11th International Conference
On
Recent Advances in Agricultural, Biological & Applied Sciences for Eco-Friendly Development (RAABASED-2025)

Venue: Maya Devi University, Dehradun, Uttarakhand, India

July 25-27, 2025

Abstract Book Cum Souvenir

Organized by

ICAR-Indian Grassland and Fodder Research Institute
Centre for Indian Himalayan Grasslands, Palampur
Himachal Pradesh, India
(www.igfri.icar.gov.in)

School of Agriculture and Technology
Maya Devi University, Dehradun, Uttarakhand, India
(www.maya.edu.in)

College of Horticulture and Forestry
Central Agricultural University, Pasighat
Arunachal Pradesh, India
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Agro Environmental Development Society (AEDS)
Majhra Ghat, Rampur, U.P., India
(Registered under the Society Registration Act XXI, 1860)
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Surinder Paul

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Disclaimer

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MAYA DEVI UNIVERSITY
Approved Under Section 2(f) of UGC Act 1956

Mr. Manohar Lal Juyal
President, Maya Devi University, Dehradun
Uttarakhand

President's Message

With immense pride and hope for a sustainable future, I am pleased to share that the School of Agriculture and Technology, Maya Devi University, Dehradun, Uttarakhand in collaboration with the Agro Environmental Development Society (AEDS), Rampur, U.P., India is organizing the 11th International Conference on "***Recent Advances in Agricultural, Biological & Applied Sciences for Eco-Friendly Development (RAABASED-2025)***" from July 25–27, 2025 at Maya Devi University, Dehradun.

On this momentous occasion, I extend my heartfelt best wishes to all participants, organizers and contributors who are actively engaging in this meaningful initiative. In an era where the delicate balance between advancement and environmental preservation is increasingly at risk, this conference serves as a symbol of hope and responsibility. The quest for sustainable and innovative solutions is not only a scientific pursuit but a moral obligation we owe to our planet and future generations.

May this conference become a vibrant platform for the exchange of knowledge, the blossoming of transformative ideas and the forging of collaborations committed to ecological well-being. I bless this gathering with a spirit of unity, curiosity and compassion, so that each participant is empowered to make a meaningful contribution toward our shared goal of environmental sustainability. Let this conference inspire pioneering thoughts, fruitful partnerships and concrete steps toward a future where science and sustainability go hand in hand for the betterment of all life on Earth. I offer my sincere blessings to the organizers for a successful, enriching, and impactful event. May your dedication continue to guide us toward a greener, healthier and more sustainable world.

Mr. Manohar Lal Juyal

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डॉ. पंकज कौशल, एफएनएएएस

निदेशक

Dr. Pankaj Kaushal, FNAAS

Director

MESSAGE

I am happy to know that Centre for Indian Himalayan Grasslands (ICAR-IGFRI), Palampur, Himachal Pradesh in collaboration with Agro Environmental Development Society (AEDS) Rampur, Uttar Pradesh, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh is organizing 11thInternational Conference on "Recent Advances in Agricultural, Biological & Applied Sciences for Eco-Friendly Development (RAABASED-2025)" from July 25-27, 2025 at School of Agriculture, Maya Devi University, Dehradun, Uttarakhand.

The conference will bring together the researchers, academicians, industry experts, and policymakers to engage in meaningful dialogue, discussion and exchange of ideas that address pressing global challenges and opportunities in relevant fields, e.g., precision agriculture, biodiversity conservation, climate change, ecosystem services, livestock production. Livestock sector becomes a pillar for economic development under such scenarios, and the role of healthy grasslands and round the year fodder availability can't be ignored in achieving a sustainable economy with a sustainable environment at the same time. Our institute has followed a multi-disciplinary and inter-divisional research approach to address issues such as fodder shortage, deficiency of good quality seeds of range grasses and legumes, restoration of degraded lands, round-the-year fodder availability and the development of high yielding fodder crop varieties adaptive to climate change. The institute has also played an instrumental role in disseminating information and newly developed technologies related to fodder crops, grassland, and pasture rejuvenation and development through training and outreach programmes across the country.

I wish the conference a great success.

(Pankaj Kaushal)

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Dr. Tripti Juyal Semwal
Vice President, Maya Devi University
Dehradun, Uttarakhand

Vice President's Message

It gives me immense pleasure to extend my warm greetings as the School of Agriculture and Technology at Maya Devi University, Dehradun, Uttarakhand, in association with the Agro Environmental Development Society (AEDS), Rampur, U.P., India, prepares to host the 11th International Conference on **"Recent Advances in Agricultural, Biological & Applied Sciences for Eco-Friendly Development (RAABASED-2025)"** from July 25–27, 2025.

This prestigious event stands as a testament to our shared commitment to advancing scientific knowledge and promoting sustainable practices for the betterment of our environment and society. In a world increasingly challenged by environmental degradation and resource limitations, this conference presents a timely and critical platform for researchers, professionals, and academicians to come together and explore innovative, eco-friendly solutions.

I commend the efforts of the organizing team and all contributors who are bringing this vision to life. May this gathering foster productive discussions, lasting collaborations, and transformative ideas that help bridge the gap between technological advancement and ecological responsibility.

I extend my best wishes for the grand success of RAABASED-2025. May the outcomes of this conference pave the way toward a more sustainable, resilient, and harmonious world for current and future generations.

(Dr. Tripti Juyal Semwal)

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Prof. (Dr.) Ashish Semwal
Vice Chancellor, Maya Devi University
Dehradun, Uttarakhand

Vice Chancellor's Message

It is a matter of immense pride and pleasure that the School of Agriculture and Technology, Maya Devi University, Dehradun, Uttarakhand, in collaboration with the Agro Environmental Development Society (AEDS), Rampur, U.P., India, is organizing the 11th International Conference on **"Recent Advances in Agricultural, Biological & Applied Sciences for Eco-Friendly Development (RAABASED-2025)"** from July 25-27, 2025 at Maya Devi University, Dehradun, Uttarakhand.

It is an honour to extend my heartfelt blessings to this prestigious event, which stands as a testament to the unwavering commitment and scholarly contributions of faculty members, scientists, researchers, and professionals in the fields of agriculture and life sciences. The insights shared through this conference have the power to shape the future of sustainable agriculture and enhance the quality of life for future generations.

As we come together to celebrate innovation and scientific progress, may this conference ignite meaningful dialogue, inspire sustainable practices, and nurture a deeper connection between humanity and nature. The ideas presented here are seeds of transformation—toward healthier ecosystems, resilient food systems, and improved human well-being.

I sincerely hope that all who engage with this compilation are inspired to carry its messages forward with dedication and vision. I extend my best wishes for the grand success of the conference and continued success in your future endeavours. May the knowledge exchanged here lead to lasting benefits for society as a whole.

(Prof. Dr. Ashish Semwal)

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Dr Sheeraz Saleem Bhat (Ph.D, ARS)
Senior Scientist & Scientist in Charge,
ICAR-Indian Grassland and Fodder Research Institute
Centre for Indian Himalayan Grasslands,
Palampur -176 061. Himachal Pradesh, India.

MESSAGE

I gives me an immense pleasure to inform that ICAR-Indian Grassland and Fodder Research Institute, Centre for Indian Himalayan Grasslands, Palampur (Himachal Pradesh), Agro Environmental Development Society (AEDS) Rampur, Uttar Pradesh, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh are collaboratively organising the 11th International Conference on "Recent Advances in Agricultural, Biological & Applied Sciences for Eco-Friendly Development (RAABASED-2025)" from July 25-27, 2025 at School of Agriculture, Maya Devi University, Dehradun, Uttarakhand.

This conference will provide a great platform for researchers, scientists, Students, entrepreneurs, officials from state-level departments, extension experts, farmers, and other stakeholders to discuss and deliberate on recent developments in agriculture and allied sectors, with a special focus on the International Year of Rangelands and Pastoralists-2026. Experts across various disciplines will share their knowledge and experience during the conference sessions, which will serve as a foundation for more advanced research and collaborations, being a multi-disciplinary forum.

Heartfelt thanks to Dr Pankaj Kaushal, Director of IGFRI Jhansi, and Dr AK Shukla, Head, Grassland and Silvipasture Management Division of the institute, for their support and mentorship in organising the conference smoothly. Special thanks to my colleague, Dr Surinder Paul, for his coordination and support.

Best wishes to all the organising team and the participants for a successful and fruitful event- RAABASED-2025.

Dr. Sheeraz Saleem Bhat
Chief Organising Coordinator
RAABASED-2025

MAYA DEVI UNIVERSITY
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Dr. Sarvesh Rustagi
Professor, School of Agriculture & Technology
Maya Devi University, Dehradun, Uttarakhand

Chief Convener's Message

The 11th International Conference on "Recent Advances in Agricultural, Biological & Applied Sciences for Eco-Friendly Development (RAABASED-2025)" is scheduled to be held from July 25–27, 2025, at Maya Devi University, Dehradun, Uttarakhand. This event is being organized with the active support of the School of Agriculture and Technology at Maya Devi University, Dehradun, Uttarakhand, India, Centre for Indian Himalayan Grasslands, Palampur, Himachal Pradesh, India., ICAR-Indian Grassland and Fodder Research Institute, Jhansi, Uttar Pradesh, India, College of Horticulture and Forestry Central Agricultural University, Pasighat Arunachal Pradesh, India, and the Agro Environmental Development Society (AEDS), Rampur, U.P., India. This conference serves as a vital platform for researchers, academicians, and policymakers to share innovative ideas and strategies aimed at addressing environmental challenges. With a focus on the convergence of engineering, biological sciences, and agriculture, the event emphasizes the power of interdisciplinary collaboration in achieving sustainable development.

Over the three days, participants will engage in cutting-edge discussions, explore recent advancements, and build collaborations that could positively impact both ecosystems and communities. By working collectively, we can inspire one another and develop actionable insights that foster resilience and sustainability.

I appreciate your participation in this crucial discussion. Together, let's strive for a sustainable future. I express my sincere hopes for the conference's great success, wish you all more success in your pursuits, and hope that the information in this compilation will benefit society as a whole.

(Dr. Sarvesh Rustagi)

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एग्रो एनवायर्नमेंट्ल डेवलपमेंट सोसाइटी (ए.ई.डी.एस.)
Agro Environmental Development Society (AEDS)
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(Registered Under the Niti Aayog, Reg. No: UP/2020/0263654)

डॉ. छत्रपाल सिंह
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President, AEDS
Organizing Secretary, RAABASED-2025

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Message

As organizing secretary, I warmly welcome to all the dignitaries, delegates and participants in the 11th International Conference on **"Recent Advances in Agricultural, Biological & Applied Sciences for Eco-Friendly Development (RAABASED-2025)"**. The conference is going to be organized by Agro Environmental Development Society (AEDS) Rampur, Uttar Pradesh, ICAR-Indian Grassland and Fodder Research Institute, Centre for Indian Himalayan Grasslands, Palampur, Himachal Pradesh, School of Agriculture and Technology, Maya Devi University, Dehradun, Uttarakhand, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh at Maya Devi University, Dehradun, Uttarakhand, India from July 25-27, 2025. The AEDS is continuously working in the agriculture and organizing various training, seminar and conference to keep the students, researchers and scientists encourage. The main focus of the society and conference is how to overcome the problems that are arising for the sustainable development and how to increases entrepreneurship with the low expenditure in agriculture and allied sectors.

I am very much thankful to our respected Chief Patron, Shri Manohar Lal Juyal Ji, President, Maya Devi University, Dehradun, Uttarakhand and respected Patrons, Dr. Tripti Juyal Semwal Ji, Vice President, Maya Devi University, Dehradun, Prof. Ashish Semwal Ji, Vice Chancellor, Maya Devi University, Dehradun, Chief Convenor, Dr. Sarvesh Rustagi Ji, Professor, School of Agriculture & Technology, Maya Devi University, Dehradun and Director, Maya Devi University, Dehradun, Uttarakhand for supporting and conducting this conference in joint collaboration.

My heartfelt thanks to Dr. Pankaj Kaushal, Director of IGFRI Jhansi, and Dr AK Shukla, Head, Grassland and Silvipasture Management Division of the Institute, Dr. Sheeraz Saleem Bhat, Senior Scientist & Scientist in Charge, ICAR-Indian Grassland and Fodder Research Institute Centre for Indian Himalayan Grasslands, Palampur, Himachal Pradesh and Prof. BN Hazarika, Dean, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh for organizing this conference in joint collaboration. I am also thankful to all the respective participants and committee members of this conference for their valuable support and guidance during the conference.

I once again express my heartfelt gratitude to all esteemed Delegates and Participants for taking part and enhancing the dignity of this conference and sharing their views on different aspects of Agriculture, Biological & Applied Sciences and making this conference grand success.

(Dr. Chhatarpal Singh)

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Lead/Invited Lectures & Oral/Poster Presentation

Processing and value addition of pork meat for food and nutritional security

A. Ameeta Devi[1*], Y. Prabhabati Devi[2] and Khumlo Levis[1]
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Abstract

Piggery meat (Pork) is important source of animal protein which is very important for the normal functioning of the human body. It is one of the major food item consumed in most part of the North east hill region since time immemorial. Pork is highly perishable, having a shorter shelf life, spoilage commences immediately after slaughtered and a vast array of biochemical and physiological changes take place from the time of slaughtered of pig until it is consumed. Effective utilization of these by-products for the production of value-added meat products is one way to realize maximum returns from the piggery sector as pig rearing is traditional practice for weaker section of the society. Pickling of meat is an alternative method to develop a low-cost shelf-stable meat product in the market. It helps to improve desirable characteristic like taste, flavor and texture along with the preservative effect. There are five pork products prepared for value addition and these pork product will act as dietary supplements of people of different age groups. These products got very high benefit cost ratio. The results showed that pork pickle stored successfully for 180 days at ambient temperature (26±4 °C) without any significant change in the quality attribute after incorporation of vinegar and sodium benzoate as a common preservative. The result showed that the preservation of pork pickle with vinegar and sodium benzoate was the best method for extending the shelf life and to retard the growth of microbial load. From the study, it was also found that treatment five got the highest sensorial score in terms of colour, flavour, texture, taste, appearance and overall acceptability than the other four treatments. The value-added products from piggery meat could facilitate sustainable livelihood and also help to increase food,consumer preference andwill help in nutritional security.

Keywords: *Processing, Pickling, piggery meat, pork, Sensory, Shelf life*

Genetic divergence studies in cotton (*Gossypium hirsutum* L.)

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Abstract

North Carolina Designs-I, II and III were utilised to create variability and to understand gene actions in the F_2 materials of SCS1061× GJHV510 cross of cotton. Total 80 crosses were developed in the *kharif* season of year 2022 and evaluated in Randomized Block Design with 2 replications during *kharif* season of year 2023 at Agricultural Research Station, Navsari Agricultural University (NAU), Achhalia.

The data were recorded for seven characters *i.e.* plant height (cm), number of monopodia and sympodia branches/plant, days to 50% flowering, number of bolls/plant, seed yield/plant and lint yield/plant. The results revealed that there was huge variation was observed in developed materials for most of all the traits and materials developed through NCD-III showed more variability compared to other NCDs. The genetic divergence studies using Mahalanobis D^2 method distributed the 80 crosses of cotton into 12 different clusters. Cluster-I accommodated maximum (25) crosses while cluster-IX, X, XI and XII accommodated single diverse cross. Cluster-X and XII showed maximum inter-cluster distance and materials from these cluster on the basis of lint yield, number of bolls/plant and plant height can be exploited in future breeding programs to develop better performing varieties/hybrids and also for breeding of advanced lines of cotton.

Keywords: *Genetic divergence, Mahalanobis D^2, North Carolina Design, Cotton, Variability.*

Nano-fungicides: A novel approach for tea gray blight management

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Abstract

Gray blight incited by *Pestalotiopsis*-like species is one of the most challenging foliar diseases of tea crop (*Camellia sinensis* (L.) Kuntze) worldwide. This affects the crop throughout the year and major crop losses occur from June to September in India. The disease is also reported on tea in China, Korea, Japan, Kenya, and Sri Lanka. At present, this disease has become a major threat for the Indian tea industry. Affected bushes defoliates completely, accounting to a crop loss of 50% and more in some cases. Currently, *Pestalotiopsis*-like species in tea crop are primarily managed through nongenetic approaches such as cultural practices along with the use of synthetic fungicides, microbial biocontrol agents and botanicals. In recent years, natural agents such as beneficial microorganisms and botanicals rich in several bioactive compounds were widely used for disease management. In addition, application of nanotechnology or microencapsulated products has been exposed as an emerging field that could help achieving sustainable disease management in tea crop. The addition of nano-materials to the microbial bioagents/botanicals has enhanced their efficacy and shelf life. In laboratory and field experiments, Chitosan-based cura nano-botanical at 1% concentration (v/v) have shown efficient mycelial growth inhibition of gray blight pathogen, *Pseudopestalotiopsis theae* (i.e., 80%) and more than 60% disease reduction over control under field condition in North Bengal and Assam tea gardens. Further, alginate and chitosan-based encapsulated beads of *Trichoderma harzianum, T. hamatum, T. reesei*, and *T. koningii* evaluated against *Ps. theae* under both laboratory and field conditions, have also shown potential results against gray blight pathogens. Encapsulated beads (1g/L) showed 58% to 74.5% range

of growth inhibitions of *Ps. theae* in laboratory bioassay and more than 66.5% disease reduction over control at 1% concentration (w/v). The disease reductions obtained with cura-based nano-botanical and encapsulated beads of *Trichoderma* sp. were significantly higher than that of crude form or aqueous spore suspension of *Trichoderma* spp. Further, the plants sprayed with nano-botanical and encapsulated beads of *Trichoderma* spp. showed upregulated induction of defense-related enzymes, such as phenols, peroxidase, polyphenol oxidase, phenyl alanine ammonia lyase, chitinase and beta glucanase. Thus, these findings suggest that nano fungicides based on cura and *Trichoderma* species spore suspensions might be useful for the management of gray blight in tea garden after multi-locations field trials. However, they must undergo for regulatory risk assessment before being released for adoption by the tea industry.

Prevalence of Aeromoniasis in Cultured Freshwater finfish of Kishanganj, Bihar

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Abstract

Aquatic ecosystem harbour a wide spectrum of biodiversity of microorganisms and fish being one the most susceptible host is vulnerable to numerous bacterial, fungal, viral and parasitic diseases. Along with the commercialization of cultured species the intensification has escalated the reports of disease occurrence, from isolated deaths to large scale mortality leading to enormous financial losses. This study aims to report the prevalence of disease caused due to *Aeromonas* spp. and other associated opportunistic pathogens, conducted in East Bihar for the very first time. Motile Aeromonad Septicemia (MAS) is a bacterial disease caused b*y Aeromonas* spp. *w*hich are ubiquitous, opportunistic pathogen often marked with ulcerative lesions, red sore, tail rot, fin rot and systemic infections. Bacteriological examination was carried on 50 infected freshwater fish species as per standard laboratory practices. Based on the preliminary phenotypic characterization 42 isolates were speculated as A*eromonas* spp. relying on clinical signs and symptoms, which was later confirmed by conventional biochemical tests. Antibiotic sensitivity against 11 common antibiotics were also tested on the bacterial strains to check the resistance it may have developed which is a silent threat to aquaculture. Thus, the findings assist in tracking the prevalence pattern of aeromoniasis, understanding correct diagnosis and alternative management strategies to minimize disease incidents in fish.

Keywords*: Freshwater fish, Bacterial, Aeromoniasis, MAS, Aeromonas spp., Antibiotics, Bihar*

Tuberculosis a major risk to global health, study and knowledge in district Doda along with challenges and status with special reference to Jammu and Kashmir

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Abstract

Tuberculosis (TB) is one of the most ancient disease of mankind and is one the ten major cause of mortality worldwide particularly in developing countries. It is an infectious disease caused by bacteria *Mycobacterium tuberculosis.* It usually affect the lungs but can also affect other organs of body .Inspite of various measures taken to eliminate the TB by Govt .of India by 2025 .The trend of TB cases and drug resistant cases in India is very disturbing .The study presents survey, knowledge ,challenges and status of tuberculosis in Jammu and kashmir with special reference to District Doda where it was observed that still stigma regarding tuberculosis is prevalent in the society.

Keywords: *Tuberculosis, India, Jammu and Kashmir, Doda, Drug resistant, Stigma Challenges, Status*

Efficacy of advanced hermetic storage methods for prevention of stored grain insect pests of sorghum and pearl millet

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Abstract

Millets are a primary dietary staple for the larger global population. Although hardy to extreme environmental conditions, they are susceptible to insect attack in the post-harvest period. To enhance grain storage capabilities, we estimated the mortality rates of *S. oryzae* (SO), *R. dominica* (RD), and *O. surinamensis* in sorghum and pearl millet stored in Polypropylene (PP), hermetic bags such as Purdue Improved Crop Storage (PICS), and GrainPro® for 7 days. Our investigation revealed that GrainPro® exhibited 100% insecticidal activity towards all the insect types, while PP bags provided the least protection. GrainPro® bags effectively reduced oxygen levels while storing sorghum and pearl millet. With *S. oryzae* present, the terminal oxygen concentration reached 4.2% for sorghum and 3.9% for pearl millet. Similar reductions in oxygen were observed in data sets involving *R. dominica* and *O. surinamensis*, indicating GrainPro® bag's consistent performance across different insect species. Furthermore, the germination (%) of millet stored in PICS and GrainPro® bags post-treatment of 6 months showed that these bags effectively preserved germination rates. GrainPro® bags exhibited optimum seed germination in sorghum (SO-90% RD-100%) and pearl millet (SO-95% RD-85%). Regarding internal polymer damage by insects, storage bags had different outcomes. For example, PP

bags showed the most insect damage, *R. dominica* drilled holes in PICS bags, but GrainPro® bags were completely undamaged by internal infestation. Thus, our study advocates using PICS and GrainPro® bags to store millets, as they have demonstrated enhanced protection against insect pests while safeguarding seed viability.

Keywords: *Sorghum bicolor, Pannisetum glaucum, Hermetic storage, Stored insect pest*

Molecular analysis of *indeterminate gametophyte1* (*ig1*) gene and development of sub-tropically-adapted *ig1*-based paternal haploid inducer lines in maize

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Abstract

The mutation in *indeterminate gametophyte1* (*ig1*) gene regulating female gametophyte development, triggers paternal haploids in maize. The *ig1*-based haploid inducer (HI) line can facilitate the conversion of fertile maize inbreds to their cytoplasmic male sterile (CMS) variants within two seasons by donating its cytoplasm when utilized as female. We sequenced the complete *ig1* gene (5431 kb) in 10 diverse inbred lines. The insertion of the *Hopscotch* transposable element in exon-1 of the *ig1* gene resulted in the formation of a mutant allele. The presence or absence of *Hopscotch* facilitated the development of a functional marker, 'MGU-IG1-Hopscotch', which effectively distinguished between the wild-type (*Ig1*) and mutant (*ig1*) alleles. An array of 14 InDel markers specific to *ig1* was developed, and they categorized 48 diverse inbreds into six distinct clusters. The analysis observed 17 haplotypes of *ig1* among the 48 inbred lines. In eight F_2 populations derived from subtropically adapted maize inbreds utilizing an *ig1*-based inducer as donor, ~2% of the plants exhibited fertility and homozygosity at the *ig1* locus. Rest *ig1* homozygous plants could not be maintained due to associated male sterility. The fertile homozygous *ig1* plants were self-fertilized to produce F_3 progeny. The F_3 progenies exhibited the expression of *R1-nj* gene for haploid identification and demonstrated enhanced agronomic characteristics compared to the original temperate *ig1*-based HI. The newly developed paternal HI lines exhibited a haploid induction rate (HIR) of 0.5-3.5%. These subtropically-adapted *ig1*-based HI lines hold great promise in expediting the conversion of maize inbreds to CMS variants in the maize hybrid breeding program.

