journal of Agronomy*, vol. 55(2), pp. 133-137.
- Chaurasia, S. K., Jain, N. and Jain, N. (2014). Effect of integrated use of fertilizers, organic manures and micronutrients on productivity of sesame (*Sesamum indicum*). *Annals of Agricultural Research*, vol. 30(3&4).
- De Ponti, T., Rijk, B. and Van Ittersum, M. K. (2012). The crop yield gap between organic and conventional agriculture. *Agricultural systems*, vol. 108, pp. 1-9.
- De Santis, M. A., Rinaldi, M., Menga, V., Codianni, P., Giuzio, L., Fares, C. and Flagella, Z. (2021). Influence of organic and conventional farming on grain yield and protein composition of chickpea genotypes. *Agronomy*, vol. 11(2), pp. 191.
- Fagnano, M., Fiorentino, N., D'Egidio, M. G., Quaranta, F., Ritieni, A., Ferracane, R. and Raimondi, G. (2012). Durum wheat in conventional and organic farming: yield amount and pasta quality in Southern Italy. *The Scientific World Journal*, 2012:973058.
- Gopinath, K. A., Saha, S., Mina, B. L., Pande, H., Kundu, S. and Gupta, H. S. (2008). Influence of organic amendments on growth, yield and quality of wheat and on soil properties during transition to organic production. *Nutrient Cycling in Agroecosystems*, vol. 82(1), pp. 51-60.
- Jackson, M. L. (1974). Soil chemical analysis. Prentice Hall of India Pvt. Ltd., New Delhi.
- Jadhao, S. D., Mali, D. V., Kharche, V. K., Singh, M., Bhoyar, S. M., Kadu, P. R. and Sonune, B. A. (2019). Impact of continuous manuring and fertilization on changes in soil quality under sorghum-wheat sequence on a *Vertisols*. *Journal of the Indian society of soil science*, vol. 67(1), pp. 55-64.
- Jat, L. K., Singh, S. K., Latare, A. M., Singh, R. S. and Patel, C. B. (2013). Effect of dates of sowing and fertilizer on growth and yield of wheat

(*Triticum aestivum*) in an *Inceptisol* of Varanasi. *Indian Journal of Agronomy*, vol. 58(4), pp. 611-614.

- Katkar, R. N., Sonune, B. A. and Kadu, P. R. (2011). Long-term effect of fertilization on soil chemical and biological characteristics and productivity under sorghum (*Sorghum bicolor*)-wheat (*Triticum aestivum*) system in *Vertisol*. *Indian journal of agricultural sciences*, vol. 81(8), pp. 58-63.
- Kitchen, J. L., McDonald, G. K., Shepherd, K. W., Lorimer, M. F. and Graham, R. D. (2003). Comparing wheat grown in South Australian organic and conventional farming systems. 1. Growth and grain yield. *Australian journal of agricultural research*, vol. 54(9), pp. 889-901.
- Kumar, R., Kumar, S., Yashavanth, B. S., Meena, P. C., Ramesh, P., Indoria, A. K. and Manjunath, M. (2020). *Adoption of natural farming and its effect on crop yield and farmers' livelihood in India*. ICAR-National Academy of Agricultural Research Management, Hyderabad, India.
- Lindsay, W. L. and Norvell, W. A. (1978). Development of a DTPA soil test for zinc, iron, manganese and copper. *Soil Science Society of America Journal*, vol. 42, pp. 421-428.
- Lyngdoh, B., Krishnamurthy, N., Jayadeva, H. M., Gowda, J. and Seenappa, C. (2019). Influence of foliar nutrition on the performance of soybean [*Glycine max* (L.) Merrill]. *Mysore Journal of Agricultural Sciences*, vol. 53(2), pp. 57-61.
- Mäder, P., Hahn, D., Dubois, D., Gunst, L., Alföldi, T., Bergmann, H. and Niggli, U. (2007). Wheat quality in organic and conventional farming: results of a 21 year field experiment. *Journal of the Science of Food and Agriculture*, vol. 87(10), pp. 1826-1835.
- Manjunatha, G. S., Upperi, S. N., Pujari, B. T., Yeledahalli, N. A. and Kuligod, V. B. (2009). Effect of farm yard manure treated with *Jeevamrutha* on yield attributes, yield and economics of sunflower (*Helianthus annuus* L.). *Karnataka Journal of Agricultural Sciences*, vol. 22(1), pp. 198-199.
- Melissa, V. (2003). Converting to an organic farming system. Available: https://organic.wvu.edu/files/d/0aa6bbb6-6a0e-4084-9aa4-af1530c0c83b/converting -to-organic.pdf
- Mere, V., Singh, A. K., Singh, M., Jamir, Z. and Gupta, R. C. (2013). Effect of nutritional schedule on productivity and quality of soybean varieties

and soil fertility. *Legume Research-An International Journal*, vol. 36(6), pp. 528-534.

- Mwale, M., Mapiki, A. and Phiri, L. K. (1997). To synchronize nutrient availability with plant uptake. *The Biology and Fertility of Tropical Soils: A TSBF Report*, 1998, pp. 40-41.
- Nagar, U. S. (2017). Long-term effects of inorganic fertilizers and FYM on soil chemical properties and yield of wheat under rice-wheat cropping system. *Himalayan Ecology*, vol. 25, pp. 28.
- Olsen, S. R., Cole, C. V., Watanabe, F. S. and Dean, L. A. (1954). Estimation of available phosphorus in soils by extraction with sodium bicarbonate. Circular USDA, 939 (pp. 19). Washington, DC.
- Pradeep, S., Ullasa, M. Y., Naik, A. H., Ganapathi, and Divya, M. (2018). Effect of different organic nutrient management practices on growth, yield of pigeonpea (*Cajanus cajan* L. Millsp.) and soil properties. *Research Journal of Agricultural Sciences*, vol. 9(2), pp. 352-357.
- Sebby, K. (2010). The Green Revolution of the 1960's and its impact on small farmers in India. Available: https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1027 &context =envstudtheses.
- Sikka, R., Singh, D., Deol, J. S. and Kumar, N. (2018). Effect of integrated nutrient and agronomic management on growth, productivity, nutrient uptake and soil residual fertility status of soybean. *Agricultural Science Digest*, vol. 38(2), pp. 103-107.
- Singh, N., Joshi, E., Sasode, D. S., Sikarwar, R. S. and Rawat, G. S. (2018). Liquid biofertilizer and inorganic nutrients effect on physiological, quality parameters and productivity of *Kharif* groundnut (*Arachis hypogaea* L.). *International Journal of Current Microbiology and Applied Sciences*, vol. 7(9), pp. 729-735.
- Subbiah, B. V. and Asija, G. C. (1956). A rapid procedure for the estimation of available nitrogen in soils. Current Science, vol. 25, pp. 259-260.
- Sudhakaran, M., Ramamoorthy, D. and Kumar, S. R. (2013). Impacts of conventional, sustainable and organic farming systems on soil microbial population and soil biochemical properties, Puducherry, India. *International Journal of Environmental Sciences*, vol. 4(1), pp. 28-41.
- Van Stappen, F., Loriers, A., Mathot, M., Planchon, V., Stilmant, D. and Debode, F. (2015). Organic versus conventional farming: the case of

wheat production in Wallonia (Belgium). *Agriculture and Agricultural Science Procedia*, vol. 7, pp. 272-279.

- Walkley, A. and Black, I. A. (1934). An examination of Degtjareff method for determining soil organic matter and a proposed modification of the chromic acid titration method. Soil Science, vol. 37, pp. 29-37.
- Williams, C. H. and Steinbergs, A. (1959). Soil sulphur fraction as chemical indices of available sulphur in some Australian soils. *Australian Journal Agricultural Research*, vol. 10, pp. 340-352.

ITAHAS/AB/2023/001

Nutritional variability of aonla (*Emblica officinalis* Gaertn.) genotypes found in Arunachal Pradesh

Uma Bulo[1], P.K. Nimbolkar[2]*, Siddhartha Singh[3] and G.D. Sahu[4]

[1&4]Department of Fruit Science, College of Agriculture, IGKV, Raipur, Chattisgarh-492012

[2&3] College of Horticulture and Forestry, Pasighat, CAU (I), Arunachal Pradesh-791102

Arunachal Pradesh exist a huge diversity of flora and fauna. The local aonla fruit trees found in wild as well as domesticated. It is a minor potential fruit crop of Euphorbiaceae family. Aonla is commonly cultivated in subtropical regions of India but its cultivation in Arunachal Pradesh is scarce. To find out an elite genotype from the different regions of Arunachal Pradesh, the present study was carried out at College of Horticulture and Forestry, CAU-I, Pasighat, Arunachal Pradesh. The districts like Papumpare, Upper Subansiri, Namsai and East Siang were selected for the collection. From these four districts, total 30 genotypes were collected and evaluated for fruit nutritional composition. The genotype G24 exhibited the highest (12.3 ^{o}B) TSS content and G1 showed the least (8.07 ^{o}B). Maximum titratable acidity was recorded in genotype G1 (3.2%) and the lowest was in G5 (0.6%). The carbohydrate was in the range of 70.30 % to 79.57 % among the thirty genotypes. The highest amount (8.85%) of total sugar was noted in G24 while the genotype G14 exhibited the maximum starch content. The genotype G29 showed the maximum amount of vitamin C (540.8 mg/100g). The overall study concluded that the genotypes

G16, G18, G19, G24 and G29 can be used for incorporating desirable nutritional characteristic in commercial varieties.

***Key Words**: Nutritional composition, genotypes, variability, aonla.*

ITAHAS/AB/2023/002

Effect of different host plants on life stages and relative toxicity of different insecticides against *Spodoptera litura*

A.R. Deshmukh, Lande G.K., Lahane P.A. and Jadhao V.H.
Department of Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishi Nagar, Akola, Maharashtra, India

The present investigation entitled "Effect of different host plants on life stages and relative toxicity of different insecticides against *Spodoptera litura*" was conducted with view of understand, To study the life stages of *Spodoptera litura* on different hosts and study the relative toxicity of different insecticides on *Spodoptera litura*. The experiment was conducted during year 2013-2014 in the Laboratory of Toxicology, Department of Entomology, Dr. PDKV, Akola.

Host plant influenced on biological parameters such as larval period, pupal period, adult longevity (in days), pupal weight (g) and female fecundity (avrg. eggs/female). This biological parameter was recorded maximum on castor host. Followed by Sunflower host (for pupal period and pupal weight) and Soybean host (for adult longevity and female fecundity). Also, host plant Influenced on the toxicity of different insecticides to *Spodoptera litura,* showed that the indoxacarb and spinosad was most effective against *Spodoptera litura* fed on castor and Soybean host followed by emamectin benzoate and for Sunflower host spinosad was most effective insecticide followed by indoxacarb and emamectin benzoate. The relative toxicity of four different insecticides in third instar larvae of *Spodoptera litura,* reared on three host plants viz. Castor, Soybean and Sunflower, the order relative toxicity for Castor and Soybean host was Indoxacarb> Spinosad>Emamectin Benzoate>Rynaxypyr. And for

Sunflower host the order relative toxicity was Spinosad>Indoxacarb>Emamectin benzoate>Rynaxypyr.

Keywords: *Host plants, rearing, Spodoptera litura, toxicity, insecticide, life stages, rearing, fecundity.*

ITAHAS/AB/2023/003

Effect of Fenugreek (Trigonella foenum-gracum L.) Seed Powder as Natural Feed Additive on Performance and Blood Parameters of Broiler Chick

B.S. Gaikwad[1]*, R.A. Patil[2] and S.S. Shinde[3]

[1]Ph.D Student, Department of Animal Husbanry and Dairy Science, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (MS.)

[2]Assistant Professor, Department of Animal Husbandry, Faculty of Animal Husbandry and Dairy Science, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (MS.)

[3]Ph.D Student, Department of Animal Husbanry and Dairy Science, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (MS.)

An experiment was conducted on the effects of Fenugreek (Trigonella foenum-gracum.L) seed powder as a natural feed additive on performance, hematological parameters and serum constituents of broilers. Fenugeek seed powder was supplemnted standard broiler ration as a T1 (control), T2, T3 and T4 in the four different diets. Eighty, day-old broiler chicks were randomly divided into four equal groups having 20 chicks in each treatment and four replicate of 5 birds reared in deep litter system feed offered a standard broiler diet (T1) and fenugreek seed powder addition in the diet of broilers @ 0.5% (T2), 1.0% (T3) and 1.5% (T4) on dry matter basis by partial of control diet for 42 days. Fenugreek seed powder supplemeted (T4) 1.5 % highest live weight is observed (2636.12 g) in this group. Fenugreek seed powder at the 1.5% level significantly (P0.05) variation was observed in Granulocytes, PLT (platlet) values was increased but in MCV values are decresed as compare control group diet. There was significant (P<0.05) differences in seum profile observed in Glucose, HDL, Cholesterol values was incresed but decreased in Triglycerides as compare to control group, however, non singificant (P<0.05) observed

Cholesterol values was decreased in 1 % supplemented group but LDL, Cholesterol, HDL, LDL ratio values were increased as compare to control group. it is concluded that the inclusion fenugreek seed powder in broiler ration increased white blood cells for strong immunity, lymphocytes and platelet count and improved the overall hematological parameter.

ITAHAS/AB/2023/004

Breeding for Colour Development in Vegetable Crops: Current Approaches and Achievements

Bangi Kyatammanavara Soumya[1], Chandra Deo[2], Yogesh. M[3] and Pramod B.S.[4]

[1]M.Sc. scholar, [2]Professor, Department of Vegetable Science, CAU College of Horticulture and Forestry Pasighat, Arunachal Pradesh India.

[34]Ph.D. scholar, Department of Vegetable Science, University of Horticultural Science, Bagalkot, Karnataka India

The world's growing population, inadequate food and nutrition, lack of vital micronutrients and vitamins, etc., are the key problems that most developing countries worldwide must deal with. Micronutrient malnutrition is a serious condition that causes hidden hunger in people even if they may appear to be eating a sufficient amount of food of poor nutritional quality. Micronutrient deficits like those in iron, zinc, iodine, selenium, and vitamin A are common in the impoverished population. The phenylpropanoids class of secondary metabolites includes flavonoids, which range in colour from pale yellow to blue and have the broadest colour spectrum. The red, blue and purple hues of vegetables including aubergine, onion, red cabbage and purple cabbage are caused by anthocyanin, a naturally occurring pigment with significant antioxidant activity. Several vegetable crops have shown an increase in anthocyanin concentration in recent years, including purple carrots (200-350mg), purple potatoes (17-20mg), red flesh potatoes (20-38mg), red onions (25-40mg), red cabbage (200-3320mg), and purple tomatoes (20-60mg). For research purposes, a number of mutants and transgenic genes, such as or (cauliflower), MYB (red cabbage and purple cauliflower), and Aft, Abg, and atv

(purple tomato), have been discovered as being responsible for colour development and increased nutritional quality. In conclusion, breeding can aid in the creation of a new generation of vegetable crops with improved bioactive qualities and, consequently, the growth of the horticultural industry.

ITAHAS/AB/2023/005

Effect of Mulching in Fruit Crops

Bhawna Thakur*, Sanampreet and Kirandeep Kaur
Department of Agriculture, Shri Guru Teg Bahadur Khalsa College, Sri Anandpur Sahib, Punjab, India

Mulching is the process of covering soil around the plants with an organic or synthetic material to create congenial condition for the plant growth, development and efficient production (Bakshi *et al*.2015). The term mulch was probably derived from the German word "molsch" which means soft to decay. It has been referred to the gardener's use of straw and leaves, as a soil cover (Jacks *et al*., 1995). Mulch plays an important role to regulate soil temperature, conserve moisture, restrict evaporation losses, and suppress wed growth, reducing the number of dirty and diseased berries, enhancing nutrient uptake, and improving water use efficiency and yield (Sharma and Goel, 2017). Borthakur and Bhattacharya (1992) observed that the continuous use of organic mulches also helpful in improving beneficial soil microbial flora, organic matter content and better soil aeration. Plastic mulch application is effective in increasing soil temperature, conserving soil moisture and weed control (Zhang *et al*., 2007). The most popular plastic mulch worldwide is black, though white-on-black and clear mulches are also used (Schales, 1990). Ham *et al*. (1993) reported that White-on black and silver mulches reflect 48 and 39% of shortwave radiation, respectively.

Keywords: *Mulching, Nutrient, organic, aeration, straw.*

ITAHAS/AB/2023/006

Oyster Mushroom Cultivation – Enterprise for Self Employment of Rural Youth and Farm Women

Bipinchandra M. Vahunia[1], Dr. Pratik P. Javiya[2] and Dr. S. A. Patel[3]
Krushi Vigyan Kendra, Navsari agricultural University, Navsari

In recent years, the production of nutrient-rich crops has received significant attention in order to meet the demand for the nutritional security of India's ever-increasing population. In this situation, a diverse agricultural system that incorporates mushroom farming is essential. In many nations nowadays, mushroom cultivation is practised, and the amount of mushrooms produced is rising. In Gujarat, amongst all the edible mushrooms, especially cultivation of oyster mushroom has increased tremendously because of their abilities to grow at a wide range of temperature and utilizing various agro-based residues and easy availability of the raw materials. In order to educate farmers, rural youth, and farm women about the potential of mushroom cultivation in creating jobs, Krishi Vigyan Kendra, Dang, Gujarat, has undertaken Front Line Demonstration (FLD) activities. The oyster mushroom crop was collected as part of the demonstration programmes in four flushes from 15 bags packed with 5 kg of spawn; the highest yield of nearly 60 kg was reported in the month of January, followed by 55.5 kg in the month of February. The month of April saw the lowest yield, with 45 kg. The results of the economic analysis of oyster mushroom production showed that, with a B:C ratio of 5.38, farmers were able to achieve the highest net income of Rs. 6500 per unit (5 kg of spawn in 1 mushroom unit). Accordingly, a small farmer who invested Rs. 1300 in a single unit would receive between Rs. 6500 and Rs. 7000 back. From these results we can say that the oyster mushroom cultivation is a profitable venture for self employment of rural youth as well as for farm women.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/007

Studies on Seed Mycoflora of Popularly Grown Soybean Cultivars from Marathwada

Dhawan Shital Sanjay
Assistant Professor, Department of Plant Pathology, College of Agriculture Business Management, Baramati

The present investigation conducted during 2017-18 with the objectives viz., to detect the fungi associated with soybean seeds by various seed health testing methods, to isolate, identify and prove pathogenicity, to evaluate in vitro the efficacy of seed dressing fungicides, bio-agents and silver nanoparticles against major fungi pathogenic to soybean and to evaluate effect of effective fungicides, bio-agents and silver nanoparticles on seed germination and seedling vigour by rolled paper towel method and in pot. Among seed health testing (SHT) methods employed Agar plate method found efficient in the detection of soybean seed mycoflora. These SHT methods revealed the association of six major fungi viz., *Fusarium verticillioides, Macrophomina phaseolina, Alternaria alternata, Aspergillus niger, Aspergillus flavus* and *Rhizopus stolonifer*, with the stored seeds of soybean cultivars MAUS-71, MAUS158, MAUS-162, MAUS-612 and JS-335. Among isolated six pathogenic fungi, further treatments conducted against three major pathogenic fungi viz. *Fusarium verticillioides, Macrophomina phaseolina* and *Alternaria alternate.* Among seven fungicides evaluated in vitro, the systemic fungicide carbendazim 50% WP found most effective against test fungi. Five *Trichoderma spp., Aspergillus niger* and *P. fluorescens* evaluated in vitro were found effective against test fungi. Among six silver nano-particles and three culture filtrate evaluated in vitro, the silver nanoparticles of *T. asperellum, T. harzinum* and *T. hamatum* @ 150 ppm, found effective against test fungi. All the seven treatments (3 fungicides, 2 bio-agents and 2 silver nano-particles) in rolled towel paper method and in pot were able to reduce the mycoflora associated with seeds and thereby increase germination percentage, root and shoot length, and ultimately seedling vigour index and also reduction in mortality per cent by rolled towel paper method and in pot.

ITAHAS/AB/2023/008

Biodiversity in indigenous Germplasm of Pear from Jammu based on Phenotypical and Morphological Traits

Ambika Bhandari*, Amit Jasrotia, Mahital Jamwal, Kiran Kour, Gurdev Chand and Vivak M. Arya

Division of Fruit science, Faculty of Agriculture, Sher-e-Kashmir University of Agricultural
Sciences and Technology of Jammu, Chatha J&K, India

Research was conducted on sixty pear accessions discovered in two districts of Jammu, focusing on various morphological characteristics relevant to horticulture. Both qualitative and quantitative traits were extensively analyzed, both in the field and through the evaluation of leaf and fruit samples post-harvest. Within the pear accessions, a wide array of diversity was observed in qualitative traits, including growth pattern, flowering time, flowering intensity, fruit setting, ripening time, productivity, as well as fruit shape and color. In terms of quantitative traits, notable variances were identified in leaf area (ranging from 8.96 to 27.17 cm2), duration of flowering (19 to 23 days), fruit weight (142.10g to 297.20g), average fruit length (4.34 to 7.54 cm), and average fruit width (5.01 to 7.45 cm) among the different pear accessions.

To analyze the data, cluster analysis was employed, resulting in the construction of two dendrograms. These dendrograms effectively categorized the pear accessions into eight distinct groups based on both qualitative and quantitative traits. The analysis revealed significant differences in traits among the accessions, highlighting the diversity present. Moreover, within each cluster, close associations were observed among the accessions in terms of both qualitative and quantitative traits. These findings demonstrate the rich diversity and similarities among the pear accessions. Further investigations at the molecular level are needed to determine their phylogenetic relationship and provide more detailed insights.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/009

Role of Biotechnology and Nanotechnology in Combating Climate Change

Anita Sinha[1]* and Pradeep Mishra[2]
[1*]Biotechnology, University Department of Botany, Ranchi University, Ranchi, Jharkhand, India
[2]Department of Agricultural Statistics, JNKVV, Jabalpur, India

Climate change has always been a major concern due to its negative impacts on the environment. In the present scenario there is an adverse effects of climate change the world is facing due to global warming, considered as one of the primary cause. In future we may face big crisis that will affect all life forms on earth. Climatic system of our earth such as warming of ocean, air and land, rise in sea levels. melting of glaciers has changed or altered due to climate change. Extreme weather conditions are the area of big concern. There is a significant contribution of Biotechnology in climate change mitigation and adaptation to environmental changes. Greenhouse gas emissions can be reduced by the use of products developed with agricultural Biotechnology Research programs are continued to develop different ways to draw excess carbon dioxide out of the atmosphere with trees and use of microorganisms and their products. Industrial biotechnology, based on renewable resources, can save energy and significantly reduce emissions of carbon dioxide. It holds much greater promise for the future by avoiding the use of fossil raw materials. In various industrial sectors there is an involvement of enzymes and microbes in making biobased products. The feedstocks are biomass of agriculture and organic waste materials also including waste waters. Nanotechnology based products are involved or engaged in the production and use of renewable energy such as biofuels and decreases the use of fossil fuels and decelerate global warming. Dyes, heavy metals and other pollutants in wastewater streams are also degraded with the help of Nanotechnology. Since a range of nanomaterials has been reported to absorb greenhouse gases, thus may help to reduce global warming and are a part of solution to climate change.

***Keywords**: Nanotechnology, Biotechnology, Global Warming, Pollutants, Green House Gases, Mitigation, Adaptation.*

ITAHAS/AB/2023/010

Evaluation of phosphogypsum and its combinations in comparison with other liming materials for the amelioration of acidity

Dr. Anusree T.[1], Dr. K. M. Durga Devi[2] and Dr. Beena V. I[3]

[1]Research Associate, AICRP on MSPE, College of Agriculture, Vellanikkara,

[2]Professor (Retd.) Dept. of Soil Science and Agricultural Chemistry, College of Agriculture, Vellanikkara

[3]Assistant Professor and Head, Dept. of Soil Science and Agricultural Chemistry, College of Agriculture, Vellanikkara

Phosphogypsum, which is more soluble and mobile than lime is suited to correct the soil acidity, Fe and Al toxicity, and as a supplier of nutrients. An incubation experiment was conducted in Kole lands of Kerala for evaluating the release and dissolution pattern of different amendments and its influence on soil chemical properties. The amendments *viz.,* phosphogypsum (PG), rock phosphate (RP), lime and dolomite (Dolo) were applied alone or in combinations or with the incorporation of vermicompost (VC). The nine treatments *viz.,* T1 (PG), T2 (RP), T3 (Lime), T4 (Dolo), T5 (PG +lime+ VC), T6 (PG +Dolo+VC), T7 (PG+RP+VC), T8 (PG+Dolo) and T9 (Absolute control) were applied in quantities decided based on the Ca requirement of the soil (140 kg Ca ha^{-1}) and Ca content of amendments. The soil samples were collected on 0th day, 30th day, 60th day and 90th day of incubation and analysed on wet basis for the important chemical properties. The sole application of phosphogypsum maintained a higher pH at all the sampling intervals as compared to the other treatments with the values 6.15, 6.31, 6.28 and 6.29 on 0th day, 30th day, 60th day and 90th day respectively. Among different amendments, sole application of phosphogypsum could increase 30.35 % of exchangeable Ca whereas sole application of dolomite, RP and lime could raise ex. Ca to the extent of 18.14 ,15.98 and 10.70 % as compared to the control on 30th day of incubation which indicated that the highest release of Ca was from phosphogypsum and the lowest release from lime. Magnesium release was significantly higher in the treatments with dolomite. The available S was significantly higher in T1 (PG) followed by T8 (PG+Dolo) at all stages of sampling with the values ranging from 58.56-51.22 and 41.43-45.50 mg kg^{-1} respectively. Application of all the amendments significantly decreased the available Fe with the highest percentage reduction due to the sole application of phosphogypsum at all the

stages. Similarly, the sole application of phosphogypsum significantly reduced ex. Al to the extent of 48.19, 51.42, 55.22 and 60.58 % on 0^{th}, 30^{th}, 60^{th} and 90^{th} day of incubation.

ITAHAS/AB/2023/011

Evaluation of antagonistic properties of native rhizobacteria and characterization of potent isolates against *Rhizoctonia solani* Kuhn

Arvind M[1*], Thippesha B. S.[1], Prashanthi S. K.[1], Hiremath S. V.[1] and Jones P. Nirmalnath[2]

[1]Department of Plant Pathology, University of AgriculturalSciences, Dharwad – 580 005, Karnataka, India

[2]Department of Agricultural Microbiology, University of Agricultural Sciences, Dharwad- 580 005, Karnataka, India

Sheath blight of rice caused by *Rhizoctonia solani* Kuhn is the second most destructive fungal disease of rice after blast. The disease is mostly controlled by chemicals which have a devastating impact on the environment. In the recent years, utilization of native antagonists has proved to be the most economical and eco-friendly method that can replace chemicals and promote sustained crop yield. With this view, a total of 32 native rhizobacteria consisting of 30 actinobacteria and 2 fluorescent bacteria were isolated from different rice growing regions of Karnataka and evaluated against *R. solani* isolate RS4 under *in vitro* and *in vivo* conditions. The actinobacterial isolates, GVTAM 8, DWRAM 10 and AUDT 502 (reference strain), were found to be most effective in *in vitro* studies. The effective isolates identified were further evaluated under glasshouse condition singly and in combination to cross-check its biocontrol potential as well as plant growth promotional activities. Among the different treatments used, the seed treatment followed by spraying with GVTAM 8 and AUDT 502 was most successful in controlling the disease and also improved the plant yield. The potent isolates, GVTAM 8 and DWRAM 10 were identified as *Streptomyces cinnabarinus* and *Streptomyces pseudogriseolus*, respectively during molecular characterization. The biocontrol and plant growth promotion activity of these actinobacteria makes it a suitable candidate for inclusion in disease management programs thereby, avoiding the complete dependency on the chemical for the management of sheath blight disease.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/012

Sensory quality of rose petal powder added *Sanwa* (Barnyard Millet) *Kheer*

Ashwini Mugale[1], Shakeel Asgar[2], S.Kartikeyan[2] and Aprna Sharma[2]
[1]Department of Dairy Technology, Parul Institute of Technology, Parul University, Vadodara (Gujarat)
[2]Department of Dairy Technology, College of Dairy Science and Food Technology, Raipur (CG)

In India, in every home various milk and milk products like *Peda*, *Burfi*, *Shrikhand*, *Gulabjamun*, etc were consumed during joyful occasions or festivals. Among all the dairy product *Kheer* is one of the simplest product which is prepared in every home during festivals. The *Kheer* is given the position of "Amrit" in Indian culture. The developed *Kheer* is prepared with replacement of rice with *Sanwa* (Barnyard Millet). Because *Sanwa* has so many health benefits to human as it has low glycemic index, high in protein, iron and full of fibers which gives fullness after eating hence consumption of *Sanwa* is good for those people who are suffering from disease like obesity, celiac, etc. Also in many states *Sanwa* is preferred as "Fasting Food" due to its high content of fibers. Now-a-days there is trend of flavors and Rose which is king of flower and it has typical rosy flavor along with antioxidant and fiber content. Hence in the above developed product rose petal powder is used due to its high nutritional value accompanying with flavor.

Sensory evaluation means the science or technique to analyze and measures the characteristics of product as perceived by the sense organs. The sensory evaluation of the *Kheer* includes color and appearance, flavor, body and consistency and overall acceptability. The developed *Kheer* has very good score and acceptance by the judges for fresh as well as for stored *Kheer* which was packed in polystyrene cups and stored for 10 days.

Keywords: *Milk, Kheer, Sanwa (Barnyard Millet), Rose petal powder, Sensory evaluation.*

ITAHAS/AB/2023/013

MODIS NDVI trends for the assessment of land degradation /restoration over Rajasthan

Brijesh Yadav*, Lal Chand Malav, Mahaveer Nogiya, R.L. Meena, R. P. Sharma and B.L. Mina

ICAR- National Bureau of Soil Survey & Land Use Planning, RC, Udaipur

The loss of natural vegetation is a serious threat to the environment that might result in soil degradation. The assessment of vegetation cover change has been made easier and more reliable due to the availability of free satellite remote sensing data. In the present study, the MODIS vegetation index, normalized difference vegetation index (NDVI) was used in order to understand the vegetation patterns over 21 years (2001-2021) in the Rajasthan state, India. The changes at 30m pixel resolution were evaluated using Mann-trend Kendall's test. It can be seen that NDVI was increased in the Rajasthan state over the period of time which clearly reflects increased greenness in Rajasthan. Among all the years, the year 2021 has a largest number of green pixels covering the study area, which shows that the majority of the area has higher NDVI values year. In 2001, on the other hand, the trend is the exact opposite, with lower NDVI values covering much of the area. The result of Mann-trend Kendall's test revealed that NDVI increased in 96.5% of the study area (S>0), which were mainly located in southern and eastern parts while decreased in 3.4% of the total pixels (S<0). It is more interesting that NDVI is following an increasing trend over Indira Gandhi Canal and it might be due to the enhancement of irrigation facilities due to Indira Gandhi Canal, restoration of degraded land, cropping pattern change, sufficient rainfall, cultivation of wastelands, rainwater harvesting structure and proper policy interventions might be the reasons in other parts of the study area. Some pixels (red pixels) are showing a decreasing trend of NDVI, particularly in the Jaipur district which could be due to industrialization, urbanization, groundwater depletion, faulty irrigation technique, and cropping pattern changes etc. The results of this research provide scientific proof of vegetation change across Rajasthan and may help the state for monitoring vegetation changes, conserve ecosystems, and implement sustainable ecological management.

***Keywords**: Vegetation trend, NDVI, Land degradation, Remote sensing, Rajasthan.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/014

Livelihood security assessment of beneficiary and non-beneficiary farmers during COVID-19 towards Pradhan Mantri Fasal Bima Yojana in Kolar District of Karnataka

Imrankhan Jiragal[1], Lakshminarayana Reddy, C. N., [2] Jahir Basha, C. R.[3] and Ganesamoorthi, S.[4]

[1]Young Professional II, AICRP on Women in Agriculture, University of Agricultural Sciences, GKVK, Bengaluru-560065

[2, 3] Associate Professor, Department of Plant Pathology, University of Agricultural Sciences, GKVK, Bengaluru-560065

[4]Associate Professor, Department of Agricultural Extension, University of Agricultural Sciences, GKVK, Bengaluru-560065

Economic contribution of agriculture and allied sectors to India's GDP is 19.90 per cent, even though, Indian agriculture is time and again hit by natural disasters such as droughts, floods, cyclones, hurricanes, landslides, earthquakes, epidemics and disasters caused by humans like fire, fertilizers, insecticides, pesticides and so on. Despite the efforts to see the livelihood security of farmers from the PMFBY insurance scheme, there are reported issues with respect to food, economic, social, ecological, physical and psychological in security. In this connection, it is essential to assess the livelihood security of beneficiaries and non-beneficiaries of PMFBY. Therefore, the study was conducted in Kolar district of Karnataka state during the year 2021-2022. The results revealed that statement wise analysis under food security, “food in some kind is available for throughout the year” stands first rank with the mean score of 4.63 in beneficiaries and under economic security, “the farming system adopted by me optimally utilizes my economic resources” stands first rank with a mean score of 4.61. Similarly, as for as ecological security is concerned “diversification level of my farming condition ensures efficiency in available water use” and under social security, “my current farming system is recognized as the ideal by my society” stands first rank with a mean score of 4.71 and 4.66 in beneficiaries respectively. However, under psychological security, “practicing diversified farming powers me to enhance my knowledge and skills in farming” stands first rank with a mean score of 4.65 in beneficiaries and under physical security, “the level of diversification in my farm increases possibilities to possess an own house” stands first rank

with the mean score 4.73 in beneficiaries. When it comes to overall dimension wise, under food, economic and ecological security respondents belonged to the better livelihood security towards the PMFBY with 53.50, 57.00 and 65.50 per cent respectively. Under social, psychological and physical security respondents have belonged to average livelihood security towards the PMFBY with 51.50, 69.50 and 59.50 per cent. When it comes to overall livelihood security 38.00 per cent of the respondents belonged to better livelihood security towards the PMFBY scheme.

Keywords: *Livelihood security, Food security, Economic security, Ecological security, Social security, Psychological security, Physical, PMFBY and Insurance.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/015

Generation mean analysis for yield traits in okra [*Abelmoschus esculentus* L. Moench]

Deshmukh K. D., Khandare V. S. and Jadhav S. D.
Department of Horticulture, College of Agriculture,
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani- 431401. (M. S.)

The experimental material was composed of six generations (P1, P2, F1, F2, BC1, and BC2) through generation mean analysis of six crosses with distinct parents. In a randomized block design with generations within each cross being randomly distributed over two replications, the generations were examined during Kharif 2019. The traits were studied total number of fruits per plant, marketable yield per plant, total yield per plant, weight of 100 seeds, disease reaction for YVMV infestation. In most of the crosses showed additive x additive (i) interaction was positively significant in the characters total number of fruits per plant, marketable yield per plant, total yield per plant, disease reaction for YVMV infestation. Dominance (h) component was observed to be important in the characters like weight of 100 seeds. The majority of the characters showed complementary type of gene action except weight of 100 seeds. It showed duplicate type of epistasis. Inheritance of traits is influenced by complementary types of gene action.

***Keywords**:- Okra, generation mean analysis, yield components, gene effects, epistasis.*

ITAHAS/AB/2023/016

Effect of integrated nutrient management practices on productivity of Fodder maize

Koushik Sar
Faculty of Agricultural Sciences, IAS, Siksha 'O' Anusandhan, Bhubaneswar

A field experiment entitled "Integrated Nutrient Management in Fodder Maize (*Zea mays* L.)" was conducted at Agricultural Research Station, Chhatabar, Faculty of Agricultural Sciences (IAS), Siksha „O" Anusandhan, Bhubaneswar during *kharif* season 2019 in a well drained sandy loam soil with pH 5.8, low in organic carbon medium in available P and K to study the effect of nutrient management practices on growth, yield, quality, nutrient uptake and economics of fodder maize variety African Tall. The experiment was laid out in a randomized block design with eight nutrient combinations (T1 -100% Organic through FYM, T2 -100% Organic through Vermicompost, T3 -100% Inorganic (RDF-80:40:40 NPK kg/ha), T4 -50% Organic (FYM)+ 50% inorganic (40:20:20 NPK kg/ha), T5 -50% Organic (Vermicompost)+ 50% inorganic, T6 -75% Organic (FYM)+ 25% inorganic, T7 -75% Organic (Vermicompost)+ 25% inorganic, T8 – Control- farmer"s practice) and replicated thrice. Results revealed that that T3 -100% Inorganic RDF-80:40:40 kg/ha was found the best treatment as it recorded significantly higher performance in growth parameters and yield attributes and quality (9.14% crude protein and 9.08 q/ha crude protein yield) and it was at par with treatment T2 -100% Organic through Vermicompost.

Malla Reddy University, Hyderabad and Just Agriculture Education Group

ITAHAS/AB/2023/017

Isolation Characterization and Identification of Cellulose Degrading Bacteria for Composting of Agro-wastes

Kshitipati Padhan[1*], Ranjan Kumar Patra[1], Debadatta Sethi[1], Narayan Panda[1], Shraddha Mohanty[1], Sanjib Kumar Sahoo[1] and Sushanta Kumar Pattanayak[1]

[1]Department of Soil Science and Agricultural Chemistry, College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar, India, 751003

The rapid increase in human population and accelerated economic has caused an exponential increase in waste generation. There are enormous municipal solid wastes (MSW) and agricultural by-product produces which caused environmental risk due to its treatment like land filling and burning. Composting is a technique which valorises the waste with limited environmental risk but takes longer duration but the shortage of lands and large volume of organic waste require these waste to be treated quickly. However, inoculation with lignocellulolytic bacteria could potentially enhance the organic degradation and reduce the composting time of the waste. In this context, an attempt was made to isolate cellulose-degrading bacteria from various sources so that it could be utilised in the composting of lignocellulosic wastes. On the basis of cellulase production and proliferation in various environmental conditions, five isolates were selected. The 16s rRNA genetic sequences of five isolates were submitted to the National Centre for Biotechnology Information (NCBI), where they were assigned accession no ON150745, ON178665, ON725042, ON479186, and ON142173 respectively for CBD4, CBG3, CBG2, CBC9, and CBG4. The growth of CBD4, CBG2, CBG3, and CBG4 reached stationary phase at 24 hours and lasted up to 78 hours, whereas CBC9 reached stationary phase between 32 and 50 hours after incubation, which was less than other bactenal strains. The optimal CMCase production conditions for the strains were 5% inoculum, pH 7.5, and 35° C for CBD4 and CBC9; 4% inoculum, pH 6.5, and 35° C for CBG2 and CBG3; and 3% inoculum with the same pH and temperature for CBG4. CBG2 strain exhibited the greatest CMCase production under optimal conditions. The highest CMCase reaction for all strains occurred at 50° C and decreases with increasing or decreasing temperature. The reaction of cellulase produced by strain CBG2 was greatest at the optimal pH and temperature. This conclude that, among the cellulose degrading bacteria, the strains CBG2 (*Bacillus* sp.) was more efficient in terms of cellulolytic enzyme production.

Key Words: *Cellulase activity; Enzyme assay, Growth curve; Holo zone.*

ITAHAS/AB/2023/018

Buckwheat: A climate smart underutilized crop to improve Nutritional and Food security of tribal farmers of N. E region.

Dr. Rajib Das[1], Dr. Prankanu Debnath[2], and Dr. Nancy Lego[3]
[1]Assistant Professor, MTTC & VTC, COA, CAU (I), Pasighat Arunachal Pradesh
[2]Professor, College of Horticulture and Forestry, CAU(I), Pasighat Arunachal Pradesh
[3]Assistant Professor, College of Agriculture, CAU(I), Pasighat, Arunachal Pradesh

Cereal-based foods are the staple food and main source of carbohydrate for human worldwide but in general they lack significant amount of protein, Lipid, vitamin, minerals and phytomedicine. Rice is the staple food crop for people of North East region. People of this region experiencing malnutrition, this is because of over reliability on rice as staple food and inability to consume nutrient rich fruits and vegetables due their poor economic condition (National Family Healthy Survey 2015-16). The COVID pandemic has brought much required focus on nutrition. It has been reported that micronutrients play synergistic role in boosting immunity. More over productivity of rice and maize in this region is very low and cost of cultivation related to labour, fertilizers, further higher dose of chemical fertilizer due to low nutrient use efficiency and use chemicals for plant protection measured polute soil, water and air. Hence crop diversification is the right alternatives to facilitate Nutritional and Food security to resource poor farmers and natural farming.

Suitable alternative crops which can replace or substitute the regular food crops should have certain desirable characteristics, such as being nutritious, nontoxic and sustainable. Plants which were domesticated early in the course of human evolution can serve as alternatives due to their reasonably good yields without any of the modern agricultural inputs, such as fertilizers and pesticides.

Buckwheat is among various ancient cultivated species of Asia and it is mainly cultivated in India, China, Nepal, Canada, North Korea, Bhutan, Eastern Russia, Mongolia and Japan. In northeast India it is mainly grown in Arunachal Pradesh and Sikkim. Buckwheat contains higher amount of protein (12%), Ca (110mg/100gm), Fe (4mg/100gm), Mg (390 mg/100 gm) and Potassium (450 mg/100 gm) which is much higher than the major cereals. It doesn't contain gluten protein and therefore it is useful for celiac disease patients. Buckwheat

protein is presumed to reduce serum cholesterol, suppress gallstones and tumours and inhibit the angiotensin I- converting enzyme. Rutin a flavonoid present in buckwheat prevents oedema, coronary artery disease and also has anti carcinogenic properties.

The crop can be grown in varied climatic condition, ranging from sub tropical to temperate zone of upto 4500m. Buckwheat is one of the best crops in higher altitude in terms of climatic variables, water stress regimes, unfertile soil and freezing temperature and is easily fitted to different cropping pattern due to short life cycle of 3 months. In a year this crop can be grown thrice. This crop can extracts phosphorus from the soil of low availability. It has a higher tolerance to soil acidity than any other cereal crops; it can tolerate soil pH levels as low as 4.8. These crops are more efficient users of water and soil nutrients. Besides, they are more tolerant to various abiotic stresses, such as drought, and are also resistant to multiple diseases and pests. Hence, these crops are more suitable for sustainable agriculture. However, the yields of these orphan crops are comparatively less than the major crops due to the intensification of agriculture led to a drastic decline in their cultivation and lack of breeding efforts to develop higher yielding varieties. Worldwide buck wheat yield reduced around 64% and area reduced around 65%. Similar trends are also followed in north eastern states.

So considering theses facts we have started collection and characterization of local germplasm/landraces from different parts of N.E region. So far we have collected 23 local land races of buckwheat from different parts of the region and DUS testing of the germ plasm is already been done. In initial evaluation it is found that the buckwheat CHFBW3, CHFBW6 and CHFBW9 yield much more than the check variety Shimla-1 and VL-7. In addition to that, for main streaming of the crop different awareness, training and seed distribution programme organized in different parts of Arunachal Pradesh. As a result of these efforts a local farmer Mr. Ojing Mengu was able to earn an income of Rs. 12000 in a single season in Mirswam village of East Siang District.

ITAHAS/AB/2023/019

Recent Advancements and Applications of Antimicrobial Active Packaging for Seafood

Rakesh R. Jadhav[1*], Su Hlaing Chein[2] and Diksha R. Jadhav[3]
[1]Fisheries Engineering, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth (Agricultural University), Maharashtra, India
[2]Myanmar Soil Development Group, Myanmar Food Processors and Exporters Association (MFPEA), Myanmar
[3]Department of Environmental Science, Institute of Science, Mumbai, Maharashtra, India

Seafood is a highly perishable food commodity that is susceptible to microbial spoilage, leading to significant economic losses and public health risks. To address these challenges, antimicrobial active packaging has emerged as a promising solution in recent years. This paper presents a comprehensive review of the recent advancements and applications of antimicrobial active packaging for seafood. An overview of the microbial challenges associated with seafood and the importance of effective packaging solutions is provided. It highlights the main types of microorganisms involved in seafood spoilage and the risks they pose to consumers. Additionally, the role of packaging in extending the shelf life and maintaining the quality and safety of seafood is emphasized. It also explores the principles and mechanisms behind antimicrobial active packaging. Various active agents, including natural extracts, essential oils, enzymes, and antimicrobial peptides, are discussed in terms of their antimicrobial properties and potential applications in seafood packaging. Furthermore, the incorporation of these active agents into packaging materials and their release mechanisms are examined. The study reviews the recent advancements in antimicrobial active packaging technologies for seafood. It covers topics such as nanotechnology-based packaging, intelligent packaging systems, and active packaging films and coatings. The advantages and limitations of these technologies are discussed, along with their potential for commercialization and widespread adoption in the seafood industry. The study also highlights the practical applications of antimicrobial active packaging for seafood. It showcases case studies and experimental results from laboratory-scale trials and industrial applications. The effects of antimicrobial active packaging on microbial growth inhibition, sensory attributes, and shelf-life extension of various seafood products are

presented. Overall, this paper provides a comprehensive overview of the recent advancements and applications of antimicrobial active packaging for seafood. It serves as a valuable resource for researchers, industry professionals, and policymakers seeking to enhance the safety and quality of seafood through innovative packaging solutions. The findings and insights presented in this paper contribute to the ongoing efforts to reduce seafood spoilage, extend its shelf life, and mitigate the risks associated with microbial contamination.

Keywords*: Seafood, Preservation, packaging, antimicrobial, shelf-life.*

ITAHAS/AB/2023/020

Effect of Foliar Application of Micronutrients on Shelf Life of Cabbage *(Brassica oleracea* var. *capitata* L.)

R. A. Jadhav[1*], S. B. MANE[2], L. V. Pimpalpalle[3] and A. S. Kadam[4]

[1]Ex. P.G. Student, College of Agriculture Parbhani, Vasantrao Naik Marathwada Krishi Vidyapeeth Parbhani.

[2]Assistant Professor College of Agriculture, Dongarshelki Tanda, Udgir, Vasantrao Naik Marathwada Krishi Vidyapeeth Parbhani

[3]Assistant Professor College of Agriculture, Dongarshelki Tanda, Udgir, Vasantrao Naik Marathwada Krishi Vidyapeeth Parbhani

[4]Associate Dean College of Horticulture Parbhani, Vasantrao Naik Marathwada Krishi Vidyapeeth Parbhani

A field experiment entitled "Effect of foliar application of different micronutrients on shelf life of cabbage (*Brassica oleracea* var. *capitata* L.)" Cv. Green-challenger was conducted during rabi season of 2016-17 at instructional cum research farm, college of Horticulture, VNMKV, Parbhani. The design for experiment was RBD with replicated thrice. The treatments consist of Fe 0.5% (T_1), Fe 1.0 % (T_2), Zn 0.5% (T_3), Zn 1.0%(T_4), Mn 0.5%(T_5), Mn1.0% (T_6), B 0.3% (T_7), B 0.6% (T_8), Fe 0.5% +Zn 0.5%+Mn 0.5%+B 0.3%(T_9), Fe 1.0% +Zn 1.0%+Mn1.0%+B 0.6%(T_{10}) and Control (T_{11}) where, only water spray was given. The foliar application of micronutrients as per treatments was done at 30, 45 and 60 days after transplanting. The shelf life of cabbage observations were recorded at 90 days after harvesting. The data regarding shelf life of cabbage heads under different storage conditions indicated that, the maximum shelf life of cabbage heads (10.33 days) at room temperature and at refrigerated condition (16.50 days) was observed in treatment T_{10} and it was statistically at par with treatment T_9 and T_8 under room temperature and T_9, T_8, T_7, T_4, T_3, and T_2 under refrigerated conditions. Whereas, minimum shelf life of cabbage heads (7.50 days) at room temperature and at refrigerated condition (13.50 days) was recorded in control (T_{11}) treatment.

Keywords: *Brassica oleracea, micronutrients and shelf life.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/021

Effect of Pusa Hydrogel and Vermi compost on soil, water productivity and nutrient uptake by the wheat crop

Sunil Kumar*, Adesh Singh[1] and Deepak Kumar[2]
Department of Soil Agronomy, Sardar Vallabhbhai Patel University of Agriculture and Technology Meerut -250110, Uttar Pradesh, India
Department of Soil Science, Sardar Vallabhbhai Patel University of Agriculture and Technology Meerut -250110, Uttar Pradesh, India

The soil of the experimental field was well drained, sandy loam in texture and slightly alkaline in nature. It was low in organic carbon and available nitrogen but medium in available phosphorus and potassium. Three irrigation levels viz., I_1 (at CRI stage), I_2 (at CRI, Booting and Milking) and I_3 (at CRI, Late tillering, Late jointing, Flowering and Milking stage) and I_4 moisture conservation practices (Application of pusa hydrogel @ 5 kg/ha, Vermi-compost @ 1t/ha, pusa hydrogel @ 5 kg/ha+Vermi-compost @ 1t/ha and no application) were tested in split plot design with 3 replications. Results revealed that the highest total nitrogen (105.22 and 97.48 kg/ha), phosphorus (23.05 and 20.94 kg/ha) and potassium (141.96 and 138.41kg/ha) uptake was recorded with 5 irrigations followed by 3 irrigations during first and second years, respectively. Besides, this treatment also gave highest nutrient uptake by crop along with maintaining the soil fertility and moisture status. Thus, in wheat application of 5 kg pusa hydrogel+1 t Vermi-compost/ha with 05 irrigations (at CRI, Late tillering, Late jointing, Flowering and Milking stage) seems to best under sandy loam soils of North Western Plain Zones of Western Uttar Pradesh.

Keywords: *Irrigation, Moisture conservation, Vermicompost, Pusa hydro-gel and Economic feasibility.*

ITAHAS/AB/2023/022

Effect of Probiotics and Multienzymes with Low Energy Diet in Japanese Quail

S. F. Nipane*, A. N. Panchbuddhe, A. A. Zanzad, G. B. Deshmukh and B. N. Ramteke

Department of Animal Nutrition, Nagpur Veterinary College, Nagpur 440006
Maharashtra Animal & Fishery Science University, Nagpur, India.

An experiment was conducted on one hundred sixty quail chicks, to study the effect of probiotics and multienzymes with low energy diet in Japanese quail from day old to six week of age. Standard managerial practices were followed throughout the experiment. Feed and fresh drinking water was provided adlib. The dietary treatment consisted of four groups of which one was (T_0) control i.e. Standard energy content of mash. Other dietary treatment contains low energy diet (T_1), low energy diet with multienzymes (T_2), low energy diet with probiotics (T_3). During experiment the data were recorded for weekly live body weight and feed consumption. The metabolic trail was conducted for three consecutive days at the end of experiment to study the nitrogen balance. The average body weight at sixth week of age was 137.62, 135.76, 144.8 and 151.63 g for T_0, T_1, T_2 and T_3 group respectively. It was observed that there was significantly difference in the body weight of treatment groups. The average cumulative feed consumption of experimental quails was found to be significantly different, whereas T_2 and T_3 group showed maximum feed consumption as compared to control group. The treatment means of average weekly feed conversion ratio were also found to be significantly different. The narrowest feed conversion ratio (3.74) was observed in T_3 group. The nitrogen retention in T_3 group was higher as compared to rest of group. The cost of production/100 g of meat was found to be Rs. 5.55 for T_3 group followed by T_2 (5.78), T_0 (6.04) and T_1 (6.25) group respectively. The overall study indicated that probiotics and multienzymes with low energy diet of Japanese quail improve the performance. Moreover, supplementation of probiotics with low energy diet was found to be more efficient in improving the production.

Key Words: *Feed conversion ratio, multienzymes, Japanese quail, probiotics.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/023

Effect of Micronutrient "Arka Vegetable Special" Spraying on Enhancing the Yield of Tomato

Ullangula Sravanthi, Rajeshwar Malavath, Shivakrishna Kota, Nagaraju Alugoju, Thirupathi Islavath and Sathish kumar Bollaveni
Krishi Vigyan Kendra, Bellampalli, Mancherial-504 251
Professor Jayashankar Telangana State Agricultural University

The present investigation was carried out to study the effect of micronutrient "Arka Vegetable Special" spraying on enhancing the yield of tomato at farmer's field of Mancherial district, Telangana state during the year from 2020-21, 2021-22 and 2022-23. Demonstrations on of Micronutrient through foliar spray conducted by KVK, Bellmapalli emphasized on sustainable production of tomato with higher yield which ultimately improves the economy and better livelihood of the vegetable grower. The percent of average number of fruits per plant was 7.81, 18.35 and 19.01 during 2020-21, 2021-22 and 2022-23 respectively. The other yield parameters were also recorded in increasing trend. The net returns were recorded 1, 57,190 Rs/ha, 1, 77, 190 Rs/ha and 1, 68,330 Rs/ha during 2020-21, 2021-22 and 2022-23 respectively in demonstrations. There was increased productivity over farmers practice and reduced extension gap and technology gap was could be due to variation in the soil fertility, varied climatic conditions, GMP followed by the farmers and also higher rated technology adoption. The present technology was very much feasible based on the lower technology index recorded in the study.

Keywords: *Micronutrient, foliar spray, vegetable special, tomato, productivity.*

ITAHAS/AB/2023/024

Effect of *Decalepis Hamiltonii* Enrichment on Shelf Life of Cane Jaggery

Vinutha C[1], Ravi Y[2], Kiran B O[3], Pavitra S[4] and Harish Nayaka M A[5]

[1]*Department of Biochemistry, University of Agricultural Sciences Dharwad, Karnataka, India

[2]Department of Food Science and Nutrition, UAS, Dharwad, Karnataka, India

[3]Department of Crop Physiology, University of Agricultural Sciences Dharwad, Karnataka, India

[4]Department of Agricultural Economics, UAS, Dharwad, Karnataka, India

[5]Department of Sugar Technology, University of Mysore, Mysuru, Karnataka, India

Sugarcane jaggery with less trouble deteriorates transitorily when stored for longer time and during extensive cloudburst. Food additives from natural plant sources were used to extend food shelf-life and retard microbial growth in foods during storage. Cane Jaggery of Co86032 variety was enriched with *Dacalepis hamiltonii* at 0.05%, 0.1% and 0.2% (w/v) concentrations and kept in plastic jars at room temperature and analyzed for variations in physical, chemical parameters and microbial contamination at an interval of 30 days periodically. The initial microbial count of control and *D. hamiltonii* enriched jaggery was in the range of 25.2 to 41.4 X 10^1 cfu/g jaggery. The pH, moisture content, sucrose, reducing sugars and total phenol content of *D. hamiltonii* enriched jaggery and control jaggery showed no net changes during 30 days of storage except for color and microbial count that was lesser in enriched jaggery than control. At 60 days of storage, pH of Control Jaggery was decreased by 0.1, slight increased moisture content (0.1%) and reducing sugar by 0.05% with slight decrease in sucrose content by 0.25% and total phenol content by 0.6%. However, *D. hamiltonii* enriched jaggery at all concentration did not vary in its physiochemical properties during its storage. Jaggery enrichment with *D. hamiltonii* at 0.2% concentration checked microbial spoilage by one fold than its control sample. The enriched jaggery with *D. hamiltonii* had higher total phenol content and contributed for inhibiting microbial growth, a causal agent of spoilage. Accordingly, *D. hamiltonii* might be preferred as an inexpensive source of antimicrobial additive and as a preservative in jaggery processing with added health benefits and shelf life.

Keywords: Jaggery, microbial count, sucrose, total phenol, shelf-life

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/025

Integrated nutrient management practices on scented rice

M. Ray[1*], K.C Sahoo[2], N. Mishra[3], M Prusty[4], S.Das [5] , P.K Majhi[6] and S. Tudu[7]

[1 & 6]AICRP on Linseed, RRTTS, (OUAT), Keonjhar, Odisha
[5 & 7] AICRP on MULLaRP, RRTTS, (OUAT), Keonjhar, Odisha
[2,3] Regional Research and Technology Transfer Station [RRTTS] (OUAT), Keonjhar, Odisha
[4]Regional Research and Technology Transfer Station [RRTTS], Mahisapat, Dhenkanal, Odisha

An experiment on "Integrated nutrient management practices on scented rice was conducted at Field Experimental Block, Regional Research and Technology Transfer Station, Keonjhar, during kharif 2022 under State plan research project. The experiment was laid out in split plot design. The treatments combination comprised 4 varieties in the main plot *viz.* V_1-Kalajeera, V_2-Shobini, V_3-Dubraj and V_4-CR Sugandhan Dhan 907 and 3 nutrient management practices in the sub plot *viz.* N_1- Control , N_2- STBFR to Paddy, N_3 - 50% STBNR + 50% N as FYM and N_4 - 75% STBNR + 25% N as FYM. Among the different scented paddy varieties, Kalajeera took the maximum number of days to 50% flowering (124) and to mature (156 days) which was at par with the variety CR Sugandhan Dhan 907(121 and 151 days respectively).Among the nutrient management practices the maximum number of days to 50% flowering and to maturity was recorded with the treatment N_4 (75% STBNR + 25% N as FYM) i.e 122 and 153 days respectively which was at par with the treatment N_2 (STBFR to Paddy) (120 and 152 days respectively). Among the different scented paddy varieties, tallest plants were observed with the variety Kalajeera and among the nutrient management practices the tallest plants were observed with the treatment N_4 (152.8 cm) being at par with the treatment N_2 (142.4 cm). Treatment N_1 recorded the shortest plants being significantly inferior to the rest of the treatments. The maximum number of tillers/ m^2 and longest panicles were recorded with the variety Kalajeera (379.6 and 29.6 cm respectively). The minimum number of tillers/ m^2 and shortest panicles were recorded with the variety Dubraj which is significantly inferior to the rest of the varieties. Among the nutrient management practices the maximum number of tillers/ m^2 and longest panicles were recorded with

the treatment N_4 (314.1 and 26.4 cm) being at par with the treatment N_2 (302.2 and 24.5 cm respectively). Highest yield was recorded with the variety Kalajeera (3387 kg/ha) which was at par with the variety CR Sugandhan Dhan 907(3231 kg/ha). Among the nutrient management practices the treatment N_4 recorded the maximum yield of 3269 kg/ha which was at par with the treatment N_2 (3230 kg/ha). Treatment N_1 recorded the minimum yield of 2612 kg/ha being significantly inferior to the rest of the treatments. Among the different scented paddy varieties, highest gross return, net return and B:C ratio was recorded with the variety Kalajeera (Rs 125319, Rs 74719 and 2.48) respectively. Among the nutrient management practices highest gross return , net return and B:C ratio was recorded with the treatment with 75% STBNR + 25% N as FYM (Rs 120953, Rs 70974 and 2.42) respectively followed by treatment N_2.

Key words: *Scented rice, nutrient management practices, varieties, net return.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/026

Role of Nano-Fertilizers in Agriculture Farming

Firdous Ashraf*, M.A. Bhat* and Subhash Chand*
*Division of Soil Science, Faculty of Horticulture SKUAST-K Shalimar
Srinagar 190025 (J&K)

Nano-fertilizers are nutrient carriers that are being developed using particles with nano dimensions (1 – 100 nm). Nano-fertilizers are synthesized or modified form of traditional fertilizers, bulk materials or extracted from different vegetative or reproductive parts of the plant by different chemical, physical, mechanical or biological methods with the help of nanotechnology used to improve soil fertility, productivity and quality of agricultural produces. These are also called smart fertilizer as they provide new opportunities to enhance the nutrient use efficiency and reduce costs of environmental protection. Nano-fertilizers are the important tools in agriculture to improve crop growth, yield and quality parameters with increase nutrient use efficiency, reduce wastage of fertilizers and cost of cultivation. Nano-fertilizer technology is very innovative and scanty reported literatures are available in the scientific journals. Nutrient use efficiencies of conventional fertilizers hardly exceed 30-35 %, 18-20 % and 35-40 % for N, P and K respectively. The data remain constant for the past several decade and research efforts did not yield fruitful results. Nano-fertilizers are very effective for precise nutrient management in precision agriculture with matching the crop growth stage for nutrient and may provide nutrient throughout the crop growth period. Nano-fertilizers increase crop growth up to optimum concentrations further increase in concentration may inhibit the crop growth due to the toxicity of nutrient. Nano-fertilizers provide more surface area for different metabolic reactions in the plant which increase rate of photosynthesis and produce more dry matter and yield of the crop. Encapsulation of fertilizers within a Nano-particle is one of these new facilities which are done in three ways a) the nutrient can be encapsulated inside nanoporous materials, b) coated with thin polymer film and c) delivered as particle or emulsions of nanoscales dimensions. In addition, Nano-fertilizers will combine Nano devices in order to synchronize the release of fertilizer -N and -P with their uptake by crops, so preventing undesirable nutrient losses to soil, water and air via direct internalization by crops, and avoiding the interaction of nutrients with soil, microorganisms, water, and air.

Keywords: Encapsulation, Nano-fertilizer, Nano-device, Nutrient use efficiency.

ITAHAS/AB/2023/027

Effects of Invasive *Prosopis juliflora* on Soil chemical properties of Sathya Mangalam Tiger Reserve, Tamil Nadu, India

Maheshnaik B. L.[1], Ganesha B. H.[2], Baranidharan K.[3] and Venkatesh L.[4]

[1]College of Forestry, Sirsi, University of Agricultural Sciences, Dharwad

[2]College of Forestry, Sirsi, University of Agricultural Sciences, Dharwad

[3]Forest College and Research Institute, Mettupalayam TNAU, Tamil Nadu

[4]College of Forestry, Sirsi, University of Agricultural Sciences, Dharwad

Prosopis juliflora belongs to the family Fabaceae (Leguminosae), subfamily Mimosoideae. Prosopis is a shrub/tree native to Mexico, Central and Northern America. Prosopis spread to Africa, Asia and Australia from its native ranges. In India, Prosopis was first introduced to Tamil Nadu during 1960's to generate the firewood and to improve livelihood condition of rural peoples of the state, and continued to establish in other states in different times. The Sathyamangalam Tiger Reserve (STR) in the foothills of the Nilgiris is one of the most famous preferred breeding landscapes for the Elephants in the Western Ghats and Eastern ghat meeting point, and it is known for its landscape beauty, varied of forest ecosystems and wildlife diversity. Unfortunately, during the last decades, there has been a drastic reduction in the diversity of the natural vegetation. The available niches have been occupied by invasive exotic species especially P. juliflora. The present part of the study deals with the impact assessment of P. juliflora on soil physical and chemical properties in Sathyamangalam Tiger Reserve (STR), Tamil Nadu. The study conducted at Bhavanisagar Forest range (STR) during the year 2016, total 36 representative soil samples collected and analyzed from the depth of 0-30cm and 30-60cm from three different stratified areas Viz., 1. Natural Forest 2. P. juliflora invaded and 3. P. juliflora eradicated areas and effectively managed area. The parameter assessed are soil physical and chemical properties. Regarding soil physical properties bulk density, particle density and total porosity of the soil in the study area, the natural forest significantly performed well as compared to P. juliflora invaded and eradicated sites. In soil physico chemical properties, in case of soil pH, the soil samples analyzed exhibited slightly acidic in nature, in all the three different sites. Regarding chemical properties organic carbon, available soil nitrogen, available soil phosphorus

and available soil potassium of natural forest area was significantly higher than P. juliflora eradicated and invaded area. The Prosopis juliflora eradicated and managed area slightly improving its fertility status as compared to P. juliflora invaded areas. An effective strategy has been made by TNFD for restoration of indigenous flora to support well habit ground for Black buck and Elephant population.

ITAHAS/AB/2023/028

Farmers Perception on Agroforestry Practices

[1]Ganesha B. H. [2]MaheshNaik B.L., [3]Bhaskar V, [4]Hanumanthappa D. C. [5]Jagadish M. R., [6]Girish B Shahapurmath, and [7]Vinayak Pai

[1&2]Ph.D Forestry Scholar and [3&4]Senior Scientist, AICRP on Agroforestry, UAS Bangalore

[5,6&7]Assistant Professor (Forestry), College of Forestry Sirsi, 581 401

Agroforestry is the sustainable land use system where woody perennials are raised along with agricultural crops. To know the farmers perception on agroforestry practices around Bangalore region, a standard questionnaire's based survey work was conducted through personnel interview during 2021. The survey was based on non-random sampling and 30 farmers were surveyed. Results shows that more than 90 per cent of the farmers belongs to small and marginal land holding categories and only few belongs moderate and big land holding categories. During survey it was also noticed that more than 80 per cent of their farmers purchased the quality planting materials from local forest department and 75 per cent of the farmers adopted the bund and boundary plantation of *Tectona grandis, Melia dubia, Grevillea robusta, Mahagony* and other fodder yielding tree species. The surveyed area is dominated by agrisilvihorticulture based agroforestry system where earning revenues mainly from sapota, mango, guava and other horticulture crops and livestock component for additional regular income and farm yard manure. More than 70 per cent of the surveyed farmers do the silviculture operations mainly pruning with an intention to get clear bole formation and good quality farmers and weeding to avoid competition during initial stages for space, water and nutrients. More than 72 per cent of the famers rearing livestock which includes Goat, Sheep and Cows and for that they are cultivating *Sesbania grandiflora, Leuceana leucacephala, tree mulberry, Melia dubia* and other fodder yielding tree species along with traditional available local grass species. In terms of harvesting and marketing of the forest trees only few farmers have harvested trees like *Grevillea robusta* and sold to local contractors. Farmers opined that they need contract farming, buyback agreement system for marketing of timber species. Farmers also expressed constraint in adopting introducing tree species on farm land *viz.,* long rotation, shading effect, host for many birds which can damage agricultural crops and uncertainty of marketing opportunities and unavailability of marketing

channels. Hence, authors took considerable interest to create awareness regarding government incentive schemes and marketing channels to the farmers.

ITAHAS/AB/2023/029

Global Climate Change risks to Global Forest Health

[1]Ganesha B. H., [2]Sachin Kumar K.H. [3]MaheshNaik B. L., [4]Jagadish M. R., [5]Vinayaka Pai, [6]Hanumantha M, [7]S.S. Inamati, and [8]Vasudeva R

[1&3]Ph.D Forestry Scholar and [2]M.Sc Forestry College of Forestry Sirsi

[4,5,6,7,8&9]Faculty, College of Forestry Sirsi, University of Agricultural Sciences, Dharwad,

The review work was done to know the how Global Climate Change risks to Global Forest Health and it was noticed that the 21st century witnessing alarming global warming from rapid industrialization, extensive use of fossil fuels; higher rate of deforestation and other anthropogenic activities accelerated the greenhouse gas (GHGs) accumulation reaching to more than 417 ppm in 2022 in the atmosphere at higher than before. It is creating the beginning of the climate cliff makes earth biodiversity survival battle line short. Both natural as well as anthropogenic causes *viz.,* Drought, insect and pest attack, variation of rainfall pattern, wildfire, loss of sea ice, melting glaciers and ice sheets, sea level rise, and heat waves *etc.,* are alarming due to higher frequency, severity, intensity, duration and timing. Because of these changes the stable earth balance is moving to imbalance earth making global warming tipping points. The cascading effect of climate change leading to stress tree physiology, asynchrony in phenology, growth of insect and pest, wild forest fire, shifting of species habitat, mass extinction of species, effect to carbon cycle, hydrogen cycle, forest structure, species composition, change in proportion of forest in various successional stages and forest ecosystem services. It was also evidenced that the current negative effects will dwindle if temperature rises 2^0 C. Hence, global forest health is under threat leading to declining the productivity of forests and trees. Among the different parameter, the drought leading to tree mortality across the globe in drastic manner in USA, Canada, European countries and other parts of the world. Apart from these, the species specific niche model is altering making the unsuitable habitat for important key stone of flora and fauna. It was also noticed that survivability and habitat of invasive species like *Lanntana camara*, *Chromolaena odorata* were enlarged. And the elevated temperature is threat to dioecious plants, failing to meet pollinators: mechanism of phenological asynchrony and negative impact on plant reproduction. Hence the global climate change

negatively impacting global forests health and hence species specific niche models, scientific forests strategies, protection from Invasive species through higher quarantine *etc.,* were need of the hour.

ITAHAS/AB/2023/030

Productivity and Carbon Sequestration Potential of 17 year old Agarwood trees

[1]Preetham Gowda, [2]Ganesha B. H. [3]Jagadish M. R., [4]Chandan C. M.[5]Rajath Gowda and [6]Girish B Shahapurmath

[1,4 & 5] B.Sc Forestry, College of Forestry Sirsi

[2]Ph.D Forestry Scholar, College of Forestry Sirsi

[3&6]Assistant Professor (Forestry), College of Forestry Sirsi

Agar is a tropical tree belonging to the Aquilaria genus of Thymelaeaceae family. Agarwood is formed as a result of infection. A stem borer insect *ie., Zeuzera conferta* bores the Agar tree making hollow tunnels and triggers the fungal infection, which ultimately leads to the formation of resin in Agar trees. Formation of Agarwood depends on the intensity and frequency of insect infestation and aging of the plant. Fungal infections and formation of oleoresin happens naturally. The study was conducted at the farmer's field in Sirsi taluk, Uttar Kannada district to find out the carbon sequestration potential of 17 year old Agarwood trees Agarwood under inoculated and non-inoculated condition. Agarwood was planted under 6 m X 6 m spacing during 2006. The suitable fungal inoculation was done during 2018-19. The results reveal that after the inoculation of the fungi the Agarwood tree's height ranges between 7 m to 14 m and girth ranges between 0.64 m to 1.02 m. The above ground biomass of inoculated trees ranges between 59.2 - 302.63 t/ha. The total biomass was between 74.62-381.31t/ha and the total carbon content after inoculation of fungi ranges between 35.07-179.22 t/ha and the carbon equivalent ranges between 128.36-655.93t/ha. The non-inoculated trees in which the Agarwood tree of height ranges between 6.5m to 11 m and the girth ranges between 0.62 m to 0.98 m and the volume ranges from 53.31-218.80 m^3/ ha. The above ground biomass of non-inoculated trees ranges between 50.75-208.30 t/ha, the below ground biomass ranges between 13.19-54.16t/ha. The total biomass was between 63.94-262.46 t/ha and the total carbon content of non-inoculated trees ranges between 32.48-123.36 t/ha and the carbon equivalent ranges between 118.88-451.48t/ha. The farmer's intervention survey through questionnaires' based survey was also conducted and it was also found that farmers eagerly want to include Agarwood plants in their agroforestry practices because of the higher market rates and huge

demand in upcoming days. Farmers of this region demands if there is proper contract farming as well as buyback agreement surely they inculcate this species along with traditional commercial crops.

ITAHAS/AB/2023/031

Efficacy of herbicides and bio herbicides on associated weeds of summer blackgram (*Vigna mungo* L)

Gayatree Mishra
Department of Agronomy, Institute of Agricultural Sciences, SOADU

An investigation was carried out at Siksha O Anusandhan, Institute of Agricultural Sciences of Odisha during 2021, to study the efficacy of herbicides and bio herbicides on associated weeds of summer blackgram. Results revealed that experiment field was infestedwith different categories of weeds. The predominant weed flora was *Poa annua, Digitaria sanguinalis, Melochia corchorifolia, Aeschynomene indica, Cleome viscosa, Portulaca oleracia, Cassia tora* and *Grangea maderaspatana*. Pre emergence application of oxyfluorfen @ 100 g ha^{-1} at 1 DAS *fb* post emergence application of imazethapyr @ 75 g ha^{-1} at 21 DAS treatment (T_6) significantly increased the growth parameters *i.e.* plant height and dry matter accumulation which was however statistically at par with treatment T_7 (Imazethapyr @ 75 g ha^{-1} at 15 DAS *fb* hand hoeing at 30 DAS) and T_8 (Oxyfluorfen @ 100 g ha^{-1} at 1 DAS *fb* hand hoeing at 30 DAS) and also significantly reduced the weed density and biomass and increased the weed control efficiency over weedy check. However, bio herbicidal treatments like pre - emergence application of Castor + Calotropis @ 10 % from prepared concentrate (T_2) and *Nerium oleander* + *Eupatorium odoratum* @ 10 % from prepared concentrate (T_3) reported phytotoxic effect on blackgram but recovered at later stages and also reported good control over weed growth.

Key words*: Bio herbicide, Weed Density, Weed dryweight, Weed control efficiency.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/032

Endophyte: A significant microbial tool in plant health and defence

Gurpreet Kaur Bhamra* and Mateti Gayithri
Department of Plant Pathology, Assam Agricultural University, Jorhat-785013, Assam

In the current era of agricultural research, the significance of sustainable agriculture is emerging as a vital issue. Chemicals in plant disease management have disturbed the ecological balance and developed resistant races of the pathogen. But with increased public awareness, the focus on the management of plant diseases has been shifted from chemical pesticides to eco-friendlier methods. One such alternative method is biocontrol utilizing plant-associated antagonistic microorganisms such as endophytes. In this context, the application of endophytes has expanded dramatically over the last several decades in various parts of the world. Endophytes are microorganisms such as bacteria, fungi, archaea and protists that inhabit and colonize the interiors of plants. These are known to promote host plant growth and antagonize pathogens due to their characteristics like the ability to synthesize plant hormones, solubilize phosphate, secrete siderophores, etc. Some of the roles of endophytes include Phyto stimulation, pigment and enzyme production, antimicrobial activity, nutrient cycling, bioremediation and production of volatile compounds.

***Keywords**: Endophyte, plant health, plant defence, bioremediation.*

ITAHAS/AB/2023/033

Evaluation and Characterization of Putative Mutant Populations in Mango (*Mangifera indica* L)

Jome Rime
University of Horticultural Sciences, Bagalkot

The present investigation on "Evaluation and characterization of putative mutant populations in mango (*Mangiferaindica*L.)"was carried out in the Division of Fruit crops, ICAR-IIHR, Hessaraghatta, Bengaluru, 2017-2018. Two different mutagenic populations have been usedfor the study which includes EMS and colchicine treated populations. The morphological, physiochemical and molecular variations reveal that reduced plant height, longer leaf length, leaf width, shorter internodal length and petiole length were observed in both the populations generated from different concentrations of Ethyl Methane Sulphonate (EMS) and colchicine. The total phenol content in leaf was maximum in 0.8 percent EMS and 1 percent colchicine treated mutants, which was correlated with dwarf plants. The mean stomata size was observed to be bigger in plants treated with EMS and colchicine in comparison to the control. Biochemical parameters such as total chlorophyll content got reduced with high doses of mutagen and the increase in activity of enzymes like peroxidase and poly phenol oxidase was also noticed. The negative correlation of plant height with thephytohormones like ABA content and positive correlation of GA was observed. The molecular characterization was employed using SSR markers to confirm the variability within the mutant progenies. The Polymorphic Information Content (PIC) values ranges from 0.6644 to 0.7238 and 0.6507 to 0.7106 in mutant progenies of mango *cvs.*Arka Puneet and Alphonso respectively and found to be informative primers. So,from the present study it can be concluded that both EMS and colchicine (0.8 to 1.0 per cent) can be used to create variability and broaden the genetic base in mango.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/034

Technological Innovation in Hi-Tech Horticulture, Precision Farming and Biological science

*** Kanchan Kumari Gupta[1], Pooja Kumari[2] and MatetiGayithri[3]**
[1.*] Ph.D Scholar,Department of Horticulture, Assam Agricultural University, Jorhat
[2.] Ph.D Scholar, Department of Plant Breeding and Genetics, Assam Agricultural University, Jorhat
[3.] Ph.D Scholar, Department of Plant Pathology, Assam Agricultural University, Jorhat

Horticulture is an integral part of food and nutritional security. It is a crucial part of the stakeholder's economic security. Hi-tech Horticulture is a modern technology that is less capital-intensive, less dependent on the environment, and has the potential to increase production and farmer revenue. Horticulture is now a thriving economic endeavour for the farming community all over the world due to changing eating patterns brought on by rising money and public health awareness. By placing a focus on crop management using technologies like GIS, GPS, and remote sensing (RS), as well as ground equipment like variable rate applicators (VRA), yield monitors, and computers with the appropriate software, precision farming integrates environmental health, economic profitability, and social and economic equity. The new technology may be able to take advantage of a number of fresher opportunities for accurately managing the agricultural sector. Predominantly used for horticulture crops, such as potato, banana, and oil palm, precision farming technology has been implemented. The commercially available techniques for potato growers are yield monitoring and VRT fertiliser application. Horticultural crops can also use yield monitoring, VRT insects and pest management. A chain for post-harvest management may be developed in hi-tech horticulture in order to minimise post-harvest losses, save existing germplasm, utilise underutilised plants, and use climate-resilient production technology. In order to practise precision agriculture on small farms, each farm will be treated as though it were a field's management zone, and a centralised organisation will send information to each farm. Small-scale precision agriculture involves treating individual farms like management zones within a field and having a central organisation work cooperatively to disseminate information to the individual farmers. The 'dead reckoning system' can address

the issue of expensive positioning systems for tiny fields. Dead reckoning relies on in-field markers, such as foam, to maintain constant application and is appropriate for small fields with predictable shapes. Adopting high-tech horticulture methods will benefit our nation by supplying food and nutritional security while also enhancing the economic standing of farmers. Hi-tech horticulture is potent instrument for enhancing crop output and has the potential to double farmer revenue. As a result, the notion of precision agriculture is based on a system approach to reorganise the entire agricultural system in order to achieve a low-input, high-efficiency, and sustainable agriculture.

