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NATIONAL CONFERENCE ON

Sustainable Development through Agriculture Production, Protection & Policy Landscape for Crop Care

Organized by

Agro Environmental Education and Farmer's Welfare Society (AEEFWS), Punjab,
MVN University, Palwal and
Just Agriculture Education Group
on
18-19 January, 2023
at
MVN University, Palwal, Haryana

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

VITAL BIOTECH PUBLICATION

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BOOK OF ABSTRACTS

National Conference

on

Sustainable Development through Agriculture Production, Protection & Policy Landscape for Crop Care

18-19 January, 2023

Co-editors
Dr. Piyush Choudhary
Paresh P. Baviskar
Pavithra S

MESSAGE FROM CONFERENCE DIRECTOR & ORGANIZING SOCIETY PRESIDENT

Agriculture production has played a pivotal role in the sustainable development and this fact led to organizing the National Conference on **Sustainable Development through Agriculture Production, Protection & Policy Landscape for Crop Care**. The Conference was collaboratively organized by Just Agriculture Education Group, MVN University, Palwal (ICAR Accredited) and AEEFWS, Punjab at MVN University, Palwal, Haryana in a hybrid mode on 18-19th January, 2023.

We hope that all the delegates had returned with sweet memories of this conference and I give them best wishes for their future endeavors. I appeal to the research community and also participants to extend their continued support and cooperation to the future activities of AEEFWS, Punjab and Just Agriculture.

"Agriculture is the foundation of manufactures, since the productions of nature are the materials of art" – Edward Gibbon.

Dr. D. P. S. Badwal
President, AEEFWS, Punjab
Founder & CEO,
Just Agriculture Edcuation Group

MESSAGE FROM CHIEF ORGANZING SECRETARY

It gives me immense pleasure to share that AEEFWS, Punjab and Just Agriculture- the Magazine in collaboration with MVN University, Palwal, Haryana (ICAR Accredited) have successfully organized the National Conference on **Sustainable Development through Agriculture Production, Protection & Policy Landscape for Crop Care** at MVN University, Palwal during 18th & 19th January, 2023 in a hybrid mode. The conference was organised as a constructive effort for providing a platform to the researchers, academicians and students to share their ideas about topics on recent innovations on agriculture and gain knowledge from the same. The conference had covered a wide spectrum of topics along with presentations, Lead papers and guest lectures that helped the participants to know that how the production in agriculture is and will create sustainable development.

I sincerely hope that the deliberation which took place during the conference will pave way to fruitful interventions in the field of Agriculture and Allied Sciences with significant positive impacts on the lives of our farmers. I thank all the participants for their positive participation and the organizing team for being supportive and making this event successful.

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

MESSAGE FROM ORGANIZING SECRETARY

Firstly I would like to thank Scientists, researchers, policy makers and young professionals who contributed their immense presence and expertise to this awesome gathering at the National Conference, ***"Sustainable Development through Agriculture Production, Protection & Policy Landscape for Crop Care"*** at MVN University, Palwal, Haryana on 18-19th January, 2023. The conference was organized by **Just Agriculture Education Group** in collaboration with **MVN University, Palwal (ICAR Accredited) & Agro Environmental Education and Farmer's Welfare Society, Punjab.** Through this the participants as a researcher, must have gained the vision, the knowledge, the resources and the experience to pave their way into the future technical activities regarding sustainable development through agriculture production.

I hope the exchange of ideas presented by scientists, research scholars and students on various themes of the conference would have served the participants with enormous knowledge on development in agriculture. I'm thankful to all the respected guests and participants for making this conference successful.

Mohit Bharadwaj
Chief Editor,
Just Agriculture Education Group

MESSAGE FROM ORGANIZING SECRETARY

I am very glad that **Just Agriculture- Education Group, MVN University, Palwal & Agro Environmental Education and Farmer's Welfare Society, Punjab** has organized two days National conference on ***"Sustainable Development through Agriculture Production, Protection & Policy Landscape for Crop Care"*** on **18-19th January, 2023** at **MVN University, Palwal**. It was my privilege to get the opportunity of inviting and welcome all the eminent speakers, invitees, delegates and participants to this conference.

This conference has provided a platform to all the scientists and scholars to have a discussion on the important issues of Modern Agriculture like Organic Farming, Role of Agrochemicals, biological & technological interventions, integrated nutrient, weed, diseases & pest management, application of biotechnology, climate change, Hi-tech Horticulture, advancement in crop production, Genome editing, Nutritional up-gradation and value addition of crops, Agri-marketing, entrepreneurship development, policy landscape and genetic engineering etc. Hence, this conference had offered a diverse platform for invited talks, lead papers, oral presentations and poster sessions on the above-mentioned topics. It provided a unique opportunity to the participants to share information, exchange their ideas and develop new vistas for their future endeavors in the field of agriculture and allied sciences. I thank all the eminent speakers, invitees, delegates and participants to spare their valuable time and participating in this conference. Meaningful discussions were made during the conference which would assist all of us to make better strategies to combat the issues of modern agriculture. I want to express my sincere gratitude to all the participants for their enthusiastic involvement and members of the organizing committee for their relentless efforts in making this event successful.

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

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REVIEW ON AERO BIONIC AGRICULTURAL TECHNOLOGY

S. Gandhiya Vendhan, K. Chitraleka and R. Ashokkumar
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Country Coordinator, International Statistical Institute (ISI), Netherland

Abstract

This study focuses mostly on aero bionics in agriculture. The development of farm equipment and agricultural machinery has been aided by bionic technology for include Machine vision, deep learning and extensions of bionic technology are frequently applied to agricultural productivity.

Keywords: *Aero Bionic, Agricultural Aviation, IoT, Machine Learning, Six Sigma.*

1. Introduction

Farm equipment and machinery have been improved with the use of bionic technology. Bionics are currently used in a variety of methods in the disciplines of research, medicine, and engineering.

The bionic study of the self-healing phenomena of the organism. The surface quality of the work piece is difficult to guarantee when cutting titanium alloy with a ball-end milling cutter, and the cutting force is the primary factor impacting the surface quality of the workpiece. The bionic structure and ball-end milling cutter are integrated to simulate the bionic ball-end milling cutter with a view to the aforementioned issues.

The sensible end effector construction and highly accurate recognition-localization techniques frequently contribute to the great performance of fruit and vegetable picking robots. The Internet of Things (IoT) in agriculture is evolving quickly. The development of agricultural sensor technology has effectively included nanotechnology, biotechnology, and optoelectronics. IoT has also effectively utilized big data, cloud computing, and artificial intelligence technology.

Drones have numerous potential applications in the agricultural industry, which is constantly growing. Real-time photography and sensor data collecting, field management, pesticide application, animal population surveillance, and soil sampling and fertilization are some typical drone applications. AI Can direct a drone to automatically fire pods with seeds and plant nutrients into a prepared soil patch as one use for seed pod planting. Drones equipped with more advanced AI systems will be able to precisely

water only the areas where moisture deficits are detected using thermal, multi-spectral, or hyper-spectral sensors.

2. Aero Bionic Agricultural Machineries

One of the areas of active research in agricultural engineering is the interaction of soil and equipment. The bionic desorption theory was gradually put together based on some biological phenomena, such as how earthworms create a lubricating interface film on their body surface through secreted mucus and surface electro-osmosis to reduce soil adhesion and how some soil animals have non-smooth surface structures that perform well in desorption and drag reduction.

Machine Vision and Neural Networks in Agricultural Engineering

In agricultural engineering, bionic technology has moved from ground mechanical drag reduction, bionic wear-resistant materials, and bionic design to the direction of intelligent agriculture and sophisticated manufacturing after the early bionic study on animal characteristics. Machine vision, which has drawn the interest of many academics, serves as the intelligent eye of artificial intelligence and is crucial for the classification of agricultural goods, the detection of weeds and pests, and intelligent agricultural machinery. Artificial intelligence has emerged as the newest bionic technology in recent years, and agricultural engineering has seen a lot of applied research in this area.

Deep Learning in Agricultural Engineering

Convolutional neural networks (CNNs) have seen a sharp rise in use and study in agricultural engineering during the past few years. The biological visual brain served as an inspiration for the convolutional neural network. CNN is based on this method, in which particular neural cells look for particular traits to fulfil visual tasks. Convolutional neural networks and deep learning have become more widely used in agricultural engineering in recent years.

3. Agricultural UAV Obstacle Avoidance Technology

By creating a variety of opportunities for autonomous spraying and intelligent navigation, the integration of visual and non-visual sensors will also increase the safety of plant protection operations. To attain the best OA effect, we, therefore, think of using numerous OA sensors.

4. Conclusion

The application of bionic technology in agricultural aviation and different field development. The aero bionic in the field of agricultural aviation is diverse and the integration of current advanced research results with agricultural aviation. Aero bionic in agriculture advanced technology is used for very easy, time-saving, and water-saving. Aero bionic is used for various advanced technology in Convolutional Neural Networks, Artificial Intelligence, and agricultural robots. Further study on the OA technology of agricultural UAVs is urgently needed given the promotion of the Pilot Programs of Farm Machinery Purchase Subsidy for Standard Operation of Plant Protection Drone. A better OA scheme for agricultural drones will be made possible by a deeper grasp of the growing OA technology, and references for the disciplined development of even global agricultural UAV OA technology will be provided.

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NC/LP/02/2023

NOVEL AND EMERGING METHODS OF ANTIBIOTIC SENSITIVITY FOR YEASTS AND BACTERIA

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Introduction

Antimicrobial susceptibility test (AST) provides an *in vitro* measure of susceptibility and resistance by determining the concentration of drug required to inhibit an organism to a specified degree, the minimum inhibitory concentration (MIC). Antibiotic sensitivity testing is used to measure the sensitivity of microbes such as bacteria to antibiotics. The test results may indicate the bacteria to be completely susceptible (S) or resistant (R) to the bacteria or have intermediate (I) susceptibility for the antibiotic. Antifungal susceptibility testing (AFST) is a tool for the selection of the optimal antifungal agent. The most value in AFST is gained when the fungal infection is invasive, when acquired drug resistance is suspected or when the patient is unexpectedly failing therapy.

Many factors influence the outcome of *in vitro* susceptibility testing, including endpoint definition, inoculum size of the organism, time of incubation, temperature of incubation and medium used for testing. There are two standards accepted for clinical laboratory AST testing: those established by the CLSI and those established by EUCAST. Most of the Clinical Microbiology Laboratories report their AST results according to Clinical Laboratory Standards Institute (CLSI) guideline. Nowadays, more and more laboratories prefer the guideline that has been published by European Committee on Antimicrobial Susceptibility Testing (EUCAST). In Indian laboratories, CLSI breakpoints for reporting AST are usually followed.

The AST profiling is performed in phenotypic and genotypic based methods. Conventional AST based on phenotypic testing examines the bacterial response in the presence of an antimicrobial agent. Genotypic methods are rapid and accurate, but limited by their cost, labour intensiveness and difficulty in translating into point-of-care platforms.

1. Conventional ASTs

Conventional ASTs are based on bacterial growth with and without antibiotics on a solid agar plate or in a liquid growth medium. The test is carried out on agar plate by identifying inhibition zones after culture whereas in liquid based methods, change in optical density is measured.

1.1. Disk Diffusion Method

In the disk diffusion method, a disk impregnated with antibiotic drug is placed on an agar plate which is coated with the test bacterium. The plate is then incubated overnight to allow the antibiotic to diffuse from the filter paper into the agar. If an antibiotic is effective, it stops the bacteria togrow around the antibiotic disk or kills the bacteria around the disk forming a clear, visible zone around the disk. The diameter of the zone area is a direct measure of the susceptibility of the bacteria to the antibiotic. The advantages of disk diffusion process are its simplicity, cost-effectiveness and easy interpretation. However, the main disadvantage of this process is that it needs manual processing and lacks automation. Further, this process provides only qualitative and not quantitative results.

1.2. Dilution Methods

AST using agar and broth dilution is one of the oldest methods used to determine the minimum inhibitory concentration (MIC). In the agar dilution method, a known number of bacterial cells are marked as a spot on an agar plate containing different concentrations of antibiotic. After incubation, the spots are examined for bacterial growth. In the broth dilution method, antibiotics are diluted two folds in a liquid growth medium and incubated after inoculation with a standard bacterial suspension. Post incubation samples are examined to find out MIC. This method is also used to measure time-kill i.e. rate of bacterial death for different concentration of drugs over a period of time up to 24 h. The agar dilution method is capable of testing one antibiotic at a time whereas more than one antibiotic can be tested at once in broth dilution. The advantages of these dilution processes are reproducibility and cost-effectiveness. However, it is labour-intensive and expensive in nature. A nearly similar technique called microbroth dilution is now employed to reduce reagents and processing time.

2. Commercial ASTs

2.1. E-test

The antimicrobial gradient method also called E-test combines the principles of both dilution and diffusion methods to determine the MIC of the drug. This method provides direct quantification of AST by dilution and

diffusion of antibiotic in an agar plate. An antibiotic-soaked strip is taken with an increasing concentration gradient from one end to the other and is deposited on the agar surface. After overnight incubation, a growth inhibition area, in the shape of an ellipse, at the immediate vicinity of the test strip can be observed. The MIC value in μg/mL range can be determined at the intersection of the growth inhibition ellipse and the strip. This process is simple to implement and is regularly used. E-test can also be used to investigate the antibacterial effect when multiple drugs are used. However, E-test is relatively expensive compared to disk diffusion and dilution methods.

2.2. Automated methods

The liquid suspension-based methods are faster than those based on solid-state medium owing to increased growth rate capabilities. But liquid suspension-based methods are more laborious than solid state ones. Several instruments like Phoenix (Becton-Dickinson, Franklin Lakes, NJ), Microscan (Beckman Coulter, Brea, CA), Sensititre (Thermo Scientific Waltham, Massachusetts, USA) and Vitek-1/Vitek-2 (Biomérieux, Marcy-L'Etoile, France) have been developed for high throughput AST.

2.2.1. VITEK 2 Systems

The first generation of VITEK system with a turnaround time of 13 h was developed for enumeration and identification of bacteria and yeasts in 1973. The VITEK 2 System, the next-generation of an instrument, is a BMD-based AST system that uses 64 well plastic cards containing 17-20 antimicrobial agents and can handle up to 240 plates. If the bacterial isolate is not previously identified, one card is used for bacterial identification (ID card) and the other for antimicrobial susceptibility testing (AST card). Two Vitek 2 instruments are available with test card (ID and AST) capacities of 60 cards (Vitek 2) and 120 cards (Vitek 2 XL). Results are reported in 4-18 h, containing MIC and category of susceptibility, whereas the detection of AMR is facilitated by the Advanced Expert System (AES). The currently available Vitek 2 Compact instruments can use 15, 30, and 60 cards. The main advantage of the Vitek 2 system with computer software is the determination of susceptibility of clinically important resistant pathogens.

2.2.2. Phoenix System

The Phoenix System is based on turbidity reading and colorimetric change. The principle of determining the susceptibility is based on the use of an oxidation-reduction indicator (resazurin dye or Alamar blue) and the detection of bacterial growth in the presence of various concentrations of the antimicrobial agent. In the Phoenix instrument, a maximum of 100 tests can be performed by using Phoenix ID/AST combination panels (51 for ID and 85 for

AST). The instrument performs automatic reading at 20 min intervals during incubation for upto 18 h and provides accurate and rapid susceptibility results with easy workflow for the laboratory worker.

2.2.3. MicroScanWalkAway System

The first generation of the MicroScanWalkAway System available on the market is the AutoSCAN-3. The new versions of instruments Auto-ACAN-4 and AutoSCAN-WalkAway are improved and use dry panels that do not need refrigeration. The AutoSCAN-WalkAway system detects bacterial enzymatic activity and can process 96 panels at the same.

2.2.4. MicroScanWalkAway plus System

The MicroScanWalkAway plus System provides accurate and rapid identification and susceptibility results for a wide range of Grampositive and Gram negative aerobic bacteria. The instrument utilises three types of panel configurations: combo panels, breakpoint combo panels and MIC panels. There are two types of system: 40- and 96-panel capacity models. The panels are manually inoculated, rehydrated by the RENOK inoculator and read automatically by recording bacterial turbidity using a specialized photodetector. The results are obtained after 4.5-18 h by reading of rapid panels.

2.2.5. MicroScanAutoScan 4

The AutoScan 4 is a semiautomated instrument mostly used in smaller laboratories or for the testing of supplemental antimicrobial agents. The instrument provides simplified ID/AST testing in a highly reliable and affordable package. The system uses the off-line incubation of the conventional MicroScan AST panels. The panels are manually inoculated or with the MicroScanRenok instrument and read automatically.

2.2.6. Sensititre

Sensititre uses 96-well plates and is capable of handling 64 plates. In this instrument, bacterial growth is monitored by measuring fluorescence intensity and the typical process time is over 18 hours.

The major limiting factor of these commercial systems is the need to culture large concentrations of bacteria for a sufficiently long time to faithfully detect antibiotic effects on bacterial growth. However, these systems strictly follow CLSI and EUCAST guidelines for antimicrobial susceptibility testing which comes across as a big advantage. Though these instruments are compatible with a wide spectrum of bacteria and antibiotics, they cannot handle polymicrobial bacteria and their corresponding antibiotics. The turbidity method has the uncertainty that it assumes bacterial growth and

absorbance plot as linear. Also, these instruments are prohibitively expensive to use in a low-resource setting.

3. Molecular based techniques

Molecular AST directly detects specific resistance genes as well as mutations in and expression of these genes. These molecular methods have been developed and tested as an alternative for or complementary to conventional AST and are generally faster than classic culture based assays with the test results available within one to a few hours. Most of the molecular AST methods fall into one of the three categories: amplification-based, hybridization-based or sequence-based. In amplification-based methods, the target gene sequence is amplified to allow detection; in hybridization-based techniques, hybridized nucleic acid probes target gene sequences allowing detection and in sequence-based approaches, genome sequences are analysed to detect resistance conferring mutations or resistance genes.

4. Emerging technologies for AST

Phenotypic methods through their fundamental interactions with the physical environment, provide more avenues for emerging engineering technologies to be applied to them to improve their efficiency and versatility. The emerging technologies such as mechanical, magnetic and optical sensing-based methods are highly sensitive but are limited by the complexity and cost of the system. Microcalorimetry, flow cytometry, microfluidics, micro cantilever technology, high-frequency electromagnet sensor, pH sensor, mass spectrometry, capacitance sensor, nuclear magnetic resonance, micro sound detection, Raman spectroscopy, semiconductor quantum well, fluorescence detection and impedance methods are developed to measure AST profile. The engineering technologies for AST will help in reducing sample volumes, testing duration, improve sensitivity up to the level of a single bacterial cell and potentially improve the portability of the overall system. Emerging approaches such as data mining and machine learning combined with critical automation will hold the key for the next generation of AST systems.

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NC/AB/001/2023

NANOFIBROUS SMART SENSORS IN THE SUSTAINABLE SOCIETAL GROWTH

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Nature muscle inspired wearable electronics are a breakthrough in the production of lightweight, mechanically robust next-generation smart textiles. Herein, to meet the urgent demand for next generation wearable electronics, the use of interpenetrating reinforced conductive fibers produced through electrospinning is proposed. Strain-insensitive and mechanically robust electrospun reinforced conductive fiber (ERCF) electrodes (elongation of 700 % and toughness of 10 MJ m^{-3}) contain compliant mechanical reinforcements and deeply adhered conductive silver nanoparticles led to durable wearable optoelectronics. An ambient condition processable and fully solution processable ERCFs exhibits strain-insensitive conductive electrical endurance presents robust hysteresis-free smart gloves and light-emitting electrochemical cells performances, establishing the wearable cognitive human–computer interfaces. A designed ERCF-based nanogenerators can yield outstanding piezoelectric voltage (29.5 V), current (0.39 μA), and power output (11.57 μW) values, surpassing the performance of expensive, toxic, non-biocompatible dopants and technologies requiring highly energy-intensive poling processes.

Keywords: *Electrospinning, Smart textiles, Wearable electronics, Energy generators, Wearable health monitors.*

NC/AB/002/2023

USE OF TURMERIC IN FISH FOOD: A TRADITIONAL WAY OF PRESERVATION

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Nowadays one of the highly preferred sources of nutrition is fish. But because of its perishable nature, it starts spoiling as soon as they come in contact with moisture. Therefore, preservation is inevitable to enhance its shelf life. Both humans and fish are harmed by the commonly used chemical preservatives. Therefore, there is a significant demand for natural, inexpensive, safe, and effective preservatives today. Turmeric (*Curcuma longa*) is one of the naturally available spices which has immunostimulatory, antibacterial, antifungal, and insecticidal properties. It has been discovered to have antibacterial activity against several different pathogens that cause spoilage in fish. Additionally, it prevents several fungi linked to fish degeneration from growing. Turmeric can increase fish immunity, making them resistant to pathogenic bacteria and effectively lowering the mortality rate. Turmeric can help to reduce insect manifestation, which is a major issue during drying process. When used externally as a coating material or as a feed supplement, turmeric has demonstrated its action. Fish has a longer shelf life when turmeric is added to the salt drying process. Future research must be done to fully assess turmeric's potential for usage as a food preservative.

Keywords: *Turmeric, application, preservative, fish*

NC/AB/003/2023

A STUDY ON INCOME INEQUALITIES OF MACS IN ANANTAPUR DISTRICT OF ANDHRA PRADESH

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According to the millennium development goals, addressing poverty is the biggest challenge of this millennium. The livelihoods of approximately 70% of India's rural people depend on agriculture and related activities. However, small holding-based agriculture has steadily lost its viability as a result of highly scattered, diverse, and fragmented landholding, growing cultivation costs, and limited access of small/marginal farmers (SF/MF) to public resources and markets. Small and marginal farmers make up the majority of members of FPOs, which are collectives of farmers. The Andhra Pradesh Mutually Aided Co-operative Societies Act of 1995 (APMACS), which was put into effect in the state of Andhra Pradesh, has updated certain restrictive clauses in the former co-operative legislation in the state. The study was conducted in Rapthadu mandal of Anantapur district of Andhra Pradesh. 10 villages were randomly chosen for the present study from a list of 30 villages in the selected mandal that were covered by the MACS. Data for the study was collected from 60 MACS farmers and a control sample of 40 non-MACS farmers from the randomly chosen villages. Gini coefficient ratio and Lorenz curve were employed to assess the income inequalities in the selected sample. Nearly 72 per cent of the farm families was between the income limit of Rs. 45,000 and their share in the total income was 24.7 per cent while 70 per cent of the non-MACS farm families was between the income limit of Rs. 45,000 and their share in the total income was 23.32 per cent. The Gini coefficient for the households of MACS and non-MACS were 0.451 and 0.465 respectively.

Keywords: *Small and marginal farmers, MACS, Income in-equalities, Gini coefficient*

NC/AB/004/2023

STUDY OF PLANT GROWTH REGULATOR AND ROOTING MEDIA ON GROWTH AND SURVIVAL PERCENT OF CUTTINGS OF GRAPE (*VITIS VINIFERA* L.)

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The present investigation entitled "Study of Plant Growth Regulator and Rooting Media on growth and survival percent of cuttings of Grape (*Vitis vinifera* L.)" Was carried out during 2020-2021 and 2021-2022 at Grape Field Choudhary Farm Bahadari, Mandsaur (M.P.). The experiment was laid down in Factorial Randomized Block Design with three replication and twenty treatment combinations. In these treatments five concentrations auxin levels was used *i.e.,* Control G_0, 1000 ppm IBA G_1, 2000 ppm IBA G_2, 3000 ppm IBA G_3 and 4000 ppm IBA G_4. Four type of rooting media *i.e.,* Soil M_0, Soil + Vermicompost (1:1) M_1, Sand + Vermicompost (1:1) M_2 and Soil + Sand + Vermicompost (1:1:1) M_3. Observations of Growth Characters *i.e.,* Leaf area index (LAI), Leaf area duration (LAD), Crop growth rate and survival percent of cuttings (CGR). Result obtained that in the pooled basis the maximum growth was observed in PGR application of G4 (4000 ppm IBA) found better in all the growth characters such as leaf area index 60 DAS and 120 DAS (0.282 and 0.326), Leaf area duration (2436.63), crop growth rate (0.192) and survival percent of cuttings (81.22 %), application of rooting media the maximum growth was observed in the treatment M3 (Soil + Sand + Vermicompost (1:1:1) in all growth characters such as leaf area index 60 DAS and 120 DAS (0.269 and 0.316), leaf area duration (2345.87), crop growth rate (0.180) and survival percent of cuttings (80.37 %). In combined application of PGR and rooting media the result was analysed in pooled basis in all characters of growth. The maximum growth of different characters such as leaf area index 60 DAS and 120 DAS (0.313 and 0.360), leaf area duration (2711.28), Crop growth rate (0.229) and survival percent of cuttings (86.27%) was found in M_3G_4 (Soil + Sand + Vermicompost (1:1:1) +4000 ppm IBA).

Keywords: *Grape, Cuttings, LAI, CGR and Auxin*

NC/AB/005/2023

IMPACT OF FOLIAR APPLICATION OF NITROGEN AND POTASSIUM APPLICATION ON GROWTH AND YIELD OF FIG (*FICUS CARICA* L.)

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A field experiment was carried out in the model farm of Dr Y S Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, during the years 2016-17 and 2017-18 to see the effect of foliar nitrogen and potassium applications on leaf nutrient contents of fig. Thirteen treatment combinations were arranged in a randomized block design comprising two levels of nitrogen viz. $N_{0.5}$ (0.5 per cent urea) and $N_{1.0}$ (1.0 per cent urea); two levels of K i.e. K_1 (1.0 per cent KNO_3) and K_2 (2.0 per cent KNO_3) and two application times i.e. September and January, and were replicated thrice. The maximum annual shoot growth was under the treatment T_{13} (29.72 cm), which also recorded maximum fruit set of 59.50 per cent, maximum fruit length of 26.60 mm, highest fruit yield (1 kg/tree) and minimum acidity values of 0.13 per cent in 2017 and 0.10 per cent in 2018.

Keywords: *Fig, urea, potassium nitrate, foliar spray*

NC/AB/006/2023

STUDIES ON COMPARATIVE ANALYSIS OF NUTRITIONAL COMPOSITION IN COCONUT WATER

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One of the most significant nut-bearing palms is the coconut (*Cocos nucifera* L.), which is cultivated all over the world. With a global production of 11.4 million tonnes, India comes in third after Indonesia and the Philippines in the production of coconuts (MT). Because of its nutritional makeup and established health advantages, coconut water is quickly becoming one of the most well-liked sport drinks on the domestic and worldwide market. Due to the presence of health-protective chemical components, coconut water is beneficial in treating Bp, diabetes, skin problems, and renal disorders. It also contains exceptional nutrients like Na, K, Ca, and Zn, lowering sugar, Fe, and Mg. With these considerations in mind, a study on comparative analysis of nutritional composition in coconut water of various varieties in Western Ghats of Maharashtra was conducted in the years 2021–2022, six varieties Chandrasankara, Chandralaksha, Lakshaganga, Kerasankara, Keraganga, and Chaughtat orange dwarf were analysed with four replications. Numerous nutrients, including coconut water volume, sodium, potassium, calcium, and reducing sugar, were analysed. It was discovered that, among all types examined, water volume ranged from (351.03 ml) to (284.56 ml per nut). When compared to other varieties, the Chaughat orange dwarf variety contains noticeably more water (351.03 ml), while the Na and K contents of the other studied varieties ranged from (23.25 ppm) to (30,84 ppm) and (2205.75ppm) to (2716.50ppm), and the reducing sugar content ranged from (3.20 g/100 ml) to (3.97 g/100 ml). Nutrient differences between all species of nuts may result from environmental changes, nut maturation, and nut selection. This study found that the content of tender coconut water varied greatly based on the species and maturity of the nut. Coconut water from all varieties having rich nutritional profile. With all the above said quantitative and qualitative characteristics not only best variety but variety with at part results can also be suitable for tender nut and water purpose.

Keywords: *Nutrients, composition.*

NC/AB/007/2023

ORGANOLEPTIC AND NUTRITION ASSESSMENT OF A PRODUCT DEVELOPED FROM *ELEUSINE CORACANA* (MANDUA) AND *RHODODENDRON ARBOREUM* (BURANSH FLOWER) FOR DIABETES

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Diabetes is a metabolic disorder widely seen up in the world. *Eleusine coracana*: finger millet (also known as ragi, nachani or mandwa in India), have low glycemic index when both *Rhododendron arboreum* also know to lower the diabetes. Eleusine coracana being incorporated in the twisters and it add different value to the product. The present study was conducted for the development of ragi twisters by inculsion of *Eleusine coracana* (mandua) and *Rhododendron arboreum* (buransh flower). Procurement of raw materials that is *Eleusine coracana* was retained from the local market of uttrakhand and *Rhododendron arboreum* from the local village of champawat. The flower was sun dried for 4 days for the desiccation process. Twisters were developed with different compositions were made i.e (mandua) *Eleusine coracana* -50% wheat flour- 45% and *Rhododendron arboreum* -5 % (T1) and (mandua) *Eleusine coracana* -55% wheat flour-35% and *Rhododendron arboreum* -10% (T2). The acceptability of the samples was determined using 9 point hedonic rating scale and nutritional composition was calculated. The data revealed that twisters formulated with *Eleusine corcana*-55%, wheat flour-35g and *Rhododendron arboreum* -10g was found to be most acceptable product in regards with taste, texture, color, appearance, aroma, and overall acceptability. The nutritional composition of sample of 100 g T2 was (energy- 379 kcal, carbohydrate – 70.15 g, protein -9.2 g, fat – 6.9 g, fiber –7) . The study concluded that twisters formulated with *Eleusine corcana* (mandua) -55g, wheat flour-35g and *Rhododendron arboreum* -10g was highly acceptable and can be used for further intervention on diabetic subject.

Keywords: *Diabetes, Eleusine coracana, intervention, metabolic disorder, Rhododendron arboreum, twisters*

NC/AB/008/2023

RECOMBINATIONAL VARIABILTY FOR FLOWERING AND FRUIT PARAMETERS IN TWENTY FIVE DOUBLE CROSS HYBRIDS OF TOMATO (*SOLANUM LYCOPERSICUM* L.)

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The field experiment was conducted at University of Agricultural Sciences, Dharwad, during the year 2019-20 in *rabi* to evaluate the performance of twenty five recombinant tomato double cross hybrids (*Solanum lycopersicum* L.) for their physical fruit parameters and flowering parameters. All these 25 genotypes showed significant variation with respect to physical fruit characters and flowering characters. Physical parameter *viz.*, fruit length (mm), fruit diameter (mm), fruit shape, fruit shape index (%), fruit color, and flowering parameters like days to 1st flowering and days to 50% flowering showed notable variation in all the tomato double cross hybrids. The hybrid line NS-526 X Shankara and Abhilash X S-85 recorded significantly higher fruit length (55.35 mm). However, the genotype MHAT-306 X Sindu showed the highest fruit girth (66.28 mm). The highest fruit shape index was reported in KTH-354 X Sagara (1.12%) line. Days to first flowering and minimum days to 50 percent flowering were observed in KSP-1326 X Shankara (14.50, 18.50 days, respectively) and MHAT-306 X NS-585 (14, 19.50 days, respectively).

Keywords: *Recombinant, Double cross, fruit physical parameters, flowering parameter*

NC/AB/009/2023

ELUCIDATING THE GENETIC CONTROL OF SEED, FORAGE AND QUALITY TRAITS IN INTERSPECIFIC CROSSES OF OAT

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The experimental material consisted of six generations (P_1, P_2, F_1, F_2, B_1 and B_2) obtained from three different interspecific crosses using *A. byzantina, A. sterilis* and *A. sativa* species of oat laid out in randomized block design with three replication to study the generation mean analysis for sixteen characters including seed, forage yield and quality attributes during *Rabi*, 2020-21 at CSK Himachal Pradesh Agricultural University, Palampur (HP). Mean values of P_1, P_2, F_1, F_2, B_1 and B_2 generations revealed that sufficient genetic variability has been generated through hybridization. Simple scaling tests were used to test the adequacy of additive-dominance model. The A, B, C and D scaling test were highly significant for most of the traits under study indicating the inadequacy of additive- dominance model to understand the inheritance of these characters. Generation mean analysis revealed that most of the characters were pre dominantly controlled by additive gene effects followed by epistatic interaction effects suggesting the presence of duplicate gene action as the opposite signs of h and l for all the traits. The results propounding that duplicate gene action played major role for most of the characters suggesting to adopt biparental mating approach to get desirable recombinants and suggesting selection in advanced generations to improve the studied traits in future breeding programmes.

Keywords: *Avena, Generation mean analysis, Oat, Six parameter model*

NC/AB/010/2023

STANDARDIZATION OF TINTING TECHNIQUE IN TUBEROSE

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An experiment entitled "Standardization of tinting technique in tuberose" was carried out at the Laboratory, Department of Floriculture and Landscape Architecture, Post Graduate Institute, Dr. Panjabrao Deshmukh Krishi Vidhyapeeth, Akola, Maharashtra state during March, 2022 with the objective to study the concentration of an different dyes for optimum colouration in spike and immersion time required for optimum colouration in spike. The experiment was laid out in Factorial Completely Randomized Design with two factors, as factor A dye concentration *viz*. A_1:- Orange Red 4 %, A_2:- Orange Red 6 %, A_3:- Apple green 4 %, A_4:- Apple green 6 % , A_5:-Lemon Yellow 4 %, A_6:- Lemon Yellow 6 % and factor B duration *viz.* B_1- 2 hour, B_2 -4 hour, B_3 -6 hour with eighteen treatments combination and replicated twice. The result of present study revealed that, among all the different concentration of dyes and duration, maximum days of vase life (5.47 days),water uptake (23.30 ml), final diameter of flower (0.344cm), appearance (9.45) and freshness of spike (8.00) were observed in the treatment combination of Apple Green 4 % with the dipping duration of 2 hours. The maximum amount of dye uptake (4.71 ml),final weight of spike (40 g) and number of flower drop (10.9 %) was observed in the treatment combination of Orange Red 6 % with the duration of 6 hours.

Keywords: *Tuberose, tinting, food dyes, vase life, dye uptake.*

NC/AB/011/2023

A STUDY ON SAFETY PRECAUTIONS TAKEN BY COLLEGE STUDENTS WHILE DISPOSING SINGLE USE FACEMASK, USED AGAINST CORONA VIRUS

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Covid-19 pandemic caused by Corona virus effects everyone irrespective of their age. The main factors that lead to rapid spread of Covid-19 are incorrect use of facemasks and carelessness while handling of used masks. Wearing masks is essential to prevent the spread of Covid-19, but wearing them correctly is even more essential. The aim of the study is to analyze the safety precautions taken by College Students while disposing single use facemask, used against Corona virus. A sample of 200 students (100-girls and 100-boys) were selected randomly from colleges of MPUAT, Udaipur, Rajasthan.4 point scale was developed and used to collect the desired information from the students. The results shown that significant difference was found between boys' and girls' habit of cleaning hands with soap & water or sanitizer before touching the mask, Folding contaminated part of mask inwards and Wrapping in a tissue/placing in plastic bag before disposing. The study concludes that more than fifty percent of the students have always or sometimes followed the safety precautions to be taken while disposing single use facemask, used against Corona virus.