Keywords: *Maize, indeterminate gametophyte1, paternal haploid, functional marker, CMS*

Antimicrobial Potential and Optimization of Bioactive Secondary Metabolite Production by Antagonistic Yeast *Hanseniaspora uvarum*

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Abstract

India is the world's second-largest producer of fruits and vegetables; the country still imports various horticultural products. One of the most critical and vulnerable stages is the post-harvest phase, during which the high rate of respiration and metabolic activity makes produce particularly susceptible to attacks by fungi, bacteria, and molds. These pathogens can cause up to 50% of global horticultural produce to be lost. Biological control agents (BCAs), particularly yeasts, are recognized as eco-friendly and sustainable alternatives to chemical pesticides for managing post-harvest diseases. *Hanseniaspora uvarum* has been previously reported as an effective biocontrol agent. The present study was focused on optimizing the production of biomass and antibacterial metabolites from the antagonistic yeast *H. uvarum*. Different parameters, including temperature, salt concentration, and pH of the culture media, were systematically optimized. The findings revealed that Yeast Extract Peptone Dextrose Broth (YEPDB) was the most suitable medium, with dextrose and glucose identified as the best carbon sources, and yeast extract as the most effective nitrogen source. An optimal salt concentration of approximately 0.1% was found to be beneficial for both yeast growth and its inhibitory effect against Colletotrichum species. Overall, *H. uvarum* grown in YEPDB at a temperature range of 25-30°C and a pH of 6-7 supported maximum biomass and antimicrobial secondary metabolite production, effectively inhibiting the mycelial growth of various Colletotrichum species. The antagonistic potential of *H. uvarum* crude extracts was further tested against several Colletotrichum species, including *C. gloeosporioides*, *C. capsicii*, and *C. musae*. The ethyl acetate crude extract consistently demonstrated the highest mycelial growth inhibition in vitro, ranging from 59.61% to 100% for *C. gloeosporioides*, 57.27% to 100% for *C. capsicii*, and 55.69% to 100% for *C. musae* at various concentrations. *In vivo* experiments further confirmed the efficiency of the ethyl acetate crude filtrate in significantly reducing disease severity in mango, chili, and banana fruits. UPLC-QToF-MS/MS analysis of the most effective ethyl acetate crude extract led to the identification and characterization of ten major non-volatile organic compounds (non-VOCs). Among these, â-damascenone, 2-hexylfuran, and 6-methyl-3,5-heptadiene-2-one showed the highest peaks in the chromatogram, suggesting their likely responsibility for the observed antifungal activity of H. uvarum. Therefore, based on these findings, it is strongly hypothesized that the potent efficacy of antagonistic H. uvarum metabolites can be harnessed and further developed as a highly effective biocontrol agent for post-harvest disease management.

Development and analysis of synbiotic food products employing *Musa acuminata* peels as an approach for sustainable utilization of food waste

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Abstract

Food waste, a worldwide problem along with inappropriate waste management exacerbates environmental and economic problems. Wastage of fruit peels may additionally lead to loss of potential nutrients and bioactive components which may be a concern considering a rising demand for low cost nutritional and health promoting solutions. This research attempts to address this by transforming *Musa acuminata's* (banana) nutrient-rich peels into a sustainable synbiotic food. The peels were fermented with *Lactobacillus rhamnosus*, yielding pickles having synbiotic benefits. The generated pickles had a high organoleptic acceptability (8.67), with adequate viable probiotics (5.3×10^9) and considerable macronutrients, fiber, micronutrients, and phytochemicals levels. They also displayed free radical scavenging potential (88.09%) and a desirable titratable acidity (7.68). The pickles were observed to maintain a significant amount of viable *L. rhamnosus* following exposure to simulated gastrointestinal microenvironments. Furthermore, these were found to be low-cost, with a shelf life of 25 days (room temperature) manifesting appropriate retention of sensory characteristics, acidity, and live bacteria, indicating their potential as a sustainable synbiotic meal. This study highlights banana peels as a viable resource in functional food innovation, supporting zero-waste practices while providing health benefits.

Keywords*: Functional; Lactobacillus; Musa acuminata; Peels; Synbiotic; Waste*

Taxonomic Redescription of Ceratina spp. including first Record of Ceratina (*Ceratinidia*) gigantia in Uttarakhand: Implications for Pollinator Diversity and Sustainable Agroecosystems in the Indian Himalayas

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Abstract

Bees are fundamental to ecosystem health and agricultural sustainability, serving as irreplaceable pollinators for a vast array of crops and wild plants. Their pollination services are vital for food security, biodiversity maintenance, and the resilience of both natural and managed landscapes. The study was conducted in various region of Almora during the period of 2023-2024. Among native bees, the genus *Ceratina* (small carpenter bees) plays a crucial role in supporting pollinator diversity and ecosystem services, yet remains underexplored in many regions. In the face of global pollinator decline and increasing reliance on chemical pesticides, documenting and conserving native bee diversity is more urgent than ever for maintaining ecological balance and sustainable crop production. This study provides a comprehensive taxonomic redescription of 04 species within the genus *Ceratina* (Hymenoptera: Apidae: Xylocopinae) from Uttarakhand, India-*Ceratina (Ceratinidia) simillima*, *Ceratina (Ceratinidia) bryantti*, *Ceratina (Ceratinidia) sutepensis*, and*Ceratina (Ceratinidia) gigantia*. Whereas, *Ceratina (Ceratinidia) gigantia has been reported first time from the Uttarakhand.* Using detailed morphological analyses and updated diagnostic features, this work enhances the accuracy of species identification and expands the known distribution of *Ceratinagigantia* to the Almora district. These findings highlight Uttarakhand as a vital reservoir of pollinator diversity and provide a crucial baseline for future biodiversity monitoring,

conservation planning, and agroecosystem management. By clarifying the taxonomy and distribution of these native pollinators, this research underpins the integration of bees into sustainable agriculture, reducing dependence on chemical inputs and promoting ecosystem stability. The study directly supports conference themes by advancing pollinator research, fostering eco-friendly pest management, and contributing to the conservation of agricultural biodiversity in the Indian Himalayas. Protecting and understanding native bees like *Ceratina* is essential for resilient food production, environmental health, and the well-being of rural communities.

Keywords: *Bees, Ceratinagigantia, taxonomy, pollinator diversity, sustainable agriculture, Uttarakhand*

In vivo production of pathogenicity determinants by invading *Sclerotinia sclerotiorum* in Egyptian clover

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Abstract

Sclerotinia sclerotiorum is a necrotrophic fungal pathogen causing stem rot in broad variety of crops. It is one of the most destructive diseases posing major yield loses in Egyptian clover (locally known as berseem). This study was designed to investigate the biochemical response of this pathogen in Egyptian clover genotypes varying in diseases resistance. For this, 30 days old moderately resistant and susceptible genotypes were inoculated with *S. sclerotiorum* and assessed for disease progression at 0, 24, 72, and 120 hours post inoculation (hpi). The pathogen secretes oxalic acid and cell wall-degrading enzymes (CWDEs) including cellulases, hemicellulases and laccases which facilitate host penetration and colonization. A significant rise in enzyme activity was recorded at 72 hpi in the susceptible genotypes with subsequent declining trend at 120 hours. Endoglucanase and exoglucanase showed higher activities than â-glucosidase, xylanase, and laccase. In contrast, resistant genotype exhibited uniformly lower levels of all enzyme activities. A similar trend was followed by oxalic acid, peaking at 72 hpi and subsequent declining. Its acidifying nature may enhance pathogenicity by softening plant tissue and optimizing the activity of cell wall-degrading enzymes (CWDEs). This study suggests a synergistic interaction, where elevated oxalic acid level at 72 hpi creates favourable conditions for CWDEs to function more effectively, facilitating colonization and necrosis and shows an indispensable role of pathogenicity determinants in disease progression of the fungus in Egyptian clover.

Keywords: *Cell wall degrading enzyme, Egyptian clover, oxalic acid, Sclerotinia sclerotiorum, stem rot*

Advancing sustainable crop yield enhancement of *Macrotyloma uniflorum* (Horse gram) by utilizing astaxanthin nanoparticles

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Abstract

The present study is focused on the synthesis of astaxanthin (ASTX) nanoparticles to evaluate their effect on the physico-chemical parameters of a crop named "*Macrotyloma uniflorum"* or "horse gram." In Uttarakhand, Horse gram, also referred to as "Gahat" or "Kulath", is a crucial staple crop due to its high nutritional content, drought resistance, and the capacity to flourish in the difficult terrain of the area. Furthermore, astaxanthin possesses a strong antioxidant property that can protect plants from oxidative stress caused by various environmental factors, including drought, salinity, high temperatures, and heavy metals. We synthesized nano-astaxanthin, and their characterization techniques were carried out using XRD, FTIR, EDX, EDS layered image, UV-visible spectroscopy, and SEM. For field application, the experiment was conducted in a glasshouse, and nano-astaxanthin was applied to *Macrotyloma uniflorum* at three different concentrations, i.e., 10 ppm, 20 ppm, and 30 ppm *via* soil application. The preliminary result showed increased morphological parameters, including seed germination rate, plant height, shoot length, number of leaves, dry weight and fresh weight, number of pods, and leaf chlorophyll, as well as increased antioxidant properties in the treatment group as compared to the control group. Similarly, various biochemical tests, including protein estimation (Lowry's Method), chlorophyll A, chlorophyll B, total chlorophyll content, carotenoid content, and catalase tests, were also performed using a UV-visible spectrophotometer. Therefore, the application of astaxanthin led to notable improvements in both biochemical and morphological traits of *Macrotyloma uniflorum* when compared to the control group (soil + vermicompost). These results highlight the importance of precisely managing physico-chemical conditions as a key factor in achieving sustainable cultivation of Horsegram.

Keywords: *Astaxanthin (ASTX), Macrotyloma uniflorum, Nanoparticle, Antioxidant, Sustainable crop production.*

Effect of systemic fungicides and its impact on the economic parameters of silkworm *Bombyx mori* L.

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Abstract

The present investigation was undertaken to know the waiting period of systemic fungicides and its impact on economic parameters of silkworms. Different concentrations (0.05%, 0.03% and 0.01%) of fungicides were sprayed on the mulberry plants. After 15 and 20 DAS of spraying the treated leaves were fed to the silkworm double hybrid FC1 × FC2 from third instar to fifth instar. The higher larval

mortality (%) 24.0 (15 DAS) and 20 .0 (20 DAS) were recorded in Hexaconazole at 0.05% concentration. However, Difenoconazole and Myclobutanil showed significantly lower mortality. There is no larval mortality was recorded in control group. The prolonged larval duration (D:H) was recorded in the fungicide Hexaconazole (24:06) followed by Myclobutanil (20:04) and Difenoconazole (19:04) in all concentration at 15 DAS and 20 DAS. However, the control group showed that lower larval duration (18:04). Maximum matured larval weight (g/10 larvae) (49g) was recorded in control groups followed by Difenoconazole (35g, 44g and 39g) and Myclobutanil (37g, 40g and 36g). The Hexaconazole showed lower larval weight (21g, 30g and 43g) at 15 DAS. In 20 DAS maximum larval weight (31g, 34g and 25g) was recorded in Myclobutanil, followed by Difenoconazole (25g, 26g and 25g) and Hexaconazole (17g, 17g and 31g) respectively to the concentrations 0.05, 0.03 and 0.01 %. The analysed economic parameters of the cocoons showed that maximum single cocoon weight (1.92g) at 15 DAS and same were recorded at 20 DAS. The maximum single shell weight was recorded in control (0.350g) followed by Difenaconazole 25%EC (0.326g) at 15 DAS and (0.356g) at 20 DAS. The longest single silk filament length was recorded in Difenoconazole 25% EC (934.33m) and shortest filament length was recorded in Hexaconazole 5%EC (536.67m). The highest single silk filament weight was recorded in the control groups (0.245g) whereas in Difenaconazole 25% EC (0.229 g) and Myclobutanil10 %WP (0.245 g) showed less filament weight. It is concluded that Difenoconazole 25% EC and Myclobutanil 10 % WP exhibited better performance among the fungicides tested. Additionally, Difenoconazole 25% EC and Myclobutanil 10 % WP showed no adverse effects after spraying in mulberry field. These findings suggest that Difenoconazole 25% EC and Myclobutanil 10 % WP are safer to the silkworm for their growth and development and cocoon production. Also, lower concentration of the fungicides Difenoconazole 25% EC and Myclobutanil 10%WP might be recommended for mulberry diseases management with waiting period of 15 DAS and 20 DAS.

Keywords: *Systemic fungicides, waiting period, economic parameters of silkworm.*

Genotype-Specific Modulation of metabolites under *Atherigona soccata* Infestation in Sorghum

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Abstract

Sorghum bicolor (L.) suffers from considerable yield losses due to *Atherigona soccata* (shoot fly) infestation. Key metabolites such as nitrate-N, nitrite-N, amino acids, nitric oxide (NO) and proline play a crucial role in six sorghum genotypes with contrasting responses to shoot fly: resistant (IS18551, ICSV705, ICSV700), moderately resistant (PSC-4), and susceptible (Swarna, SL-44) at 15 and 21 days after emergence (DAE). Our results revealed that nitrate-N content varied significantly in both leaf and stem tissues, with PSC-4 showing a 2.5-fold and 1.7-fold increase at 15 and 21 DAE, respectively. Stem nitrate-N accumulation was highest (2.7-fold) in PSC-4 and SL-44 at 15 DAE. Nitrite-N content did not vary significantly; however, SL-44 and Swarna exhibited higher fold changes at 21 DAE. Protein content showed no significant change, though SL-44 and PSC-4 showed notable increases in leaf and stem, respectively. Free amino acids significantly increased, particularly in ICSV705 (2.4-fold) in leaves

and IS18551 (1.9-fold) in stem at 15 DAE. Proline content significantly increased, with maximum fold changes in SL-44 (1.97-fold), ICSV700 (2.23-fold) and PSC-4 (3.17-fold) across tissues and stages. Nitric oxide accumulation was highly significant, with Swarna (6.75-fold), IS18551 (6.1-fold) and PSC-4 (6.1-fold) revealing the highest increases in stem tissue at 21 DAE. These findings indicated dynamic genotype-specific metabolic responses that underlie resistance mechanisms in sorghum against shoot fly infestation.

Keywords: *Amino acids, nitrate-N, nitrite-N, nitric oxide, proline sorghum and shoot fly.*

Livelihood Diversification among Marginal and Small Agricultural Households in Punjab

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Abstract

Engaging in diverse activities is a common strategy for rural households to cope with economic challenges and improve their living standards. Punjab, once a leading state in agricultural growth, is now facing stagnation due to rising input costs, declining crop incomes and environmental degradation. The present study has been based on primary data collected from 100 marginal and small agricultural households across the state during 2020-21. Agricultural income served as a universal source forming the primary livelihood for farm households. Livestock income, however, showed distinct patterns of accessibility, with smaller farms relying more heavily on it, marginal farms having the share of 40 per cent, followed by small farms at 36.67 per cent. Non-farm income sources, including salaries and business activities, also demonstrated higher accessibility among marginal(57.50%) and small farms (36.67%). These supplementary incomes played a crucial role in enhancing household financial stability by providing alternative sources of revenue beyond agricultural production. This access pattern indicated the diversified strategies employed by farm households across Punjab to navigate economic uncertainties and optimize their income potential. The analysis of employment patterns among working members of sampled farm households revealed a diverse landscape of livelihoods across the state. Marginal farms had a significantly lower percentage (52.78 %) of their workforce in agriculture, indicating a more diversified employment pattern. Public sector employment showed a small yet notable presence, particularly in marginal (2.78 %) and small farms (3.74 %). Private sector employment was most prevalent in marginal farms (25.00 %) Marginal farms exhibited the highest level of diversification with a Simpson index of 0.83, indicating a well-balanced distribution of activities across various sectors. Small farms also showed moderate diversification, reflecting a somewhat balanced but less diversified approach. Marginal and small farms exhibited a greater tendency towards livelihood diversification, to mitigate risks , combining agriculture with non-farm activities, showcasing adaptive income strategies.

Key Words *Livelihood diversification, Non-farm activities, Employment pattern, Agricultural households*

Interaction of SAR inducers and nitrogen for key fodder quality parameters and fodder yield under leaf blight infection in winter sown oat

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Abstract

Pyrenophora avenae, the causal agent of leaf blight is one of the serious diseases affecting oat crop grown for fodder and grain worldwide. Studying the interactions between different nitrogen (N) rates (0, 75, 100, 125N) and SAR inducers (Beta-aminobutyric acid, chitosan, calcium chloride and potassium nitrate) under leaf blight outbreaks is of utmost importance to find out the best management option and optimum nitrogen rate for minimizing green fodder yield losses. Taking into account, this study was undertaken for two years to estimate the effects of different N rates and SAR inducers on leaf blight severity and green fodder yield of two genotypes at four growth stages (GS). Our results indicated a decrease in disease severity in treatment 75N by 4.1% and an increase in severity in 125N by 14.6% as compared to 0N. There were significant differences for year, N rates and genotypes. Maximum disease severity was observed in 125N treatment (35.45%) and least in 75N (23.82%) as compared to 0N treatment (28.92%). Genotype x year and year x N x genotype interactions were significant as N levels affected the disease severities of both the genotypes over the years with 23.61 and 23.82% severity of OL 14 at 75N respectively with a significant increase in green fodder yield with an increase in N rates from 0N to 125N. Significant differences in nutritional quality traits like dry matter content, crude protein, acid detergent fibre (ADF) and neutral detergent fibre (NDF) were also noticed at different N rates. An increase in dry matter content, and crude protein and a decrease in ADF and NDF were observed with an increase in N rates from 0N to 125N. Among SAR inducers, application of Beta-aminobutyric acid and chitosan showed a significant reduction in the disease severity by 44.28 and 41.0% as compared to untreated control (52.85%) followed by treatment of chitosan with 29.32 and 27.81% increase in green fodder yield. These elicitors also showed enhancement in the nutritional quality traits of green fodder. Overall, the study underscores the dual benefit of SAR inducers in enhancing disease resistance and improving the nutritional value of green fodder of winter sown oat.

Keywords: *Avena sativa*, *Pyrenophora avenae*, elicitors, nitrogen fertilizer, leaf blight severity

Homology modelling and *In silico* study of structural features of a glutamate receptor of *Brassica oleracea*

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Abstract

Glutamate receptors are synaptic and non-synaptic receptor which are mainly found on the membranes of neuronal cells. Glutamate receptor like channels (GLRs) play various important physiological roles in Plants. These are homologous to the ionotropic glutamate receptors (iGluRs) which are ligand-gated nonselective cation channels that mediate stimulating neurotransmission throughout the vertebrate central nervous system. The fundamental structure of a eukaryotic ionotropic glutamate receptor resembles the typical structure of a prokaryotic GLR and consists of a channel domain and a ligand-binding domain. However, structural information of plant GLRs are scarce and primarily limited to the model plant *Arabidopsis thaliana*. However, structural analysis of these proteins from crop plants can be more beneficial for improving agronomic characters. *Brassica oleracea* L. is an economically important crop which contains several GLRs. Based on expression analysis, we have chosen a GLR protein named Bol034616 for *in silico* structure analysis as the protein is highly expressed in bud, flower, leaf, root, stem and silique. In this study, the three-dimensional structure of this protein has been developed *in silico* by homology modelling method. The modelled protein is predicted to be a membrane bound homo tetramer with a three-layer domain architecture. This study will play a significant role to gain knowledge about the structure-function relationship of plant GLRs.

Keywords: *Three-dimentional structure, Polyploidy, Gene expression.*

Evaluation of mulberry genotypes for low temperature stress tolerant under sub-tropical conditions of Uttarakh and

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Abstract

The mulberry genotypes namely, C-01 and C-11 along with zonal check (C-2028) and local check (S-146) were evaluated in Uttarakhand for low temperature stress tolerant. The following parameters, *viz*., days to sprout after pruning, leaves per meter shoot length (Nos.), primary shoots (Nos.), length of longest shoot (cm), leaf yield (g/plant), leaf yield (kg/plot), and leaf moisture (%) were recorded. The analyzed parameters showed statistically significant difference. The less days to sprouting after pruning (Days) 6.13 were noticed in the genotype C-01 followed by S-146 (7.60), C-11 (8.07), and C-2038 (13.00), the highest leaves per meter shoot length (Nos.) 19.53 were observed in C-01, followed by C-11 (18.60), S-146 (18.40) and C-2028 (17.47). The primary shoots (Nos.) showed that, more number of shoots 9.87 (Nos.) were noticed in the local check variety S-146 followed by genotype C-11 (9.47), C-01 (9.07) and C-2038 (9.07). Also, the length of longest shoot 218.60 cm, were recorded in the genotype C-01 followed by S-146 (196.85 cm), C-2028 (187.60 cm) and C-11 (176.27 cm). When comparing the leaf yield (g/plant) the genotype C-11 showed that (0.871 g/plant) followed by C-01 (0.822 g/plant), S-146 (0.778 g/plant) and C-2038 (0.751 g/plant). The highest leaf yield 43.193 (kg/plot) was recorded in genotype C-11, followed by C-01 (40.290 kg/plot), S-146 (38.140 kg/plot) and C-2038 (36.770 kg/plot) were recorded. Similarly, the higher leaf moisture (%) were recorded in C-11 (86.54 %), followed

by C-01 (84.65 %), C-2038 (80.95 %) and S-146 (80.36 %). The genotypes C-01 and C-11 showed that better results along with zonal and local check varieties, which may be subjected for further biochemical evaluation and molecular characterization.

Keywords: *Mulberry genotypes, low temperature stress, evaluation, morphological characters, leaf yield.*

Exploring the host range of *Pyricularia grisea* for effective disease management

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Abstract

The blast fungus, *Pyricularia grisea*, poses a persistent threat to crop production due to its capacity to infect a wide range of hosts. This research examines the host range of *P. grisea*, specifically focusing on isolates from pearl millet and their infectivity on several grassy weed species. The aim was to determine if these weeds could act as alternative reservoirs for the pathogen, thereby complicating disease management efforts. Five grassy hosts-napier grass, oat, ragi, barley, and sorghum-were inoculated with a P. grisea spore suspension (1×10^5 spores ml^{-1}), and disease progression was monitored over three weeks. The study revealed that *P. grisea* successfully infected napier grass, oat, ragi, and barley, but not sorghum. Barley consistently displayed the highest disease intensity 26.30, 31.48 and 52.41 per cent after seven, fourteen and twenty one days of inoculation, respectively., with an AUDPC of 587.88 units. Napier grass, ragi, and oat showed progressively lower levels of infection. The practical significance of this research is in highlighting the importance of weed management in controlling blast disease, as these alternative hosts can maintain pathogen populations even in the absence of primary crops.

Biological relevance of Manganese and Ruthenium heterobimetallic complexes

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Abstract

The relevance of manganese and ruthenium heterobimetallic complexes in biology for biomimicry is an interesting area of research in the field of coordination chemistry, bioinorganic chemistry, and material science. Heterobimetallic complexes contain two different metals that may exhibit cooperative properties and display unique synergistic characteristics arising from the combined effects of both metals. There are a several reports based on ruthenium–manganese multimetallic systems that mimic the function of photosystem II (PS II). In PS II, manganese cluster catalyzes the water oxidation. The oxygen evolving complex (OEC) in photosystem II uses manganese ions, calcium and chloride. Ruthenium can act as light-harvesting unit and mimic the photoactive centre of chlorophyll. Ruthenium and manganese heterobimetallic complexes are able to mimic electron flow and natural redox processes like

photosynthesis and enzymatic oxidation and hence have gained significant attention. Due to their water splitting tendencies, Ru-Mn complexes are explored to model the active site of metalloenzymes and photosystems. The study summarizes the recent advances in work towards ruthenium-manganese complexes mimicking natural photosynthesis that remain a great challenge to the chemist.