Keywords*: Hi-tech, Precision agriculture GIS, GPS, remote sensing (RS), variable rate applicators (VRA),*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/035

Challenges of Digital and Communication Technologies (DCTs) in Mitigating Climate Change Issues

Kharge A.P.[1], Kadam J. R.[2] and Warwadekar S. C.[3]
[1]Ph.D. Scholar, [2&3]Associate Professor, Department of Extension Education, College of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (M.S.).

Digital and Communication Technologies (DCTs) is an umbrella term defined as electronic and digital technologies for storing, processing, transferring of information and communication. These are enabling technologies that allow quicker and more efficient exchange and processing of information. Climate is one of the important determinants of agricultural production. Climate change simply means change of climate over time as a result of natural variability or human activity. The temperature will rise between 1.8°C and nearly 4°C in an average at the end of 21st century globally (IPCC, 2007). Mitigation refers to some certain actions taken to reduce greenhouse gas emissions, which are primarily driven by energy use. Application of various Digital and Communication Technologies (DCTs) in crop production though a relatively new phenomenon, evidence of the contribution of Information and Communication Technology (ICT) to agricultural development and poverty alleviation is becoming increasingly obvious. Some common barriers in adoption of DCT in rural segments such as DCT illiteracy, unavailability of relevant and localized contents in their own languages, uneasy and unaffordable accessibility and other issues like awareness and willingness for adoption of new technologies among the rural peoples can definitely be handled with the application of ICT (Ugwuishiwu *et al*., 2012). Geographic Information System (GIS) technologies like satellite imagery, thematic maps, and geospatial data play a big part in disaster risk management. The areas which are receiving priority attention include natural resources information assessment, monitoring and management; water shed development, environmental planning, urban services and land use planning (Meera, 2002). In order to tackle climate change, Meera *et al*., 2004) reported that three main strategies are available; mitigation, adaptation or both. The application of Digital and Communication Technologies (DCTs) in this sector follows the approach of applying it to mitigate climate changes as well as to adapt to

changes. Adaptation is older than mitigation. Strategies of adaptation to climate change have been employed by man throughout all of history while mitigation initiatives have been designed only when the scientific community determined a possible interaction between human actions & climate.

Population Dynamics of Fruit Flies, *B. dorsalis* Hendle and *Bactrocera zonata* Saunders on Mango and Correlation with Weather Parameters

M. K. Jena* and S. R. Patel

*[1]Section of Applied Entomology, Department of Plant Protection, Institute of Horticulture Sciences, Warsaw University of Life Sciences, Nowoursynowska 159, 02-776 Warsaw, Poland

[2]Department of Entomology, N. M. College of Agriculture, Navsari Agricultural University, Navsari, 396 450, Gujarat, India

Mango, *Mangifera indica* (L.), belongs to the family Anacardiaceae, is known as “king of fruits” which is widely cultivated in tropical and subtropical regions of the world. It is vulnerable to the attack by various insect-pests. Fruit flies are the major pests causing significant damage in mango in South Gujarat. There is the need to know the population dynamics for developing a better management strategy for fruit flies. Therefore, the investigation on the population dynamics of fruit flies *Bactrocera dorsalis* (Hendle) and *Bactrocera zonata* Saunders (Diptera: Tephritidae) was carried out by installing "Nauroji-Stonehouse Fruit Fly Trap" in the mango orchard of organic farm, Navsari Agricultural University, Navsari, Gujarat, India during 2021-22. The population of *B. dorsalis* prevailed throughout the year in mango orchard with its peak activity from 14th to 31st SMW (Standard Meteorological Week) which coincided with the fruiting and harvesting period of fruits. The population was decreased from August to February in of *B. dorsalis*, whereas it was decreased from August to January in *B. zonata*. Correlation analysis revealed a significant positive correlation of population of *B. dorsalis* with maximum temperature (r=0.27), minimum temperature (r=0.69), average temperature (r=0.64), evening relative humidity (r=0.41), average relative humidity (r=0.31), rainy days (r=0.38), rainfall (r=0.29) and wind velocity (r=0.49) but a significant negative correlation with duration of bright sunshine hours (r=-0.32). There was a significant positive correlation of population of *B. zonata* with maximum temperature (r=0.33), minimum temperature (r=0.83), average temperature (r=0.77), evening relative humidity. (r=0.50), average relative humidity (r=0.41), rainy days (r=0.38), rainfall (r=0.37) and wind velocity (0.66).

ITAHAS/AB/2023/037

Efficacy of fungicides against *Fusarium oxysporum* f.sp *ciceri* by poisoned food technique

Mateti Gayithri[1], Gurpreet Kaur Bhamra[2],Pempee[3] and Vadde Mounika[4]

[1&2]Assam Agricultural University, Department of Plant Pathology, Jorhat, Assam, India

[3]Sri Karan Narendra Agriculture University, Department of Plant Pathology, Jobner, Jaipur

[4]Central Agricultural University, Department of Horticulture, Pasighat, Arunachal Pradesh, India

The present study was conducted at Department of Plant Pathology, S.K.N. College of Agriculture, Jobner to evaluate the efficacy of fungicides against *Fusarium oxysporum* f. sp. *ciceri* causing chickpea wilt under *in vitro*. Chickpea (*Cicer arietinum* L.) also known as Bengal gram is one of the most important winter season pulse crop grown in India. It is a member of family *Fabaceae* and believed to be originated in South West Asia. The efficacy of different six fungicides at three concentrations *viz.* 50, 200 and 500 ppm were tested against *Fusarium oxysporum* f.sp. *ciceri* in *in vitro* condition by using Poisoned Food Technique. The results showed that among the six fungicides, Carbendazim, Thiram + carboxin both fungicides gave complete inhibition of growth of fungus at 50, 200 and 500 ppm concentrations, and followed by Propiconazole (98.99%) at 500 ppm and Hexaconazole (95.50%) at 500 ppm concentration. Hexaconazole and Thiophanate methyl were found moderate inhibitor of mycelial growth of fungus at 200 and 500 ppm concentrations. Thiophanate methyl at 50 ppm, Chlorothalonil at 50 and 200 ppm concentration were found least effective against the pathogen.

Key Words*: Fungicides, Chickpea, Management.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/038

A Study on Cultivation of Gladiolus Using Organic Liquid Fertilizers for Sustainable Floriculture

M. Jangyukala* and Hemanta Laishram
Dept. of Horticulture, School of Agricultural Sciences and Rural Development, Nagaland University, Medziphema -797106

The present experiment was conducted during the year 2021-22 in the Research farm of Horticulture Department, NU:SASRD to find out the effect of organic liquid fertilizers viz., Effective micro-organisms (EM), Indigenous Effective micro-organisms (IEM) and Jeevamrutha on the growth, flowering, corm production, soil fertility status and plant nutrition behaviour of gladiolus (*Gladiolus grandiflora* L.). The experiment was planned in a Randomized block Design (RBD) with 8 treatments. The results revealed that the maximum spike length (89.62 cm), number of florets per spike (10.47) and number of corms per plant (1.76) were received under Treatment T_3, i.e. application of IEM (500 ml activated IEM m^{-2}). Application of EM recorded the earliest days to sprouting (6.83 days), for spike initiation (68.48 days), first floret opening (74.24 days) and harvesting of spikes (7.91 days). Maximum plant height (108.09 cm), self life (9.35) and vase life of spike in distilled water (11.17) was recorded in Treatment T_6, i.e. 50% RDF + 50% IEM. The nitrogen and phosphorus content (4.33% and 0.011%) in index leaves was highest in T_2 (EM) and T_3 (IEM) respectively. In corms, highest nitrogen content (3.08%) was in RDF and phosphorus content (0.016%) was in T_3 (IEM). Highest available N (961.71 kg ha^{-1}), available P (61.96 kg ha^{-1}) and available K (516.50 kg ha^{-1}) in soil after harvest was obtained with T_2 (EM). The highest organic carbon content (2.81%) was recorded in T_5 i.e., 50% RDF + 50% EM. The maximum benefit:cost ratio was observed under treatment T_3 (1:2.46), i.e. application IEM in comparison with the other treatments. T_3 (IEM *i.e.* 500 ml activated IEM m^{-2} exhibited the highest net income (₹ 676,653) and benefit cost ratio (2.46). The results proved that EM and IEM are promising organic liqiud fertilizers. It is a solution for cost efficient intergrated nutrient management for sustainable floriculture.

Keywords*: Effective micro-organisms, Gladiolus, Indigenous, Jeevamrutha, Organic.*

ITAHAS/AB/2023/039

Accelerating Crop Improvement: Harnessing the Power of Haploids and Double Haploids in Agricultural Systems"

Vadde Mounika[1], Dr. Chandra Deo[2] Talamarla Yeswanth Mahidar Gowd[3], Oinam Bidyalaxmi Devi[4], Bangi Kyatammanavara Soumya[5]

[134]Ph.D. scholar, [2]Professor, [5] MSc Department of Vegetable Science, CAU College of Horticulture and Forestry Pasighat, Arunachal Pradesh, India

Day by day the world population is increasing the need for food and the need to feed an expanding population can both be met with crop improvement. From an agronomic perspective, these biotechnologies are now crucial components of breeding plans for numerous important crops. The development of haploids and Double haploids, which have become attractive biotechnological tools, has had a considerable effect on farming systems. While haploids are plants with a gametophytic chromosomal number, doubled haploids are haploids that have undergone chromosome duplication. Haploid and doubled haploids (DHs) are generated during gametic embryogenesis in order to develop entirely homozygous lines from heterozygous parent plants. The effectiveness of double haploid production depends on a number of variables, including the stage of floral part development, the culture medium, the genotype, the growing conditions of the donor parents, and the haploid detection methods. Homozygous inbred line development, a shorter breeding cycle or time, improved genetic purity, an effective population for QTL mapping, marker development, and an expedited marker-assisted breeding programme are all made possible by double haploidy. The most effective methods for obtaining haploids and DHs are isolated microspore culture or in vitro another culture. As a result, DH technology plays a significant role in quickening the breeding programme. The most effective methods for obtaining haploids and DHs are isolated microspore culture or in vitro another culture.

Keywords: *Double haploid, Haploids, Generation advancement, Crop improvement.*

ITAHAS/AB/2023/040

Digital Agriculture: Big Data Analytics, Internet of Things (IoT) and Artificial Intelligence (AI) in Agribusiness

Narayan Murigeppa Gunadal, Arun Shivayogi Honyal and Harshitha H. C
Ph.D. Scholar, University of Agricultural Sciences, Dharwad 580005, Karnataka, India

Big data is of utmost importance in agriculture, as it has the potential to revolutionize farming practices, increase productivity and tackle challenges in the sector. It is crucial in agriculture, supporting data-driven decision making, precision agriculture, crop health monitoring, supply chain optimization, climate adaptation, risk management, research, and innovation. Leveraging big data can enhance productivity, sustainability, and profitability in farming, contributing to food security and environmental stewardship. According to a McKinsey Global Institute study, applying big data analytics to farming could boost productivity by 20 per cent to 30 per cent and cost reductions of 10-30 per cent, resulting in overall income gains for farmers. The Internet of Things (IoT) holds significant importance in agribusiness, offering transformative opportunities to optimize operations, increase efficiency and improve productivity. It enabling precision agriculture, remote monitoring, livestock management, supply chain optimization, data-driven decision making, farm safety, and automation Embracing IoT technologies empowers farmers to adopt efficient and sustainable practices, leading to improved productivity, reduced costs and increased profitability in the agricultural industry. Crop monitoring and management, precision agriculture, yield prediction, disease and pest detection, farm robotics, livestock management, supply chain optimisation and farm data analytics are just a few of the many agribusiness applications of AI. Farmers who adopt AI technologies are better able to increase productivity, sustainability, and profitability while promoting resource-efficient farming methods. Precision agriculture is made possible by AI-powered technologies, which also optimise resource use and enhance crop management. The market for precision agriculture is anticipated to grow to $12.9 billion by 2025, according to a report by MarketsandMarkets, driven by the rising use of remote sensing, AI and machine learning technologies. According to the International Data Corporation (IDC), AI-enabled precision agriculture techniques have the potential to increase crop yields by up to 15

per cent while reducing water use by up to 30 per cent. According to the Food and Agriculture Organisation (FAO), supply chain optimisation powered by AI has the potential to reduce global food losses and waste by up to 15 per cent.

Key words: *Big data, Artificial Intelligence, Internet of Things and Agribusiness.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/041

Carbon Sequestration by Agroforestry: A way to mitigate Climate Change

Pravin B. Manjare[1], Neha M. Arolkar[2] and Pradip B. Kakade[3]
[1&2]Research Scholar, Dept.of Horticulture, College of Agriculture, VNMKV, Parbhani. (M.S.)
[3]Research Scholar, Dept.of Horticulture, Post Graduate Institute, MPKV, Rahuri. (M.S.)

Agroforestry, a sustainable land use practise designated as a strategy that plays a critical role in mitigating the unavoidable climate change through the utilisation of their abundant resources and a promising potential for carbon sequestration in their biomass. Agroforestry systems increase farm productivity overall, enrich soil through litter deposition, store both above- and below-ground carbon, and maintain environmental services. Globally, several agroforestry systems have been used, but the lack of a standardised approach makes it difficult to estimate the area covered by agroforestry, periodically monitor tree and soil carbon stocks, and measure soil carbon stocks. Even though the soil reservoir for carbon sequestration in short rotation tree species is primarily composed of roots and litter, the stem alone constituted the biggest carbon storehouse. The assessment examines the potential of agroforestry systems for reducing climate change and adapting to it, as well as their effects on human well-being and livelihood. In order to reduce greenhouse gas emissions, maintain livelihoods, and partially preserve biodiversity, agroforestry is essential. More over 1.2 billion people around the world practise agroforestry on around 1 billion hectares (ha) of land, but only about 25.32 million hectares of land in India fall under this practise. At the federal level, it is projected that current AFS will reduce 109.34 million tonnes of CO2 yearly, which may offset 33% of all agricultural sector GHG emissions. At the national level, the average estimated carbon sequestration potential of the agroforestry system (AFS), representing various edapho-climatic conditions, was 0.21 Mg C $ha^{-1}yr^{-1}$. The AFS which enormously better soil organic carbon covered plantation crop-primarily based practices of southern and north eastern India, followed by way of the agri-horticulture and agri-silviculture structures of the northern Himalayas.

Keywords: *Agroforestry, Climate change, Carbon Sequestration, AFS.*

ITAHAS/AB/2023/042

Biological Management of *Sclerotium rolfsii* sacc causing stem rot of groundnut using *Trichoderma viridae*

Sabari Grish P,
Department of Plant pathology, Faculty of Agriculture,
Annamalai university, Chidambaram, Tamil nadu- 608002

Groundnut or peanut (*Arachis hypogaea* L.) is one of the most important oilseed crops cultivated in various parts of the world. The soil borne fungal pathogen *Sclerotium rolfsii* inciting stem rot or southern blight in groundnut accounts for more than 30% yield loss. Chemical management of soil borne pathogen was difficult and too it causes harmful effects to environment. Thus, the fungal bio-control agent *Trichoderma viridae* was adopted for the successful management of disease. The groundnut seeds were treated with *T. viridae* @4g/kg of seeds and also soil application of *T. viridae* along with FYM were adopted for the management of stem rot disease in groundnut crop and the results were obtained. The antagonistic nature of the bio-control agent *T. viridae* against the pathogen *Sclerotium rolfsii* were evaluated through dual culture technique using PDA media in the Petri dishes. Zone of inhibition was visualised in the Petri plates. Thus, *Trichoderma viridae* can successfully be used for the effective control of the Ascomycetan fungus *Sclerotium rolfsii* causing stem rot infection in the groundnut crop.

Keywords*: Groundnut, Sclerotium rolfsii , Trichoderma viridae , Dual culture technique.*

ITAHAS/AB/2023/043

Development of Herbal Jaggery for Enhanced Quality And Shelf Life

Pooja Kolar[1], Latha Rani, R[2]. and Jamuna, K. V[3]

[1]Young Professional-II, Indian Institute of Horticultural Research (IIHR), Bangalore

[2]Young Professional-II, AICRP on Women in Agriculture, University of Agricultural Science, GKVK, Bangalore

[3] Professor, Dept. of Food Science and Nutrition, University of Agricultural Science, GKVK, Bangalore

Jaggery is the natural sweetener available in solid, liquid and powder form. Jaggery contain micronutrients which has many nutritional and medicinal properties. Medicinal herbs or plants have been known to be an important potential source of therapeutic or curative aids. The present study was undertaken to develop herbal jaggery for enhanced quality and shelf life. In the current study, sugarcane variety VCF0517 was selected for jaggery preparation. Jaggery was enriched with tulsi, mint and ginger in powder form and aqueous extract at the concentration 1.0, 1.5 and 2.0 per cent and developed herbal jaggery subjected for physical and sensory parameter. Powder, liquid and cube form of jaggery were developed. Flavored *chikki*, jaggery chocolates and in tea preparation herbal jaggery was used and products were subjected to sensory evaluation. Results showed that on initial day the physical characteristics including pH, moisture, hardness and insoluble solids were found to be unchanged in both forms of jaggery. Sensory evaluation of developed herbal jaggery record good at 2 per cent concentration. Storage study showed that, as the storage period increased the pH of herbal jaggery decreased from 6.13 to 5.20. Compared to control and aqueous extract the dried herb powder jaggery had less content of total sugar (81.23 to 82.30), reducing sugar (6.42 to 6.59) and sucrose (72.62 to 74.10). Whereas herb powder based jaggery had higher mineral composition, polyphenol, flavonoid and also exhibited more antioxidant activity at 300 µg/ml (76.37 to 88.18) compared to aqueous extract. Compared to all the jaggery sample, mint had higher percentage of radical scavenging activity. Different forms of jaggery can be used in traditional recipes in the preparation of sweets. Herbal jaggery was also found to be highly suitable for tea preparation as it had very good mouthfeel. Use of herbal jaggery enriched with tulsi, mint and ginger enhanced

the overall quality of the jaggery in both nutritionally and found to be superior with respect to bioactive properties.

Key words: *Herbal Jaggery, Antioxidant activity, Shelf life study.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/044

Role of Biotechnology and Nanotechnology in ensuring food security

***Pooja Kumari, Kanchan Kumari Gupta, and Mateti Gayithri**
1.*Ph.D Scholar, Department of Plant Breeding and Genetics, Assam Agricultural University, Jorhat
2.Ph.D Scholar, Department of Horticulture, Assam Agricultural University, Jorhat
3. Ph.D Scholar, Department of Plant Pathology, Assam Agricultural University, Jorhat

Sustainable agriculture is crucial for stimulating both developing and developed countries. To meet the rising need for food from a growing global population and to ensure environmental sustainability at the same time, agriculture needs modernization and innovation. By increasing the effectiveness of agricultural inputs and providing powerful solutions to agricultural problems for enhancing food security and production, nanotechnology has attracted more attention in the development of food safety and the protection of the environment. Nanotechnology has the potential to increase agricultural output through the use of effective pesticides and herbicides, the regulation of soil features, wastewater management, and disease identification. Enhanced food production with good market value, heightened nutritional and sensory properties, improved safety, and better antimicrobial protection are all advantages of industrial food processing. Additionally, the use of nanoparticles to extend the shelf life of products helps decrease post-farming losses. With new nanotools for quick disease diagnosis, nutrient absorption enhancement for plants, and other uses, nanotechnology has the potential to advance agriculture and the food sector. The significant interests of using nanotechnology in agriculture include specific applications like nano fertilizers and nano pesticides to trail products and nutrient levels to increase productivity without decontamination of soils, waters, and protection against several insect pests and microbial diseases. Nanotechnology is well-known to play a significant role in the effective management of phytopathogens, nutrient utilization, and controlled release of pesticides, and fertilizers. Modern agricultural practices have been found to be associated with the degradation of the environment, ecosystems, and land due to agricultural pollution. Smart nutrition delivery, chemical pollutants, bioseparation of proteins, quick monitoring of biological, and nutraceutical nanoencapsulation,

solubilization, and distribution are examples of new themes approached by nanotechnology and involved in food security that might be greatly improved. The incorporation of nanoscale agrochemicals such as nano-pesticides, nano-fertilizers, nanoformulations, and nanosensors in agriculture has revolutionized the traditional agro-practices making them more sustainable, ingenious, and environmentally efficient.

***Keywords**: Nanotechnology, nanosensor, nano pesticides, decontamination, etc.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/045

Utilising sustainable methods, such as nanotechnology, to mitigate the negative consequences of climate change on the environment

Neha M. Arolkar[1] and Pravin B. Manjare[2]
[1]Ph.D Scholar, Vasantroa naik Marathwada Krishi Vidyapeeth, Parbhani
[2]Ph.D Scholar, Vasantroa naik Marathwada Krishi Vidyapeeth, Parbhani

Climate change has always been of great concern. There have been countless documented impacts of climate change on the ecosystem. There are numerous ecological systems that have been impacted by climate change and global warming. Coastal flooding, localised flooding, biodiversity loss, heat stress, harm to the marine ecosystem, extreme weather conditions due to changes in seasonality, an increase in the number of glacial lakes and their enlargement, warming of rivers, lakes, and oceans are just a few of the effects of these changes in the climate system. Nanotechnology entails the production of tiny particles that improve their biological efficacy as well as their physical and chemical properties. These nanoparticles may be referred to as nanomaterials or nanoparticles (NPs) if at least one dimension is between 1 and 100 nm. Through the use of nanoscale devices, these nanostructures can be used to address a variety of issues in numerous sectors. Nearly all significant industries, including those in agriculture, the environment, energy, food, medicine, catalysis, and material science, are under the purview of nanotechnology. Nanomaterials/nanoparticles/nanostructures, due to their nano size (approximately 1–100 nm) exhibit extraordinary physical, chemical and biological properties. Nanotechnology deals with the design, production, manipulation and application of nano structured materials. The broad categories of advanced nanomaterials (viz. super, smart, active and swarms nanomaterials) . Environmental nanotechnology (E-nano) based products may be used for environmental remediation applications. Environmental nanotechnology (E-nano) deals with the manufacture, manipulation, and characterisation of structures, instruments, and systems by regulating the size and form to nano level dimensions. Processes based on nanotechnology are used to cure harmful substances and contamination (such as water pollution). A sensor is a device that has the ability to recognise, capture, and transmit any particular analyte or change in its environment. It is

used to detect, sense, and keep track of physical factors like pressure, temperature, and concentration. Due to stronger surface reactivity and enhanced optical characteristics, a nanosensor or its components function better and have higher sensitivity.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/046

Value addition of Fruits & Vegetables: A future of India

Pravin B. Manjare[1], Neha M. Arolkar[2] and Archana V. Mahida[3]
[1]Ph.D. Scholar, Fruit Science, Department of Horticulture, VNMKV, Parbhani (M.S)
[2]Ph.D. Scholar, Vegetable Science, Department of Horticulture, VNMKV, Parbhani (M.S)
[3]Ph.D. Scholar, Fruit Science, Department of Horticulture, Central University of Tamil Nadu, Thiruvarur (T.N)

India ranks second in the world for the production of fruits and vegetables. APEDA reports that India is the world's top producer of vegetables like ginger and okra and ranks second in the world for vegetables like potatoes, onions, cauliflower, brinjal, and cabbage. India is the country that produces the most fruits, including bananas, papayas, and mangoes. The top fruit-producing states in India are Maharashtra, Andhra Pradesh, Uttar Pradesh, Gujarat, and Madhya Pradesh, which together account for around 56% of the nation's total fruit production. On the other side, West Bengal, Uttar Pradesh, Bihar, Gujarat and Madhya Pradesh are the top vegetable growers in India, collectively accounting for almost 56% of the country's production. Even with such high output levels, there is still a 25-33% post-harvest loss of goods due to their very perishable nature and short shelf lives. The lack of adequate infrastructure for post-harvest management (PHM) and the processing of commodities is the main reason for post-harvest loss. Only by managing, processing, and marketing agricultural commodities properly can these losses be kept to a minimum. In India, there is a tremendous potential for processing fruits and vegetables into products including frozen (IQF), canned, pulp, puree, paste, sauces, snacks, dressings, flakes, dices, dehydration, pickles, juices, slices, chips, jams, and jellies. Fruit and vegetable processing is a major industry in India. India exported processed foods worth Rs. 41,460.06 billion in 2021–22, including products like mango pulp (Rs. 924.54 billion), processed vegetables (Rs. 3986.45 billion), cucumber and gherkins (prepped and prepared), processed fruits, juices, and nuts (Rs. 3626.08 billion), jaggery and confectionary (Rs. 2797.85 billion), and cocoa products (Rs. 1145.48 billion). India offers a large opportunity and is prepared for a significant retail revolution. India has the least amount of small organised retail market saturation and worldwide market competition.

Keywords: Value Addition, Fruits, Vegetables, Processing.

ITAHAS/AB/2023/047

Hybridization through Inter-Population and Population x Variety Crosses

Bharat Chandra Saha* and Ananda Kumar Mandal
School of Agriculture & Allied Sciences, The Neotia University, Diamond Harbour Road, South 24 Parganas, West Bengal-743368, India

Heterosis is defined as the superiority of an F1 hybrid over both of its parents in terms of yield or some desirable characters. Generally, heterosis is manifested as an increase in vigour, size, growth rate, yield or some other characteristics. Single-cross maize hybrids display superior heterosis and are produced from crossing two parental inbred lines belonging to genetically different heterotic groups. The rediscovery of Mendel's laws by Correns and others subsequently influenced East to think of line purification and in 1908 it was Shull who proposed the fundamental principle of inbreeding and its role in heterosis. Shull argued persuasively that selfing isolated homozygous lines and to cross those lines to capitalize on heterosis; a fact that influenced East (1908), to a positive benefit obtained by hybridizing inbred line**s.** Since then the exploitation of heterosis spread to include many other crop plants. However, for many crops, the full benefit of heterosis is yet to be realized because inbreeding efforts are still in their infancy from the genetic point of view. Since 1930s, the exploitation of heterosis has spread to include many other crops but the full benefit of heterosis has not yet been realized because inbreeding efforts are still not yet fully understood. Although few scientists have criticized the move toward F_1 hybrids for more profit than science, this argument does not address other potential benefits of F_1 hybrids such as uniformity in all economic characters. Use of heterosis has also fostered the development of a worldwide seed industry and dramatically altered the landscape of professional plant breeding, undoubtedly making a substantial contribution to research and development efforts. The success of F_1 hybrid technology has undoubtedly affected increases in food production in many regions of the world. During the last decade, maize breeding has undergone considerable changes with the advent of knowledge on the phenomenon of heterosis and its utilization in the development improved maize types. Prior to this, exploitation of heterosis was mainly based on the conventional hybrid approach. This led to a spectacular increase in yield in the form of single and double cross hybrids. However, progressive improvement could not be

sustained for several reasons, one of which was the exhaustion of genetic variability leading to decline in the magnitude of heterosis in single or double crosses. Maize breeders all over the world, now realized that in order to increase the yield of hybrids, it is essential to increase the yield level of base populations for Inter-varietal and inter-racial crosses thus indicating an alternative to break the genetic ceiling and opening a way to further improvement in yield. So, to break the present day yield barrier and maximize and magnitude of heterosis, the base-germ plasms should be developed and utilized from genetically diverse sources so that intra-population heterosis may aid the inter-population or population x variety heterosis, boosting the magnitude further. So, in order to find out if a higher magnitude of heterosis one could go for, inter –population or population x variety crosses. With that contention, new populations composed from diverse genetic sources possessing balanced intra-population heterosis, were crossed among themselves to break the heterotic ceiling. It was quite interesting to note that a mean heterosis as high as 48% was obtained in such population x population crosses .This heterosis also corresponded to the highest per se performance of the crosses which out yielded the best released check by 14 to 30 per cent. It therefore, indicates that high per se performance and high heterosis expression in the population x population crosses.

Keywords*: Heterosis, Inter population crosses, Intra population crosses, Base population.*

ITAHAS/AB/2023/048

Agroforestry for Sustainable Rural Source of Revenue: A Review

R Vijaykumar * and M Sekhar
Dept. of Silviculture & Agroforestry, College of Forestry Sam Higginbottom University of Agriculture, Technology & Scie nces Prayagraj, U.P

A livelihood is adequate and sustained access to money and resources such as food, drinking water, health care, and education to satisfy basic requirements. In the current situation, the most important task for policymakers and decision-makers is sustaining livelihood. Land-use choices that maintain livelihood security while reducing susceptibility to climatic and environmental change are required in this setting. Agroforestry has the potential to play a significant role in achieving the needed amount of diversification while also ensuring sustainability. Agroforestry has the ability to offer food security and aid in poverty reduction, in addition to contributing to environmental security through soil protection and carbon sequestration. Traditional agricultural and management practises, such as agro-forestry, have the ability to improve livelihoods by producing food, fodder, and fuel all at the same time, while also mitigating the effects of climate change. Because of the great biodiversity in forests, natural forest resources continue to play an important role in enhancing the life of rural populations. As a result, natural forests may supply energy, food, nutrition, and health. However, present levels of deforestation result in land degradation, soil nutrient depletion, loss of natural habitats, and hence changes in the structure and composition of natural woods. Improved agroforestry systems influence farming families and cause substantial changes in agricultural farming systems among farming communities. Agroforestry allows for the simultaneous development of numerous crops and gives several livelihood benefits to agricultural communities. Agroforestry has the ability to contribute to the conservation of biodiversity in natural systems by reducing rural populations' dependency on natural forest resources, since they are able to sustain their production systems through better agroforestry systems. Commercial agroforestry is more significant for guaranteed income than traditional agroforestry, yet both types of agroforestry play distinct roles in livelihoods.

Key words: *Agroforestry, Fodder, Traditional Farming, Climate Change.*

Mathematical Modelling, Artificial Neural Network and Physicochemical Quality of Coriander Puree Dried Using Refractance Window Drying

Ruchika Zalpouri[1*], Manpreet Singh[2], and Preetinder Kaur[1]
[1]Department of Processing and Food Engineering, Punjab Agricultural University, Ludhiana, Punjab
[2]Department of Renewable Energy Engineering, Punjab Agricultural University, Ludhiana, Punjab

Coriander is a rich source of carbohydrates, proteins, fats, minerals, fibre, and vitamins. Unfortunately, fresh coriander often goes to waste due to the lack of facilities for post-harvest processing. To address this issue, drying has been commonly employed as a method to extend the storage life of coriander. In this particular study, coriander leaves and soft stems were blanched in hot water for 30 seconds, then pureed and dried using a refractance window dryer with a puree thickness of 2mm. The aim of the study was to investigate the effects of different water temperatures (70°C, 80°C, and 90°C) on the drying characteristics and physicochemical quality of coriander powder. The study observed that as the water temperature increased from 70°C to 90°C, the drying time decreased. Mathematical modelling was used to analyse the data, and it was found that the Exponential two-term model yielded the highest R^2 value and the lowest RSME and SEE values. Additionally, the moisture ratio (MR) of coriander puree during drying was predicted using a back-propagation algorithm and MLF-ANN. The comparison between the mathematical model and the ANN model revealed that the ANN model accurately predicted the MR of coriander puree. The findings of the study indicated that the 2mm thick puree dried at a water temperature of 70°C exhibited the highest antioxidant capacity, total phenolic content, total flavonoid content, and total chlorophyll content, despite having a longer drying time. Consequently, this approach may be favoured for producing coriander powders with desirable physicochemical properties.

Keywords: *Refractance window drying; convective drying; ANN; coriander puree; quality.*

ITAHAS/AB/2023/050

Significance of Roadside Plantation

Sheshraj M. Kawade* and Anuradha A. Watane
Department of Floriculture and Landscape Architecture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola

Roadside tree planting is a crucial welfare strategy. A significant part of enhancing the beauty of our landscape is the planting of trees along state and national roadways. During the reign of Emperor Asoka (268-231 B.C.), roadside trees were first planted. The Mughals also planted trees along the roadsides. Trees release oxygen during photosynthesis. Therefore, the amount of oxygen in the environment increases as the number of trees increases. Trees can absorb CO_2 and utilize it in the process of photosynthesis; they are planted beside highways to help lower the amount of CO_2 in the air. If the CO_2 dispersion is localized around the tree, this ability will be maximized. The wayside trees extend their branches and leaves in the hot summer months, providing passersby with a refreshing source of shade. Long-distance automobiles may be parked comfortably under the trees, which provide shade to cool them down as well.

The dust never has a chance to settle on busy, dirty highways. Continuous movement is being made by them. They snoop into people's nostrils as they go by, get inside cars, and cause trouble for the nearby houses along the road. However, there were bushes and trees lining the roadway it serve as barriers and obstruct the dust particles, which quickly accumulate on the tree stem and leaves. As a result, the homes close by are spared from much of the dust that rises from the roadways and the debris that comes from car exhaust. The roadside trees act as acoustic barriers. Because of this, the nearby regions are well sheltered from the noise caused by vehicles on the roadways. Urban areas are heavily polluted by vehicle emissions, and being exposed to these pollutants close to roads increases the risk of public health issues. By adding flora to the roadside, pollutants may be captured and the health hazards to the urban population are reduced.

Keywords *- Roadside tree, environment, CO_2, pollutants.*

ITAHAS/AB/2023/051

Computer Aided Design for Landscaping

Sheshraj M. Kawade* and Anuradha A. Watane
Department of Floriculture and Landscape Architecture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola

Computer-aided design for landscape gardening is a relatively recent idea. It may be summed up by saying that it is the design and drawing of a landscape garden using a computer. When a design is created, modified, analyzed, or optimized, computers are used as a tool. Using CAD software helps designers work more productively, produce better designs, enhance communications through documentation and build databases. In modern times, land is considered an extremely important commodity and much effort goes into the garden designing and landscaping process by the landscape architects. The process of landscape architects demonstrating the garden design to a client has been a tedious task. This is primarily due to the lack of domain knowledge, as a client would be a haphazard process of landscape architects trying to express the idea using an existing software solutions which delivers a two dimensional view of the garden design. A variety of 2D and 3D based tools and approaches have been evaluated along with their advantages and disadvantages. The scope has been broadening to include and contrast interior designing tools in order to gain better domain knowledge. As the CAD software makes use of some of the best tools, the percentage of error that occurred because of manual designing is significantly reduced. Because the programme automates the majority of the work, the amount of effort required to develop the various models has been greatly decreased. When employing computer-aided design software, it saves time and allows for the creation of better, more effective designs in a shorter amount of time.

Keywords- *CAD, Software, Design.*

ITAHAS/AB/2023/052

Growing Profits: Exploring Novel Approaches in Horticulture to Boost Farmers' Income

Shivanand Koti[1], T. R. Ahlawat[2] and K Harish Reddy[3],

[1]PhD scholar, Department of Fruit Science, ASPEE College of Horticulture, Navsari Agricultural University, Navsari

[2]Director of Research & Dean Post Graduate Studies, Navsari Agricultural University, Navsari

[3]PhD scholar, Department of Fruit Science, ASPEE College of Horticulture, Navsari Agricultural University Navsari

Horticulture plays a crucial role in agriculture, contributing significantly to food security and rural livelihoods. In the year 2021-22, at nearly 28.08 million hectares and production was at a record 342.33 million tonnes. However, many farmers struggle to achieve sustainable income levels due to various challenges.

The first key innovation lies in the adoption of advanced technologies. Precision farming techniques, such as remote sensing and drone technology, enable farmers to monitor crop health, optimize irrigation, and apply fertilizers efficiently. Additionally, greenhouse and hydroponic systems offer controlled environments that maximize yield and reduce resource consumption. These technological advancements enhance productivity and profitability while minimizing risk.

Another innovative strategy involves diversification and value addition. Instead of relying solely on traditional crops, farmers can explore niche markets and cultivate high-value horticultural produce. Exotic fruits and vegetables, herbs, and medicinal plants have growing demand in domestic and international markets. Value addition through processing, packaging, and branding further increases product value and market competitiveness. By integrating value chains and connecting farmers directly to consumers, farmers can capture a higher share of the final product price. Beekeeping, mushroom cultivation and use of biofertilizers are emerging trends in horticulture production.

Furthermore, collaboration and collective action are instrumental in maximizing farmers' income. Farmers can form cooperatives or producer groups to collectively access resources, negotiate better prices, and share knowledge and best practices. This collaborative approach empowers farmers, strengthens their bargaining power, and facilitates access to credit, technology, and markets.

Sustainable farming practices also contribute to income enhancement. Adoption of organic and agroecological approaches not only promotes environmental sustainability but also attracts premium prices from eco-conscious

consumers. By reducing chemical inputs, conserving natural resources, and adopting climate-smart techniques, farmers can reduce production costs and improve profitability.

In conclusion, innovative approaches in horticulture offer tremendous potential to double farmers' income. By leveraging advanced technologies, diversifying crops, adding value, promoting collaboration, and adopting sustainable practices, farmers can overcome income constraints and create a thriving horticultural sector. Policymakers, agricultural extension services, and private sector stakeholders should prioritize supporting and disseminating these innovations to unlock the full income-generating potential of horticulture for farmers.

ITAHAS/AB/2023/053

Protecting and propagating indigenous cow breeds for rejuvenating mother earth and environment

Gangadhar M. Arkachari*, Sindhu R. V* and Dr. Gururaj Padil
Sri Ramachandrapura Math, Girinagar, Bengaluru

With an objective of protecting, preserving, propagating and researching the Desi cows, Shri Ramachandrapura Math, Girinagar, Bengaluru has launched the mega project "Kamadugha" almost 22 years back and established several Goushalas in Karnataka and Maharashtra. Under this project, "*Desi Cow-Based Farming*" is being practiced for the conservation of soil health, plant nutrients, biodiversity, biological control of various plant diseases and pests, reclamation of saline soils etc. A large number of awareness programmes have been conducted in collaboration with farm Universities. "Gouphala" was formed in 2019 for supporting organic and farmer-friendly approaches for sustainable agriculture development using *Desi* cow-based inputs. Dashasara, Swargasara and Panchagavya are being produced and supplied in large quantities. Use of these inputs has helped the farmers in improving the soil health; enhancing nutrient content and reclaiming salt affected soils. They have also helped to control soil borne plant diseases and pests apart from acting as plant growth promoters. Being ecofriendly and cost effective, several farmers have been using them over the years. A fresh demonstration of the efficacy of these products is the successful management of root grub in arecanut. Now Shri Ramachandrapura Math has initiated a research wing to take up scientific investigations on these cow-based inputs in collaboration with other collaborators. Overall, these efforts would enable cow-based farming and organic farming in order to improve soil health by maintaining *Desi* cow breeds and realizing true personification of Gou-Bhu Mata for rejuvenating the Panchamahabhoota. This would make the earth a heavenly place for all life forms.

Keywords*: Protecting and propagating Desi cow, products of Desi cow for farming, creating awareness among the farmers, sustainability of earth and agriculture.*

Effect of Neem Leaves Powder and Cinnamon Oil on Serum Lipid profile, Faecal microbial count and metabolic constituents of Broiler Chickens

Sudhanya Nath[1*], Guru Prasad Mandal [1] and Niranjan Panda[2]
[1]Department of Animal Nutrition, West Bengal University of Animal and Fishery Sciences, Kolkata,India
[2]Department of Animal Nutrition, C.V.Sc. & A.H., Odisha University of Agriculture and Technology, Bhubaneswar, India

A study was carried out to estimate the effect of neem (*Azadirachta indica*) leaves powder (NLP) and cinnamon (*Cinnamomum zeylanicum*) oil (CNO) on serum lipid profile, faecal microbial count and metabolic constituents of broiler chickens. Day-old (n=420) Vencobb chicks were randomly allotted into 6 experimental groups of 70 chicks (7 replicates of 10 chicks each). Dietary treatments were: T0 (control: basal diet), T1 (basal diet + 2g NLP/kg), T2 (basal diet + 4 g NLP/kg), T3 (basal diet + 100 mg CNO/kg), T4 (basal diet + 200 mg CNO/kg) and T5 (basal diet + 2 g NLP/kg + 100 mg CNO/kg). There was significant ($P<0.05$) difference in triglycerides, total cholesterol, HDL, VLDL and LDL-cholesterol levels, whereas cholesterol ratio didn't differ significantly. T5 group had significantly ($P<0.05$) higher serum HDL-cholesterol level as compared to other groups. Supplemented groups had significantly ($P<0.05$) increased faecal lactic acid bacteria, decreased faecal *E. coli* count and lower faceal NH_3-N excretion as compared to control (T0) group. Hence, it can be concluded that NLP, CNO and their combination can be used as a growth promoter in broiler chickens.

Keywords: *Broiler chickens, Neem leaves powder, Cinnamon oil, Lipid, Faecal microbial, metabolic constituents.*

ITAHAS/AB/2023/055

Problems associated with bamboo artisans: A challenge

Suprita Pawar [1] and Geeta Chitagubbi [2]

[1] Ph.D. Scholar, [2]Professor, Dept. of Family Resource Management, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka

The study was conducted in 2019-2020 in North Karnataka districts. The respondents were interviewed personally to elicit the primary information by using self structured interview schedule. Exploratory research design was used. Random sampling method was applied to select a sample size of 120 bamboo artisans' family. Cent per cent of the respondents experienced non availability of bamboo as a major general problem followed by high price of bamboo and, middle man involvement while purchasing bamboo raw materials and plastic hinders their selling. More than sixty per cent of the respondents faced problems like lack of knowledge about eco friendly products among people. Whereas maximum per cent of the respondents faced the domestic problems like difficulty to balance between family and work life followed by family responsibilities come first and respondents cannot take business decision by their own. Major per cent of the respondents mentioned difficulty to move and travel alone followed by difficulty due to caste and social status as major social constraints. First rank was given to the towards the recommended suggestion- availability of bamboo at reasonable price should be provided by government followed by provisions of drudgery and time saving devices to the artisans by government (II rank), third rank was given to advertisement of the bamboo products to be made through T.V., radio, newspaper and magazine, fourth rank given for artisan's an opportunity for participating in melas and exhibition to sell their products, government should take the responsibility of not involving the middleman for selling bamboo products was ranked fifth and sixth was given for the financial assistance from the government for the construction of work station among the suggestions to overcome general problems.

First rank was given for suggestion to overcome domestic problem-provision of government financial support to the artisans by the government followed by encouraging women in for decision making (II rank) and third rank was given for teaching of work life balance.

First rank is given for suggestions to overcome the social constraints-transportation facilities provided by the government followed by arranging workshops for innovative marketing and communication skills while selling (II rank), third rank- was given for initialization of adult education for the artisans by government and NGO's and fourth rank for provision of facilities for motivational classes for the artisans by the government.

ITAHAS/AB/2023/056

Standard heterosis for seed yield in sunflower (*Helianthus annuus* L)

S.C. Nagrale[1*], S.B. Sakhare[2], P.V. Yadirwar[3], S.S. Nichal[4] and P.V. Jadhav[5]

[1]Ph.D. Scholar, Department of Agricultural Botany (Genetics and Plant Breeding), PGI, PDKV, Akola (Maharashtra), India.

[2]Associate Professor Department of Agricultural Botany (Genetics and Plant Breeding), PGI, PDKV, Akola (Maharashtra), India.

[3] Head of agricultural research station, Yavatmal, Dr. PDKV, (Maharashtra), India.

[4] Associate Professor, Regional Research Centre, Dr. PDKV, Amravati (Maharashtra), India.

[5]Assistant Professor. Department of Agricultural Biotechnology, PGI, Dr. PDKV, Akola, (Maharashtra), India

The present experimental material consist of four CMS lines and nine testers which were crossed in line x tester mating design to estimate the standard heterosis over the check LSFH-171 for seed yield in sunflower. The resulting 36 hybrids and 13 parents along with check *viz.,* LSFH-171 were evaluated in randomized block design with three replications at Agricultural Research Station, Yavatmal. A broad range of heterotic variation observed for seed yield and it was ranged from -40.61% to 68.90% standard heterosis over check LSFH-171 for seed yield per plant. 10 hybrids displayed positive and significant heterosis over the standard check LSFH-171 and top three hybrids viz., ARM – 250 A × PKV- 103 R, CMS- 17 A × PKV-106 R and ARM – 250 A × PKV-106-R manifested highest magnitude heterosis over the standard check LSFH-171 for seed yield. Hence, these identified hybrids could be use for exploitation of heterosis after evaluating and testing with large multilocations trials.

Keywords*: sunflower, heterosis, hybrid, line x tester, yield.*

Optimum sowing window for the maximization of winter wheat yields in Sub-tropical Eastern India

Sweta Rath and Dr. A. K. Mohapatra
Faculty of Agricultural Sciences, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India

In the scenario of the global climate change, there is considerable variations in the prevailing weather parameters, like temperature, rainfall, humidity, etc. The resulting warming potentials of the environment possess a threat to the crop yields across the globe. Wheat being one of the staple crops of the world demands much attention in this regard. In the recent years, due to increase in the health concerns, people are considering wheat as an alternative to the rice-based diet, due to its slow and sustained energy release pattern. The area under study, being a non-traditional wheat growing zone calls for attention towards its popularization for diversification of the cropping systems. Being a typical C3 plant with substantial low temperature during most of its critical stages, wheat is quite sensitive to the optimum sowing time which therein influences the better growth and development of the crop. Implementation of crop-level adaptation options, viz.; cultivar selection, adjusting sowing dates can avoid the projected loss of wheat yield to some extent. In this study, an attempt has been made to find out the best sowing window for winter wheat in sub-tropical Eastern India. For this the variety PBW-343 was sown at three dates i.e.,1st November (early sowing), 20th November (recommended sowing) and, 10th December (delayed sowing) at Bhubaneswar (20.29° N, 85.82° E) in the winter of 2021-22. The results suggest that the early planting date i.e., 1st November showed significantly higher yields than the other two sowing dates. Hence, the optimum sowing date of winter wheat over subtropical Eastern India is more or less around 1st November. This study is useful to the farming community to increase the crop production in the present global warming era.

Key words: *Climate change, Wheat, Optimum sowing window, Yield maximization.*

ITAHAS/AB/2023/058

Gene Pyramiding: A strategy for durable crop protection in vegetable crops

T Yeswanth Mahidar Gowd[1], V Mounika[1] and Oinam Bidyalaxmi Devi [1]
[1]Research Scholar, Dept. of Vegetable Science, College of Horticulture and Forestry, Central Agricultural University – Pasighat

Plant breeders have sought to improve crops by selecting desired traits since the beginning of agriculture. Pyramiding is a method aimed at assembling multiple desirable genes from multiple parents into a single genotype. Among two types of gene pyramiding the conventional method is associated with the fact that the presence of target genes must be confirmed by phenotyping, while Marker Assisted Selection (MAS) involves the indirect selection of traits by selecting the marker linked to the gene of interest. Gene pyramiding has been successfully applied in crop breeding for developing new cultivars or lines in which favorable genes from several different sources were introgressed. Gene pyramiding with marker technology can integrate into existing plant breeding programmes all over the world to allow researchers to access, transfer and combine genes at a faster rate for advanced breeding programes. One significant achievement involved the study of two introgressed resistance genes, Rpi-mcd1 and Rpi-ber, from the wild tuber-bearing potato species Solanum microdontum and S. berthaultii, which were subsequently introgressed into a population of Solanum tuberosum. By utilizing tightly linked molecular markers, individual genotypes from this population were accurately classified into four distinct groups based on the presence or absence of the Rpi-genes: those carrying no Rpi-gene, only Rpi-mcd1, only Rpi-ber, and a group with the pyramided Rpi-mcd1 and Rpi-ber genes. Another notable achievement involved the pyramiding of multiple genes for resistance to Potato virus Y (PVY), Tomato spotted wilt virus (TSWV), and Pepper mild mottle virus (PMMoV) in peppers, facilitated using molecular markers. Through this approach, resistant genes to these viruses were effectively transferred and introgressed into the superior sweet Charleston pepper line 'Y-CAR'. As a result of this successful gene pyramiding, a new pepper line was developed that exhibited resistance to PVY, TSWV, and PMMoV.

Keywords*: - Crop Improvement, Breeding, Vegetable crops, MAS.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/059

Effect of biopriming of Rhizobium and Phosphate solubilizing bacteria on nutrient uptake of Soybean (*Glycine max*)

Ukey P. V., Munde B. N and Raut M. D
Ph. D Scholar, Department of Plant Pathology and Agricultural Microbiology, Mahatma Phule Krishi Vidyapeeth, Rahuri.

The present investigations entitled studies on "Effect of biopriming of Rhizobium and Phosphate solubilizing bacteria on nutrient uptake of Soyabean (*Glycine max*)" was conducted during *kharif,* 2021 in Randomized Block Design with eight treatments and three replications combinations *viz*., T_1 (Biopriming of Rhizobium and PSB at 100% RDF), T_2 (Biopriming of Rhizobium and PSB + 75% RDF), T_3 (Biopriming of Rhizobium and PSB + 50% RDF), T_4 (Rhizobium + 75% recommended N + 100% recommended P_2O_5), T_5 (PSB + 75% recommended P_2O_5 + 100% recommended N), T_6 (50% recommended N + 50% recommended P_2O_5), T_7 (100% RDF without inoculation), T_8 (Absolute control). The results of the present investigation revealed that among the different inoculation treatments, T_2 (biopriming of rhizobium and PSB +75% RDF) recorded significantly highest available NPK (208.25, 27.71.and 105.69 kg ha^{-1}, respectively) and nutrient uptake (52.22, 14.44 and 24.44 kg ha^{-1} , respectively) over rest of the treatments, however it was statistically at par with T_1 (consortium+100% RDF) for available NPK (199.66, 25.69 and 102.63 kg ha^{-1}, respectively) and nutrient uptake (45.78, 12.62 and 22.28 kg ha^{-1} , respectively) by soybean at harvest. Increased available soil nutrients and nutrient uptake after harvest due to inoculation of Rhizobium and PSB individually or in combination

ITAHAS/AB/2023/060

Trends in Export Performance of Wheat from India

Udhayan, N., A.D. Naik and G.M. Hiremath
Ph. D. Scholar, Department of Agribusiness Management, University of Agricultural Sciences, Dharwad

The present study aimed to analyze the growth and instability index of wheat export from India. The study depends on secondary data which was collected from APEDA website for the year 2011-12 to 2021-22. The compound annual growth rate analysis and Cuddy Della Valle Instability Index was employed for analysis of growth rate and instability index of wheat exported from India. The results revealed that the growth rate of quantity and value of export of wheat from India showed negative growth of 8.25 per cent and 4.72 per cent, respectively, which was insignificant. It was mainly due to surplus production of wheat in global market and domestic prices have been higher than that of international prices. The instability indices for export of wheat from India is positive in both quantity (106.42) and value (113.94) and lies in the range of above 30 which showed high instability in quantity and value over the period of eleven years. It indicates high risk in export of wheat from India in future.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/061

Effect of mulching and antitranspirant spray on wheat under limited irrigation availability

M.N. Wairagade[1], A.A. Choudhary[2], S.S. Kinge[3] and S.H. Lohale[4]
[1, 3] and [4] Ph. D. Scholar, Department of Agronomy, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India
[2]Associate Professor, Department of Agronomy, College of Agriculture, Nagpur, Maharashtra, India

A field experiment was conducted at Agronomy Farm, College of Agriculture, Nagpur during *rabi* season of 2019-20. Wheat *var.* AKAW-4627 was sown on clayey soil, low in available nitrogen, very low in available phosphorus and medium in organic carbon, very high in potassium and slightly alkaline reaction. The experiment was laid out in Factorial Randomized Block Design with 12 treatment combinations replicated thrice. The treatments consisted of three irrigation levels [One irrigation at late jointing stage (I_1), Two irrigations at crown root initiation (CRI) and flowering stages (I_2) and Three irrigations at CRI, late jointing and flowering stages (I_3)] combined with four moisture conservation practices [Control (M_0), Mulching with wheat straw (M_1), Mulching with weed biomass (M_2) and antitranspirant spray {Kaolin @ 5%} (M_3)].

Application of three irrigations recorded significantly higher plant height, number of tillers hill^{-1} and dry matter accumulation plant^{-1}. Yield attributing character *viz*. length of earhead and number of grains earhead^{-1} along with grain, straw and biological yield of wheat were significantly higher with application of three irrigations compared to its lower levels.

Application of wheat straw mulch at 30 DAS recorded significantly higher plant height, number of tillers hill^{-1} and dry matter accumulation plant^{-1}. Yield attributing character *viz*. length of earhead and number of grains earhead^{-1} along with grain, straw and biological yield of wheat were also significantly higher with application of wheat straw mulch at 30 DAS compared to rest of the moisture conservation practices.

Combination of three irrigations with wheat straw mulching gave significantly highest grain yield of wheat.

Consumptive use of water was highest in treatment receiving three irrigations and it decreased with decreasing levels of irrigation. Whereas, water use efficiency was highest with one irrigation and it decreased with increasing levels of irrigation.

Lowest consumptive use and highest water use efficiency was recorded in wheat straw mulch (M_1) followed by weed biomass mulch (M_2), antitranspirant spray (M_3) and control (M_0), respectively.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/062

Influence of NPK Levels on Yield and Quality Parameters of Hybrid Cherry Tomato (Solanum lycopersicum L. var. cerasiforme (Dunnal) A. Gray) Cultivated in Protected Conditions

Yogesh M, Pramod B. S, Bangi Kyatammanavara Soumya, Teju C. M, and T. Yeswanth Mahidar Gowd

Department of Vegetable Science, College of Horticulture and Forestry, Central Agricultural University (Imphal), Pasighat, Arunachal Pradesh, India

Cherry tomato (Solanum lycopersicum L. var. cerasiforme (Dunnal) A. Gray) is the most commonly used salad vegetable crop having high export demand. Cherry tomatoes are becoming popular among consumers because of their delightful taste and flavour-bursting characteristics as a snack and as a salad. Along with having a palate-pleasing character, cherry tomatoes are also known for their rich nutritional value and health benefits. Balanced nutrition is always a pre-requisite for improved growth, yield and quality of any crop. Fertilizer has become an important material input in present day agricultural practices. To understand the effect of NPK on plant growth of cherry tomato hybrids, an investigation was conducted at Polyhouse Complex, College of Horticulture and Forestry, Pasighat, Arunachal Pradesh in RCBD design with six treatments and four replications [T_1 – 50% recommended dose of fertilizers (RDF), T_2 – 75% RDF, T_3 – 100% RDF, T_4 – 125% RDF, T_5 – 150% RDF and T_6 – control]. The treatments significantly influenced the growth, yield and fruit quality parameters of cherry tomato hybrids. The study reviled that the maximum number of clusters per plant (26.64) was recorded in treatment T_4. The yield parameters like the number of fruits per cluster (13.75), fruit weight (12.40 g), fruit length (29.42 mm), fruit girth (24.07 mm) and yield per plant (3.16 kg), was observed highest in treatment T_4 and least was observed in treatment control T_6. With respect to quality parameters the performance of treatment T_4 was best with TSS of 9.19 °Brix, lycopene of 8.28 mg/100g and ascorbic acid of 55.64 mg/100g were recorded.

ITAHAS/AB/2023/063

Production & Promotion of Butea Therapeutic Wine for Entrepreneurial and Socioeconomic Livelihood of Vidarbha

Tanavhi Aware[1], Abhishek Zamare[2] and Ravindra Satbhai[3*]

[1,2,3] Vasantrao Naik College of Agricultural Biotechnology, Yavatmal, Dr. PDKV, Akola Maharashtra, India

Consumption of therapeutic wine is a new concept after pandemic as consumer focus shifted towards smart, healthy food all over world. In this project we tried attempt to prepare and standardize the wine prepared from Palas flowers as a therapeutic wine that may be open new way of employment and startup for tribal youth and farming community of Vidarbha region under waste to wealth concept.

Butea monosperma is commonly known as flame of forest, belongs to the family Fabaceae and locally called as Palash used since the Vedic era for different therapeutic purposes in various parts of India. Almost all the parts of plant including flowers, seeds, leaves and barks possess medicinal property. Flowers are rich in butrin, isobutrin, coreopsin, sulphurein, isocoreopsin, monospermoside, chalcones, isomonospermoside, steroids. The hills of Vidarbha region is full decorated under palash plantation. The blooms of flowers are completely dropped and waste in the month of March to April every year. If the waste bloom and fresh flowers are collected and converted in to a value-added product it will be the new startup for Vidarbha region to generate employment though entrepreneurship.

Total six prepared wine with and without blend, the Wine A, Wine B, Wine D and Wine F categorized as table wine containing 9.2 to 9.9 percent alcohol (v/v),TSS 14.5 to 15.2 Brix, Specific gravity-1.060 to 1.073 with deep ruby, pale garnet, deep garnet and medium copper colour respectively. Wine C categorized as Starter wine having deep purple colour containing 6% alcohol (v/v), TSS 13.2 Brix.pH-3.1 with 1.038 sp. gravity. Wine E categorized as a dessert wine recorded 12.2% alcohol(v/v), TSS 15.5 Brix, acidity 0.27% and 1.093 sp. gravity. All six wines are as per the standards of FSSAI and recorded zero microbial count, below detectable levels of heavy metals, higher total phenols, antioxidative activity and organoleptic score.

Keywords*: Butea Monosperma, therapeutic wine, waste to wealth.*

Effect of Insecticides and Herbicides on *Rhizoctonia solani* Kühn causing aerial blight of Soybean *in vitro*

Abhishek Kumar Tamta[1], Y. Singh[2], and R. P. Srivastava[3]
[1, 3]Department of Entomology, [2]Department of Plant Pathology, College of Agriculture, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar, Uttarakhand, India

Food safety and nutritional security are paramount with a rapidly growing population and increasing demand for food. With the interventions of agrochemicals, diseases and pests are combated resulting in the enhancement of agricultural productivity. Keeping these vitals in comprehension, the present study investigated the impact of four insecticides and six herbicides on the growth and sclerotial production of *Rhizoctonia solani* (Kühn) which causes aerial blight, and stem and root rot in soybean. *R. solani* was isolated from sclerotia on PDA and cultured at 28±2°C. Double-strength (Ds) PDA medium and various concentrations of insecticides and herbicides were prepared. Poisoned media were created by combining DsPDA (40 ml) with test insecticide/herbicide (40 ml). Discs from 3d-old *R. solani* cultures were placed on the plates and incubated at 28±2°C. Radial growth and sclerotial production were recorded once the control showed completed growth and statistically analyzed using DMRT.

Among the herbicide treatments, quizalofop ethyl demonstrated the highest inhibition percentage of 100%, effectively suppressing both the radial growth and sclerotial production of *R. solani*. Similarly, chlorimuron ethyl exhibited 93.06% growth inhibition, followed by propaquizafop (92.78%), metribuzin (53.33%), imazamox + imazethapyr (15.28%), and imazethapyr (13.06%). Notably, emamectin benzoate, an insecticide, displayed a significant inhibition percentage of 52.78%, while novaluron + indoxacarb (43.61%), flubendiamide (13.89%), and spinetoram (5.83%) showed no sclerotial production, except for flubendiamide. This indicates their considerable inhibitory effects. Moreover, certain treatments completely suppressed sclerotial production, including emamectin benzoate, spinetoram, novaluron + indoxacarb, chlorimuron ethyl, imazethapyr, metribuzin, quizalofop ethyl, and imazamox + imazethapyr. However, an average sclerotial count was observed from propaquizafop (3.25) and flubendiamide (2.50) which were significantly

lesser than the control (6.75) at P=0.05. It shows that Quizalofop ethyl is the most significant treatment exhibiting its fungicidal effect against *R. solani*. Further investigations are warranted to elucidate the underlying mechanisms and evaluate the long-term effects of these treatments on crop health and productivity.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/065

Use of Different Technical Transformation methods in Agriculture

Abhishek Raj Ranjan[1], Ajay Kumar[2], Anurag Singh Suman[3], Dhananjay Kumar[4] and Prabha Siddharth[5]

[1,2,3&4] Ph.D. Research Scholar, BUAT, Banda

[5] Ph.D. Research Scholar, CSAUA&T, Kanpur

The influence of technology on the agriculture industry is overwhelmingly good in terms of supply chain efficiency, security, and production. When adopting the conventional farming approach, farmers face several challenges during soil preparation, crop harvesting, seed sowing, and it is challenging to learn whether the soil is deficient in nutrients. In an era of globalization, trade liberalization, changing market structures and demand, and ample world food supplies, a new breed of agricultural skeptics argue that poor countries should now downplay the importance of food staples and small farms and focus instead on commercial farms, higher-value agriculture, and rural income diversification through migration and non agricultural development (Maxwell et al., 2001; Ellis and Harris, 2004). Strategic perspectives, customer centricity, ICTs, process infrastructure, talent, skills and competence building, creativity, and culture are the primary variables that may be used to assess digital maturity. Digital technology is transforming the global economy and culture, and several projects are being launched to shift corporate paradigms. Controlled precision agriculture services are expected to increase by more than 27% between 2019 and 2025. Vertical indoor farming, farm automation, also known as "intelligent agriculture," livestock farming technology, modern greenhouses, precision agriculture, block chain and big data, artificial intelligence, and crop health analysis by drones are just a few examples of agricultural technological advancements.

Keyword: *Globalization, Trade liberalization, ICTs, Vertical indoor farming and Intelligent agriculture.*

ITAHAS/AB/2023/066

A Composite Index for Evaluating the Effectiveness of Public Distribution Systems on Nutritional Security

Surjya Kanta Roy[1*], Satyapriya[2], and Fatheen Abrar. P. N[1]

The majority of Indian households rely heavily on PDS for their nutritional needs. The purpose of the public distribution system (PDS) in India is to ensure food security for all by subsidising the distribution of essential goods to the marginalised population. Therefore, grain entitlements (rice and wheat) provided through the PDS serve as the primary staple food for many beneficiary households. One of the causes of malnutrition is the insufficient inclusion of pulses, vegetables, meat, and dairy products in beneficiary households' diets. In addition, households lack knowledge of nutritional best practises. The PDS should shift its focus from "Food Security" to "Nutritional Security." There are however persistent problems with India's PDS, such as the distribution of fake ration cards that exclude the poor, the sale of commodities on the open market, the inability of fair price shops to supply the permitted amount of food grains, and the substitution of high-quality food grains with cheaper varieties, among others. The research was conducted in Bundelkhand, one of the most nutritionally vulnerable regions in the country. The Bundelkhand region is made up of two state portions, namely Uttar Pradesh and Madhya Pradesh. The districts of Jhansi, Chitrakoot, Tikamgarh, and Chhatarpur were chosen based on the Multidimensional Poverty Index (MPI) and aspirational districts. Consequently, 320 respondents from four districts constituted the study's sample. To study the effectiveness of the public distribution system, the "Nutri-PDS Effectiveness Index" was created with six indicators: accessibility, supply-management mechanism, degree of satisfaction, cost savings, viability, and nutrition. Each indicator had two attributes, for a total of twelve attributes and forty-seven indicators. Using the integrated weightage method, an attempt was made to calculate the weights of the index's dimensions and attributes. The districts were categorised and ranked according to their final Nutri-PDS effectiveness index score. On the Nutri-PDS effectiveness index, Tikamgarh ranked first, indicating that this district utilised PDS with proficiency and efficiency. In the Bundelkund region, the districts of Chitrakoot, Chhatarpur, and Jhansi ranked second, third, and

fourth, respectively. The three dimensions with the highest scores on the Nutri-PDS effectiveness index were accessibility, level of contentment, and cost savings. The effectiveness of PDS was significantly impacted by the accessibility of services, the level of customer satisfaction, and the expenditures made. Focusing on these dimensions can improve the effectiveness of existing PDS in other regions to combat malnutrition. The highest-scoring criterion for attributes indicating the costs associated with PDS's smooth operation and ability to reach poor people in order to meet their dietary needs was the operating cost. The ranking of exclusive allocation as the second-best attribute on the Nutri-PDS effectiveness index suggests that PDS is widely accessible in the study area. In spite of the fact that beneficiary satisfaction received the lowest score on the Nutri-PDS effectiveness index, indicating inadequate quality assurance from PDS, dissatisfied beneficiaries were discovered in the study area.

Keywords*: Effectiveness Index, Integrated Weightage Method (IWM), Nutritional Security, Public Distribution System (PDS)*

ITAHAS/AB/2023/067

Repercussions of Covid-19 on Education System

Adhi Sri latha[1], Harichandana Ponnapalli[2] and Dr. Suma Hasalkar[3]

[1]Ph.D Scholar, Department of Family Resource Management, College of Community science, UAS, Dharwad

[2]Ph.D Scholar, Department of Food Science and Nutrition, College of Community science, UAS, Dharwad

[3]Rtd. Professor and Head, Department of Family Resource Management, College of Community science, UAS, Dharwad

The global community has been thrown into chaos by the COVID-19 pandemic. It was originated in China and rapidly expanded throughout the world. The COVID-19 pandemic is a national health emergency that threatens economic development. Different countries are adopting different steps to halt the spread of the COVID-19 virus. The Indian government has ordered a nationwide lockdown in an effort to encourage social distance. Schools, colleges and universities everywhere are on indefinite hiatus because of the pandemic. The entire schooling system has been called off by this. Making decisions on the educational system is fraught with difficulties for policymakers. Online learning is supplementing traditional classroom instruction. There have been many challenges for kids, educators and parents as a result of this shift in pedagogy. This abstract explores the educational repercussions of the COVID-19 pandemic. Skill development was stunted when people miss out on school and learning was disrupted due to lack of access to e- learning solutions by people of underprivileged sectors of the nation. The closing of schools, colleges and universities has an effect on students education as well as on internal and external credential evaluations. Online education has largely supplanted the more conventional classroom setting. While there is no doubt that children benefit from this innovative approach to education, there are also many problems associated with it. Everyone's first concern is the epidemic's impact on jobs. Recent graduates concerned that employers would rescind job offers due to the economy. The lockdown in India has also influenced changes in pedagogy at colleges and institutions. The chalk-and-talk method has been supplanted with modern electronic communication. While e-learning systems have made it easier to teach and learn in this context, low levels of student involvement are a major drawback. Students' learning-related

internal assessment cannot be ignored. It ought to be postponed. To prevent new graduates from experiencing a prolonged period of unemployment, new policies should be developed to facilitate their entry into the workforce. Policymakers were attempting to address the digital gap and increase student involvement. Hence long-term crisis management in the Indian education sector requires a multi-pronged approach.

ITAHAS/AB/2023/068

Fast growing tree species: A way to achieve sustainable wood production

Akhilraj T.M[1], Divya Soman[1], S.S Inamati[1] and Hanumantha. M[2]
[1]Department of Silviculture and Agroforestry
[2]Department of Forest products and Utilization
College of Forestry, Sirsi, Uttara Kannada, Karnataka

The ever-expanding human population requires a huge amount of wood, which in turn, puts intense pressure on the existing natural forest wealth of India. The production potential of trees for wood generation is restricted to about 0.7 cubic metre/hectare/year in the country as compared to the world average of 2.1 cubic metre/hectare/year, this results in a huge gap between demand and supply. As cropping land is a limited resource, expansion of farm areas is not possible. However, enhancing the efficiency of farms by planting and integrating fast-growing trees under farm forestry and agroforestry is a reasonable and realistic alternative to meet the ever-increasing demand for wood. Fast growing should be considered a relative trait which depends on the dynamic interaction of genetic characteristics, environmental conditions and management practices. The present study is on the growth and productivity of fast-growing tree species. Growth and productivity of fast-growing trees would ideally suggest the species suitability to different agroclimatic zones. Tree stand density is an important silvicultural treatment and offer a means to affect the growing conditions of trees. There is always a comparison between exotic and indigenous tree species in terms of productivity, considering the negative impact of exotic species, environmental stability and restoration of ecological balance, there is a need of developing indigenous species with growth potential to meet the various requirements. Thus, to achieve sustainable source of supply of wood, lesser known and fast-growing tree species that can provide good quality wood should be identified and need to be grown.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/069

Study on Effectiveness of 'Arka Mango Special' A Folier Micronutrient Spray for Higher Productivity and Quality of Mango in Bidar District of Kalyan Karnataka

***Ningdalli Mallikarjun[1] , Sunilkumar N.M[2], Akshaykumar[3] and Gnyandev B.[4]**

[1]Scientist (Horticulture), ICAR- Krishi Vigyan Kendra, Bidar-585402, Karnataka (India)
[2]Senior Scientist and Head, ICAR- Krishi Vigyan Kendra, Bidar-585402, Karnataka (India) [3]Scientist (Animal science), ICAR- Krishi Vigyan Kendra, Bidar-585402, Karnataka (India)
[4] Scintist (Seed Science and Technology), ICAR- Krishi Vigyan Kendra, Bidar-585402, Karnataka (India)

A front line demonstration was conducted at in the farmers field of Bidar district by ICAR- Krishi Vigyan Kendra, Bidar Karnataka , India during 2018 to 2021 to study the response of mango variety 'Keshar and Dasheri ' to 'Arka Mango Special', a foliar micronutrient formulation developed by IIHR, Bengaluru for higher and quality yields in mango. The demonstration was carried out in 15 farmer's field in an one acre of orchard a randomized block design with four treatments, viz., T1: control (sprayed with normal water), T2: Arka Mango Special @ 0.5% .Treatments were foliar sprayed four times at before flowering, flower bud differentiation, flower initiation and marble stage of fruit growth. All the three micronutrient treatments significantly improved fruit retention, yield and two important fruit quality parameters over the control. The treatment Arka Mango Special recorded the maximum values for no. of fruits/panicle at pea stage (5.04), no. of fruits/tree (192.4) and fruit yield (7.55 t/ha) was higher over the (control) farmers practice.

Key words: *Arka Mango Special, Foliar nutrition of micronutrients, Red loamy and Mango Yield.*

ITAHAS/AB/2023/070

Underutilized crops for achieving the balance between economical and ecological development in agriculture

Amit Anil Shahane
College of Agriculture (CAU, Imphal), Kyrdemkulai, Ri-Bhoi District, Meghalaya, India

The agriculture development needs to keep balance between economical and ecological aspects; hence development and utilization of different options for achieving this balance is at post important. Use of underutilized crops (UUC) is one such potential option. The utilization of UUC carries significant attention due to: 1) their capacity to meet the nutritional demand (which can be seen form nutritional status of millets as well as several tropical fruits. 2) their capacity to be utilized in improving the genetic improvement of crop and 3) their medicinal values. Among the 80,000 species of plant directly or indirectly utilized by human being, 25,000 and 7000 are edible and cultivated, respectively by humans (. Among these plants only six plants viz., rice, wheat, maize, potato, soybean and sugarcane contributes to more than 75 % to the total energy intake from plants. The under-utilized crops (UUC) includes pseudo-cereals and millets (Finger millet (*Elusine Coracana*), Foxtail millet (*Setaria italicaa*), Proso millet (*Panicum miliacium*), Little millet (*Panicum Sumatrans*), Barnyard millet (*Echinoclua crusgalli*) and Kodo millet (*Paspalum scrobiculactum*), grain Amaranthus (*Amaranthus hypochondriacus*) and buck-wheat (*Fagopyrum esculentum*)), grain legumes such as horse gram *Macrotyloma uniflorum*), grass pea (Lathyrus sativus) and Petai (*Parkia speciosa*), root and bubers such as (Mashua tuber (Tropaeolum tuberosum) and Yan bean (*Pachyrhizus erosus*), leafy vegetables such as (Chinese leak (*Allium tuberosum*) and Sparrow grass (*Asparagus officinalis*)) and fruits such as (Bayberry (*Myrica esculenta*) and Indian Jujube (*Ziziphus mauritiana*).

The significance of UUC can be explained based on ecological and economical scale; besides that their prospects and constraints in their utilization need to be highlighted. The ecological prospects are: 1) increase in diversity of cropping/ farming system thereby helps in reducing crop bounded and associated weeds, 2) Provide opportunity to mimic natural ecosystem thereby helps in brining sustainability in production system, 3) Climate resilient as grown in natural ecosystem as well as resource scare environment

of dryland and hilly region and 4) expected to have less footprint in global resources as compared with the other crops. Economic benefits includes: 1) Main produce with high market demand and suitably used for the processing value addition, 2) Export demand and domestic market demand, 3) May act as break crop catch crop there by helping in plant protection and utilize land during fallow period and 4) increase employment opportunities for rural and tribal area people as most of these crops are cultivated by tribal communities.

The prospects of UUC are defined in following ways: 1) Development of cultivation practices and input recommendation for UUC and their calibration in different cultivation zones, 2) Identification of better plant type and their genetic exploration for genetic improvement, 3) searching the possibility of UUC for processing and value addition so that they can be sold in distinct market, 4) awareness creation about the significance of UUC, 5) Characterization and isolation of different biochemical from UUC and identification of their potential uses, 6) Adding UUC in cropping/farming system under edges of diversification, 7) Policy interventions such as seed/planting material development, creation of gene/ biotype collection garden at different location for their conservation, 8) Identification of biotic stresses and developing management strategy for their management and 9) Identifying the potential area acorrs the country for their commercial cultivation. In this regards, identification and utilization of under-utilized crops will be a sustainable practice provided that, scientific and technical knowledge generation, awareness creation and market orientation need to be taken care off. Their large scale cultivation across the conventional and non-conventional region/area will provide marketable surplus to catch the international market demands.