Keywords*: Single use facemasks, Corona virus, College students, Disposal practices.*

NC/AB/012/2023

TIMING OF NITROGEN TREATMENT IN MAIZE (*ZEA MAYS* L.) PRODUCED IN PUNJAB'S COARSE LOAMY TYPIC HAPLUSTEPT SOIL BEING EVALUATED

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The study was a field experiment carried out at the Experimental Farm of the School of Agriculture on the campus of Lovely Professional University on coarse loamy Typic Haplustept soil in Punjab, at 31° 24' N latitude & 75° 69' E longitude. analyzing the impact of applying nitrogen to organic and inorganic fertiliser solutions on maize growth, yield, nutrient uptake, and economics in India during the kharif season of 2022. The soil texture is coarse loamy Typic Haplustept soil. with a pH of 7.4 at the experimental site. The experiment was laid out in a randomized block design, having sixteen treatments and replicated thrice. The suggested fertilisers schedule of 50:24:12 N, P_2O_5, and K2O kg ha^{-1} was followed. Fertilizers including urea (46% N), single super phosphate (16% P_2O_5), and Muriate of potash (60% K_2O) were employed to deliver the nutrients N, P, and K, respectively. This researching and analysing use of the hybrid PAU variety of maize called PMH-13, which was used in the experiments. Potassium and phosphorus both are given in fully via basal application. And recommended dose of nitrogen was applied basally. Crop yields were calculated using the net plot area. At the 20 DAS, 40 DAS, 60DAS, 80DAS and harvest stage, observations of the crop were made. samples in each plot were marked randomly for recording biometric observations, After applying Nanourea on plant leaves, the plants increase in height by 40, 60, 80 DAS, and harvest (50.13cm, 93.08cm, 156.19cm, 174.23cm). After harvest, maizecobs with ears measured 22.9 cm, which is the highest in 100% RDF+Nanourea treatments and the lowest 17 cm in 75%RDF (3 Application Timings) treatments. The treatments with 100% RDF+FYM had the most plants at 81 after 10 days after planting. Maize cobs length without ear 16.4 cm lowest in Absolute control treatments and 18.9 cm highest in 100% RDF (2 Application timings) treatments, Fresh weight of seven maize plants is 3215 gm highest in

100% RDF+FYM treatments and 2167 gm lowest in 100% RDF + Nano urea treatments, The dry weight of seven maize plants treated with 100% RDF (2 application timings) was 804 gm highest, and the dry weight of seven plants treated with 75% RDF was 518 gm lowest among all the treatments, According to our experiments and results.

Keywords: *Maize, Maize cob, Maize height, Nanourea.*

NC/AB/013/2023

TRANSITION AND TRANSFORMATIVE TECHNOLOGIES FOR FARM MECHANIZATION

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Farm Mechanization 2.0 is a concept that has shed its shell and has risen to prominence over years. Conversations around the need for mechanization in India have seen arise. There is a requirement for the increased intervention of technology ensuring the versatility of use and affordability in terms of cost and profitability. India has the second-largest agricultural land in the world with 394.6 millionacres. Mechanization is are liable solution to enable farmers to increase the productivity of their land and make it cost-effective as well. The erratic climatic conditions make it even more compelling for the farmers to optimize their farming processes to maximize yields. Recent developments in the field of farm machinery have led to a renewed interest in the field of smart agriculture. Data-driven technologies have attracted much attention among researchers due to their potential to handle and powerful data processing capabilities. Analysis of huge different data from multiple parameters which can be integrated with agricultural knowledge from different resources. The acceleration of digital adoption and cutting-edge mechanization technology combines precision farm management tools (GPS/GNSS, connectivity DSS, VRT), end-user applications (apps, mobiles, machines, Agri-bots), and data solutions (data IoT, information, tech empowered tools). The “Transition and Transformative Technologies for Farm Mechanization” is focused on the areas such as designing, 3D printing, Virtual reality, Augmented reality, Mixed reality, Agricultural Machinery management Systems, Quadruped robots, and Nanotechnology. There is a need to simplify these technologies to rudimentary levels and make them cost effective. The boundless possibilities offered by technology and our innate ability to harness, it should make the better Farm Mechanization. This leads to several economic and social benefits for farmers.

Keywords: *AI, Additive Manufacturing, GPS, Machine Learning, Virtual Reality.*

NC/AB/014/2023

IN VITRO SCREENING OF DIFFERENT FUNGICIDES AGAINST *FUSARIUM OXYSPORUM* F. SP. *LENTIS* CAUSING WILT OF LENTIL

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Lentil (*Lens culinaris* Medik.) is one of the most important pulse crop grown in India next to chickpea. The crop suffers from a number of diseases, among which wilt of lentil (*Fusarium oxysporum* f. sp. *lentis*) has become a serious threat to lentil cultivation, resulting heavy yield losses. The present investigation was conducted *in-vitro* to evaluate the potency of fourteen fungicides against *F. oxysporum* f. sp. *lentis* @ 50, 100, 150 and 200 ppm using poisoned food technique. The observations revealed that all fungicides significantly inhibited the growth of pathogen when compared to control. Among all the fungicides, Tebuconazole and Propiconazole were found to be highly effective and recorded cent per cent growth inhibition of the pathogen at their all four concentrations. While, Hexaconazole was also effective and recorded cent per cent growth inhibition but only at its higher concentration, i.e. 200 ppm. However, Copper oxychloride was found to be least effective in this study at their tested concentrations.

Keywords*: Lentil wilt, Fusarium oxysporum f. sp. lentis, Fungicides.*

NC/AB/015/2023

DETERMINATION OF RELEASE OF NITROGEN BY THE USE OF DIFFERENT ORGANIC MANURES

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Nitrogen in manure occurs mainly in organic forms (e.g., proteins) and as ammonium (NH4+). Some composted manures contain small amounts of nitrate. Ammonium and nitrate are plant-available forms of N, while organic N is not immediately plant-available. Before organic N can be taken up, however, it must first be converted to inorganic forms. This process, which is completed by soil microbes as a by-product of organic matter decomposition, is called mineralization. The mineralization rate is therefore the rate at which organic N is made plant available. In manure forage systems, mineralization accounts for much or most of crop needs. To calculate the N fertilizer value of manure and to construct crop N budgets, an estimate of the rate of mineralization is useful. An understanding of the mineralization rate concept can help improve manure management to meet crop N demands. However, proper management of organic manures requires a capacity to predict their effect of N dynamics in inceptisol and their availability to crops. The quality of organic material is reflected in the carbon (C), nitrogen (N) and C/N ratio. These quality indicators are useful in predicting the N turnover and mineralization of organic residues. Generally, manures with low C/N ratio (lesser than 10:1) result in greater N availability at the early stage of decomposition. Therefore it gives real benefits of applying these organic materials to soil.

Keywords*: Nitrogen, Proteins, Carbon, Soil*

NC/AB/016/2023

DEVELOPMENT OF *BACTROCERA* SPP. ON PEACH, PEAR, GUAVA AND KINNOW

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The present study entitled "Development of fruit flies, *Bactrocera* spp. on different fruit crops" was conducted in the Faculty of Agricultural Sciences, SGT University, Gurugram during 2022. Studies on development of fruit flies, *Bactrocera dorsalis* (Hendel) and *Bactrocera zonata* (Saunders) on different fruit crops showed that guava was the most suitable host followed by Kinnow, pear and peach. Different combinations of temperature and relative humidity did not have any consistent influence on biological parameters. Evaluation of the impact of number of methyl eugenol based mineral water bottle traps (4-16 traps/acre) in peach, pear, guava and Kinnow revealed that number of traps had a significant impact on the number of males trapped, quality marketable fruits and yield. Maximum males were trapped in guava followed by Kinnow, pear and peach. A total of 80 thousand males were trapped in these four crops. The present study indicated that availability of host plants had a direct bearing on population of fruit flies but the population was positively correlated with maximum and minimum temperature, whereas rainfall, sunshine and relative humidity had no significant effect on population variation on different crops.

Keywords*: Kinnow, crops, Bactrocera zonata, Guava*

NC/AB/017/2023

EFFECT OF ROCK PHOSPHATE ENRICHED COMPOST AND CHEMICAL FERTILIZERS ON SOIL FERTILITY AND MUSTARD YIELD

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Developing nutrient enriched compost by using low grade waste mica and rock phosphate as low-cost source of nutrients is gaining importance as an organic fertilizer for improving mustard productivity as well as soil health. In this context a field experiment was conducted comprising five treatments combinations; T1 control; T2: Recommended dose of fertilizers (100% RDF); T3: Enriched compost @ 6 t ha^{-1}; T4: 100% RDF + Enriched compost @ 6 t ha^{-1}; T5: 50% RDF + Enriched compost @ 6 t ha^{-1}. Application of enriched compost had significantly higher amount of Walkley Black carbon (WBC) as compared 100% recommended dose of chemical fertilizers (RDF). Alkaline phosphatase activity (ALPA) was significantly improved in treatments receiving compost and chemical fertilizers than alone use of compost and chemical fertilizers. Soil amended with integration of enriched compost and chemical fertilizers had significantly improved soil microbial biomass phosphorous (MBP) microbial biomass carbon (MBC), and dehydrogenase activity (DHA) in comparison to alone use of chemical fertilizers and enriched compost. Relatively, better P availability and microbial activities with 100% RDF along with enriched compost @6 t $ha^{-1}$and resulted significantly higher grain yield of mustard (2.93 Mg ha^{-1}) over 100% RDF. Soil treated with 100% RDF produced of 16.7% higher grain yield of mustard than control. Results highlighted that integrated use of enriched compost (6 t ha^{-1}) and chemical fertilizers (100% RDF) is beneficial option for improving different fraction of P and mustard yields.

Keywords: *Available nutrients; Enzyme activities, Microbial Biomass Carbon; Microbial Biomass Phosphorus; enriched Compost; Mustard yield*

NC/AB/018/2023

EFFECT OF DIFFERENT CONCENTRATIONS OF BAP IN COMBINATION WITH NAA AND IAA ON CULTURE ESTABLISHMENT

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Tissue culture finds its tremendous application in ornamental crops, especially in areas of propagation and crop improvement. Micropropagation work in Gerbera was initiated by shoot tip culture for rapid multiplication of elite varieties as early as 1974 by Murashige *et al.* and in 1985 by Huang and Chu. The capitulum explants are also being used for micro propagation with the advantage of easier sterile isolation *in vitro* and non-destructive nature as only inflorescences are used and no shoots are lost from the plant (Pierik *et al* 1982).The present investigation entitled **"**Effect of different concentrations of BAP in combination with NAA and IAA on culture establishment" (*Gerbera jamesonii* L*.)* was carried out at "AGRI-BIOTECH FOUNDATION" in PJTSAU campus and College of Horticulture, Rajendranagar, Hyderabad during the year 2015-2016. In the present investigation, an attempt has been made to determine the response of capitulum explants of gerbera for micropropagation through enhanced axillary shoot method in an elite gerbera variety 'Savannah'. In this experiment, for culture establishment ten treatments were formulated namely MS basal medium (control), MS medium + BAP, MS medium + BAP + IAA, MS medium + BAP + NAA at different concentrations. The sterilized explants were inoculated in above various MS medium for culture establishment. The cut ends of explants were kept in such a way that they are in maximum contact with the medium. The explants on the MS medium supplemented with 3mg/L BAP + 0.1mg/L IAA (T_9) had maximum number of responded explants (6.00) and with early primordial emergence (14.66 days). While, there were no responded explants and primordial emergence in MS basal medium (control).

Keywords: *Tissue culture, BAP, MS basal medium*

NC/AB/019/2023

STUDY ON PHYSICO- CHEMICAL AND FUNCTIONAL PROPERTIES OF GLUTENS ISOLATED FROM INDIAN WHEAT VERITIES.

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Wheat is a major staple crop satisfying the hunger next to the Rice. India is the Second larger producer of wheat after China. Wheat is a major source of protein whereas the protein is present in the form of Gluten which is an important parameter for deciding the quality of Wheat. Gluten is a complex mixture of glutenin and gliadin. The purpose of studying the physico- chemical and functional properties of glutens is to check their health benefits, nutritional values and quality of wheat. For the said work The GW- 496 and Sharbati wheat varieties were selected due to found in majority of their growth in rular region of Maharashtra state. On the basis of wheat kernel analysis the Sharbati wheat was found in longer in length and lesser in weight as compared to GW-496. The falling number activity was observed in terms of both the wheat flours it was recorded at 472.33 seconds for Sharbati wheat and 483.66 seconds for GW- 496 wheat, means both the wheat flours were free from Microbial Activities. The GW- 496 wheat verities were found in high gluten content as compared to Sharbati wheat variety. The functional properties of both the wheat flours were studied on the basis of their Water holding capacity, oil holding capacity, solubility, sedimentation value, swelling capacity, foaming and emulsification properties, etc. The GW- 496 wheat flour poses good functional properties as compared to Sharbati wheat. Sharbati wheat found with greater solubility and foaming capacity than GW- 496 wheat variety.

Keywords: *Wheat, Gluten, Physico- chemical and functional Properties, etc.*

NC/AB/020/2023

ASSESSMENT OF FARMERS KNOWLEDGE AND PERCEPTION TOWARDS THE USAGE OF SUGARCANE TRASH AND ENVIRONMENTAL SAFETY

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In Maharashtra's Kolhapur district, open field burning of sugarcane trash (ST) is a major concern. This pollutes the environment, loses energy, and has a detrimental effect on biodiversity. As a result, a study was conducted to learn more about the underlying cause of sugarcane trash burning. The face-to-face interview of 186 sugarcane growers were carried in Kolhapur district of Maharashtra (India). The impact of age and education on behavior of farmers towards the usage of sugarcane trash were analyzed with help of M.S Excel, and Past-3 software and Drivers, Pressures, State, Impact, Response (DPSIR) model. The age and education has significant effect ($p < 0.01$ or 0.05) on burning of sugarcane trash.The61.12 % farmers burn the sugarcane trash in the field, whereas 38.70 % used for other purposes. The farmers (95.69 %) are very well know that burning of sugarcane trash has a detrimental effect on the environment. The 80 % farmers reported fear of rats, snakes and scorpion to use sugarcane trash as mulch in field as well as 42 % farmers reported burning of sugarcane trash in field has benefits. The study revealed that farmers have knowledge and understanding on how to use sugarcane trash for benefits but due to utilization barriers they burned the sugarcane trash in the field. There is need a robust policy as well as extension activity to address this issue.

Keywords*: sugarcane trash burning; pollution; mulching; organic fertilizer*

NC/AB/021/2023

IMPACT OF SALICYLIC AND GIBBERELLIC ACID SEED INVIGORATION ONSEED HEALTH STATUS UNDER (ARTIFICIAL AGEING) ACCELERATED AGEINGTEST IN LENTIL (*LENS CULINARIS* MEDIK.)

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Research examination led during the Rabi season of 2018-19 and 2019-20 to discover the Effect of hormonal seed strengthening on seed health status under accelerated ageing test in lentil (*Lens culinaris* Medik.) at state seed testing laboratory. The Blotter test was conducted in CRD plan with four replications. From the examination it was demonstrated that the hormonal treatment with salicylic acid at RH (90%) and temperature (35^0C) for 2 days ageing showed least infection, while contagious contamination higher with the increment in relative humidity, temperature and duration of artificial ageing. During the years, 2018 to 2020, the current experiment was carried out at the state seed testing laboratory, Department of Genetics and Plant Breeding, SHUATS, Prayagraj, Uttar Pradesh. In the experiment, 37 different treatment permutations were used. To accelerate the ageing process, the seeds were placed in an ageing chamber with high temperatures and relative humidity. The aged seeds were then revitalized with hormones, a process known as hormonal seed fortification. Our finding revealed that the aged seeds treated with gibberellic acid and salicylic acid (Growth Hormone) enhanced the quality of seed health status in Lentil.

Keywords: *Accelerated ageing, Blotter test, Hormonal seed invigoration, ISTA techniques, Seed health.*

NC/AB/022/2023

RECENT ADVANCES PROPAGATION TECHNIQUES IN CITRUS FRUIT: MICROGRAFTING

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India is a second-largest producer of fruits in the world after China and citrus is the third most important commercial fruit after mango and banana. The genus citrus comprises mandarin, lime, lemon, grapefruit, pummelo, citron, etc. In the recent years, citrus production was significantly affected by biotic and abiotic stresses viz., high incidence of insect-pests, diseases and virus-like organism. Citrus decline and also poor orchard management practices. Several modern approaches developed to combat such production problems involved in commercial citrus production includes, problems in the nursery (low seed germination, low stock growth, minimum success in budding and grafting), bahar regulation (inhibition of flowering, excess flower thinning), fruit set (low fruit set percent), fruit size (small fruit size), fruit maturity and quality (low fruit quality, early fruit maturity), fruit drop (immature fruit drop, premature fruit drop, pre-harvest drop), degreening, less shelf life, pest and disease occurrence, and physiological disorders. These problems are solved by using advanced techniques viz., quality planting materials, virus-free planting materials and HDP system. The best viable option for the development of virus-free planting material can be achieved through shoot tip grafting and micro grafting/budding. Most of the citrus crops are susceptible to virus diseases and are propagated by budding (T budding) and seeds. Virus-free plants are produced by using registered and certified bud wood from the mother plant. In citrus graft and vector transmissible diseases are most common. Shoot-tip grafting is practiced in many citrus growing regions of the world to produce virus-free planting by establishing mother blocks of citrus grafts made through shoot-tip grafting (STG) which supply disease-free buds. Hence micrografting or shoo-tip grafting is developed as an alternative. It is one of the latest techniques involving grafting an apex/shoot/meristem from the selected mother plant onto a young seedling in vitro. Depending upon the species, modifications have been made to this technique to recover pathogen-free plants.

Keywords: *STG, Shoot-tip, HDP, grafting*

NC/AB/023/2023

ASSESSMENT OF NUTRITIONAL COMPOSITION OF WHEAT & PEARL MILLET BASED PRODUCTS VALUE ADDED WITH CLUSTER FIG & BEETROOT

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Cluster Fig which is known as goolar in hindi is a medicinal fruit which is widely found in India. It is a rich source of most important nutrients of the diet which are iron and other micronutrients. Wheat is a staple food of Indian diet which is an energy dense food. It is a good source of carbohydrate & protein. Pearl Millet is most widely grown type of millet. It is known for its calorie value; vitamins & minerals present in it. Mung bean which belongs to the family of legumes has high calorie in it & is also a very good source of protein & poly-unsaturated fatty acid. For this study cluster fig powder, germinated wheat flour, germinated mung bean flour, germinated pearl millet, carrot powder & beetroot powder have been used. Products prepared were biscuit, kachari & soup mix. Each product has three treatments for sensory evaluation and nutritional assessment with three different replications. The prepared products were evaluated with sensory evaluation and analyzed for chemical composition. According to sensory evaluation T_1 was best in the biscuit and soup mix & T_2 was best in kachari. On the basis of proximate chemical analysis, it has been found that in every product and with each treatment the values of moisture, ash, iron, protein & zinc varies. The treatment with highest value of iron, protein & zinc in biscuit, kachari & soup mix is T_3.This study shed light on evaluation of organoleptic acceptability and nutritive & medicinal properties of cluster fig. It also provides idea on how much quantity of cluster fig powder & other ingredients should be used in various processed convenience healthy food. The research aims at highlighting the use of cluster fig which is widely available in India but has never been used to make convenience food and in this way its important medicinal properties are unable to reach to people especially women's who are suffering allot from health issues in daily life.

Keywords: *Cluster fig, Powder, Germinated flour, biscuits & kachari*

NC/AB/024/2023

GENETIC VARIABILITY, CORRELATION, PATH COEFFICIENTS, DIVERSITYAND PRINCIPAL COMPONENT ANALYSIS IN INDIAN MUSTARD

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Brassica species are the third most important oilseeds in the world after soybeans and palms. Indian mustard (*Brassica juncea* L.) is used worldwide as an oilseed, vegetable and spice. The seventy different genotypes of Indian mustard were grown at the farm of Institute of Agriculture, Visva Bharati University using a randomized three replicate full block design in 2017-18 and 2018-19 to assess genetic variability, correlation, path and genetic diversity. The results of the coefficient of variation showed that environmental factors play a role in the development of traits as revealed by higher PCV values than their corresponding GCA values of the respective traits. According to path analysis, the direct impact of seed yield per plant on oil yield per plant was highly positive (0.551). The seventy genotypes were divided into eight groups using the Tocher's technique. The mustard accessions' PCA displayed a diverse grouping pattern, which generally supported the cluster analysis. Results showed significant diversity among current mustard genotypes, with statistically significant variations in most of the quantitative parameters examined. Both principal component analysis and path analysis show that the total number of siliqua produced by each plant is strongly related to the total amount of oil produced. The D2 study discovered that different genotypes have distinctive traits.

Keywords: *Brassica juncea, genetic variability correlation, path coefficients, diversity, cluster*

NC/AB/025/2023

MOLECULAR CHARACTERIZATION FOR SCREENING OF PEARL MILLET GENOTYPES AGAINST FOLIAR BLAST DISEASE

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Pearl millet [*Pennisetum glaucum* (L.) R. Br.] belonging to the family Gramineae is an important cereal and forage crop in the arid and semi-arid regions of India. It is a preferred experimental millet grass in various genetic investigations on account of its diploid genome (2n=2x=14) of ~1.79 Gb with around 38,579 genes, short life cycle (60-90 days) and protogynous flowering, helpful in controlling undesirable cross-pollination. It is globally cultivated on an area of 3 million ha with a production of 32 million tonnes. India produces 26.6% of the total pearl millet produced in the world. Its productivity has been hindered due to several constraints and is not consistent since last more than two decades. Blast, also known as leaf spot caused by *Pyricularia grisea* Sacc. has emerged as a serious threat in major pearl millet growing areas in India. The pathogen has a proclivity to cause disease in all stages of crop growth causing serious crop losses. The severity of the blast disease in the previous years has indicated the need for disease screening and identification of the tolerant and susceptible genotypes. The objective of this study was to evaluate 60 Pearl millet germplasm lines for blast disease by artificial spray inoculation of *P. grisea* and molecular screening of identified lines with the help of SSR markers. High variability was observed among the genotypes based on the blast scoring data and they were classified into the categories of highly resistant, resistant, moderately resistant, susceptible and highly susceptible. 13 genotypes showed minimum blast symptoms while 7 genotypes showed maximum symptoms. These genotypes were molecularly characterized using 140 SSR markers for diversity analysis out of which 38 were found polymorphic. Based on the variability among the genotypes for the blast disease, they can be used in future breeding programs to introgress blast resistance genes into the high yielding varieties.

Keywords: *germplasm, Pearl millet, protogynous, genotypes*

NC/AB/026/2023

IMPACT OF AGRICULTURAL TECHNOLOGY MANAGEMENT AGENCY (ATMA) IN BIHAR

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Agricultural Technology Management Agency (ATMA), implemented as a pilot programme in 28 districts from 1998 to 2005 as part of the World Bank-funded Innovations in Technology Dissemination (ITD) component of the National Agriculture Technology Project (NATP), is a registered society responsible for more effective and efficient dissemination of available agricultural technologies at district level. It has linkage with the line departments, ICAR institutes, KVKs, research organizations, private sector and NGOs associated with agricultural improvement at the district and block levels In Bihar, Agricultural Technology Management Agency (ATMA) were registered as an autonomous institution and operationalized in four districts *viz*., Muzaffarpur, Madhubani, Munger and Patna districts in year 1999, 2000, 2001 and 2002 respectively across the State. ATMA is currently functional in all the 38 districts of Bihar. The interventions of the ATMA program are having a positive and significant impact on improving the skills and knowledge of farmers. Respondents' knowledge of agricultural, horticultural and animal husbandry practices changed significantly as a result of the ATMA program, signifying the program's success in improving farmers' field knowledge. The implementation of ATMA has contributed significantly a positive shift of farmers from traditional ways of farming to modern and more scientific ways of farming.

Keywords: *ATMA, Crop, Opinion, Training, Technology*

NC/AB/027/2023

USE POMEGRANATE PEEL WASTE AS A LOW COST FEED SUPPLEMENT IN POULTRY

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Pomegranate peel extract has a antioxidant, antibacterial, antifungal and antiviral properties which is helpful to prevent the birds from many disease infection. Dried Pomegranate peel extract also having good minerals and vitamins which is beneficial for weight gaining in poultry industry. Main perspective behind this study is to reduced cost of feed supplement and provide natural nutrient to the poultry for proper growth and development. This study revealed that application of pomegranate peel extract found effective over control treatment in respect of weight. In this study three observation were taken at 5, 15 and 30 days interval resp. viz.5 days, 15 days chicks and 30 days chicken in per cent is 8, 16 and 29 respectively.

Keywords: *Pomegranate, antioxidant, antibacterial, antifungal*

NC/AB/028/2023

OCCURRENCE OF RICE ROOT-KNOT NEMATODE, *MELOIDOGYNE GAMINICOLA*IN ALIGARH AND ADJOINING DISTRICTS OF WESTERN UTTER PRADESH

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A Survey was conducted in 2018-2019 for the presence of nematodes, severity of the disease, and *Meloidogyne graminicola* soil population in paddy fields at the nursery and maturity stages in different blocks of Aligarh and adjoining districts. From each block, soil and plant samples were collected during the survey. At nursery stage, the nematode occurrence was reported highest in Aligarh district (23.44%) followed by Hathras and Kasganj, and the lowest was in Mathura (10.57%).Disease severity was also highest in Aligarh (34.88%), followed by Bulandshahar (32.6%), and it was recorded lowest in Mathura (27.9%).The population of *M. graminicola*in soil (J_2 stage) was reported maximum in Aligarh (2642 J_2/kg soil) and minimum in Bulandshahar (1271 J_2/kg soil).While at maturity stage occurrence (40.28%), disease severity (41.14%) and soil population (3879 J_2/kg soil) were also recorded highest in Aligarh and lowest in Bulandshahar (14.47%, 34.82%, 1404 J_2/kg soil, respectively).

Keywords: *Meloidogyne graminicola, Disease, Rice, Root-Knot, Occurrence.*

NC/AB/029/2023

INFLUENCE OF CHEMICALS ON GROWTH AND FLOWERING IN POTATO (*SOLANUM TUBEROSUM* L.) GENOTYPES

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A field experiment was conducted to study the **e**ffect of chemicals on flowering and fruit set in potato genotypes under extended photoperiod during *rabi* season of 2021-22 at College of Horticulture, Venkataramannagudem, Dr. Y.S.R. Horticultural University, West Godavari district, Andhra Pradesh. Experiment was laid out in 2 factorial CRD with 2 replications. Nine potato genotypes *viz.,* HT/10-1554, HT/7-1329, HT/21-10, HT/21-6, HT/21-9, HT/21-8, HT/21-13, HT/21-12 and Kufri Surya were sprayed with five chemicals *viz.,* GA_3 (100 ppm), NAA (50 ppm), spermidine (20 ppm), ethephon (200 ppm) and water under extended photoperiod for inducing flowering and fruit set. Genotype HT/21-10 had recorded the highest plant height at 60 and 90 DAP whereas maximum plant spread was observed in genotype Kufri Surya at 30, 60 and 90 DAP. Genotype HT/21-9 recorded the highest number of shoots per plant and inter nodal length whereas maximum number of nodes per plant were noticed in HT/10-1554. HT/21-6 took minimum number of days to flower and recorded maximum number of flowers per plant. Highest number of flower buds was observed in HT/10-1554 followed by HT/21-6. Berries were produced in HT/21-10, HT/21-13 and HT/21-6. Genotype HT/21-10 recorded maximum pollen viability, pollen germination, berry size, number of seeds per berry and test weight. Genotypes HT/21-12 and Kufri Surya exhibited superior performance towards yield parameters while poor in floral parameters. Highest values for all the growth and reproductive parameters except pollen viability were recorded when potato genotypes were sprayed with GA_3 100 ppm. Superior performance for all yield attributes were recorded for water spray and lowest values were recorded for GA_3 100 ppm. GA_3 100 ppm spray exhibited enhancement in floral parameters while reduced yield parameters. Genotype

HT/21-10 and Kufri Surya sprayed with GA_3 100 ppm recorded highest plant height and plant spread at both 60 and 90 DAP. Maximum number of shoots per plant and number of nodes per plant were recorded in HT/21-9 and HT/10-1554 with ethephon 200 ppm whereas the highest inter nodal length was observed in HT/21-9 sprayed with spermidine 20 ppm. Response of the genotypes HT/10-1554, HT/21-6, HT/21-13 and HT/21-10 with GA_3 100 ppm were superior for all reproductive parameters. Kufri Surya with water spray recorded maximum number of tubers per plant and tuber yield per plant.

Keywords: *Genotypes. GA_3, Yield, Plant*

NC/AB/030/2023

SEASONAL EFFECT OF AZOLLA POWDER (*AZOLLA PINNATA*) SUPPLEMENTATION ON FEED CONSUMPTION OF GIRIRAJA POULTRY BIRDS

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The seasonal effect of supplementation of azolla powder in the diet of Giriraja poultry birds to evaluate the feed consumption in different season, the chemical composition of azolla powder was recorded 21.56, 15.08 and 15.88 Crude Protein, crude fibre and ash on dry matter basis. The feed consumption during rainy season was recorded 715.73, 718.03, 728.70, 719.40 and 718.87 g/birds at the end of experiment. In winter season 746.73, 749.03, 759.70, 750.40 and 749.87 g/birds and in summer season 612.73, 615.03, 625.70,616.40 and 615.57 g/birds at the end of experiment in the treatment of T_1, T_2, T_3, T_4, and T_5 respectively. Supplementation of 5% azolla powder treatment appeared best over other treatment in all the season for achieved more feed consumption and the other treatments. The feed consumption was found better result in Winter season fallowed by the rainy season and summer season. Thus it is to adopt the feeding of 5% azolla powder in all season in the diet of Giriraja birds without any adverse effect on growth performance. The better results were finding in winter season as compare to rainy and summer season.

Keywords: *Azolla, Winter, Summer, Poultry*

NC/AB/031/2023

FOOD SUPPLY CHAIN TRACEABILITY: SAFETY AND QUALITY PERSPECTIVES

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Food borne diseases are caused by contamination of food and occur at any stage of the food production, delivery and consumption chain. Every year, nearly one in 10 people around the world fall ill after eating contaminated food, leading to over 4,20,000 deaths. Children are disproportionately affected, with 1,25,000 deaths every year in people under 5 years of age (WHO,2021). Increasing international trade, food chains increase the risk of food contamination and the transport of infected food products across national borders. Food traceability is the ability to follow the movement of a food product and its ingredients through all steps in the supply chain, both backward and forward. In the case of a food borne illness outbreak or contamination event, efficient product tracing helps government and those who produce and sell food to rapidly find the source of the product and where contamination may have occurred. This paper provides comprehensive information about traceability with regards to food safety and quality aspects.

Keywords: *Food, diseases, government, chains*

NC/AB/032/2023

PERFORMANCE EVALUATION OF COTTON STALK SHREDDER

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The study was carried out to evaluate the performance of Cotton Stalk Shredder on cotton field at Cotton Research Unit Dr. PDKV, Akola. Various technical and economical aspects of cotton stalk shredder such as area covered; forward speed, shredding efficiency, uprooting efficiency, plant to plant spacing, row to row spacing, fuel consumption and cost of operation were measured. The performance of the cotton stalk shredder is found satisfactory. It gives a desired uprooting efficiency as 91.84% and shredding efficiency 98.23%. The working width of cotton stalk shredder is 108.5 cm. For shredding operation fuel consumption tractor was found 4.87 l/hr. The field efficiency of cotton stalk shredder machine during field trials was 87.65%. The cost of operation for sowing was Rs. 538.68 Rs/h. The throughput capacity of tractor operated cotton stalk shredder during the operation was found as 1174.2 kg/hr. The effective field capacity of Cotton stalk shredder was found as 0.17 ha/h.

Keywords: *Cotton, economical aspects, field, plant*

NC/AB/033/2023

ORGANOLEPTIC AND NUTRITIONAL ANALYSIS OF PRODUCT DEVELOPED FROM FOXTAIL MILLET AND JACKFRUIT SEED FOR HYPERTENSION

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High blood pressure is the one of the most important leading risk factor for disease burden worldwide. Foxtail millet contains a good amount of nutritional components, especially protein, vitamin, fibre, and minerals. Foxtail millet has a low glycemic value and also has been found to have blood pressure lowering effect. Consumption of 50g of foxtail millet daily has shown to significantly decrease blood pressure in untreated patients of mild hypertension. Jackfruit seeds are a rich source of potassium and it can be used to add value to different products. Therefore, the study was conducted to develop an innovative product from foxtail millet and jackfruit seeds. The processing of Jackfruit seeds was done. The seeds were washed and the brown layer of the jackfruit seeds was manually removed. Then the seeds were dried at 80°C for 4 hours. The dried seeds were converted into flour. Bread was formulated with different concentration of foxtail millet and jackfruit seeds i.e. 50% foxtail millet and 10% jackfruit seed flour (T1), 60% foxtail millet and 20% jackfruit seed flour (T2) and one controlled sample was developed with 100% wheat flour. The acceptability of the product was checked by using the 9 point hedonic rating scale and nutritional components were calculated. The data revealed that bread formulated with foxtail millet-50%, jackfruit seed flour 10% (T1) was found to be the most acceptable product in regard with taste, texture, color, appearance, aroma and overall acceptability. The nutritional composition of 100g of bread (T1) was energy (358kcal), protein (11.01g), fat (7.9g), carbohydrate (64.76g), fibre (11.7g) and potassium (305mg). The study concluded that bread formulated with foxtail millet-50%, Jackfruit seed flour-10% was highly acceptable and can be used further for intervention on hypertensive subjects.

Keywords: *Foxtail millet, Hypertension, Jackfruit, Jackfruit seeds, Millets, Health*

NC/AB/034/2023

SEASONAL INCIDENCE OF POD BORER (*HELICOVERPA ARMIGERA* HUBNER) AND BIHAR HAIRY CATERPILLAR (*SPILOSOMA OBLIQUA* WALKER) INFESTING SOYBEAN VARIETY RKS-45

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The infestation of pod borer larvae on 05 cultivar of soybean namely RKS-45 was started from 32nd SMW (first week of August) with mean larval population (0.85 larvae/mrl). Larval population gradually increased and reached its peak in the 36th SMW (4 September) with 2.50, 2.45 larvae/mrl, respectively in different varieties when average temperature, relative humidity and rainfall was 29.1˚C, 86.9 per cent 32.0 mm, respectively. There after larval population was found decreasing and disappeared after 39th SMW. Correlation of pod borer larval population with weather parameters revealed that average temperature and relative humidity showed positive correlation while, rainfall was negatively correlated. Results are supported with the findings of Sonule *et al.* (2019) who also found the peak population of *H. armigera* (1.40 larvae/mrl) in 36th SMW. The bihar hairy caterpillar larval population on soybean cultivar *i.e.* RKS-45first time appeared in 33rd SMW(14 August) and there after larval population gradually increased and reached its peak in the 34th SMW (21 august) with 2.35larvae/mrl, respectively in different varieties when average temperature, relative humidity and rainfall was 28.2 ˚C, 74.8 per cent and 30.0 mm, respectively. After 34th SMW larval population decreased but remained active upto 39th SMW. Correlation of bihar hairy caterpillar larval population with weather parameters showed positive correlation with average temperature and relative humidity while, rainfall was negatively correlated. Suyal *et al.* (2018) confirm the present investigation and found that *Spilosoma obliqua* increased gradually to a peak of 3.9 larva/meter row length during the 34th SMW (second week of August). Patel *et al.* (2020) found that first appearance of bihar hairy caterpillar on green gram was recorded during 33rd SMW (13th to 19th August) and the population was ranged from 0.50 to 3.10 larvae/mrl. Present findings of correlation study supported by the results of Suyal *et al.* (2018) they found that bihar hairy caterpillar showed negative correlation with rainfall.