Keywords: *Heterobimetallic complexes, Manganese, Ruthenium, Photosynthesis, Biomimicry, Complexes.*

Weather-based statistical and machine learning models for turmeric yield estimation in Meghalaya

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Abstract

Yield estimation is very crucial for understanding the agricultural outputs, import-export policies, and most importantly, the food security of the region/nation. Turmeric is one of Meghalaya's main spice crops as well as cash/ commercial crops. It is well known that crop yields are dependent upon so many factors starting from inputs (seeds/planting materials, manures/fertilizers, irrigation, etc.), their management (doses, times of application, mode of application, etc.), and the environment (soil, topography, and climate, etc.). But it has been seen that the year-on-year variability in yield is mostly due to the variability in the weather parameters, as other factors remain almost stationary. Therefore, weather parameters are used for the prediction of crop yield. This study aimed to develop a suitable model for estimating the yield of turmeric using various weather variables and different models, namely Multiple Linear Regression (MLR), Least Absolute Shrinkage and Selection Operator (LASSO), Elastic Net (ENET), ridge regression and machine learning techniques i.e. Classification And Regression Tree (CART), Random Forest Regression (RFR), Artificial Neural Network (ANN) and Support Vector Machine (SVM). Further, we have also integrated different feature selection methods like PCA, RF, CORR, BAKEL, FOREL, STPSL, etc. Results showed that different models varied in terms of their performance, even though many models were able to capture the variation in yield (having high R^2 values >0.90). The error indicated by root mean square error (RMSE) and normalized RMSE (nRMSE) was comparable with RFR, LASSO, ENET, and SVM, having very good accuracy (<5% nRMSE). The results suggest that using weather variables, the yield of turmeric in Meghalaya can be estimated with considerable accuracy and can be used for policy consideration and planning.

Key words: *Yield modelling, AI, ANN, SVM, Random Forest, North East India*

Advancements in Fodder Production Technologies: A way forward

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Abstract

Fodder crops are a critical component of sustainable farming, playing a central role in maintaining livestock productivity and supporting rural economies. However, traditional breeding practices are inadequate to meet the escalating global demand for nutrient-rich, climate-resilient and high-yielding forages. Challenges such as declining feed quality, changing environmental conditions and feed scarcity continue to threaten both food security and livestock sustainability worldwide. Recent developments in crop improvement emphasize the integration of advanced breeding techniques with genomic and biotechnological innovations. The expansion of germplasm resources through tissue culture and somaclonal variation provides foundational tools for trait enhancement. . Simultaneously, the adoption of speed breeding and marker-assisted selection (MAS) is expediting the development of improved cultivars. High-throughput genomic tools, including genome sequencing, QTL analysis, gene identification and regulatory mapping, have greatly enhanced the understanding and improvement of traits related to yield, quality and stress resilience. These advancements are further supported by genome editing and multi-omics approaches, all facilitated by bioinformatics platforms. In parallel, the incorporation of artificial intelligence (AI) and machine learning (ML) tools is being adopted to analyze complex biological data, predict trait outcomes and support informed breeding decisions. The convergence of genomics, computational biology and digital innovation presents a transformative framework for developing next-generation fodder systems that are nutritionally enriched and climate-resilient, tailored for sustainable agricultural systems.

Keywords: *Fodder Production, Tissue culture, Marker Assisted Selection, multi-omics, artificial intelligence and machine learning*

Ultrasensitive molecular imprinted electrochemical sensor using $Ti_3C_2T_x$@TiO_2 nanohybrid for antibiotic detection in environmental samples

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Abstract

Antibiotics are widely used in agriculture and aquaculture, as well as to treat and prevent infectious illnesses in both humans and animals. They are also used to increase animal growth rate and feed efficiency. Antibiotic misuse, however, can result in the development of super-bacteria that are resistant to drugs, which is extremely dangerous for the world's health. Because of their structural complexity, the majority of antibiotics pass through urine and feces unchanged, eventually polluting natural water sources and soil. In environmental samples, the normal range for antibiotic concentrations is typically ng to low ìg per liter. However, if antibiotic residues are present in excess, they might be dangerous to the aquatic systems. Accurately monitoring the traces of antibiotics in environmental samples is therefore crucial and essential. This work aims to design a molecular-imprinted electrochemical sensor for antibiotic detection using $Ti_3C_2T_x$@TiO_2 as a sensing platform. $Ti_3C_2T_x$@TiO_2 was hydrothermally synthesized and electrophoretically deposited on an indium tin oxide-coated glass substrate, followed by

electropolymerization of pyrrole. The fabricated sensor shows a good linear range (1 pM-100 nM) with a detection limit of 0.41 pM. Efforts have also been made to validate the fabricated sensor with real samples obtained from environmental samples (river water and soil), and the electrochemical results signify that the proposed sensor can be a reliable analytical tool for analyzing antibiotic residues.

Keywords: *$Ti_3C_2T_x$@TiO_2, Polypyrrole, Molecular imprinted polymer, Electrochemical sensor, Antibiotic.*

Genetic variability, divergence and phenotypic stability of Naga King Chilli (*Capsicum chinense* Jacq.)

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Abstract

The research was conducted under three environmental conditions for two growing seasons. Eight numbers of landraces were used and the number of observations recorded was taken from 17 qualitative and 12 quantitative characters. RBD was used for the investigation. The analysis of variance indicated significant difference for all the traits under study except for days to 50% fruiting, fruit width and dry weight. The PCV and GCV were high for number of fruits/plant, number of seeds/fruit and fruit yield/plant indicating that these traits has wide genetic variability and would respond better to selection. Fruit yield per plant had a significant positive genotypic and phenotypic correlation with number of fruits per plant, indicating that selection for these traits will lead to the simultaneous improvement of fruit yield per plant. Path analysis suggested that the direct relation for fresh fruit weight would likely be effective in increasing the fruit yield per plant. The 8 Naga King Chilli landraces were grouped into three clusters. Cluster II was the largest one comprising of four landraces followed by cluster I with 3 landraces and cluster III with 1 landrace. High genetic divergence was found between Cluster I and II, indicating wide genetic diversity between these two clusters. The maximum relative contribution to the total divergence was made by 1000 seed weight, fresh fruit weight and number of seeds per fruit. Significant variance due to Genotype X Environment (linear) interaction was observed for all the characters except days to first flowering, plant height and number of fruits per plant. On the basis of all the stability parameters, C5, C6 and C7 with average stability for most of the characters for yield potential were found to be best. These landraces may be used in various breeding programmes adaptable to a wide range of environments.

Blooming beyond grains: "Horticulture as the New growth driver"

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Abstract

Horticulture has emerged as a dynamic growth engine within the agricultural sector, offering substantial economic, nutritional, and environmental benefits. It encompasses a wide range of high-value crops

such as fruits, vegetables, spices, flowers, and medicinal plants that provide higher income per unit area compared to conventional cereals. The sector significantly contributes to agricultural GDP, enhances export earnings, and generates employment, particularly in rural areas. Recent technological advancements, including protected cultivation, precision farming, vertical farming, and hydroponics, have revolutionized production systems, making them more efficient and climate-resilient. In the field of genetics, developments such as tissue culture, hybrid breeding, and genome editing are improving crop quality and stress tolerance. Additionally, innovations in post-harvest management, cold chain infrastructure, and value addition are reducing losses and enhancing profitability. Integrated pest management and organic practices promote environmental sustainability. Digital tools and extension services are further empowering farmers with real-time information and market access. Overall, horticulture and allied sciences are central to sustainable agriculture, food and nutritional security, and doubling farmers' income in the modern agricultural landscape.

Keywords : *Horticulture, Precision Farming, Protected Cultivation, Genome Editing, Value Addition, Food Security, Agricultural GDP, Climate-Resilient Agriculture, Employment Generation, Digital Agriculture.*

Empowering Smallholder Farmers by implanting Poultry-Centered Integrated Farming Systems: A Socio-Economic Study

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Abstract

The study evaluated the profitability of small-scale broiler production, emphasizing contract farming. Cost-benefit analysis and financial appraisal were carried out. The net return, input, and output value indicated that broiler contract farming was more viable and profitable. Two obstacles were limiting sustainable broiler contract farming: 1) higher feed cost, and 2) low profit due to the low gross margin between production cost and the ex-farm selling price. Therefore, in this case study, the researcher tries to understand that Poultry farming, a vital sector in the agricultural industry, has seen tremendous growth and development over the past few decades. This study aims to provide a comprehensive overview of poultry farming, exploring its historical evolution, current practices, economic significance, challenges, and prospects. Poultry farming remains a cornerstone of the agricultural industry, providing essential protein sources and economic benefits worldwide. By addressing challenges and embracing innovations, the sector can continue to thrive and contribute not only to global food security and sustainability but also to improving the socio-economic status of the farmers.

Keywords: *Integrated farming, Poultry, sustainability, animal husbandry, empowerment.*

Sustainable Utilization of Jackfruit Waste-Derived Bioactive Compounds with Antimicrobial and Antioxidant Properties

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Abstract

Recent investigations into plant-derived bioactive compounds as sustainable substitutes for synthetic agents have been spurred by the growing demand for natural antibacterial agents. During the processing of jackfruit (*Artocarpus heterophyllus*), a tropical fruit widely grown in Southeast Asia and other places, large by-products are produced, including seeds, peels, and rinds. These by-products are highly rich in bioactive components like phenolics, flavonoids, tannins, and carotenoids, as demonstrated by DPPH, FRAP, and Radical Scavenging assays, which correlate with its high phenolic content and all are have significant antibacterial potential and offer a viable natural option for preventing microbial development. This study explores in the efficiency of jackfruit by-product extracts in preventing microbial growth, specifically against common pathogens such as *Escherichia coli*, *Staphylococcus aureus*, and *Aspergillus niger*. Preliminary data indicate that bioactive chemicals found in jackfruit by-products have high antibacterial potential related to their ability to break microbial cell membranes, hinder the functioning of enzymes, and impact with the function of cells. The valorization of jackfruit waste not only provides an environmentally beneficial alternative for agricultural byproduct management, but it also provides a long-term source of natural antibacterial and antioxidant compounds. This findings show the potential of jackfruit by-products as a natural, green alternative to conventional antimicrobial agents, with applications in food preservation, medicines, and agriculture that benefit both the natural world and public health.

Keywords: *DPPH, Carotenoids, Bioactive compounds, Antioxidant, Food preservation, Radical Scavenging assays*

Traditional Agroforestry systems of Kashmir: Revitalizing mountain landscapes for biodiversity conservation and climate resilience

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Abstract

Traditional Agroforestry systems in the Kashmir Himalayas cover an estimated 35–40% of agricultural land in key districts of Kashmir, providing vital ecosystem services and livelihood support to mountain communities. These systems, which strategically integrate multipurpose tree species with annual crops and livestock, have evolved as low-input, sustainable practices that enhance soil fertility, stabilize

slopes, and conserve biodiversity. Field surveys conducted in two representative districts (Baramulla and Anantnag), involving 120 farm households, revealed an average agroforestry plot size of 0.5–1.2 ha, with tree densities ranging from 120–180 trees/ha. Dominant species such as Populus deltoides (45%), Salix alba (30%), Juglans regia (15%), and Aesculus indica (10%) contribute up to 35% of household fodder demand and 25% of fuelwood consumption, significantly reducing extraction pressure on natural forests.

Diversity indices (Shannon-Weiner index: 1.8–2.5) indicate moderate species richness and structural diversity, supporting habitat connectivity for local flora and fauna. However, the study notes a 20–30% decline in agroforestry tree cover over the last two decades due to land fragmentation, unsustainable urban expansion, and weakening of traditional knowledge systems. Projected climate scenarios, including increased variability in snowfall and rainfall patterns, further threaten the sustainability of these systems. To address these challenges, the study recommends a three-pronged policy framework; (1) integrating traditional agroforestry into regional climate adaptation and land-use plans; (2) strengthening community-based institutions and farmer producer groups to enhance capacity building and market access; and (3) incentivizing agroforestry through payment for ecosystem services (PES) schemes and carbon credits. Modelling estimates suggest that scaling up resilient agroforestry could sequester an additional 1.5–2.2 tC/ha/year, contributing to India's Nationally Determined Contributions (NDCs) under the Paris Agreement. Recognizing, conserving, and revitalizing Kashmir's traditional Agroforestry systems can therefore play a transformative role in achieving ecological sustainability, economic resilience, and climate goals in fragile mountain regions.

Keywords: *Traditional agroforestry, Kashmir Himalayas, biodiversity conservation, climate adaptation, carbon sequestration, policy framework*

Rehabilitation of degraded land through walnut based Silvipastoral model in Kashmir Himalayas.

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Abstract

Study was carried out in the experimental field of Division of Silviculture and Agroforestry, Faculty of Forestry, Ganderbal, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir (J&K) at 34^0 16^1 46^{11} N and 74^0 46^1 18^{11} E with an elevation of 1790 m (5872 feet) above mean sea level. The faculty is having 50 hectare of hand with south facing slope and was completely devoid of vegetation. An attempt was made for the rehabilitation of this degraded land through Development of Walnut based Agroforestry system. In this system five Walnut (*Juglans regia*) clones CITH-walnut-1, CITH-walnut-2, CITH-walnut-3, Sulaiman & Hamdan were planted at a spacing of 7 m x 7 m with

little soil work and intercropping of alleys was done with perennial fodders viz Lucerne, Orchard grass, Red clover, Grassland Manwa. Initial soil parameters were recorded and further soil analysis was also done yearly. Life saving irrigation was only provided in the initial two years of planting The trees came into bearing after six years of planting Wherein maximum tree height of (2.78 m) CD of (59.07 mm) Crown spread of 2.81 m with no. of branches 35.01 were recorded in treatment combination of T_1 Walnut + lucerne,. Fodder yield of 18.91 t/hac was obtained in in same treatment followed by 13.91 t/hac in T_2 walnut +orchard grass.Fruiting was observed first time in the sixth growing season and maximum weight of 29 g/fruit was recorded for CITH 1 and minimum was recorded for Suliman. After the completion of the Tenth growing season, CITH-Walnut -1 remained best performer in terms of fruit weight (26.0 gm per fruit) followed by CITH-Walnut -3 (18.80 gm per fruit). The fodder yield declined little and maximum fodder yield (12.0 t/ha) was obtained in T_1 (Walnut + Lucerne) followed by T_2 (Walnut + Orchard grass) with a yield of 11.12 t/ha. The soil analysis done in terms of EC, OC, N, P, K at initial stage was below normal and started increasing yearly. EC increased from 0.12 at initial stage to 0 .15 after six years and 0.18 after tenth year of establishment of model. Organic carbon increased from 0.4 to 0.67 and finally to 1.0 after 6th and 10th year respectively. Same was case for Nitrogen which increased from 250 kg/hac at initial stage to 311 kgs per hac after ten years. P and K enhanced from 10 and 200 kgs/hac at initial stage to 13.01 and 240 after completion of six years and 15.60 and 256.51 kgs/ha after ten years of planting respectively. Among the five genotypes, the dried kernels of CITH-3 exhibited highest flavanols and flavonoid content (10.07) followed by Sulaiman (8.82), CITH-1 (6.81) and Hamdan (5.92). GC/MS analysis of the walnut kernel extract of CITH-1 revealed the presence of specific compounds that show greater percentage in peak area, viz. 9,12-Octadecadienoic acid (Z,Z)- (100.00) and n-Hexadecanoic acid (52.20). The compounds in CITH-2 that show maximum percentage in terms of peak area are n-Hexadecanoic acid (100.00) and 9, 12-Octadecadienoic acid (Z, Z) - (46.16). This region specific model developed has changed the degraded land into lush green area and enhanced soil fertility status which has turned the degraded land into productive one.

Keywords*: Agroforestry, degraded lands, Perennial fodder, Rehabilitation, Soil fertility*

Restoring Cation Equilibrium in Salinity-Affected Soils of Arid Regions through Microbial Inoculants

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Abstract

A laboratory incubation study was conducted at Tamil Nadu Agricultural University (TNAU), Coimbatore, during 2021–2022 to evaluate the effectiveness of salt-tolerant microbial inoculants for the biological reclamation of saline soils under dryland condition (soils maintained at 75 % field capacity). The experiment involved soils with electrical conductivity (EC) levels of 4.03, 5.01, 6.02 dS m^{-1}. Two microbial formulations: CSR-GROW-SURE collected from ICAR-Central Soil Salinity Research Institute (CSSRI), Karnal and TNAU culture (*Bacillus subtilis*) collected from TNAU, were applied at three different concentrations: 1, 2, and 3 L ha^{-1}. Soil samples were collected at 30, 60, and 90 days after incubation (DAI) to assess changes in exchangeable cation levels. At 90 DAI, the highest dose of CSR-GROW-SURE (3 L ha^{-1}) significantly reduced exchangeable Ca^{2+} (8.11, 4.27 and 5.69%), Mg^{2+} (8.01, 4.29 and 5.59%) and Na^{2+} (26.45, 26.04 and 25.64%) at EC levels of 4.03, 5.01, and 6.02 dS m^{-1}, respectively than control. In contrast, potassium (K^+) increased by 15.44, 17.03 and 14.72% across the same salinity levels compared to control treatment. Similarly, with application of TNAU culture at 3 L ha^{-1} showed peresentage reductions in Ca^{2+} (7.63, 4.11 and 5.55), Mg^{2+} (7.83, 4.14 and 5.48 %) Na^+ (25.80, 25.16 and 25.14), while K^+ increased in (14.99, 16.54 and 14.48%) at EC 4.03, 5.01, and 6.02 dS m^{-1}, respectively over control treatment. These findings highlight the potential of halotolerant microbial inoculants mainly CSR-GROW-SURE and the TNAU culture at 3 L ha^{-1} in improving the chemical properties of saline soils. Their application enhances nutrient availability, reduces salt-induced toxicity, and contributes to the sustainable management of dryland soils affected by salinity.

Keywords*: Bacillus spp., CSR-GROW-SURE, Dry land, Exchangeable cations, Saline soils.*

Genetic variability analysis based on Cluster and Principal component analyses for leaf yield and its attributing traits in released FCV cultivars of Tobacco

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Abstract

The Flue cured Virginia (FCV) tobacco is an economically important commercial crop worldwide. FCV is an important export oriented tobacco type in India with more than 30 FCV cultivars released for cultivation since 1947. In order to assess the genetic variability in 32 released FCV tobacco cultivars for leaf yield and morphological traits (plant height, Internodal length, leaf length and leaf width), Principal component analysis was employed. The ANOVA showed significant differences among the cultivars for studied traits. Green leaf yield ranged from 4764 kg/ha to 16180 kg/ha, cured leaf yield ranged from 775 kg/ha to 2162 kg/ha, bright leaf ranged from 195 kg/ha to 1394 kg/ha and grade index ranged from 433 to 1681. The results of analysis showed, first two principal components exhibited more than one Eigen values and accounted for 74 % percent of total variation. PC1 and PC2 accounted 41 % and 33% of the total variability contributed different leaf yield traits. The 32 cultivars were classified into three major clusters. The first cluster consists of 4 cultivars (Dhanadayi, CH 1, Hema, Kanakaprabha) showing moderate leaf yield, higher bright leaf and grade index and higher plant height

and leaf size. The second cluster consists of moderate yield and lower bright leaf and grade index. The third cluster consists of high-yielding cultivars of mainly recently released cultivars (Siri, N 98, VT 1158, CTRI Sulakshana and CTRI Shresta) with the highest leaf yield. Cultivars having desirable characteristics from these clusters could be utilized potential donors in a future hybridization programme to generate high leaf yield and quality.

Exploring genetic variation for anthocyanins and development of biofortified 'blue maize' through genomics-assisted breeding

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Abstract

Blue maize rich in anthocyanins provides sustainable solution to promote good health. Traditional yellow and white maize are devoid of anthocyanins. Blue maize rich in anthocyanins possesses high antioxidant activities desirable for good health. Accumulation of anthocyanins in maize endosperm is regulated by many dominant genes, including *A1, Pr1, C1,* and *R1*. Furthermore, conventional maize has low levels of lysine (0.150-0.250%), tryptophan (0.030-0.040%), vitamin E (á-tocopherol: 6-8 ppm), and provitamin A (1-2 ppm) in the grains. While, *opaque2* gene enhances lysine and tryptophan, *vte4* gene increases vitamin-E (á-tocopherol). In addition, *crtRB1* and *lcyE* genes boost the accumulation of provitamin-A in the maize kernels. Here, a set of 48 sub-tropically adapted maize inbreds were evaluated for anthocyanins in three different locations. Five different anthocyanins (C3G, C3MG, C3DG, P3G and Pn3G) were identified. Significant genetic variation for total anthocyanins was observed among the inbreds. Promising blue maize inbreds (>300 ppm) were identified and used as a donor parent in the breeding of biofortified blue maize hybrids. Employing a genomics-assisted breeding strategy, the favourable alleles of the *A1, Pr1, C1, R1, opaque2, vte4, crtRB1*, and *lcyE* genes were stacked into four inbreds that were the parents of four elite hybrids. Foreground selection in BC• F• , BC, F• , and BC, F, generations was effectively performed using gene-based markers for *o2, crtRB1, lcyE*, and *vte4*. The existence of anthocyanin-regulating genes (*A1, Pr1, C1* and *R1*) was confirmed in selected coloured progenies. Background selection using >100 SSR markers ensured the recovery of >90% of the recurrent parent genome. The newly-developed multinutrient-rich blue maize hybrids showed increased levels of lysine (~0.290-0.340%), tryptophan (~0.078-0.086%), vitamin-E (á-tocopherol: ~14-20 ppm), provitamin A (~8-12 ppm), and anthocyanins (~350-550 ppm). These biofortified hybrids exhibited high grain yields (8-9 t/ha). The newly developed multinutrient-rich blue maize provides sustainable solution to malnutrition.

Keywords: *Anthocyanins, Blue Maize, Malnutrition, Biofortification, Genomics-assisted Breeding*

Genome wide association study for root related traits at vegetative growth stages of soybean

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Abstract

Understanding the genetic basis of root traits is key to improving plant development and guiding climate-resilient crop breeding. To dissect genetic architecture of root traits in soybean, we applied genome wide association study (GWAS) in soybean germplasm population. Phenotyping of six root related traits of GWAS panel accessions was performed at two plant growth stages, two weeks (V_1) and three weeks (V_2), under hydroponic culture. Total 29 significant single nucleotide polymorphisms (SNPs) associated with six root-related traits were detected for two growth stages using two GWAS models, Mixed Linear Model (MLM) and the Fixed and Random Model Circulating Probability Unification (FarmCPU), with significance threshold of "log10(*P*) e" 4.0. For V_1 stage, total 19 significant SNPs were detected for six root traits at while 10 SNPs were detected for five root traits at V_2 stage. Grouping of SNPs associated with more than one trait or growth stage identified six quantitative trait loci (QTL). QTL *qRoot10.1* represented by three significant SNPs, was identified for total root length (TRL) and primary root length (PRL) at V_1 stage, and TRL, PRL and root tips (RT) at V_2 stage. Further, QTL *qRoot10.1* was validated for PRL and TRL in a separate set of soybean population. Candidate gene analysis in genomic regions of six root trait QTLs identified 16 candidate genes, with annotations associated with various root development and functions like root morphogenesis, positive gravitropism, auxin-activated signalling pathway and osmotic stress. Differential gene expression analysis in contrasting genotypes identified *Glyma.10g273000* showing high expression in long rooting genotypes. In this study, we offer new insights into the root architecture of soybean, identifying key SNPs and genes that could be instrumental in future breeding programs aimed at developing efficient root systems in soybean.