ITAHAS/AB/2023/071

Traditional Fishing Gears and Crafts of Dumboor Lake of Tripura, India

Anand Vaishnav[1*], Shivbhajan[1], Jham Lal[2], Payel Debbarma[1], N. Suresh Chandra Singh[1], Bikash Kumar Pati[1], Kumar and Prashanta Mahanta[1]

[1]Department of Fish Processing Technology & Engineering, Central Agricultural University (Imphal), Lembucherra, Tripura

[2]Department of Aquaculture, Central Agricultural University (Imphal), Lembucherra, Tripura

The livelihood of the fisher-folk community in Tripura largely depends on fishing. Fishing using traditional gear and craft is an ancient practice of the people of Tripura. Current fishing techniques, gear, and crafts are tools of knowledge and experience that the fishing community inherited from its ancestors. Documentation of these practices and equipment is important for their development on a scientific basis as well as for the betterment of the fishing community. Therefore, an attempt has been made to study the current fishing practices, fishing gears and crafts, design, structures and operations in Dumboor Lake of Tripura, which is the largest lake in the state. There are three different types of fishing equipment being used in Dumboor Lake water body. These include fishing nets, hooks, spears and nets as well as traditional fishing boats and methods used. During the study period, three different types of traditional wooden crafts, Chhoto Kusa, Bara Dingi and Saranga were being used by the fishermen for fishing. Most of the fishing crafts were built using locally available wooden materials and fishing without gear, methods of sedation, poisoning, using spit and using cast nets were also being practiced. Indiscriminate fishing, breeding season fishing, poisoning and fishing with small mesh size gillnets are some of the illegal fishing practices in Dumboor Lake. These are a potential threat to the fish biodiversity of in Dumboor Lake and hence should be completely banned.

Keyword: *Fishing gears, Hook, Spear, Trap, Saranga, Traditional fishing boat, Dingi.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/072

Cell-Based Seafood: A Novel Approach to Seafood Production

Anand Vaishnav*, Naresh Kumar Mehta, M. Bhargavi Priyadarshini, Payel Debbarma, Shivbhajan, and N. Suresh Chandra Singh
Department of Fish Processing Technology & Engineering, College of Fisheries, Central Agricultural University (Imphal), Lembucherra, Tripura

Cellular aquaculture is defined as the production of fish and fish products from cell cultures rather than from whole fish. The idea of producing seafood from fish cell- and tissue-cultures is emerging as a means to address similar challenges with industrial aquaculture systems and marine capture, as there is growing interest in cellular seafood production as a means to address public health, aquatic environmental and animal welfare challenges of aquaculture. As contrast to seafood derived from animals, cell-based seafood can include recent advancements in biomedical engineering and contemporary aquaculture methods. The framework for the large-scale synthesis of marine animal cells is provided by advances in biomedical engineering, such as the creation of terrestrial animal cells in closed-system bioreactors. Techniques used in aquaculture, including as genetic engineering and closed-loop aquaculture, have significantly increased production, opening the door for advancements in the cell-based seafood industry. Seafood made from cells that comes from various species, as well as the unique potential and obstacles that exist for developing research in this area. Cell-based seafood research will require greater knowledge of how to cultivate fish muscle cells and tissues, more study into serum-free medium formulations that are best for fish cell growth, and bioreactor designs that are tailored to the requirements of fish cells for large-scale production.

Keywords: *Cellular aquaculture, genetic engineering, serum, synthesis, seafood.*

ITAHAS/AB/2023/073

Response of spring greengram cultivars to (*Vigna radiata* L.) integrated nutrient management in Bundelkhand region of Uttar Pradesh

Ankit Tiwari,[1] A.K Tripathi[2], Jgannath Pathak[3], Gaurav Shukla[4], and Aditya Shukla[5] and Shivam Singh[6]

[1],and [5]Department of Agronomy, [6]Department of Soil Science and Agricultural Chemistry Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram Meerut Uttar Pradesh-250110

[2]Department of Agronomy, [3]Department of Soil Science and Agricultural Chemistry and [4]Department of Statistics and Computer Science, Banda University of Agriculture and Technology Banda, Uttar Pradesh

A field experiment was conducted to study the effect of integrated nutrient management on growth and yield of *spring* mungbean (*Vigna radiata* (L.) Wilczek) cultivars in Bundelkhand region of Uttar Pradesh during season of 2019 at Banda University of Agriculture and Technology, Banda (Uttar Pradesh). The experiment was laid out in asymmetrical factorial randomized block design with 6 treatment combinations of integrated nutrient management practices with 2 varieties. Results revealed that cultivar "Shikha" suits to be the better over "Samrat" in respect of growth, yield attributes, seed yield and economics. Additionally, INM practices had better effect on growth, yield attributes compared to sole application of inorganic fertilizers and vermicompost treatments. 100% RDF + 100% vermicompost had highest seed yield (771kg/ha), closely followed by 75% RDF + 50% vermicompost (741 kg/ha) compared to rest of treatments. Among the INM treatments, application of 50% RDF blended with 50% vermicompost recorded at par values of growth, yield attributes and seed yield over the application of 100% RDF + 100% vermicompost and 75% RDF + 50% vermicompost. On an average, INM treatments noted 69.89, 14.07 and 43.39% higher net returns as well as 68.92, 21.2 and 51.57% more benefit: cost ratio over the control, 100% RDF and 100% vermicompost, respectively. Therefore, application of 50% RDF + 50% vermicompost (1.25 t/ha) was optimum under the existing condition of Bundelkhand.

***Keywords**: Mungbean, Integrated nutrient management, Yield and Economics.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/074

Designing aspect of Barnyard millet Dehusker

Annu[1], Umesh Chandra Lohani[2], Navin Chandra Shahi[3],
[1] Research Scholar, [2] Junior Research Officer, [3] Professor, Department of Post-Harvest Process and Food Engineering, G.B. Pant University of Agriculture and Technology, Pantnagar, India

Barnyard millet species under genus Echinochloa, E. frumentacea (Indian barnyard millet) and E. esculenta (Japanese barnyard millet) are cultivated for food and fodder by hilly and tribal communities in Asia, particularly in India, China, and Japan. It is sometimes referred to as "poor people's crops" and "billion dollar grass" as it is superior in nutrients, crop's resilience, and the fact that farmers and poor people consume millet in larger proportions. Traditionally, at the household level, barnyard millet is consumed by making porridge or kheer, cheela, dosa and khichidi etc. Despite being a powerhouse of nutrients, its utilization is limited to the household level and is considered an underutilized crop, because it is very challenging to dehusk the millet because of the multilayer of husk. Moreover, the grain is so soft and friable that it is very difficult to remove the husk and bran layer without crushing the inside. Different type dehusker were developed based on different principles like centrifugal and abrasion alone and unable to give good dehusking efficiency with less number of broken percentage in a single number of passes. Considering the aforementioned facts, a fully mechanized barnyard millet dehusker based on the principle of impact and abrasion combined can give a good dehusking efficiency with less broken percentage. The impact can be used to lose the layers of husk, and abrasion among the grains and between the screen and roller can effectively dehusk the millet without damaging the grain inside

Keywords*: Millets, Dehusking, Imapct, Abrasion.*

ITAHAS/AB/2023/075

Effect of Integrated Nutrient Management on Growth, Yield and Quality of French bean (*Phaseolus vulgaris* L.)

Ansaba V.*[1] and S. K. Dash[2]

[1]PhD Scholar, Department of Vegetable Science, College of Agriculture, Vellanikkara, Kerala Agricultural University, Thrissur, Kerala – 680656

[2] Vegetable Agronomist, AICRP on Vegetable crops, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha – 751003

Integrated Nutrient Management (INM) approach for crop production is gaining momentum, since it is economically cheap, technically sound and practically feasible; it paves way for sustainable agriculture. The basic concept of integrated nutrient management system is the maintenance of plant nutrients supply to achieve a given level of crop production by optimizing the benefits from all possible sources of plant nutrients in an integrated manner, appropriate to each cropping and farming system. In this scenario, the present investigation was carried out under agro climatic conditions of Bhubaneswar, Odisha during *Rabi* season. The experiment was laid out in Randomized Block Design (RBD) with eight treatments and three replications. The eight treatment schedules were T_1 (100% NPK through inorganic source), T_2 (75% NPK through inorganic source + 25% N through FYM), T_3 (75% NPK through inorganic source + 25% N through vermicompost), T_4 (50% NPK through inorganic source + 50% N through FYM), T_5 (50% NPK through inorganic source + 50% N through vermicompost), T_6 (25% NPK through inorganic source + 75% N through FYM), T_7 (25% NPK through inorganic source + 75% N through vermicompost) and T_8 (control, no fertilizer). All the recommended package of practices except nutrient management was given uniformly to all the treatments to raise a good crop. The results revealed that, application of 75% NPK through inorganic source along with 25% N through vermicompost (T_3) recorded significantly higher growth parameters viz., plant height (47 cm), number of primary branches (5.53) and leaf area (169.55 cm^2); yield and yield attributing parameters *viz*., fruit length (13.58 cm), fruit girth (1.17 cm), average fruit weight (6.45 g), number of pods per plant (23.95) and pod yield (0.207 kg $plant^{-1}$, 7.93 kg $plot^{-1}$ and 97.89 q ha^{-1}); quality parameters *viz*., TSS (6.33 ^{0}Brix), protein content (6.82%) and total sugar (2.75%). The next best treatment was T_2, where 75% NPK through inorganic source along with 25% N through FYM was applied.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/076

Effect of different spacing and irrigation regimes on nutrient uptake of spring's baby corn

Anu*[1], Shweta[1], Karmal Singh[1], Dinesh[2] and Arun[1]
Ph.D. Scholar*
[1]Department of Agronomy*, [2]Department of Soil Sciences
CCS, Haryana Agricultural University, Hisar-125004 (Haryana), India

A field experiment was conducted in Spring season of 2019 at Hisar, Haryana to investigate the effect of different spacing and irrigation regimes on nutrient uptake of spring's baby corn (*Zea mays* L.). The experiment was laid out in split-plot design with four irrigation treatments viz. one irrigation - 6 leaf stage, two irrigation - 6 leaf and knee high stage, two irrigation - knee high and pre-tasselling stage and three irrigation - 6 leaf, knee high and pre-tasselling stage in main plots and four spacing treatments viz. 60 × 20 cm, 60 × 15 cm, 45 × 20 cm and 45 × 15 cm in sub-plots. The results showed significantly highest nutrient uptake in three irrigation – 6 leaf, knee high and pre-tasselling stage. In case of spacing treatments, 45 × 15 cm recorded higher growth parameters i.e. plant height, dry matter accumulation and LAI. Yield attributes i.e. cob girth, length and weight was observed higher in 60 × 20 cm spacing treatment and yield was recorded maximum in 45 × 15 cm. The highest gross returns, net returns and benefit cost ratio was recorded higher in 45 × 15 cm spacing.

Keywords*: Baby corn, spacing, irrigation, yield.*

ITAHAS/AB/2023/077

Study on the optimization of nutrient media for the growth of Propionibacterium sp. for effective production of Natural Propionic acid and Salts from Black wheat-based glucose and preparation of natural preservative against food spoilage mold infections

Anusha Manikonda[1], MVSS Sairam[2] and Abhishek Mathur[3]

[1,2]Research Scholar, CMJ University, Shillong, Meghalaya and Chief Technical Officer, Prathista Industries Limited, Telangana

[1]Reserach & Development, Prathista Industries Limited, Telangana State, Choutuppal, India

In today's times, there is a high need of natural agents which can control contamination and inhibition of growth of pathogenic strains causing infections in food products, whether the same are harvested from fields or cooked for consumption. With the increasing demand of such agents and preservatives, the people get prone towards different chemical agents conventionally available in the market. With the tremendous usage, the results of such chemical usage is also generating disaster by causing several health issues and availability of chemical residues in the environment for many years. The present study is the strengthen activity for production of NATURAL PROPIONIC ACID AND SALTS and its application in preservation of food and bakery products. The attempt was done to optimize the natural medium composition for the growth of Propionibacterium sp for production of propionic acid and salts via submerged fermentation in significant concentration and further producing the finished product in powder form for the studies in bakery to study the preservation potential and shelf life/stability studies of the bakery products. The results of the study were quite interesting as the Natural Propionic acid in comparison to conventional chemical gents enhances the shelf life to 21 days of bakery products and controls the mold infections to a significant extent.

Key words:*" Black wheat, glucose, Natural propionic acid, fermentation, biological agents, mold infections, bakery and food products, shelf life.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/078

In vitro conservation through growth retardants and molecular assessment of genetic fidelity using ISSR marker in Banana cv. Nanjanagud Rasabale

Anusha[1], Kulapati Hipparagi[2], Prabhuling Guranna[3], Rekha Bheemappa Chittapur[4], Sateesh Pattepur[5] and Huchesh C. Hoolgeri[6]

[1,2&3]Department of Fruit Science, College of Horticulture, UHS, Bagalkot, Karnataka
[3,4&6]Department of Biotechnology and Crop Improvement, COH, UHS, Bagalkot, Karnataka, India

Nanjanagud Rasabale (AAB, Silk subgroup) once leading cultivar of Mysore district, Karnataka, India is now failed to revive its GI (Geographical Indication) tag, the major bane of cultivar is highly susceptibility to Fusarium wilt. Hence, there is need for conservation of this elite cultivar from threat of extinction. Plant germplasm can be conserved by different approaches one of the valuable biotechnological approaches is *in vitro* conservation. *In vitro* studies were undertaken to come out with effective protocol of conserving plantlets through slow growth process by adding different growth retardants. Growth retardants such as ancymidol, paclobutrazol, abscisic acid, DMSO at three different concentration each were supplemented to media. Among different treatment combinations MS medium containing DMSO 2.25 ml/l was found to be most effective by prolonging the period of successive subculturing (154.53 days) and enabled mid to long term conservation of plants. The conserved cultures were regenerated using standardized media containing MS B + 4 mg/l BAP + 0.5 mg/l NAA. Growth was retrieved successfully with normal morphology. All the 15 ISSR primers amplified unambiguous indicating monomorphic bands with 100 % monomorphism. In general, the cultures were conserved by extending the sub culture period and prolonged storage period without any genetic variation by using growth retardants.

ITAHAS/AB/2023/079

Impact of pre-harvest application of plant bio-regulators and micronutrient on fruit retention, yield and quality of mango (*Mangifera Indica* L)

Anushi and Dr. V. K. Tripathi
Department of Fruit Science,
C.S. Azad University of Agriculture and Technology, Kanpur -208 002(U.P.), India

To investigate the effect of pre-harvest application of GA_3, Naphthalene acetic acid and zinc sulphate on fruit retention, yield and quality of Mango cv. Dashehari, an experiment was carried out in the Garden, Department of Fruit Science, C. S. Azad University of Agriculture and Technology, Kanpur (U.P.) during the cropping season 2021. The experiment was laid out in Randomized Block Design (RBD) with three replication and ten treatments *viz.*, GA_3 @ 20 ppm (T_1), GA_3 @ 40 ppm (T_2), GA_3 @ 60 ppm (T_3), NAA @ 20 ppm (T_4), NAA @ 30 ppm (T_5), NAA @ 40 ppm (T_6), $ZnSO_4$ @ 0.5% (T_7), $ZnSO_4$ @ 1.0% (T_8), $ZnSO_4$ @ 1.5% (T_9) including a control or water spray (T_{10}). Spraying of plant bio-regulators and micronutrient was done at pea stage of fruits set on Ist March, 2021.

From the results obtained during present experimentation, it is reported that pre-harvest spraying of GA_3 at 20 ppm results significant decrease in fruit drop (83.37%) with increase in fruit retention (16.63 %) and number of fruits per panicle (6.03). Plants sprayed with the GA_3 at 40 ppm results significantly more fruit yield (50.13 kg/tree) of fruits having more polar (9.66 cm) and equatorial diameter (7.96 cm), more pulp (72.55%) with decrease in peel (17.96%) and stone per cent (09.49 %). Increased fruit weight (242.88 g), volume (258.02 cc), specific gravity (1.08 g/cc), pulp: stone ratio (5.22), total soluble solids (18.86 ^{0}Brix), total sugars (17.89 %), ascorbic acid (37.91 mg/100g) were also found with the pre-harvest spraying of GA_3 at 60 ppm, whereas titratable acidity (0.51 %) contents in the fruits ware drastically reduced under this treatment.

Keywords*: Mango, Dashehari, Gibberellic acid, NAA, Zinc Sulphate, Fruit drop, fruit retention, Yield and Quality.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/080

Adapting to a Warming World: The Effects of Climate Change on Horticultural Crops

Appani Laxman Kumar[1], Dulam Shivaraj[2], Bheemireddy Anuradha[3], G. Chandra Sekhar[4], P. Tanuja[5], B. Anitha[6] and Rasheeba Iqbal[7]

[1,4,5,6 & 7]Assistant Professor, Malla reddy University, School of Agricultural Sciences, Maisammaguda, Hyderaba,

[2]Ph.D Scholar, Department of Vegetable Science, COH Rajendranagar , SKLTSHU, Mulugu, Siddipet, Telangana, India.

[3]Ph.D Scholar, Department of Vegetable Science, COH-Rajendranagar, SKLTSHU, Mulugu, Siddipet, Telangana, India.

In current years impact of climate change is alarming the world due to rise in temperature and increase in emission of greenhouse gases which indirectly affects the yield and post-harvest quality of horticulture crops such as rise in sugars, organic acids, flavonoids and antioxidant capacity, disease severity and ascorbic acid content of the produce. Hence, to maintain the sustainability of crops need to cut down the effect of climate on horticultural crops by various hi-tech horticulture and management methods. At elevated levels of global warming, estimated monetary impacts generally become negative and studies allowing for disastrous possibilities can reach high negative outcomes. The aim of this study is to take a snapshot how quality of different horticulture crops is affected by the climate change.

Keywords*: Climate change, Temperature, Greenhouse gases, Horticulture crops, Global Warming.*

ITAHAS/AB/2023/081

Functional Genomics for Drought and Heat Tolerance in Wheat

Arti[1] and Arpita Sharma[2*]

[1]Ph. D. Scholar, School of Agricultural Sciences, G.D. Goenka University, Sohna Road, Gurugram, Haryana

[2*]Assistant Professor, School of Agricultural Sciences, G.D. Goenka University, Sohna Road, Gurugram, Haryana

Abiotic stress drastically mitigates crop productivity on a global level, culminating in substantial reductions in yield. Under the current and future scenarios of climate change, water scarcity (Drought) and high temperature (Heat stress) are the two main environmental stress. Wheat, the third-largest grain crop, provides a predominant source of food for 60% of the world's population. Wheat output was mostly impacted by drought and heat stress on plants' root and shoot systems. Gene expression patterns, quantitative trait loci (QTL) mapping techniques, and molecular markers are all employed in developing wheat genotypes resistant to heat and drought. A number of wheat genes that are responsible for drought stress tolerance produce various enzymes and proteins, including late embryogenesis abundant (LEA), DREB (dehydration responsive element binding), ZFP (zinc finger proteins), WRKY, responsive to abscisic acid (Rab), rubisco, helicase, proline, glutathione-S-transferase (GST), Ascorbate peroxidase (APX), Superoxidase, and carbohydrates. Despite the importance of root characteristics in drought and heat tolerance, little effort has been made to include stress-adaptive root traits in breeding stress-tolerant wheat types. Many quantitative aspects have been utilized to explain the root system of wheat, also referred to as root system architecture (RSA). Architecture features include root number and length, tip and emergence angles, rooting width and depth, convex hull area, and root mass centre. Thus, current research has focused on root characteristics that improve the efficient deployment of tissues for foraging soil water and, more especially, the maintenance of productivity under water scarcity. Knowledge of heat and drought tolerance at physiological, biochemical, and morphological levels is crucial for creating new wheat varieties by breeders that can cope with variations in the climate.

Keywords: *Drought stress, Heat Stress, Root System architecture (RSA), Quantitative trait loci (QTL).*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/082

Seasonal incidence and population dynamics of Yellow Mite, *Polyphagotarsonemus latus* (Banks) (Acari: Tarsonemidae) on Mulberry

Arun Kumar K. M
Assistant Professor, School of Agricultural Sciences, Malla Reddy University, Hyderabad

The Seasonal incidence and population dynamics of yellow mite on mulberry crop was studied by simultaneous recording of mites' population fluctuation on twenty popular mulberry varieties at monthly intervals from December 2019 to March 2021 (16 intervals). Mite population (eggs + active stages) recorded from the top five leaves of twenty varieties was expressed as the mean number per cm^2 leaf area. Yellow mites remained active throughout the year on all the mulberry varieties including the most popular variety V -1. The lowest mean population of 26.87 mites/cm2 leaf area was recorded during December 2019 (24.28 mites recorded during December 2020) gradually increased up to March 2020 (85.83 mites) and declined further to record a low of 64.53mites during May 2020, which improved further to record the highest peak of 117.33 mites/ cm 2 area by August 2020. From September 2020 onwards, the mite population followed a downward trend up to December 2020 (from 102.90 to 24.78 mites). Further, as observed in the previous year, the mite activity improved gradually (from 42.41 to 69.61 mites) up to March 2021. The population fluctuation of yellow mite on mulberry was not significantly influenced by the ambient weather conditions. However, the buildup of mite population showed positive relationship with atmospheric temperatures, bright sunshine period & rainfall and negative relationship with relative humidities & amp; wind speed. Yellow mites remained active throughout the year on all the 20 popular mulberry varieties studied; mite population reached peak during the month of August, 2020 and a lower population during the month of December, 2020.

Keywords: yellow mite, seasonal incidence, population dynamics, peak.

ITAHAS/AB/2023/083

Evaluation of antagonistic properties of native rhizobacteria and characterization of potent isolates against *Rhizoctonia solani* Kuhn

Arvind M[1*], Thippesha B. S.[1], Prashanthi S. K.[1], Hiremath S. V.[1] and Jones P. Nirmalnath[2]

[1]Department of Plant Pathology, University of AgriculturalSciences, Dharwad, Karnataka, India

[2]Department of Agricultural Microbiology, University of Agricultural Sciences, Dharwad, Karnataka, India

Sheath blight of rice caused by *Rhizoctonia solani* Kuhn is the second most destructive fungal disease of rice after blast. The disease is mostly controlled by chemicals which have a devastating impact on the environment. In the recent years, utilization of native antagonists has proved to be the most economical and eco-friendly method that can replace chemicals and promote sustained crop yield. With this view, a total of 32 native rhizobacteria consisting of 30 actinobacteria and 2 fluorescent bacteria were isolated from different rice growing regions of Karnataka and evaluated against *R. solani* isolate RS4 under *in vitro* and *in vivo* conditions. The actinobacterial isolates, GVTAM 8, DWRAM 10 and AUDT 502 (reference strain), were found to be most effective in *in vitro* studies. The effective isolates identified were further evaluated under glasshouse condition singly and in combination to cross-check its biocontrol potential as well as plant growth promotional activities. Among the different treatments used, the seed treatment followed by spraying with GVTAM 8 and AUDT 502 was most successful in controlling the disease and also improved the plant yield. The potent isolates, GVTAM 8 and DWRAM 10 were identified as *Streptomyces cinnabarinus* and *Streptomyces pseudogriseolus*, respectively during molecular characterization. The biocontrol and plant growth promotion activity of these actinobacteria makes it a suitable candidate for inclusion in disease management programs thereby, avoiding the complete dependency on the chemical for the management of sheath blight disease.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/084

Characterization of specialty type sorghum grains for morphological traits

A. M. Ashok Priyadarshan*[1] and G. M. Sajjanar[2]
[1]Ph.D. Scholar, Department of Plant Biotechnology, University of Agricultural Sciences, GKVK, Bangalore, [2]Principal Scientist, All India Coordinated Research Project on Sorghum, Regional Agricultural Research Station,Vijayapur, University of Agricultural Sciences, Dharwad and

Sorghum [*Sorghum bicolor* (L.) Moench] is one of the most important cereal crops in the world because of its adaptation to a wide range of ecological conditions, suitability for low input cultivation and diverse uses. Sorghum grains could be cooked like rice, cracked, ground, flaked or steamed. Sugar syrup could be made out of sweet sorghum. Sorghum is also used in preparation of alcoholic beverages. In the present study, sorghum grains of three specialty *Rabi* varieties identified for value addition *viz.*, AKJ-1 (flaking), SMJ-1 (hurda making) and KMJ-1 (popping) were characterized in detail along with M 35-1 for morphological traits using seed image analyzer. 100 seeds of each variety were used for the analysis. The results showed different seed colurs including red (AKJ-1), white (KMJ-1), light brown (SMJ-1) and creamy (M 35-1). The seed morphometric analysis revealed that M 35-1 had the largest grain size with 5.94mm length, 4.43mm width, 5.04mm diameter and 20.55sq.mm area where as SMJ-1 was the smallest in size with 3.96mm length, 3.51mm width, 3.54mm diameter and 11.21sq.mm area. Seeds of AKJ-1, KMJ-1 and M 35-1 were very lustrous but the seeds of SMJ-1 were dull.

Keywords*: grain sorghum, specialty type sorghum, morphological traits.*

ITAHAS/AB/2023/085

Combined effect of conventional fertilizers and bio inoculants on growth, productivity and economics of Chickpea (*Cicer arietinum* L.) under central Telangana zone

Banavath Mahesh Naik, Varsha N , Nalla Divya, A Mamatha, D Mrudula, K Vamshi Krishna and B Ramya

[1]Department of Agronomy, Malla Reddy University, Hyderabad 500100, Telangana, India.

Chickpea (*Cicer arietinum* L.) is one the major legume cultivated crop of *rabi* season in India and the third most important crop in the world. Legumes play a crucial role on nitrogen cycling by the symbiotic nitrogen fixation. Current agricultural practices mainly rely on chemical fertilizers and pesticides to increase productivity and nutritional security after green revolution. Evidently, these practices enhanced crop yields but at the same cost calamitous deprivation of natural resources and become a matter of great concern for many people in the world from past few decades. In anxiety, over these problems in sustainability of agriculture and environment provoked to revaluate the modern chemical farming systems and seek appropriate alternative agronomic practices to ensure more sustainable food production and environment maintenance. In addition, organic matter content shows decline trend over the decades in India. Under present conditions, sustainability cannot be achieved without the intervention of the soil microbiome, which serves as an indispensable part of the rhizosphere. With this concern, study was conducted during *rabi* 2022-23 at SOAS, Malla reddy university, with following randomized block design and replicated thrice. The treatments were T_1 -100% Recommended dose of nutrients; T_2-100% Recommended dose of phosphorous and potassium; T_3 -150% Recommended dose of nutrients; T_4 -150% Recommended dose of phosphorous and potassium; T_5 - 100% Recommended dose of nutrient + Rhizobium inoculation; T_6 - 100% Recommended dose of phosphorous and potassium + Rhizobium inoculation; T_7 - 150% Recommended dose of nutrients + Rhizobium inoculation; T_8 - 150% Recommended dose of phosphorous and potassium + Rhizobium inoculation; T_9 -Rhizobium inoculation; T_{10} - Absolute control. Based on results, more dry matter production, nodulation and seed yield (22.8 q ha^{-1}) was observed with T_5 treatment. Similarly, more economics (Net returns- Rs.

84388 and B:C ratio- 2.90) was found to be better with application of 100% Recommended dose of nutrient + Rhizobium inoculation. Thus, adoption of 100% Recommended dose of nutrient + Rhizobium inoculation gives sustainable productivity and better economics.

ITAHAS/AB/2023/086

Recent Approaches in Agricultural Extension

Battu Preethi*[1] and G. K. Sasane[2]

[1]PhD Scholar, Dept. of Agricultural Extension and Communication, Post Graduate Institute, MPKV, Rahuri

[2]Professor, Dept. of Agricultural Extension and Communication, Post Graduate Institute, MPKV, Rahuri

Extension education and approaches have undergone through a significant change to take equal feet with scientific knowledge and technology generation. There is a shift from production, productivity to income and marketing efficiency, Pedagogic education system to the job vocational training, top-down approach to decentralized bottom-up approach, from resource exploitation to sustainable agricultural practices. The present approaches to extension are as follows. First is the Farming system approach (FSA), this is an integrated set of activities that farmers perform in their farms under their resources and circumstances to maximize the productivity and net income on sustainable basis. This approach is a problem-solving approach, learning by doing approach, participatory and bottom-up planning. Next is Pluralistic extension approach. To provide quality and timely agricultural services, sharing the burden of extension service delivery by multiple players could be helpful. Another approach is Farmer-led Extension and Market-led extension. Many innovations are taking place in farmers' fields which are untapped. These farmers led innovations need to be addressed and documented and during project formulation and implementation stage, there is a need for farmers participation at every stage. To achieve the marketed surplus, marketing efficiency and profit, the extension has shifted its role from seed-to-seed approach to rupee-to-rupee approach. One more approach is Farmer Field School (FFS). FFS, a group of 20-25 farmers meets once in a local field setting and under the guidance of the trained facilitator. The learning by doing approach promotes farm –based experimentation, group organization and decision making, thereby increasing the likelihood that farmers will eventually own and adopt improved practices. The Farmer Producer Organizations approach ensure a bargaining edge and also reduce cost of cultivation, processing, value addition, marketing. Another approach is eNam, a portal which provides a single window service for all APMC related

information and services. Para Professionalism approach is where the agents get some preliminary amount of training in a particular subject to perform basic function needed in that area. Cyber extension, ICT based extension and climate smart extension approaches are also followed in recent trends. With the help of the continuous addition of knowledge of farmers, extension workers and scientists there are significant changes in the approaches made by the extension system for betterment of the farming community.

Keywords*: Farming system approach, Market-led extension, Farmer Field School, Pluralistic extension, ICT based extension, Climate smart extension.*

ITAHAS/AB/2023/087

Effect of integrated nutrient management on production, productivity and economics of chickpea (Cicer arietinum L) in central plain zone of U.P

S. K. Singh[1], Ajai Singh[1], R. B. Singh[2], R. Pyare[2], S. Sharma[3], Bhayankar[4] and H. V. Dubey[2]

[1]Faculty of Agricultural Science and Allied Industries, Rama U, Mandhana, Kanpur, Uttar Pradesh

[2]Department of Vegetable Science C.S.A.U.A. & T. Kanpur, Uttar Pradesh

[3]Department of Soil Science and Agri Chemistry C.S.A.U.A. & T. Kanpur, Uttar Pradesh

[4]Department of Agronomy C.S.A.U.A. & T. Kanpur, Uttar Pradesh

A field experiment was conducted during Rabi, 2018-19 at Agricultural Research Farm of faculty of Agricultural Science and Allied industries Rama University, Mandhana, Kanpur (U.P.). The treatment comprised 8 integrated nutrient management practices viz., T1- Control, T2- Formers Practices (50 kg DAP/ha), T3- RDF (20:60:20), T4- FYM @ 10 t/ha, T5- Vermicompost @ 5 t/ha, T6- 75% RDF + FYM @ 2.5 t/ha+ Vermicompost @1.0 t/ha, T7- 50% RDF + FYM @ 5 t/ha+ vermicompost @ 2.5 t/ha and T8- 25% RDF + FYM @ 10t/ha + vermicompost @ 5 t/ha were tried in RBD (Randomized Block Design) with three replications. The results showed that the application of 75% RDF + FYM @ 2.5 t/ha + vermicompost @ 1.0 t/ha integrated nutrient management practices was recorded highest growth attributes viz., plant height, number of primary and secondary branches, dry matter production as well as yield attributes viz., number pod/plant (g), No. of seed/plant and test weight as compared to control plot. Variety KGD-1168 performed better and high yielded 30.67 q/ha, grain yield Rs. 1,00,506/ha net return against 11.92 q/ha grain Yield," Rs 19,307/ha net return with the application of 75% RDF + FYM @ 2.5 T/ha+ Vermicompost@1.0 t/ha. Over all on the basis of experimentation in applied of 75% RDF + FYM @ 2.5 t/ha + vermicompost @ 1.0 t/ha was higher received net return due to reason of higher production and productivity of chickpea with KGD- 1168 variety in central plain zone of Uttar Pradesh.

Response of nutrient management and bio-fertilizer for enhancing growth and yield of mustard (Brassica juncea L)

Rahul Kumar[1], Ram Pyare[1], Bhayankar[1], G Singh[1], SC Maurya[1] and Abhishek Raj Ranjan[2], Deepak Kumar[3]

[1]Department of Agronomy, C.S.A.U.A. & T. Kanpur, 208002 Uttar Pradesh
[2]Department of Agronomy ANDUAT Kumarganj Ayodhya (224229)
[3]Department of Agronomy, Dr. R P C A U, Pusa –848125, Samastipur, Bihar

The present study was conducted during Rabi season of 2021-22 at the Student Instructional Farm of Chandra Shekhar Azad University Agriculture & Technology, Kanpur, Uttar Pradesh with the objectives to find out suitable fertilizer dose with bio-fertilizer on growth and yield of mustard crop. The experiment was laid out in a Factorial Randomized Block Design with three replication. The experiment was comprised of sixteen treatment combinations in which four levels of nutrient management viz., Control, 75% RDF, 100% RDF, 125% RDF and four bio-fertilizer viz., Control, Azotobacter @10 ml kg-1 seed, PSB @10 ml kg-1 seed, Azotobacter @5 ml + PSB @5 ml kg-1 seed. The result showed that among the different recommended dose of fertilizers, applied of 125% RDF gave significantly better growth attributes, yield attributes and yields in compared to control, 75% and 100% RDF, respectively. The percentage increment of 125% RDF over no nutrients supply, 75% RDF and 100% RDF were 38.51%, 19.75% and 10.95% in respect of grain yield, 38.98%, 16.84% and 9.38% in stover yield, 35.16%, 17.60 and 9.80% in biological yield and 2.38%, 1.73% and 9.80% in harvest index, respectively. Among the different levels of bio-fertilizers, application of Azotobacter @5 ml + PSB @5 ml kg-1 seed gave significantly higher growth attributes, yield attributes and yields in compare to all rest, respectively. The increment evaluated in grain yield (24.27, 14.62 and 7.29%), straw yield (25.80, 12.81 and 6.42%) in biological yield (26.74, 13.31 and 6.62%) and in harvest index (1.93, 1.09 and 0.60%) over control, Azotobacter @10 ml kg-1 and PSB @10 ml kg-1 seed, respectively. Therefore, higher growth attributes, yield attributes and yields of Indian mustard were achieved by application of 125% recommended dose of fertilizer and inoculation with Azotobacter @5 ml + PSB @5 ml kg-1 seed over rest treatment, respectively.

ITAHAS/AB/2023/089

SWOT Analysis of the business of Baalmithai in Almora District of Uttarakhand.

Bhumika Giri Goswami and H.N. Singh
Department of Agricultural Economics
GBPUAT, Pantnagar, Udham Singh Nagar, Uttarakhand

The district of Almora in the state of Uttarakhand is mainly a beautiful hill station, with lot of scenic spots and religious places which is often visited by many tourists of national and international origin. The city of Almora is also very famous for its locally produced sweet which is named as Baalmithai. The sweet delicacy is prepared by roasting pure khoya or mawa (a processed form of milk), so due to its popularity, the demand of this sweet is very high which opens up new door of opportunities in the business of this delicious sweet. In the backdrop of these facts, SWOT (Strength, Weakness, Opportunities and Threat) analysis of the famous baalmithai sweet shop was done as this type of analysis is important for strategic planning of the business. The SWOT analysis of this kind of business also enlightens other persons or institutions in the path of entrepreneurship thus adding on to socio economic development of the state.

Keywords*: Baalmithai, Khoya, Business, SWOT Analysis.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/090

Hybrid vigour and inbreeding depression for yield and yield attributing traits in bottle gourd (*Lagenaria siceraria* (Mol.) Standl)

B. Chandra Mouli and G. Nissi Flora
Teaching Associate, SKPP Horticultural Polytechnic, Dr. Y.S.R. Horticultural University, Andhra Pradesh, India

An investigation was carried out to study the extent of heterosis and inbreeding depression through generation mean analysis (P_1, P_2, F_1, F_2, BC_1 and BC_2) of four crosses (Pusa Naveen x Local Round, Pusa Naveen x Pusa Santhusti, Pusa Sandesh x Punjab Bahar and Pusa Sandesh x Arka Bahar) in bottle gourd (*Lagenaria siceraria* (Mol.) Standl.) for yield and yield attributing characters *viz*., node number at which first female flower appeared, node number at which first male flower appeared, sex ratio (%), fruit length (cm), fruit diameter (cm), fruit yield per vine (kg), number of seeds per fruit, vitamin-C (mg $100g^{-1}$) and total sugars (%). Relative heterosis and heterobeltiosis were found significant and negative for node number at which first female flower appeared, node number at which first male flower appeared, fruit diameter and vitamin-C content for most of the crosses. Significant positive relative heterosis and heterobeltiosis were observed for fruit length, fruit yield per vine, number of seeds per fruit and total sugar content for majority of the crosses. Significant heterosis coupled with significant inbreeding depression was observed for most of the characters in majority of the crosses indicated non-additive gene action in the inheritance of these traits. The cross, Pusa Naveen x Pusa Santhusti exhibited significant negative heterosis followed by negative inbreeding depression for some economically important characters like fruit yield per vine indicating transgressive segregation in F_2 generation and thus this cross can be utilized for development of pure lines.

Keywords: *Heterosis, Inbreeding depression, Gene action and Bottle gourd.*

ITAHAS/AB/2023/091

Production of microgreen plant through Soilless culture

Avinash Sharma[1*], Mainu Hazarika[1], Punabati Heisnam[2], Himanshu Pandey[3], V. S. Devadas[4], Munnu Wangsu[5] and Bhagya D. Kartha[6]

[1*]School of Agricultural Sciences, Arunachal University of Studies, Namsai, Arunachal Pradesh

[2]College of Horticulture & Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh

[3]PG Department of Agriculture, Khalsa College, Amritsar, Punjab

[4]Vanavarayar Institute of Agriculture, Pollachi, Tamil Nadu

[5]Department of Agricultural Engineering, North Eastern Regional Institute of Science and Technology, Nirjuli, Arunachal Pradesh

[6]Department of Fruit Crops, College of Agriculture, Kerala Agricultural University, Thrissur, Kerala

The soilless culture is classified as water based culture and substrate based culture. The water based culture and substrate based culture are used in the development of microgreen plants in open or closed systems. Microgreen plants are harvested at the cotyledon leaf stage/one pair leaf stage, with a plant height of 5-10 cm and a harvesting duration of 10-15 days. The monocropping system generates money for small and marginal farmers. The landless farmers are unable to engage in agricultural techniques and must focus primarily on contract farming. The soil erosion and waste land diminish seasonal crop production. The crop loss affects the revenue of the regional farmer. The overuse of water bodies lowers the water level in the region. The substrate based culture is alternative technology and natural technology to promote microgreen plant production under closed or open system. The shoot length (cm), root length (cm), leaf area index (LAI), seed germination percentage (%), seed vigour index (%), water content (%), germination time (days), harvesting time (days), biomass production (g), nutrient use efficiency (NUE), dry weight, electrical conductivity (µS/cm), pH, temperature (°C) and nutrient content (%) estimation variables were evaluated in the growing microgreen plants. The microgreen has manifold qualities and properties for fulfilling sustainable development and human health.

Keywords: *substrate, microgreen, water content, seed vigour, germination, yield.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/092

Food Production System Transforms Rural Economy

C. Vinodhini
Assistant Professor, Kumaraguru Institute of Agriculture, Erode.

Kerala, leads the nation in terms of sex ratio, literacy rate, and human development index. The State has advanced recently as a viable location for ecotourism, information technology, etc. The State economy is held back by the rural economy, which is primarily agricultural. Since the agriculture sector in Kerala has undergone substantial structural changes, its contribution of the GSDP has decreased from 36% in 1991–1992 to 10% in 2017–2018. Due to population pressure, expansion of the secondary & tertiary sectors, agricultural land is being converted across the state for the construction of homes, businesses, roads, hospitals, and other institutions, which reduces the net area sown in the state. Kerala has a low basis in terms of food production, as seen by the diminishing percentage of agriculture in its gross state product. Kerala has always been a consumer state that relies on its neighbours to supply it with food. To meet its daily food needs, Kerala continues to rely on its neighbouring states, mainly Tamil Nadu and Andhra Pradesh. Due to its low foundation of food production, Kerala now faces a severe issue in terms of food security.

Due to the whims of weather and market volatility, agricultural performance can vary from year to year. Despite having distinct and varied agro-climatic conditions in several places that allow it to cultivate a wide variety of crops, the state's agricultural legacy is not comparable to that of other states. Kerala's agriculture industry has a lot of potential, but it faces many obstacles to expansion. Since the State's founding in 1956, the agriculture sector has undergone significant development. However, a sizable portion of the rural population still relies on agriculture for both employment and subsistence. The steady conversion of agricultural land in Kerala from food crops like rice and tapioca to plantation crops like rubber, coconut, cashew, and coffee is one of the most significant shifts that have occurred. This shift to high-value crops is mostly the result of food crops like rice, tapioca, and lentils being less remunerative in comparison to the more popular commercial crops; currently, Kerala's cropping pattern is dominated by cash crops.

The state's formerly prosperous agrarian society had been observing a gradual change in farming over the previous years. In Kerala, the area

under food grain is continuously declining, primarily as a result of the conversion of this land to the cultivation of cash crops and other non-agricultural uses. Despite the fact that rice is the only significant food crop (it takes up 99 per cent of the available land for food grain cultivation), more than Kerala's food insecurity issue is a result of the agricultural economy's structural transformation in favour of cash crops over the past two decades, which has resulted in a continuing decline in paddy production at an alarming rate. Any change in the agricultural sector is certain to have an impact on the environment, the lives of many people, and society as a whole. Food insecurity, rural unemployment, and environmental and ecological issues have all been made worse by the sharp decline in paddy production.

Food insecurity in Kerala is attributed to a number of issues. Food crops like paddy and tapioca are generally less profitable than plantations. Food crops were transformed into high-value cash crops as a result of the continued shortage of agricultural labour and the quick increase in their wages, which greatly discouraged paddy producers. Additionally, Kerala's move towards high-value crops is aided by the state's large export profits from the sale of spices and rubber as well as the low cost of vegetables and grains produced in neighbouring states as opposed to Kerala. Due to the high population density and the limited supply of land, both must be used effectively. The decision of the farmers to allocate extra resources would be heavily influenced by the productivity and price expectations of replacement crops. Additionally, the issue has gotten worse due to the extensive conversion of paddy fields for other crops and development. In addition, many farmers quit their jobs as a result of a fall in profits. Kerala underwent fast urbanisation, turning rural areas into semi-urban or urban areas, which significantly reduced the number of people who depend on agriculture. As a result, there are fewer people farming full-time, and more agricultural land is gradually being used for non-agricultural purposes.

Additionally, the agriculture sector is on the verge of collapse due to the dominance of the service sector together with a high literacy rate, migration, and standard of living. The huge amount of remittances from abroad encouraged the real estate and construction industries in Kerala, replacing the land used for paddy and other crops, the labor force used in farming, and the small landowners. The agriculture sector suffers the most catastrophic harm each year when natural disasters like landslides and floods devastate the State. These social changes have a tendency to significantly alter Kerala's land use patterns and transform it into a consumerist society. However, the trend of

using agricultural land for non-agricultural reasons has increased Kerala's food security concern and made the food scarcity crisis worse.

However, agriculture plays a key role in the economy because it is necessary for the rural population's subsistence and the food security of vast numbers of people. Even if Kerala ranks highly in terms of educational attainment, access to healthcare, and beneficiary awareness, it will be challenging to accomplish the goal of a hunger-free Kerala until the nutritional security of the most vulnerable groups of the population is addressed. Food security and agricultural production stability are strongly correlated. In order to achieve food security, it is necessary to address supply chain management and agricultural output stability in addition to providing food subsidies. Food and nutrition security are inextricably linked since only a food-based strategy can aid in eradicating malnutrition in a way that is both socially and economically viable. Since food production is a major factor in determining food availability, it serves as the foundation for food security. Without a doubt, Kerala is in serious difficulties, and in this situation, it is very difficult for the state to protect the resources for future generations.

In order to attain the Sustainable Development Goals (SDG) of no poverty, zero hunger, and decent health and well-being, agriculture is a crucial sector for the economy. The State must concentrate on output, productivity, and profitability to meet the SDG targets and ensure the sustainability of agriculture in light of the shrinking size of agricultural land holdings. Kerala is a consumer state where there is an imbalance between access to goods and purchasing power. Despite having greater purchasing power, people cannot easily get food because of agricultural inefficiency. Even though Kerala has a persistent food shortage, there is a large disparity between the supply and demand for food grains, especially rice, which is the population's main source of nutrition. Because cereals are Kerala's primary source of calories and proteins, the production gap in food grains is more significant.

ITAHAS/AB/2023/093

Optimisation of Fertiliser Doses for Desired Yield Targets of Hybrid Brinjal Under IPNS by Targeted Yield Model

Dr. Ch Kiran Kumar
Assistant Professor, College of Horticulture, Parvathipuram, Dr YSR Horticultural University, Andhra Pradesh

To assess the extent to which the fertiliser requirements of hybrid brinjal can be reduced under IPNS, the contribution of nutrients from FYM is to be quantified. Accordingly, in the present investigation, the fourth basic parameter for the targeted yield model, the per cent contribution of N, P_2O_5 and K_2O from FYM (Cfym) was computed. The estimated per cent contribution of N, P_2O_5 and K_2O from FYM was 25.51, 15.25 and 27.03, respectively for hybrid brinjal which indicated that relatively higher contribution was recorded for K_2O followed by N and P_2O_5. With a view to provide balanced fertiliser recommendations through inorganic and organic sources of nutrients, the soil testing research should be in the direction to accomplish the soil test values for desired yield targets of crops. Therefore, in the present investigation, Soil Test Crop Response based fertiliser prescription equations were developed for hybrid brinjal under IPNS using the basic parameters (NR, Cs, Cf and Cfym). The nomograms clearly revealed that with increase in yield target, there was a proportionate increase in fertiliser doses for similar soil test values. Further, with increase in soil test values, there was a concomitant decrease in fertiliser doses. For example, in the present investigation, it has been found that for every increase in 20 kg available N, there was a reduction of 19 kg fertiliser N; for every 2 kg increase in available P, the reduction was 6 kg fertiliser P2O5 and for every increase in 20 kg available K, the decline was 14 kg fertiliser K2O under both NPK alone and IPNS situations. The application of inorganic fertilisers along with FYM resulted in prominent reduction in fertiliser requirement for hybrid brinjal. The saving of inorganic fertilisers for the application of FYM @ 12.5 t ha-1 (with 25 per cent moisture and 0.73, 0.26 and 0.60 % of N, P and K respectively)was 36, 20 and 29 kg of fertiliser N, P2O5 and K2O respectively. If FYM @ 25 t ha-1 was applied, the savings were 72, 40 and 58 kg of fertiliser N, P2O5 and K2O respectively.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/094

Influence of Vermicompost as a Integrated Plant Nutrition System on Yield and Uptake by Hybrid Brinjal on Inceptisol of Andhra Pradesh.

Dr. Ch Kiran Kumar
Assistant Professor, College of Horticulture, Parvathipuram, Dr YSR Horticultural University, Andhra Pradesh

Developing site specific IPNS packages for various crops especially for vegetables warrants attention to achieve the goal of balanced nutrition so as to avoid nutrient mining in soil, enhanced productivity, fertiliser use and profitability. A perusal of the data on the maximum and minimum yield and N, P and K uptake obtained from NPK treated plots revealed that the maximum yield and uptake of N, P and K was obtained with $N_{240}P_{120}$ K_{180} along with vermicomost @ 10 t ha^{-1} in strip III with initial soil test values of 255, 42.0 and 264 kg ha^{-1} of available N, P and K respectively. Integrated plant nutrient management is the smart use of optimum combination of organic, inorganic and biological nutrient sources in a specific cropping sequence and climatic situations so as to achieve and to sustain the optimum yield and improve or to maintain the soil's physical, biological and chemical properties. The results indicated that higher fruit yield could be achieved through integrated supply of nutrients from different sources. The integrated use of fertilisers with organic manures might have enhanced the organic matter in soil that would have increased the fruit yield and availability of plant nutrients The findings of present investigation showed that vermicompost as a part of IPNS and initial soil fertility had profound effect on fruit yield and N, P and K uptake by hybrid brinjal.

ITAHAS/AB/2023/095

Innovative ideas to increase the Farmers income in present century

Ch. Shanmukhi*, B. Anitha*, P. Tanuja*, B. Ashok Kumar* and G. Pradeep Kumar*

*Assistant professor, Department of Horticulture, School of Agricultural sciences, Malla Reddy University, Maisammaguda, Medchal-Malkajgiri, T.S

Agriculture plays a vital role in the global economy and sustains the livelihoods of millions of farmers worldwide. However, farmers often face various challenges that hinder their income growth and overall prosperity. We examines strategies to double farmers' income in the 21st century, focusing on innovative approaches and technological advancements. The study emphasizes the importance of adopting a comprehensive approach to address the complex issues faced by farmers. The first key strategy involves enhancing agricultural productivity. Farmers can achieve this through the adoption of modern farming techniques, precision agriculture, and improved irrigation practices. Leveraging technological advancements like drones, sensors, and satellite imagery can enable farmers to optimize resource allocation, monitor crop health, and make informed decisions, ultimately leading to increased yields. Another critical aspect is diversifying income sources. Farmers can explore agroforestry, livestock rearing, and fish farming, alongside their traditional crop cultivation, to mitigate risks and generate additional revenue streams. Value addition through processing, packaging, and branding can further enhance profitability, allowing farmers to capture a larger portion of the value chain. Access to credit and financial services is crucial for farmers' income growth. Governments and financial institutions should design and implement farmer-friendly policies, including subsidized loans, insurance coverage, and risk mitigation mechanisms. Furthermore, promoting farmer-producer organizations and cooperatives can empower farmers to negotiate better prices, reduce input costs, and access new markets, enhancing their overall bargaining power. Additionally, investing in rural infrastructure is imperative. Upgrading transportation networks, storage facilities, and market linkages can help reduce post-harvest losses, ensure timely access to markets, and enable fair price realization. Providing farmers with training on modern agricultural practices, entrepreneurship, and financial literacy equips them with the necessary skills to adapt to evolving market demands and manage their

enterprises effectively. Doubling farmers' income in the 21st century requires a comprehensive approach that encompasses technological advancements, diversification, financial inclusion, infrastructure development, and human capital investment. Governments, policymakers, and stakeholders must collaborate to create an enabling environment that supports and empowers farmers, ensuring their sustained economic growth and improved livelihoods.

Keywords*: Innovative, Drones, Sensors, precision agriculture, agroforestry and livestock rearing.*

ITAHAS/AB/2023/096

In vitro Culture Methods and Molecular Approaches for Crop Improvement in Vegetable Crop

Chhail Bihari and Sajeel Ahamad
Ph.D. Research Scholar, Nagaland University, SAS, Medziphema, Nagaland, 797109

In vitro, culture methods play an important role in crop improvement in agricultural as well as horticultural crops through different In vitro culture methods like micropropagation, Somaclonal variation, Anther culture, endosperm culture, zygotic embryo culture and protoplast fusion etc. Somatic hybridization in solanaceous vegetables like potatoes has provided few new opportunities for the introgression of novel sources of many diseases and pest resistance into the cultivated potato. Embryo culture has so many potential uses ranging from overcoming seed dormancy to the facilitation of inter-specific hybridization. Some molecular approaches like genetic engineering and genome editing tools improved the generation of tomatoes and overcome the restrictions on important traits. Molecular techniques have been heavily utilized in the genetic development of agronomics such as biotic and abiotic stress tolerance and fruit quality (self-life) in tomatoes due to changing global climate and market competitiveness. Triploid plants are unfavourable for plants whose seeds are used economically because they produce sterile seeds. However, triploid plants are extremely useful when seed lessness is used to enhance the quality of vegetables like cucumber and watermelon.

Keywords: *In vitro Culture, micropropagation, molecular, somaclonal variation, transgenic.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/097

Studies on genetic diversity for yield and quality traits in sponge gourd (*Luffa cylindrica* (L) Roem)

Chithra, K[1]., Shashikanth Evoor[2], Sarvamangala Cholin[3] and Allolli, T. B.[4]
[1]Ph.D Scholar, Department of Vegetable Science, College of Horticulture, Bagalkot
[2]Technical Officer to DOE, UHS, Bagalkot,
[3]Assistant Professor, Department of Genetics and Plant Breeding, COH, Bagalkot,
[4]Registrar and Professor, Department of Vegetable Science, UHS, Bagalkot

Sponge gourd (*Luffa cylindrica* (L.) Roem.) is one of the minor cucurbitaceous vegetable crop cultivated in tropical and sub-tropical areas of the world. It is a diploid species with 2n=26 chromosome number belonging to the family cucurbitaceae. The 40 sponge gourd genotypes were evaluated in a RCBD design with two replications at the Department of Vegetable Science, College of Horticulture, Bagalkot during the year 2020-21. Genetic divergence analysis, using Mahalanobis's D^2 statistic, grouped all the 40 genotypes into seven clusters. Among which cluster I is the largest cluster with 19 genotypes followed by cluster II with ten genotypes, cluster III with seven genotypes and remaining cluster IV, cluster V, cluster VI and cluster VII having only one genotype each. The maximum intra-cluster distance was recorded in cluster III (D2=667.55) followed by cluster II (D2=665.10) which indicates that the genotypes included in these clusters were very diverse. The maximum inter-cluster distance was observed between cluster IV and VI (D2=10081.40) indicating wide range of genetic diversity between these two clusters. Thus the genetically diverged genotypes could be used as parent in hybridization program for getting desirable segregants. Among the 17 characters studied for D^2 analysis, average fruit weight (14.54 %) fallowed by fruit yield per vine (13.25 %) and number of seeds per fruit (11.20 %) contributed maximum to genetic divergence and hence played a major role in improvement of sponge gourd.

Keywords : *Sponge gourd, genetic diversity, cluster analysis.*

ITAHAS/AB/2023/098

Identification of QTLs Governing Strong Culm in Rice

Datla Kamala devi*[1], Jyothi Badri [2] and Susmita Dey[1]

[1]School of Agricultural Sciences, Malla Reddy University, Hyderabad, Telangana, India.

[2]Indian Council of Agriculture Research-Indian Institute of Rice Research, (ICAR-IIRR) Rajendra Nagar, Hyderabad Telangana, India.

Rice architecture is a key aspect of its domestication and a major factor that limits its high productivity. Lodging has been a major roadblock to attain increased crop productivity, reducing its yield and mechanical harvesting efficiency. To understand the mechanism for culm strength in rice, isolation of effective quantitative trait locus (QTL) is important .The ideal rice culm structure, including major axis culm, minor axis culm, and wall thickness culm, is critical for improving lodging resistance. However, the traditional method of measuring rice culms is destructive, time consuming and labour intensive. It is important to identify and utilize the quantitative trait loci (QTLs)/genes for lodging resistance breeding. QTL mapping analysis combined with single-nucleotide polymorphism (SNP) marker derived from high-throughput sequencing helps in identification of QTLs associated with lodging resistance traits [culm length, culm diameter, and culm strength, bending stress]. Identification of genomic region associated with important lodging resistance traits, improves the culm morphology and plant architecture in rice by manipulating *SHORT and SOLID CULM*. The culm development of rice is characterized by elongation and medullary cavity (MC) formation, which are determined by node formation meristem and residual meristem, respectively. Long-culm and heavy-panicle type of rice with a superior lodging resistance culm strength can perform its high yield potential by using these identified QTLs contributing yield and lodging resistance.

Keywords*: Lodging, QTLs, SNP markers, Resistance traits, Culm, QTL mapping analysis.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/099

BIOCHAR- Importance in Forestry

Dattappa[1], Pracheeka Shetty[2] and Sourav Manoharan[3]
[1 & 2]Research Scholar, Department of Forest Biology and Tree Improvement, College of Forestry, Sirsi, Karnataka, India
[3]Research Scholar, Department of Forest Products and Utilization College of Forestry, Sirsi Karnataka India

The review work was done to know about the importance of biochar and their application in forestry. Nowadays, biochar is gaining more attention because it considerably replaces fertilizers and enhances nutrient use efficiency. It also helps in carbon sequestration, which ultimately helps to mitigate climate change. Biochar is a product produced by the thermal combustion of organic matter such as plant residues in the absence of oxygen, by the process known as pyrolysis. Biochar can be made from a variety of organic materials, such as tree branches, grasses and agricultural waste, it has a long-life cycle, applying it to soil to store carbon (C) has been suggested as one method of reducing atmospheric CO_2 concentrations. Biochar has recently been widely used on arable land, not only for C storage in soil, but also to enhance the physical, chemical and biological aspects of the soil, hence it will be boosting the crop productivity. Biochar provides great opportunities to turn the green revolution into sustainable agro-ecosystem practice, it can replace the fertilizers by improving the soil organic matter, which can be secured by biochar soil management for the long term. Application of biochar can improve soil fertility and nutrient use efficiency. Using locally available and renewable materials in a sustainable way biochar can be produced. Adoption of biochar management does not require new resources, but makes more efficient and more environmentally conscious use of existing resources. The importance of biochar in carbon sequestration to mitigate climate change is adding biochar to soils has been described as a means of sequestering atmospheric CO_2, it decomposes much more slowly and more stable than biomass. Diverting only a small proportion of this large amount of cycling C into a biochar cycle would make a large difference to atmospheric CO_2 concentrations, but very little difference to the global soil C storage. Diverting merely 1 percent of annual net plant uptake into biochar would mitigate almost 10 per cent of current anthropogenic C emissions. These are important arguments to feed into a policy discussion. The production of biochar will lead to waste to wealth.

Keywords*: Biochar, Pyrolysis, Nutrient use efficiency.*

ITAHAS/AB/2023/100

Downscaling satellite land surface temperature to the farm scale

Debasish Roy, Bappa Das, Pooja Rathore, Tridiv Ghosh, Raghuveer Singh, Deepak Sethi and Debashis Chakraborty

Division of Agricultural Physics, ICAR-Indian Agricultural Research Institute, New Delhi 110012

Downscaling of land surface temperature (LST) from space-borne imagery is crucial for many finer-scale applications such as monitoring the state of crops and vegetation, soil moisture estimation, or as an indicator of the physics of land-surface processes at local to global scales. However, the downscaling accuracy of LST is strictly prohibited by different geographical and environmental factors. *This paper made a comparison between machine learning (Random Forest, RF) and classical algorithms (TsHARP and TPS) to downscale the medium resolution (100 m) Landsat-8 LST to 10 m. It was validated by the MODIS LST 1000 m product, using images derived from semi-arid (IARI), arid (CAZRI), and per-humid (UBKV) agricultural farm areas. The RF algorithms produced higher accuracy in the rabi season 2020-21 with R^2 values of 0.55-0.83, RMSE 1.59-5.35, and nRMSE 0.53-1.75 compared to TPS and TsHARP. The performance of TsHARP was poor during the initial period at IARI because of a weak indication of the Normalized Difference Vegetation Index (NDVI). The TPS methods showed a smoothing effect on the LST. The machine learning algorithm RF appeared promising to achieve a universal framework that can downscale LST for an area within the training data from long spatiotemporal sequences.*

Keywords*: Land Surface Temperature, Downscaling, satellite Remote Sensing, Agricultural Farm.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/101

Sustainable Agriculture Through Organic Farming in India

Dhananjay Kumar[1] and Shivam Chaurasia[2]

Organic Farming is the practice that relies more on using sustainable methods to cultivate crops and it avoids chemical inputs that do not belong to the natural eco system, organic agriculture can contribute to meaningful socio-economic and ecologically sustainable development, especially in developing countries. This is due to the application of local resources viz, indigenous seed varieties manure etc, and therefore cost effectiveness. Organic farming is one of the several approaches found to meet the objectives of sustainable agriculture. Ecological friendly organic farming is the answer to the problems being faced by agriculture more sustainable. This form of agriculture conserve of soil and water resources, our climate, improves agro-diversity, ensures biodiversity, meet the demand for food and safeguards livelihoods. In brief, it ensures that the environment blooms, the form is productive, the formers makes a net profit and society has adequate nutritious food. India is a country that is bestowed with indigenous skills and potentiality for growth in organic agriculture. Although India was far behind in the adoption of organic farming due to several reasons, presently it has achieved rapid growth in organic agriculture and now becomes one of the largest organic producers in the world. Therefore, organic farming has a great impact on the health of a nation like India by ensuring sustainable development.

Keywords*: Organic Farming, Agriculture and Sustainable Methods.*

ITAHAS/AB/2023/102

Studies on Fruit Rot of Papaya (*Carica papaya* L.)

Dhanshree Bachkar, Sanjay Kolase, Bramhadev Munde, Pradnya Ukey, Navnath Daingade and Mayur Bhujbal

Department of Plant pathology and Agricultural Microbiology, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar, Maharashtra-413722

Papaya (Carica papaya L.) is an important and most widely grown fruit crop of both tropics and subtropics of the world, belonging to the family Caricaceae and ranks third in importance among fruits. Papaya fruits lose their market value due to damage caused by many fungi. Fruit rot caused by Fusarium incarnatum adversely affects fruit quality, quantity and ultimately reduces market value. The fruit rot of papaya causes enormous yield losses, often in field and markets. Detailed investigations on various aspects were carried out in present study during 2019-20. The papaya fruits showing typical characteristic symptoms of fruit rot were collected from Pachkandil vegetable market, Dhule. Infected fruits exhibited water-soaked spots at stem-end portion, showed softening and mummification of fruits. In severe cases, rotten fruit showed white creamy growth of pathogen. The pathogen was isolated by standard tissue isolation method and purified by single spore technique. Pathogenicity of fungus was proved by following Koch's postulates. The fruit rot causal fungus was got identified by AGHARKAR RESEARCH INSTITUTE as Fusarium sp. aff. F. semitectum Berk & Ravenel (Current name- Fusarium incarnatum (Desm.) Sacc.) (ID.NO.3/426/2019/MYC/1135).

Morphological studies of F. incarnatum (=semitectum) revealed macroconidia were spindle or sickle shaped with or without blunt ends and microconidia were pyriform to oval or round to oval shaped. Chlamydospores were globose, intercalary, solitary or in chains and 6-11 µm in diameter. In cultural studies, maximum radial growth of fungus on Oat meal agar medium with excellent sporulation, followed by Potato dextrose agar. In vitro evaluation of bioagents and botanicals, revealed that Bacillus subtilis and garlic extract @ 5% and neem seed kernel extract @ 10% showed highest mycelial growth inhibition of test pathogen. In fungicides, carbendazim 12% + mancozeb 63% WP (0.2%) and hexaconazole 5% EC (0.1%) completely inhibited mycelial growth of test fungus. Host range studies revealed initial

chlorotic symptom on pomegranate, apple, sweet orange, banana, chilli, brinjal and no symptoms observed on sapota, cucumber, onion, tomato.

Key Words: *Papaya, Carica papaya L., Fusarium incarnatum, Fusarium semitectum.*

ITAHAS/AB/2023/103

Preserving the Ground Beneath: Promising Strategies for Sustainable Soil Management and Combatting Degradation

Dibyajyoti Nath[1]*and Shiva Nath Suman[2]

[1]Ph.D. Scholar, Department of Soil Science, Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar, India

[2]Assistant Professors, Department of Soil Science, Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar, India

Soil, a secret resource that is essential to our life, is found beneath our feet. However, constant deterioration poses a threat to this essential resource. This issue requires immediate attention, which has generated a wave of innovation in sustainable soil management techniques. This fascinating abstract explores the effective strategies used by researchers and professionals to stop soil erosion and protect the earth underneath us. Numerous options are being investigated, ranging from ground-breaking conservation agricultural methods to creative precision farming methods. We explore the transformational effects of agroforestry and cover cropping, which not only improve soil health but also protect entire ecosystems, by harnessing the force of nature. As we go further, we learn more about the function of soil additives like organic matter and biochar, releasing their ability to restore soil fertility and structure. Modern soil monitoring systems give us crucial information on the condition of our soils, enabling us to make wise decisions and put focused interventions into place. We accept traditional knowledge and indigenous traditions with a nod to the knowledge of our ancestors, fusing it with current science. We also investigate the numerous opportunities for soil restoration, which may revitalize previously deteriorated landscapes through remediation, reclamation, and rehabilitation activities. The essence of our race against time as we work to preserve and care for the soil, the base upon which all life depends, is captured in this abstract. As we set out on a quest to discover the secrets of sustainable soil management, we aim to inspire optimism for a prosperous and resilient future.

Keywords*: Sustainable Soil Management; Deterioration; Soil erosion; Agroforestry; Soil fertility; Conservation agriculture; Soil monitoring systems.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/104

Novel Approach to Synthesis a Naphthalene Bearing Chalcone to Inhibits the MAP Kinase Signaling Cascade in SKBR3 cell lines and their *in vivo* approach

M.G. Dileep Kumar, [1] & J. Shankar [2]
[1]PG Department of Biotechnology, Teresian College, Siddhartha Nagara Mysore-570011, Karnataka, India.
[2 *] PG Department of Food Technology. Davanagere University, Karnataka-577002, India

Cancer is the main cause of death in the global and the exalted rate of mortality demands a global challenge to discover potent anticancer drugs. In the present study, we synthesized a series of Naphthalene bearing Chalcone derivatives and characterized using^{1}H NMR, 13C NMR and LC-MS spectral analysis. The cytotoxic outcomes have been determined through MTT assay for all synthesized compounds against human cancer cell lines. Mechanistically, d1 compound showed potent anticancer activity against SKBR3 cell line with IC_{50} value *5.17μM*. Besides, it was discovered that d1 incited the mitochondrial apoptotic pathway by controlling Bax and Bcl-2 transcripts by expanding the Caspase 3 activation and the inhibition of MAP kinase signalling cascade via ERK, P38 and JNK inhibition in the western blot analysis confirms that compound d1 has potent MAP Kinase inhibitor. Supporting this, we have analysed *in-vitro* adversary of tumor development and anti-angiogenic activities of d1 in Ehrlich Ascites Carcinoma (EAC) mouse model. Mechanistically, compound d1 treatment inhibited the tumor development and extended the life efficacy of EAC animal without any symptoms in normal mice as revealed in Histopathological examinations. The study reveals that, compound d1 could be the potential anticancer drug that explored its significant tumor-inhibiting ability even in low concentration both *in vivo* and *in vitro* conditions.

Keywords*: Naphthalene Chalcone; Breast Cancer; BAX; Bcl2; Apoptosis, Receptor Tyrosine Kinase Inhibitor.*

ITAHAS/AB/2023/105

Effect of Feeding Hydroponic Horse Gram Sprouts on Growth Performance of Konkan Kanyal Goats

Divya Kokani*, B.G. Desai[1], D.J. Bhagat[2], V.S. Dandekar[2] and J.S. Dhekale[3]
Department of Animal Husbandry and Dairy Science, College of Agriculture, DBSKKV, Dapoli, Maharashtra, India

The experiment was conducted to study the effect of feeding hydroponic horse gram sprouts on growth performance of Konkan Kanyal goat at the instructional Livestock farm, goat unit, Department of Animal Husbandry and Dairy Science, College of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist- Ratnagiri. Twenty Konkan Kanyal goats aged between 4-6 months were grouped into four treatments and five replications using (RBD). The experimental goats were randomly assigned to four treatments with five replication. T_1 (0%), T_2 (15%), T_3 (30%), T_4 (45%) levels for hydroponic horse gram sprouts were fed with finger millet straw, mulato grass and concentrate as basal feed to Konkan Kanyal goats. Result of experiment showed that, horse gram sprouts contained higher amount of crude protein (26.68 %) than the basal feed. Average intake of nutrients (g/day) was highest in treatment T_4 (45%) horse gram sprouts than control treatment T_1 (0%). The crude protein digestibility is found better as the inclusion level of horse gram sprouts gets increased as per treatments, T_1 (38.96%), T_2 (39.53%), T_3 (39.57%), T_4 (39.84%). Higher daily body weight gain observed in T_4 (45%) 7.33kg than T_1(0%) 7.07 kg in 90 days. But as per economic assessment the treatment T_2 (15%) gives the best results in 90 days in body weight gain with cost of Rs.288.0 than treatment T_4 (45%) with cost Rs. 345.6. Therefore, it is concluded that 15% horse gram sprouts with basal feed is found beneficial for better growth performance and economic profitability of Konkan Kanyal goat.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/106

Livelihood choices of rural youth in agriculture and allied sectors sector of Punjab

Divyata Joshi[1], R. K. Dhaliwal[2] and Lopamudra Mohapatra[3]
[1]Consultant, National Institute of Agricultural Extension Management (MANAGE), Hyderabad
[2]Professor, and Dean, College of agriculture, PAU, Ludhiana
[3]Assistant Professor, Department of Extension Education, PAU, Ludhiana

Punjab is one of the leading states as far as agriculture and agripreneurship is concerned though spatial differences may be there. But in recent years a greater shift in the life-choices has been seen among the rural youth of Punjab. Majority of them now want to shift overseas in search of their desired source of livelihood leaving their ancestral land and agricultural occupation behind. An understanding of the attitude of rural youth towards continuing farming or allied occupations in future has of high significance to support the extension workers and line departments to take the important and timely measures and forming area specific policies to motivate and attract the youth towards farming. The present study was conducted in plain and sub-mountainous region of Punjab with 120 rural youth from each area. The results of the study suggested that more number of rural youth of Punjab had moderately unfavourable (47.5%) to highly favourable (17.92%) and moderately favourable (17.50%) attitude towards agriculture and allied sectors as an occupation. Further, the rural youth of plain area had more positive attitude towards farming as compared to the youth of sub-mountainous zone. The results of the study also suggested that the variables such as family size, farming experience, land holding, annual income, mass media exposure, extension agency contact, urban contacts, participation in extension activities, achievement motivation and awareness on agricultural development schemes had significant positive relationship with attitude of rural youth towards agriculture and allied sectors as occupation. Hence, a multi-agency approach should be initiated in which line departments may be involved in creating awareness, extension institutions may be involved in capacity building and stakeholders for sensitizing youth towards agriculture.

Keywords*: Attitude towards agriculture, Rural Youth, Socio-Economic Variables, Descriptive Statistics.*

ITAHAS/AB/2023/107

Varietal Screening and Economic Feasibility of Gerbera (*Gerbera jamesonii* L.) Under Polyhouse Cultivation

A.K. Mandal [1] and B.C. Saha [2]
School of Agriculture & Allied Sciences, The Neotia University,
Diamond Harbour Road, 24 Parganas South, West Bengal

Gerbera (*Gerbera jamesonii L.*) is a popular herbaceous ornamental plant and its flowers are like Daisy. It was originated in South African and Asiatic regions, mostly inhabiting in the temperate and mountainous parts. The genus *Gerbera* under Asteraceae family consists of 40 species of semi-hardy perennial flowering plants. There are five important species used for the development of recent varieties namely – *G. jamesonii, G. asplenifolia, G. auranticiaca, G. kunzeana and G.viridifolia* It can be grown as a field crop in open air on raised beds/ as a greenhouse plant under controlled conditions (polyhouse) and as a potted plant. Gerbera is the latest sensation to Indian floriculture, commercially grown elsewhere in a wide range of climatic conditions. In India, Greenhouse technology has been adopted during the last five decades for research purposes. Presently, greenhouse technology is getting popular among the farmers to grow high valued flowers, ornamentals and good quality saplings. During the past few years, cut flower growers, in 24 Parganas district of West Bengal has diversified, into other cut flowers due to some economic and marketing strategies. In present study an attempt was made to find out the sustainability of Gerbera cut flower production in that district. The main objective of present paper was to study the growth and yield of selected six varieties of Gerbera in polyhouse. Out of six varieties namely, Marinilla, Melrose, Mammut, Torroso, Palm Beach and Casablanca, 'Marinilla' performed the best in growth and yield parameters studied. It was found that under polyhouse condition for 1 ha area, Net Present Value @15% Discounting Factor was Rs. 291.02 lakh , Benefit Cost Ratio @15% Discounting Factor was 1.79 : 1 and Internal Rate of Return value was 69% over four years of study. This experiment clearly indicated that gerbera cultivation and marketing is a highly profitable business in the coastal region of West Bengal to improve the life styles of the growers.

Keywords: *Polyhouse, Gerbera, Cut flower, Benefit cost ratio, Internal rate of return.*

A therapeutic diet formulated for foot-and-mouth disease (FMD) infected crossbred calves improved growth performance and nutrient utilisation

Arun Somagond, B. H. M Patel and Ramkumar Rupner
ICAR-Indian Veterinary Research Institute (IVRI), Hebbal, Bengaluru, Karnataka

The FMD lesions in affected animals prevent intake of feed adversely affecting the production and animal welfare. Changed physical form of a therapeutic diet (TD) compatible with inflammatory condition ensures feed intake. A study was undertaken to assess the effect of therapeutic diet (TD) on the growth, and digestibility of nutrients in foot-and-mouth disease crossbred calves. A TD was offered in the mash or cooked form to 18 Holstein Friesian crossbred male calves (10–12 months) by distributing across 3 treatment groups viz. TD-Mash (TDM), TD-Cooked (TDC), TDC-Customized Nutrient Supplement (TDCNS) and 4 calves in Control-Mash (CON). The TD was basically in total mixed ration. The calves were experimentally infected with a FMD virus in Biosafety level (BSL-III) biocontainment facility. The results revealed that average daily gain (ADG) in the first week, was significantly ($P<0.05$) lower in CON and TDCNS comparing to CON but TDM and TDC were non-significant either to CON or TDCNS. The ADG from 3rd week till the end of experiment was relatively high in all infected group compared to CON group. The overall ADG of calves in CON, TDM, TDC and TDCNS were 0.446±0.08, 0.468±0.23, 0.455±0.26 and 0.462±0.15 kg, respectively. The total BW gain were 18.73±1.83, 19.67±3.33, 19.10±3.52 & 19.42±2.35 kg, respectively. The total dry matter intake in CON, TDM, TDC, TDCNS was 2.63±0.32, 2.53±0.21, 2.54±0.12 & 2.51±0.15 kg ($P<0.05$). The FCR of experimental calves in CON, TDM, TDC, TDCNS were 6.12±1.25, 7.86±1.53, 9.21±2.78 and 6.08±2.18, respectively ($P>0.05$). The DM, OM, CP, CF digestibility (%) was marginally higher in TDC and TDCNS ($P<0.05$). The total cost of feeding was ₹546.24, 523.43, 521.56 and 509 respectively. The cost/kg BW gain highest in the CON group ($P>0.05$). The feeding of TD to FMD infected calves in cooked form (with or without CNS) ensured optimum feed intake with quicker regain of bodyweight and also reduced the feeding cost. The changed physical form of TD was compatible with the inflammatory condition of the mouth and helped in quicker healing of FMD lesions.

Keywords: *Body weight, Cooked, Customized nutrient supplement, Digestibility, FMD, Mash, Therapeutic diet.*

ITAHAS/AB/2023/109

Managing soil borne pathogens by bacterial antagonists

Geetika
Mata gujri college, Fatehgarh Sahib, Punjab

Several soil-borne pathogens are known to cause serious plant losses, including *Fusarium solani, Macrophomina phaseolina, Pythium aphanidermatum, Rhizoctonia solani*, and *Sclerotium rolfsii*. Currently, most chemicals are under ban due to their hazardous effects on the environment and human health. Thus, alternate solutions to replace chemicals in crop disease management need to be strengthened. Biological control of plant pathogens can be achieved through the application of antagonistic microbes. They provide an alternative safe method of managing this pathogen. A biocontrol agent may also have the advantage of being easy to deliver, improving the growth of plants, activating resistance mechanisms within the host, and increasing biomass production. By antagonizing soil-borne pathogens through multiple strategies, antagonistic bacteria are reported to suppress these pathogens and colonize the rhizosphere effectively. Among those *Bacillus* spp., *Pseudomonas* spp, *Agrobacterium* spp., and *Streptomyces* spp. are the most common isolates controlling the fungal diseases. Plant growth is directly enhanced by bacterial antagonists (i) by fixating atmospheric nitrogen that is transferred to plants, (ii) by producing siderophores that chelate iron so that it can be absorbed by roots and (iii) by solubilizing phosphorus and phytohormones. Antifungal metabolites such as lytic enzymes and hydrogen cyanide (HCN) are synthesized as indirect mechanisms, as is antibiosis and competitive capacity with pathogens for nutrients and niches on the root. Plant pathogens can be suppressed by antagonistic bacteria, which are widely distributed in almost every agricultural soil. Utilizing indigenous bacteria for soil-borne disease management and plant growth promotion is important. To provide effective delivery and improved shelf life, such bacteria may also need to be formulated into an economical and easy-to-use carrier.