Keywords: *Caterpillar, rainfall, population, larvae*

NC/AB/035/2023

BIODIVERSITY OF ARBUSCULAR MYCORRHIZAL FUNGI ASSOCIATED WITH HERBAL MEDICINAL PLANT *'ALOE VERA'*

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Aloe vera is a well known traditional medicinal plant which is cultivated throughout the world for different medicinal and commercial purposes. The plant *Aloe* is used for curing several diseases mainly connected with digestive system and extract of this plant has antibiotic, antiseptic and medicinal properties used for curing different diseases. *Aloe vera* is rich in vitamin-A, B1, B2, B6, B12, chlorine, folic acid, enzymes, minerals, amino acids, fatty acids and natural sugars. Arbuscular mycorrhizal fungi (AMF) are soil fungi which form a mutualistic symbiosis with the roots of plants and enhanced uptake of immobile nutrients from the soil. The present study is the assessment of vesicular-arbuscular mycorrhizal root colonization in two different areas, one from the mid hill and another from valley. They show root colonization in both areas averagely. In the root both vesicles and arbuscules were observed and spores are abundant from the both rhizospheric soil sample. Both the rhizospheric soils were dominated by *Glomus* species at most. Microscopic analyses of root samples revealed a variable degree of colonization by AM fungi. The different microscopic characters like size, colour, details of the wall layers and the nature of their subtending hyphae were also investigated during this study.

Keywords: *Medicinal plants, Arbuscular mycorrhizal fungi, Rhizosphere.*

NC/AB/036/2023

QUALITY EVALUATION OF DIFFERENT AGED SEED OF GUAVA (*PSIDIUM GUAJAVA* L.)

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The present investigation entitled "Quality evaluation of different aged seed of guava (*Psidium guajava L.)*" was carried out at in the laboratories of seed science department, CCS HAU, Hisar. Seeds of different age (Fresh, One year, Two year and Three year) of variety L-49 were taken for different seed scarification treatment (Hot water at 80°C for 1 minute, Concentrated sulphuric acid for Quick dip, Water soaking for 48 h. and Control (untreated). Standard procedure for various physiological parameters(Standard Germination, seedling length, seedling dry weight, seed vigour index-I, seed vigour index-II, speed of germination, accelerated ageing test) and biochemical parameters(*peroxidase* activity, *dehydrogenase* activity, electrical conductivity) were followed. Hot water treatment resulted into maximum germination, seedling length, dry weight, seed vigour index-I, seed vigour index-II, speed of germination and maximum germination under accelerated ageing test for 24,48,72,96 h, *peroxidase* activity and *dehydrogenase* activity. Among all the scarification methods hot water treatment is the best scarification method for removing physical dormancy of guava seed. Concentrated sulphuric acid resulted in no germination and control seed also showed poor germination. Over all hot water treatment at 80°C for 1 minute along with fresh seed lot resulted into maximum physiological and biochemical parameters.

Keywords: *Biochemical, Water, Quality, germination*

NC/AB/037/2023

OPTIMIZATION OF EXTRUSION PROCESS FOR THE DEVELOPMENT OF EXTRUDED PRODUCT SNACK ENRICHED WITH MEDICINAL PLANTS

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Extrusion cooking is a popular HTST method for preparation of snacks and ready to eat food product. Extruded products were prepared from flour blend made with sorghum, corn, millet, and medicinal plants like ashwagandha, ginger, gudwel, and drumstick leaves. Single screw extruder was used to prepare the product. The experiment conducted having three level of six independent variables (moisture content- 14, 18, 22; Ashwagandha powder- 5,10,15; Ginger powder- 2,3,4; Drumstick leaves powder- 2,3,4; Blend ratio- 60:30:10, 50:35:15, 40:40:20) The effect of independent variable on dependent variables like mass flow rate, bulk density, expansion ratio, water absorption index, textural properties, colour measurement, sensory properties was studied and optimized by applying response surface methodology. Second order polynomial regression equation was used to show the effect of independent variable over dependent variable. The best optimized product was prepared at 15% moisture content, 60:30:10 blend ratio, 5% ashwagandha, 9% ginger, 2% gudwel and 2.5% drumstick leaves powder. The obtained corresponding reaction were 0.324 g/s MFR, 0.214g/s BD, 4.326 ER, 416.68% WAI, 627.135 hardness, 9.215 crispness, colour L-value 62.447 and OA 7.870.

Keywords: *Ashwagandha, absorption, MFR, product*

NC/AB/038/2023

EFFECT OF VARIOUS ORGANIC SOURCES ON SOIL MICROFLORA UNDER ORGANIC GROUNDNUT CULTIVATION

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A field experiment on "Effect of various organic sources on soil microflora under organic Groundnut cultivation" was conducted at the Agronomy Research Farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra) during summer season 2016-17. The soil of the experimental plot was very fine, clayey in texture. It was slightly alkaline in reaction, medium in organic carbon, low in available nitrogen, medium in available phosphorus content while high in available potassium. The treatments consist of two factors i.e., nitrogen levels through vermicompost (A) and phosphorous levels through PROM (Phosphate Rich Organic Manure) (B). The factor A consisted of three levels of nitrogen through vermicompost viz., N_1- 75% RDN, N_2-100% RDN and N_3-125% RDN while factor 'B' comprised of three levels of phosphorus viz. P_1-75% RDP, P_2-100% RDP and P_3-125% RDP. The experiment was laid out in Factorial Randomized Block Design (FRBD) consist of nine treatment combinations with three replications. The study revealed that application of 125% RDN (N_3) through vermicompost significantly improved the soil microflora viz., bacteria, fungi and actinomycetes population. However, the response of soil microflora (bacteria, fungi and actinomycetes) to the different levels of phosphorus through PROM were found non-significant at 60 DAS. Also, the interaction between nitrogen levels through vermicompost and phosphorus levels through PROM was recorded non-significant in relation to soil microflora.

Keywords: *Groundnut, Organic, Nitrogen, Phosphorous, Phosphate Rich Organic Manure (PROM), Soil microflora.*

NC/AB/039/2023

PERFORMANCE OF *BT* COTTON UNDER DIFFERENT LEVELS OF DRIP IRRIGATION AND FERTIGATION

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A field experiment entitled, "Performance of Bt cotton under different levels of drip irrigation and fertigation" was conducted at Cotton Research area of CCS Haryana Agricultural University, Hisar, during kharif 2019. The experiment comprising 3 irrigation levels: I1 (1.0 Etc), I2 (0.8 Etc), I3 (0.6 Etc) and 4 fertigation levels: F1 (control), F2 (50 % RDF), F3 (75 % RDF), F4 (100 % RDF) was conducted in factorial randomized block design with three replication. LAI, dry matter accumulation, sympodial branches plant-1 , seed cotton yield, yield attributes (number of bolls plant-1) and N, P and K status in soil after harvest were observed higher in I1 (1.0 Etc) level of irrigation which were statistically at par with I2 (0.8 Etc) level of irrigation. Similarly,I1 (1.0 Etc) level of irrigation recorded higher plant height, total water use, nutrient use efficiency, gross returns, net returns and benefit cost ratio as compared to all other irrigation levels. But, plant population at harvest, number monopodial branches, quality parameters and seed index did not differ significantly among different levels. I1 (1.0 Etc) level of irrigation took higher number of days to attain phenological stages (days to squaring, days to 50% flowering, days to 50% boll development and days to maturity). Whereas, I3 (0.6 Etc) level recorded highest water use efficiency. In case of various fertigation schedules, F4 (100 % RDF) level recorded higher plant height which was statistically at par with F3 (75 % RDF) level. Plant population at harvest, sympodial branches plant-1 , seed cotton yield, bolls plant-1 and water use efficiency were observed higher in F4 (100 % RDF) level which were statistically at par with F2 (50 % RDF) level. Similarly, F4 (100 % RDF) level recorded higher dry matter accumulation, N,P,K status after harvest, gross returns, net returns and benefit cost ratio as compared to all other levels of fertigation. But, monopodial branches plant-1, phenological stages, boll weight, quality parameters did not differ significantly among different levels. F2 (50 % RDF) level recorded higher nutrient use efficiency as compared to all other levels.

Keywords: *N,P,K, Performance, sympodial, RDF*

NC/AB/040/2023

YIELD AND YIELD PARAMETERS OF RICE AS INFLUENCED BY APPLICATION OF ORGANIC MANURES AND FERTILIZERS

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The study aimed to examine the impact of various combinations of nitrogen sources on the growth, yield, and yield parameters of rice crops. The experiment used a randomized block design and was conducted during the Kharif 2020 season at Chaudhary Charan Singh Haryana Agricultural University, Krishi Vigyan Kendra farm in Fatehabad, Haryana with 14 treatments *viz.*T_1 (Control), T_2 (100% RDN through urea), T_3 (75% RDN + 25% N through FYM), T_4 (50% RDN + 50% N through FYM), T_5 (25% RDN + 75% N through FYM), T_6 (100% N through FYM), T_7 (75% RDN + 25% N through Vermicompost), T_8 (50% RDN + 50% N through Vermicompost), T_9 (25% RDN + 75% N through Vermicompost), T_{10} (100% N through Vermicompost), T_{11} (75% RDN + 25% N through Poultry manure), T_{12} (50% RDN + 50% N through Poultry manure), T_{13} (25% RDN + 75% N through Poultry manure) and T_{14} (100% N through Poultry manure). Results of the study showed that the different combinations of nitrogen sources had significant effects on the growth, yield, and economics of the rice crops. The treatment that used 100% of the recommended dose of nitrogen (RDN) through the use of urea resulted in the tallest plants (95.42 cm), the highest number of tillers per square meter (364.17 m^{-2}), the highest grain yield (44.61 q ha^{-1}), and the highest straw yield (52.28 q ha^{-1}) which was statistically at par with the treatments where 25 % RDN was applied through organic manures *i.e.,* T_3, T_7 and T_{11}.

Keywords: *Plant height, Tillers, FYM, Vermicompost, B:C ratio*

NC/AB/041/2023

EFFICACY OF TRAINING PROGRAMMES AMONG THE TRIBAL FARMERS PROVIDEDBY KRISHI VIGYAN KENDRA'S OF WEST NIMAR REGION MADHYAPRADESH

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The tribal farming community also needs training for their skill and knowledge development. The economic condition of the farming community can be improved through various training programme and important activities provided by Krishi Vigyan Kendra. The present study was conducted in Barwani and Khargone district of Madhya Pradesh. The total sample consisted of 240 tribal farmers as respondents for the study. Most of the respondents 44.17 percent had found in the low category of income increased due to the programme followed by 43.75 percent of the respondents had found in medium category of income increased due to the programme organized by KVK. Out of fourteen variables, age did not establish any significant relationship with annual income increased. Majority, 76.67 percent respondents reported that KVK is far away from villages and remote areas because Barwani and Khargone both district had one KVK in district head quarter. Farmers require continuous education to stay aware of fast-paced developments agriculture for utilizing technologies and new tools to upgrade operations and increase their income.

Keywords: *Efficacy, Krishi Vigyan Kendra, respondents, training, tribal farmers etc.*

NC/AB/042/2023

MODERN TECHNIQUES OF MEAT ANALOGUE PRODUCTION

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A meat analogue or meat substitute (also called plant-based meat or fake meat) is a food product made from vegetarian or vegan ingredients, eaten as a replacement for meat. However, global demand for sustainable diets has also increased their popularity among non-vegetarians and flexitarians seeking to reduce the environmental impact of meat production. Meat analogue products are currently made by two basic processes, through either thermoplastic extrusion or fiber spinning. Thermoplastic extrusion involves the adaptation of production processes that are more commonly associated with the making of ready-to-eat cereal products. soybean flour and gluten are usually used as foundation for most meat substitutes that are available on the market. Soy protein isolate is a highly pure form of soy protein with a minimum protein content of 90%. The process of extracting the protein from the soybeans starts with the dehulling, or decortication, of the seeds. The seeds are then treated with solvents such as hexane to extract the oil from them. The oil-free soybean meal is then suspended in water and treated with alkali to dissolve the protein while leaving behind the carbohydrates. Soy protein is also considered a "complete protein" as it contains all of the essential amino acids that are crucial for proper human growth and development. Newly, Emerging 3D printing technology makes it possible to create food matrices with adjustable textures using simpler procedures and could result in meat substitutes that come close to customer expectations.

Keywords: *Meat analogue, Extrusion, Fiber spinning, 3D printing*

NC/AB/043/2023

ERGONOMIC EFFECT OF PEDAL OPERATED SINGLE ROLL FARMYARD MANURE APPLICATOR ON MALE SUBJECTS OF DIFFERENT AGE GROUPS CULTIVATED IN POLYHOUSE

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A study on six male subjects of different age groups was conducted in crop research farm of Maya Group of Colleges, Dehradun, where a pedal operated single roll farmyard manure applicator was developed. The body mass index (BMI) was estimated with the help of anthropometric data recorded. The operators were subjected to independent parameters of time of operation and forward speed of developed machine. The BMI was found 21.13 for S_1, 20.28 for S_2 and 24.25 for S_3 whereas for the male subjects within the age-group of 31-60, S_1 was estimated 19.80, S_2 was 21.01 and S_3 was evaluated to be 18.28. The pattern of body temperature was observed to be rising from 99.1ºC to 100.1 ºC from morning to evening during the operation of paddle operated farmyard manure applicator in polyhouse. It was observed that the blood pressure increased with increase in forward speed (S_{f1}= 1.36, S_{f2}= 2.41, S_{f3}= 3.60 and S_{f4}= 4.81) the blood pressure of male subject of the age group of 18-30 years in poly house whereas in the age group of 31-60 years blood group increased from 125.41/88.34 to 132.41/93.16. It was observed that in the male subjects within the age group of 18-30 years and 31-60 years had a slight increase in heart rate ranging from 78.83 to 146.34 and 81.83 to 145.083 respectively

Keywords: *Blood pressure, BMI, groups*

NC/AB/044/2023

EFFECT OF DIFFERENT COLOUR SHADENET HOUSE AND MULCHING ON YIELD OF TOMATO

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A Field experiment on tomato under silver polyethylene mulch and without mulch in different colour shadenet House and in open field was conducted at Instructional Farm of Department of Farm Structures, Dr. PDKV, Akola, during rabi season of 2018-19. The experimental site was fairly uniform and levelled. For conducting experiment the field is subdivided into three plots of 48 m^2 (8m x 6m) and the two shadenet house has been constructed and one as open field for treatment. Two shadenet houses are of different types namely Green shadenet house, White shadenet house and Open field. The white shadenet house with mulching found more suitable to obtain significantly maximum yield of tomato as compared to the green shadenet house and open field in both with mulching and without mulching. the yield parameters viz., Number of fruits per plant (62.99), Weight (kg) of fruit per plant (4.02), Weight (kg) of fruit per plot (112.27), Weight (g) of individual of fruits (70.54) and length (cm)of individual of fruit (5.22), were significantly increased under white shadenet house with mulching at last picking. Also the yield parameters viz., Number of fruits per plant (58.41), Weight (kg) of fruit per plant (3.76), Weight (kg) of fruit per plot (101.86), Weight (g) individual of fruits (63.06) and length (cm)of individual of fruit (4.65),were significantly increased under white shadenet house without mulching at last picking.

Keywords: *Green shadenet house, White shadenet house, Open field, Mulching, without mulching*

NC/AB/045/2023

CONSTRAINTS BEING FACED BY THE FARMERS TO MITIGATE THE ADVERSE EFFECT OF CLIMATE CHANGE IN UDAIPUR DISTRICT OF RAJASTHAN

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The present study was undertaken in Udaipur district of Rajasthan in order to identify the constraints faced by the farmers to mitigate the adverse effect of climate change. A sample of 120 respondents from two tehsils (Girwa & Kotra) and eight villages (Alsigarh, Karget, Pai, Panduna, Mamer, Asawara, Samoli and Ghata) were selected on the basis of random sampling technique. The result reveled that inadequate knowledge about climate change, Lack of technical guidance about climate change, Non availability of drought tolerance varieties, Dependence on monsoon, Lack of access to weather, forecasting technology, Difficulty in shifting cropping patterns, Small size and fragmented land holding, Lack of credit facilities for adaptation of crop and livestock strategies, Irregular extension services. Poor access to information resources, High cost of farm inputs. Non-availability of timely farm inputs, Non-availability of irrigation facility, High cost of efficient irrigation systems, Poor supply of electricity for use of drip and sprinkler irrigation system, Delay in settlement of crop insurance claim are most perceived constraints of the farmers of Udaipur district.

Keywords: *Climate, Adaptation, Constraints, Agriculture.*

NC/AB/046/2023

EFFECT OF PLANT GROWTH REGULATORS ON GROWTH, FLOWERING AND FLOWR YIELD OF CHINA ASTER

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A field investigation entitled "Effect of plant growth regulators on growth, flowering and flower yield of China aster" was carried out during the year 2021-22 at Department of Floriculture and Landscape Architecture, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola with the objectives to study the effect of different growth regulators on growth, flowering, yield and flower quality of China aster and to find out the suitable concentration of growth regulators for higher and quality production of China aster. The experiment was laid out in Randomized Block Design (RBD) with ten (10) treatments and replicated thrice. The treatment comprised three levels each of GA_3 (100, 150 and 200 ppm), cycocel (500, 1000 and 1500 ppm) and MH (250, 500 and 750 ppm) along with control (water spray). The growth regulators of the respective concentrations were sprayed twice at 20 and 30 days after transplanting. The result of the present investigation indicated that, the growth regulator treatments significantly influenced growth, flowering and flower yield of China aster. Maximum vegetative growth of China aster plant *viz.* plant height (61.10 cm), number of branches per plant (15.73), plant spread (36.40 cm) and leaf area (99.00 cm^2) were recorded with GA_3 @ 200 ppm spray. However, flowering parameters *viz.* minimum days for emergence of first flower bud (59.80 days), days required for full opening of flower from bud initiation (9.90 days), 50 per cent flowering (71.13 days), first harvesting (64.25 days) and maximum duration of flower (19.27 days) were recorded with GA_3@ 200 ppm spray. In respect to yield parameters, maximum number of flowers per plant (25.80), flower yield per plant (200.29 g), yield per plot (4.01 kg) and yield per hectare (16.07 t) were recorded with GA3 @ 200 ppm spray.

Keywords: *China Aster, GA3, Cycocel, MH, plant growth regulators.*

NC/AB/047/2023

LAND RACES AS A SOURCE OF GENETIC VARIABILITY IN MUSTARD

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Genetic variability and correlation studies were carried out using 200 Individual plant selection (IPS) identified from 20 land races of mustard along with 10 varieties of mustard at the farm of Agril. Botany Section, College of Agriculture, Nagpur. The experiment was conducted in RBD replicated twice. Analysis of variance revealed the existence of variation among 200 IPS progenies for all the seven traits studied and hence, are suitable for selections. The range of variations was maximum for number of siliquae plant^{-1} followed by plant height, while it was lowest for 1000 seed weight and number of branches plant^{-1}.The magnitude of variation in terms of GCV and PCV was maximum for number of siliquae plant^{-1} followed by seed yield plant^{-1} and 1000 seed weight. Narrow difference between PCV and GCV was observed for the above three traits which implied that they were less influenced by environment. High heritability estimates where obtained for all the traits studied except for days to maturity for which heritability was moderate. Among the characters studied seed yield plant^{-1}, number of siliquae plant^{-1} and 1000 seed weight recorded high heritability coupled with high genetic advance as per cent of mean. Genotypic correlation worked out revealed that seed yield plant^{-1} was significant and positively correlated with number of siliuae plant^{-1}, number of branches plant^{-1}, plant height and days to maturity. Simultaneous selection for these traits might bring improvement in seed yield. Considering GCV, PCV, heritability, genetic advance as per cent of mean, seed yield plant^{-1} and number of siliquae plant^{-1} should alone be given emphasis for selecting superior IPS progenies. Based on this criteria 38 lines for number of siliquae plant^{-1}, 30 for seed yield plant^{-1} where identified as promising lines out of which 11 lines where common for both the traits. It is therefore, concluded from the study that these promising lines should be raised and evaluated for their homozygosity and stable performance for one more year before including them in the yield trials.

Keywords: *Mustard, land races, variability, correlation.*

NC/AB/048/2023

TEXTURAL BEHAVIOR OF PLANT-BASED GUMMIES SUPPLEMENTED WITH TURMERIC AND BLACK PEPPER

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Indian confectionery sector is one of the fastest-growing sectors globally with an estimated growth of 18-20 %. Gummy candy is a very trendy confectionery product that represents approximately 50 % of candy market importance. Gummy is consumed by a large and diverse group of people. Many nutrients and supplements are used to integrate in gummies, because of their palatability, unique chewable texture, that are appropriate carriers of bioactive compounds like turmeric and black pepper to develop healthier products and effective supplements. Being turmeric as potential therapeutic agent with several medicinal properties such as antioxidant, anti-inflammatory, antidiabetic, antiseptic, antibacterial and wound healing properties. As piperine enhances the bioavailability 2000 times of curcumin so these two combinations are gaining popularity. Gummies are generally made up of gelatin, an animal-derived protein. Considering different religious beliefs and some restrictions meat on their diet, regarding of its being non-vegetarian food many people are in need of plant-based (vegan) gelling agent like agar-agar and guar gum which can provide similar textural properties to gummies as that of gelatin. The present investigation was thus aimed to develop a gelatin free gummies by using plant-based gelling agents like agar-agar and guar gum which provide chewy texture similar to gelatin, without any concern of religious beliefs and suitable for "anytime-everywhere" consumable product. Agar-agar and guar gum was used alone but the textural properties of gummies were not achieved however, combination of agar-agar and guar gum provided the maximum chewiness (1,455.12N), gumminess (2251.1N) and overall acceptability (8.96) based on sensory, which was almost similar to gelatin gummies texture. Further incorporation of turmeric and black pepper was done in combination of agar-agar and guar gum gummies as this combination was standardized from the experiment and best incorporated concentration was 2 % turmeric and 0.6 % black pepper on the basis of sensory parameters.

Keywords: *Agar-agar, gelatin, curcumin, antiseptic, antibacterial*

NC/AB/049/2023

EFFECT OF NITROGEN AND BIO-ORGANICS ON GROWTH, YIELD, QUALITY AND ECONOMICS OF OKRA

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A field experiment entitled "Effect of Nitrogen and Bio-organics on Growth, Yield and Quality of Okra [*Abelmoschus esculentus* (L.) Moench] under loamy sand soils was conducted at Horticulture farm, S.K.N. College of Agriculture, Jobner during *kharif* season 2013. The experiment comprising of 24 treatment combinations replicated three times, was laid out in split plot design with six levels of nitrogen *viz.,* control (T_0), 60 kg N/ha (T_1), 80 kg N/ha (T_2), 100 kg N/ha (T_3) 120 kg N/ha (T_4), 140 kg N/ha (T_5) and four biofertilizer inoculation *viz*., Control (F_0), *Azotobacter* (F_1), Vermicompost @5t/ha(F_2), Vermicompost (5 t/ha) + *Azotobacter*(F_3) in subplots. The results showed that the application of 100 kg N ha^{-1} produced highest and significantly both growth attributes *viz:* at harvest, number of branches per plant, leaf area and yield and quality attributes like (fruit weight, fruit yield $plot^{-1}$) quality parameters (Nitrogen, protein and crude protein content) in fruits as compared to control, 60 kg and 80 kg but remained at par with 120 kg and 140 kg N ha^{-1}. Similarly, results also showed that application of vermicompost @ 5 t ha^{-1} + *Azotobacter* significantly increased the above growth yield and quality parameters as compared to rest of treatments. The highest net return (Rs. 134749 and 147867 ha^{-1}) and B:C ratio (1:3.2, 1:3.0) were recorded in treatment T_3 (100 kg N ha^{-1}) and F_3 (vermicompost @ 5 t ha^{-1} + *Azotobacter*. Application of 100 kg N ha^{-1} with vermicompost @ 5 t ha^{-1} + *Azoctobacter* proved the best treatment combination in terms of fruit yield per plot, fruits yield ha^{-1}, net return (Rs 166392) and B:C ratio (1:3.36) in comparison to other treatment combinations.

Keywords: *Economics, Growth, Nitrogen, Quality, Yield*

NC/AB/050/2023

DESIGN OF AONLA PRICKING MACHINE

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In India an economical manufacturing remedy is vital for product being affordable to rural areas as well as small scale industries, in India *Aonla* produced on very large scale for various purposes like candy, murabba, pickles *etc.* The purpose of study is to investigate and overcome problem by overcome manual method of pricking *Aonla* while manufacturing murabba. *Aonla* has the hallowed position in *Ayurveda*. *Aonla* is native to India and also grows at tropical and sub tropical region like India, Pakistan Sri Lanka and Uzbekistan. In India Uttar Pradesh has the highest area under cultivation and production of *Aonla*. Area under Aonla orchard in Pratapgarh district of Uttar Pradesh is about 13000 hectares. Traditional method for making Aonla *murabba* is hygienic because for making *murabba,* Aonla has to be pricked first and that pricking method of Aonla is drudgery prone and most of the workers are injured by hand pricking method. Also it takes too much time for pricking. Thus to overcome these problems and keeping in mind the benefits of small and medium farmers a low cost, pedal operated Aonla pricking machine suitable for farm women has been designed. This machine is firstly designed in Solid works software where its mechanism is tested. After complete testing of this machine mechanism, machine had been fabricated and tested for pricking Aonla which was successful for pricking Aonla. This machine has prick 2.5 quintal Aonla in 1 hour.

Keywords*: Murabba, Efficient, cultivation, mechanism, drudgery*

NC/AB/051/2023

REAL-TIME EXPRESSION OF DEFENSIVE GENES IN RESISTANT AND SUSCEPTIBLE GENOTYPES OF *CITRUS* SPP. INCITED BY *XANTHOMONAS CITRI* PV. *CITRI*

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Xanthomonas citri pv. *citri* (Xcc) is a Gram-negative bacteria causing citrus canker disease in citrus species. It causes tremendous economic losses to the citrus industry in worldwide. The present study focused on the comparative analysis of defense responses in resistant (Kagzi Kalan lemon) and susceptible (ALC-35 acid lime) genotypes of *Citrus* spp. infected by citrus canker. 10 defense related genes namely *WRKY22*, *NDR1*, *NPR1*, *PR1*, *PAL1*, *NPR3*, *NDR1*, *JAR1*, *CHI*, and *EDS1*, along with the *GAPC2* house keeping gene have been selected based on transcriptome profilingin *Citrus* spp. The resistant and susceptible genotypes of citrus were challenged by Xcc for real-time expression analysis at different time points (0, 12, 24, 48, and 72 hours post inoculation) under glass house conditions. 7 out of 10 selected genes except *WRKY22*, *NDR1*, and *NPR1*, could be expressed in the leaves of susceptible 'ALC-35' acid lime and resistant 'Kagzi Kalan'. The comparative analysis revealed the higher expression of defensive genes- *PAL*, *JAR1*, *NPR3*, *NDR1*, and *CHI* in resistant genotype whilst *EDS1* and *PR1* in susceptible genotype as compared to housekeeping gene *GAPC2*. The *PAL* gene expressed the most at 24 hpi, while the majority of the genes, including *EDS1*, *CHI*, *JAR1*, *NPR3*, *NDR1*, and *PR1*, were expressed at 48 hpi in both genotypes. The outcome of this study elucidate the fold change of defense-related genes in both the genotypes. Further, the intensity of defence gene reprogramming (number of genes induced and levels of induction) correlated with the levels of citrus canker resistance observed in the genotypes studied. It will be important to determine the role of these genes in the response to Xcc infection, and any promising genes could potentially be used to engineer citrus susceptible genotypes by genetic transformation to increase disease tolerance or even to achieve resistance. Although, breeding a cultivar resistant to canker can provide the most effective and economical way to control the disease.

Keywords: *ALC-35, Defense-related genes, Hpi, Kagzi Kalan, Xcc*

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HYDRAULIC AND WATER QUALITY PERFORMANCE OF BIORETENTION FILTER MEDIA THROUGH COLUMN STUDIES

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The saturated hydraulic conductivity and water quality performance determine the performance of a bioretention filter media. An effective engineered filter media comprising of sand, compost, biochar and topsoil should ensure effect removal of total suspended solids (TSS), total phosphorus (TP), total nitrogen (TN) and other urban runoff pollutants. This investigated the effectiveness of filter media amended with compost and biochar for use as bioretention filter media mix through column studies. The columns were compared on the basis of overall saturated hydraulic conductivity and water quality improvement performance during the period of observation. The experiments showed that the bioretention column T2 with 20% compost and column T4 with 10% biochar performed better in terms of overall saturated hydraulic conductivity and water quality improvement. Column T2 and Column T4 showed average saturated hydraulic conductivity of 365.9 and 327.1mm/hr respectively. TSS, TN and TP removal averaged at 91.4, 57.6 and 90.81 % for column T2 and 91.9, 52.12 and 84.03 % for column T4. Based on the average values of saturated hydraulic conductivity and water quality performance, it can be concluded that the results were within the limits set by different design manuals.

Keywords: *Bioretention columns, Stormwater management, Water quality, Biochar, Compost*

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PATH COEFFICIENT ANALYSIS AND CORRELATION STUDIES IN SORGHUM [*SORGHUM BICOLOR* (L.) MOENCH]

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Sorghum became very popular among the farmers due to its wide adaptation, rapid growth, high green and dry fodder, ratoon-ability and tolerance to drought conditions. The study of relationships among quantitative traits is important for assessing the feasibility of joint selection of two or more traits and hence for evaluating the effect of selection for secondary traits on genetic gain for the primary trait under consideration. The experiment was carried out with 40 sorghum genotypes during *kharif*, 2021 at College Farm, Navsari Agricultural University, Navsari, Gujarat. The aim of this investigation was to study the correlations between yield and its contributing characters, and also to analyze path coefficient for assessing direct and indirect effects of individual character on yield. The association studies indicated that grain yield per plant was significant and positively correlated with plant height, panicle length, primary branches per panicle,100 seed weight, protein content and harvest index, which suggested that these characters can be improved simultaneously with grain yield per plant by direct selection. Path analysis revealed that the highest positive direct effects on grain yield per plant were exhibited by harvest index followed by straw yield per plant, 100 seed weight, days to maturity, panicle length and plant height. Therefore, selection for such traits is easy and would be useful to bring about improvement in sorghum. The highest negative direct effect on grain yield per plant was recorded by days to 50% flowering followed by primary branches per panicle, protein content, Zn content and Fe content. Thus, researcher must take care during the selection of these parameters while improving grain yield. From the results obtained, it would be reasonable to suggest the breeder who involved in increasing the seed yield to concentrate more on plant height, panicle length, 100 seed weight and harvest index.

Keywords: *Correlation, Path analysis, Sorghum*

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A PHYTOCHEMICAL CONSTITUENT OF DIFFERENT EXTRACTS OF *AZADIRACHTA INDICA* LEAVES IN URINE SOLVENT OF NON-PREGNANT COW

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This study includes qualitative analysis of phytochemicals present in fresh urine of non- pregnant cow, photo activated urine of non- pregnant cow, urine distillate of non-pregnant cow, photo activated cow urine extract of *Azadirachta indica* and cow urine distillate extract of *Azadirachta indica*. The different extracts of *Azadirachta indica* leaves were prepared by using non-pregnant cow urine as solvent. The results of qualitative phytochemical analysis showed that different extracts of *A. indica* leaves contain phytochemicals *viz.* Alkaloids, Glycosides, Tannins, Proteins, Reducing sugars, Phytosterols, Phenolic compounds, Saponins.

Thus, presence of these phytochemical suggests the pharmacological potential of the wonder tree “neem”. It was concluded that non- pregnant cow urine extract of *A. indica* leaves contain pharmacologically active constituents.

Keywords: *Azadirachta indica, Ayurveda, cow urine, herbal extracts, phytochemicals*

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GREEN MANURING IS A BOON FOR SALT AFFECTED SOILS OF INDIA

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The declination of soil quality is an emerging issue in a agriculture nowadays. Due to the use of Green revolution techniques the production has increased to much extent but it has caused the detioration of the soil quality, degradation of land which ultimately affects the human health and environment. Higher uses of agrochemicals in the soil are decreasing the soil health which also leads to less fertility of the soil. The use of green manuring crops in agriculture can restore the soil fertility, prevent soil degradation, improve physico-chemical properties of soil, maintain genetic balance; mainly they act as nutrient supply to the succeeding crops. Green manuring crops improve the physical, biological property of the soil but also protect the plants from diseases pests. Problematic soil is a major constraint to the higher production and growth of plants. The primary cause of soil degradation is the use of agrochemicals such as fungicides, pesticides, herbicides, and fertilizers. Most commonly used crops are Dhiancha (*Sesbania aculeate*) , crops has biological properties to sustain in salt affected area as it extract calcium form the salt affected for the metabolic activities. Green manuring is also known as the process of incorporating green plants into the soil which are raised in the same field or in the another field at green stage before flowering. Green manure technology helps in the nutrient supply, improves soil fertility, soil structure, water holding capacity of the soil, check soil erosion, and flourish the microbial population by the addition of humus and organic matter into the soil Green manuring improves the soil physical properties such as structure of the soil, soil bulk density, water retention capacity, texture of the soil, alters the porosity of the soil by decreasing the number of microspores and increasing the number of macro pores. Green manure crops help in the fixation of the atmospheric nitrogen by forming the symbiotic relationship with the legumes. Rhizobium species has the capacity to fix the nitrogen into the soil according to the nutrient demand of the plant.

Green manuring is one of the enumerative alternatives to improve the soil health and meet the nutritional requirement of succeeding crop. The nitrogen loses are at peak point in the submerged soil so the loss of nitrogen can be prevented by the incorporation of green manure crops in the soil. Green manure crops are mostly leguminous crop because they help in the fixation of the nitrogen by symbiotic association Rhizobium. Most commonly used crops are Dhiancha (*Sesbania aculeate)*, sun hemp, guar etc. The green manure crops check soil erosion; improve physico-chemical properties of soil, biological so we can say green manuring is a boon for salt affected soil of India and to improve salt affected soils are need of sustainable Agriculture

Keywords: *Dhiancha, soils, leguminous, enumerative*

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DEVELOPMENT AND QUALITY EVALUATION OF MULTI-MILLET KHAKHRA FROM UNDERUTILIZE SEED- HEMP SEEDS

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In the recent years increasing interest in vegetarian diets has been observed, a major problem in this type of diet is to provide the appropriate amount of protein. Value addition of food is current most talked topic because of increasing nutritional awareness among consumers today. An investigation was conducted to develop protein rich multi-millet hemp seed khakhra.
The seeds of *Cannabis sativa* L. have been a significant source of food for thousands of year. In recent years, hemp has not been thoroughly explored for its nutritional potential due to the mistaken belief regarding the cannabis plants. Two variations were prepared referencing standard recipe. Variation 1 was prepared using 25g ragi, 25g bajra,40g whole wheat flour with 10g hemp seed powder, variation 2(RF-25g,BF25g,WWF-35g,HS-15g). The product was subjected to sensory evolution by semi trained panel members using 9 point hedonic on 50 panelists. Result of the sensory evaluation revealed that the product incorporated with 15g of hemp seed were similar to control I texture, taste and overall quality and was more acceptable by the panelist and was selected as final product seed. On estimation of the nutrient content 30g of khakhra provides 107kcal of energy, 12g protein, 75g carbohydrate, and 9.6g of fats with shelf life of 3 months. Khakhras can be eaten as a snack at any time of the day. Hemp seed powder incorporated in it enhances its nutritive value and makes it more nutritious. It is suitable for consumption of all the age group.