Keywords- *Root traits, SNPs, Molecular breeding, Candidate genes, GWAS, Soybean*

Genetic modification of plant architecture in subtropical maize for smart canopy

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Abstract

Traditional maize hybrids limit yield gains through high plant density (HPD) due to tall and wide canopy. Planting densities in subtropical regions remain relatively low (~84,000 plants ha{ ¹), where temperate maize hybrids with smart canopy accommodate over 110,000 plants ha{ ¹ leading to significant difference in grain yield. In this study, we characterized two dwarfing mutants, viz., *brachytic2* (*br2*) and *Dwarf8* (*D8*) and a leaf angle mutant, *liguleless1* (*lg1*) to develop smart-canopied maize hybrids suitable for HPD cultivation. Full-length sequencing of these genes (*br2, D8* and *lg1*) revealed the causal mutations which were used to develop and validate functional markers. These markers were further used to introgress the mutant alleles into the inbred parents of elite hybrids viz., '*Pusa HQPM-1 Improved'*, 'Pusa *HQPM-4 Improved'*, 'Pusa *HQPM-5 Improved'*, and 'Pusa *HQPM-7 Improved'*. The recessive ***br2*** allele reduced plant height by 30-42%, while the semi-dominant ***D8*** allele caused a 42-60% height reduction. Introgression of the ***lg1*** allele significantly narrowed leaf angle to 2-9°, compared to 30-50° in the original genotypes. These modified hybrids also possessed ***opaque2***, ***crtRB1***, and ***lcyE*** genes with elevated levels of lysine, tryptophan, and provitamin-A. Background selection using >100 SSR markers confirmed >90% recovery of the recurrent parent genome in all lines. This work represents the first report of accelerated development of subtropical maize hybrids tailored for HPD. The new hybrids, combining smart canopy with enhanced nutritional traits, show a great promise for HPD thereby unlocking yield potential in subtropical environments.

Keywords*: Dwarf maize, Ideal Plant Architecture, Ideotype, Leaf angle, Marker Assisted Selection*

Management of square shedding in Bt cotton

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Abstract

The experiment was recorded during *kharif* 2024 for Management of square shedding in Bt cotton at Main cotton Research station, Surat. Twelve treatments were imposed after 20 days of cloudy weather and continues rain for 15 days. Plant height, no. of aborted fruit site per plant and Boll per plant were significantly deviated due to chemical spray while No. of main stem node, No. of fruiting branch per plant were non-significantly differed among treatments, highest open boll and lower aborted fruit were found in T8 (IAA @25ppm+ kinetin@20ppm). Boll per plant also found higher in T-8 treatments. As well as chlorophyll content on dry weight (11.6 mg/g DW) based also found higher in T-8 treatments. Total no. of fruiting site per plant and boll weight, Fruit shedding (%) and seed cotton yield were found significantly differed among treatments. Highest fruit shedding was found in T1 (Ascorbic Acid @0.6 mM) (53.3%) treatment followed by T6 (Mepiquat chloride (MC) @ 24.5 g ha^{-1}) and T12 (Control (Water spray)). Seed cotton yield was found highest in T8 which was at par with T11 (Forcholorfenuron 0.1% (CPPU 1L/ha).

Keywords: *Shedding, Bt cotton, Fruit shedding*

Evaluation of Sweet potato (*Ipomoea batatas* L. (Lam) genotypes for yield and quality attributes under mid hill condition

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Abstract

Although sweet potato (*Ipomoea batatas* L. (Lam) is one of the most commonly consumed tuber crops by the ethnic tribes of north eastern region, limited literature is available with regards to yield and quality attributes under mid hill condition. To study the yield and quality attributes of sweet potato, an experiment was conducted at ICAR Research Complex for North Eastern Hill Region, Umiam during 2023-24. Result revealed that significant variations were observed among the genotypes for all the parameters studied. Mynthlu Orange exhibited the highest tuber weight (258.52 gm), length (18.25 cm), diameter (5.58 cm) and yield (38.42 tonnes/ha). In terms of biochemical parameters, Meghalaya Local recorded the highest dry matter content (36.54 %), Col-6 had the highest starch content (24.81 %) and X-24 had the highest total sugar content (6.02 %). Based on the mean performance, accession Mynthlu Orange, X-24 and Col-6 was found promising for yield and biochemical quality parameters and may be potential for utilization in future improvement programme.

Keywords: *Sweet potato, genotypes, yield, biochemical parameters.*

Impact of Climatic Variability on Rice Growth and Yield under Agro-Climatic Conditions of Chhattisgarh Plains

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Abstract

Chhattisgarh plains agro-climatic sub-zone, IGKV Raipur experiences a dry moist to sub-humid climate with an annual rainfall of ~1170 mm, predominantly (87%) concentrated during the monsoon season (June–September). The region exhibits extreme thermal fluctuations, with summer air temperatures reaching up to 48/ °C and winter minima as low as 6/ °C. Soil surface temperature may exceed 60/ °C in peak summer, accompanied by a drastic drop in atmospheric humidity to 3–4%.During the kharif seasons of 2015 and 2016, detailed meteorological observations revealed significant inter-annual variability. Rainfall in 2015 (816.6 mm) was erratic and suboptimal during the vegetative phase, while 2016 received more uniform and higher rainfall (1135 mm), coupled with favorable temperature (36.5–28.5/ °C max; 26.7–18/ °C min), humidity, and radiation regimes. These conditions positively influenced rice phenology and productivity. Abiotic parameters such as temperature, humidity, solar radiation, and wind velocity exhibited pronounced effects on key physiological processes including tillering, panicle initiation, and grain filling. Elevated temperatures beyond critical thresholds impaired germination,

photosynthesis, and biomass allocation. The 2016 season, with relatively optimal microclimatic conditions, demonstrated enhanced crop growth and grain yield, underscoring the importance of meteorological variables in determining radiation use efficiency and overall crop performance in rice-based systems.

Keywords: *Climate, Rice, Abiotic Parameters*

Assessment of Chickpea (*Cicer arietinum* L.)-Chandrasur (*Lepidium sativum* L.) Intercropping Productivity using Competitive Indices under Varying Moisture Regimes

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Abstract

A field experiment was carried out during *rabi* season of 2020-21 and 2021-22 in the Instructional-cum-Research Farm, I.G.K.V, Raipur, Chhattisgarh, to study the assessment of chickpea (*Cicer arietinum* L.)-chandrasur (*Lepidium sativum* L.) intercropping productivity using competitive indices under varying moisture regimes. The experiment was laid out in split plot design with three replications with keeping three moisture regimes *viz*., no irrigation (I_0), one irrigation at 35 DAS (I_1) and two irrigations at 35 and 70 DAS (I_2) as main plot and six intercropping systems *viz*., sole chickpea, sole chandrasur, chickpea + chandrasur (1:1), chickpea + chandrasur (2:1), chickpea + chandrasur (3:1) and chickpea + chandrasur (2:2) as sub plot treatments. The application of two irrigations (I_2) recorded the highest seed yield, stover yield, CEY and SPY as compared to one irrigation and no irrigation. The varying moisture regimes did not influenced by competition indices. The chickpea yield increased progressively with the increase in number of rows of chickpea. Sole chickpea and sole chandrasur gave significantly higher yield as compared to intercropping ratios. The intercropping of chickpea and chandrasur in 3:1 row ratio was significantly superior as compared to sole in terms of land equivalent ratio (LER), chickpea equivalent yield (CEY). Chickpea was more competitive ratio (CR), aggressivity (A), relative crowding coefficient (RCC) and area time equivalent ratio (ATER) in 3:1 row ratio of chickpea + chandrasur. A lower value for competitive ratio, aggressivity and relative crowding coefficient of chickpea was recorded under chickpea + chandrasur (1:1) row ratio.

Keywords: *Chickpea + Chandrasur, Economics, Competition indices, Intercropping, Irrigation and Yield.*

Paddy crop diversification in methane emission mitigation and sustainable rice production

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Abstract

Rice is a staple food for more than half of the global population, yet its conventional cultivation under continuously flooded conditions contributes significantly to atmospheric CH,, emissions. These anaerobic flooded soil environments promote the activity of methanogenic *Archaea*, making rice paddies a major source of agricultural greenhouse gas CH,, emissions. In this context, the diversification of paddy cultivars alongside improved agronomic practices offers a climate-smart solution for sustainable rice production. Paddy crop diversification involves shifting from traditional high-emission flooded varieties to more sustainable alternatives such as upland, dry-land, drought-tolerant, early-maturing, dwarf, and climate-resilient hybrids. These cultivars inherently require less standing water, improving soil aeration and thus suppressing CH,, emissions. Furthermore, the application of bio-fertilizers in place of chemical fertilizers not only enhances nutrient availability and soil health but also supports methanotrophic microbial communities that actively CH,, uptake. In combination with this paddy cultivar diversification, modern soil and water management practices, such as Alternate Wetting and Drying (AWD), System of Rice Intensification (SRI) and restoration of degraded soils can further reduce the CH,, emissions. This integrated approach aligns with Global climate commitments and the need for sustainable intensification of paddy agriculture. To ensure successful implementation, region specific research, farmer capacity building and supportive policy frameworks are critical. In conclusion, paddy cultivar diversification, when combined with innovative soil management practices holds immense potential for transforming traditional paddy cultivation into a more sustainable, productive and eco-friendly system and offers a holistic pathway to reduce CH,, emissions with food security in rice dependent economies.
Keywords*: Crop diversification, CH,, emissions, methanogenic Archaea, climate-smart agriculture, food security.*

Haemadipsa montana infestation in highland pastures: An overlooked risk to livestock in Arunachal Pradesh

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Abstract

Leeches are rarely prioritized among the important ectoparasites in veterinary practice, yet in certain ecosystems, they can significantly impact livestock health and productivity. In the high-altitude grazing systems of Arunachal Pradesh, pastoral communities raise their livestock, such as yaks, yak-cattle hybrids, mithun-cattle hybrids, sheep, and horses, entirely on natural pastures. In this region, *Haemadipsa montana*, a blood-feeding terrestrial leech species, represents a persistent threat. Unlike most leeches confined to humid lowland forests, *H. montana* is adapted to elevations up to 4,000 meters and thrives in both forested and open highland pastures. A field survey conducted in August 2022 across three highland pastures (2900–3900 m above msl) in West Kameng district revealed alarming leech densities up to 5 leeches/m², especially concentrated along animal trails and roadsides. These leeches displayed strong host-seeking behaviour, latching onto livestock, humans, and even moving vehicles. The peak

activity was recorded during early mornings (7–9 am) and late afternoons (3–5 pm), coinciding with low sunlight intensity. Infestations often involved multiple leeches, as high as 15 per animal, and their bites led to prolonged bleeding even after detachment, causing considerable blood loss in affected animals and attracting fly attacks. Leeches not only reduce livestock productivity but also add to the occupational burden on herders. In view of the absence of effective leech control methods for high-altitude environments, this study underscores the need for ecological research and development of practical solutions for leech control. Addressing this overlooked parasitic threat is vital to protect the health of both livestock and the pastoral communities who rely on them.

Keywords: *Arunachal Pradesh, ectoparasite, Haemadipsa montana, highland pastures, leech*

Suggestions of the farmers to overcome agricultural hazards

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Abstract

About 1.3 billion people worldwide are engaged in Agricultural and among there almost 60% recide in developing countries. The agriculture sector comprises of different branches, such as crop, horticultural and livestock production and its involves a range of occupational hazards. The South Gujarat has seven districts and was included in present investigation. Study was conducted during three years i.e. 2020-21 to 2023-24. In first year one district and recent two year every year three districts was taken and from each district 90 respondents was selected randomly. Three talukas from each district was selected randomly and two villages from than with same procedure. From each selected village, fifteen respondents were selected randomly making the total sample of 630 respondents. The data was compiled by using suitable statistics like mean, standard deviation, frequency, percentage, correlation coefficient and arbitory method for inference. Simple Random sampling method was used for selection of the respondents. Major suggestions given by farmers were knowledge about selection of the correct pesticides, insecticides, chemical fertilizers and its recommended dose should be provided timely (83.33 per cent), to aware the farmers about information given on the bottle or container of pesticides, herbicides, insecticides (88.86 per cent) and training should be imparted to the farmers regarding the use of pesticides, insecticides, herbicides maintenance and repair of plant protection equipments (92.22 per cent) and to aware the farmers about information given on the bottle or container of pesticides (81.11 per cent).

Keywords: *Suggestions, agricultural hazards.*

Sugarcane (Kalpavruksha): There is a common saying in the sugarcane sector that "Sugar is 10% Cane and 90% Politics Is It True? OR This Wonderful Plant Was Scapegoated?

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Abstract

"Kalpavriksha" (or Kalpataru) refers to a wish-fulfilling divine tree in mythology. It is a popular theme in Indian mythology and cosmology, often depicted as a source of all desired objects. In some traditions, it is associated with the coconut tree, which is seen as a source of sustenance and is also called the "tree of life". Sugarcane is also Kalpavruksha, as all its parts are beneficial to human beings. It is a unique plant that reduces the level of CO_2 in the environment. However, there is a common saying in the sugarcane sector that "Sugar is 10% Cane and 90% Politics. Furthermore, it might be surprising to someone that its end product (sugar) is also politicized and scapegoated. The quality of sugar is measured by measuring its colour at 420 nm employing a standard protocol of the International Commission of Uniform Methods of Sugar Analysis (ICUMSA). It is an International Organization solely concerned with the analytical methods for sugar analysis for the world sugar trade. Today, it has a history of over 100 years, and its parameters are strictly followed by the esteemed organizations like ISO, WTO, Codex Alimentarius Commission (FAO & WHO), and Food and Sugar Market Legislations of various countries. ICUMSA organizes its Meeting every 2 years (previously 4 years) in one of its member countries. India is also a member country of this esteemed organization. There is only one Official method for measuring sugar quality (colour) at its pH (No pH adjustment). At the Montreal Session (1978) of the ICUMSA, a recommendation was proposed that sugar solution should be standardized at pH 7.0 before its quality (colour) determination, but this is just Arbitrary, and this fact has been well documented in ICUMA Proceedings. Prof. Riffer[1] (Then Referee of the ICUMSA, Subject S7) reported that the condition of pH 7.0 was introduced on the ground that sugar is an organic compound and does not pH by definition. He further mentioned that the issue is one of judgment rather than fact, and this conjecture had not been supported by facts. The colour measurements continued without maintaining pH at 7.0 of sugar solutions till 1994. The same Indian Sugar, which is very much within the permissible limit of Exportability, goes outside the accepted level. Thus, we have been losing a huge premium for years. IT WAS SEEN AS A CONSPIRACY BY THE DEVELOPED NATIONS AGAINST INDIA. Revenue loss incurred due to the arbitrary pH 7.0 could be saved if, strictly based on scientific footing, pH 6.4 is introduced in the color determination method instead of pH 7.0. The recent development in this field will be discussed in this Lead Talk.

Keywords: *Sugarcane (Kalpavruksha), Sugar, Colour, ICUMSA, pH 7.0, Revenue loss*

Climate Smart Agriculture in India: Vulnerabilities, Policies and Challenges

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Abstract

Climate Smart Agriculture (CSA) refers to farming practices that aim to boost productivity in a sustainable manner, strengthen resilience to climate change (adaptation), lower or eliminate greenhouse gas emissions (mitigation) and support the attainment of national food security and development objectives(FAO,2010). In the Indian context , agriculture sustains around 58% of the population, contributes 18% to the GDP and is dominated by smallholder farmers, who make upto 85% of all farms . The importance of Climate-Smart Agriculture (CSA) is amplified by rising climate-related pressure.

To address this, the Indian government has introduced several policies and initiatives aligned with Climate Smart Agriculture (CSA). The National Mission for Sustainable Agriculture (NMSA), a key component of the National Action Plan on Climate Change, encourages adaptive practices such as micro-irrigation and precision farming to enhance water efficiency and crop resilience . Additionally , the Indian Council of Agricultural Research (ICAR) leads the National Innovations in Climate Resilient Agriculture (NICRA) project , which focuses on developing and promoting crop varieties and technologies suited for regions vulnerable to droughts, floods, and heat stress . Complementary schemes like PM-KUSUM for solar-powered irrigation , PMKSY for irrigation and PMFBY for crop insurance, further integrates CSA strategies into India's agricultural policy landscape.

Despite its potential, several key challenges hinder the effective implementation of Climate Smart Agriculture (CSA) . A large number of farmers lack adequate awareness and training in CSA techniques and smallholders often struggle with high initial cost and limited access to credit . The adoption of CSA is further restricted by issues such as land fragmentation and inadequate rural infrastructure, including poor irrigation systems, limited storage facilities and weak market connectivity. Additionally, institutional gaps such as sluggish policy execution and overlapping responsibilities among various agencies undermine coordinated efforts . A shortage of targeted investments and limited access to climate finance also continue to be major barriers to scaling up CSA practices.

Keywords*: Climate Smart Agriculture (CSA), Agricultural Policy, Climate Vulnerability, Smallholder Farmers, Sustainable Agriculture, Adaptation*

Evaluation of Morphological, Physical and Engineering Properties of Rose Hips (*Rosa* spp.) Accessions

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Abstract

A comprehensive evaluation was conducted on 11 rose hip (*Rosa* spp.) accessions collected from the ICAR-Central Institute of Temperate Horticulture (ICAR-CITH), Srinagar, to assess their morphological, physical, and engineering properties. Significant variation was observed among the accessions. Morphological observations revealed notable diversity in fruit shape, ranging from round to oval and conical, while thorniness was categorized as less, medium, or more. The number of leaflets per compound leaf varied from 4 to 8. Physical parameters such as fruit weight ranged from 0.36 to 2.00 g, while fruit dimensions varied from 11.42 to 18.87 mm in length, 7.32 to 14.11 mm in width, and 8.97 to 19.08 mm in thickness. Color profiling revealed L* values ranging from 23.27 to 35.48, a* values from 8.60 to 30.39, and b* values from 2.92 to 18.76, indicating diverse pigmentation among the accessions. These variations also reflect differences in the accumulation of natural pigments, primarily anthocyanins and **carotenoids** in the rose hips. Engineering parameters such as arithmetic mean diameter (AMD) ranged from 9.23 ± 0.86 to 17.88 ± 0.75 mm, geometric mean diameter (GMD) from 9.08 ± 0.86 to 17.38 ± 0.70 mm, and aspect ratio from 57.01 ± 5.34 to 86.14 ± 4.93. Surface area varied from 261.36 ± 48.90

to 950.91 ± 76.69 mm². Sphericity ranged from 0.77 ± 0.03 to 0.91 ± 0.05, flakiness ratio from 1.03 ± 0.06 to 1.52 ± 0.12, and elongation ratio from 1.18 ± 0.08 to 1.56 ± 0.13. The observed variability among rose hip accessions underscores their potential for selection and utilization in breeding, value addition, and processing industries. This characterization provides a foundational dataset for future genetic improvement and commercial exploitation of rose hips in nutraceutical and horticultural sectors.

Keywords*: Rose hips, Morphological parameters, Physical parameters, Engineering parameters.*

The influence of Non-governmental organizations (NGOs) on socio-economic upliftment of women in rural settings

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Abstract

The present study explores the influence of Non-governmental organizations (NGOs) on socio-economic upliftment of women in rural settings. The data were collected from 150 women beneficiaries in Muzaffarpur district during 2023-24. A descriptive and exploratory research design was used, with data gathered through structured, pre-tested schedules involving interviews and surveys. Income assessment showed a remarkable shift after Non-governmental organizations (NGOs) involvement, with a substantial increase in monthly earnings confirmed through paired t-test analysis ($p < 0.001$). Improvements in decision-making ability were significantly linked to longer participation, as shown by chi-square analysis. Pearson's correlation revealed a strong positive association (r: 0.61) between duration of involvement and livelihood improvement. Multiple regression analysis identified duration of participation, education level, skill acquisition, and type of Non-governmental organizations (NGOs) activities as key contributors to socio-economic progress, explaining 58% of the variance. Overall, the study highlights the critical role of sustained and skill-focused Non-governmental organizations (NGOs) interventions in enhancing the economic and social well-being of rural women, advocating for broader, long-term engagement strategies.

Keywords: *NGO, Socio-economic upliftment, Skill acquisition, Participation duration, Income enhancement, Livelihood Improvement.*

Study on growth, yield and physiological responses of mustard (*Brassica juncea* L.) against the terminal heat stress under different sowing windows and mitigation strategies

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Abstract

In India, mustard is mainly cultivated as a neglected crop, and the time of sowing plays a crucial role in its growth and productivity. However, due to the late harvesting of kharif rice, the sowing of mustard is often delayed, which adversely affects its yield and quality due to terminal heat stress. To address this issue, a study was conducted at Uttar Banga Krishi Viswavidyalaya over two Rabi seasons (2023–24 and 2024–25). The experiment included the following treatment details: Main plot treatments (Sowing window): D1: 47th meteorological week (early), D2: 49th meteorological week (timely), D3: 51st meteorological week (late):Sub-plot treatments (Variety): V1: PM-28, V2: Divya-55 and Sub-sub plot treatments (Growth regulators): T1: Salicylic Acid @ 150 ppm at active growth stage and flowering, T2: Trehalose @ 10 mM at active growth stage and flowering, T3: Cycocel @ 300 ppm at active growth stage and flowering, T4: Control. The results indicated that the early sowing window (D1) was the most effective in the main plot. Among the varieties, Divya-55 (V2) outperformed PM-28, and in terms of growth regulators, Trehalose (T2) showed the best performance with respect to yield and other growth parameters.

Keywords- *terminal heat stress, sowing window, variety and growth regulator.*

Economic Impact of Front Line Demonstrations on Turmeric (*Curcuma longa* L.) Production in Northern Hill Region of Chhattisgarh

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Abstract

Turmeric (*Curcuma longa* L.), also known as 'Indian saffron' or 'Haldi' is a native of South East Asia. It is an important spice cum medicinal plant belonging to the family *Zingiberaceae.* The genus curcuma consists of about 117 species, among which around 40 species are reported from India (Velayudhan *et al*., 1999). Further scope to substantially improve the production and productivity exists especially at Korea district under Northern hill region of Chhattisgarh. The study was carried out during Kharif seasons in six villages- Nagar, Umjhar, Sonhat, Ratga, Mahora and Dakaipara under Baikunthpur & Sonhat block of Korea district. The Krishi Vigyan Kendra, Korea conducted front line demonstration with improved package of practice of Turmeric crop cultivation for average two year 2022-23 & 2023-

24. Total front line demonstrations were conducted on Turmeric in 24 ha by the active participation of the farmer's with the objective of improved technologies of Turmeric production potentials. The improved technologies consist improved variety (Roma), Seed treatment with *Trichoderma viridi* balanced fertilizers (soil test based) application and integrated disease and pest management, etc. The demonstrated recorded an average yield ranging from 218.24 q/ha to 222.32 q/ ha with a mean of 220.28 q/ha. The per cent increase yield in demonstration ranged from 41.16% to 41.85% in the respective years. The average extension gap, technology gap and technology index were 64.62 kg/ha, 29.72 kg/ha and 11.88%, respectively. The demonstrated field gave higher net return Rs. 356689.8/- to Rs. 367656.77/ ha and B: C ratio 4.47 to 4.77 with mean Rs. 362173.28/ha and 4.62, respectively. Present results clearly show that the yield and economics of Turmeric can be boost up by adoption of recommended technology.

Keywords: *FLD, Turmeric, Spices Crop, Technology gap, Economics, Extension gap, Technology index*

Hydroponics: A futuristic technology for agriculture resource management in hill ecosystem

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Abstract

Hydroponics is an advance and futuristic agricultural technology that involves growing of healthy plants in a nutrient or mineral-rich water solution without using a traditional soil medium. One of the main advantages this technology offers is the efficient agricultural resource management. In hydroponics agriculture, the water used for growing the crop is recycled reducing wastage of one of the most limiting agricultural resource. As the nutrient required by the crops are supplied directly to the root zone at the optimum level required by the crops the loss of nutrient is also minimized. As soil is not required and vertical space utilization can be achieved, hydroponic agriculture system can also offer wise land resource management. Considering all the above points a comparative study was conducted at Horticulture Research Farm, ICAR Research Complex for NEH Region, Umiam, Meghalaya on three varieties of lettuce *viz.,* Iceberg, Grant Lake and Romain to compare its yield and related parameters under traditional soil cultivation in open field and soilless hydroponics system. The marketable yield per plant (g) ranges from 120.5 to 191.0 and 125.0 to 210.0 under hydroponics and open field conditions, respectively. Eventhough the yield per plant in all the three varieties was higher under open field conditions but when comes to yield per area It was observed that all the varieties recorded higher yield per unit area under hydroponics cultivation (Iceberg-1.72 kgm^{-2}; Grant Lake-1.62 kgm^{-2}; Romain-1.08 kgm^{-2}) as compare to open field conditions (Iceberg-1.05 kgm^{-2}; Grant Lake-0.94 kgm^{-2}; Romain-0.63 kgm^{-2}). The higher yield per area under hydroponic is attributed to accommodation of more plants per unit area (1 m^{-2} area = 9 plants) compared to open field system (1 m^{-2} area = 5 plants at 45×45cm spacing). Thus from the study it can be concluded that hydroponic cultivation system could be an efficient futuristic agriculture technology for agriculture resource management.