Key words-*Bacteria, biocontrol agents, pathogens, resistance, chemical, management.*

ITAHAS/AB/2023/110

Post-Harvest Technology, Food Processing, and Value Addition: Agri-Value & Supply Chain for Sustainable Production

S. M. Sailaja[1] and Dr. K. Jyotirmai Madhavi[2]
Assistant Professor (Hort.), College of Horticulture, Chinalataripi, Dr. YSRHU, VR. Gudem. WG. Dist.
Associate Professor, (Pl. path), College of Horticulture, Chinalataripi, Dr. YSRHU, VR. Gudem, WG. Dist.

Post-harvest technology, food processing, and value addition play a crucial role in ensuring sustainable production in the agricultural sector. These processes encompass a wide range of activities that occur after crops are harvested, including handling, storage, processing, packaging, and distribution. By implementing effective post-harvest practices and value addition techniques, farmers and food processors can minimize losses, enhance the quality and shelf life of agricultural produce, and create value-added products for diverse markets.

Food processing plays a vital role in ensuring the availability, safety, and quality of food for an ever-growing global population. With the increasing demand for processed food products, the food processing industry is constantly evolving to meet consumer expectations while addressing sustainability concerns.

Post-harvest technology, food processing, and value addition are integral components of the agri-value and supply chain for sustainable production. These practices reduce post-harvest losses, enhance food safety and quality, create value-added products, improve market access, and contribute to waste management and resource efficiency. By adopting effective post-harvest technologies and value addition techniques, farmers and food processors can ensure the long-term viability and profitability of the agricultural sector while meeting the growing demand for safe, nutritious, and sustainable food. Collaborative efforts among stakeholders, including policymakers, researchers, and industry players, are crucial to promoting and implementing these practices on a larger scale, leading to a more sustainable and resilient food system for future generations.

Supply chain involves tracking and documenting every stage of the production process, from farm to fork.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/111

Farmer Producer Organization: A Way of Empowering Farmers

Manmeet Kaur[1], Subhash Chandra[2] and Rajeev Yadav[3]
[1]Assistant Professor, [2]Prof. & Head, and [3]MSc Student
Department of Agricultural Extension & Communication, College of Agriculture, Swami Keshwanand Rajasthan Agricultural University, Bikaner- 334 006 (India)

Agriculture plays an important role in the economic life of India and a wide variety of agricultural products are produced in the country. Marketing of all these items is a complex process. Farmers who do not have access to the market sell their produce through market middlemen. As a result of these middlemen, their profit margin gets reduced and their farming operations become unviable. The only way to improve the status or condition of the farmer is through diversification and commercialization of agricultural activities. This is possible only through the collectivization of producers, particularly small and marginal farmers, into producer organizations. Farmers Organizations are vital entities for the empowerment, reduction of poverty, and progress of farmers & the rural poor. Farmers Organization improves farmers' political power by raising the possibility that their needs and opinions are acknowledged by policymakers and the general public. The idea of Farmer Producer Organizations (FPOs) was introduced by the government since 2004; they are being promoted in the nation under various schemes of the central and state government. FPOs are being formed to assist farmers in earning higher returns through collective input purchase, collective marketing, processing, increasing productivity through better input procurement, augmenting farmers' knowledge of better management practices, and ensuring quality. Small farmers face a variety of challenges, including a lack of transportation and storage facilities in rural areas. Farmers do not have access to the most recent information & technology, as well as market trends and prices. As a result of all of this, farmers face distressed sales and, as a result, do not get a fair price for their produce. The current trend of globalization and liberalization is another developing difficulty for small-scale farmers. Rajasthan state of India has largest geographical area among all the states of the nation. It has the potential to become a leading player in the agriculture sector. It is the largest producer of rapeseed & mustard, cereals and pearl

millet. The FPO movement in Rajasthan was started in 2009. Being the largest area, farmers have to travel a long way to sell the crops and buy agricultural inputs, which increases the cost to the farmers and reduces the profit. Hence, FPO is a good option to solve this problem where farmers buy & sell their crops, agricultural products & inputs collectively through Farmers Producer Organizations and the cost of transportation is reduced; and farmers can get good price through grading, packaging, and labeling of their products, which ultimately increases the income of the farmers. This paper would through light on how FPOs are playing a vital role in the empowerment of farmers by doubling their income and paves the way to deal with the associated challenges hindering the process of empowerment.

Keywords: *Agriculture, Farmer Producer Organization (FPO), Farmers, Empowerment.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/112

Management of powdery mildew of green gram by using chemical and biocontrol agents

P. N. Rakhonde*, D. J. Anvikar, S. S. Mane And A. D. Harne
Anand Niketan College of Agriculture, Warora
Affiliated to, Dr. PDKV., Akola

Experiment was conducted to asses the efficiency of different fungicides, plant extracts and culture filtrate of bioagent against powdery mildew of mungbean caused by *Erysiphe polygoni in vitro,* and *in vivo* different yield attributing characters and control of powdery mildew *in vivo.* Among all tested fungicides tridemorph (0.05%) recorded higher (85.11%) inhibition of spore germination, while plant extract of behada 5% inhibited 66.45% and culture filtrate of *Pseudomonas fluorescens* inhibited 63.93% spore germination *in vitro.* Maximum disease reduction and yield was obtained in tridemorph 0.05% and penconazole 0.05% (556 Kg/ha). Highest number of pods/plant (17.27), pods weight/5plant and grain weight/5 also recorded highest in penconazole. In case of disease reduction, maximum disease reduction was observed in diphenconazole (69.11%) and tridemorph (69.11%). In plant extract maximum 57.22% disease reduction observed in behada extract and bioagent *P. fluorescens* filtrate showed 51.22% reduction of disease.

ITAHAS/AB/2023/113

Effect of Chelated Magnesium on Growth and Yield in Tomato

Shalini Badge*[1], Vinod Raut[2], Seema Thakre[3] and Harsha Mende[4]

[1]Associate Professor (Hort), Horticulture Section, College of Agriculture, Nagpur, Dr. PDKV, Akola

[2]Professor of Horticulture, Horticulture Section, College of Agriculture, Nagpur, Dr. PDKV, Akola

[3]Assistant Professor (Hort.), Horticulture Section, College of Agriculture, Nagpur, Dr. PDKV, Akola

[4]Assistant Professor of Agri. Extension, College of Agriculture, Nagpur, Dr. PDKV, Akola

An experiment entitled "Effect of chelated magnesium on growth and yield in tomato" was carried out at Agriculture Research Station, Sonapur, Gadchiroli Dr. Panjabrao Deshmukh Krishi VIdyapeeth, Akola. Dist. Akola during the *Kharif* season of 2018-19 with objective of to investigate the response on tomato to different levels of foliar application of Chelated magnesium. . The experiment was laid out in Randomized Block Design with four treatments replicated five times. Experiment comprised of three levels of Chelated magnesium (viz., T1. 0.5 g /lit. of water, T2:1.0 g /lit of water and 1.5g/ lit of water) along with control (water spray) treatment. Forty days old seedling were transplanted in rig=dges and farrow layout.

Among the different levels of chelate magnesium (6%), results revealed that chelate magnesium 1.0 gm per liter of water showed significant increase in plant height (129.38 cm), number of branches (7.75) , number of flower cluster (3.75), number of fruits cluster (3.25), number of fruits per plant (41.25), average fruit weight (40.50 gm), fruit length (7.13 cm), fruit girth (3.38) and yield per ha (203.09 q.) as compared to other treatments and control.

Key Words*: Tomato, chelated magnesium, foliar application.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/114

Effect of pre sowing seed treatments on seed germination and seedling growth of Charoli (*Buchanania lanzan* spreng)

Shalini Badge[1], D.M. Panchbhai[2], Maya Raut[3], Seema Thakre[4], & Harsha Mendhe[5]

[1]Associate professor of Horticulture, College of Agriculture, Nagpur (Dr. PDKV, Akola)
[2]Dean, faculty of horticulture, Dr. P.D.K.V., Akola
[3]Associate Dean, College of Agriculture, Sonapur-Gadchiroli
[4]Assistant professor of Horticulture, College of Agriculture, Nagpur (Dr. PDKV, Akola)
[5]Assistant professor of Agri. Extension, College of Agriculture, Nagpur (Dr. PDKV, Akola)

The experiment entitled" Effect of pre sowing seed treatments on seed germination and seedling growth of Charoli (*Buchanania lanzan* spreng)" was carried out at Agriculture Research Station, Sonapur-Gadchiroli during the year 2019-20, 2020-21,& 2021-22 with eight treatments replicated thrice. The treatments comprised with T_1: Seed soaking in GA_3 200 ppm for 24 hrs.,T_2: Seed soaking in GA_3 300 ppm for 24 hrs., T_3: Physical scarification + seed soaking in GA_3 200 ppm for 24 hrs., T_4: Physical scarification + seed soaking in GA_3 300 ppm for 24 hrs.,T_5: Seed soaking in Conc. $H_2SO_4$for 2 min.,T_6: Seed soaking in cow urine for 7 days, and T_8: Control (No pre sowing seed treatment).The pooled result revealed that among the eight pre sowing seed treatments, treatment Physical scarification + seed soaking in GA_3 300 ppm for 24 hrs. recorded early germination (21.09 days), maximum germination per cent (72.22), maximum vegetative growth parameters *viz.,* seedling height (15.94 cm), number of leaves seedling^{-1}(9.13), stem diameter (0.71 cm) and more survival percent (81.90 %).

Keyword*: Charoli, seed treatment, physical scarification*.

ITAHAS/AB/2023/115

Natural Enemies Recorded on Fall Armyworm and Effect of Novel Insecticides on them in Maize Crop

Sandip Narayan Rathod[1] and Dr. Archana Narayan Borkar[2]
[1]Department of Entomology, Dr. PDKV, Akola
[2]Department of Entomology, College of Agriculture, Mul, Dr. PDKV, Akola

Destructive invasive pests, fall armyworm (*Spodoptera frugiperda)* reported in India, from Karnataka, Tamil Nadu, Telangana and Maharashtra on maize crop (Sisodiya et al. 2018). *S. frugiperda* is a highly polyphagous insect pest. Some natural enemies are reported to be associated with. A field trial was conducted in *kharif* 2019-20 at Department of Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola with Variety Uday (Mahabeej-1114) of maize, to investigate possible occurrence of natural enemies of *S. frugiperda* at Akola location and the effect of selected newer insecticides on them under field conditions. Average population of natural enemies was recorded on 10 randomly selected plants. Insecticides namely, Chlorantraniliprole 18.5 SC @ 4 ml/10 L, Spinetoram 11.7 SC @ 9 ml/10 L, Indoxacarb 14.5 SC @10 ml/10 L, Thiamethoxam 12.6% ZC + Lambda-cyhalothrin 9.5 % ZC @ 2.5 ml/10 L, Dimethoate 30 EC @ 12 ml/10 L, Spinosad 45 SC @ 3 ml/10 L and Emamectin benzoate 5% SG @ 4 gm/10 L were evaluated against natural enemies. During study we found few potential predators of fall armyworm namely, Ground beetle (Carabidae) in range of 0.14 to 1.38/plant, and spiders in range of 0.12 to 1.54 spiders/plant. Present investigation revealed that the treatments Spinosad 45 SC, Emamectin benzoate 5% SG and Chlorantraniliprole 18.5 SC are relatively safer to natural enemies i.e. spider and ground beetle larvae, while other treatments had deleterious effect and reduce the population of natural enemies.

Rezac et al. (2010) showed that the Diflubenzuron, methoxyfenozide, acetamiprid and spinosad are harmless to predatory spiders in terms of mortality in comparison with Deltamethrin. Dai-bin et al. (2013) found Chlorantraniliprole relatively safe to spider species, *X. ephippiatus*. Wagh et al. (2017) found spinosad 45 SC @ 125 g a.i./ha, abamectin 1.9 EC @ 3g a.i./ha, chlorantraniliprole 18.5 SC @ 30 g a.i./ha and novaluron 10 EC @ 75 g a.i./ha safer to the predatory coccinellids. Shylesha et al. (2018) recorded natural enemies *viz*., *Telenomus* sp., *Trichogramma* sp., *Glyptapanteles creatonot, Campoletis chlorideae a*nd common earwig, *Forficula* sp. Abdullah et al. (2019)

reported that the Emamectin benzoate and lufenuron are relatively safer for *Coccinella septempunctata*, *Apis mellifera* and *Chrysoperla carnea* in compared to methoxyfenozide and chlorpyrifos.

ITAHAS/AB/2023/116

Response of semi *rabi* fennel to surface and sub surface drip fertigation

B.S. Parmar[1], J. J. Makwana[2] and A. K. Saini[3]
Centre for Natural Resources Management, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat, India

A field experiment was conducted to investigate the effect of different levels of drip irrigation and fertigation, as well as various level depth of drip placement in fennel during *Rabi* seasons of 2017-18 and 2018-19 at Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat, India. The experiment comprised of three levels of irrigation (0.6, 0.8 PEF through drip and 0.8 PEF by surface irrigation, two levels of nitrogen (75 and 100% RDN), and three levels of drip lateral placement (surface, 12.5 and 25 cm depth). The experiment was laid out in Split Plot design replicated thrice. Alternate day irrigation was applied through drip, while fertigation was applied in basal (40:60:00 $N:P_2O_5:K_2O$ $kg.ha^{-1}$) and remaining N (40 $kg.ha^{-1}$) in four equal split at 30, 60, 70 and 90 DAS. The statistical pooled results revealed that the yield of fennel found non-significant with different level of irrigation and fertigation, and depth of drip lateral placement, while surface drip produced the numerically higher seed yield (2245 $kg.ha^{-1}$). The different treatments and their interactions did not exert their significant effect on plant height and number of umbles/plant. The higher values of water and nitrogen use efficiency were observed as 3.94 $kg.ha^{-1}.mm^{-1}$ and 30.73 $kg.kg^{-1}.ha^{-1}$in the treatment of level of drip irrigation at 0.6 PEF (sub surface) and 75% RDN, respectively.

Keywords: *Drip irrigation, subsurface, PEF, fertigation, fennel.*

ITAHAS/AB/2023/117

Prevalent Pest and Diseases in Horticultural Crops and Management of Thrips in Onion Crop in Andhra Pradesh

C. Ruth[1], K.Gopal, K.Swarajyalakshmi[2]

[1,2] Department of Plant Pathology, Dr. YSR Horticultural University, College of Horticulture, Anantharajupeta, YSR District, Andhra Pradesh

Department of Post-Harvest Management, Dr. YSR Horticultural University, College of Horticulture, Anantharajupeta, YSR District, Andhra Pradesh

Survey was conducted in vegetable and fruit crop growing areas in Kurnool, Anantapur and Prakasam districts of Andhra Pradesh. In Kurnool district observed damping off disease 2-5% in onion, tomato and chilli nurseries. 2-5% fusarium wilt observed in tomato crop. 10-15% leaf spot in turmeric, 2-5 % yellow vein mosaic virus in bhendi, 5-10% sigatoka leaf spot in banana, 2-5 % powdery mildew in chillies and mango, 2-5 % gummosis in sweet orange, 5-10 % bacterial canker in citrus and 2-5 % downey mildew in water melon were recorded. In Brinjal, 10-15% fruit and shoot borer damage, 5-13% jassids were identified. In Bhendi 7-11% fruit and shoot borer, in Tomato, 6-13% fruit borer, in chillies 3-5 white flies were identified, 7-13 thrips in Onion and 10-15 thrips in chillies were observed in Kurnool district. Onion thrips is one of major sucking pest in onion cultivation and management trails were conducted. Among the different IPM modules, Seed treatment with lmidacloprid 5g/Kg seed + Application of Neem cake @200Kg/acre + Barrier crop with Maize + Monitoring with yellow sticky traps +Azaderachtin 1 % @1 ml/lit + fipronil @2ml/lit (Need based) was found to good in controlling thrips incidence (4.07) and more yield (24.86 t/ha) was recorded. Diafenthiuron 50WP @ 1g/lit spray was found to be good controlling the onion thrips (4.93) and more yield (23.76 t/ha) was recorded.

Keywords*: onion, pest and diseases, Thrips, management.*

ITAHAS/AB/2023/118

Estimation of Water Requirement of Wastewater Irrigated Turfgrass

D. S. Gurjar[1], R. Kaur[2], Khajanchi Lal[3] And P. S. Brahmanand[4]

[1]Senior Scientist, [2]Principal Scientist, [3]Principal Scientist, [4]Project Director, Water Technology Centre,
ICAR-Indian Agricultural Research Institute, New Delhi-110 012

An investigation on turfgrass *(Cynodon dactylon* L *var.* selection-1) planted under two planting methods (with or without sub-soil plastic mulch) and three wastewater irrigation schedules (75%, 100% and 125% of ETc) were investigated continuously for 3 years (2013-16) at WTC farm of ICAR-Indian Agricultural Research Institute, New Delhi, India. The main objective of the study was to estimate the optimum water requirement of wastewater irrigated turfgrass using soil-water balance method as compared to water requirement of turfgrass calculated by CROPWAT Model. Experiment was laid-out in randomized block design with three replications. Results indicated that turfgrass water requirement was observed minimum as 927 mm in the treatment plots where wastewater irrigation was scheduled at 125% ET_c with sub-soil porous plastic mulch and maximum as 1267 mm in the treatment plots of wastewater irrigation scheduled at 75% ET_c without sub-soil porous plastic mulch. Calculated reference evapotranspiration (ET_0) and actual evapotranspiration (ET_{turf}) or turfgrass water requirement (CWR_{turf}) were estimated as 1077 mm and 915.5 mm, respectively. Based on quality ratings, planting method and water requirement of turfgrass, the best treatment was found as wastewater irrigation scheduled at 125% ET_c with sub-soil porous plastic mulch which was associated with higher turf quality/colour. Hence, a water requirement of 927 mm may be considered as most appropriate for turfgrass under Indian climatic conditions.

Keywords*: Evapotranspiration, irrigation, plastic mulch, soil-water balance, turfgrass.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/119

Gamma rays induced mutation studies in Mandarin

Jyoti[1], Ekta P. Ningot[2], D. M. Panchbhai[3], R. P. Gajbhiye[4] and Megha H. Dahale[5]

[1]PG Scholar, [2]Assistant Professor of Horticulture, College of Agriculture, Nagpur,[3] Dean, College of Horticulture, Akola, [4]Associate Professor, College of Agriculture, Mul
[5]Associate Professor, College of Agriculture Nagpur

An experiment entitled "Mutation studies in Mandarin orange" was carried out during the year 2021-22 at Centre of Excellence for Citrus, College of Agriculture, Nagpur, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, with the objectives to study the effect of gamma irradiation on budding success and growth performance of mandarin orange budgrafts varieties *viz.,* Nagpur mandarin and Nagpur seedless and to find out the effect of gamma irradiation for induction of variability in mandarin orange.

Nagpur mandarin and Nagpur seedless budsticks of 12-15 cm length collected for mutagenic treatment. Irradiated with five doses of gamma rays and Shield budding was performed, 500 budgrafts per treatment were raised in polyhouse for its growth and performance at 30 to 180 days after sprouting. The experiment was conducted as a non- replicated trial. Increase in dose of gamma rays resulted in delayed sprouting of budgrafts and decreased sprouting percentage, shoot length, leaf width, plant height, survival and mortality percentage. Whereas branches plant^{-1}, width of leaves, leaf abnormalities and variations were recorded maximum variation at high doses of 30, 40 and 50 Gy. Variations in leaf characteristics suggest mutagenic effectiveness of gamma irradiation on budwood which may have potential for further studies.

Keywords*: Gamma rays, mutation, Mandarin.*

ITAHAS/AB/2023/120

Organic farming- impact on pest activity

G. Sarada, V.V. Padmaja and K. Lalitha

Organic farming approaches pest management in a holistic and ecologically friendly manner, focuses on prevention, cultural practices, and natural pest control methods, while conventional farming relies heavily on synthetic pesticides to control pests. Organic farmers prioritize preventing pest problems by promoting soil health, crop rotation, and biodiversity, creating a healthy and balanced ecosystem with reduced likelihood of pest infestations. Organic farming practices can have both direct and indirect impacts on pest activity. Organic farmers employ various physical methods to manage pests. These can include handpicking insects, using barriers like nets or row covers to exclude pests and employing traps to monitor and control pest populations. Mechanical methods such as tillage, mowing, or pruning can also be used to disrupt pest habitats and life cycles.

By promoting healthy plants and diverse habitats, organic farming creates an environment that may be less favorable for certain pests. However, it may also have increased pest pressure leading to occasional pest outbreaks in certain cases, as synthetic pesticides are not used to suppress pests artificially. However, by encouraging the presence of beneficial insects, predators, and parasites and implementing integrated pest management (IPM) practices, organic farms may experience natural regulation of pest populations preventing from reaching to damaging levels. Organic farms may support a broader array of pest species compared to conventional farms promoting pest diversity and the promotion of ecological balance can help maintain a balance between pests and their natural enemies. Organic farms reduce the selective pressure that drives the evolution of pesticide resistance in pests. This can slow down the development of resistant pest populations. Additionally, organic farming practices that emphasize crop diversity and ecosystem health may favor the development of more resilient plant varieties that are less susceptible to pests. It's important to note that the impact of organic farming on pest activity can vary depending on factors such as crop type, region, farm management practices, and specific pest species.

Keywords: *Organic farming, pest population, pest activity.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/121

Estimation of genetic divergence of dark brown sesame (*Sesamum indicum* L.) accessions using D^2 statistics

Gangishetti Ranjithkumar* and Rajani Bisen
Department of Plant Breeding & Genetics, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur

In this experiment, a total number of 150 dark brown sesame accessions were evaluated at JNKVV, Jabalpur during *Kharif*-2019 and 2020 to find out the genetic divergence. Sesame (*Sesamum indicum* L.) is commonly known as Til, gingelly, bennised, simsim having diploid chromosome number 2n=26 and belongs to family Pedaliaceae. It is considered as "Queen of Oil seeds" because of its high-quality oil and protein content. Genetic diversity plays a major role, as it allows the production of crops in the presence of various biotic and abiotic stresses added with the selection of parents which can be used in further plant breeding programme. Accurate information on the nature and degree of genetic diversity helps the plant breeder in selecting parents which are genetically diverse for hybridization programme. Mahalanobis D^2 Statistic (1936) has been used in most of the crops for selecting diverse parents from the population for the breeding programme. With the experimental results, we concluded that, 150 accessions were grouped into 8 clusters using Tocher's method. Out of these 8 clusters, cluster-II was observed with the maximum number of genotypes 40, followed by cluster-III (32 genotypes), cluster-I (30 genotypes), cluster-IV (21 genotypes), cluster-V (16 genotypes) and cluster-VII (9 genotypes), however, cluster-VI and cluster-VIII were having each one genotype.

Keywords: *divergence, sesame, D^2 statistics*

ITAHAS/AB/2023/122

Regeneration and Utilization Pattern of *Terminalia chebula* Retz. in Sirsi Forest Division of Uttara Kannada District of Karnataka

Girish B. Shahapurmath[1]*, Umesh R[2] and Ganesha B.H[3].

[1]Assistant Professor, College of Forestry, Sirsi-581 401, Uttara Kannada district, Karnataka, India

[2]Post Graduate (FRM), College of Forestry, Sirsi-581 401, Uttara Kannada district, Karnataka, India

[3]Ph.D. Scholar Dept of Silviculture and Agroforestry, COF, Sirsi-581 401

The present study was conducted in five natural populations of *Terminalia chebula* Retz. Distributed habitats in dry deciduous, moist deciduous and semi-evergreen forests of the Sirsi Forest Division of Uttara Kannada district in Karnataka. In every natural population, 5 quadrates of 20m×20m, size plots were randomly laid out to study the population structure and vegetation diversity of the tree species. In each quadrat, five nested quadrats of 1m×1m, in size were laid out to study the regeneration status. The entire study area tree species comprised 68 Species representing 53 genera and 28 families. All the sites are dominated by the *Terminalia chebula* tree in its natural population according to the ranking of IVI. The IVI value ranged between 30.59 to 47.29. The highest IVI was recorded from the Hulekal range (47.29), followed by Janmane (38.16). Banavasi recorded IVI of 33.42, Sirsi 33.18 and a lower IVI was recorded by Siddapur range (30.59). The value of the Shannon-wiener index of growing stock ranged between 2.84 to 3.15 in the studied area. The Simpson index varied between 0.06 to 0.08 and the Evenness index between 0.83 to 0.88. The IVI of the regeneration layer in *Terminalia chebula* distributed habitat ranged between 27.42 to 13.47. The highest IVI of *Terminalia chebula* regeneration is found in Hulekal range (27.42), followed by Janmane (22.06), Banavasi (15.04), Sirsi (15.00) and Siddapur (13.47). The Shannon-wiener index of the regeneration layer ranged between 3.03 to 2.81. Simpsons index values varied from 0.06 to 0.08. Evenness index values were found between 0.10 to 0.12. The present study also documented utilization patterns of the Harar tree by participatory discussion method through a questionnaire survey. A total of 85 families from 22 villages of Sirsi Forest Division were surveyed and 15 different using patterns and 7 various medicinal usages were documented.

Malla Reddy University, Hyderabad and Just Agriculture Education Group

Keywords: *Habitats, natural populations, vegetation diversity, utilization patterns, questionnaire survey, medicinal usage.*

ITAHAS/AB/2023/123

The Study on Marketing Channels of Non Timber Forest Products (NTFPS) In Sirsi, Siddapur And Yellapur Talukas Of Uttara Kannada District.

Girish B. Shahapurmath[1]*, Suma R[2] and Hanumantha, M[3].

[1]Assistant Professor, College of Forestry, Sirsi-581 401, Uttara Kannada district, Karnataka, India

[2]Post Graduate (FRM), College of Forestry, Sirsi-581 401, Uttara Kannada district, Karnataka, India

[3]Assistant Professor, College of Forestry, Sirsi-581 401, Uttara Kannada district, Karnataka, India

The study analyzed the significance of different marketing agencies involved in the marketing of NTFP's to the livelihood of the local people. Primary data and secondary data were used for the study. The Kadamba Marketing Society marketed 13 commercialized NTFP's during 2019-20 and are commercially important NTFP's. Among the NTFP's marketed, majority were medicinal plants. The 10 medicinal plants were sold to the pharmaceutical companies. The 7 NTFP's used for industrial purpose were sold to the industries. The 6 NTFP's used for edible purpose. The TSS societies marketed 23 commercialized NTFP's during 2019-20 and are commercially important NTFP's. Among the NTFP's marketed, majority were medicinal plants. The 23 NTFP's used for medicinal plants were sold to the pharmaceutical companies. The 11 NTFP's used for industrial purpose were sold to the industries. The 14 NTFP's used for edible purpose. EDC procured NTFP's *Garcinia cambogia* and *Myristica malabarica* The medicinal plants marketed through society were sold to the pharmaceutical companies. Even though the procurement price given by the private shops and EDC for commercially important NTFP's were higher than that of the kadamba and TSS society, the indigenous people were more benefited by the marketing through the society. Because the EDC and private shops do not share their profit with the collectors, where as the society gives certain percentage of their profit back to the primary collectors in addition to the procurement price. But the financial constraints during the lean seasons are forcing the indigenous communities to sell their products to the private shops. If the society and EDC can start the value addition units of the NTFP's with the involvement of indigenous

communities, it ensures effective utilization of their free time and a better livelihood through enhancement of their income from NTFP's.

Keywords: *Commercialized NTFP, indigenous people, indigenous communities, pharmaceutical companies.*

ITAHAS/AB/2023/124

Evaluation of Growth and Productivity of Fodder Tree Species With Intercrops Under Agroforestry Systems, Karnataka

Girish B. Shahapurmath[1]*, S. S. Inamati[2] and S. M. Mutanal[3]

[1]Assistant Professor, College of Forestry, Sirsi-581 401, Uttara Kannada district, Karnataka, India

[2]Associate Professor and Head, Dept of Silviculture and Agroforestry, COF, Sirsi-581 401

[3]Principal Scientist, AICRP on Agroforestry, UAS, Dharwad–580 005, Karnataka, India

Fodder shrubs and trees (browse) play a significant role both in farming systems, where they are protected as fallow species, and in livestock production. A field experiment was conducted to assess the growth and productivity of fodder tree species with intercrops under agroforestry systems in Northern Transitional zone of Dharwad region of Karnataka in India during 2018-19 and 2019-20 in kharif and rabi seasons. The fodder plantation was established in 2014 with seven fodder tree species with a spacing of 5m × 3m *Viz.,*1.*Calliandra calothyrsus*, 2.*Albizia lebbeck*, 3.*Leucaena leucocephala*, 4.*Sesbania grandiflora*, 5.*Gliricidia sepium,* 6.*Moringa olifera,* 7.*Bauhinia purpurea* and 8. Sole Field Crops (soybean and safflower). The experiment was conducted with Randomized Block Design (RBD) with three replications. Among seven fodder tree species evaluated under agroforestry systems, the highest MAI in volume of wood was reported in *Moringa olifera* (5.042 and 5.625 m^3 ha^{-1}) followed by *Leucaena leucocephala* (4.414 and 4.880 m^3 ha^{-1}). *Gliricidia sepium* produced the highest MAI in total tree biomass (4.18 and 4.90 t ha^{-1}) followed by *Moringa olifera* (3.81 and 4.25 t ha^{-1}) as compared to other fodder tree species studied. The pooled data of 2018 and 2019 reported maximum green fodder yield recorded in *Calliandra calothyrsus* (474.17, 586.07 and 429.46 kg ha^{-1}) followed by *Leucaena leucocephala* (444.26, 555.33 and 388.73 kg ha^{-1}) which varied significantly from other fodder tree species at all the stages of pruning intervals. Total fodder yield recorded for the year 2018 and 2019 showed significantly higher values of green fodder yield which were recorded in *Calliandra calothyrsus* (1462.89 and 1516.52 kg ha^{-1} respectively) followed by next best fodder tree *Leucaena leucocephala* (1365.88 and 1410.75 kg ha^{-1}) for the year 2018 and 2019 respectively which varied significantly from other fodder tree species. The maximum per cent dry

matter production recorded in T_1 - *Calliandra calothyrsus* + FC (50.01, 51.05 and 52.03 %) followed by T_3 - *Leucaena leucocephala* + FC (47.13, 48.20 and 49.24 %) at all the stages of pruning intervals. There was a gradual increase in dry matter from rainy to spring and winter seasons in all the fodder tree species examined. Green tree fodder yield was positively correlated with light interception (0.544) at 5 per cent significant level and negatively correlated with light transmission ratio (-0.383). Hence, these agroforestry systems have an additional role of improving socioeconomic status of farming community providing them additional income.

Keywords*: Fodder banks, woody perennials, Mean Annual Increment, pruning height and interval, lops and tops, cutting frequency, total tree biomass.*

ITAHAS/AB/2023/125

Role of ICT as a technology dissemination in fish production

H. L. Verma[1]* and Mitanshu Yadav[2]

[1]Assistant Professor (Extension Education), Division of Social Sciences, Faculty of Fisheries-Rangil, SKUAST-K (J&K), India

[2] Research Scholar (Fisheries Extension), Division of Social Sciences, Faculty of Fisheries-Rangil, SKUAST-K (J&K), India

The fisheries sector plays a crucial role in ensuring global food security and supporting the livelihoods of millions of people worldwide. India is the third largest fish producing country in the world and accounts for 7.96 percent of the global production. In recent years, the integration of Information and Communication Technology (ICT) plays a vital role in the fisheries sector to dissemination of technologies and collecting the information through various modes, like Television, Radio, Mobile, mass media channels, Global Positioning System (GPS), GPRS, Echo sounder, Sound Navigation and Ranging (SONAR), Search and Rescue Transponder (SART), Automatic Identification system (AIS), Distress Alert Transponder (DAT), and Internet enabled PC, Radio Detection and Ranging (RADAR), Community Radio, portal, Very High frequency wireless sets (VHF). For identifying vessels, Internet of things (IOTs) and tracking supply of products technologies like Barcoding, Vessel tracking devices and supply chain tracking software were valuable. Fishing communities in marine sectors were advised through Indian Marine Fishery Advisory System which helps in identification of PFZ for effective and sustainable fishing. E-Commerce activities supporting vast fisheries market chain with websites and applications such as marinefishsales, Fisher Friend, Daily fish etc. Database regarding fisheries resources are crucial for sustainable development and conservation. Repository like Fishbase, Reefbase and WIOFish provides direct access to relevant resources. Social networking software and applications like Instagram, Twitter, Whatsapp, Face Book messenger, YouTube etc. are the fastest means for transfer of information through ICT like as capture fishing, marketing of raw fishes and value added products, disease management and advancement in aquaculture practices. It concluded that ICT has emerged as a powerful tool in the fisheries sector to contributing the improved resource management, increased production and productivity, enhanced the market linkages, understand to the challenges in fish production, knowing market

policy, helping the extension personnel's, researchers and other policymakers for further plan to take the necessary steps for overall improvement of the fisheries sector. It may be suggested that harnessing the full potential of ICT requires addressing infrastructure gaps, promoting digital literacy, and formulating appropriate policies and regulations.

Key words: *Role, ICT and fisheries sector.*

ITAHAS/AB/2023/126

Exploring Exogenous Melatonin as a Biostimulant: A Promising Approach to Enhance Abiotic Stress Tolerance in Horticultural Crops for Sustainable Agriculture

Haobijam Sanjita Devi

College of Horticulture, Central Agricultural University, Imphal, Sikkim, Bermiok-737134 India

Horticultural crops face numerous challenges due to abiotic stresses, such as drought, salinity, and temperature fluctuations, which significantly impact their growth and productivity. The search for effective and sustainable strategies to enhance abiotic stress tolerance in horticultural crops has led to the exploration of exogenous melatonin as a biostimulant. Melatonin, a naturally occurring hormone in plants, has been found to play a crucial role in regulating various physiological processes, including stress responses. This article aims to review the current research on the potential of exogenous melatonin as a biostimulant for improving abiotic stress tolerance in horticultural crops, with a focus on sustainable agricultural practices.

Studies have demonstrated that exogenous melatonin application can enhance the antioxidant defense system, alleviate oxidative stress, and modulate the expression of stress-related genes in horticultural crops under abiotic stress conditions. Melatonin has also been found to regulate stomatal behavior, improve water use efficiency, and enhance photosynthesis efficiency, thereby mitigating the adverse effects of drought and high temperature stress. Furthermore, exogenous melatonin application has shown promising results in mitigating salt stress by regulating ion homeostasis, osmotic adjustment, and improving the overall salt tolerance of horticultural crops.

The potential benefits of exogenous melatonin as a biostimulant extend beyond stress tolerance enhancement. Melatonin has been reported to enhance seed germination, root development, and nutrient uptake efficiency in horticultural crops, thus contributing to overall plant growth and development. Moreover, the use of exogenous melatonin has shown to increase crop yield and improve fruit quality attributes, including increased antioxidant content, prolonged shelf life, and enhanced nutritional value.

The exploration of exogenous melatonin as a biostimulant represents a promising approach for sustainable agriculture. By harnessing the potential of

melatonin to enhance abiotic stress tolerance in horticultural crops, farmers can reduce their reliance on chemical inputs, minimize environmental impacts, and promote the development of resilient and productive crop systems. However, the molecular mechanisms underlying the exogenous melatonin-mediated abiotic stress response require further elucidation. Additional research is necessary to optimize application methods, determine appropriate dosages and timing for exogenous melatonin, and evaluate its long-term effects on crop performance, soil health, and ecosystem sustainability.

ITAHAS/AB/2023/127

Efficacy of *Trichoderma*, beneficial bacteria like as *Bacillus* and *Pseudomonas*, lead to the development of microbial synergistic bio-inoculants for sustainable agriculture

Harish Kumar, Jyoti, Vijay Kumar and Ravi Singh Thapa
Assistant Professor, School of Agricultural Sciences, IIMT University Meerut

Trichoderma is a genus of fungi that is known for its beneficial effects on plant growth. It acts as a biocontrol agent against various plant pathogens, including fungi, bacteria, and nematodes. *Trichoderma* species also promote plant growth by improving nutrient uptake, enhancing root development, and stimulating the production of plant growth-promoting substances. Bacillus is a genus of bacteria that includes several species with plant growth-promoting properties. Bacillus species can fix atmospheric nitrogen, solubilize phosphate, produce phytohormones, and exhibit antagonistic activity against plant pathogens. They also help in the degradation of organic matter, improving soil fertility. *Pseudomonas* is another genus of bacteria widely recognized for its beneficial effects on plant health. *Pseudomonas* species possess multiple mechanisms to suppress plant pathogens, such as the production of antibiotics, siderophores, and enzymes. They also stimulate plant growth through the production of plant growth-promoting substances and by enhancing nutrient availability. The combined use of *Trichoderma*, *Bacillus*, and *Pseudomonas* offers several advantages in sustainable agriculture: Disease suppression, Nutrient management, Plant growth promotion, Environmental sustainability. The selection should be based on their compatibility, ability to colonize plant roots, and effectiveness in promoting plant growth and disease suppression. Moreover, formulation development is crucial to ensure the viability and long-term stability of the bio-inoculants. This involves optimizing carrier materials, adjuvants, and production processes to maintain the microbial populations and viability during storage and application. Overall, the combined use of *Trichoderma*, *Bacillus*, *Pseudomonas*, and other beneficial microorganisms in microbial synergistic bio-inoculants holds great potential for sustainable agriculture by improving plant health, increasing crop productivity, and reducing the environmental impact of agricultural practices.

Malla Reddy University, Hyderabad and Just Agriculture Education Group

Keywords*: Bacillus, Pseudomonas, sustainable agriculture, synergistic and Trichoderma.*

ITAHAS/AB/2023/128

Dissemination of recent production technologies to enhance productivity of Chilli through Front Line Demonstrations (FLD's) in Raichur district of Karnataka State

Hemalatha K. J.[1], Veena T.[2] and Sangeetha[3]

[1&2]ICAR- Krishi Vigyan Kendra, University of Agricultural Sciences, Raichur-584 104

[3]College of Agriculture, University of Agricultural Sciences, Raichur - 584 104, Karnataka, India

Chilli (*Capsicum annum* L.) is one of the important commercial crop grown in Raichur district of Northern Karnataka. Chilli is also considered under one district one produce (ODOP). The major constraint for low productivity of chilli is due to non-adoption of improved production technologies and improved varieties/hybrids. In this context, about 50 demonstrations during four consecutive years from 2019-20 to 2021-22 in farmer's fields of different villages of Raichur district were conducted by ICAR- Krishi Vigyan Kendra, Raichur, Karnataka. The main objective was to enhance productivity of Chilli and net returns of farmers by disseminating improved crop production technologies. Improved cultivation practices included use of high yielding hybrid (Arka Kyati), seed treatments, nursery rising, weed management, irrigation; nutrient management, insect pest & disease management, use of plant growth promoters and use of biofertilizers. The findings revealed that demonstrated plots recorded an average yield of 40.50 q/ha which was 24.04% higher than the farmer's practice (32.65 q/ha). Similarly, demonstrated plots recorded higher net returns with a benefit cost ratio of 5.64 as compared to farmer's practice with a benefit cost ratio of 3.99. The average technological gap, extension gap and technological index found were 30.6 q/ha, 7.85 q/ha and 52.14% respectively. Adoption of improved production technologies will increase the productivity of chilli and improve socio-economic condition of the farmers.

***Keywords**: Onion, Front line demonstrations, Technology dissemination, Yield, Technology gap, Extension gap, Technology index, Economics.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/129

The Brunt of COVID-19 on the education system in India

Dr. Hemangi Raul[1] and Mansi Raul[2]
[1]Asst. Prof. Shardabai Pawar Mahila Arts, Commerce, and Science College, Baramati
[2]II-year, ABM, College of Agribusiness Management, Baramati

Nobody and no sector could escape the horrors of the COVID-19 pandemic. Students are the most severely affected victims of the pandemic, even though they were not at the center of it. Their lives have been knocked off by the pandemic. UNESCO reports that 87% of the world's student population has been affected by school closures and over 1.5 billion students from 195 countries.

COVID-19 has not only impacted the students but also the teachers and parents across the world. It has left an impact not only on kids but also on instructors and parents all across the world. COVID-19 has impacted every aspect of education, including examinations and evaluations, the commencement of a new semester or term, and the extension of the academic year. It has adversely affected the students of the vulnerable class. The Indian School Education System is one of the largest in the world with nearly 14.89 lakh schools, more than 95 lakh teachers, and nearly 26.52 crore students of pre-primary to higher secondary levels from varied socio-economic backgrounds.

The pandemic widened the inequalities between students, teachers, and institutions. The students of uneducated parents and the students who came to school for midday meals lost their meals too. But on the other hand, the positive aspect is that every Indian teacher adopted the technology, which enhanced digital literacy. The teachers make their classroom teaching interesting with the hybrid mode of instruction. This hybrid mode resulted in an effective and efficient teaching-learning process. Students could judge their hidden talent and parents too turned open-minded to accept varied career options for their children. The pandemic was a boon for parents in the IT industry, who hardly spent time with their children. The pandemic provided an opportunity for the students and parents to interact with one another. The educated parents guided and mentored their kids. India's efforts to face this pandemic challenge have been praised all over the world.

This paper highlights the positive and the negative aspects of the COVID-19 pandemic on the Indian education system, students, teachers, parents, institutions, and society at large.

Keywords: *learning, teaching, lockdown, education, teachers.*

Effect of time of irrigation and level of pruning on yield and quality of off-seasonal custard apple (*Annona squamosa* L.) cv. GJCA-1

J. S. Parasana*, Shivani Patel, D. K. Varu and D. R. Kanzaria
College of Horticulture, Junagadh Agricultural University, Junagadh, Gujarat

A field experiment was conducted to determine the different times of irrigation and level of pruning on yield and quality for induced early flowering and fruiting in custard apple (*Annona squamosa* L.) cv. GJCA-1 at Fruit Research Station, Madhadi Baug, JAU, Junagadh, Gujarat, India during 2021-22. The results revealed that the number of fruits per tree was 41.60 kg per plant in the treatment of no irrigation which is the highest as compared to other treatments. The information is given to the scientific community that the custard apple should not be irrigated after completion of rest to take early flowering and fruiting due to higher temperatures 41.4 ºC with lower humidity 45.3 % in the Saurashtra region of Gujarat.

ITAHAS/AB/2023/131

Effect of integrated nutrient management on growth, yield and quality in rejuvenated guava (*Psidium guajava*) cv. Bhavnagar Red

J. S. Parasana*, Shivani Patel, D. K. Varu and R. S. Chovatia
College of Horticulture, Junagadh Agricultural University, Junagadh, Gujarat

A field experiment was conducted to determine the different combinations of integrated nutrient management on growth, yield and quality in rejuvenated guava (*Psidium guajava*) cv. Bhavnagar Red at Fruit Research Station, Madhadi Baug, JAU, Junagadh, Gujarat, India during 2020-21 and 2021-22. The results revealed that treatments exerted significant effects results. The treatment T4 showed a significant effect on fruit characters like fruit weight (155.22 and 158.11 g), length (8.03 and 8.15 cm), girth (7.78 and 7.86 cm), number of fruits per tree (513 and 523.67), yield (79.72 and 82.88 kg/plant as well as 22.08 and 22.96 t/ha) respectively. While quality parameters were also affected significantly. The maximum Non- reducing sugar (4.75 and 4.79 %) was observed in fruits of treatment T8. Though minimum acidity (0.48 and 0.74 %) was reported in treatment T4 and T8 fruits. While total sugar (7.13 and 7.18 %), reducing sugar (2.39 and 2.44 %) and TSS (11.23 and 11.74 °B) were significantly affected by treatment T_4. Ascorbic acid (234.34 and 238.23) was found maximum in the fruits of treatment T_4 for 2020-21 and in T_3 for 2021-22, respectively. Farmers of South Saurashtra Agro Climatic Zone growing guava are recommended to apply 187.5 g of each N : P_2O_5 : K_2O/plant along with FYM 5 kg/plant + Vermicompost 2.5 kg/pl. + *Azospirillum* 125 ml/pl. + *PSB* 15 g/pl. as basal dose during *Kharif* season and remaining 187.50 g N/pl. as a split after completion of *Kharif* season for getting higher yield and net return.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/132

Standardization of Nutrients & Temperature on Hydro-Primed Seeds Germination & Growth Performance in Wheat (*Triticum aestivum* L.)

[1]Jyoti, [2]Harish Kumar, [3]Hitesh Kumar Yadav, [4] Vijay Kumar and [5]Ravi Singh Thapa

[1,2,4,5] School of Agricultural Sciences, IIMT University Meerut - 250001 Uttar Pradesh

[3] Department of Seed Science and Technology, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India, 224229

Seed priming is significant to improve seed quality and promote crop establishment. Hydro-priming is one of the most commonly used priming techniques. It involves soaking seeds in a solution that provides the obligatory nutrients, oxygen and moisture for germination and seedling growth. This research aimed to investigate hydro-priming's effects on seed quality parameters in two varieties of wheat (*Triticum aestivum* L.), namely Khachiya-65 and KRL-210. Dry (moisture 13%) and uniform seeds were primed for 8, 16 and 24 hours using different nutrient solutions with varying concentrations. The germination and growth performance of hydro-primed wheat (Triticum aestivum L.) seeds can vary significantly with different nutrient concentrations and temperatures. This study aims to investigate the effects of standardizing nutrients and temperature on the germination rate, root length, shoot length, seedling length, and seedling dry weight of hydro-primed wheat seeds. It also seeks to determine the optimal conditions for priming these seeds to maximize their germination rate, root length, shoot length, seedling length, and seedling dry weight. By doing so, this study will provide valuable insights into how different nutrient concentrations and temperatures can influence the germination performance of hydro-primed wheat seeds. In this investigation, we looked into the current state of four key seed quality parameters: germination, root length, shoot length and seedling length. We also considered the seedling dry weight as it can impact the germination rate and the overall growth of a plant. By analyzing these different parameters, we can conclude that there is a direct correlation between them and determine how they affect each other when it come to a successful crop yield. This research aims to provide valuable insight into how improving these parameters can lead to better yield and improved farming practices universally.

Key Words: *Khachiya-65, KRL-210, Hydro-priming, germination rate, root length, shoot length, seedling length, and seedling dry weight.*

ITAHAS/AB/2023/133

Composting of tree leaf litters using naturally occurring microorganisms for quality compost production

*Kaberi Mahanta[1], Kusum Kumar Deka[1], Seema Bhagowati[1], Masfiqual Hussain[1] and Pradip Kumar Mahanta[1]

[1] AAU – HRS, Kahikuchi, Guwahati – 17

Agroforestry systems are an alternative option for sustainable production management. These systems contain trees that absorb nutrients from deeper layers of the soil and leaf litter that help improve the soil quality The litter fall from agroforestry trees is very huge but it has not been utilized effectively. One of the best ways to manage the leaf litter is composting. Composting is a natural process through which organic wastes are converted into manure by the action of microorganisms Plant litter is an integral part of the nutrient cycling process and is an indicator of an ecosystem's productivity and stability. Leaf senescence and fall is a major component of litter, and the organic compounds of the litter are physically and chemically broken down by derivers and decomposers into inorganic nutrients that plants are able to take. This organic layer is then decomposed and released as inorganic soil nutrients. The leaf litter can be converted into quality compost and added back into the same ecosystem to improve the soil quality and growth of the trees. An attempt was made to prepare good quality compost from two agroforestry tree leaf litter (Acacia mangium and Gmelina arborea) using naturally occurring microorganisms isolated from fresh cow-dung half-decomposed crop organic matter and decomposed remains collected from under the trees of Acacia mangium and Gmelina arborea. The decomposition of rice straw with the above-mentioned isolated microorganisms is taken as a control treatment against Acacia mangium and Gmelina arborea-based treatments. Keeping this in mind, to study the decomposition pattern of leaf litter by naturally occurring microorganisms, an incubation study was carried out at AAU – HRS, Kahikuchi, Guwahati – 17, Assam with three treatments, five replications, and CRD as the design of experiment. The periodic changes in pH, temperature, total carbon, total nitrogen, C:N ratio, bacterial and fungal population and maturity test of the compost were determined by following standard protocols. Most of the biochemical properties exhibited by the tree leaf litters periodically are stabilized sixty days onwards. But the compost maturity by germination

percent of seedlings is not satisfactory at sixty days as the germination index of >70% with compost extracts determined the maturity of compost. This may further require identification of specific type of organisms for decomposition of various biochemical composition of leaf litters.

Keywords: *Agroforestry systems; leaf litter, quality compost.*

ITAHAS/AB/2023/134

Phule Rohini Rabi Sorghum Variety: A Special Processing Variety For Papad Making

Chavan U.D., Babar K.P.

Phule Rohini (RPASV 3) a rabi sorghum variety suitable for papad making purpose. It was found superior in better papad making quality over local sorghum variety. This is specially developed for processing. Organoleptic studies revealed that the papad of Phule Rohini (RPASV 3) had more crispiness and very good test. Average number of papad per kg flour of Phule Rohini (RPASV 3) is 62 pieces (each piece weight average 12 to 14 gram). Papad quality studies revealed that papad prepared from RPASV 3 had red brown attractive colour with more expansion (32.50 %) and less oil absorption (17%). Nutritional constituent's of grains revealed that Phule Rohini had recorded higher Crude Protein (8.93%), soluble proteins (1.21 %), Total sugars (1.42%) , Starch (42.6 %), zinc (4.02 mg /100g) , iron (9.68 mg /100g) and calcium (21.83 mg /100g). It had semi-compact oval shape panicle with red round grains at maturity. The variety RPASV 3 was therefore released under the name Phule Rohini for special purpose suitable for papad.

Keywords*: Papad, crispiness, red brown, organoleptic.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/135

Antibiotic Usage by Dairy Farmers of Punjab

Kritika Verma[1], S.K. Kansal[2] and Jaswinder Singh[3]
[1]Ph.D Scholar, Department of Veterinary and Animal Husbandry Extension Education, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, India.
[2]Professor, Department of Veterinary and Animal Husbandry Extension Education, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, India.
[3]Associate Professor, Department of Veterinary and Animal Husbandry Extension Education, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, India.

Self-treatment is a very significant issue and emerging challenge to veterinary health care providers, as it hinders with the proper treatment protocol and can lead to the development of resistance in disease-causing microorganisms which is known as antimicrobial resistance (AMR). The present study has been carried out to find the antibiotic usage by dairy farmers of Punjab. A well-structured and pre tested interview schedule was used for the data collection from the peri-urban dairy farmers (n=360). The data revealed that the majority of the respondents (72.50%) stored antibiotics in the medicine cabinet. Maximum proportion of respondents (79.17%) who were storing antibiotics in medicine cabinet were from Malwa region and minimum (66.67%) were from Majha region. Most of the respondents (22.50%) who stored the antibiotics in refrigerator were from Majha region and minimum (15.83%) were from Malwa region. Respondents who were storing antibiotics in any part of the house, maximum proportion (10.83%) were from Majha region and minimum (5.00%) were from Malwa region. The majority of respondents (72.50%) gave antibiotics to their animals for 4-6 days, while the remaining 24.72% gave antibiotics for 1-3 days. All the respondents gave antibiotics to animal only for therapeutic use or when the animal got sick. Not even a single respondent from all the 3 region viz. Majha, Malwa and Doaba received any training on antibiotics. It is also revealed from the study that only 2% of respondents said they didn't store the leftover antibiotics, while 98% said they did. Majority of the respondents from all the 3 regions were storing the residual antibiotics for future use viz., Majha 98.33 percent, Malwa 99.17 percent and Doaba 94.17 percent. On the other hand from Majha 1.67 percent, 0.83 percent of the Malwa and 5.83 percent from

Doaba region. Storage of residual antibiotics frequently leads to their re-use in similar diseases, resulting in self-medication.

Keywords: *Antimicrobial resistance (AMR), Peri-urban areas, Self-medication practices*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/136

Adoption of Practices Related to Safe Handling of Drinking Water by Women in Punjab, India

Loveleen Kaur[1] and Kanwaljit Kaur[2]
[1]Research Scholar, Department of Extension Education and Communication Management, Punjab Agricultural University, Ludhiana, Punjab
[2]Professor, Department of Extension Education and Communication Management, Punjab Agricultural University, Ludhiana, Punjab

Prior research has shown that most of the people rely solely on the physical characteristics i.e. taste, colour and smell to judge the quality of water. They are also ignorant about the recommended practices to ensure potability of water. Thus, the present study was conducted with the objectives to assess the adoption of recommended practices related to safe handling of water by women along with the reasons for adoption or non-adoption. The study was conducted in the rural area of Ludhiana district of Punjab, India. Data were taken from 200 women by a self-structured interview schedule. The practices of safe handling of water were divided into three major practices i.e. quality testing of water, purification of water and safe storage of drinking water. According to the study's findings, only 19 per cent of respondents regularly tested the quality of their household water one in six months. Nearly all of the respondents had not tested the TDS and pH level of their water due to lack of knowledge about the importance of these tests for drinking water. Seventy per cent respondents reported to purify their water before consuming. People need to be aware about the significance of water TDS level for installing RO purifiers because the use of an RO purifier emerged to be the commonly adopted method of water purification without considering the prerequisites for installing it. This was followed by boiling method as a common practice of water purification but chlorination method was unknown to the respondents. Users of plastic water storage containers made up 77.5 per cent of sample mainly due to ignorance of the ill effects of plastic on health (44%). Lack of information among the respondents was the main barrier to the majority of the advised practices being adopted. Thus, there is a need to educated people about recommended drinking water handling practices at the household level. This can be achieved by using a variety of extension strategies, including interpersonal, ICT-based, etc. Additionally, the reasons for adoption and non-adoption of recommended practices discussed in this study may be useful to

future researchers and extension agents in their efforts to increase the adoption of these practices.

Keyword: *Adoption, handling of water, Water quality testing, water purification, water storage.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/137

Pearl millet – Assessment with broiler performance in feed composition

Thamizhannal. M, Sreyass. K.S and Raja Rajeshwaran. T.S
Assistant Professor, SRM College of Agricultural Sciences, SRM Institute of Science and Technology, Vendhar Nagar, Baburayanpettai, Chengalpattu (D.T) - 603 201

Pearl millet is commonly grown crop in Indian subcontinent. Pearl millet is rich source of carbohydrates, protein, calcium, phosphorus, iron and also essential amino acids such as lysine, methionine and tryptophan which is necessary for poultry growth performance. It also act as source of B complex vitamins such as riboflavin and niacin. Pearl millet has additional advantages like fast growing, draught tolerant and heat tolerant properties. Along with nutritional benefits of Pearl millet in human consumption, it also act as component of animal feed composition for future especially at rural areas of our country. Previous research studies also reported that feeding ground pearl millet to laying hens results with eggs higher in omega-3-fatty acids and lower in omega-6-fatty acid than eggs from hens fed with maize based diets.

The present study was designed to utilize pearl millet at various compositions (0, 5, 10, 15 and 20 %) in Ross 308 broiler variety. Regular maize based poultry feed used along with pearl millet at various proportions were fed to broilers from day 0 to 42 days in cage system of rearing. Unbroken whole pearl millet was used throughout the study period. The nutritional composition Pearl millet was also determined as 3200 kcal/kg, crude protein, crude fibre of pearl millet were 11.2 % and 2.5% respectively. Based on observations it was evident that gizzard yield increased significantly at 10% and more with pearl millet. Usage of whole grain relatively improves grinding activity of gizzard which is muscular stomach of chicken. Also it clearly shows that no significant difference observed in dressing percentage, Feed conversion, broiler health performance and mortality percentage among (0, 5, 10, 15 and 20%) different treatments. It can be concluded that pearl millets can be incorporated more than 10 to 15 % without any unfavourable results in broiler farm. Pearl millet can also be utilized as effective alternate feed ingredient for maize in poultry feed.

Keywords: *Pearl millet, Animal feed, Gizzard, Whole seed.*

ITAHAS/AB/2023/138

BIOREACTORS: A New Approach to Managing Nutrient Loss from Agricultural Lands

Mallika, K[1] and Veena,T[2]

[1]Assistant Professor at College of Horticulture, Mudigere, KSNUAHS, Shivmogga,
[2]Scientist at Krishi Vignyan Kendra, UAS, Raichur

Agriculture has been identified as the largest contributor of Non-Point Source (NPS) pollution of surface and ground water systems globally. Fertilizers, which are used as important inputs in agriculture to supply essential nutrients like nitrogen, phosphorus and potassium (K) also serve as a major Non-Point Source pollutant. They undergo transformation through various physical, chemical and biological processes in soil. Recently, concerns have been raised regarding consequences of fertilizer use more particularly nitrogenous fertilizers, since fertilizer recovery efficiency of nitrogen seldom exceeds 50% and a major portion of applied fertilizer is lost from plant–soil system by various soil processes. Therefore, the losses of reactive nitrogen from agricultural systems are a serious cause of concern for both economic and environmental reasons. Assessing the environmental impacts of non-point source pollutants at a localized and regional scale is of prime importance to achieve sustainable agriculture. However, there is concern about pollutants moving through surface and subsurface systems. One specific water quality concern is nitrate, a form of nitrogen that moves readily through the soil and often can be present in high amounts in clear drainage waters. The water quality of our local streams, rivers and lakes can be negatively impacted by nitrate in tile drainage. Fortunately, there are a number of practices that can reduce the amount of nitrate in drainage water. Woodchip bioreactors are a new option to reduce the amount of nitrate in drainage before it gets to local surface waters. A woodchip bioreactor is made by routing drainage water through a buried trench filled with woodchips. Woodchip bioreactors also are known as denitrification bioreactors, a name that is slightly more descriptive of the actual process occurring inside the bioreactor. Denitrifying bioreactors are appropriate for agricultural drainage systems, especially with medium nutrient load and relatively long HRT (about24 h).Under these conditions, the removal efficiencies of NO_3_-N, NH_4 -N, TN and PO_4^3-P reached approximately better.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/139

Magnification of rice productivity and soil health against *Pyricularia oryzae* with minimal use of fungicides in conjunction with bioagents and phytoextracts

Manish Kumar[1]* and Rahul Kumar Sharma[2]
[1]Faculty of Agricultural Sciences, SGT University, Gurugram (Haryana)- 122505
[2]Department of Plant Protection, A.M.U., Aligarh (Uttar Pradesh)- 202002

Consumers have put a lot of pressure on grain producers to get rid of chemical fungicides. Fungicides have severe effects on food and humans due to repeated use, which has also polluted the environment. The soil microorganisms that are predominantly engaged in nutrient cycle processes, such as nitrogen fixation, phosphorus solubilization, and other critical nutrient biotransformations are adversely affected by the use of agrochemicals in farming systems. One of the most significant Poaceae family cereal crops is rice. Most people on the planet eat it as their main source of nutrition. The demand for rice is expected to increase further in view of the expected increase in population. Globally, it stands first in rice area and second in rice production after China. It is the main food source for those who live in the country's eastern and southern regions. Blast is characteristically a leaf disease that also infects panicles and necks. *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. It reduces the photosynthetic area of the plant, and panicle infection reduces the yield. Seed treatment with fungicides provides effective protection to seeds during germination, followed by an enhancement in seedling growth due to the application of bioagents that provide protection to the root system and improve plant health and development. The antimicrobial activity of plant extracts was assayed, and they showed enhanced crop yield and growth. The integration of bioagents, phytoextracts, and reduced doses of fungicides effectively managed the blast disease of rice.

Keywords: *Pyricularia oryzae, bioagents, phytoextracts, fungicides*

ITAHAS/AB/2023/140

Growth Dynamics of Litchi in India

M.S. More[1], V. J. Rathod[2] and N. T. Bagde [3]

[1,] and [2]Assistant Professor, Agricultural Economics and Statistics Section, College of Agriculture Nagpur (Dr. PDKV, Akola) Maharashtra, India

[3]Head, Agril. Econ. & Stat Section, College of Agriculture, Nagpur (Dr.P.D.K.V, Akola)

The objective of the study was to analyse the export performance of Litchi in India. The secondary time series data for the last 20 years i.e., 2001-02 to 2020-21 regarding area, production, productivity, export quantity and export value were collected from various sources like APEDA, NHB and DGCIS. The entire twenty-year period was equally divided into two periods i.e., period I (2001-02 to 2010-11) and period II (2011-12 to 2020-21). The collected data were analysed with the help of statistical tools like CGR, CV and Coppock's instability Index in order to fulfil the objectives of the study. The study indicated that compound growth rate of area was positive and significant throughout the study period. The compound growth rate of production was positive and significant in period II (3.78) and overall period (3.52). The growth rate of productivity in period II (1.40) and overall period (0.15) was observed to be positive and non-significant. The compound growth rate of export quantity (13.01) and export value (3.03) of litchi in India was positive and non-significant in period I. The compound growth rate of export quantity and export value of litchi in India was negative both in period II and overall period. The variability area and production of litchi were highest in overall period as shown by coefficient of variation and Coppock's instability index. For productivity it was highest during the period I. The variability of export quantity and export value of litchi was found to be highest during the period II as indicated by both coefficient of variation and Coppock's instability index.

Keywords*: - Export, Compound Growth rates, Instability and Litchi.*

Morpho-Physiological & Biochemical Responses of Maize (Zea mays L.) under waterlogging

Manisha Tejashwi & Dr. Muneshwar Prasad Mandal*
Department of Botany & Plant Physiology,
Bihar Agricultural University,
Sabour, Bhagalpur, Bihar – 813210 (India)

Waterlogging is a serious problem in kharif maize production because it is susceptible to high moisture as well as low moisture stress. The pot experiment with two maize genotypes (BML 6, BML 7) were studied for morphological, physiological and biochemical traits changes in control and waterlogging condition on two growth stages i.e., 11th -17th days of growth as Set 1 & 21st -27th days of growth stage as Set 2. Results showed that waterlogging causes significant changes in morphological as well as physio-biochemical activities. Parameters like leaf length, leaf area showed decreasing trend in stress condition as compared to control in both the genotypes. However, BML7 showed better from that of genotype BML6 with difference of almost 20% increase in LA on 27thth days of growth under waterlogged condition. Effect of waterlogging on green leaves was observed in both the genotypes with 50% decreased to senesced leaves at 17th and 27th days of growth in BML6 but BML7 showed lesser dead percent of only 37% on 27th days waterlogged condition. The results also stated a significant reduced in crop growth potentials due to waterlogged. However, differences in responses of root parameters were observed whereby root length was highly reduced but root- shoot ratio (weight based) with maximum increased in BML 7 genotype during waterlogged. Reduction in chlorophyll content by waterlogging was noticed in both the genotypes BML6 and BML7. But amongst the treatment there was slight increase in chlorophyll content on 13th day and 23rd of genotype BML7 with 6.70 mg g^{-1} fr wt and 6.11 mg g^{-1} fr wt respectively followed by a significant decreased with increasing days of growth. Relative water content decreased with increasing days of treatment and also as compared with control. Hydrogen peroxide showed increasing of 3 folds, on 25th days of growth in genotype BML7 under stress. Peroxidase activity was also increased in waterlogging condition having mode of scavenging the ROS generated during the stress with 88.98 µg mg^{-1} fresh wt than the control 65.22 µg mg^{-1} fresh wt on 27th day of stress. Decreased in Total carbohydrate content

was observed in the plants under waterlogging but interaction of VxCxS showed no significant changes. Results clearly showed the alterations in genotypic responses to waterlogging stress that could further hampered final yield. Therefore, understanding the exact mechanisms for the genotypes responses may be important for future research with inclusion of more diverse genetic lines that have major differences in traits that may affect flood tolerance, such as stomatal opening and root growth, also may be necessary to identify specific waterlogging tolerance traits as they may be expressed in the field.

Keyword*: Carbohydrate content, chlorophyll content, maize, RWC, Water logging.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/142

Economic Performance of Sugarcane Growers of Northern Karnataka Under Different Crisis Conditions

Mutteppa Chigadolli[1]*, Krishnamurthy[2], B., & Shivalingaiah[3], Y. N.
[1]Assistant Professor (Agril. Extension), College of Agriculture, Chamarajanagar
[2]Rtd. Assistant Director of Extension, UAS, Bangalore
[3]Professor and Head, Dept. of Agricultural Extension, UAS, GKVK, Bangalore

The present study was conducted using the '*Ex-post facto*' research design during 2021-22 to examine the economic performances of sugarcane growers under different crises conditions. The Belagavi and Bagalkot districts were purposively selected where 21 per cent yield gap but leading sugarcane producers in Karnataka. Further, vulnerable to crisis situations like price crisis, floods, and droughts. Through multistage proportional sampling, two sugarcane growing blocks from each district were selected. From each block six villages were selected based on crop complex approach and their distance from river basin. Data was collected from 80 head-reach, 80 mid-reach and 80 tail-end farmers constituting to the total sample size of 240 distributed in twenty-four villages through pretested structured interview schedule. The economic performances were ascertained using multiple indicators of economic performances. The results revealed that more than two-fifth of total sugarcane growers belongs to the moderate (40.42 %) economic performance category followed by poor (30.83 %) and better (28.75 %) categories respectively. Further highlight is that majority (71.25 %) of sugarcane growers were under the moderate to poor economic performance categories. The mean Crop Yield Index of head-reach (95.46%) and mid-reach (98.77%) sugarcane growers was lesser whereas tail-end sugarcane growers have better Crop Yield Index (101.20%). The head-reach sugarcane growers have lesser mean cropping intensity with 179.58 whereas mid-reach (204.84) and tail-end (214.84) sugarcane growers possess better cropping intensity. Tail-end sugarcane growers had better BCR (1:1.95) followed by mid-reach (1:1.93) and head-reach (1:1.79). In overall, sugarcane growers possess gross income of Rs. 1,20,788.98 per acre. Tail-end (Rs. 59319.22 acre^{-1}) sugarcane growers possess better net-income than mid-reach (Rs. 57204.69 acre^{-1}) and head-reach (Rs. 54209.77 acre^{-1}) sugarcane growers.

Key words: *Economic performance, Sugarcane, Net income, Crop Yield Index, Benefit cost ratio, Cropping Intensity, Gross returns, and Net income.*

ITAHAS/AB/2023/143

Impact of FFS on Adoption of ICM Practices for Watermelon: A Case Study from ICAR- KVK Bidar, Karnataka

***Ningdalli Mallikarjun[1], Sunilkumar N.M[2], Akshaykumar[3] and Gnyandev B.[4]**

[1]Scientist (Horticulture), ICAR- Krishi Vigyan Kendra, Bidar-585402, Karnataka (India)
[2]Senior Scientist and Head, ICAR- Krishi Vigyan Kendra, Bidar-585402, Karnataka (India) [3]Scientist (Animal science), ICAR- Krishi Vigyan Kendra, Bidar-585402, Karnataka (India)
[4] Scintist (Seed Science and Technology), ICAR- Krishi Vigyan Kendra, Bidar-585402, Karnataka (India)

The objective of this study was to determine the impact of Farmer Field Schools on farmer's adoption of ICM options for watermelon in the Ghat boral village of Humanabad Taluk of Bidar District, Karnataka. Field surveys were used to collect data from two Farmer Field Schools in the study area in the 2021-22 and 2022-23 growing season. All the FFS participants were used, i.e. 30 FFS-participants from each school. Equal number of non-FFS participants (60) was used for comparison by using the simple random sampling technique. The collected data were statistically analyzed and interpreted using percentage, frequency distribution and chi-square test. The results showed significant association between number of seasons of participation in FFS and adoption of recommended ICM package components for onion by FFS participants. It can be concluded that the FFS approach is very efficient in the transfer of farm technology for melons farmers through their participation in various activities of FFS schools. Thus, FFSs approach should be employed for effective dissemination of crop management practices, share of authority of extension organizations in coordination with FPO and FIGs. The FFSs activities with farmer producer group for more effective participations of clientele in all activities of the schools and more efforts should be exerted in providing of all techno product critical inputs to farmers with reasonable prices through concern FPO's in order to decrease the extension gap and increase adoption of need based technology for profitable crop production.

Keywords: *Farmer Field Schools (FFS) Participation ICM options for watermelon FFS-participants Non-FFS participant, FPO.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/144

Status and prospects for linseed cultivation in Nagaland

Noyingthung Kikon[1]*, L. Tongpang Longkumer[2] and Imlilemla Amlari[1]
[1]ICAR-AICRP Linseed, Medziphema Centre, Nagaland University, School of Agricultural Sciences and Rural Development, Dimapur, Nagaland-797106
[2]Department of Agronomy, Nagaland University, School of Agricultural Sciences and Rural Development, Dimapur, Nagaland-797106

Linseed (*Linum usitatissimum*) popularly known as Alsi/Tisi in India is an important dual purpose (seed and fibre) *rabi* oilseed crop. Linseed oil as well as its byproducts are used in a number of industrial applications. In recent times, due to its health protective properties, linseed is also emerging as a 'superfood' as more scientific research in the field of diet and disease points to its health benefits. In India a total area of 1.7 lakh ha is under linseed cultivation with a total production of 1.1 lakh tonnes and productivity of 644 kg ha^{-1}. In Nagaland linseed is grown in an area of 5870 ha with a total production and productivity of 4770 metric tonnes and 813 kg ha^{-1} respectively. Although the crop ranks third in area and production among oilseed crops in the State, its contribution to national area and production is almost negligible (3.4 % and 4.3% respectively) due to very low area coverage of the crop in the State. There is tremendous scope for area expansion of linseed in Nagaland, due to its potential to be adopted as an economical crop in rice based cropping systems under residual nutrients and moisture conditions. Rice is the major cereal crop and a staple food in Nagaland occupying a total area of 218810 ha out of which TRC/WRC paddy occupies 128070 ha (Terraced rice cultivation/ wet rice culture). After harvesting of TRC/WRC paddy most of the lands are left fallow and these lands can be targeted for area expansion of linseed as the crop can be suitably introduced as rainfed or *Paira/Utera* crop in rice fallows, which are usually heavy soils with sufficient residual moisture and nutrients. Given the present national & international scenario of linseed in terms of applications scope as raw materials in various industries and given the prospects for area expansion of linseed in Nagaland, there is tremendous scope and opportunity for boosting production and commercialize of the crop in the state which will not only add towards doubling of farmers income but also contribute towards national area & production of this important oilseed.

ITAHAS/AB/2023/145

Variations in the functional traits facilitate the range expansion of the globally invasive weed *Parthenium hysterophorus* in mountain ecosystems

Padma Sharma[1,*], Daizy R. Batish[2], Harminder Pal Singh[1]
[1]Department of Environment Studies, Panjab University, Chandigarh-160014, India
[2]Department of Botany, Panjab University, Chandigarh-160014, India

Plant invasions and global climate change are intricately connected. The world's vegetation communities are expected to shift dramatically as a result of rising temperatures, which could also encourage plant invasions. Invasive plant species are considered a major threat to biodiversity, ecosystem functioning, and human wellbeing worldwide. Understanding how phenotypic plasticity affects plant performance is essential to comprehending how an alien invasive plant adapts to shifting environmental factors in mountain environments. *Parthenium hysterophorus* L. (Asteraceae), one of the world's most distributed subtropical invaders, was selected as a model plant for studying its adaptive responses along the elevation gradient. Sites at elevations of 700 m, 900 m, 1100 m, and 1500 m were selected in the Shivalik Himalayas for analysing functional traits, including morphological traits, and assessing variations in functional groups along elevational gradients. Morphological traits, i.e., leaf area, specific leaf area, leaf mass, and above-ground biomass, stomatal length, and diameter, varied significantly with the elevational gradient. Soil nutrient properties also changed significantly with elevation, except for available potassium. Higher elevations witnessed plants with less above-ground biomass and a smaller height, therefore providing insights into the adaptation mechanism of *P. hysterophorus* under stressful environments associated with increasing elevation. The study confirmed that variations in plant functional traits aid in the successful invasion and range expansion of *P. hysterophorus* into mountain ecosystems.

Keywords*: climate change, functional traits, mountain ecosystem, plant invasion, range expansion.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/146

Dwarfing physiology in fruit crops

Dr. V. V. Padmaja, Dr. K. Jyothirmai Madhavi, Dr. Ch. Ruth, Dr. Y.Sireesha, Dr. M. Arunodayam and Dr. K. Gopal
Dr.Y.S.R.HU- College of Horticulture, Anantharajupeta, Annamayya Dst., AP, India

The mechanism underlying dwarfing involves anatomical, physiological and biochemical changes. Auxins are produced by shoot tips and translocate basipetally downwards to the roots through phloem. This influences the root metabolism and affects the amount and kind of cytokinin synthesized in roots and translocated to shoots via xylem. Some amount of auxin is degraded in the bark by IAA oxidase, peroxidase and phenols. It has been found that thicker bark and higher starch levels in dwarfing root indicates a low level of auxin in these tissues. Anatomical studies on dwarfing mechanism indicate large number of vessels and twice as many xylem fibers are produced in vigorous rootstocks than dwarfing ones. Application of PGRs such as Prohexadione-calcium can prevent excessive shoot growth and maintain size control by inhibiting gibbrellin biosynthesis. The use of vigour controlling root stocks is to promote early fruit bearing and increased yield. Dwarfing rootstocks reduce the amount of scion dry weight and also directs the biomass to fruit production rather than vegetative growth. Furthermore, dwarfing root stocks and inter stems reduced the number of extension shoots and promoted the formation of floral shoots.

ITAHAS/AB/2023/147

Identification of transgressive seggregants for combining ability in sorghum [Sorghum bicolor (L.) Moench]

Prashant Kariyannanavar*, M. C. Wali, B. D. Biradar, L. K. Verma and Pavan Kumar

Department of Genetics and Plant Breeding, UAS, Dharwad, Karnataka-580005

In this investigation, a previously identified restorer on *maldandi* cytoplasm DSMR 8 was employed to identify combining ability in early segregating generation. Large F_2 populations of the cross M31-2A x DSMR 8 were raised. Among them, fifteen exceptional restorative plants were chosen and passed on to the F_3 generation. In a L x T design, these fifteen F_3 plants were crossed to three male sterile lines with both milo and maldandi cytoplasmic sources (M31-2A, 401A, and 104A). Among the lines, MR 4 had substantial positive *gca* effects for traits such as earliness, plant height, number of leaves, panicle breadth, panicle weight, and grain yield per plant. Out of 45 crosses, 18 had high *sca* status while the other 27 had poor *sca* status. The crosses M 31-2A x MR 12 and M 31-2A x MR 14 have the highest overall *sca* status due to strong positive *sca* effects. Only five of the 15 lines, MR 4, MR 12, MR 1, MR 13, and MR 2, could be passed on to the next generation since they were transgressive segregants with good *gca* and *per se* performance when crossed on maldandi cytoplasm.