Keywords: *Cannabis sativa, hemp, protein, seed.*

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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH, PRODUCTIVITY AND ECONOMICS OF SUMMER GROUNDNUT (*ARACHIS HYPOGAEA* L.)

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A field experiment was conducted at Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat during summer season of 2018 to investigated the effect of integrated nutrient management on growth, productivity and economics of summer groundnut (*Arachis hypogaea* L.). The experiment was laid out in randomised block design with four replications consisting of ten different treatments with application of recommended dose of nitrogen to summer groundnut through different organic source *viz*. farm yard manure and vermicompost and integration of inorganic fertilizers along with seed inoculation of biofertilizers viz., *Rhizobium* and PSB. The results revealed that combined application of 75 % RDN and 25 % RDN through vermicompost or FYM along with seed inoculation of *Rhizobium* and PSB recorded higher growth parameters, pods and haulms yield and also higher net realization and B: C ratio of summer groundnut as compared to rest of treatments combinations.

Keywords: *Rhizobium, pods, groundnut, vermicompost*

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PROBLEMS FACED BY SMALL AND MARGINAL FARMERS IN PRACTICING INTEGRATED FARMING SYSTEM

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Small and marginal farmers are the core of the Indian economy comprising 85% of the farming community however owning only 44% of the operational land. The emergence of IFS has enabled us to develop a framework for an alternative development model to improve the feasibility of small sized farming operations in relation to larger ones. IFS refer to agricultural systems that integrate livestock and crop production or integrate fish and livestock and may sometimes be known as integrated bio systems. Integrated farming system approach, is a valuable approach to address the problems of sustainable economic growth for farming communities in India. In this regard, the present study entitled "Problems faced by Small and Marginal Farmers in Practicing Integrated Farming System" carried out in the two states of India, namely Haryana and Uttar Pradesh with the sample size of two hundred small and marginal farmers. The results of the study depicts that in the study majority of the farmers were facing the problem in integrated pest management (IPM) and integrated nutrient management (INM), poor access to animal care and health services, difficulty in managing various components of IFS simultaneously difficulty in procuring machineries for crop production, high cost of insecticide and weedicide and lack of proper marketing facilities infrastructure facilities. Certain other constraints do exist like high investment is needed at initial stage in multidisciplinary enterprise involved in dairying, horticulture, apiary, and market opportunities at village level.

Keywords: *Integrated farming, Small farmers, Constraints, Farming system*

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TOXICITY EFFECTS OF FIPRONIL AND LAMBDA-CYHALOTHRIN ON INDIAN HONEY BEE (*APIS CERANA*) UNDER LABORATORY CONDITIONS

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The effect of phenyl pyrazole fipronil and synthetic pyrethroid lambda-cyhalothrin was evaluated under laboratory conditions at Dr Y.S Parmar University of Horticulture and Forestry, Nauni, Solan, India (HP). The contact, oral and larval toxicity of these chemicals to *A. cerana* was determined with various doses based on a preliminary trial with concentrations of the test chemicals with a mortality rate of 20-80 per cent. The adults of *A. cerana* were exposed to fipronil at dosages ranging from 0.0025 to 0.015µg/bee for the contact bioassay, while the oral bioassay was done at doses ranging from 0.022 to 0.12µg/bee. The contact toxicity and oral LD_{50} of fipronil were 0.006 and 0.046 µg/bee. The adults of *A. cerana* were exposed to lambda-cyhalothrin at dosages ranging from 0.018 to 0.100 µg/bee, whereas oral doses ranging from 0.02 to 1.05 µg/bee were used for the bioassay. The contact toxicity and oral LD_{50} of lambda-cyhalothrin to *A. cerana* were 0.04µg and 0.5 µg/bee. The larval bioassay was carried out by exposing the larvae of *A. cerana* to fipronil and lambda-cyhalothrin at doses ranging from 0.04 to 0.25and 0.25 to 1.50µg/larvae. The LD_{50} of fipronil and lambda-cyhalothrin to larvae was 0.11 and 0.63µg/larvae, respectively.

Keywords*: Fipronil, Lambda-cyhalothrin, Toxicity, Lethal dose*

NC/AB/060/2023

EFFECT OF FEEDING GRAM STRAW-BASED COMPLETE FEED PELLETS ON THE PERFORMANCE, NUTRIENT UTILIZATION AND RUMEN FERMENTATION OF GOATS

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The aim of this study is to evaluate the effect of feeding gram straw-based complete feed pellets on the growth performance, nutrient utilization and rumen fermentation of goats. Twelve adult goats of approximately similar body weights were divided into two groups i.e., control (Group I) and treatment group (Group II). The goats in groups I and II were fed *ad lib* super napier hay + 300 gm concentrate daily and *ad libitum* gram straw-based complete feed pellets with roughage to concentrate ratio of 70:30, respectively. The growth performance, nutrient utilization and rumen fermentation study, along with an estimation of hematological and blood biochemical parameters, were carried out in this experiment. Significantly better growth performance, nutrient utilization, rumen fermentation and low cost of production was found in goats of group II (fed gram straw-based complete feed pellets) with the non-significant difference in body condition score, rumen motility and hematological parameters in goats of group II than group I. The blood glucose values found significantly more in group II as compared to group I. Feeding gram straw-based complete feed pellets improved performance, nutrient utilization and proved to be economical.

Keywords: *Blood biochemical, Complete feed pellets, Cost of production, Goats, Hematological, Performance, Nutrient utilization, Rumen fermentation*

NC/AB/061/2023

FORMULATION AND QUALITY EVALUATION OF LITTLE MILLET (*PANICUM MILIARE*) BASED BISCUIT WITH APPLE POMACE PECTIN AS A FAT REPLACER

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Little millet (*Panicum miliare*) is nutritious and has a significant role in providing nutraceutical components and exhibited hypoglycaemic, hypolipidemic effects. Excess fat intake associated with obesity, cardiovascular disease, weight gain etc. In order to reduce the fat content, fat replacers have been employed. Apple pomace pectin is the main by-product from apple juice and cider industry. Pectin can be obtained from apple pomace, which is present as protopectin and an acid soluble polysaccharide. Apple pomace is a well-known good source of carbohydrates, dietary fibres, vitamins and minerals and polyphenols. For both cost-effective and ecological reasons, it is worth recovering these nutrients and developing value added products and it act as a fat replacer. Hence, the present study was designed to develop and standardize the little millet-based biscuit with apple pomace pectin as a fat replacer. The developed biscuits were evaluated for sensory, physico-chemical parameters. Biscuits were developed by incorporation of little millet flour at 50 to 100 % containing 20 % fat. 100 % little millet flour biscuit was considered as control for further replacement of fat from 20 to 60 % with apple pomace pectin. Physical parameters of fat replaced little millet biscuit showed increased in diameter (4.68-4.85 cm), thickness (0.63-0.81 cm), density (0.96-1.00 g/cm^3), hardness (11.24 – 16.80 N) and decrease in fracturability from 20% of replacement of fat (15.08–13.24 N) whereas decreased in baking loss (22- 21.1 %), spread ratio (7.42-5.98) while compare to control. The significant result was observed only in crumb texture, taste and aroma, and mouth feel. The overall acceptability score showed that 60 % of millet-based fat replaced biscuit was highly acceptable. Nutrient analysis indicated decrease in fat content up to 42.79% with a content of 8.02 g than control (14.02g), increased fibre (2.50 g), protein (7.20 g) and calcium (54.5 mg) content. 100 % of little millet flour with 60 per cent apple pomace pectin biscuit was best accepted with improved nutritional quality and reduced hydrogenated fat content, further storage and consumer acceptability study were carried out.

Keywords: *Biscuits, Little millet, Fat replacer, Apple pomace pectin, Physical parameters, Nutrient analysis*

NC/AB/062/2023

ORGANIC VEGETABLE CULTIVATION: A NEW WINDOW OF SUSTAINABLE AGRICULTURE

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Conventional present day agriculture system utilizes unscrupulous usage of chemical fertilizers and pesticides which gradually reduces soil fertility status and deteriorates soil health day by day and its residual effects directly enters into the food chain which actually causes detrimental effects on human health. Hence, considering this phenomenon, organic vegetable cultivation becomes a noble alternative to encourage sustainable agriculture maintaining soil health and ecological balance to provide a gentle livelihood. Organic vegetable cultivation mostly involves crop rotation, green manuring, manuring with both animal and plant residues, bio fertilization, legume cultivation, biological control of disease-pests etc. Vegetables like tomato, cabbage, carrot, cucumber, pea, cowpea, okra performs well under organic system of cultivation, as a result both yield as well a quality of the crop is enhanced. Organic cultivation nurtures the soil health by improving amounts of organic carbon, bulk density, water holding capacity, microbial biomass carbon and dehydrogenase activity compared to conventional method of cultivation. The sequestration rate of carbon-di-oxide has been found to enhance significantly @3.2tons/ha per annuum by following practices of organic farming which has a direct influence in reducing the greenhouse gases. Organic system of cultivation also utilizes 28–32% lesser energy in comparison with conventional farming practices as it eliminates cost of fertilizers and pesticide applications and also the uses of farm machinery. Moreover, superior quality vegetable production under organic system of cultivation fetches better market price both in domestic as well as international market. Although, organic vegetable cultivation invites greater infrastructure with higher input association which is expensive to some extent compared to traditional cultivation, its noble aspect of eco-friendly environment restoration towards establishment of sustainable agriculture and superior quality vegetables production must offer a better alternative to the traditional growers.

Keywords: *Organic, Vegetable, Sustainable, Cultivation.*

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GREEN SYNTHESIZED GRAPHENE AS A NANOFERTILIZER FOR CROP PLANTS

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Reduced graphene oxide (rGO) prepared from a microbial source that had been biofunctionalized by the microbial cell components was employed as a nanocarrier for crop plants. Plant growth regulators were loaded on the rGO and the synthesized nanocomposites were characterized by standard techniques to assess their properties. Results of the characterization indicated the successful formation of the two plant growth regulators loaded rGO nanocomposites. Furthermore, the adsorption kinetics, loading efficiency, release percentage and release behavior of the plant growth regulators on rGO was determined. Lastly, the loaded rGO nanocomposites were applied on maize seeds by seed priming approach to determine their effect on plants. The green synthesized rGO as well as the plant growth regulator loaded rGO, displayed significant positive growth effects on the grown maize plants. Research presented in this work shows that the microbial synthesis of reduced graphene oxide is efficient and further suggests the promising potential of reduced graphene oxide as a nano-delivery vector for the exogenous introduction of plant growth regulators into crop plants.

Keywords: *Reduced graphene oxide (rGO), crop, plants, growth*

NC/AB/064/2023

BACTERIAL BIOFORMULATIONS: BIOTIC STRESS BUSTERS AGAINST *FUSARIUM OXYSPORUM* IN CHICKPEA

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Chickpea (*Cicer arietinum* L.), also called garbanzo bean or Bengal gram, is an old-world pulse with high protein source for the human and animal diet. The crop can be severely affected by different diseases of variable etiology. Among these, *Fusarium* wilt caused by *Fusarium oxysporum* is one of the most important soil borne disease responsible for the yield losses and declined productivity in chickpea. The present investigation was undertaken to develop a plant growth promoting microbial bioinoculant as biofertilizer and bioprotectant to reduce the *Fusarium* wilt in chickpea for improving crop productivity in sustainable manner. *Mesorhizobium* (15) and endophytic bacterial (5) isolates were assessed for antagonism against wilt causing *Fusarium oxysporum* sp. *ciceris*. Isolates of *Mesorhizobium* (6) and endophytic bacteria (5) were selected as potential antagonists on the basis of fungal growth inhibition ranged from 50-93.7%. A total of 82%, 93% and 72% bacterial isolates were found to produce lipase, protease and cellulase respectively. Compatible bacterial inoculants possessed *in vitro* plant growth promoting (PGP) traits viz., indole acetic acid, phosphate solubilization, siderophores, ACC deaminase and where further tested for developing bioinoculant formulations. Survival of dual inoculants in carrier-based (Talc and charcoal) and liquid formulations (Luria broth and nutrient broth) was monitored upto 90 days which showed sharp decline in the viable bacterial count in solid carrier formulations over liquid formulation after 60 days of storage period. The selected dual bacterial bioformulations are presently being tested under field conditions for development of a holistic formulation acting as a biofertilizer and bioprotectant in chickpea.

Keywords*: Biofertilizer, biocontrol, chickpea, Fusarium, PGP*

NC/AB/065/2023

EFFECT OF METEOROLOGICAL PARAMETERS ON POPULATION FLUCTUATION OF FRUIT FLY (*BACTROCERA CUCURBITAE* COQ.) INFESTING CUCUMBER (*CUCUMIS SATIVUS* L.)

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Population dynamics of fruit flies *Bactrocera cucurbitae* (Coquillett) was studied on cucumber (*Cucumis sativus* L.) variety Cucumber Gautam-910, during *summer* season 2020-21 and 2021- 22 at College of Horticulture, Mandsaur (M.P.). The studies revealed that, for seasonal incidence, the fruit fly was found damaging and remained active on cucumber attaining peak population in the 18th SMW (52.62%) in 2020-21 and 17th SMW (30.29%) during 2021-22. The correlation studies showed that the fruit fly population was significant and positively correlated with maximum temperature (r= 0.7246, r= 0.7454) and minimum temperature (r= 0.5367, r= 0.7871), significant and negatively correlated with relative humidity (r= -0.5949, r= -0.5598) whereas, rainfall (r= -0.0870, r = 0.1846) and rainy days (r= -0.1158, r =1.000) exhibited non-significant correlation in both year respectively.

Keywords: *Cucumber, correlation, fruit fly, meteorological parameters, incidence.*

NC/AB/066/2023

PERFORMANCE OF KHARIF GROUNDNUT AS AFFECTED BY TILLAGE-RESIDUE MANAGEMENT IN GROUNDNUT-WHEAT CROPPING SYSTEM

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Performance of kharif groundnut grown in sequence with wheat was evaluated under different tillage and residue management practices for two consecutive years. Field experiment was carried out on a fixed site during kharif season of 2019 and 2020 at Research Farm, College of Agriculture, RVSKVV, Gwalior, Madhya Pradesh to evaluate the influence of tillage practices viz. CT flat bed- Residue, ZT-Residue, CT raised bed- Residue, CT flat bed+ Residue, ZT+ Residue and CT raised bed+ Residue on growth and productivity, profitability and nutrient uptake in groundnut crop. The results revealed that conventional tillage-raised bed with residue incorporated on the surface (CT-raised bed+R) resulted in significantly higher crop growth, nutrient contents and their uptake, physiological parameters and yields during both the years over other conventional and conservation tillage systems. The pooled analysis of the data exhibited that kernel (2135 kg/ha) and pod yields (3100 kg/ha) were significantly higher under conventional tillage-raised bed system with residue incorporation. However, this treatment was found at par with conventional tillage-flat bed with residue for kernel and pod yields values during both 2019 and 2020. The same treatment recorded significantly highest uptake of nutrients (N, P, K) during both the years and on pooled basis. The pooled economic analysis of the data showed that significantly highest net and gross returns were fetched with conventional tillage practiced on raised bed with residues incorporated on the surface in comparison to other tillage practices. However, during the two experimental years this treatment was statistically similar to conventional tillage-flat bed with residue incorporation. With respect to benefit cost ratio and harvest index the treatments significantly varied and recorded higher values of B:C (2.18) and HI (0.55) on pooled basis under conventional tillage-raised bed with residues and conventional tillage-flat bed with residues, respectively. Zero tillage without residue incorporation remained the least performing treatment recording the lowest values of all parameters.

Keywords: *Conventional tillage, Resource use efficiency, Raised-bed, Residue, Zero tillage*

NC/AB/067/2023

ISOLATION AND BIOCHEMICAL CHARACTERIZATION OF *PSEUDOMONAS* SPP. FROM CHICKPEA PLANT (*CICER ARIETINUM*) RHIZOSPHERE FOR SUSTAINABLE ABIOTIC STRESS MANAGEMENT

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As the population of the world is increasing constantly, it opens new challenges to fulfil this increasing demand for food grains in an eco-friendly way. The widespread use of biofertilizers, rather than chemical fertilizers, is significantly more likely to accomplish sustainable agriculture production globally. Plant growth-promoting rhizobacteria (PGPR) are chemical-free alternatives to conventional crop protection in agriculture. *Pseudomonas* isolates were isolated from the rhizosphere soil of the Chickpea plant (Cultivar RKGK-13-414), isolates were identified as a new *Pseudomonas* species by 16SrRNA metagenomics gene sequencing. *Pseudomonas* isolates have frequently been isolated from the rhizosphere of plants, and several of them have been reported as plant growth-promoting rhizobacteria. The investigation found that *Pseudomonas* isolates were able to solubilize phosphate, produce siderophores, ammonia, HCN production and indole-3-acetic acid. This study indicates that these five novel *Pseudomonas* sp. isolates can be effective new plant growth-promoting rhizobacteria. The results showed that isolates of *Pseudomonas* sp. (Psuedo1A) increased seed germination, and *Pseudomonas* sp. (Psuedo2A) promoted seedling height. This study shows that these five novel *Pseudomonas* sp. isolates can be effective new plant growth-promoting rhizobacteria as well as promotes biotic and abiotic stress tolerances. The market for biofertilizers is expected to reach 3.8$ billion by 2025 from 2$ billion in 2019. The use of biopesticides is increasing slowly at a rate of 8% annually based on the different types of microbial pesticides. Therefore, the present research has been undertaken to discuss the fundamental processes used by *Pseudomonas* spp. to promote plant development and alleviate drought stress. Plant growth-promoting rhizobacteria (PGPR) are chemical-free, eco-friendly alternatives to hazardous

chemical fertilizers and alternatives to conventional crop protection in agriculture. The use of PGPRs as biofertilizers is a biological approach toward the sustainable intensification of agriculture.

Keywords: *Biofertilizers, Biocontrol, PGPR, Phytohormones, Phosphate solubilization, Siderophores.*

NC/AB/068/2023

COMPARATIVE BIOLOGY OF RED SPIDER MITE, *TETRANYCHUS URTICAE* KOCH. (ACARI: TETRANYCHIDAE) ON BRINJAL, OKRA AND MARIGOLD

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In this study, the impact of the three different host plant Brinjal, Okra and Marigold on life cycle, development and reproductive characteristics of the red spider mite, *Tetranychus urticae* Koch was studied at the laboratory, Department of Entomology, College of Horticulture, Mandsaur. The biology of red spider mites (*T. urticae*) consisted of egg, larvae, protonymph, deutonymph and adult stages. The lifecycle (egg to adult) of red spider mite found to vary from 18-28 days (male, mated female and unmated female) on different host plant viz., longest on Marigold (21.32±2.49, 28.18±2.18 and 25.68±2.63 days) followed by Okra (21.10±2.18, 26.86±1.69 and 25.36±1.85 days) and Brinjal (18.93±1.33, 24.16±2.01 and 21.16±1.70 days) for male mated female and unmated female, respectively. The ovipositional (fecundity) period of red spider mite was found to be lower in Brinjal (8.80±1.32 days) and higher in okra (10.40±2.01 days). The higher fecundity (no. of eggs) was observed in Okra (86±14.49). Mated female's of red spider mite progeny consisted of both males and females in the ratio varied from 1: 2.00 to 1:3.50 in Brinjal, Okra and Marigold, while unmated female produced only male.

Keywords: *Tetranychus urticae, Brinjal, okra, marigold, biology, male, female*

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OCCURRENCE AND DISTRIBUTION OF CHICKPEA WILT CAUSED BY *FUSARIUM OXYSPORUM* F.SP. *CICERIS* (PADWICK) SNYD. AND HANS. IN SOME DISTRICTS OF UTTAR PRADESH

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Chickpea (*Cicer arietinum* L.), often known as Poor man's meat, is one of the most important pulse crops cultivated in the Indian subcontinent and is known to cope protein demand of the vegetarian populous of our country. In addition to being a major contributor (nearly 47 percent) to India's total pulse production, this important leguminous crop can also be grown in a wide range of agro-climatic conditions. Besides its significance, the crop in farmer's field is prodigiously challenged by a range of abiotic and biotic stresses. Among all the biotic stresses, fusarium wilt caused by *Fusarium oxysporum* f.sp. *ciceris* (Padwick) Snyd. and Hans. is a major threat to chickpea cultivation worldwide. Considering the importance of the crop and the significance of this disease, an extensive survey was conducted in six districts of Uttar Pradesh *viz*. Banda, Jhansi, Kanpur, Aligarh, Faizabad and Ambedkar Nagar to assess the severity of wilt complex in these areas during two consecutive cropping seasons, i.e., 2018-19 and 2019-20. It was found that fusarium wilt was a predominant disease in all the surveyed districts. The incidence was noted to range between 19.58 to 42.35%. The maximum incidence of 42.35 per cent was recorded in Banda district, followed by Jhansi and Kanpur, i.e., 32.47 and 32.15 per cent, respectively. However, the lowest incidence was observed in Faizabad district, i.e., 19.58 per cent, followed by Ambedkar Nagar and Aligarh, i.e., 26.79 and 29.20 per cent. In the present study, the variations recorded in wilt incidence at different locations might result of various factors such as cropping pattern, soil type, cropping practices, the cultivar grown, sowing dates and population density of the crop.

Keywords: *Cicer arietinum, Chickpea wilt, Fusarium oxysporum f. sp. ciceris, occurrence, distribution, Uttar Pradesh.*

NC/AB/070/2023

EFFECT OF NITROGEN AND PHOSPHORUS LEVELS ON GROWTH & YIELD OF LINSEED (*LINUMUSITATISSIMUM*L.)

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In the Rabi season of 2020–2021, nine treatments were used in a field experiment at the Crop Research Farm of the Naini Agriculture Institute, SHUATS, Uttar Pradesh, to examine the effects of various levels of Nitrogen and Phosphorus on the growth & yield of Linseed (var NEELAM). Oil crop with the greatest proportion of alpha-linolenic acid, an omega-3 fatty acid, is linseed. Additionally, it contains a lot of phytoestrogens, dietary fiber, and protein. On a dry weight basis, cultivated linseed cultivars have 45–50% oil. Linseed's numerous end uses as, animal feed, food & industrial materials serve as examples of its adaptability. Linseed is fed to poultry and livestock to produce omega-3-enriched eggs and meat, and it is added to beverages to create enriched foods. Consuming linseed has been linked to a number of health advantages.It is a spring annual that may grow in a variety of soil types and climatic regions in the northern hemisphere. The levels of nitrogen used were 45, 60 and 75 kg/ha and Phosphorus 20, 40 and 60 kg/ha respectively. The dose of 75 kg Nitrogen/ha + 60 kg P/ha in treatment 9 produced higher plant height is 96.00 cm, plant dry weight is 12.84 g, number of branches per plant are 5.81, number of capsule plants are 1.20 t/ha, number of seeds capsule plants are 1.46, 1000 grain weight is 8.93 g, oil content percent (39.26%), highest gross return is 90,800.00 INR/ha, net returns is 50,327.00 INR/ha, and benefit cost ratio is 1.24 The higher growth and production characteristics of linseed were enhanced by the progressively higher nitrogen and phosphorus fertilizer levels.

Keywords*: Linseed, Nitrogen, Phosphorus, Yield and Growth.*

NC/AB/071/2023

BARNYARD MILLET (*ECHINOCHLOA FRUMENTACEA* L.) STARCH BIOFILM: AN EDIBLE ECO-FRIENDLY FOOD PACKAGING MATERIAL

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Barnyard millet is a minor millet cultivated in Asian countries for human and livestock feed as well. Recently, the crop has gained renewed interest as a health-food due to its rich nutritional profile such as carbohydrate (65%), dietary fiber (9.8%) and protein (11.1%) that are linked to various health benefits. Due to its high amylose content, enabling new usage patterns as edible biofilm with this underutilized grain starch with good mechanical properties and renewability at low cost. Plastics has been the familiar and conventional materials of packaging food items, but now the development of biodegradable edible starch films has been promising to reduce plastic usage. Barnyard millet starch is edible as it possesses desirable mechanical properties *viz.,* tensile strength, thickness, transparency and sealing property at higher level and with moisture content, swelling power, water vapor permeability and solubility index at lower level. The sensory properties of the biofilm *viz*., color and texture could be improved by adding variable amounts of modifiers like pectin, plasticizers such as glycerol or sorbitol to enhance the durability and flexibility of the film. Addition of borage (*Borago officinalis* L.) seed oil at (1%) containing bio-active compounds including fatty acids, also enhance the anti-oxidant and light barrier properties of the millet starch film resulting in a better anti-microbial, eco-friendly, edible, packaging biofilm compared to existing biofilms of cassava, corn, etc. Therefore, development of barnyard millet starch biofilm could be an economic and ecofriendly alternative to LDPE and HDPE plastic bags to be utilized as food wraps and heat-sealed pouches to pack meat, dairy and other edible products.

Key words*: Barnyard millet starch, biofilm, packaging*

NC/AB/072/2023

SOIL HEALTH MANAGEMENT AND PRACTICES: KEY FACTOR FOR CROP PRODUCTIVITY ANIMAL HEALTH, ANIMAL HUSBANDRY &DAIRY TECHNOLOGY

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Soil health is a state of a soil meeting its range of ecosystem functions as appropriate to its environment. Soil Health Management (SHM) is one of the most important interventions under NMSA.SHM aims at promoting Integrated Nutrient Management (INM) through judicious use of chemical fertilisers including secondary and micro nutrients in conjunction with organic manures and bio-fertilisers for improving soil health and its productivity. Soil health practices like Minimize Disturbance, Maximize Soil Cover and Maximize Biodiversity is very important. The benefits of healthy soil in sustaining crop production are most evident when growing conditions are less than ideal. Healthy soils increase the capacity of crops to withstand weather variability, including short term extreme precipitation events and intra-seasonal drought. Increasingly highly variable weather conditions present increased risks to crops and require more careful attention to conservation planning to mitigate impacts on soil health and crop productivity. One of the most important reasons animals depend on soil is because it allows for their food to grow. Plants are a main source of food for herbivores and Plants depend on soil to provide a protected place for them to grow. As we know, plants need soil, water, and light to grow. Healthy soil is composed of roughly 45% minerals, 25% water, 25% air and 5% organic matter. Soil is rich in minerals that the plants need and soil is able to retain water which is necessary for plants in order for them to grow. When soil is healthy, plants can grow to their full potential. For dairy farmers, the equation is as simple as it can be thatthe better, they treat their animals and the earth around them, the more rewarding their passion is for their families and the communities in which they live. One area of focus for dairy farmers is keeping the soil that grows their crops as healthy as possible because a healthy soil is the main factor of a healthy crop.

Keywords*: Soil health, Crop production, Animal husbandry and and their health, Dairy technology.*

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GENETIC STUDIES IN TOMATO (*SOLANUM LYCOPERSICOM* [MILL.] WETTSD.) FOR YIELD AND ITS ATTRIBUTING TRAITS

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The present investigation was carried out to estimate the genetic variability, heritability in broad sense, correlation and path coefficient and genetic divergence (D^2) analysis among 50 genotypes of tomato (*Solanum lycopersicom* [Mill.] Wettsd.) for twelve yield contributing traits during 2018 in Randomized Block Design with three replications. High magnitude of phenotypic as well as genotypic coefficient of variation were observed in case of number fruit per plant followed by unmarketable fruits yield per plant, average fruit weight, marketable fruit yield per plant and total fruit yield per plant. High heritability was recorded for all the traits. High heritability along with high genetic advance was estimated for average fruit weight followed by number of fruits per plant, marketable fruit yield per plant, unmarketable yield per plant and total fruit yield per plant. The polar diameter of fruit was highly significant and positive association with equatorial diameter of fruit. Positive direct effect was exerted by number of fruit per plant followed average fruit weight, polar diameter of fruit on fruit yield per plant. Maximum intra cluster distance was recorded within cluster III and inter cluster distance was recorded between cluster I to V III. Cluster III had maximum number of genotypes and highest per cent contribution towards clustering of genotypes were observe in average fruit weight.

Keywords: *Tomato, Genetic variability, Heritability, correlation and path coefficient and Genetic divergence (D^2).*

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EVALUATION OF DIFFERENT CULTURE MEDIA FOR THE GROWTH OF *ALTERNARIA BRASSICAE* (BERK.) SACC. CAUSING ALTERNARIA BLIGHT OF MUSTARD (*BRASSICA JUNCEA*)

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The present study was aimed to know the effect of different culture media on the growth of *Alternaria brassicae* (Berk.) Sacc. in laboratory conditions. Fifteen nutrient media namely, Czapeck's Dox Agar (CDA), V8 Juice Agar (V8JA), Richard's Agar (RA), Potato Carrot Dextrose Agar (PCDA), Potato Dextrose Agar (PDA), Malt Extract Agar (MEA), Peptone Iron Agar (PIA), Simmons Citrate Agar (SCA), Corn Meal Agar (CMA), Nutrient Agar (NA), Yeast Mannitol Agar (YMA), Ashby's Agar (AA), Rose Bengal Agar (RBA), Oat Meal Agar (OMA) and Potato Carrot Agar (PCA) were used in this study. The mycelial growth of the fungus was observed at three and seven days after inoculation. Colony colour, appearance, growth, margin, shape, zonation and sporulation of pathogen were also observed in this study. All nutrient media showed significantly variation in mycelial growth of *A. brassicae*. Among the tested media, Potato Dextrose Agar was superior to other tested media and recorded 48.66 mm and 90.00 mm growth of fungus at three and seven days after inoculation, respectively. However, it was at par with V8 Juice Agar which recorded 47.00 mm and 85.66 mm growth of fungus at three and seven days after inoculation. While as, the minimum growth was observed in Yeast Mannitol Agar (YMA) in this study.

Keywords: *Alternaria brassicae, Culture media, Mycelial growth, Mustard*

NC/AB/075/2023

EFFECT OF MICROBIALLY ENRICHED VERMICOMPOST AND FERTILITY LEVELS ON PRODUCTIVITY OF WHEAT (*TRITICUM AESTIVUM* L.) IN TYPIC USTIPSAMMENT

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A field experiment entitled "Effect of microbially enriched vermicompost and fertility levels on nutrients availability and productivity of wheat (*Triticum aestivum* L.) in Typic Ustipsamment" was conducted at Agronomy Farm, S.K.N. College of Agriculture, Jobner (Jaipur-Rajasthan) during two consecutive *rabi* seasons of 2020-21 and 2021-22. The experiment was laid out according to Factorial Randomized Block Design and consisted of twenty treatment combinations replicated thrice, with five treatments of microbially enriched vermicompost [*i.e.* control (V_0), vermicompost (V_1), PSB enriched vermicompost (V_2), *Azotobacter* enriched vermicompost (V_3), *Azotobacter* + PSB enriched vermicompost (V_4) @ 4 t ha^{-1}] and four levels of fertility [*i.e.* control (F_0), 50% (F_1), 75% (F_2) and 100% (F_3) RDF].

Results of the study revealed that among the different microbially enriched vermicompost treatments, application of *Azotobacter* + PSB enriched vermicompost @ 4 t ha^{-1} (V_4), recorded significantly highest yield attributes (*viz*, plant height, total tillers, effective tillers and test weight), grain yield, straw yields, biological yield, content of N, P, K, Fe, Mn, Zn and Cu by wheat and net returns were also recorded in *Azotobacter* + PSB enriched vermicompost @ 4 t ha^{-1} treatment (V_4) during both the years.

The increasing levels of fertilizers up to 75% RDF (F_2) significantly increased the plant height, total tillers, effective tillers, test weight, grain, straw and biological yield of wheat as well as net returns.

Combined application of 75% RDF (F_2) and *Azotobacter* + PSB enriched vermicompost @ 4 t ha^{-1} (V_4) recorded significantly higher number of effective tillers, grain yield, straw yield and net returns in comparison to rest of treatment combinations but found at par with treatment combination V_4F_3.

***Keywords**: Microbially enriched vermicompost; Fertility; Productivity; Profitability; Quality; Wheat*

NC/AB/076/2023

EFFECTS OF NITROGEN REDUCTION COMBINED WITH WASTE WOOL ORGANIC SUBSTITUTION ON GROWTH AND PRODUCTIVITY OF *PENNISETUM PEDICELLATUM*

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Nitrogen reduction combined with slow-release N organic amendment i.e., waste wool is of considerable significance for the production of fodder in semi-arid region. Therefore, a field experiment using nitrogen reduction combined with organic fertilizer was conducted to explore the effects of different treatments on matter accumulation, physiological resistance, and fertilizer nitrogen fate in *Pennisetum pedicellatum*. The experiment was conducted during 2018-19 and 2019-20 with reduction in dose of nitrogenous fertilizer by 25, 50, 75 and 100 % of recommended dose of nitrogen fertilizer (RDN) with (500 kg/ha) and without waste wool. Plant growth parameters were significantly influenced at all levels of applied fertilizer and waste wool. Maximum dose of N fertilizer when applied with 500 kg of waste wool resulted in significantly higher growth, fodder yield and fodder quality, although it was at par with 75% dose of fertilizer and waste wool. Therefore, it indicates that application of waste wool can reduce fertilizer dose by 25% without any compromise in yield and quality. The fertilizer dose further reduced to 50% with 21% yield penalty and 10.6% less protein over 100% RDN. Moreover, 75% RDN with waste wool was found to be superior to 100% RDN resulting in 11.8% higher green fodder yield and 2.5% higher crude protein in fodder. The results of the study revealed that a 25% reduction of nitrogen fertilizer with 500 kg per ha waste wool organic application promoted dry matter accumulation, enhanced the chlorophyll and protein content, increased the utilization and residue of nitrogen fertilizer, with reduced nitrogen pollution. Our study will help in distinguishing choices for safe use of organic wastes along with up gradation of soil health, particularly in nutrient poor soils of arid and semi-arid region of India.

Keywords: *Fodder, fertilizer, chlorophyll, RDN*

NC/AB/077/2023

MORPHOLOGY AND MORPHOMETRY OF INDIGENOUS CATTLE OF MANIPUR

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Manipur had 2.24 lakh cattle including 2.06 lakh indigenous and 0.17 lakh crossbred cattle as per the 20th Livestock Census. The trend in cattle population showed a decline of 15.02 % when compared to the 19th Livestock Census. At present, there is not a single breed of cattle registered from the state, therefore, the present study aimed to characterize and evaluate the local indigenous cattle of the state. Surveys were conducted from Imphal West, Imphal East, Senapati, Churachandpur and Tengnoupal Districts of Manipur. A total of 450 indigenous cattle of different age groups were included in the study. The coat colour pattern of indigenous cattle was found to be mostly patchy type. Out of various coat colour pattern observed in indigenous cattle of Manipur, the majority of cattle were brown in colour followed by black, grey colour and mixed with black or white colour. The other colour recorded was fawn and mixed type. The udder is small, funnel and cylindrical shaped and milk vein is not prominent. The average milk yield was 1.5 to 2.0 kg. The average milk fat and solid-non-fat are 3.7 % and 9.58 % respectively. Morphometric characteristics like body length, height at wither, heart girth, paunch girth, ear length, face length, tail length without switch, horn length and distance between horns were included in the study. There is not much significant difference between cows and bullocks in their morphometric traits. The present study showed that indigenous cattle of Manipur has a good potential for milk production, and a systematic genetic improvement programme is required to improve the breed and milk production.