Keywords*: Futuristic Agriculture, Vertical space, Agriculture Resource Management*

Quality-Focused Computational Approach for SSR Marker Development in Horsegram (*Macrotyloma uniflorum*): A Comprehensive Assessment Framework

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Abstract

Horsegram (*Macrotyloma uniflorum*) is an underutilized legume crop with significant nutritional and therapeutic potential, yet molecular marker resources remain limited. Simple Sequence Repeat (SSR) markers are crucial for genetic diversity studies, population genetics, and breeding programs in underutilized crops. This study aimed to develop and comprehensively evaluate SSR markers for horsegram using a novel multi-parameter quality assessment framework that prioritizes marker reliability over quantity. A total of 91 SSR markers were computationally designed from horsegram genomic sequences using MISA (MIcroSAtellite identification tool) and Primer3. A comprehensive quality assessment system was developed incorporating six key parameters: primer structural integrity (20%), thermodynamic compatibility (25%), GC content optimization (20%), SSR polymorphism potential (15%), primer length optimization (15%), and 3' stability (5%). Markers were classified into four categories: Excellent (e"85 points), Very Good (75-84), Good (60-74), and Poor (<60). Comprehensive quality assessment revealed that only 2 markers (2.2%) achieved excellent quality status, with 89 markers (97.8%) failing to meet stringent quality criteria. Failure mode analysis identified insufficient flanking sequences (27.5%), extreme GC content (19.8%), and suboptimal primer length (16.5%) as primary limiting factors. The two excellent markers (HG_SSR_001 and HG_SSR_002) demonstrated optimal thermodynamic properties (Tm: 58-62°C), balanced GC content (45-55%), and high polymorphism potential. This study introduces the first comprehensive computational quality assessment framework for SSR development in underutilized legumes, emphasizing scientific rigor over inflated marker numbers. The framework provides realistic success expectations and efficient resource allocation for molecular breeding programs. Despite the low success rate, this research establishes a robust foundation for horsegram genetic analysis and demonstrates the importance of quality-focused marker development. The validated markers and assessment framework will accelerate genetic studies in horsegram and provide a replicable methodology for other underutilized crops.

Keywords: *Horsegram, Macrotyloma uniflorum, SSR markers, computational biology, quality assessment, underutilized crops, molecular breeding*

Impacts of temporary structures on Relationship between Rainfall, Runoff, and Soil Loss in small watershed of Haryana.

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Abstract

Soil erosion due to surface runoff is a critical issue in many hilly and semi-arid regions, resulting in significant land degradation, reduced agricultural productivity, and sedimentation in downstream water bodies. The construction of loose boulder and gabion check dams has been widely adopted as a sustainable

soil and water conservation measure to mitigate these effects. This study evaluates the relationship between rainfall, runoff, and soil loss before and after the construction of such check dams in a micro-watershed located in IISWC Research Farm, Panchkula Haryana. Data was collected over a multi-year period, including rainfall, runoff, and soil loss. Statistical analysis revealed that before the construction of structures the values of runoff and soil loss were 0.57 and 0.14 respectively. It means prior to intervention, high-intensity rainfall events led to rapid surface runoff and severe soil loss due to lack of vegetative cover and poorly managed slopes. After the construction of temporary structures, a significant reduction in runoff (0.392) and soil loss (0.090) were observed. This shows that structures effectively reduced flow velocity of runoff, enhanced infiltration, and promoted sediment deposition upstream of the check dams. In this case, soil loss decreased by 30–44%, highlighting the role of these structures in stabilizing the watershed. The study concludes that these structures play a crucial role in altering the hydrological response of watersheds and aimed at combating land degradation and improving water conservation in vulnerable regions.

Impact of Straw Mulching and Irrigation Scheduling on Yield and Water Use Efficiency of Chickpea (*Cicer arietinum* L.)

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Abstract

A field experiment was conducted during the *rabi* season of 2018-19 and 2019-20 to assess the yield and water productivity of Chickpea as influenced by different irrigation frequencies and varieties. The field trial was laid out in a split-plot design with mulching (i) M_1- Straw mulch and (ii) M_2- No mulch, in the main plots and three irrigation frequencies (i) W_1-irrigate once at 40 days after sowing (DAS); (ii) W_2- irrigate twice at 40 and 60 DAS and (iii) W_3- irrigate thrice at 40, 60 and 80 DAS accommodated in sub plots and replicated four times. Depth of water applied was 50 mm. Seasonal evapotranspiration (SET) from straw mulch field increased by 11.51 % and 21.71 %, respectively under W_2 and W_3 irrigations frequencies. In no mulch, maximum value of IWP was recorded 19.46 and lowest value was 9.53 with water supplied thrice. Results showed that the significantly maximum plant height (60.59 cm) was recorded in straw mulch and water supplied with thrice (65.79 cm). Significantly maximum number of primary branch (6.31 numbers) recorded in straw mulch and thrice irrigated treatment (6.95 numbers). The maximum pods per plant (75 numbers) received from straw mulch and pod numbers also affected by one irrigation (46.23 numbers) at 40 days after sowing instead of water supplied with three at 40, 60 and 80 days after sowing. Significantly maximum grain yield (1776 kg ha^{-1}) of chickpea was recorded in straw mulch with water applied thrice. Growth and yield attributes, including plant height, number of primary branches, and pods per plant, improved significantly with increased irrigation and mulching. Grain yield declined notably under limited irrigation, affirming the sensitivity of chickpea to water stress during key phenological stages. The integration of straw mulch and optimal irrigation scheduling

was found to be a promising strategy to enhance water productivity and chickpea yield in water-limited environments.

Keywords*: Irrigation Scheduling, Straw mulching, seasonal evapotranspiration, water productivity, Chickpea grain yield*

Influence of lodging stress on morpho-metabolic responses of oats (*Avena sativa* L.)

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Abstract

Lodging is the permanent displacement of crops from their proper and upright position. Plant loses its vertical position, tipping and falling on the soil. Lodging in oat is the most chronic constraint that negatively affects its productivity and is one of the main barriers on the way to higher yield. The experiment was laid out in randomized block design in *Rabi* season of 2020-21 by using eight recently released oat varieties (OL-1769-1, RO-11-1, OL-13, OL-1896, JHO-822, OL-15, OL-14 and OL-12) to evaluate the impact of stem lodging on oat varieties. Dendrogram analysis depicted that Cluster I genotypes (OL-1769-1, RO-11-1, OL-13) proved to be more efficient in overcoming lodging stress as compared to Cluster III (OL-15, OL-14, OL-12) and Cluster II (OL-1896, JHO-822) genotypes. Cluster I had lower lodging scores plus lower percent reduction in thousand grain weight, lignin content, dry matter yield of lodged plants and higher breaking strength (BS), culm lodging resistance index (CLRI) than Cluster III. Nitrate-N and Nitrite-N contents were increased with the decline in nitrate reduction and OL-15 recorded highest increment under lodging stress. Soluble protein and free amino acid content were also decreased with lodging though decline was more prominent in OL-15. Biplots of principal component analysis also showed that RO-11-1 and OL-15 behaved differentially towards lodging tolerance by occupying distinct positions.

Keywords: *Genotypes, Grain weight, Lodging stress indicators, Metabolites, Oats*

Highly Sensitive Electrochemical Sensor for Lead Ions Based on Platinum Nanoparticle-Coated Gold Electrodes

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Abstract

This innovative study introduces a new and highly effective electrochemical sensor for the ultra-sensitive detection of lead ions (Pb2+). The core of this sensing platform is a gold electrode coated with novel

citrate-capped platinum nanoparticles (PtNPs). This unique design significantly increases the electrode's surface area and catalytic activity, resulting in enhanced sensitivity and faster electron transfer. When coupled with square wave voltammetry (SWV), the developed sensor exhibits an impressive detection limit of 0.05 μM for Pb2+, demonstrating its capability for detecting trace-level concentrations. Furthermore, it boasts high sensitivity (38.4 μA μM{ ¹) and a reliable linear range (0.1–0.5 μM) with an excellent R^2 value of 0.98 (RMSEC 0.02), ensuring precise and accurate quantification. The sensor also demonstrates remarkable selectivity, effectively distinguishing lead ions from common interfering substances. Its practical utility was validated through the successful analysis of real-world groundwater samples from a polluted area in Panipat, India. This robust and repeatable sensing scheme, which combines the advantages of PtNPs on a gold substrate with SWV, presents a promising and practical solution for on-site environmental monitoring of lead contamination.

Keywords: *Electrochemical strategy; ultrasensitive quantification; Lead ion (Pb^2z); Citrate-capped platinum nanoparticle; Square wave voltammetry*

Morpho-physiological impact of Iron and Zinc biofortification of sweet corn (*Zea mays* L. sachharata) for sustainable crop production

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Abstract

The "Morpho-Physiological impact of zinc and iron bio fortification on yield and quality of sweet corn (Zea mays L. Saccharata)". Experiment was laid out in randomized block design with three replications having thirteen treatment combinations with iron and zinc sulphate to understand the influence of seed treatment and foliar application of nutrients on yield and quality of sweet corn. Further, analysed parameters content of fresh grains of sweet corn hybrids. The salient findings are summarized hereunder and results were computed. It was found that Application of recommended dose of fertilizers along with seed treatment with ZnSO 4 @ 0.5 % + FeSO 4 @ 0.5 % followed by foliar spray of ZnSO 4 @ 1.0 % + FeSO 4 @1.0 % at pre and post flowering stages (55 and 65 DAS) can improve the fresh cob yield to the extent of 16 per cent in sweet corn.It has also improved the iron and zinc composition in sweet corn (47.2 mg g -1 of zinc and 42.0 mg g -1 of iron) along with extended post harvest life of sweet corn. Popularisation of such sweet corn consumption would address the problem of malnutrition. The biochemical parameters of sweet corn kernels have shown positively significant relation with fresh cob yield viz., reducing sugars (0.889**), non-reducing sugars (0.628*), total sugar (0.691**), protein (0.556*) and starch (0.647*). Biophysical parameters like rate of photosynthesis (0.901**), transpiration rate (0.692**) and SPAD (0.711**) also have a positive correlation with fresh cob yield.

Key words*: Maize hybrid, SPAD value and shelling % and seed treatment*

Assessment of okra varieties for yield, yield contributing characters and economics

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Abstract

Okra (*Abelmoschus esculentus*), is a hairy annual plant in the Malvaceae family that is commonly referred as ladies' finger or Bhindi. It is a warm season crop and thrives best under hot and humid condition. Day temperature ranging from 25°C to 40°C and night temperature over 22°C is required for proper growth, flowering and fruit development. Fruits are rich in proteins, vitamin C, calcium, potassium and other mineral matters.It is one of the promising vegetable crop in S.A.S. Nagar (Mohali) district of Punjab. It is grown in many parts of district during summer and rainy season and farmers fetch good returns from its sale. The present investigation involves assessment of okra varieties. To overcome this problem, an On Farm Trial (OFT) was conducted by K.V.K. S.A.S. Nagar (Mohali) in farmer's field during 2024 to evaluate the treatment combinations comprised T_1: FP: Farmers Practice, T_2: Punjab Suhavani. T_3: Punjab Lalima. Observations were taken on various growth, yield and economic parameters. Crop was raised following recommended package of practices. The results of the study revealed that Yield of T_3 was found to be the best (45.2 q/acre) followed by T_2 (43.6 q/acre) and T_1 (38.80 q/acre). It was noted that T_3 was earliest for first harvest (54 days) followed by T_2 (56 days) and T_1 (60 days). Yield increase of T_3 over control was found to be 16.49% while yield increase of T_2 over control was found to be 12.37%. Benefit cost ratio for T_3, T_2 and $T_1$was found to be 3.22, 3.14 and 2.84 respectively.

Keywords: *Okra, On farm trial, Yield, Economics, BC ratio*

Microbiome changes in air packed Indian mackerel stored at different temperature

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Abstract

Understanding the dynamic change in the microbial flora during spoilage process is very essential for strategizing the control measures for spoilage. To explore the microbial composition and diversity of spoilage flora in an air packed Indian mackerel (*Rastrelliger kanagurta*) stored at three different temperature such as 0 ±2 ! (Iced-T1M), 5 ±2 ! (Chilled-T2M) and 30 ±2 ! (abused-T3M), metagenomic

analysis, a culture independent method was employed. Followed by the package and storage at different temperature, samples were drawn for DNA extraction on the day at which it surpasses the threshold limit of spoilage by its biochemical analysis. Based on the alpha diversity analysis and beta diversity index, there is a significant difference in the bacterial community structure between the storage temperature. Both the classes Gammaproteobacteria and Betaproteobacteria showed abundance in all the samples, while the genus *Shewanella* sp. was more predominant in both samples T1M and T3M, whereas *Staphylococcus* sp. outnumbered in sample T2M. Looking into the species abundance and diversity, each sample showed significant difference. In sample T1M, the species abundance was as follows: *S. artica*> *S. baltica*> *S. aquimarina*, while in T2M, *Staphylococcus xylosus*, *Shewanella artica* and *Burkholderia cepacia* were abundant. In the sample stored at abused temperature (T3M), the species richness was in the order *S. aquimarina*> *S. fidelis*> *S. yunxiaonensis*> *S. pealeana*. Thus, the species distribution and abundance among the samples indicated the changes in bacterial flora contributing spoilage at different temperature and it further signifies the chance of exploration in developing methods to extend the shelf life of Indian mackerel based on the abundance in spoilage flora.

Keywords: *Metagenomics, Microbiome, Indian mackerel, Storage, Air package*

Effects of Indole-3-Butyric Acid (IBA) and rooting media on rooting and survival of air layered Pecan nut (*Carya illinoinensis* L.).

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Abstract

Pecan (*Carya illinoensis*) is the most important species cultivated mainly for its nut, as the production and consumption of nuts are increasing in the world due to strong economic returns and the nutritional value of their products. Pecan nut is conventionally propagated by budding or grafting onto rootstocks obtained by open pollination. However, the rootstocks taken years to attain appropriate size for grafting or budding for production of elite planting material. Therefore, the study was conducted for rapid multiplication of desired rootstock with desirable traits and production of healthy plants in a short time. We investigated air layered artificial root induction in pecan nut seedlings with different levels of indole-3-butyric acid (IBA) and rooting media. Five levels of Indole 3-butyric acid hormone concentration (0 mg L^{-1} IBA, 1000 mg L^{-1} IBA, 1500 mg L^{-1} IBA, 2000 mg L^{-1} IBA and 2500 mg L^{-1} IBA) and three types of rooting media (Soil + sand, Coco peat and vermicompost). The experiment consisted of fifteen treatments of combination between the concentration of IBA and the rooting media of sand + soil + IBA 0 mg L-1, coco peat + IBA 0 mg L-1, vermicompost + IBA 0 mg L-1, sand + soil + IBA 1000 mg L-1, coco peat + IBA 1000 mg L-1, vermicompost+ IBA 1000 mg L-1, soil + sand+ IBA 1500 mg L-1, coco peat + IBA 1500 mg L-1, vermicompost + IBA 1500 mg L-1, soil + sand + IBA 2000 mg L-1, coco peat + IBA 2000 mg L-1, and vermicompost + IBA 2000 mg L-1 and soil + sand + IBA 2500 mg L-1, coco peat + IBA 2500 mg L-1, and vermicompost + IBA 2500 mg L-1. The result indicates that all the concentrations of IBA significantly increased the number of roots of air layer pecan seedlings over the

control. The highest number of roots (33.23) and root length (16.12 cm) were recorded in the 2500 mg L^{-1} IBA treatment + cocopeat over the control.

Keywords: *IBA, rooting media, rooting abilities, pecan nut seedlings*

Varietal screening of Indian bean against spotted pod borer, *Maruca vitrata* (Fabricius)

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Abstract

There are several insect-pest responsible for the lower productivity of Indian bean. Here, 12 different varieties of Indian bean were screened to assess the resistance against spotted pod borer, *Maruca vitrata* F. During year 2022-23, highest number of larval population (4.46 larvae/plant) and pod damage (50.3%) was observed in 125-36. Least larval population was observed in Guj.Wal-1 (1.85 larvae/plant), while, NIB-202 (26.59%) exhibited lowest pod damage. Also, during year 2023-24, the highest number of larvae (5.22 larvae/plant) and pod damage (50.01%) was observed in 125-36. Significantly least number of larvae (1.44 larvae/plant) and pod damage (24.28%) observed in Guj.Wal-1. According to the pooled data, highest number of larvae (4.84 larvae/plant) and pod damage (50.16%) was recorded in 125-36. Lowest significant larval population was recorded in Guj.Wal-1 with 1.65 larvae/plant, while lowest pod damage was displayed by NIB-202 (27.16%). During year 2022-23, significantly highest yield was recorded in NIB-195 that was 25.66 q/ha. Lowest yield was obtained in NIB-9 with 9.85q/ha. While, in the year 2023-24, NIB-195 (30.48 q/ha) gave significantly highest yield. Lowest pod yield was obtained from GNIB-22 (13.05 q/ha). According to the pooled data, NIB-195 (28.07 q/ha) was significantly highest yielding variety. Least yield was gained from NIB-9 (10.13 q/ha). In categorization no variety was found to be highly resistance. NIB-202 and Guj.Wal-1 was evaluated as resistant according to larval population. Based on pod damage NIB-107 was also evaluated as resistance. NIB-316 and 125-36 was found to be highly susceptible.

Keywords: *Indian bean, resistance, spotted pod borer, varietal screening.*

Efficacy of organic mulches on soil properties, growth and yield of mango cv. Kesar in rainfed ecosystem

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Abstract

To understand the efficacy of organic mulches on soil properties, growth and yield of mango cv. Kesar in rainfed ecosystem, field experiments were conducted during 2013-14 and 202223 at Agricultural Experiment Station, NAU, Paria, Gujarat. Seven treatments viz., orchard grass (T_1), paddy straw (T_2), paddy husk (T_3), sugarcane trash (T_4), mango leaves (T_5), plastic mulch (black, 100 micron) (T_6) and no mulch (T_7), were kept in randomized block design with three replicates. The experiments clearly showed that organic mulching enhances the growth and yield of mango. The highest fruit number (227), average fruit weight (306.10 g) and fruit yield (79.34 kg/tree) were recorded due to plastic mulch (black, 100 ìm). Plastic mulching effectively improves soil moisture and nutrient quality of mango orchard. Quality measurements were higher for plastic mulch (black, 100 ìm) but the difference between the treatments was not significant.

Keywords- *Mango, Organic mulching, Soil properties, Yield*

Management of Mango Malformation

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Abstract

The mango (*Mangifera indica* L.) is considered as the king of fruits in India and is an essential fruit crop there. The most important biotic and abiotic issue is mango malformation, which can reduce yields by up to 60% and restrict mango farming in tropical and subtropical regions of the world. Vegetative and floral symptoms of mango malformation are expressed on the plant, and the floral symptom is far more virulent and results in the loss of the entire crop than the vegetative symptom produces. In this work the effectiveness of different chemicals was assessed for the control of these diseases in a mango orchard. There was a difference among modules for the malformation, the mixture of copper oxychloride 0.3% at the time of vegetative flush, subsequent spray carbendazim 0.1% at 20 days after first spray + spray propargite 0.18% at 20 days after second spray + spraying 200 ppm NAA in second week of December followed by spraying of 500 ppm ethrel at bud inception stage for the management of malformation in their mango orchards (cv. Kesar) as it very effective with 9.25 per cent infected diseased shoots.

Keywords- *Kesar, Malformation, Mango, Module, Vegetative flush*

Study on genetic parameters for kernel yield and its component traits in maize (*Zea mays* L.)

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Abstract

Towards understanding the nature of gene action for kernel yield and its components traits, a set of 45 F_1 hybrids generated by adapting diallel mating design (Method IV and Model I) involving 10 inbred lines were tested across three seasons for their performance and combining ability. Combined analysis revealed that mean sum of squares due to general and specific combining ability were significant indicating the contribution of both additive and non-additive gene action in controlling days to 50% flowering, days to 50% silking, anthesis-silking interval, days to maturity, plant height, SPAD chlorophyll meter reading, specific leaf area, cob length, cob girth, number of kernel rows cob^{-1}, number of kernels row^{-1}, 100 kernel weight, harvest index and kernel yield. Estimates of components of variances ($ó^2$GCA and $ó^2$SCA) and ratio of $ó^2gca/ó^2sca$ indicated the predominance of non-additive gene action for all the characters studied. Among the inbred lines, BML 2, DFTY, Heypool and PDM 1474 were found to be the best general combiners across seasons for kernel yield and most of yield components as well as developmental characters. The inbred lines BML 7, PDM 1416 and PDM 1428 were considered as poor general combiners. DFTY, Heypool, PDM 1452 and PAM 1474 were identified as good general combiners for earliness. Among the top 20 best performing hybrids, BML 15 × PDM 1452, BML 15 × PDM 1474 and BML 7 × DFTY were rated as promising hybrids based on their superior performance and *sca* effects for kernel yield and most of the yield components. Theses hybrids could be recommended for commercial cultivation after extensive testing in multi-locations.

***Keyword**: Maize, Combing ability analysis, Gene action, Yield components*

Management of sorghum shoot fly infesting sorghum crop through natural oils

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Abstract

Evaluation of different oils against sorghum shoot fly showed that two sprays 7 and 17 days after emergence of crop Neem Oil 1.0% recorded minimum shoot fly dead heart damage (18.25%) which was statistically at par with treatment of Karanj Oil 0.5%(19.19%), Neem Oil 0.5% (19.22%) and Karanj Oil 1.0% (19.61%). Highest yield was recorded in Neem Oil 1.0% (1241 kg/ha.) Higher cost benefit ratio was achieved in treatment of Neem Oil 0.5% and Karanj Oil 0.5% which was 1:4.22 and 1:3.07, respectively.

Introduction

Sorghum (*Sorghum bicolor* (L.) Moench.), commonly known as Jowar, is an important food, fodder and fuel crop and in the world ranking fifth among the major cereals after wheat (*Triticum aestivum*), rice (*Oryza sativa*), maize (*Zea maize*) and barley (*Hordeum vulgare*). Sorghum is one of the most important cereal crops of semi-arid tropics. Sorghum suitability to Iow and moderate rainfall conditions and its general ability to with stand drought makes it an ideal crop for rainfed conditions. It was

hypothesized that the origin and early domestication of sorghum took place approximately 5000 years ago in North Eastern Africa.

Introduction of hybrid and high yielding cultivars coupled with the use of high doses of fertilizers and irrigation has resulted in an increased susceptibility to pests and diseases hence plant protection is very essential to harvest good crop. So far, over 150 insect pests have been reported on sorghum (Abdisalam, 2017) among them sorghum shoot fly (*Atherigona soccata*) and stem borer (*Chilo partellus*) are important. The Sorghum Shoot fly, *A. soccata* an Antomycid fly, in the family Muscidae, order Diptera is the primary pest of economic importance of sorghum. Sukhani and Jotwani (1980) reported that the losses due to shoot fly was 85.87 per cent in grain and 44.86 per cent in fodder yield. Singh *et al.,* (2017) reported that Sorghum Shoot fly, *A. soccata* t is one of the most destructive pest at the seedling stage, which causes yield losses of 68.6 and 75.6 per cent in terms of fodder and grain yield, respectively.