Keywords: *Restoration reaction, early segregating generation, maldandi cytoplasm.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/148

Climate change and its impact on Food Security

Pretty Rani[1*] and Dr. R. Geetha Reddy[2]
[1]Teaching Associate, Department of Extension Education and Communication Management, College of Community Science, Professor Jayashankar Telangana State, Hyderabad, India
[2]Professor and University Head, Department of Extension Education and Communication Management, College of Community Science, Professor Jayashankar Telangana State, Hyderabad, India

Food security and climate variations are the major concerns affecting global community in adverse manner. Climate change is one of the greatest challenges faced by the global community today. Impact of climate change is severe. Each degree of rise in the global mean temperature is associated with threat to life, economy and also food security. This paper reviews the literature produced by researchers focusing on climate change and its impact on Food security. The review has shown that myriad of studies focuses on the impact of climate change on food security. The paper urges for a need to study the adaption and approaches for climate change which includes climate smart agriculture. The approaches will manage the landscapes, improve productivity, enhanced resiliency and reduced emissions.

ITAHAS/AB/2023/149

Performance of Physiological and Biochemical Analysis in Rooted Cuttings Using Orthotropic Shoots in Black Pepper

***Suresh Ravindran[1], Jansirani P[2], Senthamizh Selvi Balaraman[3]**

[1, 2, 3] Department of Spices and Plantation crops, Tamil Nadu Agricultural University, Coimbatore -3

An investigation was conducted at the Horticultural Research Station, Thadiyankudisai. The experiment was laid out with three types of cutting *viz.*, terminal, semi hardwood and hardwood cutting from orthotropic shoot in the three varieties of black pepper *viz.,* Panniyur-1, Kottanadan and Karimunda on Factorial Completely Randomized Design with three replications. Observations were recorded on biochemical analysis *viz.,* phenols content, soluble protein content, chlorophyll content, carbohydrates content, nitrogen content and C: N ratios were also estimated. Among the cuttings, semi hardwood recorded the highest soluble proteins (8.15 mg per g), highest the chlorophyll (1.41 mg per g), highest carbohydrates (8.31 mg per 100g) and highest C: N ratio (4.56). Among the black pepper varieties, Karimunda registered the highest phenols (6.08 µg per g), carbohydrates (9.18 mg per 100g), nitrogen (1.98 %) and C: N ratio (4.66). Among the interactions, the Karimunda variety of orthotropic shoot as terminal cutting showed the highest phenols (6.20 µg per g), carbohydrates (9.67 mg per 100g) and nitrogen (2.30per cent).

Keywords: *Black pepper, Orthotropic shoots, Biochemical, Rooted cuttings, karimunda and Panniyur -1.*

Maximizing Income from Livestock Based Integrated Farm in Cooch Behar District: A Case Study on Integrated Farming

R. D. Mukherjee[1], S. Saha[1], S. Sarkar[1], G. Das[1], S. Sultana[1], S. Hembram[1] and B. Roy[1]

[1]Cooch Behar Krishi Vigyan Kendra, Uttar Banga Krishi Vishwavidyalaya, Pundibari, West Bengal

The adoption of appropriate adaptation measures like sustainable integrated farming or mixed farming systems by the farmers is crucial for reducing the adverse effects, and it is expected that farmers with higher adaptive capacity to new farming systems would be better equipped to respond to the rapidly changing climatic conditions. The purpose of the case study is to explore a livestock based integrated farm of Mrs. Amrita Das situated in 2.0 ha of teesta and terai region of Cooch Behar District in West Bengal. While soil erosion, crop damage due to frequent and heavy precipitation, predator attack, remoteness and less accessibility of market are very common constraints in farming system, Mrs. Amrita Das has adopted sustainable agricultural practices by following rotational cropping system in growing a sequence of different crops covering cereal, pulse, oilseed, vegetables, spices, fruit, agro-forestry, livestock, fisheries, fodder, vermin-compost in different seasons. Cattle, goats, pig and poultry birds have been integrated to keep flow of the bio-circularity of the farm resources. The income analysis indicates that an annual net return of around Rs. 3,00,000/- is possible from a 1.0 ha livestock based integrated farm with a resource use efficiency of Rs. 3.00 per rupee invested. The highest annual net income sharing comes from livestock (52.44%) followed by agricultural sector (38.22%) and the rest (9.34%) is secured from vegetables, oilseed, fruit, agro-forestry, fisheries, cereal, pulse, fodder grass and vermin-compost. Mrs. Amrita Das is able to satisfy his family nutritional demands of cereal, pulse, vegetables, fruits, milk, meat and egg from his farm grown fresh and wholesome food items. This livestock based integrated farm is definitely technically feasible and economically viable in teesta and terai agro-climatic zone.

Keywords*: Integrated farming, Sustainability, Agriculture, Livestock, Vermin-compost, Fisheries, Teesta and Terai Region.*

ITAHAS/AB/2023/151

Impact of *in-situ* paddy straw management with microbial cultures on sustainability and productivity of wheat in Punjab states of India

Rajbir Singh Khedwal[1*], Jayesh Singh[2], Anu Kalia[2], KB Singh[2], JS Kang[2] and Kiran Khedwal[1]

[1]CCS Haryana Agricultural University, Hisar- 125004, Haryana, India

[2]Punjab Agricultural University, Ludhiana-141004, Punjab, India

The viability of the rice-wheat cropping system is crucial for the future of agriculture in the Indo-Gangetic plains of India. In the Northern Indian states, burning rice residue in the field is the main source of greenhouse gas emissions. Conservation-based crop residue management boosts the soil's nutrient value and farmers' revenue. So, effects of *in-situ* microbial decomposition of residue on wheat sown with a PAU Happy seeder under nitrogen (N) management were studied at Ludhiana and Ladhowal, Punjab. Experiment was laid out with three replications in split plot design, consisting of six nitrogen management options to hasten the microbial decomposition *i.e.* N_1- no application of N *i.e.* control, N_2- N120, N_3- N120+ 3% urea spray on *in-situ* rice residue after harvesting paddy, N_4- N120 (25% of total N added through FYM on rice residue just after paddy harvest and 75% N added through urea to the succeeding wheat), N_5- N150+ 3% urea spray on *in-situ* rice residue after paddy harvest and N_6- N150 (25% of total N through FYM and 75% N through urea to the succeeding wheat) in main plots and four microbial sprays on *in-situ* rice residue after paddy harvest *i.e*. uninoculated control (M_1), *Aspergillus* sp. (M_2), *Delftia* sp. (M_3) and consortia (*Aspergillus* sp.+ *Delftia* sp.) (M_4) in sub plots. The bacterial population was found to be significantly higher at 60 days after sowing when compared to different time intervals. When compared to other treatments, N_6 and M_4 were found to have greater bacterial populations at various time intervals. Better degradation process of paddy straw was analysed using Scanning electron microscope (SEM). Hence, spray of *Delftia* sp. on rice residue and treatment 150 kg N/ha along with 3% urea spray after paddy harvest (N_5) will help in enhance the microbial degradation process of rice residue, higher spike length, protein content and productivity of wheat.

Keywords: *Microbial degradation, nitrogen, paddy straw, protein, wheat*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/152

Development of harvest and post harvest technologies for drudgery reduction of farm women and sustainable agriculture

Rajeshwari Desai, * Geeta Chitagubbi, ** and Shobha Kasar***
Senior Scientist* Professor**and Junior Research Fellow***
All India Coordinated Research Project-Women in Agriculture
(Family Resource Management)
Main Agricultural Research Station, University of Agricultural Sciences, Dharwad
580005

Women play a key role in agriculture. The increased participation of women's workforce in agriculture demand more emphasis on development of gender-friendly tools, equipment and workplaces. The farm mechanization level of Indian agriculture has increased considerably. The main objective of advances in farm mechanization is to increase the overall profitability, productivity and energy use efficiency with lowest production cost. Apart from this, the technological empowerment of women is also the need of the day. With this background the present study was conducted with an objective to develop and to conduct their field validation. With this background, the harvesting technologies namely vegetable trolley, motorized groundnut stripper and post harvest technologies viz., mechanized maize sheller, mechanized groundnut decorticator were developed by All India Coordinated Research Project on Women in Agriculture (Family Resource Management), University of Agricultural Sciences, Dharwad. The filed validation of the technologies was conducted by carry out testing the efficiency of the technologies, drudgery perception of the farm women while using the technologies and by assessing the acceptability of the technologies by farming community. The main salient features of these technologies being, gender friendly, drudgery reducing and efficient in work output and cost effective against traditional methods. The farm women also perceived less drudgery while performing agricultural activities using these technologies and have accepted them. Hence, to make the availability of improved agricultural tools to the farming community the number of Custom Hiring Centres have to be increased. These will provide an innovate custom service for improved gender friendly and high-cost farm machinery to reduce the cost of operation on small farms.

Keywords*: Harvest and post harvest technologies, Field validation, Farm mechanization, Drudgery, Sustainable agriculture, Custom hiring centre.*

ITAHAS/AB/2023/153

Development and filed validation of a cost effective post harvest technology: Motorized groundnut stripper

Rajeshwari Desai*, Geeta Chitagubbi and Shobha Kasar*****

Junior Scientist* Senior Scientist**and Junior Research Fellow***

All India Coordinated Research Project-Home Science (Family Resource Management)

Main Agricultural Research Station, University of Agricultural Sciences, Dharwad 580005

The traditional method of groundnut stripping is an important post-harvest activity in which women are involved as the major labour force. It is laborious and time consuming and farm women are facing many health problems viz., body pain and blackening of palms. Even then farmers are facing difficulty due to shortage of laboures and also due to high labour wages. Manually operated strippers are developed and tested to reduce the drudgery of farm women, but still farmers are facing difficulty due to shortage of labourers and high labour wages. Hence, to reduce the drudgery while performing groundnut stripping activity, All India Coordinated Research Project-Home Science-Family Resource Management component of UAS, Dharwad has developed motorized groundnut stripper and evaluated it at the field level. Thirty non-pregnant farm women with normal health, and without any major illness or cardio-vascular problems, falling in the age range of 25- 45 years were selected for the study. The results showed that the machine is safe and easy to operate and is suitable for stripping of immediately harvested groundnut having the moisture content of 18-22 per cent. It also proved the excellence in work output with an average stripping rate of 2.64 Q/day as compared with other models and traditional method of hand stripping (0.84 Q/day). Further, 68 per cent of labour reduction was observed over traditional method. The farm women perceived using groundnut stripping machine made the work simple and light. They also experienced less drudgery as compared to traditional hand stripping and opined as a cost effective technology Hence, such small improved and mechanized farm tools can be promoted among small and marginal farmers to reduce the drudgery and save the labour cost.

Keywords*: Drudgery, groundnut stripper, work out put, Cost of Operation and Man days.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/154

Impact of climate change on biodiversity and agriculture: a global perspective

Ravi Prakash Chaudhary[1], Vinod Singh[2] and Vikash Singh Thakur[1]
[1]Assistant Professor, RNTU, Bhopal, [2]ANDUAT, Ayodhya

Both natural and human-caused factors are causing climate change. It has a significant impact on food security, agricultural production, and biodiversity. Mainly, endemic, and narrowly adapted species are on the verge of extinction. Because it provides food for all life forms and primary health care for more than 60–80 percent of humans worldwide, concerns about species extinction are justified. Even though the impact of climate change on biodiversity and agriculture has been recognized, little research has been conducted in comparison to the global scale of the issue. As a result, the goals of this review are to find, evaluate, and summarize the connection that exists between climate change, biodiversity, and food security. Utilization was made of data, climate models, emission, migration, and extinction scenarios, as well as the results of previous publications. Species distributions have shifted to higher latitudes and higher elevations at a median rate of 11.0 m and 16.9 km per decade as a result of climate change. As a result, under migration scenarios, extinction rates for 1103 species range from 21–23% with no migration to 38–52% with no migration. Any response could be described as a plastic phenotype when an environmental variation occurs earlier than the plant's life cycle. However, phenotypic plasticity may protect species from climate change's long-term effects. In addition, food security is impacted by climate change, particularly in communities and locations that rely on rain-fed agriculture. Plants and crops have thresholds that limit their growth and yield. As a result, agricultural yields could fall by more than 30% in Africa alone by 2050. When protecting biodiversity is given priority, therefore, addressing food insecurity by converting additional land to agriculture and exploiting new fish stocks is a costly solution. So, reducing food waste, compensating people who don't have enough food, conserving biodiversity, making good use of genetic resources, and using traditional ecological knowledge could help ensure food security in climate change scenarios. However, in this scenario, strong policies, the release of high-yielding stress-resistant varieties, the creation of climate-resilient irrigation structures, and agriculture are necessary for food security. In order to lessen the effects of climate change, it is suggested

that degraded land restoration, changes in land use, the use of bioenergy, sustainable forest management, and community-based biodiversity conservation be implemented.

ITAHAS/AB/2023/155

Evaluation of wheat (*T. aestivum* L.) genotypes under normal and late sowing condition for grain yield and its related characters

Ravi Singh Thapa*[1], Vijay Kumar[1], Harish Kumar[1] and Jyoti[1]
[1] School of Agricultural Sciences, IIMT University Meerut, UP-250001

A set of one hundred ninety diverse wheat genotypes along with four checks were evaluated in two environmental conditions one in normal (Timely sown) condition and another one in heat stress condition (late sown) in augmented block design at research farm of Dept. of Genetics & Plant Breeding, CCS University Meerut (UP). The data were recorded for fifteen morpho-physiological characters. The result of analysis of variance (ANOVA) revealed that the adequate genetic variability present among the taken genotypes for all the studied characters under both the environmental conditions. Further, the mean values of all characters accept protein content, Canopy temperature depression (CTD), Chlorophyll content and beta-carotene were lower in stress conditions than the mean values in normal conditions. The magnitude of genotypic coefficient of variation (GCV) was lower than the corresponding phenotypic coefficient of variation (PCV) for all the studied characters, indicating that these all characters are highly influenced by the environment. The characters *viz.* CTD, grain weight per spike, biological yield per plant, grain yield per plant and tiller number per plant showed maximum PCV values under both the condition. The estimates of broad sense heritability were recorded maximum for most of the characters such as; grain weight per spike, biological yield per plant, CTD and grain number per spike showed higher value of heritability under both the environment, it indicated that all these characters were useful for further hybridization programme. Genetic advance as percent mean were recorded highest for canopy temperature depression, 1000- grain weight, grain weight per spike, grain yield per plant and tiller number per plant and also observed that late sowing reduce the biological yield as well as grain yield under heat stress environment.

ITAHAS/AB/2023/156

Identifying efficient screening techniques for screening maize inbreds against Sorghum Downy Mildew Infection

S. Arulselvi
ICAR - Krishi Vigyan Kendra, TNAU, Thiruvarur – 614 404

Sorghum Downy Mildew (SDM) caused by *Peronosclerospora. sorghi* is one of the most devastating diseases affecting maize which causes yield losses even up to 100 per cent under favourable disease epiphytotic conditions. A sound screening method is essential to identify the resistant sources which constitutes the first step in any plant breeding programme. In the present investigation, field and glass house screening techniques were compared for promotion of SDM infection in maize. Level of infection recorded in glass house trial was slightly higher than recorded in sick plot trials. Hence, screening of maize genotypes under glass house against SDM infection was found to be the most efficient technique in inducing severe SDM infection in maize. The highly susceptible sorghum genotype, DMS 652 showed resistance in response to SDM both in sick plot and glass house trials which indicated the prevalence of maize race in maize sick plot which is one of the races of *P. sorghi*. Of nine maize inbred lines, UMI 936(w) was highly resistant to infection by SDM pathogen followed by UMI 102 and UMI 285. These inbreds can be used in future for crop improvement programme to evolve a SDM resistant composites and hybrids.

Effect of Settling Growing Medium and Settling Transplanting Density on Growth, Yield and Yield Attributes of Sugarcane under Trench Planting System in Spring Season

***Sanjay Kumar[1], Sidharth Kashyap[2], A.S. Jeena[3] and Yogendra Pal[4]**
[1.]Junior Research Officer, [2.]Scientific Officer, [3 &4.]Professor
Sugarcane Research Centre, Kashipur (GBPUAT, Pantnagar)

Sugarcane is a major cash crop grown in India and requires a long growing season. The yield of sugarcane in settling transplanting method is affected by a number of factors, including the settling growing medium used in nursery and transplanting density in the field. The most common and traditional growing medium is soil, but other materials, such as sand, cocopeat, and compost, can also be used. Cocopeat is a good alternative to soil as a growing medium for sugarcane. It is a lightweight, porous, and aerated medium The transplanting density is the number of settlings planted per unit area.

The experiment was conducted at Sugarcane Research Centre, Kashipur (G.B.P.U.A. &T. Pantnagar) during 2021-22 and 2022-23. The experiment was laid out in a factorial randomized block design with three replications. Factor A considered three settling growing medium, i.e., a1)- Sand+ soil+ compost mixture, a2)- Cocopeat alone, a3)- Cocopeat+ compost mixture. Factor B considered five settling transplanting density in different trench system, i.e., b1)- 37037 settling/ha (Single row transplanting at 30cm×90cm), b2)- 24691 settling/ha (Single row transplanting at 45cm×90cm), b3)- 27778 settling/ha (Single row transplanting at 30cm×120cm), b4)- 18520 settling/ha (Single row transplanting at 45cm×120cm) and b5)- 24024 settling/ha (paired row transplanting at 45cm× 35-150 cm).

The pooled results showed that the settling growing medium and settling transplanting density had a significant effect on different parameter. The highest germination (90.6%), lowest mortality 6.1%), highest tillers count at three months after transplanting (114.12 thousand/ha), NMC at harvest (99.55 thousand/ha) and cane yield (105.62 tonnes/ha) was achieved with the treatment of Cocopeat + compost mixture (a3). The treatment 18520 settling/ha (b4) followed by 24024 settling/ha (b5) was found significantly higher in NMC (98.38 and 96.52 thousand/ha respectively) and cane yield (106.44 and 104.50 tonnes/ha respectively) as compared to other treatments. The significantly highest cane yield (107.22 tonnes/ha) was recorded in the treatment of Cocopeat + compost mixture

(a3) at 18520 settling/ha followed by 24024 settling/ha i.e. 104.86 tonnes/ha (b5) as compared to other treatments.

The results of this study suggest that the use of cocopeat + compost mixture as settling growing medium in nursery and 18520 settling/ha (single row transplanting at 45cm×120cm) and 24024 settling/ha (paired row transplanting at 45cm× 35-150 cm) as settling transplanting density in field can significantly improve the growth, yield and yield attributes of sugarcane under trench planting system in spring season. 24024 settling/ha as transplanting density proved to be the best for the mechanization of sugarcane cultivation, as well as this method brought down the cost of sugarcane cultivation drastically.

Keywords*: Sugarcane, Settling, growing medium, transplanting density, trench.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/158

Response of 19:19:19 and Humic Acid on Growth and Quality Under Protected Conditions of Rose

Seema A. Thakre*[1], Komal M. Warkhade[2], Shalini A. Badge[3], and H. S. Mendhe[4]

Assistant Professor (Hort.), Horticulture Section, College of Agriculture, Nagpur
Post graduate student of Horticulture, College of Agriculture, Nagpur
Associate Professor (Hort), Horticulture Section, College of Agriculture, Nagpur
Assistant Professor of Agri. Extension, College of Agriculture, Nagpur

The present investigation entitled "Response of 19:19:19 and humic acid on rose under protected conditions." was carried out at College of Agriculture, Nagpur (M.H), Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. Dist. Akola during *rabi* season in year 2021-2022. The experiment was laid out in Factorial Randomized Block Design with four levels of 19:19:19 WSF [Control, 200 g 19:19:19, 300 g 19:19:19 and 400 g 19:19:19] and three levels of humic acid [Control, 500 ppm humic acid, 750 ppm humic acid] with twelve treatment combinations replicated thrice. The study of the present investigation revealed that, significantly maximum plant height (109.81 cm) and plant spread (58.46 cm) were recorded in the treatment 300 g 19:19:19 + 750 ppm humic acid. In respect of quality parameters, maximum length of flower stalk after opening of flower (66.25 cm), diameter of flower (7.26 cm) were recorded in treatment 300 g 19:19:19 + 750 ppm humic acid. Regarding yield contributing parameter, maximum yield plant^{-1} (21.18) was recorded with the foliar application $_{300}$ g 19:19:19 + 750 ppm humic acid.

Overall effect 19:19:19 and humic acid of regarding growth, quality and yield parameters were significantly influence by the foliar application 300 g 19:19:19 + 750 ppm humic acid treatment.

Keyword: *Rose, humic acid and 19:19:19*.

ITAHAS/AB/2023/159

Effect of IBA and Types of Cuttings on Rooting in Ixora

Seema Thakre*[1], D. M. Panchbhai[2], V. U. Raut [3], Shalini Badge[4] and H. S. Mendhe[5]

[1]Assistant Professor (Hort.), Horticulture Section, College of Agriculture, Nagpur
[2]Dean, faculty of Horticulture, Dr. P.D.K.V., Akola
[3]Professor of Horticulture, Horticulture Section, College of Agriculture, Nagpur
[4]Associate Professor (Hort), Horticulture Section, College of Agriculture, Nagpur
[5]Assistant Professor of Agri. Extension, College of Agriculture, Nagpur

An experiment entitled "Effect of IBA and types of cuttings on rooting in Ixora" was carried out during the year 2020-21 to 2022-23 at Horticulture Section, College of Agriculture, Nagpur at Horticulture Section farm, College of Agriculture, Nagpur. The experiment was laid out in Factorial Randomized Block Design with fifteen treatments combinations replicated three time. The treatments comprised of two factors, Factor "A" consist of type of cutting *viz.,* softwood, semi-hardwood and hardwood cuttings and Factor "B" consists of four levels of GA_3 viz., 1000ppm, 2000 ppm, 3000 ppm and 4000 ppm along with control. The stem cutting of 15 cm to 20 cm lengths were taken from healthy Ixora plants prepared by removing all leaves in each cutting during morning hours of day. Three types of cuttings were selected for planting i.e., softwood, semi-hardwood and hardwood cuttings. The lower end of cuttings were treated for 30 minutes in different concentrations of IBA with different before planting as per treatments. The treated cuttings were planted in the plastic crates filled up with propagation media i.e., garden soil, FYM and sand (2:1:1).

Results revealed that, among the fifteen treatments combinations, minimum days to rooting and sprouting, maximum plant height, number of leaves cutting^{-1}, number of branches cutting^{-1} length of root, percentage of rooted cuttings, and survival per cent were recorded in treatment combinations semi-Hardwood cutting treated with IBA 2000 ppm concentration.

Key words*: Ixora, IBA, cutting*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/160

Pradhan Mantri Krishi Sinchai Yojana

Shankar Dayal Bharti[1], Ankit Tiwari, Bhayankar[3] and Mohit Kumar Panday[4]

[1& 4]Department of Agricultural Extension and Communication,
[2]Department of Agronomy, Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram Meerut Uttar Pradesh
[3]Department of Agronomy- Chandra Shekhar Azad University of Agriculture and Technology, Kanpur

Government of India is committed to accord high priority to water conservation and its management. To this effect PMKSY has been formulated with the vision of extending the coverage of irrigation 'Har Khet ko Pani' and improving water use efficiency 'More crop per drop' in a focused manner with end-to-end solution on source creation, distribution, management, field application and extension activities. This scheme under Cabinet Committee on Economic Affairs chaired by Hon'ble Prime Minister has accorded approval of PMKSY in its meeting held on 1st July, 2015. PMKSY has been approved for implementation across the country with an outlay of Rs. 50,000 crores in five years. For 2015-16 to 2019-20, an outlay of Rs.5300 crore has been made which includes Rs. 1800 crore for DAC, Rs. 1500 crore for DoLR, Rs. 2000 crore for MoWR, (Rs. 1000 crore for AIBP, Rs. 1000 crores for PMKSY). Agriculture is most important for food grains and agriculture will be better only if irrigation is done properly. Improve on-farm water use efficiency to reduce wastage and increase availability both in duration and extent. Enhance the adoption of precision irrigation and other water saving technologies (More crop per drop). Promote extension activities relating to water harvesting, water management and crop alignment for farmers and grass root level field functionaries. Different Sources of irrigation in India Tube wells 46%, Canal 24%, Other wells 16%, Tanks 3%, Other sources 11%. Micro irrigation highest area 379.15-thousand-hectare coverage in month of march in 2021. The main purpose of this PMKSY is ''Doubling farmer's Income'' help in this scheme. India is an agricultural country, all the farmers of the country depend on agriculture tax, but in view of the problem of farmers of the country cultivating the land, the government is taking new steps. By doing this, there will be an efficient use of available resources and at the same time, farmers will get higher yields. Through the PMKSY 2021, the income of the farmers will also increase. Agriculture will expand, productivity will increase, which will lead to the

complete development of the economy. 75% grant will be given by the Centre for the scheme and 25% will be spent by the State Government. With this, the farmers also get the benefit of irrigation schemes like drip/sprinkler. With the use of the new system of equipment, 40-50 percent water will be saved and along with that 35-40 percent increase in agricultural production and quality of the product will increase.

Key words:–*PMKSY, Government of India, Water harvesting and Crop alignment.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/161

Role of Embedded Systems with Robotics and IoT in the Food Industry

Sharanabasava[1]*, Shivanand[1], Nagaratna[1] and Akshay Kumar[2]
[1]Dairy Engineering Division, ICAR-National Dairy Research Institute, Karnal, Haryana
[2]KVK, Bidar, UAS Raichur

Embedded systems, robotics, and the Internet of Things (IoT) have significantly transformed the food industry. These technologies play a crucial role in enhancing operational efficiency, safety, and quality control. By integrating embedded systems with robotics, food processing operations can be streamlined, accuracy can be improved, and human error can be reduced. Robotics, powered by embedded systems, can handle tasks such as sorting, picking, packaging, and quality inspection, resulting in optimized productivity and consistent operations. The combination of embedded systems and IoT brings further advantages to the food industry. IoT devices, connected to embedded systems, enable real-time data collection and analysis throughout the production chain. Monitoring critical parameters like temperature, humidity, and inventory levels ensures optimal storage conditions, reduces waste, and improves traceability. Moreover, IoT-enabled embedded systems enable remote monitoring, predictive maintenance, and supply chain optimization. While challenges like data security, interoperability, and the need for skilled personnel to operate and maintain exist but embracing these technologies offers immense potential for the food industry to achieve higher levels of productivity, sustainability, and technological advancement.

ITAHAS/AB/2023/162

Optimizing Food Processing with Computational Fluid Dynamics (CFD): Enhancing Efficiency and Quality

Sharanabasava[1]*, Shivanand[1], Nagaratna[1] and Akshay Kumar[2]
[1]Dairy Engineering Division, ICAR-National Dairy Research Institute, Karnal, Haryana
[2]KVK, Bidar, UAS Raichur

Computational Fluid Dynamics (CFD) is a powerful tool used in the food industry to analyse and optimize fluid flow, heat transfer, and mass transfer processes. CFD enables the simulation of complex fluid dynamics phenomena, providing insights into fluid behavior, temperature distributions, and concentration gradients within food processing equipment and systems. In the food industry, CFD finds applications in various areas. One of its key applications is in thermal processing, where it models heat transfer mechanisms in equipment like ovens, sterilizers, and pasteurizers. By optimizing heat distribution, CFD ensures uniform cooking/heating while preserving the nutritional quality of food. CFD is also utilized in food mixing and blending operations. By simulating fluid flow patterns and shear rates, CFD aids in optimizing mixing parameters, leading to consistent product quality and reduced processing time. Packaging and preservation benefit from CFD's ability to simulate gas exchange, moisture migration, and oxygen diffusion within packaging materials. This assists in designing optimal packaging systems, extending the shelf life of food products while maintaining their sensory attributes and nutritional value. CFD is equally valuable in food drying, spray drying, and extrusion processes. By modeling moisture evaporation, particle behavior, and heat transfer, CFD enables the optimization of drying conditions and product quality. In summary, CFD plays a significant role in the food industry by optimizing process design, efficiency, and product quality. Its applications range from thermal processing to mixing, packaging, and drying processes. Through CFD, the food industry can achieve improved process efficiency, consistent product quality, and reduced development time. The result is the production of safer, healthier, and more appealing food products.

ITAHAS/AB/2023/163

Combined evaluation of morphological, physiological and microsatellite markers in relation to fruit cracking resistance in pomegranate

Shilpa, P*., Aldar, K. S., Raigond, P., Singh, N. V., Patil P. G., Roopa Sowjanya, P., Babu, K. D., Girme, A. R. and Marathe, R. A.
ICAR-National Research Centre on Pomegranate, Solapur-413 255, Maharashtra, India

Fruit cracking is one of the major physiological disorders in pomegranate, which causes greater economic losses in addition to reduction in fruit quality. Development of fruit cracking resistant/tolerant varieties will be the most cost-effective approach to overcome this problem. Identification and utilization of desirable markers to assist in the selection of promising breeding lines is pre requisite in pomegranate improvement programmes. In this line the present study was formulated to evaluate and identify the morphological, physiological and molecular markers for fruit cracking resistance in pomegranate. In total 18 pomegranate accessions which exhibited diverse genetic reaction to fruit cracking (0 - 32.47 %) were evaluated for two morphological traits, four physiological parameters and 20 SSR primers during *ambe* bahar at ICAR -National Research Centre on Pomegranate, Solapur. The genetic correlation analysis indicated the presence of significant positive correlation between fruit cracking and fruit stalk/peduncle diameter (0.49*); relative rind moisture content (0.69**). While a significant negative correlation was recorded between fruit cracking and rind membrane thermal stability (-0.505*). Among the 20 SSR primers screened, 11 were found to be polymorphic. A total of 27 alleles were produced with an average of 2.25 alleles/primer. Among 11 polymorphic SSRs, the heterozygosity values ranged from 0.38 to 0.66 and PIC (Polymorphic Information Content) value ranged from 0.3 to 0.6. The SSR primers, PgSSR 73 (0.6, 0.66), PgSSR 29 (0.5, 0.6) and PgSSR 23 (0.49, 0.57) have showed higher PIC and heterozygosity values. These identified polymorphic SSR primers could be used for association and linkage analysis to map genes/QTLs for fruit cracking resistance in pomegranate.

Keywords: *Pomegranate, fruit cracking, morphology, physiology, simple sequences repeats, PIC, heterozygosity.*

Line X Tester Analysis for Heterosis and Combining Ability Analysis for Quality Traits in Tomato (*Solanum lycopersicum* L.)

Vijay Kumar*, [1]Amarjeet Kaur, Ravi Singh Thapa, Harish Kumar, and Jyoti
[1]Dept. of Agriculture Mata Gujri College Fatehgarh Sahib Punjab 140407
School of Agricultural Sciences of IIMT University Meerut U.P. 250001

Heterosis and combining capacity are two vital contemplations within the utilization of heterosis, which can be utilized to produce amazing hybrid asset candidates and is exceptionally vital in customary hybrid breeding. In this consider the combining capacity and heterosis of eight major agronomic characteristics was analyzed in 8 tomato guardians and 15 crosses between them. As well as EC- 163605, a recognized and official great assortment that's as of now offering well on the showcase was utilized as a control to conduct a control heterosis examination, with the objective of selecting perfect parents with tall combining capacity and modern hybrids with product esteem, plant tallness, natural product distance across, add up to abdicate per plant.The comes about appeared that both additive and non-additive hereditary impacts are included within the expression of the characteristics which the additive hereditary impact is prevailing in characteristic legacy. In spite of the fact that common combining capacity (GCA) and specific combining capacity (SCA) were not correlated, and the quality of heterosis depends on SCA, the entirety of the parental GCA values (GCA sum) did predict heterosis for a few characteristics with higher predictive accuracy than did SCA.

ITAHAS/AB/2023/165

Modern Beekeeping and its Emerging Problems

Vikram and Geetika
Mata Gujri College, Fatehgarh Sahib, Punjab

In addition to contributing to the development of rural areas, beekeeping aids ecosystems with pollination services and increases agricultural production yields. From extensive to intensive and specialized beekeeping, oriented to economic profits, both from bee products and pollination, beekeeping has changed. Subspecies of bees that exhibit traits desired for production are replacing endemic bee populations. Because beekeeping production is increasingly profitable from monocultural forages, bees are not only facing a scarcity of food, but also a lack of diversity in their diet. The immunity and vitality of these insects are significantly reduced by climate change and many pathogens that threaten their health. Bee products are also suffering from a reduction in quality due to these factors. Honey bees are one of the greatest pollinators of crops, so this is causing huge losses to agriculture. Thus, less beekeeping activity means less crop production. In the end, farmers suffer a huge loss.

Keywords- *Beekeeping, pollination, Economic profit, Pathogen and Forage.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/166

Studies on documentation and utility pattern of tuber diversity in Joida taluk

Shrikanth K.,[1] Vinayak Pai,[2] Sindhu D. P[3]. and Rachana [4]
[1,3,&4] Research Scholar, College of Forestry, Sirsi
[2] Assistant professor, College of Forestry, Sirsi

Tuber crops are the most important subsidiary or subsistence food and nutritional crops in tropical and sub-tropical countries. It plays a vital role in the dietary habits of small and marginal farmers especially in the food security of tribal population. Tuber crops form the major component of the food of the local Kunabi community people of Joida taluk. Tuber crops not only enrich the diet of these people but also possess medicinal properties to cure many ailments. Different tuber crops are being cultivated, consumed, processed and marketed and which helps to generate income to the local people**.** A semi structured questionnaire survey was conducted in five different villages *viz*., Chapoli, Ambarde, Katel, Godashet and Deriya of Joida taluk of Uttara Kannada district to document the tuber diversity, season of availability and parts used and marketing status etc.. The information related to different tuber crops cultivated, their local name, scientific name, family, traditional knowledge, methods of cultivation, uses and present status of tuber cultivation were recorded. A total 24 cultivated tuber species belongs to eight families were documented. The growth season for tuber crops varies depending on the tuber species. The optimal time to plant tubers is between March and May and can be harvested between October and December. They consume different parts of tubers and more preference was given to tuber (68.34%), followed by the petiole (13.26%), and leaves (18.37%). The utility pattern of tuber was dominated by home consumption (31.4%) followed by marketing purposes (28.7%), traditional usage (27.7%) and medicinal purposes (12.1%). Among different tuber dishes majority of the local people preferred tuber for sambar making (24.6%) followed by boiled tuber (22.1%), chips (20.2%), curry (10.3%) and sweet of tuber was least preferred i.e 5.7% among all products. Market cost of the tuber varies species to species. It fetches around 100-120 Rs per Kg local market rate for the tubers.

Key words: *Tubers, Community, Utility pattern.*

ITAHAS/AB/2023/167

Studies on value chain analysis and cost benefit assessment of different value added products of *Artocarpus heterophyllus* (Jack)

Sindhu D. P[1]., Vinayak Pai[2], Shrikanth K.[3] Anusha Revankar[4] and Ganesha B.H.[5]

[1,3,4&5]Research Scholar, College of Forestry, Sirsi.

[2]Assistant professor, College of Forestry, Sirsi.

Jack which is well known and widely available fruit in Western Ghats during summer season belongs to Moraceae family. Jackfruit is multipurpose tree which provides edible fruit used as a supplementary food. Different types of value added products such as jack chips and jack papad can be prepared by processing of jackfruit. Local people of Sirsi taluk involved in the value addition business of jack. Hence the study was conducted in selected villages of Sirsi taluk, to assess the value chain analysis of *Artocarpus heterophyllus* (Jack). A semi structured questionnaire survey was conducted among the different value chain actors of the selected villages of Sirsi taluk to understand the key characteristics of value chain actors and economic link between them, steps involved in jack value addition, cost benefit involved in the value addition were assessed during study. The results revealed that, value addition of jack chips and jack papad includes four different value chain actors viz., Fruit collectors, processors, marketing agencies and online marketing basements. Among these value chain actor's fruit processors were identified as most benefited group in both jack chips and jack papad making business. The Benefit:Cost ratio for processors was found to be 0.15:1 and 0.12: 1 for jack chips and jack papad respectively followed by marketing agency (0.1:1 B:C ratio) for the products. Value addition of jack fruit was found to be viable business and creates a good source of secondary income to the local people residing in and around Sirsi, where jack fruit availability was plenty.

Key words: *Value chain, Processing, supplementary food.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/168

Perceived Benefits of e-Retailing of Agri Inputs: Study of Farmers in South Gujarat Region

[1]Mr. Kiran N. Patel and [2]Dr. Mehul G. Thakkar
[1]Research Scholar – Ph. D. (Agribusiness Management), Navsari Agricultural University, Navsari (Gujarat)
[2]Associate Professor in HRM and University Placement & Counselling Head**,** Certified National Trainer, Master Trainer & Lead Assessor of Govt. of India**,** International Certified Career Coach from Mindler-India & CDA-USA**,** Start-up MAARG Mentor of Govt. of India in 5 Sectors**,** Navsari Agricultural University, Navsari (Gujarat)

In an agrarian economy like ours, wherein nearly 70 percent of population is dependent on agriculture for their livelihood; farmers' concerns need to be at the centre stage. Easy and timely availability of high quality agri inputs at reasonable price is one of the prominent concerns of the farmers, as several agri inputs are indispensable to high yield agriculture practices. Earlier, farmers used to purchase Agri-inputs from an agro retail shop or cooperative societies. In the hi-tech digital age, some Agri-input companies have started electronic retailing of Agri-inputs, wherein farmer can order from the website or by phone call and Agri-inputs are delivered to their doorstep. Although e-retailing of agri inputs seem to be in infant stage with only few companies engaged in it, this trend is sure to pick up momentum in times to come. Considering this, this present Empirical Research Paper, utilizing the published theoretical literature and Communication Approach of the Descriptive Cross-sectional research design, highlights the benefits perceived by the farmers while doing e-Retailing of Agri inputs. The research was conducted in three randomly selected districts of Gujarat. 300 farmers were selected purposively by adopting multistage sampling technique. Required data were collected by using pre-coded interview schedule and analyzed considering the objectives of the study. The result of the study indicates that the benefits like Shopping Convenience, Ease/Comfort of Shopping, Product Selection and Hedonic Motivation/Enjoyment were perceived by the farmers from e-Retailing of Agri inputs; and they serve as the major 'pull factors' for farmers to continue e-Retailing of agri inputs.

Keywords*: Agrarian Economy, Agri Inputs, e-Commerce, e-Retailing, Hedonic Motivation, Perceived Benefits.*

ITAHAS/AB/2023/169

Micronutrients Role in Crop Production and Human Health

***M. Balakrishna, K. Gopal and T. Thulasiramireddy**
Dr. YRHU, College of Horticulture, Anantharajupeta, Annamayya District, A.P.

The mineral elements like Zn, Fe and Cu are as crucial for human health as organic compounds such as carbohydrates, fats, protein and vitamins. The daily dietary intake of young adult ranges from 10-60 mg for Fe, 2-3 mg for Cu and 15 mg for Zn. Intake less than these values can cause slow physiological processes. These micronutrients deficiencies in soil are not only hampering the crop productivity but also are deteriorating produce quality. High consumption of cereal based foods with low contents of micronutrients is causing health hazards in humans. The contents of micronutrients in food can be elevated either by supplementation, fortification or by agricultural strategies i.e., biofortification and application of micronutrients containing fertilizers. Food fortification and supplementation are too expensive, not practical to be applied on large scale and not easily accessible to poor masses. The development of micronutrient efficient genotypes can be a successive tool to overcome the micronutrient disorders in soil and for improvement in human health. However, the harvesting of micronutrient enriched grains from field would mine out more micronutrients. The cultivation of these genotypes can be integrated with the application of micronutrients containing fertilizers. Addition of such fertilizers will not only correct the deficiencies but also improve the fruit size and quality of crops. In general, 2-5 kg Zn ha-1 may be adequate for improved crop production, however, soil applied Fe is generally ineffective except for Fe-sequestrine. Repeated sprays of Ferrous sulphate (FeSO4) or chelated Fe cure the chlorosis and improve the quality of food stuff. However, despite being highly cost effective, currently micronutrient use is negligible.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/170

Influence of mutation on bio-chemical parameters of *Hibiscus rosa-sinensis* L. Cultivar Red Single

N. Naveena[1*], S. Subramanian[2], M. Jawaharlal[3], K. Iyanar[4], C.N. Chandrasekhar[5] and N. Manikanda Boopathi[6]

[1]Assistant Professor (Horticulture), Vanavarayar Institute of Agriculture, Pollachi Affiliated to Tamil Nadu Agricultural University, Coimbatore

[2] Professor (Horticulture), Horticultural College & Research Institute, Tamil Nadu Agricultural University, Coimbatore

[3]Director, Directorate of Extension Education, Tamil Nadu Agricultural University, Coimbatore

[4]Associate Professor (PBG), Department of Millets, Tamil Nadu Agricultural University, Coimbatore

[5]Professor (Crop Physiology), Agricultural College & Research Institute, Tamil Nadu Agricultural University, Coimbatore

[6]Associate Professor (Bio-Tech), Department of Plant Biotechnology, CPMB & B, Tamil Nadu Agricultural University, Coimbatore

Mutagenesis is an efficient tool employed to improve the vital characters of the floricultural crops. Present investigation was carried out to study the effects of potential mutagens (gamma radiation and Ethyl Methane Sulphonate) on the famous Red Single cultivar of *Hibiscus rosa-sinensis* L. Based on the pre-determined LD_{50} values, Six treatments were employed to induce mutation which includes 2.5 kR, 3.0 kR and 3.5 kR gamma ray treatments and 0.8%, 0.9% and 1.0% EMS treatments and control maintained separately without mutagenic treatment. Results reported that total chlorophyll content reduced in a linear trend with the increase of doses in both the mutagens. Increased total monomeric anthocyanin (75.27 mg l^{-1}) and total flavonoids (27.21 mg g^{-1}) were noted in the higher dose (1.0% EMS) of chemical mutagen treated plants which performed better than the control. In 3.5 kR of gamma-ray treatment, level of total phenol (66.04 mg g^{-1}) was elevated as a result of stress caused by gamma-rays. Hence, Chemical mutation (EMS) at higher concentration has the potential to enhance the important floral pigment (Total Monomeric Anthocyanin) in *Hibiscus rosa-sinensis* L.

Keywords*: Mutagenesis, gamma radiation, EMS, Total Monomeric Anthocyanin.*

ITAHAS/AB/2023/171

Effect of Insitu Moisture Conservation Techniques on Growth and Yield of Thenai Under Rainfed Condition

N. Satheeshkumar[1] and P. Thukkaiyannan[2]

[1]Associate Professor (Agronomy), Maize Research Station, TNAU, Vagarai

[2]Associate Professor (Agronomy), Agricultural College and Research Institute, TNAU, Karur

Field experiments were conducted at Dryland Agricultural Research Station, Chettinad to find out the effect of different *in situ* moisture conservation techniques for enhancing the productivity of Tenai under rainfed condition. The experiment consisted of the following treatments *viz*., T_1- Broad Bed and Furrow, T_2- Compartmental Bunding, T_3-Ridges and Furrows, T_4-Tied Ridges, T_5.Basin Listing, T_6-Vertical Mulching and T_7-Flat Bed. The different *in situ* moisture conservation techniques such as broad bed and furrow (105 cm width and 50 cm furrow depth), compartmental bunding (8x5cm), ridges and furrows (25x15cm), tied ridges (25x15) at 60 cm intervals, basin listing (10x15 cm), vertical mulching (25x30cm) were formed with residual soil moisture and these treatments were compared with flat bed. The results revealed that, tied ridges produced maximum no. of productive tillers per hill (13.4 no/hill), ear head length (cm), 1000 grain weight (2.89 g), grain yield (1470 kg/ha) and fodder yield (5680 kg/ha) followed by ridges and furrows. The lowest growth and yield parameters were observed under Broad Bed and Furrow treatment. With respect to economics, though the treatments Tied Ridges and Ridges and Furrows recorded the highest gross return, both failed to produce higher benefit cost ratio of 2.26 and 2.12 respectively due to its higher cost of cultivation. Despite, the grain yield and gross return recorded under the treatment Compartmental Bunding as low as compared to Tied Ridges and Ridges and Furrows, it could give higher benefit cost ratio of 2.32 owing to its lowest cost of cultivation. From this study, it could be inferred that for higher productivity and yield in Tenai, either Tied Ridges or Ridges and Furrows may be followed and for higher BC ratio Compartmental Bunding is recommended.

Keywords: *Insitu moisture conservation, tied ridges, ridges and furrows, grain yield and benefit cost ratio*.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/172

Supplementary Irrigation Through Rain Water Reuse to Enhance the Productivity of Thenai

N. Satheeshkumar[1] and P. Thukkaiyannan[2]
[1]Associate Professor (Agronomy), Maize Research Station, TNAU, Vagarai
[2] Associate Professor (Agronomy), Agricultural College and Research Institute, TNAU, Karur

Field experiments were conducted at Dryland Agricultural Research Station, Chettinad to find out the effect of supplementary irrigation through reuse of rain water to enhance the productivity of tenai. The experiment consisted of the following treatments *viz*., T_1-Irrigation at primordial formation, T_2- Irrigation at flowering, T_3-Irrigation at primordial formation and flowering and T_4-Control (without supplemental irrigation). The trial was laid out in a Randomized block design with four replications. The results showed that, among the different supplementary irrigation evaluated, Irrigation at primordial formation and flowering recorded highest no. of productive tillers (12.5 no/plant), ear head length (21.1 cm), 1000 grain weight (2.83 g), grain yield (1140 kg/ha) and fodder yield (2135 kg/ha) followed by Irrigation at Primordial Formation. With respect to days to 50 % flowering and days to maturity, the crop attained 50 percent flowering at 45 DAS and matured 14 days earlier under the treatment Irrigation at Primordial Formation and flowering as compared to control (without supplementary irrigation). The same trend was observed for gross return and benefit cost ratio. From this study, it could be concluded that Irrigation at Primordial Formation and flowering stage had recorded the highest grain and fodder yield and gave maximum gross return (Rs.45600/ha), net return (Rs.23560/ha) and benefit cost ratio of 2.07 as compared to rest of the treatments.

Keywords: *Supplementary irrigation, rain water reuse, primordial formation, grain yield and net return.*

ITAHAS/AB/2023/173

Nanotechnology: Emerging technology in Horticulture

Dr. P. Tanuja*, Dr. B. Anitha* and Dr. Ch. Shanmukhi*

*Assistant Professor, School of agricultural sciences, Malla reddy university

Food security is a broader concept than food safety it is based primarily on adequate food production enough to feed the world's population adequate financial resources to buy or obtain the food that is available, adequate nutrition, and good food hygiene. Due to a number of significant changes, including a growing population, altered dietary patterns, an increase in the interdependence of food, energy, and bioenergy over natural resources, and climate change, food security is likely to become more serious in the near future. By 2030, it is predicted that 40% more land will be needed to feed the city's growing middle class. Nanotechnology is helping to advance technology and address issues with horticulture and food security. By controlling insects and pests in horticulture in an environmentally friendly way nanotechnology is offering effective alternatives to raise crop production. Additionally, it enhances the ability of plants to absorb nutrients. A major challenge is ensuring a sustainable supply of food that is both safe and nutrient-dense. It will be possible to increase productivity and improve food safety by nanotechnology. Some nanoparticles are appealing as a new weapon against pathogenic bacteria, yeasts, and fungi because of their antibacterial properties. By reducing the infiltration of gases and water vapour from the surrounding environment to food products, materials with high barrier properties also play a significant role in ensuring food safety. Polymer nanocomposites have garnered the most interest among the nanotechnologies currently in use for food packaging and food security.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/174

Suitability of the Mechanical weeder by altering the crop geometry in hybrid maize

P. Thukkaiyannan[1] and N. Satheeshkumar[2]
[1] Agricultural College and Research Institute, Karur – 639001, Tamilnadu, India
[2] Maize Research Station, Vagarai – 624613, Tamilnadu, India

A research experiment was conducted to assess the suitability of mechanical weeding by altering the spacing of hybrid maize at Maize Research Station, Vagarai (Tamilnadu) during 2014-15 to 2015-16. The treatments of the experiment comprised of pre-emergence application of herbicide and mechanical weeding at two stages *viz*., 20 and 45 DAS using different weeder width (45 and 60 cm) in different crop geometry (60 x 25 cm and 75 X 20 cm) without affecting the recommended plant population. The result of the onfarm test, higher plant height was recorded in closed spacing (60 X 25) cm than that of wide spaced (75 X 20 cm). The dry matter production at the time of harvest was higher (8946, 12184, 8366 kg/ha in Vagarai, Madurai and Bhavanisagar centres respectively) in 75 X 20 cm spacing with one pre emergence herbicide + power weeder operation on 45 DAS. The cob length, cob girth, number of grains per row, number of rows in a cob were comparatively higher in 75 X 20 cm spacing with one pre emergence herbicide + power weeder operation on 45 DAS in all centres. The grain yield of maize was comparatively higher in T_1 (75 X 20 cm spacing with one pre emergence herbicide + power weeder operation on 45 DAS) and T_3 (PE atrazine @ 0.25 kg/ha followed by one hand weeding with the spacing of 60 x 25 cm) (7199 kg/ha and 7136 kg/ha in Vagarai, 6721 kg/ha and 6318 kg/ha in Madurai and 6356 kg/ha and 6420 kg/ha in Bhavanisagar centres respectively). Stover yield was comparatively higher in T_1 when compare with other treatments in all the centres. The net returns and benefit cost ratio were also comparatively higher in T_1 than other treatments (Rs. 81,659, Rs.74,495 and Rs.71,300 per hectare and 4.1, 3.8 and 3.7 in the tested centres). The time taken to weeding by using of power weeder, more time was consumed at Madurai centre (16.5 hr/ha) than other centres. The labour requirement was high in weeding twice at 20 and 45 DAS than one pre emergence herbicide application with one power weeder operation in maize. It was concluded that pre emergence application of atrazine @ 0.25 kg/ha on 3 DAS + weeding with power weeder of 60 cm width on 45 DAS under 75 x 20 cm spacing reduced the cost of cultivation on weeding increased the grain yield

(10,393 kg/ha), net returns (Rs.72,239) and benefit cost ratio (2.38) in irrigated maize.

Key words: *Maize, Crop geometry, Mechanical weeding, Grain yield and Power weeder.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/175

Newer herbicide molecules and their effect on weed management maize

P. Thukkaiyannan[1] and N. Satheeshkumar[2]
[1]Agricultural College and Research Institute, Karur – 639001, Tamilnadu, India
[2]Maize Research Station, Vagarai – 624613, Tamilnadu, India

To assess the performance of herbicide molecules on weed dynamics and grain yield of maize under irrigated field condition experiments were conducted at Maize Research Station, Vagarai, Tamilnadu during kharif season of years 2015, 2016 and 2017. The herbicide molecules of atrazine, pendimethalin, halosuluron and tembotrion were tried at different doses, combinations and time. The combinations were fixed as Atrazine @ 1500 g a.i./ha PE, Atrazine (750 g a.i./ha) + Pendimethalin (750 ml a.i./ha) PE, Atrazine (750 g a.i./ha) + 2,4-D Amine (75%) at 25 DAS as PoE, Halosulfuron 60 g a.i./ha at 25 DAS, Atrazine @ 1500 g a.i./ha PE fb Halosulfuron 60 g a.i./ha 25 DAS, Tembotrione 120 g a.i./ha PoE at 25 DAS, Pendimethalin (1000 ml a.i./ha) PE fb Atrazine (750 g a.i./ha) + 2,4-D Amine (75%) at 25 DAS, Atrazine @ 1500 kg a.i./ha PE fb Tembotrione 120 g a.i./ha) PoE at 25 DAS, Atrazine @ 250 g a.i./ha + One hand weeding at 30 – 35 DAS and Atrazine @ 250 g a.i./ha + 2,4 D @ 1000 g/ha at 20-25 DAS. These combinations and their effect were compared with weedy check and weed free check. These trials were laid out in the statistical model RBD and replicated thrice. The result of the experiment revealed that lesser number of broad-leaved weeds were recorded under application of atrazine @ 1500 g a.i./ha PE fb tembotrione @ 120 g a.i./ha PoE at 25 DAS at 50 DAS and at harvest. Grass weed population was significantly lesser under atrazine @ 250 g/ha + One Hand weeding done at 30-35 DAS and application of atrazine @ 750 g a.i./ha + pendimethalin @ 750 ml a.i./ha as pre-emergence at harvest stage. Weed control efficiency was higher under pre-emergence application of pendimethalin @ 1000 ml a.i./ha fb atrazine @ 750 g a.i./ha + 2,4 D amine salt. Higher grain yield (9768 kg/ha) was recorded in atrazine (1500 g a.i./ha) as pre- emergence herbicide, which was followed by halosulfuron @ 60 g/ha at 25 DAS as PoE at 50 DAS, which was on par with weed free treatment.

Keywords- *Maize, herbicide, weed management, weed population, weed dry matter, weed control efficiency, grain yield.*

ITAHAS/AB/2023/176

Studies on Extending the Shelf Life of Fig (*Ficus carica* L.) Fruits Cv. Dinkar Fig

P. B. Sable[1*] and D. P. Waskar[2]

[1]Assistant professor, Department of Horticulture, Shri. Shivaji Agriculture College, Amravati, M.S., India

[2]Director of Research, Late Shri. Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, M.S. India

The present investigation entitled "Studies on extending the shelf life of Fig *(Ficus carica* L.*)* fruits Cv. Dinkar Fig" was conducted at Department of Horticultre, Late Shri. Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, M.S., India during the year 2008-2009. The experiment was conducted in Factorial Completely Randomized Design (FCRD) with six pre-harvest treatments and two storage conditions. The treatments were replicated three times. The pre-harvest sprays (0.5%, 1.0% and control) were undertaken 10 and 20 days before harvesting fruits of fig Cv. Dinkar fig. The fruits were packed in CFB boxes and stored under two environments viz. at room temp. (15.10 to 41.3^{0}C and 49.00 – 71.00% RH) and in cool storage (5^{0}C and 90-95%RH). The results revealed that there was an increase in TSS, reducing sugars and total sugars with corresponding decrease in acidity of fig Cv. Dinkar fig under both the storage conditions irrespective of pre-harvest treatments. Fruits stored in cool store followed the same trend of physico-chemical changes but at a slower rate. The shelf life of control fig fruits was found to be hardly 2 days at room temperature. However fig fruits of variety Cv. Dinkar fig could be stored up to 4 days at room temperature when these were given spray of $CaCl_2$(1.0%) 10 days before harvesting. The shelf life of untreated fruit of this variety was hardly 5 days in CS. However, it could be further extended upto 8 days when given spray of $CaCl_2$ (1.0%) 10 days before harvesting and stored in CS.

Keywords: *pre-harvest spray, room temperature, cool storage, shelf life, fig fruits.*

Development of gene family derived InDel markers for genetic improvement of Pomegranate

Prakash G. Patil[1]*, Shivani M. Jamma[1], Manjunatha N[1], Dhinesh Babu K[1], Nilesh Gaikwad[1], Pinky Raigond[1], Shilpa P[1] and R. A. Marathe[1]

[1] ICAR-National Research Centre on Pomegranate (NRCP), Solapur 413 255, India

In order to develop insertion or deletion (InDel) markers specific to gene families, we retrieved 140 representative genes belonged to seven gene families *i.e.* PgSWEET (20 genes), PgSUS (5), PgSUT (10), PgTALE (17), PgYABBY (6), PgARF (17), and PgbZIP (65) from four draft genomes of pomegranate cvs. Tunisia, Dabenzi, Taishanhong and Bhagawa using BLASTn homology search. These gene sequences were examined and compared for four genomes using multiple sequence alignment to identify InDels. The consensus region (~400 bp) around each InDels (~8 bp) was used for primer designing as a result 245 InDels primers were designed. Through *e*PCR, 148 (60.41%) markers were got verified on the Tunisia genome. Further, the 148 markers were ePCR-confirmed on multiple genomes resulting in 107 polymorphic markers with an average PIC value of 0.62. *In silico* comparative mapping using physically mapped InDel markers uncovered the higher syntenic relationships of Tunisia with the Bhagawa (100%) genome, followed by Dabenzi (97.97%) and Taishanhong (97.30%). Wet-lab validation of fifty four InDel primers on six pomegranate genotypes was performed and identified 37 (71.15%) polymorphic markers, 24 of which had PIC values ≥0.48. The immediate utility of these developed InDel markers was demonstrated by analysing genetic diversity and correlations in 16 pomegranate genotypes using sixteen InDel markers. In summary, for the first time we report the development of InDel markers that are specific to seven well characterized gene families of pomegranate involved in growth and development. These markers will serve as valuable genomic resources for trait mapping, gene discovery and gene editing application for genetic improvement of pomegranate.

ITAHAS/AB/2023/178

Impact on Artificial Intelligence and Applications of Internet of Things in Fruit Harvesting

R. Vasanthi[1], V. Saravanan[2], K. S. Shanthini[3], M. Umamaheswari[4] C. Mohan Raj[5]

[1&5.]Assistant professor- Department of Agriculture Engineering, Kalaignar Karunanidhi Institute of Technology, Coimbatore

[2.]Assistant professor, Department of Computer Science, GRD college of arts and science – Coimbatore

[3 & 4 -]Assistant professor- Department of Computer Applications, Kalaignar Karunanidhi Institute of Technology, Coimbatore

Farming is the bedrock of manageability of any economy. In the advanced world cycles and advances will generally be computerized, independent and exact. The total population is continually developing and consequently food creation innovations ought to be brought to a subjectively new level. Quality necessities for food items additionally will quite often increment and become more intricate. The deficiency of occasional natural product pickers has animated the requirement for robotization. Modern Agriculture gives the likelihood to utilize soil all the more astutely and actually. Modern Agriculture incorporates sensor advancements for yield planning and estimating, soil detecting, supplement and pesticide application, water system control, automated reaping, and so on. current sensor frameworks utilized in semi or completely mechanized mechanical reaping, including natural product recognition and limitation before pick or cut. Sensors utilized in particular reaping were additionally checked on. Sensor frameworks were ordered in the accompanying classifications: PC vision, synthetic sensors, material sensors and vicinity sensors. The principal patterns in store for mechanical gathering will include use of blends of various sensor frameworks that give exactness and unwavering quality. The use of Artificial Intelligence (AI) has been clear in the farming area as of late. Technologies are focused on both delicate and hard natural products, like strawberries and apples, separately, and take advantage of cutting edge vision frameworks, picture handling procedures and AI. The presentation of current horticulture strategies utilizing IoT and AI is upsetting the conventional agribusiness techniques and are making cultivating a productive endeavor moreover.

Malla Reddy University, Hyderabad and Just Agriculture Education Group

Keywords*: Modern farming – horticulture - fruit harvesting – AI-IoT-Robotization.*

ITAHAS/AB/2023/179

Studies on Induced mutations in Quantitative Characters for Electron beam Treatment in Black gram (*Vigna mungo* (L.) *Hepper*) in M_1 generation

S. Anandhi Lavanya*[1], C. Vanniarajan[2], J. Souframanien[3] and G. Vaidehi[1], C. Gurumoorthy[1]

[1]School of Agriculture, [1]Centre for Applied Nuclear Research
Bharath Institute of Higher Education and Research, Chennai
[2]Department of Plant Breeding and Genetics, Agricultural College and Research Institute, Madurai
[3]Nuclear Agriculture and Biotechnology Division, Bhabha Atomic Research Centre, Trombay, Mumbai

Mutation breeding is relatively a faster method for improvement of crop plants. Induced mutation in plant improvement has been proven to be one of the replacements to generate new sources of genetic variation in Black gram. It has been identified that induced mutations can more yield as well as other quantitative traits in plants. For this aspect, the present study was analyzed using Electron Beam with ADT 3 and CO 6 varieties of black gram. The black gram seeds were treated with various dose of Electron Beam like 200, 300 and 400 Gy.To study their effect on various characters like plant height, number of branches per plant, days to fifty percent flowering, number of cluster per plant, number of pods per plant, number of seeds per plant, hundred seed weight and yield per plant. In M_1 generation the results revealed that all the characters were considerably reduced when compared to control. The results attained in the present study clearly indicated that dissimilar doses of Electron Beam can be effectively utilized to establish variability for various quantitative characters of the crop.

Keywords: *Electron Beam, Blackgram, M_1 generation, quantitative characters.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/180

Antimicrobial resistance of ESBL Producing and Carbapenem resistant *E. coli* isolated from piglets and pig farm workers

Shikha Tamta[1]* and Vinodh Kumar O.R[2]
[1]Assistant professor, Department of Veterinary Public Health and Epidemiology, IIVER, Rohtak, Haryana
[2]Senior scientist, Department of Veterinary Public Health and Epidemiology, IVRI, Izatnagar, Bareilly

To study the epidemiology of ESBL and carbapenmase producing *E. coli* isolates from piglets and pig farm workers fecal samples a cross section study was conducted in 5 different locations and total of 176 fecal swabs were collected. On preliminary screening with 1 mg/L cefotaxime added MacConkey 124 *E. coli* isolates were isolated. The phenotypic screening of 124 *E. coli* isolates were resistant to imipenem (6.4%), ertapenem (4.8%), meropenem (1.61%) , aztreonam (42.7%) and moxalactam (23.38%) and against commonly used antibiotics viz. ampicillin (44.3%), pipercillin (41.93%), cefotaxime/clavulanic acid (44.33%), ceftazidime (44.33%), ceftazidime / clavulanic acid (44.33%) cefepime (42.7%), cefotaxime (44.3%), cefoxitin (17.7%), cefpodoxime (42.14%), ciprofloxacin (11.2%), tetracycline (27.41%), chloramphenicol (14.5%)and trimethoprim/sulfamethoxazole(22.5%). Out of 124 *E coli* isolates 55 were ESBL producing and 9 were carbapenem resistant. All positive isolates are showing ratio of >8 as per the manufacturers guidelines and were confirmed as ESBL producers and all carbapenem resistant isolates showing ratio of >4 was confirmed as carbapenem resistant. In our study the PCR detected *bla*AmpC, *bla*TEM, *bla*CTX-M genes and *bla* NDM gene. The 631 bp, 867bp, 540bp, 621bp PCR amplicon product was sequenced by Eurofins Ltd, Bangalore. The sequences of this amplicons were made a homology search using BLAST algorithm. The result of 631bp, 867bp, 540bp, 621bp product BLAST search indicated 100% homology with blaAmpC*, bla*TEM*, bla*CTX-M gene, bla NDM gene of bacterias of Enterobacteriaceae family. In ERIC –PCR the NDM isolates of human and piglet isolates showed clonal relationship. Across place, age, sex, breed, health status only place (P value – 0.00), age (P value - 0.03) and breed (P value- 0.03) showed significant difference to ESBL producing *E. coli* isolates from piglets and no significance difference across

place, breed, sex and health status to carbapenem resistant *E. coli* isolates in piglets as well as in human samples.

Keywords*: Antimicrobial resistance; ESBL Genes; E. coli; Piglets; Pig farm workers.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/181

Phytochemical characterization and functional textile applicability of *Bixa orellana*

Dr. V. Priyanka, Dr. K. Kumaran and Dr. B. Vinothini
Forest College and Research Institute, Tamil Nadu Agricultural University

Recently, due to increasing awareness of environmental issues and also pollution produced by synthetic dyes, wide spread interest has emerged in the dyeing of textile fibres using natural colorants on account of their better biodegradability and higher compatibility. In a world of fast fashion and ban of Azo dyes, we are need of natural and sustainable dyeing components that is both sustainable and eco-friendly to cater the needs. Natural dyes have been an integral and intriguing part of human life from time immemorial. *Bixa orellana* or Annatto is one such natural dye plant whose seed extract contains carotenoid pigments which are widely used as a dye in the food, cosmetic and textile industries. The present study on Bixa was carried out to investigate chemical constituents, dyeing performance and antimicrobial activity. Phytochemical screening of *Bixa orellana* genotypes carried out had led to the isolation and identification of a number of structurally diverse chemical compounds. Among the screened Bixa genotypes, a total of 16 common bioactive chemical compounds were found wherein four major compounds were observed in all the genotypes *viz*.,trans-Geranylgeraniol (78.09% to 37.49%), Spathulenol (12.07% to 3.04%), Aromadendrene (13.62% to 0.79%) and Methylhydrogen-(9'Z)-6,6',-dioate (3.52% to 1.15%). These compounds are known for their dyeing ability, anti-cancerous property and antimicrobial properties. It was observed that Bixa dyed cotton fabric showed an inhibition of 88.9 per cent and 99.95 per cent against *Bacillus cereus* and *Staphylococcus aureus* and a reduction of 90.2 per cent and 99.99 per cent against *Escherichia coli* and *Klebsiella pneumoniae* respectively. Hence showcasing that Bixa dyed fabric expressed significant antimicrobial property in the fabric. Possible issues and disadvantages, which may arise from utilization of metal salts, low fastness, waste biomass etc., may easily be solved by aimed scientific research on natural dyes.

Keywords: *Natural dye, Bixa, Annatto, Phytochemical analysis, anti microbial, GCMS, Ecofriendly.*

ITAHAS/AB/2023/182

Evaluation of Maize (*Zea mays* L.) Hybrids under agro-climatic conditions of Prayagraj U.P.

Dwaram Mrudula[1] qnd Afrose Mohammad[2]

[1] School of Agricultural Sciences, Malla Reddy University, Hyderabad, Telangana

[2] Department of Agronomy, Faculty of Agriculture, Sun Institute of Agricultural Sciences, Vizag

The major elements for growth and production of maize are soil type, rainfall and water availability. They will help in supplying nutrients to plants which help in improvement of yield. Due to changes in agro climatic conditions, it will effect the yield of maize. so with this background a field expermient was conducted during the kharif season of 2021 at experimental field of the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj, and Uttar Pradesh, India to determine the Growth and Yield of Maize (*Zea mays* L.) Hybrids Under Agro-Climatic Conditions of Prayagraj, Uttar Pradesh, India. The experiment was done on 15 Maize Hybrids. It was carried out through a statistical design of Randomized Block Design (RBD) with three replications. The soil of the experimental plot was sandy loam in texture and contain pH 7.8, organic carbon (0.35%), available nitrogen (243kg/ha), available phosphorus (20.10kg/ha) and available potassium (105 kg/ha).Report of study indicate that, among different Hybrids UM-14 produced significantly higher plant height (218.48 cm), number of leaves per plant (13.07), dry weight/plant (166.11 g), cob length (17.12 cm), number of cobs per plant (2.07), number of rows per cob (15.60), number of grains per row (31.10), Seed yield (7.99 t/ha), stover yield (18.95 t/ha) and harvest index (29.67%). Hybrid UM-14 also fetched highest gross returns (Rs.2,00,631/ha), net returns (Rs.1,43,736/ha) and benefit cost ratio (2.53) when compared to other Hybrids in both growth and yield attributes.

Keywords*: Kharif, yield attributes, growth attributes, maize and economics.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/183

Farm Diversification in Haryana: A Way to Double Farmer's Income

[1]Elizabeth Jose, and [2]K. Ponnusamy
[1]Asst. professor, Extension Department, SOAS, Malla Reddy University, Hyderabad
[2]Principal Scientist, Dairy Extension Division, ICAR- National Dairy Research Institute

In the late 1960s, the Green Revolution, which was successfully implemented in the states of Haryana, Punjab, and Western Uttar Pradesh, enabled India in overcoming a severe food shortage and achieving food grain self-sufficiency, particularly in the case of wheat and paddy. The sustainability of the future agricultural production system in terms of soil, water, climate, and market characteristics is threatened by continuous mono cropping of rice-wheat cropping system. Increased rice-wheat mono cropping trend necessitates diversification on account of ecological concerns. Recent trends in crop farming witnessed a multifold shift towards paddy and wheat specialization in Haryana. So farm diversification is an important strategy to maintain sustainability of the state agriculture. The study aimed to assess the efficiency of farm diversification was conducted in Kaithal, Hisar and Bhiwani districts of Haryana during 2021 by selecting 180 farmers. The efficiency of farm diversification assessed through Benefit Cost Ratio (BCR). Kaithal district reported the highest farm diversification efficiency of 2.46 followed by Bhiwani (1.88) and then by Hisar (1.64). The findings of the present study would act as supporting evidence of the potential enterprises that can contribute to achieve farm diversification in farming sector of Haryana. Ultimately it will act as way to achieve doubling farmer's income.

ITAHAS/AB/2023/184

Monthly Rainfall Modeling for Citrus by using Artificial Neural Network

Khaire S. K.*

College of Technology and Engineering, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, India

The present research paper has articulated the application of ANN in the field of rainfall forecasting for the Citrus crop. Three combinations of weather parameters, four input parameters, five input parameters, six input parameters as Model I, Model II, and Model III have been prepared to generate a nonlinear relationship. There is a single layer ANN generated by increasing of hidden layers by trial and error method. The neurons varied from 1 to 20. The performances of developed models are selected based on statistical indices such as Least Mean Square Error along with higher correlation Coefficient. Different models were developed and validated by using two input datasets. Models were trained and validated using 16 years (1996 to 2011) and 7 years (2012 to 2018) weather parameters respectively. The result showed that the single hidden layer ANN model (6-10-1) of Model III has a good Correlation Coefficient (0.99) and Least Mean Square Error (8.55) which was selected as best among the models. The obtained results of the models showed that increasing the number of inputs significantly improved the performance of models. Sensitivity analysis revealed that relative humidity is the most sensitive parameter and wind speed is less sensitive to reduce unexpected events like fruit drops of Citrus crop and to avoid economical losses of farmers in the Vidharbha region of Maharashtra.

Keywords*: rainfall forecasting, weather parameters, ANN, validation, sensitivity.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/185

Climate Change Adaptation in Indian Drylands: A Systematic Review

Fatheen Abrar. P. N[1], Satyapriya[2], Surjya Kanta Roy[1], and Amandeep Ranjan[1]

[1] Ph.D. Scholar, Division of Agricultural Extension, ICAR-IARI, New Delhi-110012
[2] Principal Scientist, Division of Agricultural Extension, ICAR-IARI, New Delhi-110012

Agriculture represents a core part of the Indian economy and provides food and livelihood activities to much of the Indian population. Indian agriculture is quite vulnerable to climate change since dryland farming depends significantly on rainfall, and the farmers are smallholders with poor coping mechanisms and low risk management penetration. The major impacts of climate change on dryland agriculture include low productivity, increased pest population, longer growing periods, and changes in plant defense mechanism. In order to combat the effects of climate change, it is imperative to implement the proper adaptation measures. Adaptation refers to a group of processes and actions that enables a system to absorb changes that have already happened, or may be expected to occur in the future. This article systematically reviews 104 articles, books, book chapters, conference papers, and notes from 2000 to 2022, to summarize different adaptation strategies followed by the farming community in Indian drylands to cope with the changing climate. Major adaptation strategies include crop intensification using climate resilient varieties (such as drought tolerant varieties, heat stress tolerant varieties, and flooding and submergence tolerant varieties), climate smart cropping management (most common practice among farmers, such as crop diversification and crop rotation), soil and water conservation techniques (such as rainwater harvesting and watershed management), climate smart nutrient management (such as use of slow releasing fertilizers and site specific nutrient management practice), and other alternate strategies like livestock management, income diversification, change in food provision, migration etc. It highlights the considerable contributions of extension advisory services, and village level institutions at the local level in improving the system's adaption to climate change. It also outlines the importance of government's role in enhancing climate resilience through supporting policies and programmes, timely delivery of weather forecasts, critical farm inputs, and crop insurance mechanisms.

Keywords: *Adaptation strategies, Climate change, Climate resilience, Dryland agriculture.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/186

Role of Nano-Fertilizers in Agriculture Farming

Firdous Ashraf, M.A. Bhat and Subhash Chand
*Division of Soil Science, Faculty of Horticulture SKUAST-K Shalimar Srinagar 190025 (J&K)

Nano-fertilizers are nutrient carriers that are being developed using particles with nano dimensions (1 – 100 nm). Nano-fertilizers are synthesized or modified form of traditional fertilizers, bulk materials or extracted from different vegetative or reproductive parts of the plant by different chemical, physical, mechanical or biological methods with the help of nanotechnology used to improve soil fertility, productivity and quality of agricultural produces. These are also called smart fertilizer as they provide new opportunities to enhance the nutrient use efficiency and reduce costs of environmental protection. Nano-fertilizers are the important tools in agriculture to improve crop growth, yield and quality parameters with increase nutrient use efficiency, reduce wastage of fertilizers and cost of cultivation. Nano-fertilizer technology is very innovative and scanty reported literatures are available in the scientific journals. Nutrient use efficiencies of conventional fertilizers hardly exceed 30-35 %, 18-20 % and 35-40 % for N, P and K respectively. The data remain constant for the past several decade and research efforts did not yield fruitful results. Nano-fertilizers are very effective for precise nutrient management in precision agriculture with matching the crop growth stage for nutrient and may provide nutrient throughout the crop growth period. Nano-fertilizers increase crop growth up to optimum concentrations further increase in concentration may inhibit the crop growth due to the toxicity of nutrient. Nano-fertilizers provide more surface area for different metabolic reactions in the plant which increase rate of photosynthesis and produce more dry matter and yield of the crop. Encapsulation of fertilizers within a Nano-particle is one of these new facilities which are done in three ways a) the nutrient can be encapsulated inside nanoporous materials, b) coated with thin polymer film and c) delivered as particle or emulsions of nanoscales dimensions. In addition, Nano-fertilizers will combine Nano devices in order to synchronize the release of fertilizer -N and -P with their uptake by crops, so preventing undesirable nutrient losses to soil, water and air via direct internalization by crops, and avoiding the interaction of nutrients with soil, microorganisms, water, and air.

Keywords: Encapsulation, Nano-fertilizer, Nano-device, Nutrient use efficiency.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/187

A Study on Climate Change Resilience and Adaptation Strategies for Sustainable Development in the Modern Environment

Fr. Baiju Thomas
Research Scholar
Ramakrishna Mission Vivekananda Educational and Research Institute,
Faculty of Disability Management and Special Education,
Vidyalaya Campus, SRKV Post, Coimbatore

The contemporary study explores climate change resilience and adaptation strategies for sustainable development in the modern environment. The complex relationship between the climate and social and environmental systems necessitates rethinking sustainable development strategies in the face of climate change. Adaptation strategies to a changing environment and resilience strategies for its adverse effects are essential for sustainable development. Change management necessary can be thought of as evolving processes inside the framework. Today's robust acceptable environment needs an outlook that can bounce rapidly back from mistakes and reconsider priorities. Think about the effects on the environment, the economy, and our way of life that climate change resilience and adaptation methods will have as you plan for the future. Resilience and adaptation strategies for sustainable development are not likely to substantially decrease the extent of specific outcomes or boost the scope of gains from other people, given the modern environment and the high cost involved. Climate change resilience and adaptation strategies for sustainable development are the defining challenge of our day since they compromise environments, natural resources, waterways, agricultural production, access to water, and human health. Climate change certainly poses a new and unique security risk to human populations. Greenhouse gases are mainly released into the environment due to the extraction, transformation, and use of remaining energy, as well as the unsustainable management and excessive exploitation of the environmental setting. Ecological, social, and economic systems are developed considering climate change resilience's present and future impacts. Adaptation refers to measures taken to decrease the unfavourable effects of climate change and promote the positive outcomes it offers. During the harmful effects of climate change, resilience, and sustainable development, adaptability can make

communities better. Being resilient to climate change involves not just being able to deal with its effects but also preventing them from increasing. Low carbon emissions and adaptation strategies are characteristics of a climate-resilient society. Adaptations to climate change necessitate the planning and assessment of response options, as well as an assessment of sustainable development in the current environment.