Keywords: *Milk production, solid-non-fat, Senapati, Churachandpur*

NC/AB/078/2023

MOLECULAR VARIABILITY IN *DRECHSLERA ORYZAE* [(BREDA DE HAAN) SUBRAMANIAN AND JAIN] CAUSING BROWN SPOT OF RICE IN KASHMIR

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Rice (*Oryza sativa L*) is the second largest crop grown in the world in terms of both area and production after maize and is grown on about 11 per cent of the total cultivated area globally. Rice serves as staple food for more than half of world's population and is the primary source of nutrition for 65 per cent of India's population. The annual losses due to diseases in rice are estimated to be 10-15 per cent worldwide. Among the fungal diseases, brown spot caused by *Drechslera oryzae* (Breda de Haan) Subramanian and Jain is most important disease of rice which occurs in almost all the rice growing areas of the country and cause yield loss upto 52 per cent when protective measures are not taken. In the present investigation, molecular variability in *Drechslera oryzae* was studied using molecular markers. Thirty-six isolates of *Drechslera oryzae* were sampled from three rice growing districts (Baramulla, Budgam and Kulgam) of Kashmir. Molecular variability among the isolates was studied using five Inter-Simple Sequence Repeat (ISSR) primers. The total number of scorable bands ranged from 5-8 and all the primers showed 100 per cent polymorphism. In cluster analysis, four clusters (cluster I, cluster II, cluster III and cluster IV) and six independent lineages were formed at 50 per cent similarity coefficient indicating a high level of molecular variability in *D. oryzae* in Kashmir valley. The isolates were grouped irrespective of their geographical locations.

Key words*: Brown spot, Drechslera oryzae, Molecular variability, Rice,*

NC/AB/079/2023

IDENTIFICATION OF QUANTITATIVE TRAIT LOCI (QTLS) AND CANDIDATE GENES FOR SEED SHAPE AND 100-SEED WEIGHT IN SOYBEAN [*GLYCINE MAX* (L.) MERR.]

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Seed size and shape are important traits determining yield and quality in soybean. Seed size and shape are also desirable for specialty soy foods like tofu, natto, miso, and edamame. In order to find stable quantitative trait loci (QTLs) and candidate genes for seed shape and 100-seed weight, the current study used vegetable type and seed soybean-derived F2 and F2:3 mapping populations. A total of 42 QTLs were mapped, which were dispersed across 13chromosomes. Of these, seven were determined to be stable QTLs and five of them were major QTLs, namely qSL-10-1, qSW-4-1, qSV-4-1, qSLW-10-1, andqSLH-10-1. Thirteen of the 42 QTLs detected in the current study were found at known loci, while the remaining 29 were discovered for the first time. Out of these 29 novel QTLs, 17 were major QTLs. Based on Protein Analysis Through Evolutionary Relationships (PANTHER), gene annotation information, and literature search, 66 genes within seven stable QTLs were predicted to be possible candidate genes that might regulate seed shape and seed weight in soybean. The current study identified the key candidate genes and quantitative trait loci (QTLs) controlling soybean seed shape and weight, and these results will be very helpful in marker-assisted breeding for developing soybean varieties with improved seed weight and desired seed shape.

Keywords: *Soybean, seed shape, seed weight, QTL, candidate genes, marker assisted breeding*

NC/AB/080/2023

FEASIBILITY OF ADOPTION OF ECO-FRIENDLY, ORGANIC, NON-CHEMICAL ALTERNATIVES FOR PEST MANAGEMENT IN MANIPUR, NE INDIA

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Excessive reliance on chemical pesticides has rendered the agro-ecosystem unsustainable and tremendously increased the cost of cultivation for the average farmer. Secondary pest resurgence, insecticide resistance, pesticide residues in food, death of non-target beneficial organisms etc., are some of the adverse effects of wrong and unwarranted application of pesticides which has both human and environmental costs. With the Govt. of India advocating organic farming in the NE Region, the use of non-chemical alternatives to synthetic chemical pesticides has to be explored and encouraged. The use of modern non-chemical pest management techniques such as pheromone traps, light traps, yellow sticky traps and microbial pesticides are evaluated in different agricultural and horticultural crops. The crops include rice, maize, cole crops, onion, king chilli, etc. The non-chemical technologies selected for evaluation in each crop targeted the major pests causing economic losses in each crop. These techniques are tried throughout Manipur state in both hills and plain areas with conventional and organic farmers. The farmers were eager to try the technology introduced to them and were explained the benefits of using and adopting the technology. In rice, the most important cereal crop in NE Region, yellow stem borer (YSB) is one of the important major pests, and farmers use a lot of synthetic chemical pesticides for its control. Pheromone traps were used to manage yellow stem borer through mass trapping @10 traps per ha. The farmer reported excellent management of YSB and stopped using chemical pesticides. Another rice farmer was recommended *Beauveria bassiana* to manage swarming caterpillars in rice in the initial stages of infestation and could easily manage the pest. In maize, a woman farmer who preferred organic cultivation was recommended *Beauveria bassiana* and *Metarhizium anisopliae* to manage fall armyworm in

the initial stages of infestation and was very satisfied with their performance in her field. Another rice farmer installed light trap on his fish pond in his paddy-cum-fish field, and the attracted insects served as feed to the fishes in the pond. Along with managing the insect pest, the farmer could get bumper harvest from his pond.

An organic cabbage farmer was given pheromone traps of diamondback moth (DBM) to manage the pest in his field. DBM causes huge economic losses in the winter months on cole crops, and the pheromone traps could control the pest successfully. Similarly, an organic onion tribal woman farmer was given yellow sticky traps to manage onion thrips, *Thrips tabaci* and onion fly, *Delia antiqua*. Sucking pests like onion fly and thrips are the major pest causing economic damage to onion. The use of eco-friendly, organic, non-chemical alternatives for pest management in Manipur was found to be very feasible, economical and convenient to farmers. They were easy to use. The lack of awareness of their benefits and easy availability in NE Region proved to be a disadvantage in their adoption on a vast scale.

Keywords: *Organic cabbage, adoption, Beauveria bassiana and Metarhizium anisopliae*

NC/AB/081/2023

DISTRIBUTIONAL RECORDS ON LARVAL PARASITOID, *APANTELES* SPP. (HYMENOPTERA: BRACONIDAE) FROM UTTARAKHAND, INDIA

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Apanteles Foerster is the largest genus of subfamily Microgastrinae (Hymenoptera: Braconidae), comprising the economically important group of larval parasitoids of insect pests. They mainly parasitize the insect pests of agricultural crops, forest tree species, medicinal plants, orchards & cash crops. Some researchers recorded the species of *Apanteles,* parasitizing various host insect including the insect pests of forest tree species. Present paper includes a brief account of 12 species of *Apanteles antipoda* Ashmead, *Apanteles erionotae* Wilkinson, *Apanteles agilis* Ashmead, *Apanteles caniae* Wilkinson, *Apanteles creatonoti* Viereck, *Apanteles darjeelingensis* Sharma & Chatterjee, *Apanteles hyblaeae* Wilkinson, *Apanteles javensis* Rohwer, *Apanteles neocajani* Yousuf& Ray, *Apanteles phytometrae* Wilkinson, *Apanteles prodeniae* Viereck, *Apanteles tachardiae* Cameron. Out of twelve species, one species has been reared from the teak defoliators (*A. hyblaeae* reared from *Hyblaeapuera* larvae, teak defoliator) and remaining eleven species have been collected by sweeping method.

Key words: *Larval parasitoid, Biological control, Microgastrinae, Apanteles.*

NC/AB/082/2023

IMPACT OF NATIONAL HIGHWAY EXPANSION ACTIVITIES ON AMBIENT AIR QUALITY IN MOUNTAINOUS REGION

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The study was conducted to analyse the impact of highway expansion activity on air quality. The study area was divided into four equal sites based on distances viz. Site 1, Site 2, Site3 and Site 4. The observation on different air quality parameters at each site were recorded periodically (three times) at an interval of 15 days during pre-monsoon and post-monsoon seasons. The ambient air quality levels were compared with NAAQS standards.SO_2 concentration in the study area lies in between the range from 6.24µg m^{-3} to 7.53µg m^{-3}. NO_2 concentration in the study area varied from 16.82µg m^{-3} to 26.98µg m^{-3} .The highest SO_2, NO_2 and PM_{10} concentration were observed in the post-monsoon season and lowest in the pre-monsoon season. The VOC's concentration in the study area lies in between in the range from 2.75µg m^{-3} to 6.37µg m^{-3}. The highest VOC's concentration was recorded in the pre-monsoon season and lowest in the post-monsoon season. The concentration of SO_2 , NO_2 and VOC's lies within the permissible limits given by NAAQS in all the sites while PM_{10} concentration in all the sites was higher than the permissible limits given by NAAQS.

Keywords: *Seasons, physical, construction, concentration, permissible, ambient*

NC/AB/083/2023

STUDIES ON PHYSICO-CHEMICAL AND SENSORY EVALUATION OF TURNIP SQUASH

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Turnip is an excellent vegetable in terms of human nutrition. It is a traditional medicine for liver diseases, constipation, chronic gastritis, cholecystolithiasis and diabetics. In order to encourage the increase in turnip consumption, development of value-added product is envisaged. It also focuses on consumer demands for healthy and palatable products. In the current investigation, recipes of turnip squash with 25 and 30 per cent pulp, 40 and 45° Brix total soluble solids and 1.0 per cent acidity were prepared and subjected to physico-chemical and sensory evaluation during the storage period of 90 days. In squash increasing trend of pH, TSS, total sugars and reducing sugars was noticed and decreasing trend of acidity, non-reducing sugar and ascorbic acid content was observed during storage period of 90 days. Squash prepared with 30% pulp and 40° brix TSS was rated best among all the recipes of squash.

Keywords: *cholecystolithiasis, physico-chemical and sensory evaluation*

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ROLE OF VARIABILITY IN CROP IMPROVEMENT

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Genetic variability is prime requirement for any plant breeding programme to develop a superior strain. This study aimed to estimate the genetic variability and determine the correlation between the various quantitative and qualitative characteristics of Bottle gourd accessions. The research was conducted at main experimental station Department of vegetable science C. S. Azad University of Agriculture and Technology Kanpur, UP, India and 10 diverse accessions including Pusa Naveen, Pusa Santusthi, Kalyanpur Long green, KBGL-20, KBGL-14, KBGL-22, KBGL-29, NDBG-1, NDBG-121 and H-22 evaluated in a Randomized Complete Block Design with three replicates. Various morphological descriptors namely node number to first staminate flower appears, node number to first pistillate flower appears, ratio of pistillate: staminate flowers, internodal length (cm), vine length at last picking stage (m), number of primary branches per plant, days to first fruit harvest, average weight per fruit (kg), number of fruits per plant, fruit diameter (cm), fruit length (cm), duration of crop (days), and qualitative descriptors total soluble solids (TSS) ^{0}Brix, specific gravity of fruits (g/cc) and fruit yield per plant (kg) were results of phenotypic coefficient of variation (PCV) were higher than genotypic coefficient of variation (GCV) for all the characters and high heritability coupled with high genetic advance in percent of mean for node number to first staminate and pistillate flower appears, ratio of pistillate: staminate flowers, average weight per fruit, number of fruits per plant, fruit length in both F1 and F2 generations and fruit yield per plant in F2. The result indicating selection may be effective because of heritability is due to additive gene effects.

Keywords: *Variability, Heritability, Correlation, Genotype and Phenotype*

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AMMI ANALYSIS FOR ASSESSMENT OF STABILITY IN ELITE LINES OF CHICKPEA (*CICER ARIETINUM* L.)

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The G x E interaction was studied in chickpea genotypes using AMMI model. Ten elite chickpea breeding lines along with two check varieties (HC5&GNG2171) were grown in five different environments during *rabi* 2020 and *rabi* 2021 at crop research centre GBPUA&T Pantnagar, Uttarakhand. Five different environments were created by following different dates of sowing in viz. early sown, timely sown and late sown during first year and timely and late sown during second year of experiment. The results indicated that main effects as well as G x E interaction effects were significant for most of the traits indicating broad range of diversity among genotypes and differential performance of genotypes over the environments. Major portion of the G x E was contributed by the environment. AMMI model having two principle components axis was found as the best predictive model in this study. AMMI biplots, ASV and YSV indicated PG289 to be the most stable genotype for seed yield during in all five environments.

Keywords: *Chickpea, Genetic variation, cold tolerance, pollen germination.*

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EFFECT OF VARIOUS NITROGEN MANAGEMENT SOURCES ONGROWTH AND YIELD OF SOYBEAN IN VERTISOLS

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A field experiment entitled "Studies on nitrogen source diversification in vertisols and its effect on soybean productivity" was conducted during the year 2017-18 at the Research Farm of Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The soil of the experimental plot was clayey in texture dominated by smectite clay minerals which belongs to hyperthermic family of Typic Haplustert having swell shrink property. It was slightly alkaline in reaction (8.6), medium in organic carbon content (0.52 %), low in nitrogen (216.5 kg ha-1) and phosphate content (16.86 kg ha-1) while very high in exchangeable potassium (367.22 kg ha-1). The rainfall received during the cropping period amounted to 378.8 mm as against the normal of 567.9 mm for the specific duration. The experiment was laid outin randomized block design with three replications. The treatments were comprised of seven nutrient management practices viz., Recommended Dose of Fertilizer (30:75:30 NPK kg ha/1) and in remaining six treatments, 50%Recommended Dose of Nitrogen was given through urea and 50% Recommended dose of Nitrogen through different organic sources viz. Vermicompost, Farm yard manure+ Jivamrut, Farm yard manure, Compost, soybean crop residue + *Trichoderma virride* and *Gliricidia* leaf incorporation. Sowing of soybean (var. JS-335) was undertaken on 28 June, 2017. The other inter-cultivation practices were kept common as recommended, while the nutrients were provided as per the treatments of nutrient management. Study revealed that highest values of growth and yield parameters were noticed with application of recommended dose of fertilizer alone being at par with treatment 50%recommended dose of Nitrogen + 50% N through vermicompost.

Keywords: *Nitrogen source diversification, Vertisols, Soybean, Yield.*

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INFLUENCE OF MICROBIAL CONSORTIA IN COMBINATION WITH HUMIC ACIDON GROWTH AND YIELD OF TOMATO (*LYCOPERSICON ESCULENTUM*)

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A field experiment was conducted in the Department of Agricultural Microbiology, PAJANCOA&RI, Karaikal (U.T. of Puducherry) to study the Effect of Humic Acid & Microbial Consortia on Growth & Yield of Tomato. Excessive application of chemical fertilizers may affect soil health and sustainable productivity and has increasing concern about health associated with their extensive use. Humic Acid is a relatively stable product of organic matter decomposition and it is an alternate way of Organic crop production to yield more. We examined the effect of Humic acid @2ml&4ml concentration along with the combination of microbial consortia @2ml concentration (*Azospirillum*, *Pseudomonas fluorescens* & PPFM) on Tomato. Application of Humic acid@2mlalong with the microbial consortia had more beneficial effect on shoot length, root length, biomass, plant height, LAI, and Yield in tomato. This is due to microbial action along with the support of humus in soil which enhances the plant growth.

Keywords: *Microbial consortia, Humic Acid, Growth, Yield, Organic matter, Tomato*

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OCCUPATIONAL HEALTH HAZARDS AMONG WOMEN BEEDI ROLLING WORKERS IN INDIA

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The beedi industry in India has a long history and is one of the largest employers of women in the unorganized sector. According to the Indian Ministry of Labour, over 4.4 million people are employed in beedi rolling industry. The beedi rolling industry employs, Beedi rolling is essentially a rural and home-based labour intensive industry, which provides employment to about 55 lakh workers in the country. The majority of beedi laborers are largely poor, illiterate, and unskilled. The Indian smoking industry is dominated by Beedi. "Beedis" are hand-rolled, unfiltered cigarettes. About 0.2 grams of processed, sun-dried tobacco flakes are rolled in tendu or temburni leaves and fastened with cotton thread to make a beedi. While many types of tobacco were used for manufacturing beedi, tobacco was typically utilized in cigarettes. Though beedi rolling has been identified as a hazardous occupation by labour authorities, the health and working conditions of beedi workers has not been in the forefront of public consciousness. Most of the beedi workers are facing so many health related issues they were as respiratory problems like cough; throat burns and asthma were reported by more than 50% of women. Musculoskeletal disorders like back and neck pain, joint pains, pain in the lower extremities and fatigue due to prolonged sitting. Gynecological problems like irregular menstrual cycle and low birth weight. Other health effects included gastro intestinal problems, giddiness, visual problems, oral problems, constipation, anemia and headache. Health effects of beedi rolling on pregnant women were more. A negligible drop in birth weight and crown heel length was linked to beedi rolling after the 7th month of pregnancy and for more than six hours a day. The last trimester saw a considerable decline in birth weight among newborns who roll on beedi for more than six hours each day. Illness was independent of the time spent in beedi rolling. Higher tobacco use increases the likelihood and tenacity of health hazards. Health hazards and

safety precautions were not well known. Women can reduce health effects of beedi rolling by performing some body stretches in between the working hours.

Keywords: *Beedi rolling, Beedi workers and occupational health hazards*

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BIOEFFICACY OF NOVEL INSECTICIDE MOLECULES AGAINST SUCKING INSECT PESTS OF INDIAN BEAN

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The relative efficacy of twelve insecticides, viz., buprofezin 25 SC (0.04%), pyriproxyfen 10.8 EC (0.005%), diafenthiuron 50 WP (0.05%), vertimec 1.9 EC (9.5 mg/l), chlorantraniliprole 18.5 SC (0.005%), chlorfenapyr 10 SC (0.01%), emamectin benzoate 5 SG (0.005%), flubendiamide 39.35 EC (0.01%), pymetrozine 50 WG (0.025%), pyridalyl 10 EC (0.015%), bifenthrin 10 EC (0.016%) and dimethoate 30 EC (0.03%) against leafhopper, Empoasea fabae (Harris), aphid, Aphis craccivora Koch and whitefly, Bemisia tabaci (Genn.) was evaluated. The reduction in population revealed that diafenthiuron 50 WP (92.90% reduction), dimethoate 30 EC (91.77% reduction) and chlorantraniliprole 18.5 SC (90.58% reduction) were found most effective against leafhopper. The same insecticides exhibited 95.17, 94.60 and 94.04 per cent reduction in aphid population, respectively after three days of first spray. ln case of whitefly, the most effective treatments were diafenthiuron 50 WP (93.60% reduction), dimethoate 30 EC (92.04% reduction) and pyriproxyfen 10.8 EC (90.10% reduction). The treatment of pyridayl 10 EC, vertimec 1.9 EC and pymetrozine 50 WG proved to be least effective.

Keywords*: Bio-efficacy, novel insecticide molecules, sucking insect pests, Indian bean*

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ASSESSMENT OF *BACILLUS THURINGIENSIS* C_{33} STRAIN AGAINST FALL ARMYWORM IN SWEETCORN

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Fall armyworm is a major pest of sweet corn in Chittoor district of Andhra Pradesh. Farmers used to spray 4-5 times in total cropping period to control the pest resulting in increased cost of cultivation and there is a chance of developing resistance to the insecticides. Considering the harmful effects of insecticides, On Farm Trial was conducted by DAATT Centre, Chittoor during Kharif, 2022. Two generations of the pest were observed during entire crop growth period. Larva become sluggish and stopped feeding after spraying of Bt. 50% of pest control achieved after 1st spray of Bt whereas it was 90% in case of chemical spray hence no. of sprayings increased in Bt plots. 1st and 2nd instar larvae are more susceptible to Bt than later instars. Leaf damage score reached 4 in case of Bt spray *i.e.* 26-50% leaf damage with presence of chewed areas larger than 1cm whereas in case of chemical sprat score was 3 *i.e.* 11-25% leaf damage with presence of chewed areas ≥5mm. Hence it can be concluded that Bt can be included as one of the components in IPM and also in organic farming to manage fall armyworm below ETL.

Keywords*: Bt spray, IPM, ETL, DAATT*

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CHLOROPHYLL AND MORPHOLOGICAL MUTATIONS INDUCED BY GAMMA RAYS AND EMS IN M_2 GENERATION OF INDIAN MUSTARD (*BRASSICA JUNCEA* L. CZERN AND COSS)

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The experiment was carried out in the experimental field of College of Agriculture, Central Agricultural University, Imphal during 2018-2021. Seeds of two Indian mustard genotypes CAULC- 2 and NRCHB-101 were exposed to three doses of gamma rays (1000, 1100 and 1200 Gy), three concentrations of ethyl methane sulphonate (0.3, 0.5 and 0.7%) and their combination (1000Gy+0.5%, 1100Gy+0.5% and 1200Gy+0.5%). A wide range of chlorophyll and morphological mutants were observed in M_2 generation. Macro-mutations (chlorophyll and morphological) induced, were isolated for estimation of mutation frequency. Five different types of chlorophyll mutants viz. albina, chlorina, xantha, viridis and alboviridis were observed. The highest frequency of chlorophyll mutations was observed in combination treatment in both the genotypes. Among the genotypes, CAULC-2 showed higher frequency of chlorophyll mutation compared to NRCHB-101. Different types of morphological mutations affecting plant growth habit, plant height, maturity, foliage, seed and siliqua characteristics were induced in the present study. Combination treatment was found to be more effective than single treatment in inducing morphological mutations. NRCHB-101 produced more viable mutants. Mutation frequency was found to be more in combination treatments of EMS and gamma rays than their individual treatment. Total mutation frequency was higher in NRCHB-101 than CAULC-2.

Keywords*: Indian mustard, Gamma rays, Ethyl methanesulphonate, chlorophyll mutation, morphological mutation, mutation frequency*

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BACTERIAL ASSISTED BIOFORTIFICATION: A GREENER APPROACH FOR SUSTAINABLE AGRICULTURE

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Current agricultural practises focus on growing micronutrient-enriched crops in order to reduce the risk of micronutrient-associated malnutrition. A deficiency of zinc (Zn) in the soil slows down plant growth and also causes less Zn to be received by the edible portions of the plants. Thus, biofortification strategies are applied to improve the Zn concentration in palatable parts of the plant. However, the majority of biofortification approaches are arduous and require expensive expenditures. Therefore, improving Zn concentration in plants and enhancing crop quality via bacterial-assisted biofortification may be useful in ensuring more environmentally friendly agricultural practices. By secreting organic acids, siderophores, and other chelating substances, Zn-solubilizing bacteria serve as natural bio-fortifiers that can solubilize the inaccessible form of Zn. In our study, two potential plant growth promoting and Zn-solubilizing rhizobacterial strains were determined using dye-based Zn solubilization primary assays and subsequent screening using quantitative Zn solubilization. In the field trial experiment, these two bacterial strains, *Burkholderia cepacia* (BMRR126) and *Pantoearodasii* (BMAR64), as well as their consortium with and/or without ZnO supplementation, increased rice crop growth-related features (plant height, number of tillers, 1000 grain weight, grain yield, etc.) and soil parameters (organic carbon, NPK, available Zn, and dehydrogenase activity). In addition, bacterial treatments significantly increased the level of Zn in grain as compared to the control, providing the advantages of bacterial-mediated biofortification.

Keywords: *Bacteria, Biofortification, Crop, Zinc, Zn- solubilizing bacteria,*

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STUDIES ON INTEGRATED FARMING SYSTEM RESOURCE BASED NUTRIENT MANAGEMENT ON CROP GROWTH, YIELD AND UPTAKE OF RICE UNDER LOW LAND SYSTEM OF PERIYAR VAIGAI COMMAND AREA

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A field experiment was conducted at AC&RI, TNAU, Madurai during *rabi* season, 2020 to investigate the IFS resource based nutrient management in low land rice system of PVC command area. The experiment was laid out in randomized block design with eight treatments having three replications using the rice variety TKM 13 as test crop. The treatments consist of different organic amendments and inorganic fertilizers which include Tank silt @ 20 t ha^{-1} (T_1), IFS fish pond silt @ 5 t ha^{-1} (T_2), 100 % RDF (T_3), Tank silt @ 20 t ha^{-1}+ IFS fish pond silt @ 5 t ha^{-1} (T_4), Tank silt @ 20 t ha^{-1} + NPK fertilizer on nutrient balance basis (T_5), IFS fish pond silt @ 5 t ha^{-1} + NPK fertilizer on nutrient balance basis (T_6), Tank silt @ 20 t ha^{-1} + IFS fish pond silt @ 5 t ha^{-1} + NPK fertilizer on nutrient balance basis (T_7) and control (T_8). The combined application of organic amendments and inorganic fertilizer enhanced the availability of nutrients, it were directly influencing on growth, yield and uptake of rice. It could be concluded that application of Tank silt @ 20 t ha^{-1}+ IFS Fish pond silt @ 5 t ha^{-1}+ NPK fertilizer on nutrient balance basis is the best IFS resource based nutrient management practice to obtain higher crop growth, grain yield and uptake of rice under low land system of Periyar Vaigai Command area.

Keywords: *Rice, PVC command area, fish pond silt, tank silt, crop growth, yield and uptake*

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IMPACT OF INTEGRATED NUTRIENT MANAGEMENT ON THE CHEMICAL CHARACTERISTICS OF SOIL IN NECTARINE (*PRUNUS PERSICA* CV. SILVER KING)

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The experiment was laid out in a randomized block design with 12 treatments *viz*., T_1-Recommended dose of nutrients (RDN) + 40 kg FYM-(control), T_2-100% RDN + dual inoculation with *Azotobacter* and PSB, T_3-100% RDN + 10 kg vermicompost, T_4-100% RDN + 20 kg vermicompost, T_5-75% RDN + 10 kg vermicompost,T_6-75% RDN + 20 kg vermicompost,T_7-75% RDN + 10 kg vermicompost + inoculation with *Azotobacter*,T_8-75% RDN + 20 kg vermicompost + inoculation with *Azotobacter*,T_9-75% RDN + 10 kg vermicompost + inoculation with PSB,T_{10}-75% RDN + 20 kg vermicompost + inoculation with PSB, T_{11}-75% RDN + 10 kg vermicompost + dual inoculation with *Azotobacter* and PSB, T_{12}-75% RDN + 20 kg vermicompost + dual inoculation with *Azotobacter* and PSB. Soil chemical properties viz., pH, electrical conductivity, organic carbon content, N, P and K content were significantly influenced by integrated nutrient management practices.

Keywords: *Azotobacter, vermicompost, chemical properties*

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BIOPESTICIDES: A SUSTAINABLE APPROACH FOR INTEGRATED PESTMANAGEMENT

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The injudicious, continuous and unscheduled application of conventional broad-spectrum pesticides have underscored by many negative externalities including environmental degradation and pest resistance. (Fenibo *et al.* 2021). Consequently, their use in commercial farming is attracting regulatory restrictions leading to 2% decline per year in synthetic pesticides use in favor of 10% increase of biopesticides as alternative agrochemicals (Damalas and Koutroubas, 2018).Biopesticides are an important component of Integrated Pest Management (IPM) programs for insect pest control since they are more natural, environmentally friendly, safer than chemical pesticides and have relatively no or little effect on non-target organisms. They are effective tools for creating new sustainable agricultural products. Several botanicals and microbial biopesticides have been identified, isolated, processed, and used to eliminate hazards caused by Coleopteran, Hemipteran, Dipteran, Lepidopteran, Hymenopteran, and Thysanopteran insects. Several species of botanicals such as Neem (*Azadirachta indica* A.), Chili pepper (*Capsicum annuum*), Garlic (*Allium sativum*), Moringa *(Moringa oleifera*), Clove basil (*Ocimum gratissimum*), China berry *(Melia azedarach*), bitter leaf (*Vernonia amygdalina*) etc. and microbes such as *Bacillus thuringiensis*, *Beauveria bassiana*, *Metarhiziumanisopliae*, Baculovirus (nucleopolyhedrovirus (NPV) and granulovirus (GV), *Steinernema carpocapsae*, Nosema, etc. have been used as biopesticides. In the meantime, as the world waits for research advances to address the drawbacks, presently, crude extracts of pesticidal plants can be relied on, especially for local farmers and developing countries. Biopesticide-driven sustainable agriculture enjoys social acceptability, promotes economic productivity, and engenders environmental stewardship.

Keywords: *Biopesticides, Conventional, IPM, Pest Resistance, Insect-pest.*

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ASSESSMENT OF GROUNDWATER QUALITY IN THE WELLS OF ANBIL DHARMALINGAM AGRICULTURAL COLLEGE AND RESEARCH INSTITUTE, TIRUCHIRAPPALLI

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The ground water quality is deteriorating due to over exploitation of resources, rapid urbanization. Globally about 40% of irrigation water is obtained from groundwater, but the Indian scenario is 50%. Today the groundwater system is the largest covering 160 million ha of cultivable land in India with 39 million ha irrigated by groundwater, 22 million ha irrigated by irrigated canal, about 2/3rd of cultivable land in India still depends on monsoon. The Water quality study of Anbil Dharmalingam Agricultural College and Research Institute, Trichy has been carried out to assess water quality for irrigation purpose. The groundwater samples were collected from seven wells and analyzed for pH , electrical conductivity (EC), major anions (carbonate , bicarbonate, sulphate and chloride) and major cations (calcium , magnesium, sodium , potassium) and calculated the water quality parameters like Sodium Adsorption Ratio (SAR) and Residual Sodium Carbonate (RSC). pH of the samples ranges from 7.3 to 7.7 and EC ranges from 2.9 to 3.4 dS m^{-1}. Calcium, magnesium, sodium and potassium content ranged from 4.45 to 8.95 m.e L^{-1}, 3.76 to 11.76 m.e L^{-1}, 11.45 to 33.83 m.e L^{-1} and 0.23 to 0.56m.e L^{-1} respectively. Most of the samples were found to be sodium dominating and magnesium exceeds the calcium content in most of the water samples. carbonates were noticed from 0.0 to32me L^{-1}. Bicarbonates, chloride and sulphate concentration varied from 0.0to 18.0 m.e L^{-1} , 10.4 to 31.6 m.e L^{-1} and 0.01 to 0.32m.e L^{-1} respectively. The sequence of cations were found in the order of Na^{+}> Mg^{2+}> Ca^{2+} >K^{+} and anions followed the sequence of Cl^{-}> HCO_3^{-} >CO_3^{-}> SO_4^{2-}. Sodium Adsorption Ratio (SAR) varied from 6.81 to 8.36 m mol /L. Residual Sodium Carbonate (RSC) varied from 2.14 to 7.17. About 66.5 % of water samples is found to be alkali, 9.5 % of groundwater is in good quality and 23 % of water is found to be saline in three different seasons.The alkalinity is due to the accumulation of sodium chloride ions in groundwater. The outcome of this study suggests the need for certain improvement in groundwater quality.

Keywords: *Ground Water quality, cations, anions, Sodium adsorption ratio, Residual sodium carbonate*

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DURABLE RESISTANCE: A DARWINIAN PROSPECTIVE

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Plant diseases from pathogenic fungi, bacteria, viruses, and nematodes cause huge yield losses ranging from 10.1% to 28.1% in wheat (*Triticum aestivum*), 24.6% to 40.9% in rice (*Oryza sativa*), 19.5% to 41.1% in maize (*Zea mays*), 8.1% to 21.0% in potato (*Solanum tuberosum*), and 11.0% to 32.4% in soybean (*Glycine max*) (Savary et al*.* 2019; Schultink et al*.* 2017). Development of resistant cultivars is an economical and eco-friendly alternative as compare to the expensive and environmentally harmful chemicals used against different diseases. Plant breeders conventionally rely on the use of single dominant or recessive resistant (R) genes due to their strong effects and ease of selection which is commonly termed as qualitative resistance. Most R genes confer race-specific or qualitative resistance against a single or few pathogen strains; however, mutations and virulence shifts in pathogen populations make the effectiveness of these race-specific R genes short-lived (Li et al*.* 2020). If a new gene for resistance is available on time, it can be incorporated into new cultivars. By repeating the latter process at frequent intervals, new cultivars with different resistant genes will replace the varieties that have become susceptible (Tapiero, 1999). The limited durability of qualitative resistance is a major problem in plant breeding for pathogen resistance. Thus, quantitative resistance has gained interest in recent years to address the major challenge of genetic resistance durability. Several genes usually control quantitative resistance and are associated with genomic regions or QTL (quantitative trait loci) (Pilet-Nayel et al*.* 2017). Quantitative resistance is the foundation of breeding for disease resistance in crops, especially in achieving durable resistance, which unfortunately remains poorly understood in comparison to the well-studied gene-for-gene recognition process (Cowger and Brown, 2019). It is therefore important to deploy new resistance genes in such a way that the useful genes are available for a longer period. Moreover, combining major R genes with QTL in crops can maintain the effectiveness of plant resistance to pathogens. Combining resistant QTL with complementary modes of action appears to be an interesting strategy for breeding effective and potentially durable resistance and is a potential approach for extending the effectiveness of major genes (Pilet-Nayel et al*.* 2017).

Keywords: *Durable resistance, R gene, Gene deployment, QTL, Quantitative resistance.*

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EVALUATION OF AQUAFERT AS A FOLIAR FERTILIZER ON APPLE CV. ROYAL DELICIOUS

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Insufficient nutrient availability and occurrence of intermittent drought other stress during critical growth periods are the significant limiting factors in production of apple in dry temperate region of Kinnaur, Himachal Pradesh. Foliar fertilization is a common practice of supplying fruit crop production with mineral nutrients, especially under limited soil nutrient availability conditions like. To evaluate potential effectiveness of the foliar application of AQUAFERT® FOLIAR APPLE in Apple Growing Regions of Himachal Pradesh, an experiment was carried out at Regional Horticultural Research & Training Station, Sharbo (Kinnaur, Himachal Pradesh), to determine the response of Aquafert as a foliar fertilizer on apple cv. Royal Delicious. It has been revealed that foliar nutrition reduces. Three rounds foliar application of AQUAFERT® FOLIAR APPLE 100g/plant at 15, 30 and 45 days after Petal Fall stage of fruit development have shown better influence on fruiting and quality parameters of Apple cv. Royal Delicious. Higher fruit weight (182.50 g), fruit diameter (76 mm), yield (32 kg), Reducing Sugars (6.05 %), Total sugars (7.14 %), visual fruit colour (94%) and Shelf life (142 days) was recorded with QUAFERT® FOLIAR APPLE 100g/plant at 15, 30 and 45 days after Petal Fall stage.