Objectives:

To evaluate efficacy of different oils against sorghum shoot fly.

Materials and Methods

To study the Evaluation of different oils against sorghum shoot fly, the trial was carried out under the field condition at Main Sorghum Research Station, Navsari Agricultural University, Surat (Gujarat) during Kharif-2017-18 to 2019-20. The experiment was conducted in randomised block design with ten treatments including control and three replications. Normal tillage operation was carried out to bring the experimental plot to proper tilth and ridges. The sorghum variety GJ-42 was sown in *Kharif* season with the spacing of 45 cm X 15 cm to find out bio efficacy of different botanical oils for eco friendly management of sorghum shoot fly. 2 sprays of botanicals were done at 7 and 17 DAE of crop. 3 gram detergent /10 lit. of water were added in spray solution during each spray. Per cent shoot fly dead hearts were record at before 3 and 7 days after each spray.

Results and Discussion

Results of pooled analysis of three years showed that minimum shoot fly dead heart recorded in treatment of Neem Oil 1.0% (18.25%) which was statistically at par with treatment of Karanj Oil 0.5% (19.19%), Neem Oil 0.5% (19.22%) and Karanj Oil 1.0% (19.61%). The untreated control treatment had shown maximum shoot fly dead heart damage (34.06%). These findings are in accordance with data reported by Joshi *et al.,* (2016). Highest yield was recorded in Neem Oil 1.0% (1241 kg/ha.) Sable (2009) recorded the highest yield in neem oil (2%) treated plot. Higher cost benefit ratio was achieved in treatment of Neem Oil 0.5% and Karanj Oil 0.5% which was 1:4.22 and 1:3.07, respectively. Joshi *et al.,* (2016) also recorded higher cost benefit ratio in treatment of Neem Oil 2.0% and Karanj Oil 2.0%.

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Development and optimisation of biscuits fortified with novel iron-rich underutilised food sources

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Abstract

On account of the prevailing issue of iron deficiency anaemia across the globe, especially in India, along with the negative contribution of unhealthy snacking practices on aggravating micronutrient deficiencies, the present study was undertaken with the broader objective of developing an iron-rich biscuits fortified with traditional, and underutilised iron-rich food sources – Amaranth grains (AG), Moringa oleifera leaves (MOL), and Garden cress seeds (GCS). The biscuit formulations were optimised by employing Response Surface Methodology based on their iron content and their sensory attributes, which included body and texture, flavour, colour, appearance, and overall acceptability. While most sensory attributes (body and texture, colour, and appearance) were inversely correlated with MOL and GCS (independent variables), flavour was found to be inversely correlated with the two independent variables. Furthermore, the overall acceptability and iron content of the biscuit formulations were positively correlated with MOL and GCS at 12% and 7.5%, respectively, resulting in a high desirability score of 0.852. Notably, the iron content in the optimal formulation of the iron-rich, food-fortified biscuits exceeded levels reported in recent literature, likely due to the use of ingredients naturally abundant in iron. Furthermore, the protein- and fibre-rich ingredients caused the biscuit spread to become more compact, resulting in increased thickness and overall weight. Essentially, the findings indicate that utilising underutilised, iron-rich plant-based sources, such as AG, MOL, and GCS, for fortifying chocolate-flavoured biscuits is a practical option for creating iron-rich, healthy snacks and promoting better iron intake through nutrient-dense options.

Keywords: *Food-to-food fortification, Response surface methodology, Underutilised plants, Iron-rich snack, Fortified food*

Diversity analyses of advanced breeding lines for their yield and its contributing characters in FCV tobacco

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Abstract

The Flue cured Virginia (FCV) tobacco is major cash crop of Karnataka cultivated as rain fed (kharif) crop grown on light soils with crop size fixed at 100 mkg. Owing to monsoon vagaries, incidence of pests and diseases, tobacco farmers often doesn't reach this target. National and international regulations leave no scope for expansion of cultivated area which necessitates vertical increase in yield which can be achieved through genetic improvement. Genetic improvement in FCV tobacco has resulted in development of many advanced breeding lines. However further gain in yield can be achieved only through careful selection of parental material which should come from diverse gene pool. In this regard, present study was undertaken to study the genetic diversity of sixty three advanced breeding lines (ABLs) developed from diverse along with checks Kanchan, FCH 222 and CH 3 using cluster analysis for leaf yield and its contributing characters. Cluster analysis divided the sixty three ABLS into three major clusters, cluster1 represented high yielding lines consisting of 16 ABLs and checks FCH 222 and CH 3. Cluster 3 represented medium yielding lines consisting of 22 ABLs and check Kanchan while cluster 2 represented low yielding lines consisting of 23 ABLs. ABL, M4-18 alone represented a single cluster and recorded highest leaf yield could be further evaluated for its yield potential and suitability to Karnataka light soils. The study also revealed existence of variation for plant height, internode length and leaf yield This study provides crucial information on distribution of genes/alleles contributing for leaf yield and its contributing traits which will aid tobacco breeder in selecting parental lines for breeding high yielding varieties/hybrids.

Morphological, Biochemical and Yield Evaluation of Mandarin (*Citrus reticulata* Blanco) Accessions for Elite Germplasm Selection in the Eastern Himalayas

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Abstract

Darjeeling mandarin (*Citrus reticulata* Blanco) is an essential cash crop for farmers in the Sikkim and Darjeeling hills. However, recent years have seen a significant decline in both area and productivity due to the lack of quality planting materials. The widespread use of unselected mother plants for propagation is a common practice in the region, which contributes to declining yields. The study aimed to identify elite germplasm of Darjeeling mandarin across thirty-three grafted mandarin trees grown at IARI Regional Station, Experimental Farm. The age of the mandarin trees were 6 years and grafted on Rough Lemon. Eight important key horticultural traits i.e. fruit weight, pulp percentage, juice percentage,

total soluble solids (TSS), TSS: Acid ratio, number of seeds, and yield per plant were recorded during 2023-24 and 24-25 on the accessions. Notably, Accessions such as MD-15, MD-21, MD-22 and M-48 outperformed others in composite scores. These findings suggest that the selected germplasm has significant potential for conservation and can in future breeding programs to improve productivity and for planting material production.

Keywords*: Darjeeling mandarin, Elite germplasm, Conservation, Selection, Horticultural traits.*

Isotherm and Kinetic Modeling of Equilibrium Sorption of Cr (VI) into Zinc-Aluminum Layer Double Hydroxides

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Abstract

In this study, zinc-aluminum layered double hydroxide, prepared using co-precipitation (ZAC-21) and urea hydrolysis method (ZAU-21), was used as an adsorbent for removal of Cr(VI) from aqueous solution. As-prepared adsorbents were characterized by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM) and the effect of pH, adsorbent dose, contact time and initial Cr(VI) concentration was studied by batch adsorption method. The equilibrium sorption data were fitted into Langmuir, Freundlich, Temkin and Dubinin–Radushkevich (DR) isotherms, and the applicability of these isotherm model compared by coefficient of determination (R^2) and sum of square error (SEE) values. The maximum monolayer coverage from Langmuir isotherm were determined to be 41.2 mg/g and 59.35 mg/g for ZAC-21 and ZAU-21, respectively. Moreover, the equilibrium kinetics data were fitted to pseudo-first order, pseudo-second order, Elovich model and Weber-Morris intra-particle diffusion model. Analysis of the kinetics data indicated that sorption process followed pseudo-second order kinetic model. The results indicated that sorption efficacy of layered double hydroxide prepared by urea hydrolysis method was better than that prepared from co-precipitation method.

Keywords: *Layered double hydroxide, Cr (VI) removal, sorption, sorption isotherm and kinetics,*

Molecular investigation of Astrovirus, Kobuvirus and Rotavirus A coinfection in pigs from Haryana, India

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Abstract

Various RNA and DNA viruses like porcine astrovirus (PAstV), porcine kobuvirus (PKV) and porcine rotavirus A (PRV-A) either individually or in combination contribute to diarrhoea, leading to mortality and morbidity in pig population and ultimately cause economic loses to the farm. In this study, 182 faecal samples were collected from diarrheic (n=116) and asymptomatic (n=66) pigs of different age groups from Haryana, India. The presence of these three viruses was examined in the samples using reverse transcription-polymerase chain reaction (RT-PCR) assay. Among the samples, 54 (29.6%), 90 (49.45%), and 60 (32.9%) were found to be positive for PAstV, PKV, and PRV-A, respectively. Single virus infection was detected in 63 samples whereas mixed infections were found in 59 samples with 37 and 22 samples having two and three viruses, respectively. PAstV was more prevalent in weaning pigs (37/95), whereas PKV and PRVA were more predominant (36/59 and 30/59) in suckling piglets. Phylogenetic analysis revealed the circulation of lineage 1, 2 and 4 of PAstV, and genotypes I1, I2 & I5 of PRVA in this region. The study shows that PAstV's specific role in causing diarrhoea is unclear; however, the presence of PKV or PRVA has led to an increase in diarrhoea cases among pigs.

Keywords: *Porcine Astrovirus, Porcine Rotavirus A, Porcine Kobuvirus, Pigs, Diarrhea, Coinfection*

Bioactive properties of *Tecomella undulata* bark extract and its potential utilization in wood protection

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Abstract

The chemical-based wood preservatives are not only toxic to human health; it causes potential hazard to the environment as well. Therefore, the biopreservative obtained from renewable resources are promising hope to develop an alternate ecofriendly preservative. The present work is focused on potential utilization of *Tecomella undulata* bark extracts as bio-protective agents. The *Tecomella undulata* bark extracts were prepared in two different solvents i.e. water and methanol and subsequently named as Water Based Bark Extract (WBBE) and Methanolic Based Bark Extract (MBBE). The chemical composition of extracts was analyzed using bioassay technique. The antifungal properties of both the extracts were assessed against the brown rot (Oligoporus *placenta*) and white rot (*Trametes versicolor*) fungi at different concentration of 0.5%, 1%, 2%, 4%, 6% and compared with control test. The result shows that both WBBE and MBBE have remarkable efficiency as a bio-preservative. It ceased the growth of both type of fungi up to 95-100% when concentration is increased to 6%. Furthermore, when the performance of MBBE and WBBE were compared against the fungi, the MBBE has better performance in all the cases. The results indicate that bark extract obtained from *Tecomella undulata* can be a good alternative source wood preservative in place of chemical preservative.

Keywords*: Tecomella undulata, Methanol extraction, Bioassay, preservative inhibition Inhibition, Brown rot, White rot.*

From Agro-Waste to Nanotech:Green Synthesis of ZnO Nanoparticles using Citrus Waste with Mechanistic Insights And Multifunctional Applications

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Abstract

The growing interest in sustainable nanotechnology has led to the development of eco-friendly methods for synthesizing zinc oxide nanoparticles (ZnO NPs). This review highlights the use of citrus fruit waste, especially *Citrus reticulata* (mandarin) peels and extracts, as a green source for the synthesis of ZnO NPs. Rich in natural compounds like flavonoids and phenolic acids, citrus waste serves as an effective reducing and stabilizing agent during NP formation. Key factors such as pH, temperature, and precursor type have been reported to influence the size, shape, and surface properties of the NPs. Aqueous extract of *Citrus sinensis* peels (100 mg/mL) facilitated the formation of ZnO NPs under mild reaction conditions without the need for toxic chemicals. UV–Vis spectroscopy confirmed the synthesis of nanoparticles, showing a characteristic absorption peak at 374 nm. X-ray diffraction analysis revealed a hexagonal wurtzite structure with an average crystallite size of 22.6 nm. FTIR spectra indicated the involvement of hydroxyl, carbonyl, and carboxyl groups from citrus phytochemicals in the stabilization of the nanoparticles. The biosynthesized ZnO NPs exhibited potent antioxidant, antibacterial, photocatalytic, and potential anticancer activities, making them suitable for applications in wastewater treatment, agriculture, food packaging, and medicine. The review also discusses current challenges in scaling up production and maintaining consistency. Overall, citrus-waste-derived ZnO NPs offer a cost-effective, sustainable, and environmentally responsible solution for various technological and biomedical needs.

Keywords: *Zinc oxide nanoparticles (ZnO NPs),Green synthesis,Citrus waste,Phytochemicals, Antibacterial activity, Photocatalytic activity.*

Entrepreneurship Development in Agri-Horticultural and Allied Sector: A Techno-Psychological Approach

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Abstract

Over the time, the concept of extension education transformed from an educational system to an empowerment tool. It is a programme and a process of helping village people to help themselves in view to increase production and raise their general standard of living. As a science, Extension Education

deals with the creation, transmission and application of knowledge designed to bring about planned changes in the behaviour-complex of people. This particular branch of agricultural science is devoted to bring changes in perception and attitude towards scientific farming techniques, adoption of hi-tech horticulture, precision farming, improved machineries of pre and post-harvest management etc. through vocational training, capacity building, participatory approaches and through many other approaches. However, farming being perceived non-remunerative, the educated rural youth has the tendency not to undertake farming as their livelihood vocation. Over time, different extension approaches were adopted in our country. These are extended over individual approach like Gurgaon experiment, Sriniketan experiment, Etowah pilot project etc.; nationwide extensive development approaches like Community Development Programme, National Extension Service or Panchayeti Raj system; intensive extension approach like High Yielding Variety Programme etc.; and many other approached like target group/area specific approach, mono-purpose extension approach or group approach. But all these approaches were having various limitations like having too narrow focus limiting to crop production technologies only, low ratio of skilled experts in relation to no. of serving households under each expert, uncoordinated and duplication of efforts etc. These approaches also failed to make the sector techno-smart and modern to satisfy the ego of the educated youths. The present study depicted a socio-psychological perspective of development of such apathy among the rural youth and advocated a techno-psychological approach through development of agri-preneurship models to attract educated youths in agricultural sector.

Keywords: *Entrepreneurship, Agri-Horticultural sector, Techno-psychological approach, Educated youth, Rural youth, Extension approach*

Enhancement of phytoextraction ability of marigold using soil amendments

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Abstract

Marigold (*Tagetes erecta*) is a visually appealing and widely cultivated ornamental plant from the Asteraceae (Compositae) family. This plant is extensively grown across India, occupying the largest area among flower crops. The rapid growth and extensive root system of *Tagetes erecta*, along with its ability to establish itself in poor soils, indicates its suitability for the remediation of areas contaminated by metal pollution. Enhancing the phytoextraction capability of ornamental plants like marigold can be achieved through microbial inoculations, soil amendments, etc. all of which aim to improve the bioavailability, uptake, and sequestration of heavy metals. There is a lack of research on the role of soil amendments and microbes in improving the phytoextraction capacity of marigold. Hence, the present study was conducted to study the effectiveness of various soil amendments in enhancing the phytoextraction ability of marigold cv. Pusa Bahar.

In the present study, The DTPA extractable Nickel and Zinc content varied significantly across treatments, with the highest concentration in the Green Manure + FYM + MSB treatment (T7) while lowest concentration was observed in the Control (T1). The FYM (T2) treatment resulted in the highest biomass yield for both shoot and flower production in marigold plants, while the control group (T1) consistently

produced the lowest biomass. The Green Manure + FYM + MSB treatment (T7) significantly enhanced nickel (Ni) and zinc (Zn) uptake in both shoots and flowers of marigold plants compared to the control (T1), which had the lowest metal levels. The combined application of Green Manure, Farmyard Manure, and Metal Solubilizing Bacteria (MSB) effectively increased metal uptake, demonstrating the potential of these amendments to improve metal accumulation and boost plant biomass. This study, therefore, indicates the benefits of using integrated soil amendments to enhance the phytoextraction ability of marigold.

Keywords: *Phytoextraction, marigold, soil amendments*

Natural Colours are controlled by, Astronomical, Meteorological, Geological, Chemical, Genetical and Biological phenomenon in our Biosphere

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Abstract

Each living and non-living component in our earth is full of color and surrounded by Colors. Humans use colors for different purposes -from food to philosophy. We see color in all organisms, including bacteria, plants, animals, soil, water, landscapes, and the atmosphere. This is a big question among scientists about how and why colors are present on Earth. Colors are more than recreation, painting, and printing. All organisms on Earth are controlled by colors from sunlight-VIBGYOR, directly and indirectly. Natural colors are neither created nor destroyed; they pass from one form to another and finally go back to nature. A Genetic-metro-bio-geological evolution took place for color development in flora, fauna, living and non-living components of Earth. With the evolution of cells on earth, colored molecules formed in proto cells and prokaryotic systems for some important physiological functions for their survival on the earth. They interacted with specific electromagnetic wavelengths of VIBGYOR for their specific function, though Light Harvesting Complexes which found in plasma membranes. Simultaneously, genes started developing for this colored molecule in cells to establish itself with continuous and drastic changes in climatic conditions, which was part of evolution. These developed genes of chromatic pigment were mainly for physiological and biochemical purposes, which were transferred from one species to another species with continuous evolution. Genes for colors are transferred into the organism automatically, according to the need of that chromatic pigment in a single or multicellular system. Although this different chromatic pigment is mainly required for metabolism, beautiful VIBGYOR colors -violet, indigo, blue, green, yellow, orange, and red- started expressing externally or internally by linked or independent genes. At the same time, chromatic molecules and their related genes passed from the prokaryotic system to the eukaryotic plants and animal systems simultaneously. As the most accepted theory of cellular evolution is endosymbiotic, so many genes for color/chromatic pigment, passed or joined together through one or more organisms, and thus multicolored organisms developed. During the journey of development of colors multicolored organisms developed in nature. In due course of time colours with special physiological functions developed in internal organs also. Colors, along with their energy, are trapped and controlled by sunrays through biological systems-Light Harvesting complexes (LHC) for specific physiological processes through pigments.

Colors flow in nature and ultimately back to nature. This is a cyclic process, like all other natural components. Back to nature refers to abiotic components like air, water, and soil. The colors go back by decomposition, or directly by evaporation along with water or wind. Generally, this process cannot be seen by eye, as this is very slow and goes on a nano/molecular level. Colors from plants like flowers, leaves, and fruits, if not taken out from plants, after a period, change first in their chemical composition and then evaporate or get mixed with the soil. Thus, colors go back to the atmosphere. Water content in soil, heat, and temperature play a major role in this phenomenon. In animals, colors do not fade or evaporate because here, colors are very strong/complex, and stable. They last as long as the life span of animals. Only after their death does it decompose and often get mixed with soil or water. As the organic colors decompose, they release their components back into the ecosystem, where they can be absorbed by plants or enter the soil and water systems. This re-integration of the pigments into nature parallels the natural cycle of life, death, and rebirth seen in the natural world. A systematic study on colors could give an answer to many complex processes and diseases. This could give scientists a new way to see the evolution of life. There is a great need to focus on this unexplored subject.

Keywords: *colors, VIBGYOR, Light Harvesting complexes, Astronomical, Meteorological, Geological, Chemical, Genetical and Biological*

Comparative Study of Chemical Composition and Biological Activities of the Essential Oils from *Artemisia indica* Willd and *Artemisia gmelinii* Weber ex Stechm.

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Abstract

Artemisia is a very vast genus of the family *Asteraceae.* It possesses both shrubs and perennial herbs. Here in our research, we are leading to the chemical constituents with its biological activity of two such *Artemisia* species, Artemisia *indica* Willd. and *Artemisia gmelinii* Weber ex Stechm. The chemical analysis of the plant essential oil by GC and GC-MS examination led to the characterization of essential oil. *Artemisia indica* Willd. is characterized by thirty-six components comprising different classes of compounds with 95.58% of the essential oil. On the other hand, *A. gmelinii* Weber ex Stechm. is characterized by 86.60% of the essential oil representing distinct class of compounds. *Artemisia indica*

Willd. shows predominant presence of the following compounds-1,8-cineole (19.21%), camphor (15.70%), *cis*-chrysanthenol (13.50%), *cis*-sabinene hydrate (9.00%), â-thujone (3.40%) and artemisia alcohol (3.70%) whereas, *A. gmelinii* showed a dominant presence of 1,8-cineole (14.97%), terpinen-4-ol (11.04%), ar-curcumene (5.73%), and á-zingiberene (5.05%). Thus, the chemical evaluation of both essential oils shows that 1,8-cineole is a major constituent in both species but *A. indica* also comprises other bioactive compound along with 1,8 -cineole such as camphor and *cis*-chrysanthenol. On the other hand, *A. gmelinii* also comprises of terpinen-4-ol and ar-curcumene. We evaluated the antioxidant activity (DPPH radical scavenging and hydrogen peroxide analysis radical scavenging activity) of both essential oils of *Artemisia* species. The results found were positive. Further, the nematicidal activity of both essential oils was also performed against *M. incognita* which revealed that *A. indica* Willd. and *A. gmelinii* weber ex stechm both exhibited notable nematicidal activity. However, *A. indica*. exhibited more potent nematicidal as well as antioxidant activity in comparison to *A. gmelinii.* To the best of our knowledge, this is the first ever report mentioned on the nematicidal activity of *A. indica* Willd. and *A. gmelinii* weber ex stechm. mentioning their potential as natural alternatives for nematode management.

Keywords: *GC-MS, Antioxidant, nematicidal, Meloidogyne incognita, Chemometric*

Uncertainty, chaos and entropy in social-ecology: Social energy reinvented in social ecology with global implication

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Abstract

All social science tools and techniques have to confront with complex negentropies such as discontinuance, disagreement, rejection, conflict, dissonance, disillusionment and confusion about the 'imposed technologies. Farmers are reeling under uncertain weather, market, income and livelihoods, which are supposed to simmer up in coming days. No extension worker should cherish the clichés of adoption or rejection. The dialectics of ***rejoption*** and analogy of *redox* process perhaps justify the essentiality of application of social physics in extension science. Here in this empirical study, the second law of thermodynamics has been applied to estimate the residual energy vis-à-vis motivational energy in the form of psychic entropy of farmers. Social energy being the main driving force for transformation, the energy entropy level has not been considered so far. In technology led development of agriculture farmers are motivated to adopt modern technologies by any means, but at the same time there is a gap between motivation unleashed and achievements made. This gap is nothing but negative behavior which can be referred to Social entropy. Therefore, it is necessary to maintain social entropy to a minimum level for sustainable agricultural system in India. Face to face interview was conducted with 150 respondents, from Bihar and West Bengal, India with the help of structured interview schedule. Data were analyzed with the help of following statistical tools viz. coefficient of correlation, stepwise regression, path analysis canonical correlation. It has been found that education, market orientation, adoption leadership, anomy, farm size, information seeking behavior, promise driven motivation were

predominating causal factors for social entropy. The design of research owes to the model created by Kenneth Bailley, California, USA and for the first time experimented in Indian farming society.

Keywords: *Social entropy; Social metabolism; Technology socialization, Farm modernization, Urbanization.*

Identification of Promising Dual-Purpose Sweet Corn Hybrids for Fodder Quality Traits, Kernel Sweetness and Yield

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Abstract

The role of green fodder is pivotal in sustaining the nutritional well-being of the country's increasing cattle population. Among non-legume fodders, maize stands out as a widely preferred green fodder crop due to its nutritive value and wide adaptability. While fodder quality traits in traditional maize have been extensively studied, the genetic variability of fodder quality traits, particularly in sweet corn, has received less attention. Here, a set of 30 sweet corn hybrids with *shrunken2* gene was evaluated at three diverse agro-climatic locations to analyse the variability in fodder quality traits such as crude protein (CP), crude fibre (CF), acid detergent fibre (ADF), neutral detergent fibre (NDF), and in-vitro dry matter digestibility (IVDMD). Significant effects of genotype, environment, and G×E interaction were observed for fodder traits. Wide variability for CP (7-14%), CF (15-24%), ADF (33-39%), NDF (35-55%), and IVDMD (58-63%) was recorded. Strong positive correlations were observed between CF and ADF (r=0.43), between GFY and IVDMD (r=0.42), while strong negative associations were observed between CF and IVDMD (r=-0.43). All hybrids possessed high sweetness (>15% brix) in the kernels. SWTH-6 and SWTH-24 were identified as the best hybrids with high IVDMD (>61%), while SWTH-13 showed high CP (>13%), and low ADF (<36%) and NDF (<40%). These hybrids also exhibited high green cob yield (>10 t/ha) and green fodder yield (>18 t/ha). Newly identified dual-purpose sweet corn hybrids hold great promise for enhancing green fodder quality while supporting sustainable agricultural systems.