Keywords: *Climate Change, Resilience, Adaptation Strategies, Sustainable Development, Modern, and Environment.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/188

Plant Growth Promoting Fungi (PGPF) instigate plant growth and induce disease resistance against *Sclerotium rolfsii*

Bridget Santhiya. G* and Ramalingam. K
RVS Agricultural College, Tamil Nadu, India

Plant growth-promoting fungi (PGPF) have diverse genera of non-pathogenic fungi deliver variety of benefits to their host. The mechanisms involved in the promotion of plant growth by fungus include increased access to nutrients by the production of organic acids and the production of plant growth regulators (auxins, cytokinins, gibberellins, ethylene, and abscisic acid), siderophores (nitrogen, phosphorus, potassium, zinc, and iron), the production of hydrolytic enzymes (xylanases, pectinases, laccases, and cellulases), increase in water uptake, reductions in the amount of ethylene, induction of plant defense mechanisms against pathogens, and relief of different abiotic stresses in harsh environments. *Sclerotium rolfsii* is a necrotrophic, soilborne fungal plant pathogen causes disease on hundreds of plant species, including field, vegetable, fruit, and ornamental crops. S. rolfsii causes the destructive diseases to numerous vegetable and fruit crops, *Sclerotium rolfsii* is major fungal disease that cause severe yield losses up to 80% in many different field and horticultural crops. In our current study, many fungi were isolated the PGPF from soils from different areas in Tamil Nadu. We have got the PGPF of *Trichoderma*, *Penicillum*, *Aspergillus*, *Purpureocillium* and *Metarhizium* has been evaluated against *S. rolfsii* under invitro condition and find out the growth promoting activities in vegetable crops through invitro and in vivo condition, it shows the *Trichoderma* and Penicillium shows greater effect on plant pathogenic growth inhibition under *invitro* and it show the greater growth promoting activities in vegetable seedling under *invivo* condition. PGPF is also known to increase the health of soil and soil fertility with the addition of humus by decomposing plant debris in the rhizosphere.

KEYWORDS: *PGPF, Sclerotium rolfsii, Plant growth, Disease resistance.*

ITAHAS/AB/2023/189

Transmissible Venereal Tumor in a Pomeranian Bitch with Uterine Implantation

G. Shalini, Uma and D. Antoine
Department of Veterinary Gynaecology and Obstetrics, Rajiv Gandhi Institute of Veterinary Education and Research, Kurumbapet, Pondicherry-605009

A three-year-old non-descript bitch was presented to the veterinary clinical complex with the history of prolonged intermittent sero-sanguineous and hemorrhagic vaginal discharge for a past few weeks. The animal had a history of unilateral removal of one uterine horn. A multi-lobulated vegetative growth was observed in the vaginal passage. Exfoliate cytology of Leishman-stained vaginal smear revealed high cellularity. Individual neoplastic cells had round nuclei, fine to granular chromatin pattern, prominent nucleoli with and frequent mitotic figures suggestive of TVT. Following excision of the vaginal growth, the bitch recovered without any complication. After three months, the condition recurred with hard palpable mass in the lower abdominal area, which was found to be radiolucent. Cytological study of the discharge showed evidence of TVT. Exploratory laparotomy through right flank approach revealed an intact right uterine horn and ovary and a healed stump of the left horn. A hard mass observed in the cervical area was exteriorized. The mass along with the uterine horn and ovary was removed. The mass, which was pale red, fleshy in consistency, measured about 2 cm in diameter was histopathological confirmed as TVT based on the characteristic round to ovoid shaped neoplastic cells arranged in compact masses or sheets with minimal stroma. In the affected part of the uterus, endometrium was completely replaced by the neoplastic growth. After a span of three months, the animal again showed sero-sanguineous vaginal discharge, the cytology of which confirmed the recurrence of the neoplasm. The animal was placed on chemotherapy with vincristine sulphate at a dose rate of 0.025 mg/kg.bwt. per week by intravenous route at weekly intervals for three weeks. The animal recovered well and subsequently did not show any signs of illness.

Assessment of Nutrient management technologies for Rice (*Oryza sativa* L.) to improve productivity and quality through Nano-mediated fertilizer approaches in Western U.P. conditions

Gajjela Indira and Vivek Dhama
Department of Agronomy, Sardar Vallabh Bhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh, India

Rice (*Oryza sativa* L.) is a cereal grain which is a staple food for nearly half of the world's population. It is a crop that contains a wide range of nutrients such as starches, proteins, dietary fibres, nutrients and minerals. With the increase in population attended by rising cases of malnutrition and decreasing agricultural lands for crop production, an innovative strategy is a must. Nitrogen- based fertilisers like urea, which have been instrumental in increasing crop yields in India, are now turning into potent destroyers by polluting land and water, affecting people' s health and leading to climate change. Nitrogen pollution is a serious matter of concern in the rice-wheat growing tracts of Western Uttar Pradesh. This has had a serious adverse effect on soil health leading to lower yields. What is needed now is rationalisation of unbalanced use of nitrogen fertilizers and a balance between achieving food security and the use of fertilizers. Nanotechnology offer an alternative solution to overcome the disadvantages of conventional agriculture. It would be very helpful if nano fertilizers are applied for specific crops such as rice to minimize the potential negative effects brought about by the extensive use of chemical inputs without compromising production and nutritional benefits. Utilization of nanotechnology in the field of agriculture is still in its growing stage. However, it has the potential to revolutionise agricultural systems particularly where the issues on fertilizer applications are concerned. Therefore, balanced and integrated application of nano nutrients, biofertilizers, bio stimulants and inorganic fertilizers should be a key factor in order to achieve improved and sustainable soil fertility and crop yield. The main idea to undertake this research is to achieve a balance of nutrients in the soil without destroying the beneficial soil microorganisms through use of Nano fertilizers and Biostimulants. Rice growth, development and quality can be enhanced by Nanofertilizer and bio-stimulant application which has the potential to

improve crop production and plant nutrition. This in turn can pave the way for improved soil health and will address the environmental pollution and soil health hazards raised by the use of conventional sources of nutrient management in Western U.P. region.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/191

Physiological Responses of 24-Epibrassinolide (24-EBL) and Salicylic Acid (SA) Seed Priming in Wheat (*Triticum aestivum* L.) Genotypes under Hydroponic Salinity Stress

Gali Suresh[1] and K.D. Sharma[2]
[1]Ph. D Research Scholar and [2]Professor,
Department of Botany and Plant physiologyCCS HAU, Hisar-125004, Haryana, India

Wheat (*Triticum aestivum* L.) is the second most extensively cultivated cereal crop in India, assumes a pivotal role in ensuring food and nutritional security for the country. The growth and development of crop plants often adversely affected by salinity stress. Seed priming is a widely adopted physiological technique aimed at enhancing the metabolic activities of seeds before germination. It involves the controlled hydration and dehydration of seeds, which has been result in improved germination rates and percentages, as well as enhanced seedling growth and crop yield under both normal and diverse biotic and abiotic stress conditions. Seed priming with plant growth regulators like 24-Epibrassinolide (24-EBL) and Salicylic acid (SA) has emerged as an important tool for mitigating the effects of abiotic stress. The main objective of this experiment was to evaluate the physiological role of 24-EBL and SA at seedling stage in wheat under hydroponic salinity. Seeds of two wheat genotypes (WH 1270 and KRL 210) primed in effective optimum concentrations of 24-EBL (0.50 µM) and SA (100 ppm). These seeds were cultivated in hydroponic system under three different salinity levels (5 dS m^{-1}, 7.5 dS m^{-1} and 10 dS m^{-1}) along with a control (0 dS m^{-1}). Root length, shoot length, fresh weight and dry weight of seedlings recorded at 21 days after sowing (DAS) to evaluate the positive effect of 24-EBL and SA. The findings of this study revealed that increased root length, shoot length, fresh weight and dry weight at 0.50 µM of 24-EBL and 100 ppm of SA in both genotypes. Comparatively KRL 210 shown prominent response to seed priming treatments than WH 1270 in different hydroponic salinity levels compared to control.

Keywords: *Abiotic stress, 24-Epibrassinolide (24-EBL), Hydroponics, Salicylic acid (SA), Salinity stress, Seed priming and wheat.*

ITAHAS/AB/2023/192

Study on the Effect of Antimicrobial Resistant Pathogens of Bovine Mastitis and Lactic Acid Bacteria in Dahi

Ganesh
M.Tech Research Scholar

Antibiotics are used in combating pathogens of bovine mastitis in dairy farms, there excessive usage leading to antimicrobial resistance. Lactic acid bacteria may act as reservoirs of antibiotic resistance genes similar to those found in human pathogens. In fermented foods there is possibility of horizontal transfer of resistance to commensal or pathogenic bacteria which is public health significance which can reduce the efficacy of antibiotic treatment. In the present study 45 isolates of bovine mastitis were obtained from Veterinary Microbiology Department, KVAFSU, Bangalore. The purified 40 Gram-positive isolates and 5 of Gram negative, were identified as *Streptococcus uberis* (10), *Streptococcus agalactiae* (12); one each of *Staphylococcus delphini, Staphylococcus carnosus* and *Staphylococcus gallanarium* while 6 each of *Staphylococcus equorum* & *Staphylococcus epidermis* and 3 *Staphylococcus aureus*. Gram negative 5 isolates were identified as *E. coli* (3), *Salmonella enterica* (1) and *Alcaligenes* sp. (1). All the isolates were subjected to antibiotic susceptibility test (18 antibiotics), *Streptococcus agalactiae* M36, *Staphylococcus aureus* M35, *E. coli* M33, *Salmonella enterica* M27 showed highest resistance for 16, 15, 7, 5 antibiotics, respectively. The highest antibiotic resistant isolates were PCR analysed for their speciation. *Lactococcus lactic ssp. Lactis* 1*, Lactococcus lactic ssp. lactis* 2*, Lactococcus lactic ssp. cremoris* were used in dahi preparation alone or in combination along with selected mastitic causing bacteria having public health significance and highly resistant to antibiotics. The prepared dahi had viable count of log8.6 both in individual and in mixed lactic cultures with lactic acid of 0.77%. Lactic cultures exhibited resistance to ampicillin, azithromycin, cefoperazone, ceftriaxone, nalidixic acid, penicillin, rifampicin and vancomycin. Mastitic isolates, showed resistant to all the antibiotics, while the *Streptococcus agalactiae* and *E. coli* showed susceptibility to streptomycin. In dahi prepared using mixed lactic culture, there may be possibility of transfer of resistant factor of ceftriaxone to *Salmonella enterica* ssp. *enterica* M27 and both ceftriaxone and ofloxacin

resistance to *Staphylococcus aureus* M35 from lactic cultures which were resistant in dahi while pathogens in broth were susceptible.

ITAHAS/AB/2023/193

Study on the production of Propionic acid and its salts using different media composition using Propionibacterium sp.

G. Ramesh[1*], Jyoti Sharma[2] and KVSS Sairam[1]

[1]Prathista Industries Limited, Telangana, India

[2]Department of Biotechnology, Agriculture and Agri-informatics, Shobhit Institute of Engineering and Technology, Meerut, India

Organic acids are extensively distributed in nature making its presence in animal, plant and microbial sources. Production of such organic acids at a commercial scale is mainly regulated to acids of microbial origin. Several organic acids that are of bacterial and fungal origin are significant industrial products as they have a definite economic advantage over chemical synthesis. Propionic acid and its salts are meant to have effective applications for preservation in bakery and other food products. In the present study, an attempt was made to investigate the propionic acid production using Propionibacterium species for production of propionic acid. The study extended with the use of different media compositions for observation of propionic acid concentration. The Propionibacterium cells having microbial cell density (>10^5 cfu/ml) were inoculated in the constant specific seed media compositions followed with inoculation in commercial/final set media compositions at pH 7.0-7.2 and temperature 30-32^{0}C. The results of the studies reveal the propionic acid production in different percentages in the different sets of the commercial/final sets. The commercial/final set was checked for calcium lactate broth as one of the key ingredients in media composition. The studies justified that, calcium lactate % in the calcium lactate broth of commercial/final set should be 10-12% for optimum production of propionic acid. The studies reveal also revealed that, media compositions and suitable C/N ratios also plays a significant role in effective production of Propionic acid.

Key words: *Propionic acid, Propionibacterium, media compositions, optimal parameters, microbial cell density.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/194

Assessment of drain discharge from subsurface drainage system at 60 m lateral spacing in saline vertisols of Tungabhadra command area

Hanamantappa Meti[1*], J. Vishwanath[1] and Ranjitha G. [2]
[1]Department of Soil Science and Agricultural Chemistry, College of Agriculture, Raichur
[2]Department of Soil Science and Agricultural Chemistry, College of Agriculture, Mandya

The characterization of drain water for irrigation over the cropping season was assessed from February 2021 to March 2021 at ARS Gangavati in the TBP command area. Fifteen times of water samples collected from three different sampling man holes revealed that, the pH and EC values of drain water varied from 7.55 to 7.09 with a mean of 7.27 and EC values varied from 5.25 to 4.33 dS m^{-1} with a mean of 4.73 dS m^{-1}. The SAR values in drain discharge varied from 25.2 to 18.10 $(mmol/L)^{1/2}$ with a mean value of 21.6 $(mmol/L)^{1/2}$ and RSC values varied from 11.50 to 9.50 me L^{-1} with a mean value of 9.00 me L^{-1}. The DCR in drain discharge varied from 0.19 to 0.12 with a mean value of 0.14 and SSP concentrations in drain discharge varied from 88.4 to 80.9 with a mean value of 85.6. The Mg/Ca ratio in drain discharge varied from 5.00 to 0.13 with a mean value of 0.98 and the Cl/SO_4 ratio in drain discharge varied from 1.80 to 0.97 with a mean value of 0.63. In general, the maximum variations in EC, the SAR, and RSC values of drain water among the sampling stations were observed, particularly in the months of February and March. Drain discharge varied from 1.21 to 0.75 mm day^{-1}. The EC, SAR, Mg/Ca ratio, and SSP values are the major constraints on the majority of drain water samples as far as their irrigation feasibility is concerned. As a result, based on the salinity of the drain water, it is possible to conclude that these waters are unsuitable for irrigation.

Keywords*: Subsurface drainage system, Drain discharge, Drainage water quality, Irrigation water quality, Irrigation water shortage.*

ITAHAS/AB/2023/195

Role of certification in quality management of non-wood forest products

Priyadarshini K C[1], Hanumantha M[2], Gowri B Gowda[3] and Ganesha B H[1]

[1]Dept. of Silviculture and Agro-forestry, College of Forestry, Sirsi, UAS Dharwad

[2]Asst. Professor, Dept. of Forest Products and Utilization, College of Forestry, Sirsi, UAS Dharwad

[3]Dept. of Forest Resource management, College of Forestry, Sirsi, UAS Dharwad

The increasing concern surrounding the harvesting of non-timber forest products (NTFPs) in recent years reflects a growing demand. These NTFPs play a crucial role in supporting the livelihoods of community members in developing countries. One advantage of NTFP harvesting is that it has a relatively minor impact on the forest environment. However, there are differing opinions on sustainable harvesting methods and the feasibility of extracting NTFPs. In response to these concerns, certification has emerged as a new and widely used marketing tool. Its purpose is to promote responsible resource stewardship by ensuring proper labelling of consumer products, thereby fostering consumer trust regarding the sustainable and legal origin of the harvested produce. Forest certification is a voluntary process that involves an independent third party, known as the "certifier," assessing the quality of forest management and production against predetermined standards established by a public or private certification organization. Certification requires meeting three essential components: environmental appropriateness, social benefits, and economic viability. The Forest Stewardship Council (FSC) serves as a centralized decision-making body for setting standards and providing accreditation. Conversely, the Program for the Endorsement of Forest Certification (PEFC) functions as a system for mutual recognition between national certification systems. While almost two-thirds of the world's certified forests carry a PEFC certificate, the FSC accounts for 28%, with the remaining certified forests falling under national systems. In tropical regions, the majority of certified forests are FSC-certified.

Major certification schemes in India include the AYUSH, India Organic Certification, Chhattisgarh Certification Society, MP State Organic Certification Agency, Odisha State Seed and Organic Product Certification Agency, and Aditi Organic Certifications Pvt. Ltd. Certification of non-timber forest products faces challenges, including inadequate scientific knowledge about their life cycle,

population density, distribution, regeneration, and sustainable harvesting levels. Often, the usable part of the plant as an NTFP consists of regenerating plant propagules. Certification standards for NTFPs should incorporate specific aspects, such as harvesting and collection practices tailored to each type of NTFP. The certification process, with third-party verification, can address several gaps in NTFP management, including resource inventory and dynamics, regeneration status, sustainable harvesting and collection limits, protocols and standards for non-destructive harvesting, primary processing, storage of forest-derived products, and protocols for cultivation and good cultivation practices. It is crucial to emphasize that NTFP certification should adhere to ecological constraints and ensure social and economic benefits for local harvesters, processors, and native communities.

ITAHAS/AB/2023/196

Vegetative propagation techniques in *Cinnamomum* species

Hanumantha M[1] Chaitra K Muddi[2],. Niharika M[1], Ganesha B H and Roopa S patil[3]

[1]Asst. Professor, Dept. of Forest Products and Utilization, College of Forestry, Sirsi, UAS Dharwad

[2]Dept. of Forest Products and Utilization, College of Forestry, Sirsi, UAS Dharwad

[3]Assoc. Professor and Head, Krishi Vigyan Kendra, Sirsi, UAS Dharwad

Vegetative propagation is a process of multiplication of plants from vegetative parts other than seeds. There are different methods in vegetative propagation like cutting, layering, grafting, budding, micro-propagation and propagation through specialized plant parts. The success of vegetative propagation depends upon proper environment, the genetic gain components and the physiological status of propagating material. The genus *Cinnamomum* belongs to family Lauraceae and distributed in Asia and American tropics. Commercially important parts are bark, leaf, immature fruit and root from which essential oil is extracted which is having wider applications. *Cinnamomum* species can be propagated through seeds but practice of vegetative propagation helps to overcome problems associated with seed propagation.

Several works were done on vegetative propagation of *Cinnamomum* through cutting, layering and micro-propagation. Root induction is basic factor in success of vegetative propagation. Semi hardwood cuttings treated with IBA 7000 ppm during Septmber to December recorded the highest rooting per cent and epicormic shoots cuttings treated with IBA 5000 ppm during January to April season showed highest rooting per cent. Cuttings collected from 3rd-4th node and 5th-6th node showed the good rooting and sprouting with husk charcoal and cocopeat as a planting media. Early rooting, higher root length and established per cent can be observed in the month of May and higher rooting per cent observed in IBA 4000 ppm and 5000 ppm for Bangladesh region. In case of layering May to July season showed better results with IBA treatment at 4000 ppm concentration. *In-vitro* propagation of *Cinnamomum verum* using embryos and in-vitro axillary buds using MS medium supplemented with the treatment combination of highest BAP level (4 mg/l)

with lower level of NAA (0.1 mg/l) in the medium was given the highest root length.

ITAHAS/AB/2023/197

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.

Impact of Frontline Demonstration of Bio Fertilizers and Novel Organic Liquid Nutrients on Yield of Mango in the Dangs District of Gujarat

H. A. Prajapati[1] and J. B. Dobariya[2]
[1]Scientist (Horticulture), Krishi Vigan Kendra, Navsari Agricultural University, Waghai (Gujarat)
[2]Senior Scientist and Head, Krishi Vigan Kendra, NAU, Waghai (Gujarat)

To create awareness for use of bio fertilizers and the Novel organic liquid nutrients in mango var. Kesar, total 25 demonstrations in 5 hectare area were conducted during the year 2016-17 in subir blocks of the Dangs district. Use of bio fertilizer in soil and foliar spray of Novel organic liquid nutrients resulted in higher yield (58.00 q/ha) compared to check plots (56.20 q/ha) in mango crop. The yield increase compared to check field plots was 3.20 % in mango crop. The extension gap was recorded in mango was 1.8 q/ha. The benefit-cost ratio was recorded higher in the demonstrated plot of mango (2.87) compared to the check plot (2.68). Moreover, net return in mango was also recorded in demonstrated plot (Rs.75600/ha) compared to check plot (Rs. 70400/ha).

ITAHAS/AB/2023/199

Revolutionizing Agriculture: The Transformative Impact of ChatGPT in the Agricultural Sector

Harshitha H. C., Narayan Murigeppa Gunadal and Arun Shivayogi Honyal
Ph.D. Scholar, University of Agricultural Sciences, Dharwad 580005, Karnataka, India

The agricultural sector plays a crucial role in ensuring global food security and sustainable development. Technological advancements have the potential to revolutionize various aspects of agriculture, and one such advancement is the development of chatbots powered by AI, such as ChatGPT. Knowledge dissemination in the agricultural sector is vital for farmers to stay informed about the latest practices, innovations, and market trends. ChatGPT can serve as an interactive and accessible platform, providing farmers with real-time information and expert advice. By leveraging its vast knowledge base and natural language processing capabilities, ChatGPT can effectively answer queries, offer personalized recommendations, and guide farmers in making informed decisions regarding crop selection, pest management, fertilization, and more. In terms of decision-making support, ChatGPT can assist farmers in optimizing their operations. By analyzing various data sources, including weather patterns, soil conditions, and market demand, ChatGPT can generate insights that help farmers make precise decisions. For instance, the chatbot can suggest optimal planting times, irrigation schedules, and harvesting techniques based on local conditions and historical data. This personalized support can contribute to improved yields, reduced resource wastage, and enhanced overall productivity. Furthermore, ChatGPT can facilitate farm management by acting as a virtual assistant to farmers. The chatbot can streamline administrative tasks, such as recording farm inputs, monitoring inventory, and managing logistics. It can also provide real-time alerts and notifications, ensuring timely action in case of disease outbreaks, extreme weather events, or market fluctuations. By automating routine tasks and providing proactive assistance, ChatGPT enables farmers to focus on more strategic and value-added activities, leading to increased efficiency and profitability. However, it is essential to acknowledge potential challenges and limitations associated with ChatGPT implementation in the agricultural sector. Factors such as language barriers, internet connectivity, and accessibility of technology may pose obstacles, particularly in rural and developing regions. Privacy and data security concerns also need to be addressed to ensure farmers' trust and

adoption of chatbot technologies to harness their full potential in driving sustainable agricultural practices and improving the livelihoods of farmers worldwide.

Keywords: *ChatGPT, chatbots, knowledge dissemination, decision-making support, farm management.*

ITAHAS/AB/2023/200

Biomass Supply Chain Logistic Models for Economical and Sustainable Bioenergy Development

J. Neeraja[1], D. Maski[2], V. Palled[2], Sushilendra[2], and K. V. Prakash[2]

[1] Assistant Professor, School of Agricultural Sciences, Mallareddy University - Hyderabad, Telangana, India

[2]Associate Professor, College of Agricultural Engineering, University of Agricultural Sciences – Raichur, Karnataka, India

As the global population continues to grow rapidly, great pressure is being placed on availability of arable land, water, energy and biological resources to provide an adequate quantity of food while maintaining the integrity of ecosystem. India being an agriculturally dominant nation, about 32% of total gross crop residue is the surplus residue fraction available for energy generation. To derive energy from the surplus biomass, the quality feedstock has to be supplied from farm to bioenergy plant, which involves sequential operations such as, harvesting, baling, loading, storage and transportation, called as biomass supply chain. The objective of biomass logistics is to deliver a specified quantity and quality of feedstock to the bioenergy plant at a competitive price with minimum energy consumption and least carbondioxide emission. Hence to achieve this, an artificial intelligent based computerised modeling tool is necessary for analysing complex sequential operations interacting with crop and weather parameters. There are several models available and are broadly classified in to simulation and optimization models. These models also act as decision support system for optimizing complex biomass supply chain logistics and helping the emerging bioenergy industry as a viable and sustainable enterprise and thus making future India as energy independent nation.

Keywords*: biomass supply chain; simulation models; optimization models; decision support system; bioenergy plant.*

Evaluation of the effect of foliar nano nitrogen and zinc on chlorophyll (SPAD) and qualitative traits of green chilli in comparison with Urea and $ZnSO_4$

Jayanth Kanavi G B[1], Sunil C[2], Sarvajna S B[3] and Mallikarjuna H B[4]

[1]M. Sc. Scholar, Dept. of Agronomy, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

[2]Assistant professor and Farm superintendent, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

[3]Assistant professor, Dept. of Soil science, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

[4]Assistant professor, Dept. of Agricultural statistics Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

An experiment was carried out at AHRS, Bavikere, UAHS, Shivamogga to study the effect of foliar nano nitrogen and zinc application on the growth, yield and quality of green chilli. There were eight treatments which replicated three times using the RCBD design. Treatment combinations of foliar nano nitrogen and zinc and foliar urea and $ZnSO_4$ with different levels of RDN (75 %, 100 %, 125 %) were tested against control (100 % RDF). Among the treatments, application of RDN (125 %) and foliar nano N (0.4 %) and Zn (0.4 %) at 30 and 45 DAT registered significantly higher chlorophyll, oleoresin, ascorbic acid and TSS. T_3 reported significantly superior ascorbic acid content and oleoresin content to the tune of 14.94 per cent and 22.10 per cent over control.

Keywords: *Green chilli, Nano fertilizers, Chlorophyll, Ascorbic acid, Oleoresin.*

ITAHAS/AB/2023/202

Enhanced removal of crystal violet dye from wastewater using low-cost coconut shell powder as a potential adsorbent

Jyoti Chowdhry and Meenakshi Nandal
Department of Environmental Science, Maharishi Dayanand University, Rohtak (INDIA)

Crystal violet (CV) is a synthetic dye that is widely utilised in a variety of industrial sectors, including paper, textile and leather. However, due to its high toxicity and bioaccumulation potential, the discharge of wastewater containing crystal violet (CV) might constitute a severe threat to the environment. In this study, coconut shell powder (CSP) was investigated as a potential adsorbent for the removal of CV from aqueous solution. Adsorption experiments were performed in batch mode, and the effects of various operational parameters, such as initial dye concentration, adsorbent dosage, solution pH, and contact time, were studied to optimize the process. The results showed that the maximum removal capacity of CSP for CV was 92 percent at a pH of 7 and a dye concentration of 40 ppm. Overall, the results of this study suggest that CSP is a promising and cost-effective adsorbent for the removal of CV from wastewater.

Keywords: *Crystal violet, coconut shell, batch mode, adsorption.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/203

Role of agrochemicals in food security and production

Akash Saharan*[1] and Jyoti Indora[2]
[1,2]Department of Entomology, CCS Haryana Agricultural University, Hisar, Haryana

During the last decades, agrochemicals have enabled to more than duplicate food production and due to rapid growing human population, the situation needs to enhance the food production by the intensive use of pesticides and fertilizers. By the discovery of pesticides, these efforts are helps in increase the productivity by fighting the losses inflicted by insects, weeds, and plant pathogens but at the same time, pesticides concludes to be highly dangerous due to their excessive use and indiscriminate nature, contaminates with food and environment, causing pest resistance, pest resurgence, and pest outbreaks. On another side, the intensive use of crop agro-chemicals are open, by the adaptation of genetically engineered organisms, organic farming, change of dietary habits, development of food technologies with less toxic contaminants are ensure the success of food safety and nutritional security. Agricultural innovators should think about for agricultural production by a new vision with available resources to deliver economic growth and opportunity, improved food security and nutrition, and environmental sustainability. Hence, scientific research for new developments in food production and food safety, as well as for environmental protection, is a necessary part of this endeavor.

Keywords: *Food security, nutrition, agrochemicals, GMO's, sustainability, etc.*

ITAHAS/AB/2023/204

Positive Impact of Covid-19 on Agricultural Education

K. Karuna Sri[1], Elijah Ajay Kumar[1], Ruqsar Khanum[1], P. Sai Priyanka[2]
[1]University of Agricultural Sciences, Bengaluru, 560065
[2]Indian Agricultural Research Institute, New Delhi, 110001

The global educational systems have experienced significant disruptions due to the COVID-19 pandemic, results in the widespread closure of schools, colleges and universities. Amidst of COVID-19 pandemic numerous sectors worldwide have been adversely affected. However, it is essential to shift our focus towards finding solutions and embracing them positively in order to overcome the challenging situation. This work has been done with the intention of highlighting the positive impact on students and teachers. The purposive sampling has been carried out in order to study how the pandemic has affected the education sector in general and agricultural education in particular. The data was gathered from agricultural students enrolled in various state agricultural universities. Descriptive and tabular analysis was carried out. According to the results, the positive impact of COVID-19 on education was *i.e.,* The pandemic provided an enhanced opportunity for self-study and acquiring new computer skills. Students were able to access the teaching materials, e-content and relevant lecture videos resulting in a deeper understanding of the concept. They also experienced greater flexibility in time, pace and planning. As a result, students enthusiastically embraced new techniques and gained a profound appreciation for the vital role of Information and Communication Technology (ICT). The COVID-19 pandemic has propelled the relationship between education and technology to new heights. It remains undeniable that the new technologies are utilized effectively, they open up a plethora of possibilities for both teachers and students.

Keywords*: COVID-19, Agricultural Education.*

Role of Biotechnology and Nanotechnology in ensuring food security

***Pooja Kumari, Kanchan Kumari Gupta, and Mateti Gayithri**
1.*Ph.D Scholar, Department of Plant Breeding and Genetics, Assam Agricultural University, Jorhat
2.Ph.D Scholar, Department of Horticulture, Assam Agricultural University, Jorhat
3. Ph.D Scholar, Department of Plant Pathology, Assam Agricultural University, Jorhat

Sustainable agriculture is crucial for stimulating both developing and developed countries. To meet the rising need for food from a growing global population and to ensure environmental sustainability at the same time, agriculture needs modernization and innovation. By increasing the effectiveness of agricultural inputs and providing powerful solutions to agricultural problems for enhancing food security and production, nanotechnology has attracted more attention in the development of food safety and the protection of the environment. Nanotechnology has the potential to increase agricultural output through the use of effective pesticides and herbicides, the regulation of soil features, wastewater management, and disease identification. Enhanced food production with good market value, heightened nutritional and sensory properties, improved safety, and better antimicrobial protection are all advantages of industrial food processing. Additionally, the use of nanoparticles to extend the shelf life of products helps decrease post-farming losses. With new nanotools for quick disease diagnosis, nutrient absorption enhancement for plants, and other uses, nanotechnology has the potential to advance agriculture and the food sector. The significant interests of using nanotechnology in agriculture include specific applications like nano fertilizers and nano pesticides to trail products and nutrient levels to increase productivity without decontamination of soils, waters, and protection against several insect pests and microbial diseases. Nanotechnology is well-known to play a significant role in the effective management of phytopathogens, nutrient utilization, and controlled release of pesticides, and fertilizers. Modern agricultural practices have been found to be associated with the degradation of the environment, ecosystems, and land due to agricultural pollution. Smart nutrition delivery, chemical pollutants, bioseparation of proteins, quick monitoring of biological, and nutraceutical nanoencapsulation, solubilization, and distribution are examples of new themes approached by

nanotechnology and involved in food security that might be greatly improved. The incorporation of nanoscale agrochemicals such as nano-pesticides, nano-fertilizers, nanoformulations, and nanosensors in agriculture has revolutionized the traditional agro-practices making them more sustainable, ingenious, and environmentally efficient.

Keywords*: Nanotechnology, nanosensor, nano pesticides, decontamination, etc.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/206

Effect of severity of pruning and fruit retention on growth and maturity of custard apple

Jadhav KP, Panchbhai DM, Asha Bahadure and Temak SD

The present investigation entitled "Effect of severity of pruning and fruit retention on fruit yield and quality of custard apple" was carried out during 2019-19 and 2019-20 at Dhanaj (Khu), Tq- Karanja, Dist- Washim (MS). The experiment was laid out in Split Plot Design designed with four severity of pruning viz., P_{1-} No pruning (control), P_{2-} Light pruning: thickness of branch 3-5mm (Refill thickness), P_{3-} Medium pruning: thickness of branch 6-10mm (Pencil thickness) and P_{4-} Hard pruning: thickness of branch 11-15mm (Thumb thickness) and fruit thinning are T_{1-} no thinning (control), T_{2-} fruit retention up to 100 fruits per plant, T_{3-} fruit retention up to 80 fruits per plant, T_{4-} fruit retention up to 60 fruits per plant and T_{5-} fruit retention up to 40 fruits per plant. Light pruning shows the highest number of flowers per branch. However, maximum fruit set percentage and less stony fruit percentage was obtained in medium pruning. Early sprouting, maximum number of shoots emerged per branch, minimum days to flowering and minimum days to harvesting was found in unpruned plant. The early harvesting and less stone fruit were noticed in fruit retention up to 40 fruit per plant followed by fruit retention up to 60 fruit per plant. The fruit retention does not show any significant effect on growth parameters except days to harvesting.

ITAHAS/AB/2023/207

Post harvest processing and value addition of medicinal plants

A. Karthika[1*], G. Thanuja sivaram[2], K.M. Yuvaraj[3], G.Chandra Mohanreddy[4],& K. Swarajya lakshmi[5]

[1,2,3,4]Department of Plantation, Spices, Medicinal and Aromatic Crops

[5]Department of Postharvest Technology

Dr. Y.S.R. Horticultural University, Andhra Pradesh.

Medicinal plants hold immense potential for benefiting communities, especially those facing poverty and poor health conditions. The World Health Organization (WHO) states that approximately eighty percent of people residing in rural areas rely on ayurvedic and medicinal plants as their primary source of healthcare. Currently, consumers are increasingly inclined to purchase healthy and natural foods. The rapid genetic loss of medicinal plants necessitates the need for conservation of medicinal plants to ensure its availability for future generations. The variation in quality observed in herbal preparations can be attributed to the complexity involved in their production. Recent years, Good agricultural and collection/harvesting practices (GACHP) are essential for maintaining the safety and quality of medicinal plants and their products. GACHP involves implementing a set of guidelines and procedures to optimize the cultivation, collection, and harvesting of medicinal plants while minimizing the risk of contamination and ensuring the highest possible quality of the final products. To acquire an herbal drug of superior quality and effectiveness, it is necessary to store it under conditions that preserve the active ingredients. Furthermore, the processing technique employed should be optimized to maximize the recovery of phytochemicals. Therefore, proper post harvest management technologies should be developed for individual Medicinal plants. This includes cleaning, grading, washing, drying, peeling, grinding, extraction, packaging, storage, transportation etc. Such management is essential for getting maximum product yield from the medicinal plants.

Keywords: *Medicinal plants, Collection, Post-harvest, Processing, Phytochemicals.*

ITAHAS/AB/2023/208

Trends in Poultry meat consumption: Consumers' perspective

Kiranjot Kaur, Rajesh Kasrija and R K Sharma
Department of Veterinary and Animal Husbandry Extension Education,
Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana

Food is one of the very basic necessities of life. It must contain nutrients that are crucial for growth, repair and maintenance of body tissues. One of the essential nutrients of food is protein. According to a Indian Council of Medical Research -National Institute of Nutrition (2020) report total protein requirement for adult males and females is 54.0 g/ day and 46.0 g/day respectively. As per National Family Health Survey 5 (NFHS) report 2019-2021, Ministry of Health and family welfare, GOI, a huge population of India (83.4 per cent of men and 70.6 per cent of women in the 15-49 age group) in the country eat non-vegetarian food daily, weekly or occasionally. The present study was conducted to know about trend in consumption of Poultry meat. Sixty non vegetarian persons were purposely selected from District Ludhiana (Punjab) and were personally interviewed with the help of an interview schedule. Analysis of data revealed that Majority (66.67 %, n=40) were on the side of consumption of backyard poultry meat and (33.33 %, n=20) preferred meat from commercial poultry farm. The reasons for likeness towards backyard poultry meat was reported to be good flavor (n=36, 90 %), pigmentation (n=20, 50%), leanness (n=15, 37.5 %), rich source of protein (n=38, 95 %). Reasons for dislikeness of meat from commercial poultry farm included feeding of harmful chemicals such as antibiotics/hormones or drugs (n= 34, 85 %), chances of adulterated meat (n= 20, 50%) and chances of meat from diseased or dead poultry birds (n=18, 45 %). Reasons for likeness of meat from commercial poultry farm included easy availability (n=20, 100%) and low price (n=18, 90%). Reasons for dislikeness of meat from backyard poultry farm are high price and difficult availability (n=20, 100 %). The present study suggests that meat from backyard Poultry farming is gaining importance these days due to its high nutritive value. Also, backyard poultry farming can provide employment to small, marginal and landless farmers which includes women, unemployed youth and elder family members. This farming system require hardly any infrastructure and here eggs and meat can be produced with low investment, thereby it can help in uplifting the income of the farmer.

ITAHAS/AB/2023/209

Effect of Kyro Herbicide on Corn

Lakshmi Sri. K and Dr. Rajesh. P
RVS Agricultural college, Tamil Nadu, India

Lately, released pesticide named kyro, it was the first sludge pesticide on the request to combine the three active constituents like, acetochlor, topramezone and clopyralid into one mixture. It's a unique one to the request that will help control toughest weeds, including glyphosphate and ALS resistant weeds. With this, sludge growers are helpful for keeping their fields clean late into the season to attain optimum yield implicit- and help and alleviate weed resistance. It also gives some further benefits like, being a important post emergence weed control, it combines three effective modes of action for controlling more than 65 of the most delicate and resistant weeds. It can give extended residual control at advance use rates. It majorly controls the weeds like, waterhemp, Palmer amaranth, giant ragweed, marestail, barnyard lawn, fall panicum and woolly cupgrass and it's formulated with an reprised acetochlor for excellent crop safety. Also, the lower crop response helps to keep the crops healthy until crop for better yield potential. It can be applied to the crop up to 24 elevation altitudinous for their operation programs. It also can be used on traited and non traited sludge products, including seed and popcorn. It's compatible with a wide array of tank blend mates, including atrazine, glyphosphate, pesticides, germicides and micronutrients. This allows growers to completely customize their operations to their individual requirements.

Keywords*: weeds, contol, resistance, pesticides.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/210

Multiple Cropping for Raising Productivity and Farm Income of Small Farmers

Lalit kumar verma[1], Manish kumar sonkar[2] and Navdeep kumar[3]
[1]Department of Horticulture, Sam Higginbottom university of Agriculture Technology and Sciences (SHUATS), Naini Prayagraj (U.P.) India
[2]Department of Horticulture and Post Harvest Technology, Palli Siksha Bhavana, Visva Bharti University, Bolpur, West Bengal, India
[3]Department of Horticulture, SASRD, Nagaland University, Medziphema, India

Multiple cropping is an agriculture system long adopted by marginalized small holder farmers especially in hills and mountains. This practice was a meant to enhance farm productivity when farming area is limited. Here, in this paper, a brief review on the benefits of multiple cropping is presented focusing on the practices adopted by marginalized farmers, in general. In multiple cropping, it is generally argued that the practice favors an efficient utilization of resources like air, water, light, space, and nutrients by companion crops in both temporal and spatial dimensions due to their differential growth habits and seasonality. Multiple cropping could be one of the viable alternatives to cope uncertainties and changes, where food and nutritional uncertainty looming large. The ultimate outcome of multiple cropping could be visualized in adverse or harsh environment for increase agriculture production, livelihood and income. Various food products are obtained through multiple cropping. Land equivalent ratio (LER), relative yield total (RYT) and income equivalent ratio (IER) can be increased with mixed/intercropping systems. Multiple cropping helps in getting more than one crop simultaneously, so even if the selling price of one commodity is less, the other might compensate. In the tropics, smallholder farms, which produce over 60% of the food resources of developing nations from intercropping of cereals with many crops mostly legumes, had been the field of much investigation because of synergistic effects of diversifying food production and household cash incomes in these systems.

Keywords:-*LER, RYT, Farmer, Income, Cropping.*

ITAHAS/AB/2023/211

Impact of IPM in Vegetable Crops

Lalit kumar verma[1], Navdeep kumar[2], Manish kumar sonkar[3]

[1]Department of Horticulture, Sam Higginbottom university of Agriculture Technology and Sciences (SHUATS), Naini Prayagraj (U.P.) India

[2]Department of Horticulture, SASRD, Nagaland University, Medziphema, India

[3]Department of Horticulture and Post Harvest Technology, Palli Siksha Bhavana, Visva Bharti University, Bolpur, West Bengal, India

A reduction in the amount of active ingredients by weight (low-dosage pesticides replacing pesticides with a higher dosage) is not a strong indicator to measure the impact of Integrated Pest Management (IPM) programs because the toxicity of the pesticides to humans and the environment is not considered. Although, pesticide use frequency is a good indicator to measure the impact, it does not consider the qualitative aspect of the use of more toxic pesticides of low dosage. The field environmental impact quotient (FEIQ) developed at Cornell University, USA, considers the toxicological aspect of the pesticides used. A field study was conducted to evaluate the long-term impact on vegetable Integrated Pest Management-Farmer Field School (IPM-FFS) Program, implemented in the 2000s, in the sub-tropical Jammu region of the state of Jammu and Kashmir, India. A sample of 80 IPM-trained and 60 non-IPM farmers were selected for the study. Pesticide use by weight in the non-IPM villages was greater in the cases of cauliflower and eggplant by about 19 and 39%, respectively, but in the case of cabbage and okra it was less by 12 and 26%, compared to the IPM villages. The mean numbers of pesticide applications were lower in the IPM villages by 23, 22 and 40% on cauliflower, okra and eggplant, respectively. Overall, the IPM-trained farmers had reduced pesticide use (active ingredients), by weight by 10%, and by treatment frequency by 29% in vegetable crops. The FEIQ of pesticide use was higher in the IPM villages compared to the non-IPM villages, as the farmers trained under the IPM program applied more toxic pesticides.

Keywords:- *pesticide , Fields , IPM, Pest, impact.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/212

Doubling the Farmers' Income through Different Approaches in India

M Sekhar[1]* and R Vijaykumar[2]
1. Assistant Professor, CASAR, BEST IU
2. Dept. of Silviculture & Agroforestry, College of Forestry. Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj, U.P

Nearly 74.3% of India's population lives in 6.40 lakh villages, most of which rely on agriculture and animals for a living. Crop yield is severely hampered by unpredictable and variable rainfall, a lack of irrigation water, and loss of soil quality. A farming system model that includes crops, trees, and cattle is the greatest solution for combating climate change, recurring droughts, biodiversity loss, and land degradation caused by dry land agriculture. A biodiversity system meets the farmers' family's food, fodder, fuel, and fertiliser needs, offers agricultural employment, and improves soil health. Out of the 139 million Indian rural households, 60.03 million (43%) are livestock keepers, 29.08 million (20%) are fish keepers, 43.06 million (30%) are poultry keepers, and 9.73 million (7.3%) are involved in other activities (sericulture, fruit and vegetable production, and mushroom cultivation). Livestock has played a variety of roles in rural people's livelihoods, including providing money, employment, nourishment, crop assistance, and risk aversion in the event of crop failure. Landless men and women are increasingly dependent on goat keeping to supplement their income. Agriculture provides a living for more than half of the people. It is a challenging job to double farmers' revenue in such a short period of time. According to the literature, farmers' actual per capita farm income (from agriculture and allied activities) grew by 65% between 2004-05 and 2014-15. NSSO and CSO data between 2002-03 and 2015-16 indicated a 35% rise in farmers' real per capita income. The Prime Minister added that it is his aim to see farmers' income double by 2022, when India would celebrate 75 years of independence. It is obvious that farmers get a larger percentage of their revenue from agriculture (47%) than from other linked sectors (43%). As a result, it is determined that, with the assistance of several ways, namely, Along with agriculture, cattle production (4.3-11.9%), fishing, poultry, beekeeping, mushroom farming, sericulture, and other associated sectors would quadruple and boost farmers' income.

Keywords: *Agriculture, Livestock, Crop yield, Production, biodiversity.*

National Agriculture Market (e-NAM) in India: A Step Towards re-organizing Agricultural markets for enhancing farmers income

Machapathri Praneeth[1], Shaik N Meera[2] and H.K Awasthi[3]
[1]M.sc. (Ag.), Department of Agricultural Extension, IGKV, Raipur, Chhattisgarh
[2]Principal scientist, Indian Institute of Rice Research, Rajendranagar, Hyderabad
[3]Professor, Department of Agricultural Extension, IGKV, Raipur, Chhattisgarh

Agricultural marketing plays a pivotal role in promoting and sustaining agricultural production and productivity, leading to food security and inclusive growth of the country. The shift in focus from food production and productivity to farmer's income and welfare was essential. While increasing productivity is one way to increase farmer's income, it is even more important to ensure remunerative farm harvest prices and providing them with access to efficient and assured markets. The market is efficient when farmers earn more and consumers pay less. There are several challenges concerned in agricultural marketing like a slew of market-distorting laws and regulations, limited access to the market information, low farmers literacy level, infrastructure development, present of large number channels eats away the pockets of both farmers and consumers, postharvest issues and most importantly, establishing a competitive national market for food commodities.

A large-scale initiative was launched in 2016, when the Government of India started the electronic national agriculture market (e-NAM), which is a pan-India electronic trading platform which connects the existing APMC mandis to create a unified national market for agricultural commodities which promotes uniformity, streamlining of procedures across the integrated markets, removes information asymmetry between buyers and sellers and promotes real time price discovery, based on actual demand and supply, promotes transparency in auction process, and access to a nationwide market for the farmer, with prices commensurate with quality of his produce and online payment and availability of better quality produce and at more reasonable prices to the consumer. e-NAM confronts a number of obstacles, including legal, assaying, and storage infrastructure, unified trade licensing, one-point levy, quality, market participant capacity building, and harmonization of grades and standards, among others. The Indian government is taking the right steps in striving to bring all APMCs on board, but farmers-

producers would only be able to double their income if dealers and buyers from all over the country join in online trading on e-NAM platforms. The development of e-NAM for agricultural produce, with the tagline "One Nation, One Market," is a watershed moment in the agricultural marketing sector, helping to strengthen the sector and boost farmer income.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/214

Vitality of organic carbon in organic soil matter

Mandeep Kumar[1], Y. K. Singh[2] and Shravan Kumar Maurya [3]
[1,3]Ph.D. Research scholar, Department of Agronomy,
[2]Asst.Professor Department of Agronomy
Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (UP)

Just 2–10% of soil's bulk is made up of organic matter, although this component is essential to soils' ability to operate physically, chemically, and biologically. The carbon content of soil organic matter may be measured. Farmers have a stake in retaining and increasing soil organic carbon for individual fields because soil and yield typically improve when the soil organic carbon level increases. The agricultural sector has the potential to have a significant impact on the carbon cycle, frequently through the release of carbon. Organic matter supports soil structure, moisture availability and retention, pollutant degradation, greenhouse gas emissions, and soil buffering. It also supports nutrient turnover and cation exchange capacity. One of the most intricate natural substances is soil organic matter. In addition to the organic components found in unaltered plant and animal tissues, soil organic matter also includes live and dead microbial cells, chemicals made by microbes, and an infinite number of derivatives of these substances. Most of the naturally occurring organic chemicals are likely found in soil organic matter. Undoubtedly, certain soil organic matter constituents, particularly those involving inorganic-organic complexes, are unique to the soil environment. Increased tilth or soil structure is a result of more soil organic carbon, which increases physical stability. This lowers the danger of erosion and nutrient leaching while increasing soil aeration (the amount of oxygen in the soil) and water drainage and retention.

Keywords:*-Soil, Soil Organic Matter, Organic Carbon, Carbon cycle.*

ITAHAS/AB/2023/215

Recent Developments in Fermented Food for Health Benefits

Maneesh Kumar[1], Sajeel Ahamad[2], Chhail Bihari[3], Menaka M[4] and Ganesh Kumar Choupdar[5]

[1,4,5] Ph.D. Research Scholar, Division of Food Science and Postharvest Technology, ICAR- Indian Agricultural Research Institute, New Delhi

[2] Ph.D. Research Scholar, Department of Horticulture (Vegetable Science), Nagaland Central University, SASRD Medziphema, Nagaland, India

[3] Ph.D. Research Scholar, Department of Horticulture, G.B. Pant University of Agriculture & Technology Pant Nagar, U.S. Nagar, Uttarakhand, India

Fresh vegetables have a very short shelf life since these are subjected to physiological and rapid microbial spoilage and in some cases contamination by pathogens also. Processing or modification of raw foods by using food processing methods and techniques is needed to meet the challenges of food security and safety, nutrition demand and availability of food. Fermentation is one of the important methods of preservation of vegetables. It is one of the oldest means of food preservation and reduces the risk of food borne diseases and food spoilage. Sauerkraut is a traditional fermented vegetable product and is prepared by the fermenting salted cabbage by naturally occurring lactic acid bacteria. Reduction of the consumption of sodium salt (NaCl) is widely recommended for the prevention/treatment of cardiovascular diseases. The WHO has set a global target of reducing the population salt intake from the current level of approximately 10g daily to < 5g daily. The high sodium consumption and insufficient potassium intake can lead to severe hypertension and risk of cardiovascular disease, such as stroke and heart attack. Shalgam is a traditional lactic acid fermented beverage that is produced at industrial scale in Turkey and is well known throughout the country. The main ingredient of shalgam is black carrot (*Daucus carota* var. *L.*) and for this reason shalgam is characterized by a red colour, cloudy appearance and sour soft taste. It is similar to 'kangi', a beverage very popular in several parts of India. Kimchi a globally favored traditional Korean food, is manufactured through the fermentation lactic acid bacteria of cruciferous vegetable ingredients (e.g., Chinese cabbage and radish) with flavoring agents such as red pepper, garlic, and ginger.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/216

Studies on Plant Growth Promoting Rhizobacteria in Onion

Raut Mangesh Dattatray
and
Poman Yashraj Ashok

The onion (*Allium cepa*) is a common vegetable plant in the Alliaceae family, which being cultivated worldwide for vegetable purpose. The onion, commonly known as the bulb onion or common onion, is the genus *Allium's* most frequently farmed species.

The aim of the present study was to isolate plant growth promoting rhizobacteria (PGPR) from the rhizosphere soils of onion crop and to develop a protocol for efficient phosphate solubilizing and nitrogen fixing PGPR consortium in the form of liquid bio- formulation evaluate their effect on growth parameters and yield of onion.

In the present study, a total of 9 isolates were isolated from the rhizosphere soils of major onion growing district of Western Maharashtra *viz.* Ahmednagar, Nashik and Pune.

A total no. of 9 PGPR isolates was isolated. Out of 9 PGPR isolates, 6 isolates showed zone of phosphate solubilization while 3 showed nitrogen fixation ability. On the basis of screening of phosphate solubilizers, out of 9 isolates, 3 isolates were found more efficient in phosphate solubilization zone and phosphate solubilizing activity in Pikovaskaya's broth.

Based on the morphological, cultural, physiological and biochemical tests, the selected bacteria were identified at genus level as *Pseudomonas spp., Bacillus spp.* and *Azotobacter spp.* Out of the 9 isolates, 3 were to be found *Pseudomonas spp*., 3 were *Bacillus spp*. and 3 *Azotobacter spp.*

Isolate No. 2 isolated from MPKV. Rahuri location from Ahmednagar district found efficient on the basis of nitrogen fixing ability and Isolate No. 3 and Isolate No 4 were found efficient on the basis of phosphate solubilization activity. Theses efficient PGPRs were utilized for further study. Three efficient *Pseudomonas spp., Bacillus spp. and Azotobacter spp*. having the ability to highest phosphate solubilization and nitrogen fixation were selected to develop the consortium. Based on the compatibility of bacteria with bacteria the consortium of phosphate solubilizers and nitrogen fixation were designed. After preparation of consortium, the different bio-formulations such as liquid

based bio-formulations were evaluated for their potential in the field conditions.

A field experiment was conducted for evaluation the effect of Plant Growth Promoting Rhizobacteria (PGPR) efficient isolates with graded levels of P_2O_5 on onion at Post Graduate Farm, Department of Plant Pathology and Agril. Microbiology, Mahatma Phule Krishi Vidyapeeth, Rahuri during *rabi* season of 2020-21. There were significant differences were observed between various treatments due to the applications of consortium under graded levels of phosphorous on all growth attributing parameters *viz.,* Plant height, number of leaves, length of shoot and root, fresh and dry weight of shoot and root, fresh weight of bulb, bulb yield, microbial count of PGPR in soil, available and total N, P_2O_5, K_2O uptake parameters of onion crop as compared to the absolute control and the consortium alone.

The treatment T_4 -SI of *Pseudomonas*+ *Azotobacter* + *Bacillus* + 100% P_2O_5 recorded significantly maximum total fresh weight of shoot and root and total dry weight of shoot and root (34.88 g, 3.35 g) at harvesting which was statistically at par with T_3 treatment T_3 -SI of *Pseudomonas*+ *Azotobacter* + *Bacillus* + 75% P_2O_5 of total fresh weight of shoot and root and total dry weight of shoot and root (34.25 g, 3.17 g) and treatment T_5 -100% P_2O_5 without PGPR of fresh weight of shoot and root and total dry weight of shoot and root (33.35 g. , 2.95 g) at harvest, respectively.

The treatment T_4 -SI of *Pseudomonas*+ *Azotobacter* + *Bacillus* + 100% P_2O_5 recorded significantly maximum nitrogen uptake, phosphorus uptake and potassium uptake (167.75 $Kgha^{-1}$, 26.36 $Kgha^{-1}$, 129.71 $Kgha^{-1}$) which was statistically at par with treatment T_3 -SI of *Pseudomonas*+ *Azotobacter* + *Bacillus* + 75% P_2O_5 (165.03 $Kgha^{-1}$, 25.83 $Kgha^{-1}$, 126.30 $Kgha^{-1}$) and treatment T_5 -100% P_2O_5 without PGPR (162.75 $Kgha^{-1}$, 25.50 $Kgha^{-1}$, 123.02 $Kgha^{-1}$) at harvesting, respectively.

The treatment T_4 -SI of *Pseudomonas*+ *Azotobacter* + *Bacillus* + 100% P_2O_5 recorded significantly maximum yield of at harvesting 28.30 t/ha, which was statistically at par with treatment T_3 -SI of *Pseudomonas*+ *Azotobacter* + *Bacillus* + 75% P_2O_5 and treatment T_5 -100% P_2O_5 without PGPR. The treatment T_6 Absolute control (without PGPR) recorded minimum yield of onion *i.e.* 20.64 t/ha than other treatments at harvesting.

All the growth and yield parameter of onion influenced by the treatment T_4 (Seeding inoculation of PGPR *Pseudomonas fluorescence* +*Bacillus* +*Azotobacter* + 100% P_2O_5) which was significantly superior over rest of the treatments and was at par with treatment T_3 (Seeding inoculation of PGPR *Pseudomonas fluorescence*+ *Bacillus* +*Azotobacter* + 75 % P_2O_5) with respect of

their influence on all growth and yield attributing characters at 30, 60, 90 DAS and at harvest stage. The consortium of efficient strains of phosphate solubilizing (PGPR) could reduce 'P_2O_5' fertilizer application by 25% without any significant reduction in crop yield.

ITAHAS/AB/2023/217

Exploration of the efficacy of Beet Root Extract Based Natural Chromogenic Indicator to Ascertain the Proper Pasteurization of Milk rapidly

Parita A. Mangroliya*, Tanmay Hazra, Rohit G. Sindhav, Manishkumar P. Parmar, Kunal K. Ahuja

College of Dairy Science, Kamdhenu University, Amreli-365601, Gujarat, India

Pasteurization is one the most popular and important unit operation in dairy industry. Alkaline phosphatase (ALP) activity test (qualitative and quantitative) recommended as one of the best methods (marker) to ascertain the proper pasteurization of milk. For detection of ALP activity in milk to ascertain proper pasteurization either time consuming methodologies, trained man power or sophisticated instruments are required. Therefore, applications of these methods in-field testing conditions, especially in rural based dairy industries where trained manpower and sophisticated instruments are very rarely available. Also, synthetic dyes are reported for having carcinogenic effect; therefore, natural dye-based tests are in trend, as it is safe for use. Present study was aimed to develop a simple, quick and economical natural dye based chromogenic test protocol to ascertain the proper pasteurization in milk; based on the activity of Alkaline Phosphatase (ALP). The chromogenic dye was prepared from water extract of *Beet root.* Under selected assay conditions, the raw (un-pasteurized) milk turns to light orange whereas pasteurized milk remains bright pink in colour; which can be visualized by the naked eyes within two minutes. The method was validated by testing its accuracy, limit of detection. The assay has a sensitivity of >0.3 units/L (ALP activity). The efficacy of this rapid test was also checked using Front-face Fluorescence Spectrophotometer (excitement and emission mode) along with Principal Component Analysis (PCA). This rapid chromogenic test is extremely useful to ascertain the proper pasteurization of milk in two minutes without requirement of any sophisticated instrument, hence, can be adopted in rural based dairy centre.

Keywords- *Alkaline Phosphatase, Beet root, Chromogenic dye, Fluorescence Spectroscopy, Milk, Pasteurization, PCA.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/218

Specific strategies for Doubling of farmers' income

Bharath kumar[1] and Pooja srivastav[2]
College of Agriculture (PJTSAU), Hyd-30, School of Agriculture- SR University

Nearly 75% population of India are mostly dependent upon Agriculture and livestock for their livelihood. Crops productivity is largely restricted by uncertain and erratic rainfall, scarcity of water for irrigation and deterioration of soil-health. As a part of 75 years of its independence Government of India aimed to double the farmers' income by 2022-23 as one of nine distinct pillars aiming farmers' welfare. Dr M S Swaminathan was also on opinion that the net income of farmers' can be doubled because of the prevailing large gap between potential and actual yield per ha and income. Approximately 80% of the low-income marginal farmers are concentrated in eastern (58%) and western (21%) regions due to several factors, such as under-investment in agricultural research, markets and roads infrastructure, under-development of institutions like credit, extension, insurance etc. hence marginal farmers, of these regions should be at the forefront of the income enhancing strategy which could be possible through the redesign of interventions of strategies of bringing green revolution in eastern India (BGREI) associated with higher income. Recently Telangana, Tripura and Mizoram's achievement was be close to the target. Following specific strategies would only be a solution for achieving Doubling of farmers income viz., Diversification of Agriculture, Integrated farming system, information and communication technology (ICT) for yield improvement, National Agriculture Market (e-NAM), Increase in cropping intensity, Promotion of farmers' producer organizations, Agripreneurship development, modification of present model of Production, Processing and Marketing (PPM) at farmer's level to the Procurement, Processing, Marketing and Export (PPME) resulting in overall increase in total output and better price realization in market, reduction in production costs, efficient post-harvest management, and value addition, risk coping through various approaches like crop insurance, govt. schemes would also help indemnify loss of income. All these when worked out together will not only doubles the income of farmers but also provides sense of income security through supplementary activities.

ITAHAS/AB/2023/219

Role of Cotton Cultivators in Value Chain of Cotton

Modi Ragini*, Rajeshwari N[1] and Surekha Sankanagoudar[2]

*Ph.D. Scholar, [1]Professor & Head, Dept. of Extension & Communication Management, CCSc, UAS, Dharwad, Karnataka - 05

[2]Programme Officer & Head, Krishi Community Radio Station, UAS, Dharwad, Karnataka - 05

Cotton cultivators play a crucial role in the value chain of cotton production. They are the most responsible stakeholders for cultivating and growing cotton plants. They prepare the land, select appropriate seed varieties and sow the seeds. They manage the crops by applying fertilizers, pesticides and water as needed, while ensuring optimal conditions for growth. Cotton farmers play a key role in crop management, those monitor the progress of the cotton plants throughout the growing season. They assess pest and disease management requirements and take appropriate measures to protect the crop by implementing integrated pest management strategies, using crop rotation techniques and employing environmentally sustainable farming practices. At the time of harvesting, when the cotton plants reach maturity, farmers harvest the cotton bolls. Depending on the scale of the operation, they may use manual labor or mechanical equipment like cotton pickers or strippers to gather the cotton fibers. This step requires skill and attention to ensure the quality of the harvested cotton.

After harvesting, cotton fibers are separated from the seeds through a process called ginning, where the cotton fibers are cleaned, dried, and processed. Later farmers market their cotton to various buyers, such as cotton merchants, textile mills or cooperatives. The cultivators are also responsible for maintaining the highest and good quality of cotton throughout the production process, where the cotton meets the required fiber length, strength, color, and cleanliness standards as the high quality cotton fetches better prices in the market. Today, many cotton farmers are adopting sustainable farming practices to minimize environmental impact and promote long-term sustainability. This includes reducing pesticide and fertilizer usage, implementing water conservation techniques, practicing soil health management, and exploring organic or regenerative farming methods.

Overall, cotton farmers are essential stakeholders in the cotton value chain, starting from cultivation to marketing. Their efforts and expertise

directly impact the quality, quantity, and sustainability of cotton production, ensuring a steady supply of this versatile fiber for the textile industry.

Keywords*: Cotton Cultivators, Cotton Value Chain, Cotton cultivation, Cotton crop management practices, Sustainable agriculture.*

ITAHAS/AB/2023/220

Unveiling the Genetic Basis of Seed Zinc and Iron content in Chickpea: A Computational Quest for Candidate Genes

Mounika Reddy Macha[1*], Himabindu Kudapa[2], Susmita Dey[1]

[1] School of Agricultural Sciences, Malla Reddy University, Hyderabad, Telangana, India

[2] International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, Telangana, India

Zinc (Zn) and Iron (Fe) are the essential components of the human diet. Inadequate intake of Zn and Fe leads to micronutrient deficiency, which develops symptoms like stunted growth, impaired cognitive and physical development, reduced immunity and anemia. Chickpea (*Cicer arietinum* L.) is a vital legume crop with high nutritional quality and contains several macro and micronutrients including high Zn and Fe concentrations. These micronutrients, Zn and Fe are critical for resolving micronutrient deficiencies and promoting human health. The aim of this study is the *In-silico* identification of candidate genes associated with Zn and Fe content in chickpea seeds. In the present investigation, whole genome re-sequencing data is being used to detect genetic variants and putative candidate genes linked with seed Zn and Fe content. The resequencing data is aligned to the chickpea reference genome using computational tools, to discover the genetic variations related to Zn and Fe concentration. Once potential candidate genes have been discovered, their functional roles are being investigated further utilizing an array of computational tools. Pathway enrichment analysis can offer information about the biological processes and pathways in which the candidate genes are involved. Simultaneously, orthologous genes in model organisms with well-characterized Zn and Fe metabolism can be found using a comparative genomics approach. These potential candidate genes could be useful targets for future research and breeding efforts aimed at developing chickpea varieties with improved Zn and Fe content. Furthermore, the use of genetic markers obtained from these candidate genes can aid in marker-assisted selection in chickpea breeding programmes, resulting in more efficient and targeted trait improvement. These findings may aid in the production of nutritionally better chickpea cultivars, thereby addressing global nutritional security and human health concerns.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
Keywords: *Candidate genes, Chickpea, Iron and Zinc, Marker-assisted selection.*

ITAHAS/AB/2023/221

Unveiling the Effects: *Phytophthora* Infection Reshapes the Rhizospheric Microbial Community in Khasi Mandarin

Mridupol Handique[1]*, Popy Bora[2], Sukanya Gogoi[2]
[1]Dept. of Plant Pathology, Assam Agricultural University, Jorhat, Assam, India
[2]AAU-AARI, Titabar, Jorhat, Assam, India

Phytophthora gummosis, foot rot, and root rot pose significant challenges to the global citrus industry. Despite numerous studies demonstrating the ability of plants to modify their microbial composition in response to pathogen invasion, little is known about the *Phytophthora*-microbiome interaction. This study investigated the microbial diversity and community structure in the rhizosphere of healthy and *Phytophthora*-infected Khasi mandarin plants. *Phytophthora*-infected orchards of Khasi mandarin in Northeast India were surveyed, and the isolated pathogen was confirmed as *P. nicotianae* through morpho-cultural and molecular characterization and pathogenicity testing. Culturable microbe analysis revealed the prevalence of *Fusarium* spp. in the diseased rhizosphere, while *Trichoderma* spp. was detected in the healthy rhizosphere. Metagenomic study further revealed that the rhizosphere of *Phytophthora*-infected plants were dominated by species such as *Bacteroidia* spp., *Patescibacteria* spp., and *Pythium* spp., while the healthy khasi mandarin rhizosphere had a more diverse community such as *Trichoderma*, *Penicillium*, *Linnemannia*, *Mortierella*, *Talaromyces*, *Saitozyma*, *Bacteroidetes*, *Pseudomonas*, *Cytophagia*, *Cyanobacteria*, *Bacteroidia*, *Sphingobacteriia*, *Burkholderia*, *Bacillus*, and *Bradyrhizobium*. Our study highlights that the presence of *Phytophthora* spp. in the rhizosphere can lead to alterations in microbial community structure, with potential implications for plant health and productivity and provide insights for the development of effective management strategies against *Phytophthora* gummosis disease in Khasi mandarin plants.

Keywords: *Phytophthora gummosis disease, Pathogenicity, Microbial diversity, Metagenomics, ITS1 and ITS4 universal primers, Bacillus spp., Pseudomonas spp., Penicillium spp., Management strategies.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/222

Processing and Value Addition of Dragon Fruit

[1]Archana V. Mahida, [2]Rama Krishna. K, [3]Pravin B. Manjare and [4]Chithra M.
[1&4] Ph.D. Scholars, Department of Horticulture, School of Life Sciences, Central University of Tamil Nadu, Thiruvarur
[2] Assistant Professor, Department of Horticulture, School of Life Sciences, Central University of Tamil Nadu, Thiruvarur
[3] Ph.D Scholar, Department of Fruit Science, Vasantrao Naik Marathwada Krishi Vidhyapeeth, Parbhani (M.S.)

Dragon fruit, also known as 'Pitaya', 'Kamalam', is a tropical fruit with a unique flavour and vibrant appearance. It is gaining popularity across the globe. Dragon Fruit is a perennial herbaceous climbing cactus. In India, the Kamalam fruit is grown in Karnataka, Kerala, Tamil Nadu, Maharashtra, Gujarat, Chhattisgarh, Odisha, West Bengal, Andhra Pradesh, Andaman & Nicobar Islands, Mizoram, and Nagaland. The tasty and wholesome exotic fruit known as dragon fruit is grown across the dry regions of the planet, particularly in Asian countries. Beautifully shaped and colourful fruits are reviving and have a delicious flavour, carotene, calcium, fibre, vitamin B, vitamin C, and phosphorus are all important nutritional ingredients that are present in large proportions in dragon fruit It has significant therapeutic effects and is advantageous for enterprises that add value through processing. Because it is perishable nature, dragon fruit needs special attention during all stages of production, including growing, harvesting, handling, storage, processing, and transportation before being distributed in the market. Fruit should only be picked when it has finished developing and attained physiological maturity. A variety of processing and value-adding techniques are needed for dragon fruit in order to convert the raw fruit into a variety of products with a longer shelf life and higher market value. Dragon fruit are good for making jam and jelly as it contain 0.20 to 1.04% pectin. Providing consumers with wholesome, secure, nourishing, and palatable food all year long is the primary goal of dragon fruit processing. It can be made into juice, jam, RTS, beverages, nectar, squash, and red vine, among other things. In addition to wine, it is used to make commercial items including preserves, ice cream, sherbet syrup, yoghurt, candy, pastries, spread, and ketchup, as well as fruit juice.

Keywords*: Jam, Jelly, Transportation, Tropical Fruit, Processing, Maturity.*

ITAHAS/AB/2023/223

An examination of the relationship between physical activity and the prevalence and incidence of overweight among adults

[1]Harichandana Ponnapalli

[1]Ph.D Scholar, Department of Food Science and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad

A medical condition or illness not brought on by infectious organisms or not contagious is called a non-communicable disease (NCD). Seventy per cent of fatalities globally are caused by NCDs, which include chronic respiratory diseases, cancer, diabetes, cardiovascular diseases and other conditions (WHO, 2011). In accordance with the Global Burden of Disease 2016 report, ischemic heart disease was the main cause of death for nearly six million non-communicable disease (NCD) deaths in India in 2016. Sedentary behaviour, or physical inactivity, is one of the main independently modifiable risk factors for chronic diseases and causes obesity. Regular physical activity is an essential lifestyle habit for maintaining one's health. As a result, it can effectively lower the likelihood of being overweight or obese. The results revealed that 10.0% of the subjects were overweight, 10.0% were obese, and 75.0% were normal. The findings showed that men spent 2940 minutes (49h) engaging in vigorous activities at work, while women were not engaged in these activities. Males performed more moderate activity overall than females at work, during the recreational time and while travelling (walking). Thus, physical activity is essential to reduce the risk of cardiovascular diseases. The results of the study demonstrated that unbroken time spent engaging in moderate and vigorous activities is necessary to lower the risk of overweight, obesity, and non-communicable diseases. Because they were more concentrated, vigorous activities may have had a greater positive impact than moderate ones, but it is easier to increase the amount of moderate activities than vigorous ones. Recreational physical activities require more consideration and time as occupations become more sedentary.

Keywords: *Physical activity, obesity, overweight, lifestyle disorders.*

Effect of *Glomus fasciculatum* and plant growth promoting rhizobacteria on growth nutrient uptake and yield of maize (Zea mays L.)

Munde B. N.[1], Ukey P. V.[2], Bachkar D. A.[3] and A. M. Navale[4]

[1]Ph. D Scholar, Dept. of Plant Pathology and Agril. Microbiology, Mahatma Phule Krishi Vidyapeeth Rahuri

[2]Ph. D Scholar, Dept. of Plant Pathology and Agril. Microbiology, Mahatma Phule Krishi Vidyapeeth Rahuri

[3]Ph. D Scholar, Dept. of Plant Pathology and Agril. Microbiology, Mahatma Phule Krishi Vidyapeeth Rahuri

[4]Head, Dept. of Plant Pathology and Agril. Microbiology, Mahatma Phule Krishi Vidyapeeth Rahuri

Laboratory studies were conducted at the Laboratory of Division of Plant Pathology and Agricultural Microbiology, College of Agriculture, Kolhapur for isolation and characterization of native *Glomus fasciculatum* and *Bacillus megaterium.* Moreover, a field experiment was conducted at the Instructional Farm of Division of Plant Pathology and Agricultural Microbiology, College of Agriculture, Kolhapur during *rabi*, 2015-16. In this experiment, *Bacillus megaterium* isolate Bm4, which was found efficient under *in vitro* study was evaluated singly and in combination with *Glomus fasciculatum* and *Pseudomonas fluorescens* for promoting growth, nutrient uptake and grain yield of maize.

Spores of *Glomus fasciculatum* fungi were isolated from the rhizospheric soil samples and based on the taxanomic key of Gerdemann and Trappe (1974), the spores were identified as of *Glomus fasciculatum*.

A total of six isolates of *Bacillus megaterium* were obtained from the rhizospheric soil samples. These 6 isolates were maintained on nutrient agar slants and studied to select an efficient strain. Among all the isolates of *Bacillus megaterium*, the isolate Bm4 was found most efficient in solubilizing phosphate, potash and zinc, both qualitatively and quantitatively. Isolate Bm4, which was found most efficient in *in vitro* study, was identified as *Bacillus megaterium* on the basis of morphological, cultural and biochemical characteristics as stated in Bergey's Manual of Systematic Bacteriology (Garrity, 2001). This isolate was used in the further field study conducted to appraise the effect of *Glomus fasciculatum* and plant growth promoting

rhizobacteria *viz., Pseudomonas fluorescens* and *Bacillus megaterium* on growth, nutrient uptake and yield of maize.

Results regarding growth, yield and yield contributing parameters of maize, as influenced by inoculation with *Glomus fasciculatum* and plant growth promoting rhizobacteria *viz., Pseudomonas fluorescens* and *Bacillus megaterium* indicated that the plots inoculated with *Glomus fasciculatum* + *Pseudomonas fluorescens* + *Bacillus megaterium* recorded significantly highest germination (95.33%), tallest maize plants (mean plant height of 54.07 cm, 128.29 cm and 177.74 cm at 30 and 60 days after sowing and, at harvesting of the crop, respectively), highest dry matter production (187.16 q ha^{-1}), highest number of cobs $plant^{-1}$ (1.93), highest weight of grain cob^{-1} (168.60 g), highest length and girth of cob (21.89 cm and 16.79 cm, respectively), highest weight of cob (226.96 g), highest grain yield (90.41 q ha^{-1}) and, highest uptake of nitrogen (168.44 kg ha^{-1}), phosphorus (39.43 kg ha^{-1}) and potash (118.90 kg ha^{-1}). Results of the present investigation pertaining to per cent root colonization by *Glomus fasciculatum* unveiled significantly highest root colonization to the tune of 96.17% in the plants inoculated with *Glomus fasciculatum* + *Pseudomonas fluorescens* + *Bacillus megaterium*. Non mycorrhizal treatments showed lesser root colonization.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/225

An Overview of Feeding Practices Followed by Dairy Farmers of Punjab

Muskaan[1], Rajesh Kasrija[2] and R K Sharma[3]

[1]M.V.Sc. scholar, Department of Veterinary and Animal Husbandry Extension Education, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana (Punjab)

[2]Associate Professor, Department of Veterinary and Animal Husbandry Extension Education, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana (Punjab)

[3]Prof-cum-Head Department of Veterinary and Animal Husbandry Extension Education, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana (Punjab)

Dairy sector is most vital component of livestock sector contributing about 5 per cent to national economy and it directly provides employment to eight crore farmers. The livestock sector grew at a CAGR of 7.9 per cent during 2014-15 to 2020- 21 (Economic survey 2022-2023). India is the top milk-producing country in the world, producing 221.06 million tonnes of milk annually during the year 2021-22. The Punjab state contributing about 6.37 per cent of total milk production in country and with highest per capita availability of milk (1271 gram/day). However, the milk production should be expanded in order to meet the rising demand for milk. Approximate 60- 70 per cent of total expenditure in dairy farming is on feed. The present study was conducted on randomly selected 50 dairy farmers from Punjab, who were personally interviewed at various Kissan melas, Pashu Palan melas, Trainings, KVKs, seminars, awareness camps, regional centres of GADVASU and at their door step. They were subjected to pretested semi- structured interview schedule to study about overview of feeding practices. Analysis of data revealed that 58 per cent and 42 percent uses of dairy farmers prefer self-made concentrate feed and branded feed respectively. A large chunk of farmers (48 per cent) follows different feeding practices for different age and stage of production i.e different feeding practices for calves, heifer, lactating animal and during gestation. Silage feeding and Hay feeding is being adopted by only 48 percent and 12 per cent dairy farmers respectively. Only 36 per cent dairy farmers had any formal training related to dairy farming. Majority of farmers (62 per cent) faced problem in feeding due to lack of knowledge regarding adequate nutrition and feeding practices. More than 50 percent farmers complained about poor credit support, high cost of feed ingredients

and high cost of production of per litre of milk and low market price of milk. The present study suggests that in order to ensure the production of high-quality milk and the well-being of dairy livestock, it is crucial to provide trainings and credit support to dairy farmers related to adequate feeding practices.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/226

Effect of Aloe vera powder (*Aloe barbadensis*) on carcass characteristics of Satpuda poultry

N. B. Bhargande*, D. K. Deokar and G. S. Hingonekar

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-ventilated 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 carcass characteristics data indicated non-significant differences among all treatments regarding dressing percentage, weight of heart, liver and gizzard and also cut up parts percentage like thigh percentage, drumstick percentage, breast percentage, neck percentage and wings percentage.