Keywords: *AQUAFERT, Quality, Fruit weight, Acidity, Fruit set, Royal Delicious.*

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ESTIMATION OF AGRICULTURAL DROUGHT USING STANDARD PRECIPITATION INDEX (SPI) IN THE REGIONS OF TRICHY DISTRICT

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A tool for investigating drought by taking into consideration its intensity and length is the Standard Precipitation Index. SPI can be used to analyse the rarity of a drought or an anomalously wet occurrence at a specific time frame for any region in the world with a precipitation data. A Short time scale of SPIs as 1, 2, and 3 month can help in identify drought early and quantify its severity. It follows spatial consistency. The analysis was carried out for 35 years (1984 – 2019) rainfall of Trichy district, Tamil Nadu. The maximum range of rainfall occurred from June to November, in the study region. Therefore, the 6 month rainfall data were taken for analysis of 1 month, 3 months and 6 months and adapted to the gamma distribution, the SPI value is calculated. The graphs were drawn between actual rainfall and the SPI value for six month to know the relationship between the actual and the SPI value. The Standard Precipitation Index is used to analyse rainfall data of the study area from 1984 to 2019 for the time scale of SPI 1, 3 and 6. The SPI 1 result showed that 1984 was extremely wet, 1985, 1990, 1995, 2004, 2009 were moderately dry, 1996 severely dry. The SPI 3 shows 1986 and 1988 severely dry conditions, 1991, 1998, and 2000 were moderately dry, 2010 was moderately wet and 1985 and 2019 was extremely wet. The SPI -6 (June to November) endured the1986 and 1988 severe drought conditions, whereas 1984, 1985, 1989, and 2016 show the moderately dry (-1.00 to -1.49). From this study, SPI may be used to determine how frequently dry and wet years occur as well as trends in the severity of these conditions. A good indicator for drought study and a good way to learn about a station's record of drought is to plot data against year and SPI. The result gives the early warning of mitigation measures for drought and flood analysis.

Keywords: *Flood and Drought condition, Gamma distribution, Normal Distribution and SPI.*

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FEEDING THE WORLD IN THE 21st CENTURY

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A surplus of food in many of the world's wealthier countries has led to a certain complacency there about future supplies and availability. But for the vast majority of the world's people, who live in poorer developing countries faced with growing populations and increasing demand for food, concern rather than complacency is the order of the day. Fortunately, there are reasons to be optimistic that an end to population growth is finally in sight, albeit at some distance. The rate of world population growth peaked around 1970 and has been steadily declining since then. International cooperation in plant breeding has been particularly successful in producing improved crop varieties that benefit the developing world. When combined with appropriate management practices, these modem varieties have substantially increased productivity and contributed significantly to food self-sufficiency and economic development in many countries of Asia and Latin America. Modem plant breeding, which revolutionized agriculture in the 20th century, is now on the verge of significantly extending its technological potential. New genetic monitoring and manipulation tools, in aggregate commonly referred to as biotechnology, are becoming available as a result of advances in molecular and cellular biology. These new tools are contributing to both phases of plant breeding, the evolutionary phase, in which variable populations are produced, and the evaluation phase, in which desirable genotypes are selected. Variability, at the heart of the evolutionary phase, traditionally has been created by hybridization and to a lesser extent by mutations. Wide hybridization through embryo rescue or somatic hybridization, somaclonal variation, and genetic engineering are biotechnology tools that can dramatically expand the range of variability available to breeders. Genetic engineering, especially, should make the process of generating desirable variability much more predictable and help obtain other goals that are beyond the reach of conventional techniques.

Keyword: *Breeding, Biotechnology, Population, Food*

NC/AB/101/2023

MOLECULAR DIVERSITY ANALYSIS OF POTASH MOBILIZING BACTERIA FROM RHIZOSPHERIC SOILS OF RAJASTHAN, INDIA

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Potassium (K) is one of the major plant macronutrients influencing plant growth, development and grain quality. It plays a key role in the synthesis of cells, enzymes, proteins, starch, cellulose, and vitamins. Moreover, K not only participates in nutrient transportation and uptake, but also confers resistance to abiotic and biotic stresses, leading to enhanced production of quality crops and provides resistance to plant diseases. Different strains of KMB strains were isolated on Aleksandrov medium and characterized morphologically, following their plant growth promoting activities and potash mobilizing activities. 44 bacterial strains were isolated from the rhizospheric soil from various districts of southern Rajasthan. Among morphological parameters, colony color, shape and size has been considered for this study. Most of the colonies are white many shows color and circular. Biochemical characteristics of these bacteria included the following: Gram negative, aerobic and catalase positive. All the isolateshydrolyze starch, utilize citrate, and produce H_2S. All the strains shows positive reactions for various PGPR activities like production of Indole Acetic Acid, HCN, siderophore, ammonia and phosphate solubilization. All the strains showed zones when inoculated on Aleksandrov medium. The present results concluded the successful isolation of isolates of Potash mobilizing bacteria from the rhizospheric soils having an important role to enhance the soil fertility. Further these strains show PGPR activity and can be used as a biofertilizer.

Keywords: *Potash mobilizer, Abiotic stress, PGPR, Biofertilizer*

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IDENTIFICATION OF SUPERIOR GENOTYPES FOR YIELD AND QUALITY IN MULTIPLIER ONION

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Seven genotypes of multiplier onion (*Allium cepa* var *aggregatum*) were evaluated under Northern transitional zone of Karnataka at University of Agricultural Sciences, Dharwad both during *Kharif* and *Rabi* for yield and quality parameters. The outcome of the experiment revealed that over the seasons, the genotype MP16-24 was registered highest total yield (167.86 q/ha), marketable yield (160.41q/ha), TSS (15.41), average bulb weight (4.64g) and less number of bolters, low infestation of thrips (7.83) and purple blotch (7.66). Therefore, the genotype MP 16-24 can be commercially grown under Dharwad conditions during both *Kharif* and *Rabi* because of its favorable characters.

Keywords: *Genotypes, Allium, Kharif and Rabi*

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MASS PRODUCTION AND STABILIZATION OF MYCOHERBICIDES

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Despite the urgent need for alternatives to chemicals in plant protection, biological herbicides are not widely used as bio fungicides and bio insecticides. The review is devoted to connections between fungal biology, biochemistry, their ability to survive in extreme environment and development of effective mycoherbicides. Advanced studies on the production and stabilization of mycofungicides and mycoinsecticides were analyzed too in order to obtain ideas for the improvement of efficacy and technology of mycoherbicides in the future. The analysis of research data published within last 20 years showed following trends. First, more attention is paid for production both effective and stress tolerant propagules especially based on the submerged fungal mycelium and its modifications (blastospores, chlamydospores and microsclerotia). Second, the construction of bioreactors, in particular, for solid-state fermentation is continuously being improved that allows producing highly stress tolerant fungal aerial conidia. Third, based on studies of biochemical mechanisms of viability of fungi in extreme environment, the approaches of stabilization and storage of fungal propagules were developed. However, the positive reply to the question, if biopesticides including mycoherbicides, will become a serious alternative to agrochemicals, will be possible when they demonstrate stable efficacy in the field conditions and safety for both environment and end users.

Keywords: *Biopesticides, fungi, biology, biochemistry, ecology, stress tolerance, mycoherbicides, mycoinsecticides, mycofungicides, production, stabilization, formulation*

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IMPACT OF QUALITY OF LIFE ON WELL-BEING OF JUVENILE DELINQUENTS

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The main objective of the present study was to examine the impact of quality of life on well-being of juvenile delinquents. Further, the study also signifies to explore the prognostic role of physical, psychological, social relationships and environmental health of juvenile delinquents. Total 30 juvenile delinquents (both boys and girls) were selected from the observation home of Udaipur City in Rajasthan. Interview method were used to collect data from juvenile delinquents. Quality of life scale and case study proforma were used to assess in-depth background profile of juvenile offenders. Based on the analysis most of the juvenile delinquents perceived low and moderate level of overall quality of life. Moreover, four significant dimensions of quality of life have poorly influence on well-being and development of juvenile delinquents. Result also revealed that delinquents have moderate level of physical health and low level of psychological health and moderate level of social relationships while low level of environmental health. It is concluded that low level of quality of life is an essential aspect of enhancing criminality among juvenile delinquents. In contrast, poor quality of life experienced by minors may lead to stress, aggression, tendency to revenge, conflict with friends/family, inferiority complex and this can be increasing their risk of offending. Results showed that quality of life of juvenile delinquents as significant predictor to enhance the occurrence of criminality among children who have below 18 years of age.

Keywords: *Quality of life, Well-being, Delinquency, Juvenile Delinquents*

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EFFECT OF IRRIGATION SYSTEM TECHNOLOGIES ON THE GROWTH AND YIELD OF COTTON

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Cotton is the important cash crop of the Kharif season in Haryana as it has grown on 15.6 lakh acres (2021). It plays an important role in the economical and industrial sectors of Haryana. A case study was planned to demonstrate the effect of micro irrigation systems (MIS) on different locations. The Government of Haryana targeted the areas, where the water table is below 100 feet to promote MIS in different crops under the umbrella scheme "MeraPani Meri Virasat" and "More Crop Per Drop." The Micro Irrigation and Command Area Development Authority is providing an 85% subsidy to the farmer on the adoption of MIS in their fields. The increased water use efficiency and lower input demand not only lower the economic load on the farmer's head but also put forward the path of doubling the farmer's income. The use of MIS and Good Agronomic Practices (GAP) are able to produce a higher yield as well as benefit the environment by lower Green House Gas emissions. Keeping these points in view the field trials were planned to demonstrate the system profitability among farmers at farmer's fields. The data was collected from the three different locations in District Charkhi Dadri and Mahendergarh in the presence of farmers. The trials were conducted on different irrigation technologies (drip irrigation, drip irrigation with mulching, mini-sprinkler, and mini-sprinkler with GAP) at farmer's fields. At all the locations Bt- cotton was sown under different locations. The maximum yield recorded with drip irrigation with mulch was 11.6 q/acre followed by drip irrigation at 10.5 q/acre. The cotton yield with mini sprinkler was 7.35 and 7.83 q/acre at two different locations at Mahendergarh and Charkhi Dadri respectively and one irrigation with GAP was 4.89 q/acre.

Keywords: *Micro irrigation, water use efficiency, environment, mulching*

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NANO-PARTICLES AND NANO-CARRIERS IN PLANT DISEASE MANAGEMENT: A NOVEL APPROACH

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Upto 40% losses in crops each year are due to plant pests and pathogens. Moreover, existing pest management relies mainly on the application of pesticides, such as insecticides, fungicides, and herbicides. In spite of many advantages of high availability, fast action, and reliability, pesticides have several side effects towards non-target organisms, the resurgence of the pest population, and the development of resistance which is also becoming one of the major challenges in present day agriculture. Here, nanotechnology is playing a miracle role, by being less toxic, having a longer shelf life, and becoming more water soluble, all of which have a positive effect on the environment. This approach is bi-directional in nature where, nanoparticles can be used either as nanoparticles alone, acting as protectants or as nanocarriers for fungicides, insecticides, herbicides and RNA-interference molecules. Despite the many potential benefits of using nanoparticles in agriculture, only few nanoparticle-based products have been made commercially available. There are a variety of issues that could account for the lack of commercial applications, including the insufficient number of field trials and the underutilization of pest-crop host systems. Moreover, comprehensive understanding about the structural properties of the nanoparticles, such as morphology, size, functional groups, and active adsorption/loading capacity, may provide a useful guide as a starting point for the rational choice of suitable nanoparticles. Limited knowledge of the destiny and safety features of nano pesticides in field and long-term trials, their high production costs, the need for big volumes, regulatory uncertainty, and public opinion are factors to take into account when producing nanopesticides. Hence, we need to address the research and scientific gaps coming in the way of nanotechnology mediated disease and pest management.

Keywords: *Moreover, comprehensive, nanopesticides, organisms*

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BIOLOGICAL MANAGEMENT OF FUSARIUM WILT DISEASE IN TOMATO INCITED BY *FUSARIUM OXYSPORUM*F. SP. *LYCOPERSICI* (SACC.)

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Tomato Fusarium wilt incited by *Fusarium oxysporum* f. sp. *Lycopersici* (Sacc.) Snyder and Hansen is regarded as serious pathological threat in eastern parts of Rajasthan as well as in India. *Fusarium oxysporum* f. sp. *lycopersici* reduced significantly tomato yield as well as its quality. The over and repeated use of chemical fungicides to control plant diseases has resulted in unwanted effects, such as environmental pollution residual toxicity and resistant buildup against pathogens. Biological control has emerged as one of the most promising alternatives to the chemical fungicides. Many previous studies have aimed to develop biological control agents to replace chemical fungicides. A research experiment was conducted at Division of Plant Pathology, at RARI, Durgapura, Jaipur (SKNAU, Jobner) Rajasthan. Weekly observations revealed and results were showed that the antifungal efficacy of antagonists *Trichoderma viride*, *Trichoderma harzianum, Pseudomonas flouroscens* and *Bacillus subtilis* effectively reduced the pathogenic ability of *Fusarium oxysporum* f. sp. *lycopersici.* Among all above bio-control agents, *Trichoderma harzianum* was found most effective in inhibition of mycelial growth (*in vitro*) and in reducing disease incidence (pot conditions) *in vivo* bioassay. It was clearly showed that biocontrol agents can serve as a new management strategy for control of the soil fungus *Fusarium oxysporum* f. sp*. lycopersici* (FOL) in tomato.

Keywords:-*Tomato, Fusarium wilt, Fusarium oxysporum f. sp. lycopersici. Biological Control Agents and Per cent Disease Incidence.*

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IN-VITRO EVALUATION OF BIOCONTROL AGENTS AGAINST COTTON WILT DISEASE PATHOGEN, *FUSARIUM OXYSPORUM* F. SP. *VASINFECTUM*

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Cotton (*Gossypium* spp.) is an important cash crop of India and other cotton growing countries for it cotton seeds, fiber and oil. Cotton yield production is affected by many abiotic and biotic factors. The biotic factors include fungi, which are responsible for causing significant yield losses in cotton. Fusarial wilt disease caused by *Fusarium oxysporum* f. sp. *vasinfectum*, which is a major plant pathogen in reducing the cotton yield. For eco-friendly management of the disease can be achieved with the use of biocontrol agents such as *Trichoderma* spp., *Pseudomonas fluorescens* and *Bacillus subtilis*. The management of fusarial wilt pathogen *in vitro* condition through dual culture method. The effect ofout of nine biocontrol agents, the most effective was *T. Harzianum* inhibition of mycelium growth followed by *P. fluorescens, T. viride, B. subtilis, T. atroviride, T. asperellum, T. virens, T. hamatum* and *T. koningii*. The biocontrol agents such as *T. harzianum*, *P. fluorescens*and *T. viride*can be used in field conditions for controlling the cotton wilt disease and increase the cotton seed yield.

Keywords: *Cotton, fusarial wilt, Fusarium oxysporum f. sp. vasinfectum, biocontrol agents and Trichoderma spp.*

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IN-VITRO CHROMOSOME DOUBLING IN SWEET PEPPER (*CAPSICUM ANNUM* L.) USING COLCHICINE

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In-vitro and rogenesis is a quick and easy biotechnological method for producing haploids in sweet pepper. Successful chromosome doubling of haploids while ensuring maximum survival is an added accomplishment. However, in general practice the chromosome doubling using root dip method mainly encounters with poor survival rate during hardening. To overcome this study was conducted for chromosome doubling of anther-derived haploid plants of three sweet pepper genotypes- Ambika, Paladin and Almirante. Haploids plants were cultured in MS Medium containing different concentrations of colchicine(0.30, 0.40 and 0.50% w/v) followed by incubation at different time intervals (4, 6, and 8 days) to double the chromosome number. Flow cytometry analysis proved successful chromosome doubling of haploid plants. Based on the results obtained, the highest chromosome doubling of haploid plants was 58.2% along with survival of 61.3% was seen in Paladin using 0.50% colchicine for 8 days. While the lowest rate (0%) was accomplished using 0.30%colchicine for 4 days with maximum survival ranges of 85 to 93 % in all genotypes. It was noteworthy that the survival rate of haploid plants decreased significantly as the concentration of colchicineis increased, particularly over a longer period of time. The study's findings show that high doses of colchicine concentration with increased time duration enhance the chromosome doubling. The present protocol can be used to double the number of chromosomes ensuring maximum survivability.

Keywords: *Androgenesis, Colchicine, Chromosome Doubling, FCM, Haploid*

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STUDIES ON PREPARATION OF MANDARIN JAM

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Fruit processing of mandarin oranges offers great scope to avoid wastage and huge economic losses caused due to perishability of fruits and inability to trade fruits within a given period during market glut. Hence the present experiment was conducted at Post Harvest laboratory of Horticulture section to study the effect of different levels of sugars viz. 550 g, 650 g, 750 g, 850 g and 950 g sugar per kg pulp on preparation of mandarin jam. The experiment was laid out in Completely Randomized Block Design with four replications. Observations of different physic-chemical parameters of jam were recorded upto 90 days of storage at ambient condition. The results revealed that significant differences were observed amongst different treatments of sugar levels for physic-chemical and sensory parameters of mandarin jam. Total soluble solids of jam with different sugar levels ranged from 70.0 -72.15^0 B, titrable acidity 0.19-0.25 %, reducing sugars 18.27- 21.25 %, non-reducing sugars 24.30-25.75% and ascorbic acid between 18.63-20.08 mg/100 g jam. As regards sensory parameters maximum score for appearance, colour, taste, texture and overall acceptability was recorded for jam prepared with 750 g sugar. Similar trend of sensory score was recorded in jam stored at 90 days. No microbial spoilage was observed in all jam treatments upto 60 days of storage at ambient temperature. However, jam prepared with sugar 550 g and 650 g/kg pulp showed initiation of spoilage at 90 days of spoilage at ambient temperature.

Keywords: *mandarin orange, sugar levels, jam, storage*

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POPULATION DYNAMICS OF TOBACCO CATERPILLAR (*SPODOPTERA LITURA*) AND GREEN SEMILOOPER (*CRYSODEIXIS ACUTA*) INFESTING SOYBEAN VARIETY RKS-24

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The tobacco caterpillar larvae population on RKS-24 of soybean was first appeared in the 2nd week of August (33rd SMW) and thereafter population gradually increased and reached it's peak 2.90 larvae/mrl, respectively) during 38th SMW when average temperature, relative humidity and rainfall (27.2 ˚C, 79.3 per cent and 26.5 mm, respectively) remained during this period, there after larval population decreased but remained active up to 40th SMW. Correlation of tobacco caterpillar larval population with weather parameters revealed that average temperature and relative humidity showed positive correlation while, rainfall was negatively correlated. The present result are corroborated with the findings of Brahman *et al.* (2018) and Chavan *et al.* (2018) they reported the peak incidence of tobacco caterpillar during 38th SMW (third week of September). The present results of correlation study supported with the findings of Bangala *et al.* (2019) they reported that relative humidity exhibited positive correlation and rainfall are was negatively correlated and similar trend. The green semilooper larval population on soybean cultivar *i.e.* RKS-24 was initially seen in the 31st SMW (last week of July). Larval population gradually increased and reached it's peak in the 34th SMW (21 August) with 2.95 larvae/mrl, respectively in these verities when average temperature, relative humidity and rainfall was 28.2 ˚C, 74.8 per cent and 30.0 mm, respectively. After 34th SMW larval population decreased and remained active up to 40th SMW. Results of present investigation are corroborated with Chavan *et al.* (2018) who observed incidence of green semilooper throughout the crop season with peak of 25.33 larvae/mrl during 34th SMW. Correlation of green semilooper larval population with weather parameters revealed that average temperature relative humidity showed positive correlation while, rainfall was negatively correlated. Ahirwar *et al.* (2015) also found similar observation on the peak population of *Crysodeixis acuta* (0.7 larvae/mrl) during third week of August (34th SMW).

Keywords: *Tobacco, semilooper, rainfall, humidity*

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ARBUSCULAR MYCORRHIZAL FUNGI'S INTERACTION WITH PEA PLANTS (*PISUM SATIVUM* L.) AND GROWTH FACTORS IN HIMACHAL PRADESH'S MID-HILL ENVIRONMENT

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Mycorrhizal association is very important for the plants because it has several benefits like absorption of nutrients, increases drought resistance, enhance plant efficiency in absorbing water from soil and they are very useful in agriculture because it serves as biofertilizers as it helps in the absorption of phosphorus, and nutrient uptake. Pea (*Pisum sativum L.*) is commonly grown leguminous vegetable in the world. This study included Arbuscular mycorrhizal fungi isolation from rhizospheric soils and growth parameters of pea plant are isolated from four identified Arbuscular mycorrhizal fungi from five selected localities (Chail-Chowk, Ganai, Chachyot, Naugraun, Ratti) of Chail- Chowk of Mandi district, Himachal Pradesh, India. The different growth parameters were studied with respect to pea plant. *Glomus intraradices* had significant impact on plant height, root length and total number of roots of pea plant. The results revealed that the pea plant isolated with *Glomus intraradices* has highest plant height, root length and total number of roots as compare to other treatments.

Keywords: *Arbuscular mycorrhizal fungi, Inoculation, Growth parameters, Rhizosphere.*

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AFFECTIVE, COGNITIVE AND BEHAVIOURAL ATTITUDES OF STUDENTS TOWARDS ENTREPRENEURSHIP

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The attitudes of the student were studied using affective, behavioral, and cognitive components. The '*affective component*' refers to emotional reactions or feelings; the '*cognitive component*' refers to the person thoughts, ideas, or perceptions; the '*behavioral component*' refers to their act or behavior. The study was conducted to access the attitudes of students towards entrepreneurship during 2021 among the postgraduate students of Manipur University (MU). Students were chosen through stratified random sampling from five Schools of Studies of the university. A structured questionnaire was designed and data was collected from 160 respondents. An attitude scale with score ranging '0 to 0.33' was regarded as 'unfavorable'; '0.33 to 0.67' was regarded as 'moderately favorable' and any score 'higher than 0.67' was regarded as 'highly favorable' was used. Entrepreneurship Attitudes Score of students was found to be '0.647' for the School of Humanities; '0.635' for the School of Human & Environmental Sciences, '0.702' for the School of Social Sciences, '0.609' for the School of Life Sciences; '0.677' for the School of Mathematical and Physical Sciences. The overall normalized average score of students' attitudes towards entrepreneurship was found to be 0.65, revealing that the majority of the students i.e. 58.28% were moderately favorable towards entrepreneurship. This shows that majority of the students understand and appreciate the role of entrepreneurs, economic environment and the challenges of unemployment and view entrepreneur as a career option. There was a significant difference in attitudes to entrepreneurship among different Schools of Studies, between males and females, and among students of different family occupations. Students of the 'School of Social Sciences' showed the highest attitude towards entrepreneurship. Male students showed higher attitudes towards entrepreneurship than females. It was also found that

44.14% of the students showed highly favorable towards entrepreneurship. Students of the School of Social Science were found to be more aware of the potential resource and demand and are more aware of different programmers, schemes, ideas and strategies. Such potent and knowledgeable students should be selected and nurtured with proper training and exposure.

Keywords: Students Attitudes, Affective, Cognitive, Behavioral, Entrepreneurship.

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MOLECULAR APPROACHES FOR IMPROVING SALINITY STRESS TOLERANCE IN PLANTS

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Salinity stress, an excess amount of mineral ions in the soil, is one of the major abiotic stresses threatening global food security under current climatic regimes by diminishing agricultural productivity which ultimately hinders achieving the "zero hunger" goal (SDG 2: sustainable development goal). It is characterized by >4 ECe (Electrical conductivity of saturated soil) and sodium ion toxicity, has multifarious negative effect son seed germination, plant growth and development by interfering with major physiological processes and by triggering oxidative damage with the accumulation of reactive oxygen, nitrogen, and sulphur species. Plants exposed to salinity stress led to undergo various morphological, physiological, and biochemical changes that induce early leaf senescence, nutritional disorders, membrane disorganization, and necrosis ultimately leading to cell death, which is reflected as loss in plant biomass, leaf area, root, and shoot length, crop production, and productivity. A major challenge for global agriculture is improving salt tolerance, since most crops are sensitive to salinity. Various molecular approaches have been used for the incorporation of salinity tolerance characteristics are QTL mapping, marker assisted backcrossing (MABC), marker assisted recurrent selection (MARS), genomic selection (GS), candidate gene mapping and genetic engineering (GE) which could be used in breeding of a new variety with improved salinity tolerance in crop plants. Salinity responses include trigger stress-related genes, proteins, and the accumulation of metabolites, modulation of ion homeostasis, antioxidant defense system induction, and biosynthesis of numerous phytohormones and osmoprotectants to cope with the adverse consequence of salinity.

Keywords: *Salinity, ECe, salt-tolerance, QTL, MAS.*

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THE WONDERS OF MOLECULAR FARMING FOR COMBATING FUTURE AGRICULTURAL CHALLENGES

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Transgenic plants offer a promising expression platform for producing economically valuable recombinant proteins like antibodies, growth factors, aromatic compounds, vaccines, industrial enzymes, polymers, and peptides which have been tested in various plant species, including rice, tobacco, maize, soybean, potato, barley, carrot, and safflower, and have shown remarkable progress known as “molecular farming” or “gene farming”. Among the first molecular agricultural products that were effectively expressed in plants mainly tobacco were human growth hormone and a vaccination against hepatitis B. In comparison to the more traditional yeast, bacterial, and mammalian platforms, molecular farming offers advantages in terms of scalability, relative low cost, accumulation of complex proteins with correct and proper folding, and freedom from human or animal pathogens. This innovation in production technology has made it possible to create plant-based "green biofactories," which open new doors and provide a safe environment. Despite being in its infancy, the plant-based molecular product (PMP) market already has a large number of biopharmaceuticals in various stages of preclinical and clinical development like a noteworthy development of taliglucerase generated from carrot cells (Protalix®) that received FDA market approval as "Elelyso" in USA 2012, is Gaucher's disease treatment. The recent development of plant-made antibodies, which are currently undergoing phase 3 clinical trials to treat dangerous infections with pandemic potential SARS Covid-19 virus, as well as Covifenz & Zifivax, Medicago's most recent developed edible vaccines, have drawn attention to the immense potential of next-generation plant-made medicines. Likewise, Meripase, Trypzean, Lysobac, Lacromin, Aprolizean, Avidin, Coban, L1294, ZMapp, GUS, IBIO400, Isokine, Dermokine, Denka, and Ven Beta etc., are among the other products that are sold in the market for a variety of uses. More recently, the biggest biotech discovery of the century in the "omics" sciences, including "the CRISPR technology" and use of Virus-like particles (VLPs), as well as bioinformatics

and nanotechnology, as new frontiers of biomedical discoveries. Despite the fact that plant platforms have several benefits for producing PMPs, regulatory unreliability and widespread worries about the intrinsic yield of recombinant proteins are some of the challenges faced by molecular farming users. Therefore, to revitalise the end products within plant systems and to overcome the considerable difficulties and hazards related to their large-scale production and commercialization, future studies with respect to visualisation and optimization of viable regulatory pathways would be needed.

Keywords: *Edible vaccine, Molecular farming, Omics, Pharmaceuticals, Recombinant protein, VLPs*

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STORAGE STABILITY AND ORGANOLEPTIC EVALUATION OF RADISH SQUASH

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Radish (*Raphanus sativus* L.) is an annual or biennial cultivated vegetable belonging to the family Cruciferae. It is a good source of antioxidants such as catechin, pyrogallol, vanillic acid and other phenolic compounds. It is used in the treatment of diseases like cancer, whooping cough, piles, liver problems, arthritis, gallstones, kidney stones. Consumers acceptance towards white radish juice is very low due to its pungent flavor.so, in order to make it more acceptable it needs value addition. Hence an attempt was made to develop a value-added product of radish to increase its level in consumption. In the current investigation, recipes of radish squash with 25 and 30 % pulp, 40 and 45°Btotal soluble solids and 1 % acidity were prepared and subjected to physico-chemical analysis and organoleptic evaluation at 0, 30, 60 and 90 days of storage. In the prepared squash, an increasing trend of pH, TSS, total sugars and reducing sugars and decreasing trend of acidity, non-reducing sugar and ascorbic acid content was observed during storage period of 90 days. Squash prepared with 25% pulp, 45° B TSS and 1% acidity was rated superior for overall acceptability at the end of storage period.

Keywords: *Radish, catechin, pyrogallol, vanillic*

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A STUDY ON MOTIVATIONAL CLIMATE AS PERCEIVED BY THE SUBJECT MATTER SPECIALISTS OF KRISHI VIGYAN KENDRA'S UNDER ASSAM AGRICULTURAL UNIVERSITY

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The study entitled as **'A study on motivational climate as perceived by the Subject Matter Specialists of Krishi Vigyan Kendras under Assam Agricultural University'** was conducted at the KVKs functioning under the administrative control of Assam Agricultural University (AAU), Jorhat, Assam. All the 23 KVKs functioning under the administrative control of AAU were selected purposively for the study. Motivational climate was measured on six motive dimensions, *viz,* achievement, affiliation, extension, dependency, control and expert power. Eleven organizational dimensions were also considered for the purpose of measuring the six motive dimensions. A total of seven socio-personal and organizational variables, viz., age, educational level, service experience, level of aspiration, job involvement, attitude towards KVK and job satisfaction were selected as independent variables for the study. Data were collected with the help of a structured pretested questionnaire. The statistical techniques and tests used for analysis and interpretation of data included frequency, percentage, mean, standard deviation, coefficient of variation, 't' test, and *chi square* test. As regards perceived existing motivational climate, the mean perception score of dependency climate motive (41.69) was found the highest among the six motives. Findings revealed that the dominant existing motivational climate pattern in the KVKs was Dependency-Control. As regards perceived desired motivational climate, the mean perception score of extension climate motive (44.57) was the highest among the six desired motives. Findings revealed that a decrease in the climate motives of dependency and control was desired by the respondents over the existing. The results of chi square tests between characteristics of respondents and perceived existing motivational climate revealed significant association of 'level of aspiration' with 'control' 'level of aspiration' with 'expert power', and 'job satisfaction' with 'dependency'. In case of desired motivational climate findings revealed significant association of 'service experience' with 'expert power') and 'level of aspiration with 'affiliation'

Keywords: *climate, affiliation, variables, 't' test, and chi square test*

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EFFECT OF FUNGAL METABOLITES OF *ALTERNARIA ALTERNATA* ON SEED GERMINATION AND SEEDLING VIGOUR INDEX OF CORIANDER

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In India, spices are considered of the highest quality in the world and is known as the "Home of Spices". Coriander (*Coriandrum sativum* L.) is one of the important spices crop. The coriander plant suffers from several diseases caused by fungi and other microorganisms. Out of these diseases, alternaria blight of coriander (*Alternaria alternata*) is emerging as a major and widespread problem in India. Coriander leaf blight caused by *A. alternata* is one of the most important foliar disease-causing heavy losses in Gujarat state. The present study included the effect of fungal metabolites of *A.alternata* on seed germination and the seedling vigour index of coriander. Fungal metabolites of *A. alternata* were prepared on potato dextrose broth medium to test the effect of various ages and concentrations on seed germination and seedling growth (radicle and plumule length) and vigour index on a variety of coriander GC-3. It is a clear positive relationship between the toxicity of fungal metabolites increasing with an increase in age and concentration. Fifty days old fungal metabolites were highly toxic and caused a maximum reduction of seed germination, seedling growth (radicle and plumule length) and vigour index over control in both 7 days and 14 days after seed germination, respectively. While the highest reduction of germination per cent, seedling growth (radicle and plumule length) and vigour index at 100 per cent fungal metabolites concentration over control. The evaluation of the coriander seed's germination and seedling vigour index is helpful in evaluating the seed's health status and is helpful to the scientific community in identifying strategies for improving these indices.

Keywords: *Alternaria, radicle and plumule length*

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CULTIVATING NUTRI-CEREALS AS AN ALTERNATE TO MAKE FOOD PRODUCTION CLIMATE RESILIENT IN INDIA

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One of the critical challenges for a country's food security is climate change and its impact in form of extreme weather events. The predicted 1-2.5 degrees Celsius temperature rise by 2030 is likely to show serious effects on crop yields. High temperatures may reduce crop duration, permit changes in photosynthesis, escalate crop respiration rates and influence pest population. Climate change accelerates nutrient mineralization, hampers fertilizer use efficiency (FUE) and hastens the evapo-transpiration in soil. The impact of climate change is directly or indirectly related to crop, water and soil as it influences the water availability, changes the intensity and frequencies of drought, effects microbial population, soil organic matter reduction, yield reduction, depletion of soil fertility as driven by soil erosion, etc. Climate-resilient agriculture (CRA) is an approach that includes sustainable use of existing natural resources through crop and livestock production systems to achieve long-term higher productivity and farm incomes under climate variabilities. A study has found that while almost all grain crops are sensitive to these changes, adding more coarse grains or millets in crop production mix may help make food supply withstand vagaries of climate change. As compared to rice, alternative grains (finger millet, pearl millet, barnyard millets, sorghum) are significantly less sensitive to climate variability and generally experienced smaller decline in yields under climate extremes. All these are mostly rain dependent crops and grown during the kharif season. In general, the yields of alternative grains are lower than rice, but in certain districts, coarse grains performed better than rice under rainfed conditions for example, pearl millet and sorghum in central India. This means there is already an opportunity to increase climate resilience and grain production both by increasing crop area for these grains. However, Agriculture is intimately linked with socio-economic factors and market forces, all of which affect crop choice. If poorer and subsistence farmers choose alternative crops more than rice farmers, then how can mixing crops to increase stability at a national level affect crop choices? A better option would be to incentivize poor farmers to

increase their crop diversity to reduce the sensitivity of rice to rainfall variability. Health and nutrition benefits of millets could be an additional advantage. In addition, increasing production of alternative grains helps save water, reduces energy demand and greenhouse emissions from agriculture. Thus, diversifying crops that a country grows can be an effective way to adapt its food production systems to the growing influence of climate change.

Keywords: *Climate change, greenhouse, water, rainfed*

NC/AB/120/2023

NATURAL FARMING - A BOON

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Natural Farming can be defined as the chemical free farming because Natural refers to something that comes from nature and Farming refers to activity of growing crops. It is an agro-ecological process. Natural farming is not only good for soil health but it is also good for health of environment as well as it helps in reducing emission of greenhouse gases. When we use chemical fertilizers it harm our soil as the natural entities like microbes which help in decomposition of soil get killed by these harmful fertilizers . During Decomposition microbes gradually add nutrients to the soil. Tilling and ploughing is totally absent in soil it is left as it is to maintain natural environment. It encourages the natural symbiosis of soil micro flora and crop plants. It works on the principle that there will be no shortage of nutrients in soil, air and water and biology of healthy soil can release these nutrients. one of the most popular natural farming program practiced in India namely Zero Budget Natural Farming. This scheme aims to promote our traditional practices which give farmers choice to avoid harmful chemical fertilizers and use natural indigenous practices so that natural entities of soil do not disturb. Natural Farming considered as cost effective farming as it minimizes the cost of production and it raises the employment of farmers and it has a very good scope for rural development.