Keywords: *green fodder, sweet corn, quality*

Biometric Parameters of Crops Grown under Different Substrates and Concentration of Nutrient Solution

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Abstract

Using the Nutrient Film Technique (NFT), this experiment was carried out to determine the ideal substrate and nutrient solution content for the mass production of sweet basil. The research work conducted in different seasons (Season1_April and May, Season2_August and September, Season3_October and November and Season4_January and February) for treatments four nutrient solutions and four substrates is presented in this paper. The final results revealed that the height of plant was highest 36.8 cm in T2 (1000 ppm), using rock wool (M1). Among all the seasons, season2 showed better growth. The number of branches in vermiculite showed a higher value (18 no.) in T3 (1100 ppm) in season2. The number of leaves in in vermiculite (M4) showed higher no. of leaves (136 no.) in T3 (1100 ppm) in season2. The mean diameter in T3 (1100 ppm), basil plant diameter grown using perlite was higher (6.74 mm) when compared to those grown in clay balls, vermiculite, and rockwool in season2. The ideal nutritional solution in four different seasons is T3, (1100 ppm) and the substrates differ depending on the season due to various characteristics.

Keywords: *Hydroponics, Biometric parameters, Substrates and Nutrient Solution*

Effect of sustainable organic nutrient management treatments on the growth, productivity and nutrient content of peach cv. Redhaven.

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Abstract

In organic nutrient management, we utilize the natural materials like manure, compost, bio fertilizers, crop residue and other farm by-products for crop production. It is a sustainable approach which reduces the wastage and improves the soil properties especially soil organic carbon levels. This approach is

quite helpful to reduce the use of inorganic fertilizers, which is good for the environment. There are a number of organic amendments i.e. Jeevamrit, plant growth promoting rhizobacteria (PGPR), ghan jeevamrit and panchgavya etc. which are capable of improving the soil microbial population and could also be a replacement for inorganic/chemical fertilizers. In our experiment on effect of sustainable organic nutrient management treatments on growth, productivity and nutrient content of peach cv. Redhaven, there were ten treatments i.e. T_1 :Recommended dose of manure and fertilizers, T_2 : 18 kg Ghan Jeevamrit + 4 L Jeevamrit, T_3 : 18 kg Ghan Jeevamrit + 4 L PGPR, T_4 :15 kg Ghan Jeevamrit + 5 L Jeevamrit, T_5 : 15 kg Ghan Jeevamrit + 5 L PGPR, T_6 : 12 kg Ghan Jeevamrit + 6 L Jeevamrit, T_7 : 12 kg Ghan Jeevamrit + 6 L PGPR, T_8 : 18 kg Ghan Jeevamrit + 4 L Jeevamrit + 4 L PGPR, T_9 : 15 kg Ghan Jeevamrit + 5 L Jeevamrit + 5 L PGPR and T_{10} : 12 kg Ghan Jeevamrit + 6 L Jeevamrit + 6 L PGPR. The results of organic nutrients application trials revealed that application of 18 kg Ghan Jeevamrit + 4 L Jeevamrit + 4 L PGPR resulted in higher total soluble solids (TSS) and sugars contents, while the other parameters of study i.e. vegetative growth, fruiting, fruit yield, physical parameters of fruits, soil and leaf nutrients contents were significantly higher under recommended dose of manure and fertilizers.

Keywords*: Ghan Jeevamrit, Plant growth promoting rhizobacteria, Peach, Organic nutrient management.*

The Secondary Metabolite Profiling of Crude Extract and Fractions with Biological Applications of Methanol Extract of *Elaeocarpus aungustifolius* Blume Flower

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Abstract

The GC-MS analysis of methanol extract revealed the presence of several secondary metabolites. This study also calculated the total phenolic content, total flavonoid content, antioxidant, antidiabetic, antimicrobial potential and acute oral toxicity of the *Elaeocarpus aungustifolius* Blume flowers methanol extract for the first time. The secondary metabolite screening of methanol extract revealed the presence of alkaloids, terpenoids, flavonoids, polyphenols, saponins, glycosides, and reducing sugars. The total phenolic content was determined by Folin-Ciocalteu assay and total flavonoid content by $AlCl_3$ colourimetric method and the values are 169.111 ± 18.867 mg GAE/g (at concentration 0.644) and 84.401 ± 6.204 mg QE/g (at concentration0.582) respectively. We analysed the antioxidant efficacy of extract by the DPPH method with an IC_{50} of 70.659 µg / mL. The antidiabetic assay (á-amylase assay) was performed by DNSA (3, 5-dinitrosalicylic acid) reagent with an IC_{50} of 1717.0 µg/ mL. The antibacterial assay was performed by agar well diffusion method against gram +ve bacteria such as *Bacillus subtilis* and *Staphylococcus aureus* and gram-negative bacteria such as *Escherichia coli* and *Klebsiella pneumonia*. The zone of inhibition was not found against the tested organisms, indicating the absence of antibacterial action. We performed the antifungal assay by the agar well diffusion method using two different fungi *Alternaria* and *Fusarium* specie. The zone of inhibition was not found against tested fungi indicating, the absence of antifungal activity. The acute oral toxicity test of plant leaf extract and powder was performed on the Albino mice following the OECD TG 425 Up and down

procedure and found to be non-toxic. The high phenolic and flavonoid content indicates its use as a therapeutic agent to control diabetes and obesity along with its use as an antioxidant.

Keywords: *Secondary metabolite, TPC, TFC, antioxidant, antidiabetic, antibacterial, antifungal.*

Surgical management of canine coxo-femoral joint dislocation and ipsilateral femur fracture

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Abstract

A 8-month-old dog weighing only 7 kg was presented with signs of limping in left hind limb. On Clinical and radiological examination, the case was diagnosed as dorso cranial coxo-femoral joint dislocation with ipsilateral short oblique overriding diaphyseal fracture. After blood profiling dog was prepared for aseptic surgery and operated under general anaesthesia. Xylazine and butorphanol used as preanesthetic, then induction was done using propofol and maintenance of anaesthesia was done with isoflurane inhalant anaesthesia. Using standard surgical technique, coxo-femoral joint dislocation was stabilized using toggle pining technique while diaphyseal fracture was stabilized with bilateral titanium elastic nail and unilateral percutaneous clamp cerclage fixation to prevent postoperative overriding of fracture fragments. The diameter of femur head was approximately 10 mm, which was a major constraint to put 3.5mm toggle pin towards the pelvic cavity. For toggle pinning ultra-high molecular weight polyethylene fiber of size 5 USP was used. Presence of two different surgical conditions in one bone and performing toggle pining in a bone with diaphyseal fracture with very small femoral head makes this case unique and worth to present.

Keywords*: Coxo-femoral, Clamp cerclage, Elastic nail, Toggle pining.*

Persistent Typhoid Burden Amid Advancements: A Systematic Review of *S. Typhi* Trends in India (2000-2024)

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Abstract

Salmonella enterica serovar *Typhi* (*S. Typhi*), the etiological agent of typhoid fever, continues to be a significant challenge to the public health system in a developing country like India. There is persistently high incidence of infection despite the availability of the typhoid conjugated vaccine and advancement in the health and hygienic practices. Moreover, the emergence of MDR and XDR strains has increased the threat to effective clinical management. We have done a systematic review of publications of last 24 years, for *S. Typhi* incidence and antimicrobial resistance in India. For this purpose, we followed the research publications during 2000-2024 with incidence and prevalence of *S. Typhi* and antimicrobial

resistance India. We found that data from the Surveillance for Enteric Fever in India (SEFI) study (2017–2020) estimated a national average incidence of approximately 360 per 100,000 person-years, translating to around 4.5 million cases annually. Incidence was higher among children and in urban areas. These findings highlight that there is need to strengthen Typhoid Conjugate Vaccine (TCV) programs, enhance WASH (Water, Sanitation, and Hygiene) interventions, and maintain robust antimicrobial resistance surveillance to mitigate transmission and control drug-resistant *S. Typhi* strains.

Keywords: *S. Typhi,* typhoid, antimicrobial resistance, systematic review, ep

Purple maize for a healthier future: A breakthrough in multi-nutrient biofortification

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Abstract

Malnutrition remains a major global health issue, especially in developing and underdeveloped countries, where nearly one-third of the population is affected by stunting, wasting, and micronutrient deficiencies. Poor nutrition hampers physical and cognitive development, and limits economic and social progress. Maize, a staple food crop in many regions, is inherently low in essential nutrients such as lysine, tryptophan, vitamin-A and vitamin-E, and completely lacks anthocyanins. The *Purple plant 1* and *Booster 1* genes regulate anthocyanin accumulation in the pericarp, resulting in purple-coloured grains with high antioxidant activity. The *opaque2* mutant significantly enhanced lysine and tryptophan levels (~2-fold), while *crtRB1* and *lcyE* increased provitamin A content by ~5-8-fold. Additionally, a natural variant of *vte4* led to a 2-3-fold rise in á-tocopherol (vitamin-E). Here, we employed genomics-assisted breeding to develop multi-nutrient-rich purple maize by pyramiding *Purple plant1, Booster1, opaque2, crtRB1, lcyE,* and *vte4* genes into four elite inbred lines (PMI-PVE-5, PMI-PVE-6, PMI-PVE-7, and PMI-PVE-8). Foreground selection using gene-based markers in BC• F• , BC, F• and BC, F, generations successfully identified progenies homozygous for all target genes. The seeds exhibited purple pigmentation, thereby confirming anthocyanin expression. Background selection with >100 SSR markers enabled the recovery of >90% of the recurrent parent genome (RPG). Selected plants closely resembled their recurrent parents for key agronomic traits. This is the first-ever development of multi-nutrient-rich purple maize globally, offering a cost-effective and sustainable strategy to combat malnutrition. With its enhanced nutritional profile and agronomic stability, these biofortified maize has strong potential to contribute meaningfully to global Sustainable Development Goals (SDGs) related to health, nutrition, and food security.

Dystocia Due to Fetal Ascites and Ventral Deviation of Fetal Head: Study of two Cases

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Abstract

Difficulty in parturition is referred as Dystocia. Dystocia can result into fetal death, retention of placenta and puerperal metritis. Two cases of pluriparous buffaloes suffering from fetal cause of dystocia were brought to clinics of the university. In Case No. 1, the cause of dystocia was diagnosed as fetal ascites. After epidural anaesthesia to the dam, the fetal abdomen was pierced by long eye hook and gentle forced traction was applied to deliver the dead foetus. In case no. 2, there was severe deviation of fatal head on the ventral side. After epidural anaesthesia to the dam, the fetal mal-posture was corrected through repulsion followed by application of traction on fetal head using eye hook and dead foetus was delivered. In both the cases, the placenta shed off simultaneously with the foetuses. Both the dams were administered with broad spectrum antibiotics, NSAIDS, antihistaminics, fluid therapy and vitamin B-complex for 5 days. Both the dams recovered without any post-partum complication.

Keywords*: Buffalo, Dystocia, Fetal ascites, Ventral deviation of head*

Unlocking Low Temperature Stress in Maize: Physio-Chemical Insights into Early Seed Vigour for Climate-Smart Cultivation

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Abstract

Maize is highly sensitive to low temperature stress during germination and early seedling stage, posing a major limitation for its cultivation in early spring-summer and winter season. The prevailing sub-optimum temperatures (10-15^{O}C) impairs germination, delays emergence, and retards crop growth and yield. The present study was undertaken to assess the effect of temperature on early seed vigour traits of maize and identify parameters for screening lines with better performance under sub-optimum temperatures. Six genetically diverse maize inbred lines were evaluated for physiological and biochemical responses under low temperature (10°C, 15°C, and 20°C) and optimum conditions (25°C). The physiological traits namely germination percentage, seed vigour indices (SVI-I and SVI-II), mean germination time (MGT), and germination rate index (GRI) were assessed. The seed germination (97-79%), seed vigour indices (SVI: 3887 -3770), mean germination time (2.73-1.80 days) were highest

under 25p C followed by 20p C and 15p C, and least under 10p C (seed germination: 64-18 %, SVI: 747-625; mean germination time (5.9-8.3 days). Low temperature-tolerant genotypes showed faster and higher germination, shorter MGT, higher GRI, and better seedling vigour, indicating physiological adaptability. Tolerant genotypes showed higher germination, seed vigour indices (SVI-I and SVI-II), lower MGT and GRI as compared to susceptible lines. Tolerant lines displayed enhanced root system architecture such as better root length, higher lateral branches (forking), and more surface area. Biochemical profiling revealed higher total protein, á-amylase and dehydrogenase activity and antioxidant enzyme activities (Superoxide dismutase, Catalase, Peroxidase), along with reduced hydrogen peroxide (H, O,) accumulation. In contrast, sensitive lines showed poor metabolic resilience and higher oxidative damage under identical stress. The study showed that early seed vigour traits could be used to screen maize lines for their low temperature tolerance and successfully used in breeding programmes.

Keywords: *Maize, low temperature stress, seed vigour, winter sowing, Indian agriculture, oxidative stress, antioxidant enzymes, climate-resilient crops.*

Urban forests for resilient and sustainable cities: integrating ecosystem services, food security, and social-ecological equity

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Abstract

Urban forests are increasingly recognized as essential elements of resilient and sustainable urban environments, providing a diverse array of ecosystem services such as air purification, temperature regulation, carbon sequestration, stormwater management, food provisioning, and fostering social cohesion. Covering nearly 21% of land in global megacities, these green areas help alleviate the negative impacts of urbanization and climate change while promoting public health and ecological balance. In India, urban trees are estimated to eliminate over 100,000 metric tons of air pollutants each year, sequester around 2.7 million metric tons of CO, , reduce urban temperatures by as much as 3°C, and decrease stormwater runoff by 30,000–60,000 gallons per acre annually, thereby playing a crucial role in urban ecological well-being and climate resilience. However, significant inequalities in tree canopy coverage underscore the challenges of environmental injustice and the pressing need for inclusive green planning. A variety of tree species are utilized in Indian urban environments to meet multifunctional objectives. Species that are commonly adapted to urban conditions, such as *Azadirachta indica* (neem), *Ficus religiosa* (peepal), *Polyalthia longifolia* (ashoka), *Cassia fistula* (amaltas), and *Alstonia scholaris* (devil tree), are preferred for their resilience, canopy density, and ability to tolerate pollution and heat stress. Simultaneously, food-producing species like *Mangifera indica* (mango), *Psidium guajava* (guava), *Syzygium cumini* (jamun), and *Moringa oleifera* (drumstick tree) are being incorporated into urban food forestry initiatives to address growing concerns about food security. Additionally, traditional forestry species such as *Tectona grandis* (teak), *Dalbergia sissoo* (Indian rosewood), *Shorea robusta* (sal), *Terminalia arjuna* (arjun tree), and

Butea monosperma (palash) are increasingly being integrated into urban green belts and peri-urban forests to enhance structural diversity, biomass production, and biodiversity. These species not only contribute to the ecological integrity of urban areas but also enhance the overall resilience of urban ecosystems.

Keywords: *Urban forestry, Ecosystem services, Urban sustainability, Climate resilience, Carbon sequestration*

'Manjari Madhura', a new promising grape hybrid for table and raisin purpose

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Abstract

India is one of the major grape producing countries and contributes about 11 percent of global table grape production. Despite of having huge grape production in India, the share in export is only 10 percent of total grape production. The major reason for the limitation in export and domestic markets is a lack of varietal collection. Grape grower demands new varieties that are easy to cultivate and cost effective. ICAR-National Research Centre for Grapes, Pune initiated grape breeding programme, which has resulted in the development of a new grape variety 'Manjari Madhura'. The variety is recommended for table and raisin purposes. It is a heavy yielding variety (>17 kg/vine) with 75-85 bunches/vine, 17-18 mm berry diameter, medium bunch compactness, long pedicle (8.0-8.5 mm), good raisin recovery (25-26 %) and better shelf life (32 days for 5% physiological loss in weight). In comparison to the check variety 'Sharad Seedless', the percent increase for yield per hectare and raisin yield per hectare was 72.0 and 82.0 percent, respectively. However, the benefit cost ratio was 1.76 in Manjari Madhura and 1.23 in Sharad Seedless. As raisins are consumed for nutritive value; comparative analysis was also carried out for reducing sugar, total carbohydrate, phenol, tannin, protein, proline, anthocyanin and colour intensity. Among the biochemical parameters, 36.8 percent increase in anthocyanin content was recorded in Manjari Madhura (2.08 mg/g). Considering the yield potential, nutritive value, shelf life and cost effectiveness; the variety Manjari Madhura is a potential candidate in the table and raisin grape industry.

Keywords: *Manjari Madhura, yield, benefit cost ratio, raisin recovery, biochemical parameters, table grape, raisin grape*

Evaluation of surface water quality of Dahod Reservoir using water quality index

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Abstract

The present study aimed to evaluate the water quality of Dahod Reservoir of Raisen district of Madhya Pradesh, India, using water quality indices. The water samples were collected from four different season ie., monsoon, post- monsoon, Winter, and summer in the year 2023-2024. The collected water samples were

analyzed for the physicochemical parameters like pH, water and air temperature, electrical conductivity, total dissolved solids, total alkalinity, chloride, total hardness, calcium hardness, magnesium hardness, dissolved oxygen, nitrate and orthophosphate. The analysis was carried out according to the standard procedures described by APHA (2012) and Workbook of Limnology (Adoni, *et al.,* 1985). The Seasonal variations in water quality parameters were recorded, compared with standards and pollution status was studied using water quality index. Results showed that all physicochemical parameters were within the prescribed limits by BIS standard. Overall water quality index showed the reservoir falls under excellent to good category, indicating that the water is suitable for drinking and other domestic purposes. These results are essential for the future management of water in Dahod Reservoir.

Keywords: *Dahod, Reservoir, Physico-chemical parameters, Water quality index.*

Gross Study on Spleen of Dog (*Canis lupus familiaris*)

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Abstract

The morphological studies were conducted on the 10 spleens of dog. It revealed that spleen was single largest lymphoid ductless gland in the body and was situated in the left hypogastric region, parallel to the greater curvature of the stomach. The location was determined by the size and position of the other abdominal organs. The spleen was roughly tongue-shaped and appeared reddish-brown in color and often has a purple cast. The average weight was 102 $\pm$ 30.72 gm and it was 0.51 % of the body weight. The average volume was 113.5 $\pm$15.6 ml, average length was 19.5 $\pm$ 0.99 cm, average width was 4.91 cm and thickness was 0.794 cm. It had two surfaces, two borders and two extremities and a hilus.

Keywords*: Gross, Spleen, Dog*

Antifungal Activity of Plant Essential Oils Against Post-Harvest Pathogens of Cultivated Mushrooms in Rupandehi, Nepal

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Abstract

Mushrooms are one of the most important perishable crops having nutritional, medicinal and culinary properties. Postharvest loss of mushroom is common especially of button mushroom. The culture and cultivation of Oyster mushroom is comparatively high in comparison to the Oyster mushroom. Micro-contaminants is the main factor of post-harvest loss of the cultivated mushroom. Chemical pesticide is

always the first choice to control the disease. But, the adverse effects of chemical pesticides on human health and environment cannot be ignored, hence it seems that novel alternative compounds should be applied to control plant pathogens. Altogether 37 species of fungi were detected from the present investigation where Aspergillus flavus, *Aspergillus niger* and Trichoderma viride were the dominant species in their occurrences. Essential oils from the four plants i.e, *Cymbopogon citratus*, Citrus limon, Cinnamomum tamala and Citrus reticulate were investigated in this study to find out their effectiveness against the tested fungi of mushroom species. Eos were extracted from the hydro distillation process using Clevenger's apparatus. GC-MS analysis of the Eos was performed in order to study the physiochemical properties of essential oil that could be involve in the antifungal activity. Among the essential oil used, *Cymbopogon citratus* has shown a complete inhibitory effect on all tested fungi at 20 µl/ml concentration whereas Citrus limon also has shown an absolute inhibitory effect on all tested fungi at a concentration of 40 µl/ml. Cinnamomum tamala also has shown a complete inhibitory effect on the Trichoderma viride. But Citrus limon showed very less inhibitory effect on *Aspergillus niger* and Aspergillus flavus while negligible effect on Trichoderma viride. Thus, plants essential oil can be used as a natural fungicide instead of a synthetic chemical fungicide to control postharvest micro pathogens as they have a promising potential to combat with infectious microorganisms.

Keywords: *Mushroom, Identification of fungal contaminants, microscopic characteristics, Essential oil, Antifungal activity, GC-MS analysis, Postharvest*

Effect of zero and minimal tillage on growth and productivity of potato (*Solanum tuberosum* L.)

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Abstract

In conservation agriculture, soil disturbance is kept to minimum level along with maintenance of soil organic cover with crop residues and crop rotation is practiced. Conservation agriculture has several advantages. A Field experiment was carried out during rabi seasons of 2020-21, 2021-22, 2022-23 and 2023-24 at C-unit research farm of Bidhan Chandra Krishi Viswavidyalaya, to determine the effect of minimum and zero tillage on growth and productivity of potato grown after rice crop. The experiment was laid out in a randomized block design with three replications having seven treatments viz. T_1- Farmer's practice, T_2- Flat planting of seed tubers without slit opening after FYM & fertilizer application+ covering with paddy straw mulch, T_3- Regional AICRP/ ICAR-CPRI recommendations, T_4- Flat-bed planting: Direct planting of potato by opening slit and covering it with soil and no mulching or earthing, T_5- Flat-bed planting & mulching by opening slit + mulching by chopped straw and no earthing, T_6 - Flat-bed planting & ridging: Direct planting of potato by opening slit and covering it with soil, earthing after 20-25 days by tilling soil between rows and no mulching, T_7 - Flat-bed planting, ridging & mulching. The results of the experiment revealed that the treatments significantly affected the plant height, no. of leaves/plant, grade wise tuber yield and total tuber yield of potato. The highest total tuber yield (31.19 t/ha) was recorded under T_3 which was found statistically at par with T_1(28.04 t/ha). Among the minimum

tillage practices T_2 i.e. Flat planting of seed tubers without slit opening after FYM & fertilizer application+ covering with paddy straw mulch recorded the highest total tuber yield (26.08 t/ha) which was found statistically at par with T_7. The treatment T_2 also recorded significantly higher periodic soil moisture content just before irrigation, highest soil organic carbon content at 0-15 cm soil depth and reduced soil bulk density at post harvest soil and recorded highest net return.

Efficacy of botanical and fungicides against *Rhizoctonia solani* Kuhn, the cause of sheath blight of rice

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Abstract

Sheath blight of rice caused by multinucleate *Rhizoctonia solani* Kuhn (teleomorph: *Thanatephorus cucumeri*s Donk) is one of the most devastating diseases in India. This disease renders potential yield losses alone in India has been up to 51.3%. In this study, an attempt was made to evaluate the fungitoxicity of botanicals including, garlic (*Allium sativum)*, Zinger (*Zingiber officinale)*, neem *(Azadirachta indica)*, datura *(Datura stramonium)*, bhang *(Canabis sativa)*, parthenium *(Parthenium hysterophorus*), ashok *(Polyanthia longifolia)*, and clerodendron (*Clerodendrum canescens)* belonging to diverse group of families and various fungicides namely Hexaconazole, Azoxystrobin, Kresoxym methyl, and carbendazim, against *Rhizoctonia solani* both *in vitro* and *in vivo* condition by poisoned food technique at different concentrations. The botanicals were prepared in distilled water, acetone or methanol showed significant inhibition of radial growth of *Rhizoctonia solani.* The 5.0, 10.0 and 15.0% concentration of botanicals were mixed in PDA with 2 % agar using poisoned food technique to evaluate their antifungal activities. The concentrations of fungicides were prepared at 1 ppm, 10 ppm, 25 ppm, 50 ppm and 100 ppm concentration by the "poisoned food technique" observations were taken after 24, 48 and 72 hrs of incubation. The increase in per cent inhibition was invariably proportional to the increase in the concentration of each botanical as well as fungicides. Among all the botanicals, minimum radial growth (10.69 mm) with maximum per cent inhibition (71.71 %) was observed by datura followed by ashok with radial growth (14.93 mm) and per cent inhibition (60.49 %) after 24 hrs of incubation at 5 % concentration. Pot experiments conducted under artificial inoculation conditions revealed that 10 % extract of datura showed minimum relative lesion length (23.71 %) and maximum per cent reduction (67.19 %), followed by ashok which showed (30.23 %) RLH and (58.17 %) reduction over control. However, maximum RLH (57.63 %) with least disease reduction (20.26%) was found in case of chlorodendron. Among all the fungicides, maximum inhibition of radial growth of *R. solani* was observed with hexaconazole (38.28 %) followed by azoxystrobin (24.81 %), while minimum inhibition of radial growth was observed with kersoxim methyl (7.95 %) followed by carbendazim (23.57 %), 72 hrs after incubation at 1 ppm concentration.