***Keywords**: Satpuda, Aloe vera powder, carcass characteristics.*

ITAHAS/AB/2023/227

To reduce the wide C: N ratio in sorghum cultivated field by the application of *lentinus sajor caju*

K. Nayagan[1*], S.P. Subashvalavan[2], V.Santhosh[3] and Uma Subramanian[4]

[1*, 2&3]UG Student, JSA College of Agriculture and Technology, Aavatti - 606 108

[4]Assistant Professor - Agronomy, Department of Crop Management, JSA College of Agriculture and Technology, Aavatti - 606 108

Sorghum bicolor is called as great millet, Indian millet, milo, durra, or shallu, cereal grain plant of the grass family (poaceae). The plant originated in Africa, where a major food crop, including grain sorghums, is used for food; grass sorghum and broomcorn, used in making brooms and brushes. Sorghum is considered as an important fodder crop. It is highly influence in lactation capacity of cattle. Sorghum is grown well in drought condition so it is also called as camel crop. It reaches up to a height of 6-8 feet approximately. Sorghum crop has the following effects such as sorghum poisoning and sorghum effect. In former it is affected in the young stage of the plant because of its high HCN (or) Dhurin (or) prussic acid. If the young stage of the crop is feed to the cattle it leads to death of the cattle. In latter the stubbles of sorghum takes a long time to decompose due to wide C:N ratio hence, during the process of decomposition soil nitrogen gets blocked or temporarily immobilized, affecting the growth of succeeding crop by showing early nitrogen deficiency symptoms due to wide C:N ratio of sorghum residue. To reduce sorghum effect 25% more nitrogen is applied at the time of first fertilizer dose for the succeeding crop. To overcome this sorghum effect we can use *lentinus sajor caju*. It is a type of mushroom which is popularly used for decomposition process. The spawn is directly applied to the field after the harvest of sorghum and pinning of *lentinus sajor caju* is occurred during 15 days and then the decomposition of the sorghum stubbles will be enhance. Hence the decomposition is faster it leads to narrow C: N ratio.

Keywords: *C: N ratio, HCN, Indian millet, Oyster mushroom, Decomposition faster.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/228

Wheat irrigation approaches to optimising water productivity under drip irrigation in places with limited water resources

Neha[1, 2 *], Rajpal Meena[1] and Koushal Kishore Bijarniya[1,2]
[1]ICAR-Indian Institute of Wheat and Barley Research, Karnal, India-132001
[2]Department of Agronomy, CCS Haryana Agriculture University, Hisar, India-125004

Wheat is India's and the world's second most significant food crop. One of the greatest challenges confronting wheat-growing countries is the rapid depletion of water supplies. The purpose of this study was to see if using less irrigation water will preserve the grain production of the wheat genotypes. The intensive production of irrigated wheat on 30 million acres of land in India is primarily responsible for the loss of groundwater supplies. These need immediate technological interventions to boost wheat water productivity in order to sustain farmer profitability. During 2021-22, 10 genetically varied wheat genotypes were tested for high water productivity (WP) at low soil moisture levels at 60% Cumulative Pan Evaporation (CPE). The restricted irrigation treatments were implemented using a drip irrigation system to ensure precise delivery of the estimated amount of water to the root zone. Saving 20 and 40% water fewer than 80% and 60% CPE treatments, respectively, saves 20% of the farmer's water cost spent on irrigating the wheat crop, which is reflected as higher remuneration in the farm. WP was found to be greater under deficit irrigation at 60% CPE compared to 80% and 100% CPE. This was owing to a less proportionate fall in yield under water stress at 60% CPE, and the observation may be justified by the fact that excess irrigation water hinders plant growth and, as a result, decreases grain yield. The noted high WUE genotype could be a valuable resource for researchers worldwide looking to develop water-efficient cultivars with high yield.

Key words: *Water Productivity, Genotypes, Drip Irrigation, Cumulative Pan Evaporation*.

ITAHAS/AB/2023/229

Prevalence of Corynespora leaf spot disease of cotton under South Gujarat of India

Nirva Patel[1], Prashant B. Sandipan[2] and Nishi Saini[3]

[1]Department of Plant Pathology, N. M. College of Agriculture, Navsari Agricultural University (NAU), Navsari, Gujarat, India

[2] Main Cotton Research Station (MCRS), Navsari Agricultural University (NAU), Surat, Gujarat, India

[3]Department of Genetics and Plant Breeding, Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur, Rajasthan, India

Cotton is one of the most important economic products of the group of fibers due to volume and value of production. Its cultivation is also of great social importance, due to the number of jobs generated directly or indirectly. Cotton is an important fiber yielding crop of global importance, which is grown in tropical and subtropical regions of more than 80 countries of the world. Cotton is a premier cash crop of our country and belongs to the family Malvaceae. It is one of the most ancient and important commercial crops next only to food grains and is the principal raw material for flourishing the textile industry. It provides employment and sustenance to a population of nearly 42 million people, who are involved directly or indirectly in cotton production, processing, textiles, related activities and others. In this experiment, prevalence and incidence was recorded in the cotton growing regions of Surat, Bharuch and Narmada districts of South Gujarat in the year 2021 to examine the presence of the *Corynespora cassiicola* pathogen on cotton plants and to record the observations on Per cent Disease Incidence (PDI). The maximum per cent disease intensity was found in the Surat district, while lowest disease intensity of *C. cassiicola* was found in the Bharuch district. Maximum disease intensity of 0.00-26.50 per cent was observed in LRA 5166 followed by G. Cot. Hy. 12 BG II with 0.00-8.50 PDI, G. Cot. Hy. 8 BG II with 0.00-6.50 PDI and G. Cot. Hy. 10 BG II with 0.00-5.50 PDI at Main Cotton Research Station (MCRS) of Choryasi taluka of Surat.

Keywords: *Cotton, Gossypium, Prevalence, Incidence, Corynespora, Village, District, Intensity, Diseases.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/230

Role of temperature on morphology and cultural characteristics of Corynespora pathogen of cotton under South Gujarat of India

Nirva Patel[1], Prashant B. Sandipan[2] and Nishi Saini[3]
[1]Department of Plant Pathology, N. M. College of Agriculture, Navsari Agricultural University (NAU), Navsari, Gujarat, India
[2] Main Cotton Research Station (MCRS), Navsari Agricultural University (NAU), Surat, Gujarat, India
[3]Department of Genetics and Plant Breeding, Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur, Rajasthan, India

Cotton (*Gossypium hirsutum* L.) is one of the most important fiber crops playing a key role in the economic and social scenario of the globe. India is one of the major cotton growing countries in the world. India ranks first in area and second in the total production of cotton in the world. Cotton is grown worldwide for its natural fiber and oil. As cotton seed contains 30 per cent starch, 25 percent oil and 16.20 per cent protein. Cotton is grown worldwide for its natural fiber and oil. Cotton seed contains 30 per cent starch, 25 percent oil and 16.20 per cent protein. It is also being used in the manufacture of medicinal supplies, tarpaulin, cordage and belting. The cotton hulls serve as roughage for livestock and the fuzz (short seed hair) is used in the manufacture of papers, plastics, carpets, rayon, explosives and cotton wools *etc.* Looking to the overall situation, it is felt necessary further to investigate its potential in terms of morphology and cultural characteristics. In this experiment, effect of different temperature on morphological and cultural characteristics of the *Corynespora cassiicola* pathogen was studied. Result showed that at 30°C temperature, there was the maximum dry mycelium weight (60.33mg) and abundant (++++) sporulation was noticed. The size of conidia was maximum at 30°C (126.00 × 8.30µm) followed by 25°C (118.23 × 7.82µm) was recorded. The cultural studies of *C. cassiicola* was made by growing single spore cultures on PDA medium at various temperatures *in vitro* yielded the largest colony diameter (90.00mm) at 30°C temperature.

Keywords: *Cotton, Gossypium, Temperature, Morphology, Cultural, Pathogen, Disease.*

ITAHAS/AB/2023/231

Characterization of different brinjal (*Solanum melongena* L.) genotypes under foothills condition of Nagaland

Oinam Bidyalaxmi Devi[1], Dr. Pranabjyoti Sarma[2], Vadde Mounika[3], Talamaria Yeswanth Mahidar Gowd[4]

[134]Ph.D. scholar, [2]Professor, CAU College of Horticulture and Forestry, Pasighat, Arunachal Pradesh

A field experiment was conducted to evaluate the performance of brinjal genotypes under foothill condition of Nagaland. Eighteen genotypes of brinjal *viz.* 2016/ BRRVAR-2, 2016/ BRRVAR-3, 2016/ BRRVAR-4, 2016/ BRRVAR-5, 2016/ BRRVAR-6, 2016/ BRRVAR-7, 2016/ BRRVAR-8, 2016/ BRRVAR- 9, 2016/ BRLVAR-1, BRLVAR-2, 2016/ BRLVAR-3, 2016/ BRLVAR-4, 2016/ BRLVAR-6, 2016/ BRLVAR-7, 2016/ BRLVAR-8, 2016/ BRLVAR-9, Manipur Local, Azad- Brinjal were evaluated at the experimental farm of SASRD, Medziphema campus, Nagaland University during Feb- July 2017 with three replication in Randomized Block Design (RBD). Results revealed that genotype 2016/ BRLVAR- 8 gave maximum plant height (101.63 cm). Genotype 2016/ BRLVAR- 4 exhibited maximum number of leaves per plant (85.37), number of branches per plant (24.77), highest LAI was observed in 2016/ BRLVAR- 6 (3.34), number of fruit per plant (52.20), yield per plant (2690.67 g), yield per plot (13.49 kg) and projected yield per ha. (416.35 q) but fruit length were maximum in genotype 2016/ BRLVAR- 3 (17.01 cm). Genotype 2016/ BRLVAR- 6 recorded maximum leaf area index (3.34), maximum diameter (7.89 cm), fresh weight of fruit (299.51 g), number of seeds per plant (1364.00), vitamin C content (8.57 mg/ 100g) while highest TSS was found in Azad Brinjal (5.19 °B). Thus from these results it can be conclude that genotypes 2016/ BRLVAR-4 were found to be potential yielder under foothill condition of Nagaland.

Keywords*: genotypes, brinjal, growth, yield, quality.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/232

Soil moisture conservation: Role of hydrophilic polymers

Okenmang Jamoh and Linthoingambi Ningombam
Ph.D. research scholar, College of Horticulture and Forestry, Pasigaht, Arunachal Pradesh

One of the most essential variables in raising crop yields is the availability of water in the soil. Low soil moisture levels at various developmental stages slow growth and productivity. Good crop management practises can have a big impact on crop growth and quality. As a result, the advantages of climate resilient technology such as mulching and the usage of hydrogel should be increased. Mulching is a practise that helps plants grow and develop properly by altering soil temperature, increasing nutrient availability, and conserving moisture. It increases soil moisture retention and helps moderate temperature variations, improves physical, chemical, and biological qualities of soil, provides nutrients to the soil, and eventually promotes crop growth and production. Another soil addition that has been utilised to retain water in the soil is hydrophilic polymer. Hydrogels are water-absorbent polymers that can swell to several times their initial size and weight when exposed to water. They are networks of hydrophilic polymer chains that are mildly cross-linked. The network may swell in water and store a huge amount of water while remaining structurally stable. Furthermore, even under pressure, the absorbed water is released very slowly. As a result, they have been widely used in agriculture. The purpose of this study was to examine the use of various hydrophilic polymers as water retention agents, as well as the improvement in plant survival and yield.

Keywords*: Hydrophilic polymers, soil moisture, hydrogel.*

ITAHAS/AB/2023/233

Comparison of the Total Polyphenols and Antioxidant Abilities of Herbal Green Tea and Its Various Infusions with Hibiscus Flower

Padmini Baskey[1], Vinutha C[2], Nagaratna S Olekar[3], Chaitanya R Itagi[4], Kiran K Mirajkar[5], S. Md. Akbar[6] and Renuka S Patil[7]

[1,3,5,6,7]Department of Biochemistry, University of Agricultural Sciences, Dharwad, Karnataka

[2]Department of Biochemistry, College of Agriculture, Hanumanamatti, Karnataka

[4]Department of Food and Nutrition, College of Community Science, UAS, Dharwad, Karnataka

Green tea, or *Camellia sinensis*, a universal beverage, is known for its therapeutic potential. Herbal infusions with edible flowers are a way to obtain beneficial components from plants that provide antioxidant molecules and at various levels can control the side effects of metabolic illnesses. Hence, the present study was undertaken with the objective to compare the phenolic contents and in-vitro antioxidant activity between green tea and its infusions with hibiscus flowers in different formulations (5%, 10%, 20% and 40%). The processed green tea leaves were combined with hot air oven dried hibiscus petals in various formulations, and they were steeped for 5 minutes in hot water maintained to 95^{o}C. Following this, the herbal infusions were subjected to analyses for total phenolic content (TPC), reducing sugars, protein content, ferric reducing power (FRAP assay) and free radical scavenging activity (DPPH assay). The results showed that herbal green tea had more phenolic content and antioxidant activity as compared to edible floral infusions. The findings showed (143 ± 0.14 mg GAE/g) in TPC, (36.48 ± 4.09 mg eq AA/g) in DPPH assay, (56.06 ± 1.46 mg GAE/g) in FRAP assay, (62.33 ± 0.53 mg/g) in reducing sugar and (4.53 ± 0.30 mg/g) in protein content for the herbal green tea. While various infusions with hibiscus revealed results ranging from (130 ± 0.50 to 114 ± 0.10 mg GAE/g) in TPC, (63.48 ± 5.59 to 159.63 ± 3.00 mg eq AA/g) in DPPH assay and (21.42 ± 1.24 to 17.84 ± 1.34 mg GAE/g) in FRAP assay and it showed highest amount of reducing sugars ranging from (129.87 ± 0.15 to 235.06 ± 0.11 mg/g) and protein content (4.43 ± 0.13 to 5.81 ± 0.25 mg/g).

Our findings showed that green tea exhibited highest phenolic content and antioxidant activities. The herbal tea infusions compared to green tea showed variation in polyphenolic antioxidant effects and are suitable for

consumption as herbal tea with positive health effects. The edible flowers are also rich in effective phytochemicals, and the infusions can be prepared as a beverage that is a good source of bioactive compounds.

Keywords:-*Herbal green tea infusions, total phenolic content, ferric reducing power and free radical scavenging activity.*

ITAHAS/AB/2023/234

Influence of Nitrogen and Iron on Growth and Yield of Foxtail Mlillet

Palli Susan Grace[1*], Dr. Joy Dawson[2], Buriga Teja Swaroop[3*] and Pinninti Ajay Kumar[4*]**

1,3&4* M.Sc. (Agri.) Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences
Prayagraj, Uttar Pradesh, India

2**Professor and Head, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

The field experiment was conducted during Zaid season 2022 at the experimental field of Crop Research Farm, Department of Agronomy, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj and Uttar Pradesh, India. The soil of the experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.3), low in organic carbon (0.48%), available nitrogen (230 kg/ha), available phosphorus (13.60 kg/ha) and available potassium (215.4 kg/ha). The treatments consist of 3 levels of Nitrogen (40 Kg, 50 Kg and 60 Kg/ ha) as a basal application and Iron (0.2, 0.4 and 0.6 %) as foliar spray along with control. The experiment was layout in Randomized Block Design with Ten treatments each replicated thrice. Growth attributes namely higher plant height (101.57cm), maximum dry weight/plant (14.83 g), more number of tillers/hill (8.87) and yield attributes namely higher panicle length (18.61 cm), grains/panicle (1389.30), grain yield (1.79 t/ha) and straw yield (2.53 t/ha) were observed with application of nitrogen 60 Kg/ha and iron 0.6%.

Keywords*: Foxtail millet, Nitrogen, Iron, Growth parameters, Yield parameters.*

Water use efficiencies (WUE) of rice under elevated CO_2 and temperature condition

ParthaPratimMaity[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

Greenhouse gas (GHG) emissions from anthropogenic activities are the most significant drivers of climate change, which has both direct and indirect effects on crop production. Rice (*Oryza sativa* L.) is an important food crop with half of world's population relying on it every day. Elevated carbon dioxide (CO_2) concentration and rise in temperature in the atmosphere can have a significant effect on several morphological and physico-chemical processes in rice. A study was conducted during the *kharif* season inside the Open Top Chamber (OTC) at the Genetic-H field of ICAR-Indian Agriculture Research Institute (IARI) to quantify the interactive effect of elevated CO_2 and temperature on water use efficiency (WUE) in rice. There were two different CO_2 concentrations i.e. ambient and elevated (550 ppm) and also two different temperature levels i.e. ambient and elevated (+2.5 °C). Results suggested that elevated CO_2 plus high temperature interaction treatment has stomatal conductance and transpiration rate reduced under elevated CO_2 plus high temperature treatment as compared to chamber control. Co-elevation of CO_2 and temperature, has improved WUE (both instantaneous and intrinsic) through enhanced carbon assimilation and decreased stomatal conductance, thus, reducing the amount of water lost through transpiration, eventually improving WUE of the crop.

ITAHAS/AB/2023/236

Development and Performance of Tractor-operated Applicator for Liquid Urea Application

Parveen Dhanger[1]*, Rohinish Khurana[2], Manjeet Singh[1], Anoop Kumar Dixit[1]

[1]Ph.D Scholar, [2]Professor, [3,4]Principal Scientist, Department of Farm Machinery and Power Engineering, Punjab Agricultural University, Ludhiana 141004, India

The method and type of fertilizer application to the crop have significance role in smooth uptake of nutrients by the plant. Excess nitrogen losses were caused by the widely used fertilizer urea. As a result, a low amount of nitrogen will be available for plant uptake. At present, limited research units are engaged in the development of machinery related to liquid fertilizer injection application. Hence, there was a need to develop liquid urea applicator consisting of an electronic metering mechanism to apply liquid urea below the residue mulch into the upper layer of soil surface under high mulched no-till. An electronically controlled tractor-operated applicator for liquid urea application was developed at PAU, Ludhiana. A specially designed circuit regulates the whole cut-off mechanism. In electronic metering mechanism water pump, limit switch, proximity sensor, relay and solenoid valve were provided for cutoff mechanism. The amount of fertilizer injected per unit area was consistent and ensured fertilizer injection uniformity in field operations. The statistical analysis revealed that the effect of different soil type and forward speed on application rate was found significant ($p<0.05$). The mean value of application rate of liquid urea was found 1134.27 litre/ha and mean fuel consumption in the field was found 4.26 l/h with average crop yield of 37.53 q/ha in the field. The economic benefits of mechanized crop fertigation are of great significance, and will also play a strong role in promoting the sustainable development of agriculture in the country.

Keywords: *Tractor operated Applicator, Farm Machine, Electronic metering.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/237

Influence of Foliar Application of Boron and Silicon on Growth and Yield of Maize

Pinninti Ajay Kumar*[1], Biswarup Mehera[2] and Palli Susan Grace*[3]**
[1&3*] M.Sc (Agri) Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India
[2**] Associate Professor, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

The field experiment was conducted during *Zaid* season 2022 at experimental field of Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology& Sciences, Prayagraj, Uttar Pradesh, India. The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH7.3), low in organic carbon (0.48%), available nitrogen (230 kg/ha), available phosphorus (13.60 kg/ha) and available potassium (215.4 kg/ha). Ten treatments consists of 3 levels of Boron (50, 75, 100ppm) along with Silicon (300, 500,700 ppm) as foliar application along with control. The experiment was layout Randomized Block Design with Ten Treatments each replicated thrice. Growth attributes namely higher plant height (193.66 cm), maximum number of leaves/plant (12.83), maximum dry weight/plant (93.61 g/plant), and Yield attributes higher number of cobs/plant (3.4), length of the cob (20.94 cm), number of rows/cob (15.6), number of grains/cob (534.2), Seed index (30.7), Grain yield (6.98 t/ha), and Straw yield (14.73 t/ha) were observed with the application of Boron100 ppm and Silicon 700 ppm.

Keywords*: Maize, Boron, Silicon, growth, yield.*

ITAHAS/AB/2023/238

Exopolysaccharide Production by utilizing Agro-industrial waste

Pooja Subhash Wandhekar[1] and Dr. Sonal Rameshwar Zanwar[2]
[1]PhD Scholar, IBT, MGM University, Aurangabad
[2]Principal, MGM CFT, Aurangabad

Microbial polysaccharides have interesting and attractive characteristics for the food Industry, especially when produced by food-grade bacteria. Some of the agro-industrial waste which is used as a replacement to synthetic ingredients used in commercially defined media are described below.

Molasses, an agriculture-based co-product is rich in fermentable sugars. Syrups and molasses have been used as substrates for the fermentative production of commercial polysaccharides.

Sugar beet pulp (SBP) is mainly composed of cellulose, hemicellulose, and pectin. SBP has a high carbon-to-nitrogen ratio (C/N, 35–40).

Olive mill waste (OMW) contains approximately 15 % organic material that is made up of carbohydrates, proteins, and lipids as well as several other organic compounds.

Cheese whey consists mainly of lactose (70–80%), lactic acid (0.8–12%), minerals (12–15%), soluble proteins (8–14%), and fats (1–7%). Whey also contains a pool of nutrients and growth factors.

Grape pomace: The sugars in the grape pulp are extracted and the clarified solution is used for EPS production. Like grapes pomace, apple pomace, and citrus fruits peels are easily available and are low-cost substrates, they can be used to evaluate their ability to produce exopolysaccharides.

Fruits wastes are rich in sugars like fructose, sucrose, and glucose as well as pectin and cellulose and due to their organic nature; they are easily assimilated by microorganisms.

Lignocellulosic biomass is abundant and cheap and, is utilized by microbial systems with hydrolytic capability via cellobiose or endoglucanases. Kitchen Waste contains abundant carbon and nitrogen sources, mineral nutrition, and trace elements.

Crude glycerol is used as a substrate for the synthesis of xanthan by Xanthomonas campestries using urea along with crude glycerol. Oils and fat-containing waste (Olive oil produced) is rich in oleic, linoleic, palmitic, archaic, and other nutrients which can be used for microbial EPS synthesis. Carob

extracts have also been used for microbial production of xanthan and pullulan polysaccharides. Condensed corn solubles (CCS) contains variable levels of carbohydrates, proteins, vitamins, and nutrients.

Keywords*: Exopolysaccharides, molasses, pomace, hydrolyzates.*

ITAHAS/AB/2023/239

Green manure, organic amendments and nitrogen levels accelerate soil enzymatic activities and crop yields for rice-wheat cropping system of North west India

Prabhjit Kaur[1], K S Saini[2], Sandeep Sharma[3], S S Walia[4] and Kirandeep Kaur[5]

[1]Department of Agronomy, Punjab Agricultural University, Ludhiana, Punjab, India
[2]Department of Agronomy, Punjab Agricultural University, Ludhiana, Punjab, India
[3]Department of Soil Science, Punjab Agricultural University, Ludhiana, Punjab, India
[4]School of Organic Farming, Punjab Agricultural University, Ludhiana, Punjab, India
[5]PAU- Research station, Dyal Bharang, Amritsar, Punjab, India

We studied the effect of green manuring, organic amendments and different nitrogen levels on enzymatic activities and productivity for three years at PAU, Ludhiana and Research station, Dyal Bharang, Amritsar in split plot design with four replications. Four main plot treatments in rice were: green manuring, farmyard manure, poultry manure and control. Four subplot treatments were: control, 50 kg N ha^{-1},75 kg N ha^{-1} and 100 kg N ha^{-1}. Application of PM significantly increased grain yield of rice and its subsequent wheat crop than incorporation of GM followed by FYM. N_{100} recorded significantly higher yield than N_{50} and was at par with N_{75}. The conjoint application of different amendments and fertilizer nitrogen significantly increased basal soil respiration after completion of two years of rice-wheat cropping system with PM followed by FYM, GM and control due to increased soil enzymatic activities i.e. dehydrogenase activity and alkaline phosphatase activity. The study showed that incorporation of green manuring and application of organic amendments with different fertilizer N levels in rice and its subsequent residual effect on wheat was the best crop production strategy for enhanced enzymatic activities and gives an idea of its overall fitness for carrying out ecosystem functions. Highest rice equivalent yield was recorded with poultry manure (PM) being higher than those found in other treatments. Poultry manure (PM) and N_{100} registered significantly the highest economic parameters and system productivity for both rice and wheat crops compared rest of the organic treatments.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/240

Recent trends and propagation techniques significance in Bamboo

Pracheeka J. Shetty[1]., Vinayak Pai[2]., Dattappa[3]
[1] Research Scholar, College of Forestry, Sirsi
[2]Assistant professor, College of Forestry, Sirsi
[3]Assistant professor, College of Forestry, Sirsi

Bamboo is known as multipurpose tree belongs to Poaceae family. Due to its fast growing nature, easy establishment, greater adoptability and readily available market the bamboo cultivation area in India has been increased in recent time. The versatile nature of bamboo can be potentially utilized in a wide range of products *viz*., handicrafts, furniture making, pulp and paper industries etc. which leads to increased market demand to this species. Large scale cultivation of Bamboo fetches high income to the farmers and also creates an employment opportunities. In spite of having multiple demands, there is a shortage of supply of quality planting material (QPM) of Bamboo which resulted yield reduction. Hence there is a necessity of QPM production through rapid propagation techniques to meet the current market demand. Adopting the suitable propagation techniques to these raised qualities planting material helps to achieve the targeted yield in quick time. Different propagation techniques can be adapted to bamboo based on nature of species, branching pattern, size of the culm and also cost of the technique etc. Propagation through seeds is a best option if seeds are available but due to irregular flowering this method of propagation is not suitable (*Bambusa bambos*). Culm propagation is a destructive mode of propagation but is effective in terms of rooting and survival (*Bambusa balcooa*). Branch cutting is non-destructive method as there is more availability of branches but not so success as culm cutting in terms of rooting (*Bambusa vulgaris*). Rhizome offset cutting is the traditional method of propagating bamboo (*Phyllostachys pubescens*) using either culm or culm-less rhizomes. Layering is the technique where culm or branch is bringing together with the soil or growth regulator. Tissue culture is a sterile and precise method for growing plant cells, tissues, or organs of using a synthetic nutrient medium (*Dendrocalamus strictus*). Macroproliferation is also a great technology for the mass propagation and continuous production of bamboo. Tissue culture is an effective technology for rapid propagation, but it

is quite expensive. Culm cutting and branch cutting would be preferred in case of economic perspective.

Key words: *Quality planting material, propagation techniques.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/241

Effect of biopriming of Rhizobium and Phosphate solubilizing bacteria on nutrient uptake of Soybean (*Glycine max*)

Ukey P. V[1]., Munde B. N[2] and Raut M. D[3]
Ph. D Scholar, Department of Plant Pathology and Agricultural Microbiology, Mahatma Phule Krishi Vidyapeeth, Rahuri
Ph.D Scholar, Department of Plant Pathology and Agricultural Microbiology, Mahatma Phule Krishi Vidyapeeth, Rahuri
Ph.D Scholar, Department of Plant Pathology and Agricultural Microbiology, Mahatma Phule Krishi Vidyapeeth, Rahuri

The present investigations entitled studies on "Effect of biopriming of Rhizobium and Phosphate solubilizing bacteria on nutrient uptake of Soyabean (*Glycine max*)" was conducted during *kharif,* 2021 in Randomized Block Design with eight treatments and three replications combinations *viz*., T_1 (Biopriming of Rhizobium and PSB at 100% RDF), T_2 (Biopriming of Rhizobium and PSB + 75% RDF), T_3 (Biopriming of Rhizobium and PSB + 50% RDF), T_4 (Rhizobium + 75% recommended N + 100% recommended P_2O_5), T_5 (PSB + 75% recommended P_2O_5 + 100% recommended N), T_6 (50% recommended N + 50% recommended P_2O_5), T_7 (100% RDF without inoculation), T_8 (Absolute control). The results of the present investigation revealed that among the different inoculation treatments, T_2 (biopriming of rhizobium and PSB +75% RDF) recorded significantly highest available NPK (208.25, 27.71.and 105.69 kg ha^{-1}, respectively) and nutrient uptake (52.22, 14.44 and 24.44 kg ha^{-1} , respectively) over rest of the treatments, however it was statistically at par with T_1 (consortium+100% RDF) for available NPK (199.66, 25.69 and 102.63 kg ha^{-1}, respectively) and nutrient uptake (45.78, 12.62 and 22.28 kg ha^{-1} , respectively) by soybean at harvest. Increased available soil nutrients and nutrient uptake after harvest due to inoculation of Rhizobium and PSB individually or in combination.

ITAHAS/AB/2023/242

Spatial analysis of Cadmium and Lead in soil of Nagaon District of Assam using geospatial technique

Prarthana P. Hazarika[1]*, B.K. Medhi[2] and Bhaskar J. Buragohain[3]

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

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

[3]Young Professional (Social Science), North Eastern Regional Institute of Water and Land Management

Heavy metals are pernicious for human health and these contaminants with quantities above permissible limit on entering the human body through food chains may exhibit different hazardous symptoms. Thus, characterization of heavy metals and their extent of distribution are critical for making informed decisions to manage the soil resources. The study was conducted emphasizing basically in high agricultural chemicals dependent Nagaon District of Assam, India, 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. 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 Pb (>24.45 mg/kg) and Cd (>0.31 mg/kg) in soil 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, and Pb in soils. Significant numbers of pairs of heavy metals to a certain extent were found to be spatially autocorrelated and all the pairs away from X-axis towards the extreme right corner and far above the axis reflected less influence of local characteristics of the heavy metal. Co-variance cloud with search direction from North to South revealed the existence of spatial autocorrelation revealing a wider spatial shift of correlation towards the southern direction. The current study provides baseline data to update the mitigation approaches to better manage the heavy metal contamination in soil.

Keywords*: Geospatial, Geostatistical, GIS, Spatial autocorelation, trend analysis, Assam.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/243

To record disease incidence, mortality and morbidity of non-descript buffaloes in Konkan region

P. D. Chendge*, R. M. Dhuppe, N. B. Bhargande and D. J. Bhagat

The present study was carried out to analyse disease incidence, morbidity and mortality of buffaloes in Raigad district of Maharashtra state. Three stages stratified random sampling design was implemented and the data of total 400 non-descript buffaloes were selected by 200 buffalo owners. The data were analysed by using suitable statistical techniques i.e., least square method. Overall higher 68.03 per cent buffaloes has no any incidence of disease followed by H.S. and F.M.D. in 17.78 and 14.19 per cent, respectively. The mortality percentage was 100.00 per cent zero (0), no one buffaloes found to die with any disease. Because of these non-descript buffaloes was in native place and feeding in all over field. Hence resistance to diseases but percentage of morbidity were 31.77 per cent, the period of suffering from any disease was much more but no one could be died. Morbidity was recorded higher in Poladpur tahsil as compared to other tahsils. This study provides the important tool for determining the health status of buffaloes and has special importance in planning of prevention and control strategies designed to reduce the incidences of diseases in livestock and therefore economic status of farmers.

Keywords*: Disease incidence, mortality, morbidity, Raigad district, non-descript, buffaloes.*

ITAHAS/AB/2023/244

Role of ICT on Agriculture and Its Future Scope in Marathwada

Lohar Prashant Shivaji [1], Dr. Dr. R. D. Ahire[2] and Sampraja Bandi [3]

[1]Ph.D. Scholar, Department of Agricultural Extension, UAS, GKVK, Bengaluru

[2]Professor, (Agril. Extension), Associate Dean and Principal, College of Agriculture Badanapur, V.N.M.K.V. Parbhani

[3]Ph.D. Scholar, Department of Agricultural Extension Education, UAS, GKVK, Bengaluru

Agriculture is the oldest as well as traditional profession in India. Since, the historic human civilization periods, agriculture has gradually evolved with the newer technologies to enrich itself with the pace of time. Modern agriculture now a days being mostly dependent on ICT, helped the farmers to build their experience and knowledge conveniently. A thorough review of secondary data sources i.e., overlook of literatures from web, online published articles, reports, news etc. on some selective districts of Marathwada was made to study the current features of ICT, its exercise and future prospects in the context of agriculture information and communication. Findings revealed that the majority of the farming group and thereby involved extension workers have limited access, usage, knowledge and capacity on the use of ICT tools and media. Farmers mostly use AICCs (Agriculture Information and Communication Centre), non-smart cell phones, TV and radio for agricultural communication. Conversely, SAAOs (Sub Assistant Agriculture Officer) used mobile phones, demonstrations and consulted AEO (Agriculture Extension Officer) for information and communications.

Their utilization level of ICT based service was found much lower. Solutions to address these problems were found to be IT-based trainings, easy access and availability of ICT tools and services at a convenient price. There's a huge opportunity for improvement of ICTs in the agricultural sectors. These include, dedicated bandwidth of internet, electricity, reducing internet data charges, establishment of a data centre, agriculture database, encyclopedia, GIS, RS, GPS, radio-based technologies, online-based agricultural (seed, fertilizer, pesticide, irrigation, marketing linkage etc.) management systems, IoT, drone, artificial intelligence, robotics, nanotechnology, machine learning and big data analytics etc. Incorporation of these high techs are now a burning issue for the future development of agriculture and sustain production in a rapid changing world. Due to Covid-19 Pandemic, virtual agriculture education

is being widely encouraged with the use of the educating applications like YouTube, Zoom, Google search, Power Points, Microsoft teams along with What's app, Facebook and other social medias even in the post pandemic era.

ITAHAS/AB/2023/245

Studies on Storage of Jackfruit Seed Flour

Pratiksha T. Garje[1], Dr. C. D. Pawar[2], Dr. M. M. Kulkarni[3], Dr. J. J. Kadam[4] and Dr. R. V. Dhopavkar[5]

[1]M.Sc. Student, Department of Fruit Science, College of Horticulture, Dr. B.S.K.K.V., Dapoli Dist. Ratnagiri

[2]Professor, College of Horticulture, Dr. B.S.K.K.V., Dapoli Dist. Ratnagiri

[3]Assistant Professor, Department of Fruit Science, College of Horticulture, Dr. B.S.K.K.V., Dapoli Dist. Ratnagiri

[4]Associate Professor, Department of Plant Pathology, College of Agriculture, Dr. B.S.K.K.V., Dapoli Dist. Ratnagiri

[5]Associate Professor, Department of Soil Science and Agriculture Chemistry, College of Agriculture, Dr. B.S.K.K.V., Dapoli

The present investigation entitled 'Studies on storage of jackfruit seed flour' was conducted at the Fruit and Vegetable Processing Unit of College of Horticulture, Dapoli- 415712., Dist. Ratnagiri, Maharashtra during the year 2021-2022. In this experiment i.e. completely randomized design (CRD) was used with four treatments viz. T_1 ('0' month), T_2 (1 month), T_3 (2 months) and T_4 (3 months) were studied. The prepared jackfruit seed flour was analyzed for different chemical and sensory qualities and also microbial count was taken at each month during storage. Before that physical parameters of jackfruit seed and flour were studied. It was observed that the original fresh weight of seeds was 13.4 kg from this dry weight of the seeds obtained was 5.971 kg (44.56%). The weight of the seed cover after drying was 1.280 kg (21.44%). The weight of the dried seed without the seed cover was 4.691 kg (78.56%) and the weight of the flour made from the dried seed without the seed cover was 4.409 kg. The recovery of seed flour from dried seed without seed cover was 93.99 per cent and recovery of seed flour from fresh seeds was 32.90 per cent. During three months storage of jackfruit seed flour, protein(6.94 to 3.85%), crude fibre (2.80 to 1.39%), fat (1.67 to 1.25), calcium(6.72 to 2.36 mg/100g), magnesium (5.08 to 3.48 mg/100g), phosphorus (0.119 to 0.079 mg/100g) and potassium (0.794 to 0.573 mg/100g) were found to be decreased from T_1('0' month) to T_4 (3 months), whereas moisture (6.41to8.11%) and carbohydrate (77.37 to 82.80%) are found to be increased. Ash content was constant i.e. (4.8%) for two months, but then it decreased during the three months storage period. In case of sensory evaluation of jackfruit seed flour, the score for colour(7.93 to7.48), flavour(7.58 to6.95), texture (7.87to 7.63) and overall

acceptability(7.79 to 7.35) decreased from treatment T_1 i.e. '0' month to T_4 (3 months) during storage. Treatment T_1 ('0' month) for jackfruit seed flour obtained highest scores for colour, flavour, texture and overall acceptability. . During three months storage (T_1 to T_4) of jackfruit seed flour no microbial growth was detected.

ITAHAS/AB/2023/246

Standardization of Agronomic practices in chia (*Salvia hispanica* L.) under Southern Dry Zone of Karnataka

K. M. Pravalika[1], S. B. Yogananda[1], S. Supriya[1] and G. Ranjitha[2]
[1]College of Agriculture, V C Farm, Mandya, Karnataka
[2]University of Agricultural Sciences, Bangalore, Karnataka

An investigation was carried out during *kharif* season of 2020 to standardize the agronomic practices like row spacing and nutrient levels through organic manures in chia under Southern Dry Zone of Karnataka at ZARS, V. C. Farm, Mandya. The field experiment was laid out in Factorial RCBD comprising of two row spacings (45 cm × 15 cm and 60 cm × 15 cm) as one factor and six nutrient levels through organic manures (N_1: 75% RDN equivalent compost, N_2: 100% RDN equivalent compost, N_3: 75% RDN equivalent compost + jeevamrutha application at the time of sowing, N_4: 100% RDN equivalent compost + jeevamrutha application at the time of sowing, N_5: 75% RDN equivalent compost + jeevamrutha application at the time of sowing and 30 DAS and N_6: 100% RDN equivalent compost + application of jeevamrutha at the time of sowing and 30 DAS) as another factor. Among different treatments, 100% RDN equivalent compost + application of jeevamrutha at the time of sowing and 30 DAS combined with the row spacing of 45 cm × 15 cm recorded statistically higher seed yield (1014 kg ha^{-1}), haulm yield (3323 kg ha^{-1}), organic carbon (0.74%), available N (260.77 kg ha^{-1}), available P_2O_5 (29.67 kg ha^{-1}), available K_2O (189.86 kg ha^{-1}), N uptake (66.16 kg ha^{-1}), P uptake (12.82 kg ha^{-1}), K uptake (52.19 kg ha^{-1}) and lowest values was recorded with 75% RDN equivalent compost combined with the row spacing of 45 cm × 15 cm (seed yield - 577 kg ha^{-1}, haulm yield - 1758 kg ha^{-1}, organic carbon - 0.65%, available N - 229.54 kg ha^{-1}, available P_2O_5 - 25.29 kg ha^{-1}, available K_2O - 170.80 kg ha^{-1}, N uptake - 43.04 kg ha^{-1}, P uptake - 4.83 kg $ha^{-1}$and K uptake - 28.95 kg ha^{-1}, respectively).

Keywords: *Equivalent Compost, Jeevamrutha, Nutrient Management Through Organic Manures and Spacing.*

Studies on variability and correlation of fenugreek genotypes under lower altitude of western Himalayan region of Uttarakhand

Prawal P S Verma[1, 2*], Abu Nayyer[2], Saudan Singh[1], Saba Siddiaqi[2], Dipender Kumar[1], B Agri[1] and R C Padalia[1]

[1]CSIR- Central Institute of Medicinal and Aromatic Plants Research Centre Purara, PO Gagrigole, Bageshwar (Uttarakhand) India

[2]Integral Institute of Agricultural Sciences and Technology, Integral University, Lucknow, India

This investigation was conducted during the Rabi seasons of 2021-22 and 2022-23 at the Research Farm of CSIR CIMAP Research Centre Purara, Bageshwar (Uttarakhand) to evaluate the genetic variability, heritability, and genetic advance for thirteen quantitative traits in thirty genotypes of fenugreek. The study implemented a randomized block design (RBD) with three replications. The analysis of variance demonstrated significant genetic variability among the fenugreek genotypes for all the investigated traits, both individually and in pooled analyses across the two environments. Notably, seed yield per plant exhibited high phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) in both environments, indicating substantial genetic diversity within the fenugreek population. Additionally, high estimates of PCV, GCV, heritability, and genetic advance as a percentage of mean were observed for seed yield per plant in both environments, highlighting its potential for genetic improvement. Moreover, the study revealed varying degrees of GCV (%) and PCV (%) for the traits, with the highest values observed for fresh herb weight per hectare and the lowest for days to start flowering. The small differences between PCV and GCV for most traits, except root length and seed yield per hectare, suggested minimal environmental influence, supported by high heritability values. Traits exhibiting high heritability (> 90%) combined with significant genetic advance were identified, indicating their predominantly additive genetic control and the potential for effective selection. In conclusion, this study underscores the presence of significant genetic variability among fenugreek genotypes for various quantitative traits. The high heritability estimates and substantial genetic advance observed for seed yield per plant emphasize the feasibility of

implementing targeted breeding programs to enhance the yield potential of fenugreek.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/248

Monitoring the vegetation cover of Gorumara National Park using remote sensing and GIS

Pritam Kumar Barman[1] and Afaq Majid Wani[2]
[1]Department of Forest Biology, Tree Improvement and Wildlife Sciences, College of Forestry, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj, Uttar Pradesh, India
[2]Department of Forest Biology, Tree Improvement and Wildlife Sciences, College of Forestry, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj, Uttar Pradesh, India

In order to better understand how environmental factors affect long-term vegetation change, researchers have been driven by the current global warming challenges to improve vegetation monitoring systems. The rising use of satellite remote sensing for civilian purposes has shown itself to be the most cost-effective and time-effective method of mapping and monitoring vegetation changes. This study aims to analyze and detect changes in vegetation using the normalized difference vegetation index (NDVI) and normalized difference moisture index (NDMI) over five years, i.e., from 2016 to 2021, in Gorumara National Park using Landsat 8 datasets. For this study, the 4 (Red), 5 (NIR), and 6 (SWIR1) multi-spectral band combinations are used separately. Open-source software such as QGIS was used for image pre-processing and mapping. The area under high vegetation cover and very high moisture content was marked by dark green and deep blue colors, respectively. According to the NDVI and NDMI classifications, the area under high vegetation and high moisture content has slightly increased by 0.15% and 0.23%, respectively. The outcomes derived from remote sensing data are very reliable. This is crucial for determining the vegetation's general health, providing the required data for long-term conservation efforts, and developing efficient management plans.

Keywords: *Vegetation monitoring, remote sensing, GIS, NDVI, NDMI.*

ITAHAS/AB/2023/249

Nutrient management study in sweet orange (Citrus sinensis L) cv. Mosambi under Gwalior agro-climatic condition of M.P.

Purnima Singh Sikarwar and K. S. Tomar
Department of Horticulture, Collage of Agriculture, Rajmata Vijayaraje Sindia Krishi Vishwa Vidyalaya, Gwalior, (M.P.) India

Effect of micronutrients on growth, yield and quality parameters of sweet orange was studied at Experimental field of department of Horticulture, Collage of Agriculture, RVSKVV, Gwalior (M.P.). Foliar application of 4g $CuSO_4$ (Copper sulfate)+ 2g $FeSO_4$ (*Ferrous sulfate*), + 2g Borax+ 4g $ZnSO_4$ (Zinc sulfate) + 4g $MgSO_4$ (Magnesium sulphate) + 10g lime per liter water during the mid of March and 1st week of July with 600 N + 500 P+300 K g/tree on sweet orange gave maximum *Yield per tree (*41.03 *kg),* Number of fruits/tree (248), *Fruit weight (*167 *g),* Fruit length (11.8 cm), Fruit diameter (21.8 cm) and good quality fruits *Juice (56.08 %)* (*Titratable Acidity (*0.78%*), Ascorbic acid (*58.04 *mg/100ml*) with Total Soluble Solids (11.6 ^{o}Brix). Therefore, application of this dose of micronutrient combination will improve yield and fruit quality in sweet orange of these micronutrients as a result of which the orchardist will be economically benefited.

Keywords: *Sweet orange, Micronutrients, Quality, Ascorbic acid, Fruit weight.*

Introducing a New Chemical Flocculant for Enhanced Microalgal Harvesting

R. Dinesh[1], V. Nitheswara[1], S. Poornima Aishwarya[1], N. Ramesh[1], S. Nandhakumar[1], C. Anand[1], J. Stephen Sampath Kumar[2]

[1]Mandapam Centre for Sustainable Aquaculture, Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Seeniappa Dargha, Ramanathapuram, Tamil Nadu

[2]Directorate of Sustainable Aquaculture, Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Nagapattinam, Tamil Nadu

A rise in fish consumption, paired with a fall in wild fish harvest, is propelling the aquaculture business forward at breakneck speed. Farmed fish now accounts for around half of the total worldwide seafood demand for human consumption. As the aquaculture business expands, so does the aquafeed market. Microalgae biomasses are prospective feed ingredients, providing a combination of vital amino acids, essential fatty acids, vitamins, minerals, pigments, and bioactive compounds that can improve the growth, survival, coloration, and nutritional quality of the farmed species. One of the most significant obstacles to the mass production of microalgae is the high cost of harvesting biomass from a huge volume of growth medium. As a result, developing an efficient and cost-effective technology for harvesting microalgae is critical. In this work, the effects of zinc sulphate (feed grade) as a new chemical flocculant and alum and ferric chloride (analytical grade) as conventional flocculants for harvesting microalgae *Nannochloropsis gaditana* via flocculation technique were examined and compared. The results showed that zinc sulphate (0.8 g L^{-1}) achieved maximum flocculation in 95 seconds with a maximum harvesting efficiency of 99.63%, followed by alum (1.0 g L^{-1}) and ferric chloride (1.2 g L^{-1}) with harvesting efficiencies of 89.54% and 86.71% in settling times of 8 and 10 minutes, respectively. The cost of harvesting 1 kg of biomass with feed-grade zinc sulphate was projected to be in the range of 0.22 USD, which was significantly lower than that of the others. The results herein show that flocculation with feed-grade zinc sulphate is a worthwhile harvesting method and can be utilised in a full-scale operation that yields the dual benefit of harvesting microalgal biomass and zinc-fortified feed ingredient for better production of farmed fish and shrimp since zinc is an essential trace element for their growth and metabolism.

ITAHAS/AB/2023/251

Forest Carbon sequestration: Nature's Climate change Mitigator

Rachana [1], Vinayak Pai [2*], Dinesh C V [3] and Rakesh H N [4]**

[1,3&4] Research Scholar, Department of Forest resource management College of Forestry, Sirsi Karnataka, India

[2]Assistant professor, Department of Forest Biology and Tree Improvement College of Forestry, Sirsi, Karnataka, India

Global warming and climate change are the burning issues of main concern in today's changing world, which poses a major threat to the ecosystem. The main causes of climate change include deforestation, volcanic eruptions, ocean currents and emission of carbon dioxide (CO_2) from industries. The greenhouse gasses are the major prime contributor for the increasing temperature of the atmosphere. The amount of carbon dioxide in the atmosphere has increased since the beginning of the industrial age and this increase has been caused mainly by the burning of fossil fuels and other anthropogenic activities. Forest plays a vital role in mitigation and adaptation to ongoing climate change. Forest's ability to sequester carbon has gained significant global interest as an affordable and effective approach to mitigate climate change. Forests are the important part of ecosystem which provides various ecosystem services, among which the most important one being carbon sequestration. Forest Carbon sequestration is the process through which the green plants absorb the carbon dioxide from the atmosphere and convert it into living biomass through photosynthesis process and act as a major carbon sink. The more carbon is stored and sequestered by healthy forest vegetation than by any other terrestrial ecosystem. India's forests are one of the richest terrestrial ecosystems, which stores approximately half of the world living terrestrial carbon and a very significant proportion is fixed in the form of above ground biomass. The maximum amount of carbon is stored in soil organic matter and later in living biomass, litter and in dead woods. Forest biomass is an important variable for evaluating carbon sequestration and carbon balance capacity of forest ecosystem. The major portion of the total above ground biomass and carbon is accumulated within the large sized trees and therefore, the removal of such trees from the forests will substantially reduce the C-stock. The carbon sequestration potential of less disturbed forests like Kaan forests or sacred groves is more due to less biotic pressure and

human interference. Therefore, effective terrestrial carbon accounting at the regional level is crucial for mitigating global climate change and to understand carbon cycle.

Key word: *Carbon sequestration, Greenhouse gases, Mitigation, Forest biomass.*

ITAHAS/AB/2023/252

Genetic diversity analysis in chickpea (*Cicer arietinum* L.) genotypes grown under drought stress condition

Rahul V Chahande, Pawan L Kulwal and Laxman B Mhase

Genetic diversity study was conducted in 32 chickpea (*Cicer arietinum* L.) genotypes using Mahalanobis D^2 Statistics. Based on D^2 values, 32 genotypes were grouped into eight clusters. The cluster III consisted of maximum 9 genotypes, followed by Cluster II, cluster I and cluster IV, which had 8, 7 and 4 genotypes, respectively. Inter cluster values varied from 3.27 to 11.60. The maximum inter cluster distance was recorded between cluster IV and VI (11.60). Characters 100 seed weight (58.67%), days to maturity (13.91%) and days to 50% flowering (13.10) contributed maximum towards diversity. On the basis of cluster mean values, cluster IV was superior for 100 seed weight and seed yield per plant. The genotypes belonging to the clusters separated by high genetic distance could be used in hybridization programme for obtaining a wide spectrum of variation among the segregants.

Keywords: *Chickpea, D^2 Statistic.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/253

Recent Advances in Relation to Organic Vegetable Production

Rajat Rajput and Satyarath Sonkar
Ph.D. Research Scholar Nagaland University, School of Agricultural Science, Medziphema, Nagaland

Vegetables are herbaceous plant those are consumed by humans or other animals as food. Organic vegetable production is a system based on the principle of taking care of nature accounting all life forms. The agricultural practice is economically and health-wise, it does not use costly synthetic and harmful toxic chemicals. Organic farming also protects the environment and has a greater socio-economic impact on a nation **(Das *et al.* 2020).** India produced around 2.75 million MT (2019-20) of certified organic products. Organic cultivation affected the growth of vegetables positively in 43% of studies and negatively in 57% of studies. Organic cultivation affected the yield of vegetables 59% positively, 29% negatively and 12% did not have any significant influence. Weed control is the most difficult part of vegetable production in organic cultivation. The most efficient methods are used against weeds like tillage, mulching, flaming and hot water treatment. If the proper technology is used, the organic cultivation of vegetables is not so timely and money consuming produces vegetables of better quality and nutritional value with no pesticide residues. cultivation of vegetables uses a variety of methods for disease and insect control: hot water, hot air and electron treatment, biological seed treatment groups like microorganisms, plant extracts and inducers of resistance, solarization for nematode control, bio-pesticides, insect net **(Olle and Williams 2012).** The demand for certified organic produce, especially vegetables, currently exceeds supply in many cases, produce attracts premium prices. Organic vegetable cultivation offers one of the most sustainable farming systems with recurring benefits to only long-term soil health but provides a lasting stability in production by importing better resistance against various biotic and abiotic stresses. Organic vegetables fetch a premium price of 10%- 50% over conventional products **(Kumar *et al*. 2017).**

Keyword:*-Organic farming, herbaceous plant, sustainable farming, Organic vegetable.*

ITAHAS/AB/2023/254

Studies on Impact of Forest Fire on Soil Properties Under Different Vegetation Types in Uttara Kannada District

Raji J Mohan[1], Gopal. V. Dasar[2], Girish B. Shahapurmath[3], Akhilraj T M[4], Sourav Manoharan[5] and Divya Soman[6]

[1] College of Forestry, Sirsi, Uttara Kannada, Karnataka

[2] Professor and Head, Dept. of Forest Resource Management, College of Forestry, Sirsi, Uttara Kannada, Karnataka

[3] Assistant Professor, Dept. of Forest Resource Management, College of Forestry, Sirsi, Uttara Kannada, Karnataka

[4]College of Forestry, Sirsi, Uttara Kannada, Karnataka

[5]College of Forestry, Sirsi, Uttara Kannada, Karnataka

[6]College of Forestry, Sirsi, Uttara Kannada, Karnataka

This study was conducted in the dry deciduous and moist deciduous forests of Banavasi and Dandeli respectively, in Uttara Kannada district to assess the impact of forest fire on soil physico-chemical properties during 2021-2022. Composite surface soil samples (0-30cm) were collected from two vegetation types, two canopy density classes and three fire disturbance levels. Tree regeneration was assessed by quadrat method.

Moist deciduous forest soils showed higher pH (6.36), organic carbon (1.77%), organic matter (3.05%), available nutrients *viz.,* N (203.50 kg/ha), P_2O_5 (26.15 kg/ha), K_2O (210.78 kg/ha), exchangeable Ca (4.86 meq/100g), Mg (2.15 meq/100g) and micronutrients *viz*., Mn (3.66 ppm), Fe (4.79 ppm), Cu (3.75 ppm), Zn (3.17 ppm). But bulk density (1.12 g/cc), particle density (2.13 g/cc) and porosity (47.42%) found lower. Soils under very dense canopy showed maximum pH (6.31), organic carbon (1.98%), organic matter (3.41%), available P_2O_5 (25.56 kg/ha), available K_2O (211.73 kg/ha), exchangeable Ca (4.55 meq/100g) and available S (18.61kg/ha). Bulk density (1.23 g/cc), pH (6.55) and available P_2O_5 (25.12 kg/ha) increased in fire-affected soils while porosity (46.05%), organic carbon (1.12%), organic matter (1.92%), available K_2O (188.49 kg/ha), available S (20.36 kg/ha) and micronutrients decreased. Tree regeneration showed higher diversity in non-fire-affected areas, as expressed by Shannon-Wiener (H = 3.06 and 3.10) and Simpson (D = 0.06 and 0.06) index, for both dry deciduous and moist deciduous forests respectively.

This study revealed that fire has a significant effect on soil physico-chemical properties and tree species regeneration. Repeated fires might have a higher negative impact on dry deciduous forests than moist deciduous forests. Thus, better management practices are required to reduce the impact of forest fire.

ITAHAS/AB/2023/255

Impact of climate change on biodiversity, food security and IPR Issues

Raju Namdeo Gawade[1] and Dr. G. M. Waghmare[2]

[1]Ph.D. Scholar, Department of Horticulture (Fruit Science), College of Agriculture, VNMKV, Parbhani

[2]Head, Department of Horticulture, College of Agriculture, VNMKV, Parbhani

Human activity as much as natural elements are to blame for climate change. Biodiversity, agricultural output, and food security are all expressively altered. The majority of endemic and narrowly adapted species are in danger of extinction. Because it provides nourishment for all life forms and primary healthcare for more than 60–80 percent of humans worldwide, concerns over species extinction are justified. Despite the fact that the effects of climate change on biodiversity and food security have been acknowledged, nothing has been done to address the issue given its global scope. Distributions of species have changed to higher elevations at a median pace of 11.0 m and 16.9 km per decade to higher latitudes as a result of climate change. In light of this, extinction rates for 1103 species under migration scenarios range from 21-23% with unlimited migration to 38-52% with no migration. Furthermore, communities and regions that depend on rain-fed agriculture are particularly affected by climate change in terms of food security. Plants and crops have limits that, when exceeded, compromise growth and yield. Seed security is a prerequisite for food security, and timely access to high-quality seed in the necessary quantity at the proper time and price is essential to raising output and productivity. The issues are made worse by growing population pressure, depleting natural resources, and an increase in the frequency of catastrophic occurrences because of climate change. Farmers' varieties that are climate resilient make a substantial contribution from a food and nutritional standpoint, especially for small and marginal farmers under low input marginal situations. The creation of new plant varieties by itself cannot support an increase in agricultural output unless the existing plant varieties are safeguarded to ensure proper use for their best performance and plant breeders are encouraged to continue making improvements to the existing plant types. The significance of intellectual property rights for plant variations and their contribution to the creation of novel plant breeds that are resistant of various biotic and abiotic stresses, climate resilient, and nutritionally adequate.

Keywords: *Climate change, Intellectual property rights, Food security.*

Screening of *cry* genes from the *Bacillus thuringiensis* isolates using anti-coleopteran specific gene universal primers

Rituraj Borah[1], Madhu Kamle[1] and Pradeep Kumar[2]*
[1]Applied Microbiology Laboratory, Department of Forestry, North Eastern Regional Institute of Science and technology, Nirjuli- 791109, Arunachal Pradesh, India
[2]Department of Botany, University of Lucknow, Lucknow, 226007

Bacillus thurigiensis (*Bt*) is a gram positive, soil borne, sporulating bacteria and has been isolated throughout the world from diverse ecosystems. *Bt* strains produces various insecticidal proteins which shows larvicidal activities against insects of different class and is used variedly in pest management. The present work aims to isolation, characterization of *Bt* isolates from different habitats and evaluate for the spore production, along with their anti-coleopteran activity. Soil samples were collected from different locations (orange garden, tea garden and rice agriculture field) of Arunachal Pradesh. The collected soil samples were heat treated at 80°C for 10 min and followed by serial dilution and 0.1 ml aliquot from each dilution was spread over petri-plates containing *Bacillus* Differentiation Agar Medium and were inoculated at 30±1°C for 24 h. A total 95 *B. thuringiensis* were isolated and out of these the 54 morphologically different *Bt* isolates were used for spore production and subjected to screening of anti- coleopteron gene using fifteen universal primers (Uns). Genomic DNA was extracted from pure cultures and PCR-screened with pairs of Uns for relevant genes. Out of 54 isolates only 23 isolates show anti-coleopteron gene specific amplification. After the screening of 15 Uns the presence of *cry7*, *cry8R1*, *cry1Db, cry23* and others in the selected isolates were found. Selected genes will undergo additional full-length sequencing for further investigation and gene uniqueness. And also, larvicidal activity of the selected strains will be carried out.

ITAHAS/AB/2023/257

Forecasting of Tomato Prices Using Long Short Term Memory

Ruqsar khanum[1] and Dr. Siddayya[2]
[1]Institute of Agri-Business Management, Collage of Agricultural Sciences
[2]University of Agricultural Sciences, GKVK, Bangalore

Fluctuations in agricultural commodity prices affect the supply and demand of agricultural products and have a significant impact on consumers. Accurate prediction of agricultural commodity prices would facilitate the reduction of risk caused by price fluctuations. This paper applies an Artificial Neural Network (ANN) method to forecast tomato prices. We showed how this new tool from machine learning, particularly Long-Short Term Memory (LSTM) models. Here we used LSTM model to implement price prediction as it is a best model for time series data. The research question investigated in this article is that whether and how the newly developed deep learning based algorithms for forecasting time series data, such as "Long Short-Term Memory (LSTM)", are superior to the traditional algorithms. The empirical studies conducted and reported in this article showed that deep learning-based algorithms such as LSTM outperform traditional-based algorithms such as ARIMA and SARIMA model. From the result, LSTM is discovered to be the most accurate and efficient in handling increasing amounts of complex data. To evaluate the LSTM, weekly field prices of tomato for 10 years (20011-202) were used. The results showed that, compared to the ARIMA and the SARIMA, the Root Mean Squared Error (RMSE), Mean Absolute Percentage Error (MAPE) and Mean Absolute Error (MBE) of LSTM showed lesser error value *i.e.,* 267.66, 0.15 and 176.40 respectively. Thus, it provides a new idea for agricultural commodity price forecasting and has the potential to stabilize the supply and demand of agricultural products, thus help to understand the price fluctuation and also it provides an insight for the government in order to take necessary decisions for managing risk.

Keywords: *ANN; Deep Learning; Machine Learning; LSTM; ARIMA; SARIMA; RMSE; MAPE; MBE.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/258

Impact of Covid-19 on Education Sector, Agriculture and Environmental Sustainability

S. Gowri Shankar[1] and Dr. V. Sakthivel[2]
[1]PG Scholar and [2]Associate Professor
Department of Agricultural Extension, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India

The Covid-19 pandemic has affected the Education sector, Agriculture and Environment sustainability across the world. In the education sector schools and colleges across the country have been closed to protect students from the spread of the coronavirus. This hampered the education of school and college students. According to the latest UN report on the state of education, the study of more than 160 crore students has been affected by the coronavirus and the education system has been largely destroyed. The report also says that the economic fallout caused by the pandemic could put more than 3 crore students out of school in the coming year. Due to this, the education of more than 32 crore children is affected, according to UNESCO data. In India, due to Corona, schooling has been stopped halfway in 62 per cent of families, according to a study. In agriculture it caused impacts on production, demand and supply mismatch, prices and availability of agricultural inputs and labour, in Farmers Interest Groups (FIG), Farmers Producer Organisation (FPO), Micro, Small and Medium Enterprises, it mainly affected many Agri- preneurs and startups. It caused the sharpest decline in the availability of seeds, fertilizers, pesticides, rental agricultural machinery, fodder or cattle feed. It had hiked the prices of agricultural inputs like seeds, fertilizers, pesticide, agricultural goods, and value-added agricultural products. In MSME sector it had a huge impact on Price of key raw materials, Production level of crops, cash flow, Employment, Supply chain, Export and Consumer sentiment/demand. In Environmental sustainability it has both positive and negative impacts. Some of the positive impacts are reduction in emission of greenhouse gases, upgraded water quality, restored pristine forest environment, disposal of domestic waste and reduced waste recycling. The negative impacts are increase in bio medical waste such as masks, sanitizer bottles, syringe needles, bandages and other medical wastes which are made of plastics are detrimental to the nature are not controlled and managed. There are no significant changes in the domestic waste management.

Keywords*: Pandemic, Agriculture, UN report, Environment Sustainability.*

ITAHAS/AB/2023/259

Post-Harvest Technology, Food Processing, and Value Addition: Agri-Value & Supply Chain for Sustainable Production

S. M. Sailaja and Dr. K. Jyotirmai Madhavi
Assistant Professor (Hort.), College of Horticulture, Chinalataripi, Dr. YSRHU, VR. Gudem. WG. Dist
Associate Professor, (Pl. path), College of Horticulture, Chinalataripi, Dr. YSRHU, VR. Gudem, WG. Dist

Post-harvest technology, food processing, and value addition play a crucial role in ensuring sustainable production in the agricultural sector. These processes encompass a wide range of activities that occur after crops are harvested, including handling, storage, processing, packaging, and distribution. By implementing effective post-harvest practices and value addition techniques, farmers and food processors can minimize losses, enhance the quality and shelf life of agricultural produce, and create value-added products for diverse markets.

Food processing plays a vital role in ensuring the availability, safety, and quality of food for an ever-growing global population. With the increasing demand for processed food products, the food processing industry is constantly evolving to meet consumer expectations while addressing sustainability concerns.

Post-harvest technology, food processing, and value addition are integral components of the agri-value and supply chain for sustainable production. These practices reduce post-harvest losses, enhance food safety and quality, create value-added products, improve market access, and contribute to waste management and resource efficiency. By adopting effective post-harvest technologies and value addition techniques, farmers and food processors can ensure the long-term viability and profitability of the agricultural sector while meeting the growing demand for safe, nutritious, and sustainable food. Collaborative efforts among stakeholders, including policymakers, researchers, and industry players, are crucial to promoting and implementing these practices on a larger scale, leading to a more sustainable and resilient food system for future generations.

Supply chain involves tracking and documenting every stage of the production process, from farm to fork.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/260

Performance of Rice Cultivars for Yield and Yield Attributes at Twelve Different Dates of Sowing

Sadras Bhavana*, T. Ramesh[1], P. Raghuveer Rao[2], B. Balaji Naik[3] and CH. Damodar Raju[4]

*Assistant Professor, Dept. of Crop Physiology, Kaveri University, Gowraram, Siddipet
[1]Professor and Head, Dept. of Crop Physiology, PJTSAU, Rajendranagar, Hyderabad
[2]Principle Scientist and Head, Dept. of Plant Physiology, IIRR, Rajendranagar, Hyderabad
[3]Principle Scientist, Dept. of Agronomy, PJTSAU, Rudrur
[4]Principle Scientist, Dept. of Plant Breeding and Genetics, PJTSAU, Kampasagar

A field investigation was conducted to evaluate the effect of different sowing dates on yield and yield components of six rice cultivars during 2018-2019 at Indian Institute of Rice Research, Rajendranagar, Hyderabad. Experiment constituted of twelve sowing dates *i.e.,* from 20th June 2018 to 01st Feb 2019 with an interval of 20 days between each sowing. Data on morphology, yield attributes and yield of six rice genotypes were recorded and statistically analysed by split plot design (main plot- cultivars, sub plot- dates of sowing). Significant interaction studies between cultivars and dates of sowing revealed *cv*. JGL 3855 to perform best for grain yield over other cultivars. The yield contributing parameters such as productive tiller number m^{-2}, panicle weight, grain number per panicle and spikelet fertility attributed for the high yielding feature in *cv*. JGL 3855. Further, interaction studies indicated that sowing date D1 (20th Jun'2018) was best suitable for all the cultivars except WGL 24071 to attain maximum grain yield. WGL 24071 performed best (7556 kg ha^{-1}) on D8 (20th Nov'2018) sowing indicating that this cultivar is well suited for Rabi than Kharif season. D1 (20th Jun'2018) sowing also recorded maximum plant height, number of productive (panicle bearing) tillers, panicle length, panicle weight, number of grains per panicle, 1000-grain weight, filled grain per m^2 and spikelet fertility percentage.

Keywords*: Sowing dates, yield attributes, yield, split plot design.*

ITAHAS/AB/2023/261

Calcium is an important element to maintain postharvest quality of fruits and vegetables

Sajeel Ahamad[1], Chhail Bihari[2], Maneesh Kumar[3], Menaka M[4] and Vivek Saurabh[5]

[1,4,5] Ph.D. Research Scholar, Division of Food Science and Postharvest Technology, ICAR- Indian Agricultural Research Institute New Delhi 110012

[2] Ph.D. Research Scholar, Department of Horticulture (Vegetable Science), Nagaland Central University, SASRD Medziphema, Nagaland, India

[3] Ph.D. Research Scholar, Department of Horticulture, G.B. Pant University of Agriculture & Technology Pant Nagar, U.S. Nagar, Uttarakhand, India

Calcium is involved in maintaining the textural quality of produce it forms cross-links or bridges between free carboxyl groups of the pectin chains, resulting in strengthening of the cell wall. Endogenous and added calcium can make plant tissue firmer by binding to the pectin carboxyl groups that are generated through the action of PME. Calcium can also help to keep longer the fresh-like appearance of minimally processed fruits and vegetables by controlling the development of browning. The ability of fresh-cut apple matrix for calcium incorporation by impregnation techniques using calcium lactate and calcium gluconate that control flesh browning in apple and peach. Sensory analysis also showed that the use of calcium improved the textural characteristic of the product during storage. Calcium content of fresh-cut lettuce significantly increased when treated with calcium lactate compared with chlorine treatments. Sensory analyses of minimally processed products treated with calcium have been reported in some cases, depending on the source of calcium used, bitterness as a side effect of the treatment. Calcium chloride in fresh-cut musk melon finding undesirable bitterness, which was avoided when using calcium lactate at the same concentration. Calcium plays an important role in maintaining the structure of cell walls in fruits; thus, calcium treatment could effectively maintain fruit firmness and delay fruit softening and ripening. Postharvest calcium treatment can effectively reduce physiological diseases and delay the senescence of apples, which greatly maintains fruit quality. Preharvest calcium chloride spray treatment significantly enhanced fruit calcium content and improved fruit quality, and reduced fruit weight loss and decay incidence during storage and shelf-life of kiwifruit.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/262

Role of women in Food waste management

Sampraja Bandi[1] and Lohar Prashant Shivaji[2]
[1]Ph.D. Scholar, Department of Agricultural Extension Education, UAS, GKVK,Bengaluru-560065
[2]Ph.D. Scholar, Department of Agricultural Extension, UAS, GKVK,Bengaluru-560065

Through agriculture, people were able to produce more food than they needed, use it in times of crop failure, or exchange it for other things. People were able to work on jobs unrelated to farming thanks to food surpluses. On the other hand, food waste is a major environmental and social problem throughout the world. The food wastage index report from the United Nations Environment Programme estimates that 68,760,163 tonnes of food or about 50 kilograms per person is wasted in Indian homes each year. These losses occur throughout the supply chain, in homes, on kitchen tables, and due to a lack of refrigeration and cold storage facilities. They also occur during shipping, storage and marketing. Food waste is a careless act that adds to the garbage burden, which puts additional strain on the waste management system and ends up in landfills and water bodies. Women in India have historically been in charge of managing household waste as a part of their everyday responsibilities and research has shown that they are more interested in domestic waste management and waste management services. Women are the primary consumers of waste management services at the household level and are involved in a variety of trash-related jobs. By recognizing their knowledge and expertise, waste management operations can become more effective, efficient, sustainable and fair. The minimization and separation of household garbage is one area where women can lead immediately, but men also need to get involved and take on a bigger and eventually equal share of household responsibility for domestic waste management. Through waste reduction, recycling and composting, this tactic can help reduce overall waste. Additionally, it is crucial to support and encourage women's leadership, agency and voices in waste management.

ITAHAS/AB/2023/263

Impact of Pandemic (Wave-I) on Indian Rural Economy and Livelihoods

Sampraja Bandi[1], Dr. Vinay Kumar R[2] amd Lohar Prashant Shivaji[3]

[1]Ph.D. Scholar, Department of Agricultural Extension Education, UAS, GKVK, Bengaluru-

[2]Asst. Professor, Department of Agricultural Extension, UAS, GKVK,Bengaluru-

[3]Ph.D. Scholar, Department of Agricultural Extension, UAS, GKVK,Bengaluru

India is primarily a rural nation, where Rural India has a population of 68.8 per cent and contributes 25–30 per cent of the country's economy to the Indian GDP. The WHO declared Covid-19 a pandemic on 11th March, 2020 and Kerala was where the first Covid-19 case in India was discovered on 27th January, 2020. Both the rural and urban sectors were affected, but the lockdown had a greater impact on rural area activities such as local non-farm sectors, agriculture and related activities and rural- urban migration. Export closures, job losses and supply chain delays were the main issues affectingrural markets during the lockdown. Over 45 per cent of households across the country have reported a decrease in income and many workers lost their jobs during the shutdown while having their pay reduced. GDP in India and GVA fall to -23.9 per cent and -22.8 per cent in the month of June, 2020, respectively. Debt, social ills (untouchability, caste and wage discrimination, violence against women), a surge in child marriages & child labour and the workload of women performing unpaid domestic and caregiving duties in rural regions were also documented. Nearly 17M children (under 5 years old) were undernourished as a result of the epidemic, locusts and extreme weather. The disruption of the agricultural supply chain, the delay in the planting and harvesting of crops due to the lack of inputs, the suspension of exports, lower prices for goods, limited availability and high prices of agri-inputs. The shut down in India had an impact on the handloom, handicraft and toy industries, which are important rural economic sectors. Atma Nirbhar Bharat Abhiyan granted 20 lakh crore Covid-19 economic stimulus package focusing on migrant workers, street vendors, small farmers, urban.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/264

Importance of packaging technology in fruit crops

Sanampreet
Sri Guru Teg Bahadur Khalsa College, Sri Anandpur Sahib

Fruit industry in India is growing at fast pace but its storage for long time is still a big problem. Most of fruits can only be sent to the local market because their transport to long distance is not possible because quality will be decreased during transportation. The principal purpose of food packaging is indeed to maintain the safety, wholesomeness, and quality of food. The factors mentioned, such as the growing middle class, liberalization, and organized retail sector, have contributed to the growth of the packaging industry.

Keywords*: Fruit, quality, market, packaging.*

ITAHAS/AB/2023/265

Natural Enemies Recorded on Fall Armyworm and Effect of Novel Insecticides on them in Maize Crop

Sandip Narayan Rathod[1] and Dr. Archana Narayan Borkar[2]
[1]Department of Entomology, Dr. PDKV, Akola
[2]Department of Entomology, College of Agriculture, Mul, Dr. PDKV, Akola

Destructive invasive pests, fall armyworm (*Spodoptera frugiperda)* reported in India, from Karnataka, Tamil Nadu, Telangana and Maharashtra on maize crop (Sisodiya et al. 2018). *S. frugiperda* is a highly polyphagous insect pest. Some natural enemies are reported to be associated with. A field trial was conducted in *kharif* 2019-20 at Department of Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola with Variety Uday (Mahabeej-1114) of maize, to investigate possible occurrence of natural enemies of *S. frugiperda* at Akola location and the effect of selected newer insecticides on them under field conditions. Average population of natural enemies was recorded on 10 randomly selected plants. Insecticides namely, Chlorantraniliprole 18.5 SC @ 4 ml/10 L, Spinetoram 11.7 SC @ 9 ml/10 L, Indoxacarb 14.5 SC @10 ml/10 L, Thiamethoxam 12.6% ZC + Lambda-cyhalothrin 9.5 % ZC @ 2.5 ml/10 L, Dimethoate 30 EC @ 12 ml/10 L, Spinosad 45 SC @ 3 ml/10 L and Emamectin benzoate 5% SG @ 4 gm/10 L were evaluated against natural enemies. During study we found few potential predators of fall armyworm namely, Ground beetle (Carabidae) in range of 0.14 to 1.38/plant, and spiders in range of 0.12 to 1.54 spiders/plant. Present investigation revealed that the treatments Spinosad 45 SC, Emamectin benzoate 5% SG and Chlorantraniliprole 18.5 SC are relatively safer to natural enemies i.e. spider and ground beetle larvae, while other treatments had deleterious effect and reduce the population of natural enemies. Rezac et al. (2010) showed that the Diflubenzuron, methoxyfenozide, acetamiprid and spinosad are harmless to predatory spiders in terms of mortality in comparison with Deltamethrin. Dai-bin et al. (2013) found Chlorantraniliprole relatively safe to spider species, *X. ephippiatus*. Wagh et al. (2017) found spinosad 45 SC @ 125 g a.i./ha, abamectin 1.9 EC @ 3g a.i./ha, chlorantraniliprole 18.5 SC @ 30 g a.i./ha and novaluron 10 EC @ 75 g a.i./ha safer to the predatory coccinellids. Shylesha et al. (2018) recorded natural enemies *viz*., *Telenomus* sp., *Trichogramma* sp., *Glyptapanteles creatonot, Campoletis chlorideae a*nd common earwig, *Forficula* sp. Abdullah et al. (2019) reported that the Emamectin benzoate and lufenuron are relatively

safer for *Coccinella septempunctata*, *Apis mellifera* and *Chrysoperla carnea* in compared to methoxyfenozide and chlorpyrifos.