Keywords: *Agro-ecological, Zero Budget Natural Farming, Rural Development.*

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IN-VITRO ASSESSMENT OF THE ANTIFUNGAL POTENTIAL OF SOME COMMERCIALLY AVAILABLE FUNGICIDES AGAINST *A. BRASSICAE*

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Rapeseed-mustard is one of the most important oilseed crops cultivated around the globe. India contributes quite significantly to total oilseed production (especially rapeseed-mustard). Besides its economic significance and importance, the crop in the field is attacked by several plant pathogens; however, *Alternaria brassicae* causing Alternaria leaf blight is one of the most potent threats to rapeseed-mustard and nearly all the cruciferous crops cultivated around the globe. The disease is known to incur a severe lossto rapeseed-mustard in farmer fields regarding production and oil yield. Although several management practices are employed to manage this disease, none is found to be completely successful. However, only chemical fungicides exhibited promising results up to some extent. In the present experiment, *in-vitro* evaluation of eight commercially available fungicides was made through poison food technique and their efficacy to inhibit the radial growth of *Alternaria brassicae* was assessed. The result exhibited that all the fungicides under evaluation were significantly effective at all the tested concentrations. However, among all the fungicides, only two, i.e., Propiconazole and Hexaconazole were the most effective and exhibited 100 per cent inhibition of radial growth, even at their lowest tested concentration (i.e., 50 ppm); the efficacy of these fungicides has remained constant for their further higher concentrations. Moreover, the trend of a cent per cent growth inhibition tested fungus was again recorded in the case of Vitavax and Flusilazole at their relatively higher concentration, i.e., 150 ppm. The fungicides like Propiconazole, Hexaconazole, Azoxystrobin + Difenoconazole and Propineb exhibited complete inhibition of mycelial growth of the test fungus at their higher concentration of 200ppm. It was noted that Mancozeb, one of the most popular fungicides, was found to be least effective with maximum mycelial inhibition of 86.08 percent at its highest tested concentration of 200 ppm.

Keywords*: Rapeseed-mustard, Alternaria brassicae, Alternaria leaf blight, Chemical fungicide, In-vitro*

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A REVIEW- MANAGEMENT OF INSECT PEST IN ARID AND SEMI ARID HORTICULTURAL CROPS

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In India, nearly 3, 17,090 sq km area falls under arid region, of which 70, 300 sq km is classified as cold arid and remaining is under hot arid region. About 61% of total hot arid area lies in Rajasthan. The dynamics of the pest population were drastically altered by the astonishing expansion in fruit crop cultivation in the hot, desert region of western India. Among the arid and semi-arid horticultural crops Ber (*Ziziphus mauritiana*), Date palm (*Phoenix dactylifera*), Lasora (*Cordia myxa*), Aonla (*Emblica officinalis*), Bael (*Aegle marmelos*), Jamun(*Syzygium cumini*), Pomegranate (*Punica granatum*), Khejri (*Prosopis cineraria*) and cucurbits are the major crops which can be grown easily in arid and semi-arid eco-system of the country. The major pests of this area ber fruit fly, *Carpomyia vesuviana*; ber stone weevil, Aubeus himalayanus; fruit borers; aphids; thrips; lemon butter fly; datepalm scale, *Parlatoria blanchardi*; fruity fly, *Bactrocera cucurbitae*; leaf miner, *Liriomyza trifolii*; pod borer, *Helicoverpa armigera*; white flies, *Bemisia tabaci*; thrips, *Frankliniella occidentalis*; shoot and fruit borer, *Leucinodes orbonalis*; Hadda beetle, *Epilachna viginctioctopunctata*; aphids, *Aphis gossypii* and ash weevil, *Myllocerus subfasciatus* are major constraints which causing the considerable economic loss and increasing the cost of arid and semi-arid horticultural crops production of rain fed farmers. Because of the hard environment (high temperature, little precipitation, high PET, high wind velocity), poor soil fertility, and salt, production is a challenge. In addition to them, biotic pressure from pests and diseases, which raises production costs and results in significant loss, also plays a key role. As a result, we reviewed the current situation of insect pests of these fruit trees and their management choices in this post. The farmers in this area will find this information to be very helpful in managing various insect pests.

Keywords*: Insect pests, Bactrocera cucurbitae, Bemisia tabaci, Myllocerus subfasciatus*

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FUNCTIONAL RESPONSE OF *CHRYSOPERLA CARNAE* (NEUROPTERA: CHRYSOPIDAE) LARVAE TO OKRA APHID *APHIS GOSSYPII* OF OKRA IN LABORATORY CONDITION

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Functional response of the predator larvae of chrysopa to the okra was studied under laboratory conditions. The culture of predator and host was collected from the okra as and when required from the experimental field. Study was conducted at constant temperature of 25±1^{0}c with 16L: 8D photoperiod in incubator with 60±5% RH maintained using saturated salt solution of $MgNO_3$. based on Holling's disk equation Predators as above was collected from host crop and starved for 24hrs at 25^{0}c in the incubator in order to standardize their appropriate appetite and their weighed by using microbalance to record initial fresh body weights prior to being introduced individually into 9 to 12 cm diameter petridishes together with 5, 10,20,40,80,120,240 and 360 various aphid densities on excised okra leaves stuck to agar medium. Medium size aphids were selected. One of every two petridishes was placed in large transparent box with saturated salt solution with $MgNO_3$ in small cup. Larvae of chrysopa were randomly assigned to various aphid density treatments as above. At each aphid density 5 to 8 replicates was used. At aphid densities of 360 for chrysopa larvae was weighed using a micro-balance (accurate to 0.001 mg) to record their initial fresh body weights prior to being introduced into the feeding arenas. Thereafter, the petridishes was checked every 3 hrs after releasing the predator into the petri dishes for up to 24 hrs and the number of aphids consumed was noted, but the aphids consumed was not replace during the feeding time.

The number of prey consumed increases, the percentage of consumption decreases towards higher prey density which confirms type II response of prey predator relationship confirmed through study conducted on *Chrysoperla carnae* over their prey i.e. aphids. The highest prey consumption potential of *Chrysoperla carnae* (145.3 aphids) was recorded at 24 hrs of prey offered. Similarly, the highest consumption rate of *Chrysoperla carnae* for aphid 572.79% was recorded at 24 hrs of prey offered. Highest predation efficiency of *Chrysoperla carnae* was recorded at prey density of 5 aphids. The attack rate or searching efficiency for *Chrysoperla carnae* against *Aphis gossypii* was found

to be higher at 12 hrs(0.05) than at 24 hrs (0.04) of exposure as against it at 12 hrs handling time was found to be shorter(0.03) than 24 hrs (0.04).

Keywords: *Functional response, Chrysoperla carnae, Aphis gossypii Photoperiod, Attack rate, Searching efficacy, Holling's disk equation*

NC/AB/124/2023

GERMINATION AS AN EFFECTIVE APPROACH FOR QUALITY ENHANCEMENT OF UNDERUTILISED LITTLE MILLETS

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Little millet (*Panicum sumatrense*) was domesticated in India more than 5000 years ago and is known as Indian millet. Despite its nutritional, therapeutic and agro economic potential, it falls under the umbrella of underutilized grains due to its coarse nature concomitant with drudgery associated with its processing and lack of novel techniques for its valorisation as food products. Minimal processing such as germination could convert the underutilised raw little millets to edible form, thereby enhancing their sensorial and nutritional quality. However, the duration of this process is significant as extended germination affects hydrolytic enzymes activity affecting grain quality. Henceforth, optimum duration for sprouting of little millets at constant soaking time of 12 h and temperature of 30°C was standardised and the physical, cooking and nutritional characteristics of germinated little millets were compared with ungerminated ones. Better understanding of quality parameters of germinated little millet is prerequisite for its utilisation as functional ingredient in designing novel foods.

The 24 h germinated little millets were found to be rich in vitamin C (5.11 mg/100g), total soluble solids (2.33°Brix), overall acceptability of 8.73 on hedonic scale for cooked grains and desirable germination percentage (96.33%), α-amylase activity (1.34 µg/100g), milling yield (71.03%), pH (6.04) and titratable acidity without compromising quality compared to those germinated for 12, 18, 36, 42 and 48 hours. Germination enhanced the hydration, swelling capacities of little millets by 25.71, 36.17% respectively and decreased the bulk density, tapped density, cooking time, gelatinisation temperature by 5.06, 5.88, 31.95, 20.26 % respectively due to saccharification of complex carbohydrates into simpler ones. Further, it improved protein, crude fibre, ash (total mineral) contents by 6.92, 26.90, 130.77% respectively and reduced moisture, fat, energy, reducing sugar contents by 5.79, 65.80, 5.74, 6.07 % respectively due to activation of metabolic machineries in grains that

promoted synthesis and release of bound constituents by reducing ant nutrients. These germinated little millets with better nutritional and sensorial profile can be efficiently utilised as functional ingredient for formulation of low bulk weaning foods with easy digestibility for growing children and nourishing convenience foods for globetrotting and fast paced lifestyle consumers.

Keywords: *Lifestyle, quality, grains, acidity*

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PERCEPTION OF THE FARMERS ON PAIRED ROW METHOD OFPLANTING IN MAIZE IN KHAMMAM DISTRICT OF TELANGANA

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Maize (*Zea mays* L.) is the third most important food grain crop in India next to rice and wheat. It is main source of cereal for food, feed and processed industrial products and it has the highest yield potential among the cereals hence it is called Queens of cereals. In Khammam district maize is grown in an area of 44422.5acresout of which 8950acres of area is under paired row method of planting. The paired row method of planting in maize is an innovative technology disseminated by the Krishi Vigyan Kendra, Wyra scientists, the spacing between plant to plant is 20- 25cm,row to row spacing is 30cm, and spacing between one pair to another pair is 90 cm. For irrigation and fertigation to the plants a drip laterals are spread in between the two rows helps in uniform water and fertilizers availability to both rows. The technology has the potential to efficient use of sunlight, water, nutrients and increase light interception leads to thick and stronger stalks, healthy development of cobs contributing for higher yields. present study was conducted with an aim to determine the perception of the farmers toward the paired row method of planting in maize. A total of 80 respondents from4 villages were selected purposively in Khammam district and ex post facto design was used for the study. The perception of the farmers towards paired row method of planting inferred that 81.5%of the farmers noticed reduction in cost of cultivation, 78.5 % of the framers felt efficient use of fertilizers, 74% and 72% of the farmers opined efficient use of fertilizers and increase in water use efficiency is more compared to conventional method planting. Many of the farmers (70%) stated that that paired row method of maize have healthy cobs, reduction, saving organic matter and easy in harvesting cobs are other important advantages perceived by the farmers. Paired row method of maize cultivation may become the boon in modern agriculture by not only producing more maize but also this technology could enhance the resources use efficiencies substantially.

Keywords: *Maize, drip, farmers, fertilizers*

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IMPACT OF DIFFERENT SOURCES OF NITROGEN ON GROWTH AND YIELD, OF POTATO (*SOLANUM TUBEROSUM* L.) KUFRI CHIPSONA-3 UNDER BHOPAL REGION OF MADHYA PRADESH

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The experiments was conducted at the Horticulture nursery, Fruit Research Station, Entkhedi, Bhopal (M.P.) during the *Rabi* seasons of 2018-19. The topography of the field was uniform with proper drainage system. The soil of the experimental field was sandy-loam. The experiment was conducted in the randomized block design with three replications. The six treatment of nitrogen and 01 control such as T_0- No Nitrogen, T_1- Nitrogen 20 kg/ha, T_2- Nitrogen 60 kg/ha, T_3- Nitrogen 100 kg/ha, T_4- Nitrogen 140 kg/ha, T_5- Nitrogen 180 kg/ha and T_6- Nitrogen 220 kg/ha. The growth characteristics observation was recorded under the research trials such as days of germination, no. of shoots per plant, height of plant (cm.) and number of compound leaves per plant at 30, 60 and 90 days. The yield characteristics like days to maturity, no. of tubers per plant, no. of tubers per plot (kg/ha), yield of tuber kg/plant, yield of tuber kg /plot and yield of tuber q/ha. Quality parameter like dry matter and moisture content per cent. Economical parameters like gross return (Rs/ha), Net return (Rs./ha.) and Benefit: Cost ratio.

Keywords: *Nitrogen, Potato, Tuberosum, Kufri Chipsona-3 and Economics.*

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PERFORMANCE OF PEPPER GERMPLASM FOR YIELD PARAMETERS

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The investigation was carried out at Horticultural Research Station, Tamil Nadu Agricultural University, Yercaud during 2018-19. The experimental site is situated between 11° 04" to 11° 05" North latitude and 78° 05" to 78° 23" East longitude and at an altitude of 1500 m above Mean Sea Level. The average minimum and maximum temperature of the area were 12.4^{o}C and31.0^{o}C respectively. The soil is laterite in texture with 0.5 to 1.5 m depth. The experiment was laid out in a Randomized Block Design with three replication. The yield characters viz., spike length, number of berries per spike, 100 green berry weight, 100 dry berry weight, green berry yield and dry berry yield were recorded .Among the 28 accessions, the significant difference was observed for the characters spike length, number of berries per spike, 100 green berry weight, 100 dry berry weight, green berry yield and dry berry yield. Spike length ranged from 7.73 to 12.83 cm. The highest spike length was observed in PN 74 (12.83 cm) followed by PN 77 (12.03 cm) and lowest was observed in the entry PN 5 (7.73 cm).The accession PN 47 recorded mean number of berries per spike (68.00) followed by PN 60 (66.33) and PN 77 (61.00). Green berry weight for 100 berries was the highest in the accession PN64 (13.58g) followed by PN 79 (13.06 g) and the lowest in the accession PN 74 (10.59g). Dry berry weight for 100 berries was the highest in the accession PN 51(3.77 g) followed by PN 55 (3.71 g) and the lowest in the accession PN 60 (2.77 g). The accession PN 11 recorded the highest green berry yield per vine (3.07 kg) followed by PN 5 (2.80 kg) and the accession PN 11 recorded the highest dry berry yield per vine (1.02 kg) followed by PN 51 (0.890 kg) and the lowest in PN 33 (0.530 kg).

Keywords: *Performance, Pepper, Germplasm, Yield*

NC/AB/128/2023

PLANT's PROTECTION FROM THE SEVERAL FUNGAL DISEASES

Arti
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The main purpose of this study is to see the impacts of fungal diseases on plants due to the unfavourable environmental factors (like-temperature, relative humidity) which causes the various diseases by their specific fungal causal agents which loss their beneficial importance. Plants are the most usable and marketable products which are the major part of nature & are used everywhere for most of purposes and helps to provide a better environment & spread positive vibes, but nowadays these plants get damaged due to the inappropriate conditions. Fungi produces the different kinds of spores that causes the diseases symptoms in the plants. It can cause the necrosis which is associated with some other symptoms like: leaf spot, canker, dieback, blight scab, anthracnose, mildew, damping-off, leaf spot, fruit rot, etc. The fungal causal organisms inhibit the growth of plants or induce the poor-quality products from the plants. The occurrence of fungal infection suppresses the beauty, growth, production and commercial values of plants and also affect the living beings by increasing air pollution due to the infected plants. Synthetic fungicides, antifungal plant's extracts and molecular techniques are already in used to enhances the lifespan &better yielding of the plant's products, but still more research needs to be conducted to find another way for increasing the higher yield and preventing the plants more.

Keywords: *Leaf spot, canker, dieback, blight scab, anthracnose, mildew*

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POPULATION DYNAMICS AND MANAGEMENT OF OKRA SHOOT AND FRUIT BORER, *EARIAS VITTELLA* (FABRICIUS)

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Okra, *Abelmoschus esculentus* (L.) Moench is one of the mostimportant vegetable crop has its own importance, an account of its taste, flavour and nutritional values as human food grown in tropical and sub-tropical parts of the world. In India, an estimated loss of 69.00 per cent in marketable yield was due to attack of shoot and fruit borer (*Earias vittella*) pest on okra alone. The seasonal incidence study will help to determine the relation between the weather factors and population of this pest. It is a fact that farmers have to depend upon synthetic insecticides for the control of this pest. The study of efficacy of some newer insecticides will be helpful in finding out the best chemical for managing the *Earias vittella (Fabricius)*.The shoot infestation commenced from 4th week after sowing (9th SMW) with maximum (25.71%) in 9th week after sowing (14th SMW). Whereas, fruit infestation noticed from 6th week after sowing (11th SMW) with maximum (40.20%) in 11th week after sowing (16th SMW). Shoot damage showed positive and significant correlation with maximum temperature (0.509), while fruit damage was found positive and highly significant correlation with minimum temperature (0.685). Shoot damage exhibited negative and non-significant correlation with morning relative humidity (-0.030) and wind velocity (-0.286). During field evalution the different insecticides against shoot and fruit borer (*E. vittella*), spinosad 45 SC (0.018%) was found the best treatment and recorded significantly lowest fruit damage (8.05%), which was at par with chlorantraniliprole 18.5 SC (0.05%) and lambda-cyhalothrin 4.90 CS (0.03%) having 8.85 and 9.17 per cent fruit damage, respectively. Treatment pyridalyl 10 EC (0.01%) was found least effective against fruit borer (13.96%).

Keyword: *Okra, Shoot and fruit borer, Earias vittella (Fabricius), seasonal incidence, Insecticides.*

NC/AB/130/2023

ESTIMATION OF INTERRELATIONSHIPS AMONG YIELD AND YIELD CONTRIBUTING TRAITS INFORAGE MAIZE (*Zea mays* L.) THROUGH CORRELATION AND PATH ANALYSIS

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India is ranked first in milk production contributing 23% of the global milk production and milk production is heavily reliant on the availability of high-quality fodder. Thus, the estimation of the interrelationships among the different traits, especially those quality traits affecting yield is one of the important tasks for breeders. The present research was carried out using fifty elite genotypes of forage maize (*Zea mays* L.) at Main Forage Research Station, AAU, Gujarat, India during *Kharif*-2021.Results indicated that days to 50% tasseling, days to 50% silking, number of leaves per plant, plant height, stem thickness, leaf length, leaf width, leaf: stem ratio and dry matter content had a significantly positive correlation with green fodder yield at both genotypic and phenotypic level. The highest correlation of plant height (r_g = 1.043) and stem thickness (r_p = 0.819) with green fodder yield per plant was found at genotypic and phenotypic levels, respectively. The path coefficient analysis revealed positive direct effects of days to 50% tasseling, days to 50% silking, number of leaves, stem thickness, leaf length, dry matter content and crude protein content on yield. The highest positive direct effect of leaf length on green fodder yield was observed. Therefore, selecting the plant with more leaves, higher leaf length and good stem thickness will eventually increase the green fodder yield in forage maize.

Keywords: *Forage maize, Character association, Path analysis, Correlation coefficient, Fodder quality*

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PRICE SPREAD AND CHALLENGES FACED BY POULTRY LAYER FARMERS IN CHITTOOR DISTRICT OF ANDHRA PRADESH

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In the present study, three marketing channels for eggs were identified in the study area and marketing efficiency is calculated using modified Acharya's method which in turn revealed that channel III(Producer –> Consumer)is more efficient than the other two channels as intermediaries are not involved in this channel. Price spread is calculated by collecting data from 20 wholesalers and 40 retailers. Challenges faced by poultry layer farmers in production and marketing of eggs are identified and ranks are assigned using the Garrett ranking method. Data on constraints faced by farmers are collected from 60 poultry farmers of which 20 are small farmers, 20 medium and 20 large farmers. The results revealed that high feed cost and high chick cost are major problems in production of eggs whereas price fluctuation is the major problem faced in marketing of eggs. Need to create awareness on egg consumption to increase usage of eggs. Need to provide assistance to layer farmers as most of them are shifting to broiler farming as it yields higher returns in a short period of time.

Keywords: *Marketing channel, Price spread, marketing efficiency, layer farmers*

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PROTECTED CULTIVATION: A TECHNOLOGICAL INNOVATION IN HORTICULTURE

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In the present scenario, yield and quality of horticultural crops are dictated by the changing climatic conditions which includes extremes of temperature, humidity, light, rainfall, wind velocity and carbon dioxide concentration, among others and also biotic stress which includes problems of weeds and pests. These factors have led to regular crop loss and caused huge economic losses to the farmers. Therefore, new production technologies are required which can enhance the productivity of crops and profitability of farmers. One such technological innovation in the field of horticulture is protected cultivation. Protected cultivation is a process of growing crops in a controlled environment as per region and requirement of the crop. Some of the commonly used practices under protected cultivation includes greenhouse technology, low height tunnels, naturally ventilated polyhouses, net houses, walk-in tunnels, anti-insect net polyhouses, drip irrigation systems, fertigation and mulching. Vertical farming techniques by growing vegetables in vertically stacked layers which maximizes crop productivity in a limited space, is also included under the protected modes of cultivation. It often incorporates controlled environment agriculture, which aims to optimize plant growth, and soilless farming techniques or hydroponics by using mineral nutrient solutions which provides access to nutrition, water and oxygen. Among all the protected cultivation structures or techniques, greenhouse cultivation provides maximum benefit to the farmers. The major crops which can be grown under protected structures includes high-quality vegetables like cherry tomatoes, yellow and red bell peppers, cucumber, chilli, green capsicums, parthenocarpic brinjal, leafy and exotic vegetables and floriculture crops like orchids, carnation, rose or gerbera. Protected cultivation technology is being widely practiced in the developed countries, but in India its use is limited because of high initial capital cost and lack of skilled human power and technical knowledge. Therefore, need of the hour is to focus more on this high technology-based agriculture so that the economic returns from the horticultural produce can be increased substantially.

Keywords: *cultivation, horticulture, innovation, protected, technological.*

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NANOMATERIAL MEDIATED SOIL HEALTH MANAGEMENT: POTENTIALS AND LIMITATIONS

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The indiscriminate use of conventional agrochemicals to increase agricultural production is causing huge degradation of soil and groundwater resources due to their low use efficiency and high environmental risk. In order to sustain agricultural productivity and to maintain health of soil, it is of utmost importance to have some novel approach, as an alternative to the conventional ones that can help sustain or improve crop productivity besides having minimal adverse impact on the natural resources including soil, air and water. Nanotechnology is one such novel approach envisioned with the potential of increasing agricultural production besides sustaining soil health. Its main focus is on efficient management of natural resources and other inputs. This technology envisions the use of nanoparticles (particles having at least one dimension below 100 nm) that can be used to supply nutrients to the plants in an effective manner besides applying pesticides to the crop in a more effective manner. Use of nano – materials, with their high surface area and appropriate sorption properties, reduce the chance of losses by runoff and reducing release kinetics. Moreover, they are also having unique magnetic/optical properties, electronic states, and catalytic reactivity that differ from equivalent bulk materials. Hence, nanoparticles play an important role in reducing the problems affiliated with conventional fertilizer / pesticide system such as low nutrient use efficiency, soil and water pollution, increasing carbon footprints, residue of chemical fertilizers and many other problems. Nano - fertilizers are generally used for seed / seedling treatment besides being sprayed on plant surfaces at a lower dose so that its effects and residues in soil are very meagre with little adverse impact on soil health as well as soil biota. However, there are certain studies that have reported less effective results with the use of nano – fertilizers, thus the subject needs a thorough and extensive research so as to reap the benefit of this new technology. Also, several translocation and bio-transformation pathways need to be studied for clear understanding of the

potential uptake / benefit of nano - materials in soil-plant system, and the favourable and unfavourable effects that have been reported in different crops. Hence, in the present scenario, we can go with the nanomaterial mediated approach of soil health management, keeping its toxicity aspects into consideration as well.

Keywords: *Health management, toxicity, agrochemicals, pollution*

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DEVELOPMENT OF YIELD FORECAST MODELS WITH RAW DATA THROUGH STEPWISE REGRESSION ANALYSIS (FORWARD METHOD) AND DISCRIMINANT FUNCTION ANALYSIS FOR PIGEONPEACROP ON CHHATTISGARH PLAIN ZONE

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Under this investigation we studied about minimization of weekly data through stratification and Simple Random Sample technique. Individual effect of weather parameters has been considered under the study. Forecasting model developed on two statistical technique i.e. Stepwise Regression Analysis (Forward Method) technique and Discriminate Function Analysis technique. Both the techniques are found very suitable for the district wise and zone level pre-harvest forecast for the pigeon pea crop on Chhattisgarh. Models fitted with the Stepwise Regression Analysis on 35 variables and Time Trend (T) for Zone. The developed model is showing best fit on the basis of very high value of significance and maximum R^2(84%) for the plain Zone, highly significant at 0.1% level of significance and models fitted with DFA then 2 Discriminant score (ds1 and ds2)and Time Trend (T) the models found highly significant and R^2value 69% for plain zone for Pigeonpea crop. The developed model has been validated by the error parameters *viz.* Minimum MAE, Minimum MSE, Minimum RMSE, Minimum PE and Minimum PD along with maximum R^2.These developed models are useful to farmers of Chhattisgarh to decide their future prospects and possible course of action in advance. This was very challenging task for the researchers to develop a precise & accurate and best fit model for the future forecast. May this study will clear the fog through new methodology and also will create the new way on the direction of forecast.

Keywords: *Pigeonpea, Coefficient of determination, Stepwise Regression Analysis and Discriminant function analysis.*

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HIGH-FREQUENCY EMBRYOGENESIS AND PLANT REGENERATION IN BROCCOLI *(BRASSICA OLERACEA* VAR. *ITALIC)* USING MICROSPORE CULTURE TECHNIQUE

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The development of doubled haploids (DH's) by microspore culture is the most efficient technique for producing homozygous inbred lines in a short period of time, aiding in crop improvement. The current study focuses on embryo efficiency per bud along with effective regeneration in three broccoli genotypes- Green head, Pusa-KTS-1, Palam Haritika. The conditions for reliable embryogenesis induction from isolated microspores were identified. In order to induce embryogenesis, significant variations in embryo yield were found between genotypes depending on the type of carbon source used. Pusa-KTS-1 was found with maximum embryogenesis of 43 embryos/bud when buds were cold pre-treated at 4°C for 48 hours prior to microspore isolation. Isolated microspores incubated at 32°C for 24 hours prior to maintaining at 25°C enhanced the rate of embryogenesis. Where lowest embryogenesis of 3 embryos/bud was obtained using maltose 15% in Green head. In two widely used media, MS and Gamborg B5, the effectiveness of regeneration frequency was compared with different phytohormones. Following that, the use of solid B5 medium containing 1mg/ml BAP resulted in an efficient rate of regeneration in all genotypes. Pusa-KTS-1 resulted with 72.5% regeneration potential. The genotype effect was identified as the most prominent factor effecting embryogenesis and regeneration, as Green Head was found least effective. The current findings will help to accelerate the production of homozygous lines in broccoli by improving embryo efficiency per bud and effective regeneration.

Keywords*: Broccoli, Microspore culture, Embryogenesis, Regeneration, DH.*

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STUDY ON GENETIC VARIABILITY, HERITABILITY AND DIVERGENCE IN SORGHUM [*SORGHUM BICOLOR* (L.) MOENCH]

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Sorghum is multipurpose food crop and ranked fifth in world as principal cereal crop. The present experiment was carried out to obtain information about genetic variability and divergence among the genotypes. The experimental material consisted of 40 sorghum genotypes, evaluated in a RBD with three replications. The experiment was carried out during *kharif*, 2021 at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari (Gujarat). Moderate values of GCV and PCV for plant height, panicle length, primary branches per panicle, grain yield per plant, straw yield per plant, harvest index, protein content and Fe content, while high values for Zn content indicated the greater scope of improving these characters by applying judicious selection. Low GCV and PCV values were recorded for the characters *viz.,* days to 50% flowering, days to maturity and 100 seed weight indicated the narrow range of variability for these traits and restricting the scope of selection. High heritability coupled with high genetic advance as percent of mean was observed for plant height, panicle length, primary branches per panicle, grain yield per plant, straw yield per plant, harvest index, protein content, Fe and Zn content. For the further improvement in these traits, mass or progeny selection would be worthwhile. The D^2 analysis revealed a generalized distance (D) range from 9.11 to 29.64 between two clusters, which indicated the presence of diversity. The maximum inter cluster distance was found between clusters IV and VIII followed by clusters V and VIII. Maximum contribution towards the divergence was exhibited by Zn content followed byFe content, protein content, plant height, straw yield per plant, primary branches per panicle and panicle length. So, high yielding genotypes coupled with other desirable traits could be selected as parents for hybridization programme from cluster IV and cluster VIII.

Keywords: *Sorghum, Genetic variability and Divergence*

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A STUDY ON CHALLENGES LEADING TO DECLINE OF GROWTH IN THE HANDLOOM INDUSTRY OF INDIA

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Indian handloom industry is a prime example of the country's rich and varied culture. One of the greatest economic sectors after agriculture that generates both direct and indirect employement is handloom weaving. According to the 4th All India Handloom Census 2019-20, the country is home to 26,73,891 handloom weavers and 8,48,621 allied workers. Handloom industry of India produces 95% of the world's hand woven fabrics. Due to its decentralized structure and ability to thrive even in the most isolated and underdeveloped locations, the handloom industry can also help to reduce regional disparities. The key advantage of handloom is the introduction of labor-intensive design patterns that cannot be imitated by the power loom industry. The majority of handloom weavers in this industry come from low socioeconomic backgrounds. The handwoven industries generate energy and environmental friendly products enhancing sustainable development. Despite its enormous potential and growth prospects, the sector is currently facing numerous issues and difficulties. One by one, the handlooms are vanishing and the number of people employed in handloom production keeps decreasing. Due to globalization and shifting socioeconomic conditions, handloom weavers are experiencing a major crisis in their means of subsistence. Another important factor is that weavers lack knowledge of numerous government policies and schemes. The main challenges preventing the handloom industry from growing include (i)weaver-related issues like low wages, a lack of credit options and ignorance of government programmes (ii) supply chain issues like raw material supply and price, a labour shortage, a lack of infrastructure, inadequate design and product development, limited financial support, marketing and (iii) external issues like branding, consumer buying habits and increased competition. The study findings concludes that India's handloom industry demands special attention because it is vital to the country's economy. Despite of various government welfare schemes and policies, new techniques handloom industry goes on decline in growth and so many weavers are migrated to other jobs for their source of livelihood.

Keywords: *Handloom industry, handloom weavers, emerging challenges*

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SECONDARY AGRICULTURE: NEED, SCOPE AND OPPORTUNITIES FOR ENTERPRISES IN RURAL INDIA

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The goal of secondary agriculture is to make agriculture an enterprise and facilitate to create value on the agriculture produce, capture value for farmers and deliver value on his investment. Hence there is a need to consider agriculture into two streams- as primary agriculture and secondary agriculture. Within secondary agriculture are three kinds of avenues- type A which is related to adding value to inputs and outputs for example jams, jellies,; type B which is related to alternative enterprises that do not compete for resources viz agrotourism, agroforestry, lac cultivation, sericulture etc.; and type C which are residue based enterprises or enterprises which utilize crop of residue from primary agriculture as inputs and convert them into wealth e.g. fibre and products from banana pseudostem, fibre from lotus stem, cutlery from tendu leaves, mushroom production from paddy straw etc. Such enterprises may be established or encouraged at household level, village level or cluster level (in the form of MSME's). The beauty of secondary agriculture is that it utilizes the locally available resources- human and other working capital hence also aids in generating profits and employment along with development of a circular economy at village level. Changing societal mindsets is necessary and awareness has to be built in. This will help in meeting marketing challenges faced in the marketing of these products. In a nutshell, secondary agriculture has the capacity to raise profits by many a times for example processing alone adds value to any product by three times. Even if in real terms it is two times only, the incomes are doubled. The face of rural India can certainly be brighter and merrier with the secondary agriculture. Government, academic and industry must worked together in this direction. This study establishes the concept and estimates the income and employment potential of few secondary agriculture enterprises.

Keywords: *innovation, secondary agriculture, agriculture, income, employment, rural enterprise, entrepreneurship*

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IMPACT OF ICT ON EDUCATION DURING COVID-19 PANDEMIC

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A number of technological developments have occurred at the start of the twenty-first century, affecting every aspect of our lives. Information and communication technologies (ICTs), which are constantly developing, are present in every aspect of life, including the workplace, sports fields, educational institutions and personal and social settings. Education has profited the greatest benefits from technological advancements. Faculty of Education professors have struggled to keep up with the integration of ICT into teaching due to the rapid pace of technological change in education. In this 'Global Information Age,' the role of ICTs as a tool for progress and development has been widely recognized. The outbreak of CORONA VIRUS in China had spread across the globe and the World Health Organization officially declared it pandemic. The WHO recommended maintaining social distance as the first preventive measure after monitoring the corona virus pandemic condition. So, in order to isolate the infected people, every nation initiated a lockdown. As a result, every student's timetable was wrecked by the lockout and life of each one of us came to stand still. Even though it is a unique circumstance in educational history, COVID-19 has opened up numerous options to transition from the demanding classroom teaching paradigm to a new era of digital model. ICT was the only way to be in connection with each other. Many educational institutions have been forced to cancel their lessons, exams, internships, etc. and opt for online alternatives due to the lockdown. The university administration asked the teachers to prepare for online classes and start all teaching and related activities, which could bring out the teachers and students from the depression and anxiety of Covid-19 pandemic. As time went on, everyone recognized how many lessons the lockdown had taught them about how to deal with pandemics of this nature. It has created many challenges and opportunities for the educational institutes to strengthen their

technological knowledge and infrastructure. The lockdown has given them a ray of hope for teachers and students to continue their educational activities through online. Lecturers used various platforms in online learning during the COVID-19 pandemic. Teachers used various Apps to offer lessons via live video conferencing and assign homework to students in order to meet the target. There are WhatsApp groups of guardians, teachers, students and parents for affective communication through which they are always in touch to share their difficulties through this e-medium.

Keywords: *WhatsApp, COVID-19, lockdown, communication*

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DEVELOPMENT AND STANDARDIZATION OF BLENDED SQUASH FROM SINGAPORE CHERRY (*MUNTINGIA CALABURA)*

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The study was on development of blended squash from Singapore cherry fruits were carried out at the Dept. of Food Science and Nutrition in GKVK. Squash was developed by using three different fruits by blending with Rose apple and Passion fruit in different combinations (100 %, 50:50:00, 50:25:25 and 50:00:50). The base fruit was Singapore cherry. The prepared products were subjected for biochemical and sensory analysis. The results revealed that the products prepared in the combination of 50:25:25 showed very good with respect to colour (7.23), texture (7.0), flavour (7.05), over all acceptability (7.29) with pH (1.2) and TSS (40.50º Brix). The product was subjected for nutrient analysis and results showed that all the products contained high moisture, vitamin C and calcium.

Keywords: *Texture, nutrient, products, vitamin C and calcium*

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CRISPR/CAS9 TECHNOLOGY: A FUTURE OF PLANT DISEASE RESISTANCE IN THE CROP IMPROVEMENT PROGRAM

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Plant diseases are threatening the food security of the ever-growing population. In the current scenario, genome editing technologies have progressed rapidly and become one of the most important genetic tools in plant disease resistance to improve the yield and quality of major food crops. We witnessed the emergence of novel site-directed genetic modifications tools like zinc finger nucleases (ZFNs), transcription activator-like effector nucleases (TALENs), and clustered regularly interspaced short palindrome repeats (CRISPR)/CRISPR-associated protein 9 (Cas9). Recently, CRISPR/Cas9 has largely overtaken other genome editing tools since it is relatively more versatile, less costly, and easier to design and implement with a higher success rate. CRISPR is a reverse genetics RNA programmed genome-editing technology, which is basically used as a bacterial defense mechanism against bacteriophage viruses. Subsequently, it emerged as a revolutionary tool to engineer plant disease resistance in various crop improvement programs with precise genome editing and transgene-free applications. In Arabidopsis and *Nicotiana benthamiana*, CRISPR-encoding sequences targeted against viral diseases. Furthermore, the CRISPR/Cas9 targeted the susceptible gene-specific modification as regards fungal and bacterial disease resistance in crop species like rice, wheat, maize, tomato, banana, and citrus. This review focuses on the recent advancements in plant protection using CRISPR/Cas9 technology in model plants and various crops in response to fungal, bacterial, and viral diseases.