ITAHAS/AB/2023/266

Rapid RT-LAMP assay for detection of heavy metals in milk

Sanjay Sharma[1], Ankita Kapri[2], Mansi Joshi[2], Suneel Kumar Onteru and Dheer Singh*

Molecular Endocrinology, Functional Genomics and Systems Biology Laboratory, Animal Biochemistry Division, National Dairy Research Institute, Karnal, Haryana, India

Milk is a primary source of nutrition consumed by the people of every age group. In some industrial areas, due to excess of heavy metals in the environment, the milk might get contaminated with these heavy metals. These heavy metal reaches liver, which is the primary organ for detoxification of xenobiotics. In liver cells, heavy metals can cause alteration in the expression levels of certain genes which are responsive for heavy metal toxicity. This change in gene expression level can be utilised as a potent strategy to develop a cell-based biosensor for the detection of heavy metals in milk. Therefore, the present study was designed to analyse the expression level of different genes responsive to heavy metal toxicity as per the CTD database and previous literature. The gene expression level of several genes such as AHR, CYP1A1, CYP1A2, TNF-α, CASPASE-9, 3, 7, ER-α, MAPK1, ALBUMIN as well as HMOX1 were analysed in HepG2 cells at different dose and time intervals after treatment with Lead and Cadmium. The heavy metals, Lead and Cadmium, were chosen in the present study based on their higher prevalence in the milk and environment, as per the previous literature. It was found that the expression of these genes was increasing after the treatment with both Lead and Cadmium at different dose and time. Conclusively based on the gene expression data, HMOX1 gene was considered as a molecular marker for both Lead and Cadmium toxicity, as the gene expression of HMOX1 gene was increasing linearly as per increasing dose and time intervals. HMOX1 is basically responsible for the degradation of heme group into biliverdin that is further reduced to bilirubin by biliverdin reductase, one of the primary bile acids. Therefore, the levels of bilirubin were also measured in the spent media after heavy metal treatment. It was found that the level of bilirubin was increasing in the media after 6 hours of treatment with both lead and cadmium. Therefore, a cell-based RT-LAMP assay was developed using HMOX1 gene to detect heavy metal toxicity in milk. The RT-LAMP reaction was optimized at

different RNA concentrations and time to distinguish the color change between control and treatment group. Further, for the validation of the developed assay, milk was spiked with a known concentration of heavy metal (10µg/ml) which was further diluted with media to produce the desired concentration of treatment viz. 100, 200 and 300ng/ml for lead and 10, 100, 200ng/ml for cadmium. These samples were then used to treat the cells, RNA was isolated and used for LAMP. The LAMP reaction was then performed for different treatment doses and time intervals and the color change was quantified by means of RGB quantification using ImageJ software. Finally, RT-LAMP assay was developed to screen Lead and Cadmium contamination in milk using HepG2 cells even after 6 hours of treatment. This strategy can be further used to estimate the amount of heavy metals (Lead and Cadmium) present in milk by simply treating the cells with milk, then RNA can be isolated and RT-LAMP can be performed. The standard curve prepared in the present study can be used to extrapolate the amount of heavy metals in the sample by means of RGB quantification.

ITAHAS/AB/2023/267

Study on population dynamics and biorational management of *Helicoverpa armigera* (Hubner) in Chickpea

Saurabh Singh[1] and B. K. Singh[2]
Department of Entomology, College of Agriculture
Banda University of Agriculture & Technology, Banda, UP

Chickpea (*Cicer arietinum* L.) is a major source of protein (22.5%), carbohydrates (58.9%) and fats (52%) to the vegetarian population. It also fix atmospheric nitrogen and maintain the soil in better physical condition and richer in nitrogen. Among the various factors responsible for low yield of chickpea as compared to potential yield, the losses caused by biotic and abiotic factors, out of biotic factors, insect pest are more prominent factor. The gram pod borer, *Helicoverpa armigera* (Hubner) is one of the major biotic constraint in increasing production and productivity of chickpea crop throughout the country. Injudicious use of pesticides against this destructive pest, further ignites the problem of resistance, resurgence and environmental and ecological imbalances. Present investigation envisaged to study on population dynamics and biorational management of *H. armigera* (Hubner) in chickpea. Experiments were conducted at Students Experimental farm of Banda University of Agricultural & Technology, Banda. Various observation were recorded *viz.* population dynamic of *H. armigera,* larval parasitization by *C. chlorideae*, effect of biorational pesticides against *H. armigera,* percent pod damage, yield of chickpea and cost: benefit ratio.The lowest population was recorded throughout the cropping period with 15th November date of sown crop and larval population recorded at only vegetative stage and when crop reached in reproductive stage larval population was nil. The highest percent parasitized was recorded in 49th standard week and in the month of December and population was recorded up to March. Indoxacarb is the best treatment as it exhibits lowest larval population, lowest pod damage, highest yield and highest cost: benefit ratio were recorded. It is advisable to sow the crop in the mid of November and when pest population reached at ETL, application of Indoxacarb give better result instead of bio-pesticides and subsistence phase.

Keywords: *Chickpea, population, Bio-pesticides and H. armigera.*

Mineralogical assessment of soils of Saraswati River palaeochannels across Haryana

Sawan Kumar[1*], Dinesh[2] and Sekhar Kumar[3]
[1,2,3]Department of Soil Science, CCS Haryana Agricultural University, Hisar, India

Palaeochannels are the old river courses either buried or extinct due to climatological, geological and geomorphological activities. The delineation of the palaeochannels of Sarasvati and Drishadvati in the northern parts of Haryana got a big boost by the discoveries of Harappan sites. 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 different physical, chemical and mineralogical characteristics of soils. Mineralogical assessment of the surface samples showed the presence Quartz in all the pedons alongwith some major silicate minerals such as Muscovite, Albite, Sodium silicate and some fractions of Halloysite and Vermiculite. Quartz, feldspar and muscovite-mica were the main minerals in the light sand fraction and opaque type of minerals like zircon, tourmaline, augite, hornblende and biotite in heavy fractions of sand. The soils of pedon 1, 2, 3, 4, 5 and subsurface horizons of pedon 7 and pedon 11 were having more SiO_4. The SiO_4 content was found to increase with depth or exhibited no particular pattern which may be attributed to sediment deposition. Al_2O_3 and Fe_2O_3 concentrations rose with depth, showing that almino-silicates and ferro-magnesium minerals had weathered at the surface and subsequently been enriched by leaching in the B-horizons. The irregular distribution of CaO and MgO showed the lithological discontinuity and the presence of Na_2O and K_2O showed the weathering of sodium and potassium in feldspar minerals. The distribution of minerals and low degree of pedogenic development was mainly due to the influence of preservation of sediment sequences with less time and lower intensity of weathering in Ghaggar river basin of Haryana and Punjab.

Keywords*: Palaeochannels, Saraswati, Quartz, Feldspar, Alumino-silicates.*

ITAHAS/AB/2023/269

Optimization via Response Surface Methodology using low–cost biomass for Methylene blue Removal

Sheetal Kumari and Manoj Chandra Garg
Amity Institute of Environmental Science (AIES), Amity University Uttar Pradesh, Sector-125, Noida-201313, Gautam Budh Nagar, (INDIA)

A significant class of organic pollutants known as dyes are known to be harmful to both people and aquatic habitats. Interest in agricultural-based adsorbents has increased in the water treatment industry, particularly around adsorption. This study used a *Triticum aestivum* as a biosorbent to remove methylene blue from an aqueous solution. The biomass of *Triticum aestivum* is characterized by its capacity to simultaneously absorb dyes from binary solutions, including methylene blue. These materials are generally available and inexpensive, although the cost can be significant in wastewater treatment batch trials. Fourier Transform Infrared Spectroscopy (FTIR) spectra showed the existence of functional groups, which are significant binding sites involved in the process of methylene blue biosorption. Additionally, a scan electron microscope (SEM) showed that new shiny particles had been absorbed on the surface of the *Triticum aestivum* after the biosorption process. A detailed assessment of the process's adsorption kinetics and isotherms is also presented. In conclusion, it has been shown that *Triticum aestivum* biomass is an effective biosorbent for the simultaneous bio-removal of methylene blue from wastewater effluents. It is also a promising, biodegradable, environmentally friendly, economical, and cost-effective biosorbent.

Keywords: *Agricultural waste, Biosorption, Isotherm study, Methylene blue, Optimization, Triticum aestivum.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/270

Effect of Spacing, Seed Tuber Size, and Bio-inoculants on Marketable and Unmarketable Potato Seed Tubers

Shivanjali Sarswat, Dr. Sandeep Chopra, Dr. Satish Kumar, Dr. Brajeshwar Singh and Dr. Devinder Sharma
Sher-e-Kashmir University of Agricultural Science and Technology, Chatha

The effects of spacing, seed tuber size, and bio-inoculants on the yield of marketable and unmarketable potato seed tubers are investigated in this study. It investigates the impact of various planting spacing, seed tuber size, and bio-inoculant efficiency on marketable and unmarketable yield of potato. All those tubers that are diseased, rotten, insect attacked, deformed tubers and under sized (less than 15 mm in diameter) were considered as unmarketable tubers. It was found that Spacing, tuber size and bio-inoculant application greatly impact the yield of marketable and unmarketable tuber size. The study discovered that seed tuber size, spacing, and bio-inoculants all have an impact on unmarketable tuber yield. Although closer spacing and larger seed tubers increase the unmarketable tuber proportions, the efficacy of bio-inoculants varied depending on inoculant and disease pressures. These findings assist growers in optimising agricultural practises by employing proper spacing configurations, larger seed tubers, and appropriate bio-inoculants to maximise marketable yield while minimising unmarketable losses. The findings aid in the optimisation of potato production practises by giving growers with advice to boost marketable yield, reduce unmarketable losses, and improve tuber quality and further helps in building sustainable and efficient potato crop farming practises.

Keywords*: Bio-inoculants, Marketable and Unmarketable.*

ITAHAS/AB/2023/271

Performance of filter media for improving the irrigation water quality of village pond

Shrankhla Mishra, Sanjay Satpute* and Samanpreet Kaur
Punjab Agriculture University Ludhiana

With the increased addition of household wastewater in the village pond, the water quality of the pond was deteriorating rendering it unsuitable for irrigation. Therefore, a study was conducted to treat the pond water for making it suitable for irrigation using different types of filter media. The five types of filter media viz., biochar, activated charcoal, zeolite, fine sand and coarse sand were individually tested for the quality improvement of the pond water for irrigation. The water quality parameters, such as BOD, COD, TDS, TSS, TS, pH, and EC were analysed before and after passing through the filter media. The discharge of treated water for media thickness of 30 and 40 cm and water head of 10, 20 and 30 cm was passed through each filter media and discharge was collected for the water quality analysis. The BOD, COD, and TSS decreased by 12, 9.7 and 28%, respectively due to the combined effect of activated charcoal, zeolite and fine sand, respectively. To further enhance the performance of the -1 filter materials, the study was conducted with the controlled discharge of 5 and 8 l h -1 through the same thickness of filter media. The discharge rate of 5 l h, materials depth of 40 cm and water head of 10 cm decreased the values of BOD, COD, TSS and TDS -1 more efficiently than the uncontrolled flow of water and discharge rate 8 l h. The 40 cm depth of material was found more efficient than the 30 cm depth of material whereas there was an insignificant difference in the efficiency at 10, 20 and 30 cm heads therefore, the 10 cm head along with the 40 cm material depth was selected. Efficient materials based on the removal efficiency were selected (zeolite, activated charcoal, biochar and fine sand) and each selected material having a depth of 40 cm were put in the column one over the other by keeping course material at the bottom and finer at the top and water head 10 cm (Biochar, activated charcoal, zeolite and fine sand at top). Two cycles of 24, 48, 96 and 168 hrs duration were performed and treated water was collected at the outlet of the filter media for determination of quality parameters. For a combination of materials keeping the thickness of each material as 40 cm, the efficiency of 49, 57, 75, and 10% was achieved in terms of BOD, COD, TSS, and TDS.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/272

Environmental Issues & Sustainable Development

Shravan Kumar Maurya[1], V. K Verma[2] and Mandeep Kumar[3]
[1,3]Ph.D. Research scholar, Department of Agronomy,
[2]Professor Department of Agronomy
Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (UP)

Humans and the environment are interconnected in many ways. Air, water, land, sunlight, plants, and animals are all parts of the environment. The interdependence of plants and animals. Without the other, neither can survive. They fulfil each other's basic needs in a satisfying way. All animals release carbon dioxide, which is one of the constituents in food for the plants, while plants supply food resources for the animals. As a result, the planet cannot function without a healthy ecosystem. Since humans are logical creatures, it is their responsibility to preserve natural balance. But many human activities have put the environment in danger in the name of development. Global warming, pollution of the environment, climate change, natural disasters, acid rain, resource depletion, extinction of some bird species, etc. are a few of the major environmental concerns. Humans are to blame for these issues due to their actions, which include population expansion that is out of control, deforestation, industrial development, technical advancement, the creation of contemporary communication systems, a lack of environmental awareness, overfishing, etc. Even while these actions are essential to the advancement of human civilization, they cannot in any way be disregarded. They are controllable and can be done. For instance, to prevent population growth that is out of control, we should adopt the policy of two children; deforestation must be followed by reforestation; industrial wastes should be handled before being released from factories; and we should use as few cars as possible for transportation.

Keywords: *Climate, environment, sustainable development.*

ITAHAS/AB/2023/273

Wildlife as Bio resources: Issues and Challenges

Shreya Shivani[1] and Vinayak Pai[2]
[1]Research Scholar, College of Forestry, Sirsi
[2]Assistant professor, College of Forestry, Sirsi

Bio resources also known as biomass, which designates all the biological material and biotic elements from the ecosystems such as plants, animals, micro-organisms or bio-wastes. Wildlife is one of the important bio resources refers to undomesticated animal species, but has come to include all organisms that grow or live wild in an area uninhibited by humans. Wildlife exist in different ecosystem specially forest. In recent scenario, rapid urbanization is taking place at global level which leads to considerable impact on the environment. Human activity, particularly overconsumption, population growth and intensive farming that humans have unleashed a sixth mass extinction event. Many human wildlife interactions were noticed *viz*., illegal wildlife trade, hunting and gathering, religion, media and wildlife tourism etc. Illegal wildlife trade is widespread and constitutes one of the major illegal economic activities comparable to the traffic of drugs and weapons. Wildlife trade is a serious conservation problem, has a negative effect on the viability of many wildlife populations. Today, hunting, fishing and gathering wildlife is still a significant food source in some parts of the world. Many animal species have spiritual significance in different cultures around the world and their products may be used as sacred objects in religious rituals. Wildlife has long been a common subject for educational televisions. Wildlife tourism, in its simplest sense, is interacting with wild animals in their natural habitat, either by actively (e.g. hunting/collection) or passively (e.g. watching/photography). Many causes leads to destruction of wildlife, which includes Overkill, habitat destruction and fragmentation, impact of introduced species and chains of extinction. Main concern should be to instill the conservation measures and also to spread the importance of wildlife, not leading them towards extinction, which can be done by pressurizing the human animals to conserve the fellow non-human animals. As finally there are moral arguments every day that all species have the right to exist and it's high time that these words are better put into action.

Keywords*: Bio resource, Urbanization, Habitat destruction.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/274

Effect of Zeolite on Potassium Use Efficiency of Maize Crop Grown in an Inceptisol

S. R. Ingle[1*], S. R. Shelke[2] and K. Navya[3]
[1]Ph.D. Scholar, Dept. of Soil Science and Agricultural Chemistry, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri (MS)
[2]Assistant Professor, Dept. of Soil Science and Agricultural Chemistry, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri (MS)
[3]M.Sc. (Soil science), Dept. of Soil Science and Agricultural Chemistry, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri (MS)

An experiment entitled "Effect of zeolite on potassium use efficiency of maize crop grown in an inceptisol" was undertaken during summer 2022, at Department of Soil Science and Agricultural Chemistry, M.P.K.V., Rahuri, with an objective to access the effect of zeolite on nutrient use efficiency of potassium. The experiment was laid out in a randomized block design with three replication and ten treatments comprised of T_1 - Absolute control, T_2 - GRDF (120:60:40 N, P_2O_5, K_2O kg ha^{-1} + FYM 10 t ha^{-1}), T_3 - Zeolite @ 400 kg ha^{-1}, T_4 - Zeolite @ 600 kg ha^{-1}, T_5 - Zeolite @ 400 kg ha^{-1} + 50% K_2O of RDF (20 kg ha^{-1} K_2O), T_6 - Zeolite @ 400 kg ha^{-1} + 75% K_2O of RDF (30 kg ha^{-1} K_2O), T_7 - Zeolite @ 400 kg ha^{-1} + 100% K_2O of RDF (40 kg ha^{-1} K_2O), T_8 - Zeolite @ 600 kg ha^{-1} + 50% K_2O of RDF (20 kg ha^{-1} K_2O), T_9 -Zeolite @ 600 kg ha^{-1} + 75% K_2O of RDF (30 kg ha^{-1} K_2O), T_{10} - Zeolite @ 600 kg ha^{-1} + 100% K_2O of RDF (40 kg ha^{-1} K_2O). From the findings it was observed that the significantly highest uptake of N, P, K (213.30, 23.16 and 140.24 kg ha^{-1}) and micronutrients viz., Fe, Mn, Zn and Cu (2548.83, 1210.53, 913.27 and 141.87 mg kg^{-1}) was in treatment T_{10} over rest of treatments except T_9 which was at par with T_{10} in respect to nitrogen and phosphorus uptake but in case of potassium uptake treatment T_7 is found to be at par with treatment T_{10}. The potassium use efficiency was significantly influenced by the application of different levels of zeolite and potassium after harvest of maize. The highest potassium use efficiency (92.50%) was observed in treatment T_{10} i.e., Zeolite @ 600 kg ha^{-1} + 100% K_2O of RDF (40 kg ha^{-1} K_2O) over rest of the treatments except T_9 i.e., Zeolite @ 600 kg ha^{-1} + 75% K_2O of RDF (30 kg ha^{-1} K_2O) with potassium use efficiency (91.66%) was statistically at par with treatment T_{10}.

ITAHAS/AB/2023/275

A Study of Growth Rates showing Agricultural Diversification in Uttarakhand

***Somya Misra[1] and H.N. Singh[2]**

[1]Assistant Professor, School of Agriculture, Graphic Era Hill University, Dehradun-248002, Uttarakhand, India

[2]Professor, Department of Agricultural Economics, College of Agriculture, G.B. Pant University of Agriculture and Technology, Pantnagar-263145, Uttarakhand, India

Diversification is an important part of the changing economy especially for a country like India with varying agro-climatic conditions. Conceptually the term "diversification" has been derived from the word "diverge" which means to move in different directions from a common point. Agricultural diversification can be defined as shift from the regional dominance of one crop (like rice) to another crops (like oilseeds), or from one enterprise (like crop based) to another enterprise (like livestock) or to engage in other complimentary activities. Shrinking size of land holdings, rise in per capita income as well as growing consciousness about health has lead to the shift in the consumption patterns of people thus inclining in favour of high value food commodities like fruits, vegetables, dairy, poultry, meat and fish products from staple food such as rice, wheat and coarse cereals in the recent years. Such a shift in consumption pattern in favour of high value food commodities has brought a change in farming patterns, this transformation is leading toward a silent revolution of agricultural diversification. The present study was done with the aim to study the pattern of growth of various crops and other agri-commodities. The growth rates were calculated for the year 2000-2020 and it was found that growth rate of horticultural production is 4.84% which is more than total food grains production growth rate of 2.34%. Fruits and vegetables are considered to be protective food as they contain various vitamins and minerals. Under horticulture, specifically fruits and vegetables have a good rise owing to the growing health awareness among the people of about 5.05% and 4.75% respectively in the last twenty years. Milk and egg production have also seen a growth of 4.81% and 5.99 % respectively during the last twenty years. Meat production has seen a high growth of 9.55% during the period 2000-2020. The study showed that there has been a paradigm shift in the farming activities taken up by farmers. Over the years production of traditional crops is being substituted by various others agri-commodities, thus diversification is catching pace in India. Horticultural crops mainly fruits and vegetables, milk,

eggs, etc not only fetch good price as compared to the cereal grains but also have various secondary agriculture activities attached with them which can help to earn additional income to the farmers. Agricultural diversification is one of the several pathways that lead to agricultural development. Thus, diversification of agriculture is an important strategy to stabilize and enhance farm incomes, increase employment opportunities as well as conserve natural resources.

Keywords*: Diversification, income, growth rate, secondary agriculture.*

ITAHAS/AB/2023/276

Studies on performance and morphometric characterization of Pole Type French bean genotypes under Mid-Hill Conditions of Himachal Pradesh

Srishti*[1], Hem Raj Sharma[2] and Akhilesh Sharma[3]

[1]Ph.D Scholar, Department of Vegetable Science and Floriculture, CSKHPKV, Palampur, (HP)

[2]Former Professor and Head, Department of Vegetable Science and Floriculture, Dr. YSP UHF, Nauni, Solan, (HP)

[3]Professor, Department of Vegetable Science and Floriculture, CSKHPKV, Palampur, (HP)

French bean (*Phaseolus vulgaris* L.), a member of Fabaceae family, is one most popular and short duration of the principal legume vegetable crops with a chromosome number 2n = 22. In the present investigation, mean performance and morphological characterization was determined for yield and its contributing characters of twenty-nine pole type genotypes of French bean during *Kharif,* 2020 with the objective of discovering desirable traits that contribute to increased pod yield. Study reported considerable variation amongst the genotypes for the observed agro-morphological traits such as flower colour, pod colour, pod shape, stringiness and seedcoat colour. Based on agronomic performance, the minimum days to first picking (56.67 days) was recorded by the genotype LCPB-12 while, maximum days to first picking (83.00 days) was observed in LCPB-15. Longest harvest duration was recorded in LCPB-3 (46.67) while, LCPB-17 (24.00) exhibited shortest harvest duration. The genotype LCPB-1 was found highest in number of pods per plant (42.33) followed by LCPB-12 (38.11). Highest pod length was recorded in LCPB-12 (17.56 cm). Genotype LCPB-6 recorded highest pod weight (7.53 g). Maximum plant height was recorded in LCPB-1 (204.00 cm). Pod yield per plant was found highest in the genotype Kentucky Wonder (220.50 g) followed by LCPB-1 (217.65 g). The genotype LCPB-1 could be taken under multi location testing program for accessing its suitability and adaptability in French bean having pole type growth habit.

Keywords: *agro-morphological traits, French bean, mean, Phaseolus vulgaris, Pole type.*

Optimizing Multiple shoot induction in *Litsea cubeba* (Lour.) Pers

Sukni Bui[1], Madhu Kamle[1] and Pradeep Kumar[2]
[1]Department of forestry, North Eastern Regional Institute of Science and Technology, Nirjuli, Arunachal Pradesh, India
[2]Department of Botany, University of Lucknow, Lucknow, India

Litsea cubeba, commonly known as the May Chang or Mountain Pepper, is an important aromatic plant known for its medicinal and commercial value. It's essential oil is widely used in the fragrance and cosmetics industries. The plant has been extensively studied for its chemical composition and pharmacological properties, with several studies demonstrating its potential as a natural remedy for a variety of ailments. In this study, we aimed to establish an efficient protocol for the shoot proliferation of *L. cubeba* through *in vitro* techniques. Shoot tips, nodes, leaves were used as explants for the initiation of cultures. The explants were sterilized and placed on Murashige and Skoog (MS) medium supplemented with different concentrations of plant growth regulators (PGRs) such as cytokinins and auxins. Multiple shoots were successfully induced from the explants on the MS medium supplemented with indole-3-butyric acid (IBA) and 6- benzyl aminopurine (BAP). The best response was observed with a combination of 2.0 mg/L BAP and 0.5mg/L IBA, resulting in an average of 5-6 shoots per explant. The presence of L-ascorbic acid (100mg/L) in the culture medium prevented the phenolic leaching. This study provides an efficient and reliable method for further plantlet regeneration of *L. cubeba* through shoot induction. The ability to rapidly propagate this valuable plant will not only aid in its conservation but also contribute to its commercial cultivation for various purposes, including the extraction of essential oils and pharmaceutical applications.

ITAHAS/AB/2023/278

Impact of Farmer Producer Organisations in Rajasthan

Sunita Tevatiya[1]*, Chubamenla Jamir[2], and Sapna Narula[3]
[1]Ph.D. Scholar at TERI School of Advanced Studies, New Delhi, India
[2]Kanoi Foundation, New Delhi.
[3]School of Management Studies, Nalanda, Bihar

A Farmer Producer Organisation (FPO) is an inclusive idea that addresses challenges being faced by farmers, particularly small and marginal farmers. It provides numerous services to farmers which includes financial, marketing-related, technological and educational, organizational and pertaining to production services. Therefore the need to assess the socio-economic impact of FPO on its members was felt. The study was conducted in three districts of Rajasthan namely Sriganganagar, Hanumangarh, and Bikaner. These were purposively selected as they are agriculturally developed districts of the state. One functioning FPO was selected from each district. From each selected FPO, 100 members were randomly selected making a sum of 300 farmers from three FPO which were compared with nonmember farmers. Thus a total number of 600 respondents were surveyed, and primary data was collected through a structured questionnaire. For assessing the impact of FPOs Difference in Difference (DID) method has been used. It was found that FPOs had a favorable and significant impact on livelihood patterns, which encompass six factors such as economic, educational, nutritional, health-related, and social empowerment . Sriganganagar district's FPO was showing a positive and significant impact on the economic and social life of members of the FPO. Similar socioeconomic effects of FPO interventions were observed in the districts of Bikaner and Hanumangarh, except for the habitat pattern. The socioeconomic analysis will impart an in-depth understanding of the socioeconomic characteristics of the farmers. The research will help in designing and improving policies and programs for supporting sustainable livelihood through FPOs so that member farmers get better standard of living and improved quality of life. It will also aid the policy planners, academicians, scheme implementing agencies, and researchers to conduct further research on FPO -farmer interplay.

Malla Reddy University, Hyderabad and Just Agriculture Education Group

Keywords*: Farmer Producer Organisation, Impact, Difference in Difference, Farmers.*

ITAHAS/AB/2023/279

Nanoherbicides- A Novel Approach for Effective Weed Control

Supunya Nath
M.Sc. Agriculture, Department of Agronomy, College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha-751003, India

Nanotechnology is defined as a group of emerging technologies in which the structure of the matter is controlled at the nanometre scale to produce materials having unique properties. Nanotechnology has potential to get rid of weeds by using Nano-herbicides in an eco-friendly way, without leaving any toxic residues in soil and environment. Nano-herbicides are being developed to address the problems in perennial weed management and exhausting weed seed bank. Nano-encapsulation of herbicides is a delivery method in which an active ingredient is covered with various materials of different sizes in nano range and released in a controlled way for achieving season long weed free condition. The target specific release is also helpful in killing the weeds without even interacting with the crop plants and ultimately results in a higher crop yield. Nano-herbicides, encapsulation, Nano-formulations and many other applications will revolutionize the agriculture.

Keywords*: Nanotechnology, Nano-herbicides, Nano-encapsulation, weed seed bank, target specific, Nano-formulations.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/280

Advances in Biological and Life Sciences

Surender and Monika
CCS Haryana Agricultural University, Hisar - 125004, Haryana, India

Advances in Biological and Life Sciences have had a significant impact on our understanding of the living world. These fields encompass the study of all living organisms and their interactions with each other and the environment. In recent years, there have been remarkable breakthroughs in the biological and life sciences, resulting in a deeper understanding of the complexity of life and leading to significant advancements in healthcare, agriculture, and environmental science. One of the most significant advancements in the biological and life sciences is the development of gene editing technologies such as CRISPR-Cas9. This technology allows scientists to edit specific genes in organisms, leading to improved disease treatment, genetic modificationsof crops, and animal breeding. Another notable advancement is in the field of personalized medicine, where doctors can tailor treatments to an individual's genetic makeup, leading to better outcomes for patients. Moreover, the use of artificial intelligence and machine learning in biological research has revolutionized the way scientists analyse and understand complex data sets. The integration of these technologies has led to improved diagnoses, drug development, and a better understanding of genetic disorders. In addition, advances in biotechnology have led to the development of new vaccines and treatments for diseases. The COVID-19 pandemic demonstrated the importance of rapid vaccine development, with mRNA vaccines developed in record time. In addition, scientists are developing new treatments for cancer, Alzheimer's disease, and other debilitating conditions. Finally, in the field of environmental science, advancements have been made in understanding the impact of climate change on ecosystems, and the development of sustainable agriculture practices. This knowledge will help in the creation of policies and practices that aim to mitigate theimpact of climate change on the environment. In conclusion, the biological and lifesciences are rapidly advancing, leading to significant improvements in healthcare, agriculture, environmental science, and other areas. As technology continues to evolve, we can expect to see even more remarkable breakthroughs in the years to come.

Keywords*: COVID-19, Alzheimer's disease, mRNA vaccines and sustainable agriculture.*

ITAHAS/AB/2023/281

Impact of Covid 19 on Education

Jagdale Swati Uttam
Ph.D Scholar, College of Agriculture, Dapoli
Dr. Balasaheb Sawant konkan Krishi Vidyapeeth, Dapoli

Education has been severely impacted by COVID-19's devastation. Schools, colleges, and universities have all been significantly impacted. Over 800 million students worldwide are affected, 1 in 5 cannot attend school, 1 in 4 cannot enrol in higher education classes, and 102 countries have ordered nationwide school closures while 11 have implemented localised school closures, according to the United Nations Educational, Scientific and Cultural Organisation (UNESCO). *"Governments and civil society concerted efforts that mobilise resources, and expertise to address the impact of COVID-19 on education is urgently required. This process should include developing long term strategies to address the needs of education in emergencies"* Global campaign for education, Global Coordinator.COVID-19 outbreak has caused a downward spiral in the world economy and caused a huge impact on the higher education system. The sudden closure of campuses as a social distancing measure to prevent community transmission has shifted face-to-face classes to online learning systems. Emerging evidence from some of the region's highest-income countries indicate that the pandemic is giving rise to learning losses and increases in inequality.The higher education institutions and universities need to plan the post-pandemic education and research strategies to ensure student learning outcomes and standards of educational quality. the closure of school and university will not only have a short-term impact on the continuity of learning of young learners but it will have a large effect on the economic growth of the country as well as having large effect on the society.

Hi-Tech Horticulture: A boon for the future world

Syeda Simran Zaffor[1*], Richa Bora[2] and Dr. Abu Syed Nuruz Zaman[3]

[1]Daffodil College of Horticulture, Khetri, Kamrup (M), Assam, India

[2]Department of Genetics & Plant Breeding, Assam Agricultural University, Jorhat, Assam, India

[3]Zonal Research Station, Assam Agricultural University, Karimganj, Assam, India

By 2050, there will be more than 9 billion people on the planet, with tropical areas home to half of them. There will therefore be a greater requirement for food production. Poor farmer productivity and low income are major issues in the SAARC countries. Hi-Tech Horticulture is a better option to increase the production and productivity of horticultural crops and, as a result, the revenue of farmers. The use of genetically modified (GM) crop varieties derived from biotechnology and genetic engineering, micro-propagation, integrated nutrient management, plant protection, protected cultivation, precision farming, organic farming, mechanisation, use of modern immuno-diagnostic techniques for quick detection of viral diseases, value addition, and post-harvest processing are all examples of hi-tech horticulture. Hi-tech horticulture is a contemporary, less dependent on the environment, and capital-intensive technology. To maintain productivity and economic stability for Indian farmers in the new era of climate change, hitech horticulture has become essential. Various advanced propagation techniques, such as soil less media, plugtray seedling production, propagation under insect proof net, and tissue culture, etc., are the key hitech interventions for the production of healthy, disease-free, and quality planting materials as well as raising the productivity of horticultural crops. Because these nations have already embraced hi-tech interventions in horticulture production, developed countries have much higher horticultural productivity and farmer incomes than SAARC nations. Various studies stated that high-tech horticulture encourages horticultural crops to produce more and be more productive. Hi-Tech Horticulture will be used in SAARC countries as a more scientific technique to increase horticulture production and produce of higher quality, which would ultimately assist double the farmer's income.

Keywords: *Horticulture, Hi-tech horticulture, protected cultivation, SAARC countries.*

ITAHAS/AB/2023/283

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.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/284

Climate change towards climate resilient agriculture and its sustainability

Tejeswini Pedada
Department of Agronomy and Agroforestry, Centurion University of Technology and Management, Odisha, India

Climate change, caused by an anthropogenic activity is a universal phenomenon across the globe. Agriculture remains important in driving economic transportation, sustainable livelihoods and development in developing countries. Increase in CO2 concentration in atmosphere is the root cause of the climate change which is responsible for global warming. Increasing emission of greenhouse gas (GHS) is trapping the heat within the earth's atmosphere resulting in the rise in the temperature i.e., global warming. Another factor is seasonal rainfall pattern having significant importance to influence the agro-ecosystem. Different weather events such as heat wave, cold, cyclone, hail storm etc also affect the crop performance within short span of time. Widespread hunger and poverty continue to be among the most life-threatening problems confronting mankind. Adoption of climate resilient agriculture is the key point of achieving the sustainability, profitability and productivity of the agricultural produce. It is necessary to adopt the climate change with such intelligence that it will bring sustainability in the crop and farm income. It has become very important to manage the resource, environment efficiently and social safeguards, sustainable approaches and long vision in agriculture should be adopted. In traditional manner for increasing the farm productivity, transfer of technology can be adopted. But while considering the climate change and variability, the farmers should adopt these technologies in quick manner in order to increase their resilience towards increase in threats of drought, flood and other climate hazards. So, utilization of this resilience agriculture will ease to manage the sustainability of the natural resources, improves the soil health which leads to enhance the crop productivity which in turn will make farmer self-resilient and will help to sustain their socioeconomic status.

ITAHAS/AB/2023/285

Behavioural consequences and exploring networks among Indian population on mental health issues and insomnia during covid-19 pandemic

Umamah M[1], Mufti A[2], Kashif Ali[3], Farooqi I[4], Renu Dhupper[1], Manoj Chandra Garg[1], Deepak Kumar[5] and Khan A S[1]

[1]Department of Environmental Sciences, Amity University Noida-201313, India
[2]Department of Physiology, All India Institute of Medical Sciences-110029, India
[3]Department of Physiology, Jamia Millia Islamia-110025, India
[4]Department of Environmental Engineering, Aligarh Muslim University-202002, India
[5]Department of Geoinformatics and Remote Sensing, Amity University Noida-201313, India

Background: On March 25th 2020, the Indian Government enforced and announced the national lockdown to control the viral infection and to reduce physical social contact with infected and exposed COVID-19 people. People were isolated and home quarantined with limitations in every outdoor activity. Previous studies have postulated that this type of isolation create a negative impact on the psychological aspect on those who have infected and their families, which may leads to sleep disturbances and post-traumatic stress. **Aim:** We aim to assess neuro psychological impact on sleep quality and sleeping habits and other mental health issues in Indian population due to the COVID-19 pandemic. **Methods:** This study is an online survey on college students friends and others to enlarge the sample size to assess the effects of covid-19 on sleeping habits using PSQI, WHOQol, DASS-21 questionnaires. **Results:** 1147 participants filled the questionnaire 64.1% participants have some knowledge and 35.9% have full knowledge about COVID-19. We found a significant difference in the WHOQOL & DASS-21 between the male and female participants (p=0.0001) and age (18-39 years & 40-64 years) (p=0.0001). There was significant difference in the WHOQOL (p= 0.0002) & DASS-21(p=0.0001) with education level (bachelors and above or without bachelors) and occupation (government job/ private job) WHOQOL (p=0.0001) DASS-21(0.0001). There was no significant difference between the average monthly family income groups (p > 0.05). Participants of majority and other religious groups showed a significant difference in WHOQOL (p=0.0001) and DASS-21 score (p=0.0001). 50% students reported delay in bed time, 36% reported

increase in number of minutes to fall asleep. Usual getting up time was delayed in 47%, Number of hours of sleep per night was increased in 43%. Despite increase in number of hours of sleep we found that the proportion of poor sleepers (i.e., PSQI > 5) increased from 28% to 38%. **Conclusion**: We conclude that effective psychological interventions are needed which may be helpful in curing these deteriorations in sleep quality and to maintain daytime productivity in students.

Keywords*: Corona Virus, COVID-19, Pandemic, Mental Health, Psychological issues, Anxiety, Depression, Stress, Public health, sleep.*

ITAHAS/AB/2023/286

Enhancement of Nutrient Availability in Soil using Siderophore Producing Microorganisms in Green Gram (*Vigna radiate L.*)

Amolic U.V.*, Margal P.B. and Titirmare N.S.
Department of Soil Science and Agricultural Chemistry,
Mahatma Phule Krishi Vidyapeeth, Rahuri 413722, Maharashtra

Field experiment was conducted during *kharif* season at Research Farm, Department of Soil Science and Agricultural Chemistry, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani on iron deficient Vertisol to study the enhancement of nutrient availability in soil using siderophore producing microorganisms in green gram crop. Before starting field trial the promising microbial isolates were evaluated in laboratory condition for their siderophore producing capacity in control condition in CAS agar media. Only selected isolates were used in field trial on the basis of laboratory results for siderophore producing capacity. Field experiment consists of ten treatments replicated thrice in randomized block design. Seed treatment of green gram was done with selected siderophore producing microbial cultures along with *Rhizobium phaseoli* at the time of sowing with soil application of recommended dose of NPK. Results of lab experiment indicated that *Pseudomonas flurescens* produced highest per cent siderophore (75%) on CAS agar plate followed by *Azospirillum lipoferum* (67%). Further, the results of field experiment emerged out indicated that seed and straw yield, soil properties, biological properties, microbial properties and enzymatic activity were improved with all the siderophore producing microorganisms along with *Rhizobium phaseoli.* However, highest seed yield was noted with seed treatment of RDF + *Rhizobium phaseoli* + *Pseudomonas flurescens i.e*. 848.80 kg ha^{-1} which was higher as compared to uninoculated control. Application of siderophore producing microorganisms along with *Rhizobium phaseoli* also enhanced the growth attributes and improved the iron availability to the crop. RDF + *Rhizobium phaseoli* + *Pseudomonas flurescens* was found as the best combination in overall improvement of yield attributes, soil properties, microbial population, biological properties and enzymatic activities in soil.

ITAHAS/AB/2023/287

Enzyme Assisted Extraction and Analysis of Essential Oil from Zingiber Zerumbet

[1*] V .V. Tejaswini, and Harshitha .P

[1]Assistant Professor, Department Agricultural Engineering, SOAS, Mallareddy University, Hyderabad

[2]PG student, Department of food processing technology, Anand agricultural University, Anand

Zingiber zerumbet is a perennial, aromatic and tuberose plant that grows in humid locations. It has various pharmacological activates, which is due to zerumbone, a crystalline monocyclic sesquiterpene. It is mainly present in the volatile oil, which is extracted by hydrodistillation methods. The present work describes the feasible method of extraction of essential oil from zerumbet. Few extraction techniques generally applied are conventional solvent extraction, microwave-assisted extraction, ultrasonic-assisted extraction and hydro-distillation. In the present investigation, enzyme-treatment of dry zerumbet powder with various enzymes that have impact on the extraction feasibility of essential oil is tested. The variation in the enzyme concentration to optimize the extraction efficiency was checked. After, enzyme concentration was optimized, the incubation time and temperature of incubation was varied by keeping one variable at a time. *Zingiber zerumbet* powder was treated with enzymes like pectinase, viscozyme, hemicellulase, cellulase amylase, and bio-protease N enzyme for herbal extract. At the temperature of 30 ºC and incubation of 1 h with different enzymes, the essential oil yield was measured. The result indicated that there is significant increase in the oil yield (25%, 4% overall oil yield) compared to the untreated sample (3.2% overall oil yield). Under the optimized conditions such as 2% enzyme treatment with incubation of 1 h at 30 ºC, the net oil recovery was accounted to be 2.5% to 25% with respect to different enzymes. Enzymes such as pectinase, viscozyme, amylase and hemi-cellulase afforded 25% more oil yield while cellulase afforded 19% more, enzyme for herbal extract afforded 12.5% more and bio-pectinase-N afforded 2.5% more oil. The GC profile of all the extracts was carried out and GCMS of the oil indicated the major compound as zerumbone as accounted by earlier reports.

ITAHAS/AB/2023/288

Factors Affecting the Marketing Efficiency of Fresh Mango Supply Chain in Nellore District of Andhra Pradesh

Vankadari Jyotsna Devi [1], Dr. J. D. Bhatt [2] and Dr. Sudhakar Tallapragada [3]

[1]Student of Junagadh Agricultural University PGIABM, Junagadh, Gujarat

[2]Assistant professor at Junagadh Agricultural University, PGIABM, Junagadh, Gujarat

[3]CEO at IFFCO Kisan SEZ

Mango, an ancient tropical fruit crop, boasts an annual production of 8.50 million tonnes in India. Despite being a tropical plant, mango thrives across a wide range of temperatures, particularly in tropical and sub-tropical conditions. The profitability of mango cultivation is evident, especially in semi-arid regions with adequate irrigation. The research identifies key factors influencing marketing efficiency and highlights strategies for improvement. Primary data from 120 farmers and 30 traders is analyzed to optimize these factors and maximize returns on investment. Channel-III is recognized as an efficient marketing channel, and leveraging modern technologies such as eliminating middlemen and commission agents can lead to higher returns for farmers. Emphasizing efficient post-harvest management techniques, exploring direct marketing channels, and fostering partnerships with industries and organizations are essential for enhancing profitability. The study employs Interpretive Structural Modeling (ISM) to identify fifteen factors impacting marketing efficiency and develops an ISM model as a decision-making tool for farmers. Four primary drivers, including technological advancements, education levels of farmers, changes in the marketing system, and proper governance, significantly improve marketing efficiency and generate profits. The study reveals major constraints faced by growers and traders, such as the lack of processing centers, storage facilities, preservation methods, market infrastructure, and high transportation costs. Addressing these constraints and capitalizing on improvement factors can empower stakeholders to enhance marketing efficiency, driving economic development in the region.

Key words: *Mango, Marketing efficiency, ISM modelling, MICMAC analysis, Fresh mango supply chain, Constraints.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/289

Field efficacy of Plant Growth Regulators on the growth, physiological and yield parameters of Fenugreek, *Trigonella foenum graecum* (L.).

Vaidehi, G*[1]., Malarvannan, S[2] and Anandhi Lavanya, S.[3]
[1]Associate Professor, Department of Horticulture, School of Agriculture, Bharath Institute of Higher Education and Research, Chennai
[2]Associate Professor, Department of Entomology, School of Agriculture, Bharath Institute of Higher Education and Research, Chennai
[3]Associate Professor, Department of Plant Breeding and Genetics, School of Agriculture, Bharath Institute of Higher Education and Research, Chennai

A field experiment was conducted to elucidate the effect of plant growth regulators on Growth, physiological parameters and Yield in Fenugreek (Trigonella foenum graecum (L.) CV.RMT-305. The study was done at Puthur farm of Bharath Institute of Higher Education and Research, Chennai during January to May 2022. Ten different treatments (T1-GA3 50 ppm, T2-GA3 100 ppm, T3-GA3 150 ppm, T4- NAA 10 ppm, T5-NAA 20 ppm, T6-NAA 30 ppm, T7-Ethrel 75 ppm, T8 Ethrel 100 ppm, T9-Ethrel 150 ppm and T10-water spray) were tested at three concentrations and replicated thrice. Treatments were sprayed uniformly to all the plots at 30 and 60 DAS and at harvest with hand sprayer. Plant height, Number of primary branches, Days to fifty per cent flowering, Chlorophyll content in Leaves and Number of pods per plant were documented. Foliar application of 100 ppm of GA3 significantly increased the plant height observed at 30 DAS and harvest whereas it was least in the control plot. NAA 30 ppm treated plants flowered earlier compared to control. The chlorophyll content of leaves at flowering and pod filling stage was highest in plots treated with NAA 20 ppm. Application of 20 ppm NAA recorded higher number of pods per plant.

***Keywords**: Fenugreek, Flowering, Chlorophyll, Ethrel.*

ITAHAS/AB/2023/290

Vermicompost – A Sustainable Agricultural Technology

P. Vaishnavi[1] and Bhagyalaxmi Sahu[2]

[1]Ph.D. Scholar, Department of Agricultural Extension Education, UAS, Dharwad, Karnataka

[2]M.Sc. student, Department of Agricultural Extension Education, UAS, Dharwad, Karnataka

Vermicompost is a valuable organic alternative to chemical fertilizers that can provide numerous benefits for sustainable agriculture also benefit for both farmers and the environment. The process of vermicomposting is one of the dimensions of secondary agriculture which generates income by way of utilization crop residues to enhance the crop productivity which creates self-employment among young who are unemployed and under-employed and also all categories of farmers, who can earn their livelihood from this enterprise. Keeping this point in view, the main objective of this study was to determine the knowledge and adoption of vermicompost and to find out the factors contributing to the adoption of vermicompost technology. The present investigation conducted in Dharwad district of Karnataka involving 60 farmers who were randomly selected. Data was personally collected by the researcher with the help of structured pre-tested interview schedule and analyzed by applying appropriate statistical procedure viz., frequency, percentage, mean, standard deviation and correlation. The results indicated that, more than half of the farmers (55.00 %) had medium level of knowledge followed by 25.00 per cent and 20.00 per cent belongs to high and low knowledge level, respectively. Further, the results with respect to adoption level of vermicompost indicated that, nearly half of the farmers (43.33 %) had high adoption followed by 40.00 per cent and 16.67 per cent belong to medium and low adoption, respectively. The data clearly indicated that majority were in the category of medium to high of utilization vermicompost because they know the importance of the vermicompost. Among the selected variables, the variables viz, education, annual income, extension participation, mass media exposure and cosmopoliteness were positive and significantly influenced the adoption of vermicompost technology. The major constraints observed were lack of marketing facilities for vermicompost, unavailability of worms at right time,

lack of exposure to technology during the training session and lack of organic feed for earthworm species.

Keywords: *Vermicompost, Knowledge, Adoption, Secondary agriculture, Self-employment.*

ITAHAS/AB/2023/291

Integrated weed management in Phule Samarth variety of *kharif* onion (*Allium Cepa* L.) with new generation herbicides on growth attributing characters in black cotton soil of Western Maharashtra

Varnekar K.D., Jamdade S. S., Shete B. T. and Ilhe S. S.
Department of Agronomy, Mahatma Phule Krishi Vidyapeeth, Rahuri. 413722, Maharashtra, India

The field experiment has been conducted during *kharif,* 2021-22 at Seed Cell Unit, 'F' Block MPKV, Rahuri to assess the effect of integrated weed management on growth and yield of *kharif* onion. There were ten treatments laid out in randomized block design (RBD) with three replications. The experiment consists of ten treatments *viz*., T_1 Oxyflourfen 23.5 % EC (PE) @ 100 g a.i./ha.; T_2 Pendimethalin 38.7 % CS (PE) @ 677.25 g a.i./ha.; T_3 Oxyflourfen 23.5 % EC (PE) @ 100 g a.i/ha. fb Hand weeding 40 DAT; T_4 Pendimethalin 38.7 % CS (PE) @ 677.25 g a.i/ha. fb Hand weeding 40 DAT; T_5 Oxyflourfen 23.5 % EC (PE) @ 100 g a.i/ha. fb Quizalofop ethyl (PoE) 5 % EC @ 37.5 g a.i/ha at 30 DAT; T_6 Pendimethalin 38.7 % CS (PE) @ 677.25 g a.i/ ha. fb Quizalofop ethyl (PoE) 5% EC @ 37.5 g a.i/ha at 30 DAT; T_7 Oxyflourfen 23.5 % EC (PE) @ 100 g a.i/ha. fb Ready mix Propaquizafop 5 % EC + Oxyflourfen 12 % EC (43.75 +105) g a.i/ha at 30 DAT; T_8 Pendimethalin 38.7 % CS (PE) @ 677.25 g a.i/ha. fb Ready mix Propaquizafop 5 % EC + Oxyflourfen 12 % EC (43.75 +105) g a.i/ha at 30 DAT; T_9 Weed free check (2 Hand weeding at 20 and 40 DAT) and T_{10} unweeded check (control).

The mean plant height at 28, 56, 84 days after transplanting and at harvest were 30.19, 44.12, 53.24 and 50.65 cm, respectively. The mean plant height increased progressively with the advancement up to 84 DAT in the age of the plant. The plant growth rate in terms of plant height was more vigorous during the period of 28 to 84 days after transplanting and it was decreased slowly till harvest. At 28 DAT plant height gives non-significant response to different weed management treatments. Plant height ranging from 32.80 to 33.80 cm. The plant height was influenced significantly due to different weed control treatments. Treatment T_9 exhibited significantly highest plant height at 56, 84 and at harvest than the rest of the treatments. However, it was at par

with treatment T_6, T_7 and T_8. This might due to higher accumulation of photosynthesis in leaves, stem and less crop weed competition. Treatment T_{10} recorded lowest plant height at 56, 84 and at harvest.

The mean number of leaves plant^{-1} was 3.60, 8.56, 9.55 and 9.58 at 26, 56, 84 days after transplanting and at harvest, respectively. The mean number of leaves plant^{-1} was found to be increased progressively up to 84 DAT in crop age. Maximum number of leaves plant^{-1} was recorded at 84 DAT. At 28 DAT number of leaves plant^{-1}gives non-significant response to different weed management treatments. The difference in mean number of leaves plant^{-1} was influenced significantly at 56, 84 and at harvest stages of observations due to different weed control treatments. The mean number of leaves plant^{-1} under treatment T_9 was significantly higher than rest of treatments. However, at 56 DAT and at harvest it was at par with treatment T_6, T_7 and T_8. At 84 DAT it was at par with treatment T_8. The lowest number of leaves plant^{-1} were recorded from treatment T_{10}. This might be attributed to more competition for light, nutrients and space in the weedy check. Due to less crop weed competition in weed free check, application of post emergence and ready mix post emergence herbicide might have resulted in broad spectrum weed control during crop weed competition period and there by less competition for light, nutrient, moisture and space in the weed free environment.

The difference in mean neck thickness of onion was influenced significantly at all the stages of observations due to different weed control treatments. AT 56 DAT the mean neck thickness of onion under treatment T_9 was significantly desirable than rest of treatments. At 84 DAT and at harvest, it was at par with treatment T_4, T_6, T_7 and T_8. The lowest neck thickness of onion recorded from treatment T_{10}. This might due attribute to more competition for light, nutrients and space in weed check environment.

The mean dry matter plant^{-1} was 4.10, 6.93, 10.64 and 17.89 g at 28, 56, 84, DAT and at harvest, respectively. The average dry matter plant^{-1} was influenced significantly due to different weed control treatments. The mean dry matter plant^{-1} under weed free check treatment was significantly higher than rest of the treatments. However, at 28 DAT, 84 and at harvest it was at par with treatment T_8. At 56 DAT it was at par with T_4, T_6, T_7 and T_8. This might be due to higher accumulation of photosynthesis in leaves, stem and reproduction parts due to less crop weed competition. Less crop weed competition in herbicide treatment attributed to broad spectrum weed control during critical crop weed competition period due to application of post emergence and hand weeding also resulted reducing the weed density and weed dry matter and there with less crop weed competition.

ITAHAS/AB/2023/292

Demonstration on Solar Tunnel Dryer for Chillies

Er. Veena T[1], Dr.Hemalatha K J[2], Er.Sudha Devi G[3]
[1]Scientist, Processing and Food Engg, ICAR KVK Raichur
[2]Scientist, Horticulture, ICAR KVK Raichur
[3]Assistant Professor, Dept. of PFE, CAE Raichur

The solar energy option has been identified as one of the promising alternative energy sources for the future. Agriculture is the main source of livelihood in India. One of the most commonly used methods for preserving foods & agricultural product is drying. Sun drying is the most widely practiced agricultural drying operation in India. The solar tunnel dryer consists of different parts such as drying chamber, collector area and chimney. The drying chamber is covered with UV-stabilized polythene sheet, which is available at the local market. The solar tunnel dryer having semi cylindrical shape for increasing absorption of solar radiation. The dryer are made to open and close easily for the functions of spreading the drying product at the beginning of the day and cleaning the absorber surface and trays. Base of the tunnel dryer is covered with thermal insulation of one inch, in order to reduce the heat loss. The initial moisture content in red chillies is found to be 75%. The experiment on drying chilly is conducted in the solar tunnel dryer to evaluate the performance of the dryer under loaded conditions under Front line demonstration by scientists of ICAR KVK Raichur. The dryer is loaded at 9:00 am with 5 kg of chillies, by spreading the chillies inside in a single layer. The process is continued with the required moisture content is achieved. The ambient temperature during drying period varied from a minimum of 33.7^{0}C to a maximum of 44.5^{0}C. The corresponding average temperature inside the solar tunnel dryer ranged from 40.46^{0}C to 62.9^{0}C. It is observed that the temperature achieved maximum inside the solar tunnel dryer is 30^{0}C more than the ambient temperature at 14:00 hours. This is due to absorption of more solar energy inside the solar tunnel dryer and the prevention of heat loss from the tunnel dryer.

Crop Residue Management in Paddy

Er. Veena T[1], Dr.Hemalatha K J[2], Er.Sudha Devi G[3]
[1]Scientist, Processing and Food Engg, ICAR KVK Raichur
[2]Scientist, Horticulture, ICAR KVK Raichur
[3]Assistant Professor, Dept. of PFE, CAE Raichur

Paddy is a major crop is Raichur district, cultivated over one lakh ha area including kharif and rabi seasons. According to the statistics available with the department of Agriculture (2020-21) per ha production of rice is about 8500 kg/ha and average straw production is about 5 t/ ha. Collection and management of rice straw is a major challenge for the environmental and economic reasons. Collecting this huge amount of straw manually is a major challenge for the farmers because of the labour shortage and also due to bulkiness. This straw stored as well as stored fodder. Because of the mechanization in rice. Crop residues are natural resources with tremendous value to farmers. These residues are used as animal feed, thatching for rural homes, residential cooking fuel and industrial fuel. However, a large portion of the crop residues is not utilized and left in the fields. The disposal of such a large amount of crop residues is a major challenge. To clear the field rapidly and inexpensively and allow tillage practices to proceed unimpeded by residual crop material, the crop residues are burned in situ. Farmers opt for burning because it is a quick and easy way to manage the large quantities of crop residues and prepare the field for the next crop well in time. Agricultural residues burning may emit significant amount of nutrients.

ITAHAS/AB/2023/294

Effect of potash application through gliricidia green leaf manuring on soil fertility and soybean productivity in Vertisols

V.H. Jadhao*, V.V. Gabhane, Shweta Deshmukh, and A.R. Deshmukh
AICRP for Dryland Agriculture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (MS)

A field study was conducted to evaluate the "Effect of potash application through gliricidia green leaf manuring on soil fertility and soybean productivity in Vertisols" was conducted during *Kharif* 2016 at Research field of AICRP for Dryland Agriculture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The six treatments replicated four times in randomized block design comprised of control, 100% RDF (30:75:30 NPK kg ha^{-1}), 75% and 50% N and 100% P through chemical fertilizers and the combinations of 15 and 30 kg K ha^{-1} through gliricidia green leaf manure at 30 DAS and remaining recommended dose of potassium as basal dose through inorganic fertilizers. The results indicated that application of 100 % RDF (30:75:30 NPK kg ha^{-1}) resulted in higher nutrient uptake and soybean yield and was found to be on par with application of 75% N +100% P+15 kg K (inorganic) +15 kg K through gliricidia. However, the significant improvement in physical, chemical and biological properties of soil was recorded with application of 75% N +100% P+15 kg K through chemical fertilizers +15 kg K through gliricidia. In view of the above, it can be stated that the use of gliricidia green leaf manuring at 30 DAS in conjunction with chemical fertilizers recorded higher soybean yield with improvement in physical, chemical and biological properties of soil and combination of inorganic fertilizers with organics is essential to maintain the soil health and increase the nutrient use efficiency. Hence, it is concluded that conjunctive application of 75% N +100% P+ 50% K through chemical fertilizers and 50 % K through gliricidia green leaf manuring at 30 DAS resulted in improvement in soil fertility, nutrient uptake and yield of soybean grown in Vertisols under rainfed conditions.

Keywords: *Potash, Nitrogen, Gliricidia green leaf manure, Soybean, Vertisols.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/295

Transforming Agricultural Prosperity: Doubling Farmers' Income through Innovative Marketing Technology via e-NAM

V. Eshwar Reddy
Under graduate

Doubling farmers' income in India is crucial for poverty alleviation, food security, rural development, addressing farmer distress, fostering agricultural innovation, attracting youth to farming, promoting socioeconomic equality, and achieving sustainable agriculture. It is an essential step towards creating a prosperous and resilient agricultural sector in the country. Marketing improvements can play a pivotal role in doubling farmers' income by enabling them to capture greater value from their agricultural produce. By harnessing the power of new technology in marketing through the e-NAM platform, farmers can gain access to larger markets, eliminate intermediaries, make informed decisions, reduce costs, and optimize their agricultural practices. Integrating technology with e-NAM can provide farmers with easier access to financial services such as loans and insurance. Financial institutions can leverage digital platforms to assess farmers' creditworthiness and offer tailored financial products, enabling farmers to invest in modern farming techniques, irrigation systems, and other technologies that enhance productivity. This technology can optimize supply chain management, ensuring timely and efficient movement of agricultural produce from farm to market. This reduces post-harvest losses and improves the quality of produce, leading to better prices for farmers. These advancements can significantly contribute to doubling farmers' income and creating a more sustainable and prosperous agriculture sector. The marketing system in present condition required is smart marketing which connects both farmers and consumers on same flat form so that this will not involve any middle man ship the value for the product which farmers produce should directly reach them so that he can benefit. The present smart farming require smart marketing too which connect the farmers from village level. This advancement in marketing system will definitely doubles the farmers income.

ITAHAS/AB/2023/296

Status of clonal propagation in *Dalbergia sissoo*

Yalal Mallesh[1*] and Rakesh K. Garg[2]

[1]M.Sc. student, Department of Forestry and Natural Resources, Punjab Agricultural University, Ludhiana, Punjab, India

[2]Professor, Department of Forestry and Natural Resources, Punjab Agricultural University, Ludhiana, Punjab, India

Dalbergia sissoo Roxb., commonly known as shisham, tahli, sissoo etc. is an indigenous timber tree species, belonging to the family Leguminosae. It is widely grown under agroforestry and farm forestry conditions, as the competition for nutrients and water with crops do not occur due to its deep root system. It has the ability to fix atmospheric nitrogen, and can accumulate good amount of organic matter rich in nitrogen which improves the soil fertility. It can withstand average annual rainfall up to 2000 mm and droughts for 3 to 4 months. Its leaf juice is used for eye ailments in the Indian system of medicine, while its wood and bark are utilised for anal disorders, blood diseases, burning sensations, stomach issues, nose disorders, and skin maladies. Owing to its nitrogen fixing nature, high commercial value, multifarious uses and its large-scale mortality in northern region in the past years there is an urgent need for undertaking large scale afforestation of this tree species. Vegetative propagation is widely used in agriculture, horticulture and forestry for multiplying elite plants selected from natural populations or obtained in breeding programmes. Vegetative propagation is a means of rapidly multiplying desirable genetic/clonal material while capturing the majority of the genetic potential. Vegetative propagation can be used for large scale propagation of identified and tested clones with valuable properties, such extended use of superior clones, is referred to as clonal forestry. Various factors such as hormones (particularly auxin), age of mother tree, size of cuttings, rooting media, light conditions, all influence and govern the production of adventitious roots in *Dalbergia sissoo*. The majority of the genetic potential, including non-additive variance, is passed to the next plant when vegetative propagation is used. For the production of high-quality timber and faster tree development, it is important to adapt clonal propagation technique by selecting elite clones or genotypes from which the shoot cuttings are to be taken. Clones are abundant in nature and have long been employed as a tool for domestication, as well as in large-scale forest operations.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
Keywords*: Dalbergia sissoo, clonal propagation, genetic potential.*

ITAHAS/AB/2023/297

Entomopathogenic Nematodes- bioagents for management of insect pests

Yazhini.B and Kalaivani.M
RVS Agricultural College, Tamil Nadu, India

Chemical pesticides use in agriculture have a hazardous effects on environment. There is an need for methods that are eco-friendly. Biological control is an attractive alternative which is environmentally safe and feasible in crop protection. Entomopathogenic Nematodes (EPNs) are effective bio-control agents for the management of insect pests, especially soil dwelling insects. Two genera, *Steinernema* and *Heterorhabditis* are highly virulent EPNs, killing the insect host within 1-2 days. *Steinernema* and *Heterorhabditis* has symbiotic bacteria *Xenorhabdus* and *Photorhabdus* respectively in their guts which they will release upon entering the insect. There are two methods of mass production, In vivo and In vitro mass production methods. In vivo mass production is done using greater wax moth larvae or rice moth larvae. It is oriented for small scale production which is more laborious. In vitro mass multiplication is done using solid or liquid media. Bacteria from EPNs is isolated and inoculated in media. After 2 days incubation at 27 degrees, fresh IJ are inoculated. After 2-3 weeks, newly emerged IJs can be harvested through white's trap. This method is used for large scale production. Formulation plays a significant role in commercialization of bioagents. EPNs can be formulated either with active nematodes in various substrates or with reduced or arrested mobility (partial of complete anhydrobiosis). A number of formulations are available with good nematode storage and application including activated charcoal, alginate and polyacrylamide gels, baits, clay, paste, peat, polyurethane sponge, vermiculite, and water-dispersible granules. Formulated entomopathogenic nematodes can be stored for 2 to 5 months depending on the nematode species and storage media and conditions. The quality of the nematode product can be determined by nematode virulence and viability assays, age and the ratio of viable to non-viable nematodes.

Keywords*: Biological control, EPNs, Production, Formulation.*

Antifungal screening and Plant Growth Promoting activities of Termitarium Soil Inhabiting Bacteria

Zeiwang Konyak[1], Madhu Kamle[1] and Pradeep Kumar[2]
[1]Applied Microbiology Laboratory, Department of Forestry, North Eastern Regional Institute of Science and technology, Nirjuli, Arunachal Pradesh, India
[2]Department of Botany, University of Lucknow, Lucknow

Biological control of phytopathogens is increasingly being utilized as an alternative to chemical pesticides for its ability to colonize the plant phyllosphere and induction of induced resistance. The Bacillus spp. Produce wide range of antimicrobials such as lipopetptites - iturins, surfactans, fungicins and enzymes which can degrade the cell wall of the fungi such as chitinolytic enzyme and cellulases or β-glucanase. The present study aims to isolate the termitarium soil inhabiting bacteria, their antifungal screening against important tomato plant pathogens and their plant growth promoting activities. A 100 gm of termite hill (TH) soil samples were collected from the different locations of Papum Pare district, Arunachal Pradesh such as forest, plantations and agricultural fields and used for isolation of thermophillic and spore forming bacterial strains. Isolation of spore forming bacteria was done by heat treatment of soil sample at 80°C for 10 minutes followed by serial dilution. A total 278 bacterial isolates were isolated and screened against *Colletotrichum* spp. (Tomato anthracnose) and *Alternaria alternata* (early blight of tomato). The antifungal activity of the bacterial isolates against *A. alternata* and *Colletotrichum* spp. was screened *in vitro* using dual culture. During initial screening of 278 isolates, 15 bacterial isolates showed antagonistic activity against Colletotrichum spp., whereas 7 isolates showed antifungal activity towards *A. alternata.* In dual culture, 15 bacterial isolates showed varying degrees of percentage inhibition against *Colletotrichum* spp. ranging from 23.67% to 75.55 %, and *A. alternata* from 61.44% to 71.44 %. Plant growth promotion activities test was also carried out for the potential strain and showed positive responses. Therefore, the present studies reveal both phytopathogenic as well as plant growth promoting activities under *in vitro* conditions. Development of environmentally friendly alternatives to replace the extensive use of chemical pesticides is one of the biggest ecological challenges at present and the use of beneficial microorganism is considered

one of the most promising methods for the more rational and safer crop management.

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/299

Effect of biofertilizer, liquid organic manures along with inorganic fertilizers on economic yieldof okra (*Abelmoschusesculentus* L. Moench)

Sonam D. Jadhav[1], S. J. Shinde[2] and B. M. Kharat[3]
[1]M.Sc. Scholar, Department of Horticulture, V.N.M.K.V, Parbhani, India
[2]Associate professor, Department of Horticulture, V.N.M.K.V, Parbhani, India
[3]M.Sc. Scholar, Department of Horticulture, V.N.M.K.V, Parbhani, India

An experiment was conducted at Department of Horticulture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, during *kharif* 2019 to study the effect of biofertilizer, liquid organic manures *viz*., *Panchagavya, Vermiwash, Jeevamrit* and *Cow urine* on economic yield of okra in the open field condition. The experiment was laid in Randomized Block Design with fifteen treatments replicated twice by using the variety Parbhani Kranti. The various types of liquid organic solutions prepared from plant and animal origin are effective in promotion of growth and increasing yield in okra. Different concentration of liquid organic manures like *Panchagavya* (500 lit/ha), *Vermiwash* (100 lit/ha) and *Cow urine* (100 lit/ha) were given at 15, 45 and 75 DAS through foliar spray and *Jeevamrit* (500 lit/ha) and biofertilizer like *Azospirillium* (2.5 lit/ha) was applied through drenching at 15, 45 and 75 DAS along with Recommended dose of fertilizers (N:P:K::100:50:50]. The observations on yield parameters were recorded during the investigation. On the basis of observations recorded, the result of the present investigation revealed that, combined application of different organic liquid manures along with recommended dose of fertilizer has significant effect on economic yield of okra as compared to RDF alone. The yield parameter like weight of fruit (14.15 g), length of fruit (12.97 cm), diameter of fruit (14.81 mm), number of fruit per plant (20.73), fruit yield per plant (293.32 g) and fruit yield per ha (162.95 q/ha) were significantly superior in the treatment T14 [RDF + Jeevamrit + Vermiwash + Panchagavya] and it was found to be significantly superior over other treatments and gives best results as compared to Control (100:50:50 N:P:K kg/ha).

Keywords: *Azospirillum, Cow urine, Jeevamrit, Okra, Panchagavya, Vermiwash and Yield.*

ITAHAS/AB/2023/300

Effect of chitin polysaccharides on breaking yield barrier of soybean

Sapana B. Baviskar[1], P.V. Shende[2] & Nishigandha Mairan[3]

[1]Assistant Professor, Department of Agril. Botany, College of Agriculture, Nagpur

2 Associate Professor, Department of Agril. Botany, College of Agriculture, Nagpur

3Assistant Professor, Department of SSAC, College of Agriculture, Nagpur

The objective of this experiment was to determine the appropriate concentration of chitin polysachharides (growth substance) applied to soybean for getting higher yield. The experiment was conducted at farm of agricultural botany section, college of Agriculture Nagpur during *kharif* 2019, 2020 and 2021. The experimental design was RBD replicated three times. Eleven concentrations of chitin polysachharides viz., 0 ppm, 10ppm, 20 ppm, 30 ppm, 40 ppm, 50ppm, 60 ppm, 70ppm, 80ppm, 90 ppm and 100 ppm were tested. Data revealed that foliar application of 60 ppm concentration of chitin polysachharides 25 and 40 DAS significantly enhanced all morpho-physiological observations viz., Plant height, No. of branches plant^{-1} (at maturity), Leaf area, Dry matter, 100 seed weight, No. of pods plant^{-1}, N content in leaves, chlorophyll content and yield of soybean.

Keywords*: chitosan, physiology.*

Role of resistance inducing chemicals against soybean dry root rot (*R. bataticola*) disease

Agale, R. C., Suryawanshi, A. P. and Ashwini G. Patil
Department of Plant Pathology, VNMKV, Parbhani

All of the test ISR chemicals, applied as seed treatment and foliar spray (alone and in combination) and the standard check fungicide Carbendanzim 50 % WP seed treatment @ 1g/kg seed were found to reduce significantly soybean dry root rot incidence, over untreated control. However, the most effective treatment found was Salicylic acid ST + it's FS, with significantly highest reduction in average mortality (92.90%), followed by Chitosan ST + it's FS (89.34 %), Salicylic acid ST (86.88%), β-amino butyric acid ST + it's FS (85.89%), Chitosan ST (82.63%), β-amino butyric acid ST (80.64%), Jasmonic acid ST + it's FS (77.62%) and Jasmonic acid ST (72.85%) and Carbendazim (53.16 %).

Key words: *Salicylic acid, Chitosan, Carbendazim, R. bataticola.*

ITAHAS/AB/2023/302

Pathogenic variability among different isolates of *Xanthomonas campestris* pv. *mangiferaeindicae* causing bacterial leaf spot of mango

Ashwini G. Patil, K. T. Apet and R. C. Agale
Department of Plant Pathology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (M.S.), India

Mango bacterial leaf spot, (*X. campestris* pv. *mangiferaeindicae*) is one of the most devastating diseases throughout the world, affecting all kinds of commercial mango varieties. Pathogenic variability among the eight isolates of *Xanthomonas campestris* pv. *mangiferaeindiace* collected from different agro climatic zones of Marathwada region was detected by two separate methods *viz.,* attached leaf assay and detached leaf assay. Eight different isolates collected from Marathwada region were subjected to pathogenic variability in attached leaf assay under screen house condition. Entire eight test isolates of *X. campestris* pv*. mangiferaeindicae* found pathogenic and caused bacterial leaf spot in mango (Kesar). Average incubation period (days) varied from 12.33 (AR) to 14 (MR). In detached leaf technique under controlled lab conditions, leaves of total six varieties of mango *viz.,* Local, Kesar, Dasheri, Neelam, Amrapali and Alphonso were used and observation were recorded on incubation period and symptom type. The entire eight test isolates of *X. campestris* pv*. mangiferaeindicae* found pathogenic and caused bacterial leaf spot in leaves of all mango cultivars However, Local and Kesar cultivar showed moderate and more symptoms of leaf spot, while rest all cultivars *viz.,* Dasheri, Neelam, Amrapali and Alphanso showed less symptoms of leaf spot.

Keywords: *Xanthomonas campetris pv. mangiferaeindicae, bacterial leaf spot, mango, Pathogenic variability.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/303

Combining Ability Studies in CMS based and Conventional Hybrids of Cotton (*G. hirsutum*)

G.R. Gopal, D.B. Deosarkar and G.W. Narkhede
Department of Agricultural Botany (Genetics and Plant Breeding),
Vasantrao Naike Marathawada Krishi Vidyapeeth, Parbhani, (M.S.), India

Sixty crosses with thirteen parents and three checks *viz.,* PKV-Hy-4, NHH-206 and NHH- 44 were grown in Randomized Block Design with two replications. The results showed that the tester AKH- 07R possessed the highest GCA effect for the seed cotton yield per hectare and also exhibited high GCA (in desirable direction) for the traits, number of sympodia, number of bolls per, harvest index and cotton seed yield per plant. The line CAK 23 B reported the high GCA effect to the traits, earliness index, number of bolls per plant, boll weight, seed cotton yield per plant, seed cotton yield per hectare, ginning percentage and fiber strength. The CMS cross, CAK 53A x AKH-07 R possessed the highest SCA for the traits number of sympodia per plant, number of bolls per plant, boll weight, seed cotton yield per plant also it showed highest per se performance for the seed cotton yield per plant. From the conventional system the highest SCA effect for the trait seed cotton yield per plant observed for crosses CAK 23B x DHY-286-1R with high mean performance. For the fiber traits in CMS, highest SCA for strength showed by SRT-1A x R-2000-23 also high SCA for the traits upper half mean length. In the conventional hybrids, CAK 53B x R-2000-23 exhibited the highest SCA effect for the fiber strength also the high per se performance to the seed cotton yield.

Key words: *Combining ability, GCA, SCA, Yield, Fibre strength.*

ITAHAS/AB/2023/304

Nutrient Dynamics in Guava Grown on Vertisol and Yield Influenced by co-inoculation of Plant Growth Promoting Rhizobacterial Agents

Akshay Ingole, Syed Ismail and Anil Dhamak
Department of Soil Science and Agriculture Chemistry. Vasantrao Naik Marathwada Agriculture University, Parbhani, (M.S.)

A field experiment was carried out in 2019 and 2020 years at the farmer's orchard situated near Parbhani, in which inoculation of different promising microbial isolates along with recommended dose of fertilizers to estimate "effect of plant growth promoting rhizobacterial agents on yield of guava grown on Vertisol". The experiment was carried out with eleven treatment (Ten microbial isolates and one uninoculated control) and three replications and the design of experiment is randomized block design. The laboratory stock cultures (*Bacillus subtilis, Bacillus lecheniformis, Bacillus megaterium, Bacillus thuringiensis, Pseudomonas fluorescens, Pseudomonas striata, Trichoderma viride. Trichoderma herzenium, Azotobacter chroococcum and Azospirillum lipoferum*) selected on the basis of their nutrient solubilizing potential. Obtained result indicated that in the guava plant or row treated with treatment RDF+ *Pseudomonas striata* shows higher number of fruits plant^{-} and average fruit weight followed by *Trichoderma viride*, *Bacillus megaterium* and *Azotobacter chroococcum* over other treatments.

Keywords*: PGPR and yield and quality of guava.*

Malla Reddy University, Hyderabad and Just Agriculture Education Group
ITAHAS/AB/2023/305

Genetic diversity analysis in chickpea (*Cicer arietinum* L.) genotypes grown under drought stress condition

Rahul V. Chahande1, Pawan L. Kulwal and Laxman B. Mhase
[1]Assistant Professor of Agricultural Botany, College of Agriculture, Mul, Dr. Panjabrao Deshmukh Agricultural University , Akola, Maharashtra, India
[2]Professor (CAS), Agricultural Botany, State Level Biotechnology Centre, Mahatma Phule Agricultural University, Rahuri, Maharashtra, India

Genetic diversity study was conducted in 32 chickpea (*Cicer arietinum* L.) genotypes using Mahalanobis D^2 Statistics. Based on D^2 values, 32 genotypes were grouped into eight clusters. The cluster III consisted of maximum 9 genotypes, followed by Cluster II, cluster I and cluster IV, which had 8, 7 and 4 genotypes, respectively. Inter cluster values varied from 3.27 to 11.60. The maximum inter cluster distance was recorded between cluster IV and VI (11.60). Characters 100 seed weight (58.67%), days to maturity (13.91%) and days to 50% flowering (13.10) contributed maximum towards diversity. On the basis of cluster mean values, cluster IV was superior for 100 seed weight and seed yield per plant. The genotypes belonging to the clusters separated by high genetic distance could be used in hybridization programme for obtaining a wide spectrum of variation among the segregants.

Keywords: *Chickpea, D^2 Statistic.*

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 45 National and International Conferences. He also delivered many Guest Lectures in various National and International Events. His publications include more than 31 popular articles, 15 Research & Review Papers, 6 Books. Furthermore, he is a member of many reputed agricultural societies. Due to his dream & passion Just Agriculture is now in the list of India's Top 5 Agriculture Magazines with more than 2 lakh + readers.

Mr. Mohit Bhardwaj is currently pursuing his doctoral research from College of Veterinary and Animal Science, GBPUAT, Pantnagar, Uttarakhand. He did his graduation in Animal Husbandry and Dairying and completed his Master degree in Animal Nutrition, both from SHUATS (Deemed to be), Allahabad, Uttar Pradesh. Mr. Bhardwaj is also Editor in chief of Just Agriculture Magazine and Newsletter which is one ot the top leading agriculture magazine of India. He is also Secretary of AEEFWS Foundation, Punjab. He is Ex- State Secretary at AIASA Foundation, New Delhi. In view of publications, he has published ten popular articles and four research papers. Mr. Mohit has also attended almost ten national and international conferences, trainings, workshops and symposium.

Dr. Paresh Pundlikrao Baviskar holds a Doctorate in Agricultural Economics and was awarded the prestigious SARTHI National Research Fellowship-2019. He is the Vice-President of Just Agriculture magazine and an executive member of the AEEFWS Foundation. Dr. Baviskar has contributed 22 research papers, 7 abstracts, and numerous popular and technical articles. He has presented his research at national and international conferences and actively participates in professional development events.

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. A. Raja Reddy Dean of Agriculture at Malla Reddy University, Hyderabad, has dedicated decades to the field. He taught agricultural subjects at Loyola Academy, played a vital role in campus greening, and improved the syllabus as Chairman of the Board of Studies. With 25 research articles published, he guided undergraduate projects, organized workshops, and held leadership roles in professional associations. Dr. Reddy's achievements include the Lions Clubs International President Appreciation Award, the title of Fellow of the Plant Protection Association of India, and the State Best Teacher Award.

ISBN: 978-93-92953-91-0

9 789392 953910

Price: ₹ 1050.00

VITAL BIOTECH PUBLICATION

www.vitalbiotech.org | +91-9784677044 | Kota, Rajasthan, India