Keywords: *CRISPR/Cas9, genome-editing,crop-improvement, disease-resistance*

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STUDIES ON GENETIC ANALYSIS OF RICE GRAIN QUALITY TRAITS

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An experiment was carried out involving 64 rice genotypes the analysis of variances reveals high genotypic and phenotypic variation was observed in panicle weight, number of grains per panicle and gelatinization temperature. Moderate estimates were observed for plant height, number of productive tillers per plant, days to 50 per cent flowering, kernel breadth after cooking, kernel breadth, kernel length after cooking, breadth wise expansion ratio, volume expansion ratio, gel consistency, single plant yield and L/B ratio.

Out of 24 characters under investigation, 16 characters *viz.,* days to 50 per cent flowering, plant height, number of tillers per plant, number of productive tillers per plant, panicle weight, 1000-grain weight, kernel breadth, L/B ratio, gelatinization temperature, amylose content, kernel breadth after cooking, breadth wise expansion ratio, volume expansion ratio, number of grains per panicle, gel consistency and single plant yield registered high heritability and genetic advance, indicating predominance role of additive gene action and shows much prospects of improvement by simple phenotypic selection. Path analysis, revealed that selection based on the characters *viz.,* head rice recovery, number of grains per panicle, number of productive tillers per plant and kernel breadth would be rewarding for genetic improvement of grain yield while the characters *viz.,* kernel length after cooking, breadth wise expansion ratio, L/B ratio, kernel length and kernel breadth after cooking would be reliable for the improvement of linear elongation ratio. Hence these traits could be focused for selection while improving grain quality and yield.

Keywords: Genotypic, cooking, quality and yield

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A STUDY ON THE FACTORS AFFECTING HIGH SCHOOL DROP-OUT IN RANCHI DISTRICT JHARKHAND

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The fundamental prerequisite for human progress is education. Employment options are expanded and income levels are raised with schooling. Education is essential for both personal growth and national advancement. The aim of this study is to identify the factors that lead to high school dropout in Ranchi Jharkhand. Through this study, the researcher was able to experience, learn and gain knowledge. The causes of high school dropout differ from one location to another. According to this study, the top reasons why young adults leave high school early include lack of smartphone during lockdown, lockdown effect, financial problem, lack of interest, migration, poor quality education in school, parent's problem, failure in exam and ill health etc. Total 400 respondents from the Burmu, Angara, Mandar and Tamar blocks were purposively selected and studied accordingly. After leaving school, young adults in this region faced a number of difficulties, including a lack of job opportunities, difficulty applying for government jobs or others programmes, financial difficulties, difficult with reading and writing and difficulties adjusting to or preparing for the future. Most of the young adults who have been dropping out of school did not participate in any community activities and did not play any significant roles in society. The majority of them engage in daily labour since they have no alternative option for employment that will allow them to support themselves. The researcher would like to suggest that in order to avoid or prevent high school dropouts, the government, parents, teachers and the public as a whole need to take action. Teaching children and their parents about value of education is crucial. Parents and students don't show interest in public school due to no cost of tuition at most government schools in the villages. This will make it easier for people who are struggling financial problem to attend class and finish their 12 standards and matriculation. The dropout students who have lack of interest in study are found lazy in other work also.

Keywords: *Factors affecting, Dropout, Lockdown effect, migration, Burmu, Angara, Mandar, Tamar.*

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DEMONSTRATION OF REDROT RESISTANT SUGARCANE VARIETY SWARNAMUKHI

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Sugarcane is the major crop in Chittoor district of Andhra Pradesh mainly grown for jaggery purpose. Farmers grow local varieties which are susceptible to red rot disease, a devastating disease of sugarcane. The disease is more prominent during grand growth stage and farmers are unable to take any control measures at this stage. Growing of resistant varieties is the only option to control the disease. In this connection, frontline demonstration was conducted on redrot resistant sugarcane variety Swarnamukhi which was released from Agricultural Research Station, Perumallapalli, Tirupati District, Andhra Pradesh. The variety is resistant to red rot disease with 10months duration, cane yield of 120t/ha and jaggery of 10.5-11%. Demonstration was conducted during Rabi, 2021 and 2021-22 in 10 locations. Crop was planted during January and harvested by December. Red rot disease was not observed in swarnamukhi variety whereas in local variety it was 30%. Hence, lower yields were recorded in local variety *i.e.* 90t/ha whereas in swarnamukhi variety average yield of 115t/ha was recorded. Jaggery yield of 12.25t/ha was recorded whereas it was 9.1t/ha in local variety. Elephants damage was also very less in swarnamukhi as the cane is very strong than local variety which is very much susceptible to elephants damage because of its soft cane. Hence it can be concluded that swarnamukhi variety is resistant to and performed well with respect to cane and jaggery yield.

Keywords: *Jiggery, crop, yield, growth*

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USE OF PUSH-PULL STRATEGY FOR ENVIRONMENTALLY VIABLEINSECT PEST MANAGEMENT

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Insect pest is second most threatening to agriculture system after weeds. Yield losses due to insect pest infestation counts about 25 to 30 per cent. As a major factor in yield losses, trade of insecticide is highest in India than any other pesticide. Integrated pest management aims to minimize residue and other hazardous effects of chemicals on human and environment. The term push-pull was first given by Pyke et al. (1987) from Australia as a new approach for integrated pest management.

The "push-pull" method, a new tool which changes the distribution and abundance of insect pests and their natural enemies by using a combination of behaviour-modifying stimuli. This approach is recently developed for pest control which utilizes non-toxic components to lower the pest population with using less pesticide. In this tactic, the pests are repelled or deterred away from the main crop (push) by making food source undesirable or inappropriate to them and are simultaneously attracted to a trap crop (pull), from which the pests are then removed. This approach has several benefits in agriculture. Companion crops and intercrops are typically useful forage for farm animals, whereas through nitrogen fixation process, leguminous intercrops add organic matter and nitrogen to the soil. A variety of trap crops aid in water retention and soil particle binding, thus minimizing erosion of soil and nutrient leaching. The main advantage is that some intercrops and trap crops employed in this technique may also aid in weed control by drastically reducing the weed seed bank in the soil due to the allelopathic effect. In this way, it is useful method to boost agricultural productivity.

Keywords: *Attractant, behavioral manipulation, intercrops, push–pull, repellent, semiochemicals, trap crops*

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CHANGING CROPPING PATTERNS FOR OPTIMIZATION OF VIRTUAL WATER FLOWS IN THE BANAS RIVER BASIN OF RAJASTHAN

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Efficient use of available water resources is vital to meet our current and future demands, ensuring food security and fulfilling the needs of human consumption as well as other sectors. The present study deals with optimizing the virtual water flow in Banas River Basin by changing the cropping patterns using the water footprint approach for sixteen major crops. The possibility of changing the cropping pattern was evaluated in terms of potential blue water reduction. The water footprint of crop production in the basin was 19254.5 million cubic meters per year (MCM/yr) on average, of this nearly 3942.1 MCM/yr is blue water footprint. Banas basin is a net exporter of agricultural commodities. On average, almost 7390.9 MCM/yr of water flows out of the Banas basin due to agricultural exports and approximately 265.3 MCM/yr is virtual blue water outflow. Crops having low economic water productivity of blue water are being grown in vast areas resulting in a high blue water footprint. The optimized cropping pattern resulted in a 5.4 % lower blue water footprint with an overall higher economic output. Water footprint can be managed sustainably by improving water resource allocation for better economic, social and environmental productivity and going for less aggressive agricultural production.

Keywords: *Water Footprint, Optimizing cropping patterns, Cropping patterns, Sustainable Agriculture and Water scarcity.*

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STUDY THE EFFECT OF ADDITION OF KINNOW JUICE ON SENSORY PROPERTIES OF *KALAKAND*

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Kalakand is the indigenous milk product obtained by heat desiccation /concentration of whole standardized milk with subsequent addition of proper coagulant and sugar. Sensory evaluation of *kalakand* was carried out by the panel of judges selected from the staff of Department of Animal Husbandry and Dairy, College of Agriculture, Parbhani. It will be evaluated for Colour and appearance, Flavour, Body and texture, and Overall acceptability. Score card will provide to all judges, comparing "9-point hedonic scale" developed by Quarter Master Food and Container Institute, U.S.A. (Gupta, 1976). Kalakand was prepared from buffalo milk (standardized with 6 per cent fat and 9 per cent SNF) with constant level of sugar (6 per cent by volume of milk) and different levels of kinnow juice (0, 10, 15, 20 and 25 part by vol. of milk i.e 100, 90, 85, 80, and 75 parts of milk). It was observed that the overall acceptability score for treatment T1, T2, T3, T4 and T5 were 8.31, 8.37, 8.54, 8.19 and 7.83 respectively. As the level of kinnow juice in *kalakand* increases the overall acceptability score also increases upto treatment T3, thereafter it was decreased. The treatment (T3) comprises kinnow juice @ 15 per cent secured maximum score with 8.54 and lowest score was found to be 7.83 in treatment T5. For all sensory evaluation scores, it was observed that treatment T3 (15 parts of kinnow juice) was superior to other treatments with respect to Flavour, Colour and appearance, Body and texture, and Overall acceptability.

Keywords: *Kinnow juice, milk product, buffalo milk, kalakand*

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YIELD PERFORMANCE OF GROUNDNUT VARIETIES UNDER VARIED SOIL MOISTURE REGIMES OF MICRO SPRINKLER IRRIGATION

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A field experiment was conducted at Regional Agricultural Research Station, Palem during rabi 2021-2022 to study the "Yield performance of groundnut varieties under varied soil moisture regimes of micro sprinkler irrigation". The experiment was laid out in a strip plot design with four irrigation regimes comprising of micro sprinkler irrigation at 20 centi bars soil moisture potential(I1), micro sprinkler irrigation at 40 centi bars soil moisture potential (I2), micro sprinkler irrigation at 0.8 Epan (I3) and check basin irrigation at 0.8 IW/CPE ratio (I4) as main treatments and three groundnut varieties comprising of K-6 (V1), TAG-24 (V2) and K-1812 (V3) as sub treatments and replicated thrice. Significantly greater pod yield, kernel yield and haulm yield were recorded with micro sprinkler irrigation at 0.8 Epan (3050, 1977 and 5534 kg ha-1, respectively) while pod yield in micro sprinkler irrigation at 0.8 Epan was on par with check basin irrigation at 0.8 IW/CPE ratio (2915 kg ha-1)and micro sprinkler irrigation at 20 centi bars soil moisture potential (2703 kg ha-1). Water productivity was higher with micro sprinkler irrigation at 40 centi bars soil moisture potential (7.14kg ha mm-1) followed by micro sprinkler irrigation at 20 centi bars soil moisture potential (6.97 kgha mm-1), micro sprinkler irrigation at 0.8 Epan (5.84 kg ha mm-1) and check basin irrigation at 0.8IW/CPE ratio (5.55 kg ha mm-1). Among the varieties, pod yield was significantly higher in K-6(2950 kg ha-1) over TAG-24 (2467 kg ha-1) and was on par with K-1812 (2833 kg ha-1) while the kernel yield, haulm yield and water productivity were significantly higher in K-6 (1947, 5750 kgha-1 and 6.63 kg ha mm-1, respectively) followed by K-1812 (1722, 5248 kg ha-1 and 6.37 kg hamm-1, respectively) and TAG-24 (1477, 4401 kg ha-1 and 6.13 kg ha mm-1, respectively)

Keywords: *Micro sprinkler irrigation, soil moisture, irrigation*

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EFFECT OF PLANT SPACING AND ORGANIC NUTRIENT MANAGEMENT ON GROWTH AND YIELD ATTRIBUTES OF GREEN GRAM (*VIGNA RADIATA* L.)

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The field experiment entitled "Effect of plant spacing and organic nutrient management on growth and yield attributes of green gram (*Vigna radiata* L.)" was conducted during *Zaid* season of 2020-22 at Crop Research Farm, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.). The soil of the experiment plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.2), low in organic carbon (0.72%), available (278.48 kg/ha), available P (27.80 kg/ha) and available K (233.24 kg/ha). The treatments consisted of three spacing (20 cm x 10 cm, 30 cm x 10 cm and 40 cm x 10 cm) and three organic nutrient managements (4 t/ha Vermicompost + 10% Vermiwash + 10% Jeevamruth at 20 DAS, 5t/ha Vermicompost + 12% Vermiwash + 5 kg/ha FYM + 12% Jeevamruth at 40 DAS and 6 t/ha Vermicompost + 14% Vermiwash + 6 kg/ha FYM), respectively. The experiment was laid out in randomized block design with nine treatments and were replicated thrice. The results obtained that growth parameters such as plant height (63.41 cm), number of branches (6.60/plant), plant dry weight (13.38 g/plant), recorded significantly higher with the application of 30 cm x 10 cm + 5t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS. While yield parameters such as pods (25.52/plant) were obtained in 40 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at40 DAS. Whereas, seed yield (1,869.82 kg/ha), haulm yield (3,888.33 kg/ha) and harvest index (33.84%) were recorded maximum in the treatment combination of 20 cm x 10 cm + 5 t/ha VC +12% VW + 5 kg/ha FYM + 12% J at 40 DAS. However, in economic point of view, maximum gross returns (Rs. 2,28,266.33/ha), net returns (Rs. 1,64,206.33/ha) and benefit: cost ratio (2.89)were obtained highest in the treatment combination of 20 cm x 10 cm + 5 t/ha VC + 12% VW + 5kg/ha FYM + 12% J at 40 DAS, respectively.

Keywords: *Economics, Farmyard Manure, Jeevamruth, Seed yield, Vermicompost, Vermiwash,*

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IMPACT OF NAA ON THE MORPHO- PHYSIOLOGICAL TRAITS AND YIELD ATTRIBUTES OF DAHLIA (*DAHLIA VARIABILIS* L.)

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The experiment was conducted in the Department of Plant Physiology, Agricultural Biochemistry, Medicinal and Aromatic Plants, College of Agriculture, Indira Gandhi Krishi Vishwavidhyalaya, Raipur in the year 2021-22 during the month of Nov- March or Rabi season. The experiment was laid out in Completely Randomized design with 2 varieties 4 treatments (T1 T2 T3 and T4) with 3 replications (R1 R2 and R3) respectively. The plant growth substance used was a member of Auxin family named Naphthalene Acetic Acid (NAA) at the concentrations of 60ppm (T2), 90ppm (T3) and 120ppm (T4) along with control (T1) or with no hormone to show the different impact that occurs by the application of NAA on the morph physiological traits and the yield attributes of Dahlia (*Dahlia variabilis* L.). Among the different concentrations of synthetic growth substance/ hormone used the maximum plant height was recorded with the ones treated with T4 NAA @120ppm, used the maximum plant stem girth was recorded with the ones treated with T4 NAA @120ppm, used the maximum number of leaves plant-1 was recorded with the ones treated with T4 NAA @120ppm for the observable morphological traits followed by used the maximum leaf area for photosynthetic produce was recorded with the ones treated with T4 NAA @120ppm, used the maximum specific leaf area was recorded with the ones treated with T4 NAA @120ppm with maximum percentage moisture produced in the ones treated with T4 NAA @120ppm for the quantitative physiological traits as well as the maximum fresh flower weight was recorded with the ones treated with T3 NAA @90ppm, maximum fresh bud weight was recorded with the ones treated with T3 NAA @90ppm, maximum fresh tuber weight was recorded with the ones treated with T3 NAA @90ppm and the biological yield(g) was recorded with the ones treated with T3 NAA @90ppm respectively. The use of NAA in the plant increased the thickness of the abscission layer formed between the attachment site of stem and flower base which increased the total number of days the flower remained fresh and attached to the plant stem.

Keywords: *Dahlia variabilis, plant stem, morphological traits, Auxin*

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MANAGEMENT OF RED COTTON BUG THROUGH NEEMASTRA

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Red Cotton Bug (*Dysdercus koenigii*) is a common insect pest of cotton crop in Palwal District, Haryana, India. It is crimson red colour, elongated slender insect which has white bands on its abdomen. It's fore wings, antennae and scutellum is black. Both adults and nymphs feed on the cell sap of cotton and some other crop also. This insect is active throughout the year. In spring season, the bug behaves actively and lays about 100-130 eggs in moist soil. It has 5 nymphal stages and completely developed in 49-89 days. In summer, the life of an adult is very variable, but in winter, it may live up to three months. We found this red bug in cotton field of MVN University, Palwal, Haryana during first week of November 2022. A heavy infestation was observed at the time of boll bursting stage. Heavily attacked bolls open badly and a poor quality lint found. To manage this pest, we prepared an organic pesticide – "Neemastra" by using 2 kg of Cow dung, 5lit of cow urine and 5 kg of Crushed Neem leaves and ferment for 24 hrs. After fermentation, extract was filtered and diluted into 100 lit of water. This pesticide solution was sprayed on infested cotton crop during evening. Next day we observed that all the bugs were dead. This experiment was performed in laboratory condition also. A piece of cotton dipped in prepared neemastra and put inside the jar contained red cotton bug with few cotton leaves. Same result was observed, initially the insect stops feeding and gradually died. Neemastra is a botanical pesticide which can be stored for 6 months and it is effective against another sucking insect pest also.

Keywords: *Red Cotton Bug, Neemastra, Botanical pesticide.*

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SOCIO-ECONOMIC EMPOWERMENT OF FARMERS THROUGH FARMING SYSTEM INTERVENTIONS FOR SUSTAINABLE AGRICULTURE DEVELOPMENT IN AHMEDNAGAR DISTRICT

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The present study was conducted mainly with the objective of 1.To enhance the socio-economic empowerment of the farmers through appropriate farming system interventions *viz*., seed replacement in pulses, five point rabi sorghum production technology etc. by increasing yield and income. 2. To create livelihood opportunities for the marginal and the landless through subsidiary occupations *viz.*, goatary, backyard poultry etc. 3. To develop integrated farming system modules for sustainable agriculture. 4. To obtain feedback with the participation of farmers and landless for enhancing production, productivity, income and equitability of the households.

The study was conducted in two villages namely Chinchvihire and Kangar of Rahuri tahsil of Ahmednagar district. From these two villages 750 farmers were selected for study. Mainly focus on Integrated Farming System model which is developed by MPKV, Rahuri. It was observed that the majority of respondent had secondary and higher secondary education, marginal land holding and above 10 year farming experience.

Change in cost in term of value 15%, change in cost in terms of yield or production 35%, change in income in term of value Rs. 1,35,000.

Keywords: *Integrated Farming System.*

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FEEDING PRACTICES FOLLOWED BY CROSSBRED CATTLE OWNERS IN KONKAN REGION OF MAHARASHTRA

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In feeding practices maximum number of crossbred cattle owners adopted grazing + stall feeding system of feeding in study area and it was found highest in Raigad district with 94.4 per cent. Practice regarding individual feeding of milch animal was prominently adopted by crossbred cattle owners of Ratnagiri (87.2%) district and though group feeding practice was not adopted widely it was maximum found in Raigad (26.4%) district. Among selected districts of Konkan region feeding of animals twice in a day was maximum adopted by Raigad (67.2%) district and minimum by Thane (56%) district. All the crossbred cattle owners of study area followed the practice of feeding colostrum to new born calf except Thane district (96.8%). Processing of roughages and concentrates before feeding was adopted by crossbred cattle owners of Palghar, Thane, Raigad, Ratnagiri and Sindhudurg district with 26.4 per cent, 40 per cent, 24 per cent, 37.6 per cent 35.2 per cent, respectively. No farmers used urea for the enrichment of poor quality straw except Thane (2.4%) and Ratnagiri (0.8%) district. In study region majority of crossbred cattle owners adopted the practice regarding manual chaffing of green fodder and dry fodder than mechanical chaffing and it was observed maximum in Raigad district with94.4 per cent. Feeding of green fodder was maximum and minimum followed by crossbred cattle owners of Sindhudurg (62.4%) district and Palghar (40%) district, respectively. No crossbred cattle owner followed the practice of feeding silage except Thane (6.4%) and Ratnagiri (0.8%) district. From total selected crossbred cattle owners of study area the practice about conservation of feeds and fodder was majorly followed by Ratnagiri (84%) district. Feeding of dry matter @ 2 to 2.5 kg/100 kg body weight of animal was minimum followed by crossbred cattle owners Raigad (69.6%) district and maximum followed by Ratnagiri (80.8%) district, whereas feeding of concentrate @ 40% of milk production and 1 kg for maintenance was adopted by crossbred cattle owners of Palghar, Thane, Raigad, Ratnagiri and Sindhudurg district with 30.4 per cent, 43.2 per cent, 28 per cent, 40 per cent

and 36.8 per cent, respectively. Practice of feeding readymade purchased type of concentrates was abundantly used by farmers than homemade concentrates and it was highest found in Thane (77.6%) district. Pregnancy allowance ration for pregnant animals was maximum given by 80.8 per cent farmers of Thane district. Use of mineral mixture or mineral bricks for feeding was practiced by crossbred cattle owners of Palghar (8.8%), Thane (27.2%), Raigad (7.2%), Ratnagiri (24%) and Sindhudurg (21.6%) district, whereas feeding of unconventional roughages and concentrates during scarcity was majorly followed by crossbred cattle owners of Ratnagiri district with 72.8 per cent. Separate processing of concentrates was widely adopted than processing of concentrates with roughages and it was majorly found in Raigad (81.6%) district.

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CONSERVATION AGRICULTURE-BASED SYSTEM INTENSIFICATION OF PEARL MILLET – MUSTARD CROPPING SYSTEM FOR EFFICIENT CARBON FOOTPRINTS

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Energy, economics, and the environment are mutually dependent. Modern agricultural systems are energy and carbon intensive. Reducing the carbon footprint and increasing energy use efficiency are two important sustainability issues of the modern agriculture. Conservation Agriculture (CA) and crop intensification have the greatest potential due to their ecological and environmentally friendly implications. Management options such as the intensity of tillage are known to influence the dynamics of soil organic carbon and system carbon footprints overall. This study aimed to analyse the impact of smart cropping intensification pearlmillet mustard system equipped no tillage (NT), conventional tillage (CT) with residue retention on carbon pools, energy productivity, carbon budgeting and greenhouse emissions scenarios of all six cropping systems equipped with different tillage and residue intensity levels. CA practice had the highest soil organic carbon (4.72 g kg^{-1}) and microbial biomass carbon (192.3 μg g^{-1} soil). Double crop residue cover (4 t ha^{-1}) noticed significantly higher energy output and energy intensiveness in both conventional and zero tillage whereas energy-use efficiency (12.32) and energy productivity (0.32 kg MJ^{-1}) was highest under single season or no-residue cover. Carbon footprint value was highest with double season residue cover and found least under convention till system. Therefore, judicious residue cover and legumes intensification for pearl millet mustard rotations is advocated for improve system productivity, climate resilience and higher carbon sequestration rate at system scale.

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EFFECT OF FEEDING POULTRY MANURE WASTE ON MILK PRODUCTION OF CROSSBREED DAIRY COWS IN SUMMER

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India ranks first in buffalo and second in cattle population in the world. The total population of cattle in India is 192.49 million as per livestock census 2019, an increased by 0.8% over previous census in that milch Exotic-crossbreed cattle were 25.67 million in 2019 census, an increased by 32.2% over previous census. Increasing livestock population as well as reducing fodder production and grazing or browsing land in the country we have make other feed sources for animals. Poultry manure waste is easily available with lower cost as compared to all other sources of feed offered to the livestock so the study was selected for offering poultry manure waste on lactating crossbreed cattle on their milk performance in summer season. For this study 24 lactating crossbreed cows after parturition with their same lactation were selected. Selected animals were separated in cow shed at the Instructional dairy farm Nagla, College of Veterinary and Animal Science, Pantnagar Uttarakhand, India. Total number of animals divided into four groups with non-significantly different in weight and initial milk production i.e., 6 animals in each group. T_1 - Control (fed as per the requirements), T_2 - concentrate replaced with 10 percent poultry manure waste, T_3 - concentrate replaced with 20 percent poultry manure waste and T_4 - concentrate replaced with 30 percent poultry manure waste. The collected data of milk production were averaged on 15 days' interval and statistical analysis were done at 0.05 significance level. The results were observed that T_3 - produce more milk ($P<0.05$) than all other treatment groups which is 14.15 ± 0.23 kg/day, after that T_2 - produce 13.63 ± 0.24 kg/day, T_4 - 13.43 ± 0.21 kg/ day and T_1 - produce 12.66± 0.20 kg/day. It is found that the replacement of concentrate mixture with poultry manure waste gives sufficient nutrient up to 20 percent

of concentrate with highest milk production than compared to other treatment groups.

Keywords: *Poultry Litter Waste, Crossbreed lactating cows, Milk production, Winter season*

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STUDIES ON PREPARATION AND ANALYSIS OF FINGER MILLET BISCUIT'S

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Finger millet (*Eleusine coracana*) also called as ragi. Nachani, and Nagli is cultivated on anarea of 1.93 lakh ha in Maharashtra with total production of 2.07 lakh tones and averageproductivity of 1000 kg/ha. The crop is mainly cultivated in Konkan region of Maharashtra withapproximately 50% of the total area under the crop in the state (Patil, 1998). Finger millet has great nutritive value with some unique qualities, which make it a potentiallyvaluable product.It has excellent malting qualities with considerable industrial potential for producing malt extract and for brewing. A particularly important feature in the humid tropics is the excellent keeping quality of ragi grain- the best of all cereals.It was found that each property gives different relationship at different moisture content. The new process technology for ragi malt biscuit was developed. There were about sixtreatments undertaken for study so as validate the results statistically.The sensory evaluation was undertaken to evaluate the effect of malt percentage and baking time combination on ragi malt biscuits. Considering all aspects such a Colour, flavour and texture treatment B-2 (with 50 % malt, 50 % rava& for 25, 30 and 40 min. baking time) was found to be most suitable, as it ranks first for flavour & second for colour & texture properties among all six treatments. The cost of biscuits of B-2 treatment was calculated which is comes around Rs. 6.00 per 100 gm which is comparable with available glucose biscuit's. An examination of the several desirable features of ragi suggests an important role in contributing to future nutritional needs. It can be use for the preparation of nutritionally balanced supplement for weaned children.The treatment A-2 of the biscuits prepared using 100% ragi for temperature 150°C and 30 minute baking time is most liked by judges for colour, flavour and texture. The treatment B-3 of the biscuits prepared using 50% ragi and 50% rava for temperature 150°C and 30 minute baking time is most liked by judges for colour, flavour and texture.

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FINANCIAL FEASIBILITY OF COCOON PRODUCTION IN SERICULTURE UNIT

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Sericulture is the cultivation of Silk through rearing of Silkworm. It involves the raising of food plants for silkworm, rearing of silkworm for production of cocoons, reeling and spinning of cocoon for production of yarn etc. for value added benefits such as processing and Weaving. The Ramanagara district is the largest market for silk cocoons in India. About 57 % of the gross value of silk fabrics flows back to the cocoon growers with share of Income to different groups. Sericulture can be practiced even with very low holding of land. Farmers can earn profit ranged between Rs. 60,000 to 75,000 every 45 Days. The Main objectives of this study are to study management system and financial feasibility analysis of cocoon production in sericulture unit. This research study is based on the primary as well as secondary data. The primary data were collected by conducting personal interviews of the producer of cocoon production as well as observation method and secondary data collected from Research paper, Articles and report of sericulture unit and different web sites. It nut shell that cocoon production plays major role in sericulture unit as well as used as raw material for silk production. It observes that the efficient management system i.e housing management, fodder management, labour management, and quality management properly applies to increase the financial feasibility. It is concluded that benefit cost ratio is 1: 1.80. The payback period is 1 year and 4 months. BEP is 178 kg cocoon or Rs. 7, 56.538 is the point were sericulture project is neither in profit or nor in loss.

Keywords: *Sericulture, Financial, Cocoon, Marketing*

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GROWTH, INSTABILITY AND DECOMPOSITION ANALYSIS OF ONION IN INDIA

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The horticulture sector has established its credibility in enhancing the income of the farmer by generating employment through increased productivity. India is the second-largest producer of the fruits and vegetables *i.e.,* onion, cauliflower, cabbage, okra *etc.* Onion is contributing 205 billion Indian rupees in Indian economy of the fiscal year 2020-21. This study looks over the growth, instability of onion in India. The data regarding area, production and productivity of onion in India pertaining to 20 years (2000-2020) were made available through the secondary source from National Horticulture Board and further analyzed by using cuddy Della Valle's index, exponential model and decomposition analysis. The results of the study reveals that there was significant and positive growth in area, production and productivity of onion in overall study period. The CAGR of area, production and productivity are (6.60%), (9.44%) and (2.75%) respectively. It was found that there was a medium instability in terms of area (21.06%) and low instability in terms of production (14.27%) and yield (8.04%). The decomposition analysis indicated that area in onion play a major important role. Change in production can be explained by change in mean area 99 per cent, change in mean yield 2.85 per cent. The results of decomposition analysis have important policy implication that each component has finite time to expand over time so ICAR institutes and SAU should play an important role to bring technological change to enhance the production of onion.

Keywords: *Onion, instability, growth rate, India*.

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IMPACT OF CLIMATE CHANGE ON INDIAN AGRICULTURE

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Climate is that the long-term pattern of weather for a given area. Climate change is the most vital global environment challenge facing humanity with implication for natural ecosystem, agriculture & health. Global climate change is the most important determinant of crop productivity, particularly in country like India, where about 2/3rd of the cultivated area is rainfed climate change, therefore is of serious concern having large scale impacts directly and indirectly on agriculture. It is manifested with increases of extreme events such as drought, flood, and high temperature. In India around 36 mha agricultural area was affected due to heavy rain and floods since 2016-6.65 mha in 2016, 5.08 mha in 2017, 1.70 mha in 2018, 11.42 mha in 2019, 6.65 mha in 2020 and 5.04 mha in 2021. Climate change is likely to directly impact food production across the globe. Increase in the mean seasonal temperature can reduce the yield. In areas where temperature is already close to the physiological maxima for crops, warming will impact yield more immediately. The direct solar radiation striking on earth's surface is being trapped by greenhouse gases (GHGs) like carbon dioxide, Methane, nitrous oxide etc resulting in atmospheric temperature increase. India's average annual temperature increased at a rate of 0.62^0 C per 100 years between 1901 and 2020, according to data from the World Bank and maximum temperature have claimed even more quickly at a rate of 0.99^0 C every hundred years. Higher temperature tends to reduce crop yield and favour weed and pest proliferation, ultimately be Devastating the overall productivity. Integrated simulation modelling studies indicated that under representative concentration Pathways 4.5 maximum temperature is expected by 1 to 1.3^0 C in 256 districts by 1.3 to 1.6^0 C in 157 district (2022-2049). The increase ranged from $<1.3^0$ C in 199 districts $>1.6^0$ C 89 districts. Cultivation of wheat in these districts likely to be affected by heat stress. Vegetable crops when exposed to Extreme high temperature are subject to very high transpiration losses and is also limit fruit setting in citrus fruit. High temperature causes burning or scroching effect of Blossoms on young trees.

Keywords: *Climate change, Agriculture, Floods, Temperature.*

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GIS AIDED ASSESSMENT OF SOIL ERODIBILITY IN A TRANSECT OF DIKHARI WATERSHED UNDER DHEMAJI DISTRICT OF ASSAM

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A study was carried out in a transect of Dikhari watershed, under Dhemaji district of Assam, to assess the erodibility status of the area using GIS platform. A total of 57 numbers of geo-referenced surface soil samples (upto 30 cm) were collected, from over an area of 15,263.60 ha, which were taken for laboratory analysis. The method of sampling was random. Based on satellite data, three distinct landform units were delineated which includes: piedmont plain, alluvial plain and flood plain. The results revealed that there was a decreasing trend in total sand and very fine sand content in soils down the elevation, i.e., from piedmont plain towards flood plain. On the contrary, silt and clay content are higher in the lower elevation areas like flood plain and alluvial plain compared to piedmont plain. The textural properties of studied soils varied from loamy sand to silty clay loam; sandy loam being the dominant texture. Among the different landform units, the highest bulk density was recorded in the piedmont plain soils. The pH in the studied soils varied from very strongly acidic to slightly acidic. Cation exchange capacity and exchangeable cations were higher in flood plain soil. Likewise, the status of soil organic matter, available nitrogen and total nitrogen was high in soils of flood plain. Soils of lower elevation exhibited higher macro-aggregation, owing to higher clay and soil organic matter. However, piedmont plain soils exhibited higher micro-aggregate content. Soil erodibility indices viz., silt clay ratio, clay ratio, modified clay ratio, dispersion ratio, erosion ratio and erosion index showed that piedmont plain soils are more susceptible to soil erosion. The findings from erodibility indices were further corroborated by soil loss assessment by universal soil loss equation. The geospatial assessment of the soil loss variability clearly prioritizes the areas with higher erosion susceptibility. Principal component analysis revealed that component 1 has the highest impact on soil loss over the study area which is dominated by Modified Clay Ratio (MCR). This further accentuated the above findings.

Thus, it may be stated that the farmers should be careful in

selecting crops in the study area. The major limitations of these soils lie in the physical properties (primarily texture), fertility status, climate and slope.

Keywords: *Erodibility, GIS, erodibility indices, modified clay ratio.*

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STUDY ON ENTREPRENEURIAL BEHAVIOUR AMONG TRIBAL YOUTH UNDER ARYA (ATTRACTING AND RETAINING) PROJECT IN SOUTHERN RAJASTHAN

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Youth are expected to play a vital role in the much-anticipated transformation of agriculture in India. Because young people bring energy, vitality and innovation into the work force and when their willingness to contribute is matched with opportunity; they can have a transformative impact on economic growth and social development. In today's changing scenario, skills in entrepreneurial development have become important. Many entrepreneurial opportunities are emerging in various fields such as computers, electronics, medicine, agriculture, food technology, fashion designing etc. Entrepreneurship is the central force of economic activity and prime mover of development and most needed component for the development. Accessing markets for agricultural products can be particularly challenging for young people: they often lack the capacity to produce large quantities to benefit from economies of scale; they frequently lack the required knowledge of prices and market structures and have limited bargaining power. Sometimes young people's voices are not heard during the policy process, and often it fails to account for the heterogeneity and multifaceted needs of youth. To remedy this, youth need the requisite skills and capacities for collective action to ensure that their voices are heard. There many good things related to ARYA On the other hand, small land holdings are on the rise which poses challenge to food security for increasing population. Thus, it was felt to bring a comprehensive model for the development of tribal youth in general and agricultural youth in particular.

Keywords: *Entrepreneurial development, Tribal youth, Agriculture.*

About the Book

Mr. Mohit Bhardwaj is currently Pursuing his Doctoral Research from College of Veterinary and Animal Sciences, GBPUAT, Pantnagar. He did his Graduation in Animal Husbandry & Dairying and completed his Master Degree in Animal Nutrition, both from SHUATS University Prayagraj, Uttar Pradesh. He is also editor in chief of Just Agriculture magazine and Newsletter which is the one of the top leading agriculture magazine of India. In View of Publications, He has Published 5 research & review paper in national and international reputed journals and he has published 8 book chapters, 2 lead papers, 40 popular article and 4 technical articles in National and International Magazines. He has presented various oral and poster presentation. He has also attended various National and International conferences, trainings, workshops and symposium. He is life member of various scientific societies.

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