Regulatory influence of sugars on amylase production by *Aspergillus fumigatus* using agricultural waste as fermentation substrate

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Abstract

Amylases are one of the most important microbial enzymes and are used in many industrial applications. *Aspergillus fumigatus* NTCC1222 has been found to successfully use cheap lignocellulosic residues to produce amylases with potential applications in textile desizing (Singh et al., 2014). In current times with urgent need of adopting sustainable industrial practices, lignocellulosic biomass offer a precious resource to generate valuable products of economic value while aligning well with the Sustainable Development Goals (SDGs). The current study evaluates the influence of additional sugars on amylase production, under solid state fermentation using wheat bran, a cheap and readily available agro-industrial residue, as the substrate. 12 different sugars (Monosaccharides, Disaccharides and Polysaccharides) were added to the wheat bran-based fermentation medium to see the potential effect of the given simple and complex sugars. Amongst monosaccharides, galactose exhibited the best positive effect with about 46% higher enzyme activity than control. Cellobiose was the best enhancer of amylase activity as a disaccharide, when evaluated against sucrose, lactose, maltose, melibiose. Glycogen best supported amylase production amongst the polysaccharides tested. The highest increase and decrease in amylase production was observed for galactose (+45.53% at 0.50% concentration) and soluble starch (-94.22% at 1.25% concentration), respectively, amongst all the sugars evaluated. Interestingly, fungal growth decreased at all concentrations for soluble starch. The given investigation helps us to understand the effect of different sugars as metabolic regulators, while assisting in improving amylase production using wheat bran as substrate.

Keywords: *Amylase, Sugars, Metabolic regulators, Wheat bran, Sustainability, Solid State Fermentation*

Combined effect of Ultrasound and Blanching Pre-treatments on the Physicochemical, Nutritional and Phytochemical Properties of Quince based Sugar Free Tooty Frooty

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Abstract

Quince (*Cydonia oblonga*) an important pome fruit of temperate growing region belongs to Rosacea family. The fruits though packed with nutrients and health promoting nutraceuticals the direct consumption of fruits limited owing to astringency caused by tannins. The present study aimed at processing the quince into value added tooty frooty using ultrasonication as a pretreatment. The size

reduced fruits were pretreated with ultrasonication (40 % amplitude for 60 sec) and sequentially soaked in jaggery syrup (60 °Brix for 3, 6, and 9 min) maintained in water bath at 60 °C. The fruits without ultrasonication pretreatment acted as control and were osmotically dehydrated in jaggery syrup (60 °Brix for 30 min) in a water bath (60 °C). All the samples were dehydrated with tray drier at 55 °C for 18 hours. The dehydrated fruits were analyzed for physicochemical, nutritional, and functional properties. The ultrasonication as pretreatment had significantly lowered the osmotic time uptake by the fruits by 70% as compared with control. The ultrasonically pretreated fruits had an improvement in L^* (54.84±3.1 -56.95 ± 2.58) which denotes an improved uptake of solute owing to cavitation effect and reduced enzymatic browning. The treated fruits had a better retention of vitamin C (5.76±0.34 mg $100g^{-1}$), as compared with the control (2.97±0.12 mg $100g^{-1}$) which may have been destroyed due to prolonged high temperature exposure. The treated fruits also exhibited highest antioxidant activity (169.35 ± 3.75 ìM Trolox $100g^{-1}$) due to better retention of polyphenols. Notably the tannin content lowered significantly (p<0.05) in the treated fruits thus mitigating the astringency effect. Among all the treatments, the fruits pretreated for 9 min showed optimal texture, improved sensory performance, greater overall acceptability and a better retention of nutritional and phytochemical components.

Keywords: *Quince; Ultrasonication; Vitamin C; Jaggery; tooty-frooty, Tannins*

Identification, Characterization, and Collection of a Unique Year-Round Jackfruit Germplasm

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Abstract

Jackfruit (Artocarpus heterophyllus) is a highly valued tropical fruit with numerous applications and nutritional benefits. Despite its potential, jackfruit is considered an underutilized crop, particularly in tropical to subtropical climates, where factors such as ignorance, lack of post-harvest technology, and shortcomings in supply chain systems contribute to significant fruit wastage. This study focused on the exploration and collection of a specific jackfruit cultivar, known as Barahmasi Kathal, which is renowned for its year-round fruit production and is particularly relevant for meeting consumer demands during off-seasons. We surveyed Khunti, Simdega, and neighbouring areas of Ranchi District of Jharkhand and collected a high-yielding, year-round fruit-bearing tree (IC 0650715) at Domtoli, Simdega. The cuttings were grafted and planted for establishment and conservation at the ICAR-NBPGR regional station in Ranchi. Morphological traits of the source tree were recorded during scion collection, and the geo-coordinates collected during the expedition were projected on a map. The study concluded that the continuous fruit-bearing habit of Barahmasi Kathal offers a consistent source of fruits, commanding higher prices in the off-season, and thus providing farmers with a commercial advantage.

Structural and Rheological Optimization of Gellan gum-Agar Biopolymers for *Xylanase* Immobilization and Food Processing Applications

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Abstract

Gellan gum, produced by *Sphingomonas elodea*, and agar, extracted from red algae such as Gelidium spp., are anionic polysaccharides known for their excellent gel-forming ability, biocompatibility, and environmental safety. Their rheological properties, including elasticity and shear strength, are essential for applications in enzyme immobilization and industrial processing. Xylanase is a microbial enzyme that catalyzes the hydrolysis of xylan, a major hemicellulose component in plant cell walls. It plays a vital role in biotechnological applications such as pulp bleaching, animal feed enhancement, and fruit juice clarification. In this study, xylanase was produced from *Bacillus australimaris* KS2 under optimized conditions and immobilized on gellan-agar (GLA) beads prepared using 0.5% gellan gum and 0.2% agar. Rheological analysis of the GLA beads showed significantly higher shear stress tolerance and gel strength due to synergistic polymer interactions. The produced xylanase was immobilized on glutaraldehyde-activated GLA beads. The immobilization was confirmed through SEM and FTIR analysis, resulting in a 60.07% yield and 80.23% efficiency. The immobilized xylanase retained 51.77% of its activity at 75°C, whereas the free enzyme exhibited almost complete activity loss. Furthermore, immobilization notably improved enzyme reusability, thermal stability, and pH stability. After 1 month of storage, the immobilized xylanase maintained 75.44% of its initial activity, compared to only 31.70% for the free enzyme. Treatment of wood apple (*Limonia acidissima*) juice with immobilized enzyme led to higher clarity, increased reducing sugar content, reduced turbidity, acidity, and viscosity, and enhanced its filterability. This study highlights a microbiologically driven solution that combines biopolymer science, enzyme technology, and food processing innovation to support environmental sustainability and industrial efficiency.

Keywords: *Gellan gum, Agar, Rheology, Xylanase, Xylan, Immobilization, Wood apple juice*

Impact of forest fire severity on soil in Chir Pine (*Pinus roxburghii*) forest of Narendra Nagar Forest Division, Tehri Garhwal, Uttarakhand

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Abstract

Chir Pine (*Pinus roxburghii*) forests, widespread across the Western Himalaya, are highly susceptible to recurrent forest fires, which significantly alter soil properties and forest health. The impact of forest fires on vegetation and soil properties depends significantly on the fire regime, including factors such as frequency, intensity, duration, spatial extent, and the season in which the fire occurs within a given ecosystem. In this study, changes in physico-chemical properties of soil in Chir pine forest of Saklana Chamba Range, Tehri Garhwal Forest Division, Uttarakhand are assessed over various fire severity classes. Sentinel 2 data was used to obtain differenced normalised burn ratio (dNBR) to classify the burned region in the study area into different fire severity classes that is Low severity, Moderate severity, High Severity and Unburnt Class. Random point generator of ArcGIS is used to generate location points in various severity classes for soil sampling. Field assessments reveal that frequent surface fires lead to a substantial decline in Organic Carbon %, particularly in the topsoil (0–10 cm), due to combustion of organic litter and surface humus. Soil nitrogen and phosphorus levels also decrease post-fire, while pH tend to increase. The findings highlight that repeated fires in Chir Pine forests degrade soil quality, impede natural regeneration, and may compromise long-term ecosystem productivity. These insights underscore the need for effective fire management and soil conservation strategies in fire-prone Himalayan regions.

Keywords: *Remote sensing; Ecology; Soil Sampling; Fire Severity; Western Himalaya.*

Comparative Study of Hymenoptera (Apoidea) Pollinator Diversity and plant-pollinator interaction in Two Forest Types of Garhwal, Uttarakhand

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Abstract

Pollinators from the order Hymenopter (Apoidea) play a vital role in maintaining biodiversity and ecosystem functioning through their interactions with flowering plants. This study investigates the diversity and plant–pollinator interactions of hymenopteran insects across two distinct forest types—(i) Shivalik Sal forest and (ii) Ban oak forest —in the Garhwal region of Uttarakhand, India. Field surveys were conducted using transects walk method during the flowering seasons across selected plant species. Hymenoptera were recorded, belonging to families such as Apidae, Halictidae, Megachilidae, Colletidae and Andrenidae. The comparative analysis revealed significant variations in species richness and pollination activity between the two forest types.

Keywords: *Hymenoptera, Pollinator diversity, Apoidea, Forest, Biodiversity and Ecosystem*

Demonstration of Pangasius catfish for inland saline water (2-4 ppt) fish culture

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Abstract

The water resources for fish farming are being utilized from rain fed as well as irrigation. Fish seeds and feed found to be critical input for encouragement of fish farming. The brackishwater based fish seeds availability of this district is mostly depending on the natural resources and season bounded. Thus, it is often unable to do fish culture by the farmers in the need based circumstances. During the rainy season, salinity may arrive below 6 ppt and it is most suitable to culture the salinity tolerant freshwater fish varieties like Pangasius catfish, etc. Hence it is essential to increase the inland fish production in low saline based fish ponds particularly using Pangasius catfish both horizontally and vertically. In the present study, Pangasius catfish was stocked separately at 1500 Nos (1 No/sq.mt.) in 0.15 Ha earthen ponds for 6 months culture period at ten villages (Totally 20 fish ponds) in Chengalpattu district, Tamil Nadu, India. Among total locations, each 10 Nos were allotted with Pangasius catfish and the remaining 10 fish ponds with Polyculture of carps and Tilapia were used as farmers' practice (control). The higher fish growth (0.52 kg), survival (87.70 %) and production (4560 kg/Ha) was significantly ($p<0.05$) showed in the fish production of Pangasius catfish when compare with farmers' practice of fish growth (0.36 kg), survival (77.60 %) and production (2794 kg/Ha). Therefore, the Pangasius catfish culture may be a suitable intervention for inland saline water (2-4 ppt) based fish farming about higher fish production.

Keywords: *Fish culture, Pangasius catfish, growth, inland saline water, fish pond*

Effect of some botanicals on the biology of rice weevil *Sitophilus oryzae* (Linnaeus)

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Abstract

A laboratory experiment was carried out during 2023-2024 in the Entomology Department at the Institute of Agricultural Sciences, SOADU, Bhubaneswar, Odisha, to evaluate the effectiveness of various plant powders against the rice weevil *Sitophilos oryzae* (Linnaeus). The tested plant materials included seeds and leaves of *Azadirachta indica* (Neem), along with powders from *Pongamia pinnata*, *Calotropis procera*, *Annona reticulata*, *Lantana camara*, *Vitex negundo* leaves, dried fruits of *Capsicum annum*

(chili), and rhizomes of *Curcuma longa* (turmeric), applied at 5% and 10% concentrations. The study showed that egg-laying by the pest varied from 3.55 to 24.52 eggs depending on the treatment. The fewest eggs were laid in the Neem Seed Kernel (NSK) powder treatment (8.06 and 3.55), indicating high effectiveness. Chili and *Calotropis* powders also reduced egg-laying. The development period from egg to adult was longest in NSK powder (34.5 and 41.3 days) and shortest in *Lantana* leaf powder (24.52 and 19.68 days). The highest adult emergence rate was seen in *Lantana* leaf powder (41.94% and 37.12%), while the lowest occurred with NSK powder (6.12% and 2.40%). Male longevity peaked in the *Lantana* treatment (21.7 and 16.5 days) and was shortest with NSK powder (2.2 and 1.6 days); a similar pattern was observed in females (22.2 and 18.9 days in *Lantana*, 2.6 and 2.0 days in NSK). The highest mortality rates were recorded in NSK powder treatments (97.24% to 99.70%), while the lowest were in *Lantana* leaf powder (23.87% to 46.57%). In conclusion, Neem Seed Kernel (NSK) powder proved to be the most effective plant-based treatment against rice weevil, showing the highest mortality and lowest reproduction. In contrast, *Lantana camara* leaf powder was the least effective, with higher adult emergence and lower mortality.

Keywords: *Rice weevil Sitophilos oryzae, Botanicals, Plant powders, Neem, Biology.*

Development And Analysis of Cereal-Pulse Based Crackers Enriched with Betel Leaves (*Piper betle*)

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Abstract

Betel leaves, popularly known as paan in India are dark green heart shaped leaves, belonging to *Piperaceae* family and is recognized for its medicinal and nutritional value especially for those suffering from non-communicable diseases. The present study was therefore undertaken to develop crackers using a combination of cereal-pulse (oats and black gram) and further enriched with betel leaves at 5%, 10%, 15%, 20% and 25% levels. Consuming whole grain cereals and pulses in a combination has been associated with protection against chronic inflammatory and lifestyle related diseases. Further, the sensory parameters of the developed crackers were evaluated organoleptically using 9- point hedonic scale, where in Variation D, that is crackers prepared with 15% of fresh betel leaf, also known as 'misti paan' of Bengal scored the highest (7.44±1.45). This variation was further assessed for its nutritional content. Results revealed that crackers prepared with 15% betel leaf contained moisture (9%), crude fiber (9.9%), carbohydrate (15.3g), protein (3.32g) and fat (10.67g) per 100g of the product. The â-Carotene, vitamin C, iron, calcium, phosphorus, sodium, potassium, magnesium content was found to be higher in the developed product than the basic one. Phytochemicals have been linked to lower the probability of chronic diseases like diabetes, heart disease, cancer, and age-related disorders due to the antioxidant and anti-inflammatory qualities. The phytochemical analysis showed that tannin, total phenolic compounds, flavonoids and oxalic acid content was also higher in the developed product thus

increasing the antioxidant scavenging activity which was evaluated using DPPH method. The crackers were suitable for more than 60 days of storage at room temperature, according to the shelf-life study based on microbiological load, making it fit for consumption for a long duration of time.

Keywords: *Betel leaves, crackers, non- communicable disease, phytochemical, shelf life.*

Clinical and Microbiological Insights into *Flavobacterium* Infections in Cultured Fish of Bihar

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Abstract

Bihar is an inland state with rich freshwater resources like ponds, rivers, canals and wetlands, making it ideal for inland aquaculture. As the aquaculture expands, fish health management becomes a critical component for sustainable fish production and farmers' profitability. Flavobacteriosis or columnaris disease is an important emerging freshwater fish disease due to its wide range of habitat and opportunistic behaviour. Although clinical signs of *Flavobacterium*-like infections have been observed in cultured fish from Bihar, the disease has not been formally documented to date. The goal of this study was to isolate, identify, and characterize the bacterial flora associated with flavobacteriosis in cultured fish of Kishanganj, Bihar. In the current study, a total of 38 bacterial strains were recovered from various freshwater fishes, including carps, catfish, and ornamental fishes with emaciated bodies, ulceration, eroded gills, body discoloration, and haemorrhages, all of which often resonating to flavobacteriosis. Bacterial strains were identified as *Flavobacterium* or closely associated strains according to clinical signs, phenotypic characterization and biochemical characteristics specific to distinguish *Flavobacterium spp*. Furthermore, mixed bacterial infections and parasitic infestation were also encountered which is common for flavobacteriosis diseased fish. The research involves a thorough overview of the disease, which maps the notable favourable temperature changes in the sampling area which may be a dominant reason for escalating the disease outbreak. The findings highlight the temporal pattern of the disease based on the recorded signs, symptoms and other variations which can be used to assist in early detection and management of the disease, thereby contributing in successful fish production in Bihar.

Keywords*: Freshwater fish, Bacterial, Flavobacteriosis, Flavobacterium spp., Bihar*

Integrative Taxonomy and Molecular Characterization of Chalcid Wasps Associated with Himalayan Indigo Galls: Advancing Eco-Friendly Pest Management and Biodiversity Conservation in Hill Agroecosystems

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Abstract

An urgent need for sustainable and environmentally friendly pest management in agriculture has intensified interest in natural enemies as alternatives to chemical pesticides, which often cause ecological harm and pest resistance. Chalcid wasps (Hymenoptera: Chalcidoidea) are pivotal in their ecological role yet understudied parasitoids that naturally regulate gall-inducing insect populations, particularly in the biodiversity-rich but fragile Himalayan ecosystems. This study delivers the first integrative taxonomic and molecular characterization of chalcid parasitoids associated with spherical stem galls induced by Cecidomyiidae (Diptera) on *Indigofera heterantha* in Lohaghat, Uttarakhand, India. Field surveys and laboratory rearing from July 2023 to September 2024 revealed 08gall-forming midges and 04chalcid genera—*Aprostocetus* and *Tetrastichus* (Eulophidae), *Eurytoma* (Eurytomidae), and *Torymus* (Torymidae)—emerging from single galls, highlighting a rare instance of multiple parasitism. Morphological identification was combined with optimized molecular protocols targeting mitochondrial COI and nuclear 28S rRNA genes. Phylogenetic analyses resolved taxonomic ambiguities and clarified evolutionary relationships, filling critical knowledge gaps in Himalayan Chalcidoidea systematics. Ecological observations, including dynamic gall pigmentation tracked via macrophotography, provided a novel, non-invasive substitution for monitoring host-parasitoid interactions and parasitoid development. This research establishes a taxonomic and genetic baseline for future biodiversity assessments, enabling precise monitoring and conservation of these natural biocontrol agents. By bridging taxonomy, molecular biology, and ecology, this work demonstrates the superiority of chalcid wasps as eco-friendly, sustainable alternatives to chemical pesticides, supporting crop protection, environmental health, and rural livelihoods. The findings also highlight the urgency of conserving these intricate multitrophic networks, which are vital for ecosystem stability and climate-resilient agriculture, and provide actionable data for policymakers to promote biodiversity-based pest management in hill agroecosystems.

Keywords: *Chalcid wasps, biocontrol agents, integrative taxonomy, sustainable agriculture, biodiversity conservation, host-parasitoid interactions.*

Effect of gibberellic acid and calcium on morphological and biochemical traits of linseed under salinity stress

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Abstract

The experiment was conducted to investigate the impact of gibberellic acid and calcium on the morpho-physiological and biochemical responses of linseed genotypes under salinity stress. The plants were exposed to three different salt stress conditions. Salt stress adversely affected morpho- physiological and yield-attributing parameters. The effects were more pronounced at higher salt concentrations resulting in huge decline in physio-biochemical parameters such as RWC, chlorophyll content, antioxidant enzyme activities and increase in electrolyte leakage. The foliar application of gibberellic acid and calcium increased growth and development by decreasing oxidative stress and raising the activities of antioxidant enzymes under salt stress, whereas the combined application of gibberellic acid and calcium showed

the highest increase when compared to control. These findings suggested that gibberellic acid and calcium application might be a useful technique for enhancing crop growth and lowering oxidative stress in saline soil.

Keywords: *Amelioration, flaxseed, GA_3, antioxidant enzyme, salinity tolerance, salt stress*

Effect of potassium nitrate sprays on the yield and fruit size of kiwifruit

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Abstract

Kiwifruit (*Actinidia deliciosa*) is a high-value temperate fruit crop, and improving its yield and fruit quality is essential for commercial success. Despite potassium being a key macronutrient for fruit development, limited research exists on the effect of foliar potassium nitrate (KNO_3) application on the yield attributes of kiwifruit. Therefore, the present study was undertaken to evaluate the impact of foliar KNO_3 sprays on yield and fruit size under field conditions. Seventeen-year-old kiwifruit vines were subjected to foliar sprays of KNO_3 at three concentrations: 1.0%, 1.5%, and 2.0%, with varying spray frequencies—single, double, and triple applications. The treatments were scheduled as follows: the first spray was applied at 15 days after full bloom (DAFB), followed by a second spray at 60 DAFB and a third spray at 90 DAFB, depending on the treatment. A water spray was used as the control for comparison. The results revealed that foliar application of potassium nitrate significantly enhanced the fruit yield and improved the number of marketable (A grade) fruits compared to the control. Among the treatments, a single spray of 1.0% KNO_3 at 15 DAFB produced the highest fruit yield, fruit number per vine, and number of A grade fruits. However, increasing the frequency of sprays, especially at higher concentrations, showed a declining trend in yield and fruit quality, suggesting that excessive or repeated KNO_3 application may exert a phytotoxic effect or disrupt physiological balance. In conclusion, the study indicates that a single foliar application of 1.0% potassium nitrate at 15 DAFB is optimal for enhancing yield and fruit size in kiwifruit, while repeated applications may not provide additional benefits and can be counterproductive.

Keywords: *Kiwifruit, Foliar spray, Potassium nitrate, Fruit yield, Fruit size.*

Bioprospection of the Plant Microbiome for sustainable fodder production

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Abstract

A huge gap exists in fodder availability and requirement leading to the unavailability of sufficient amount of good quality fodder. various factors which further leading to the reduction in terms of quantity and quality include climate change, abiotic stress (drought, temperature variations, salt stress), disease and pest (emergence of disease and pest-reduce quality as well as quantity, problem in post harvesting), nutrient stress (phosphate, potassium, iron etc.) shrinking area under forage crops, extensive farming of food crops. There are many scientific methods for agronomical trait improvement in fodder crops including breeding methods; biotechnological methods: MAS, transgenics. use of chemicals for disease and pest management. Some of these methods are may be time consuming while other are costly and may have harmful impact on environment. Along with these methods, usage of plant associated microorganisms for various agronomical traits improvement is gaining importance day by day as a more environment friendly approach. Plants are colonized extensively by diverse microbes (bacteria, fungi, actinomycetes etc.) these Complex Plant-microbe interactions is highly required for sustaining plant life. The Plant Microbiome plays such an important role for the growth and development of plant so regarded as Plant's Second Genome. Plants provide nutrition and shelter to associated microflora while microorganisms contribute for yield and quality of the crops by High Biomass production and supporting plant growth and morphogenesis via production of phytohormones, small molecules or VOCs. The plant associated microbes provide tolerance to abiotic factors (drought, heat, cold and salt stress) and activation of stress related genes in plants and Resistance to diseases (Antagonism, activation of immune response and defence related genes in plants). Some of the microorganisms help in the Nutrient nitrogen fixation, mineral (phosphate, potassium, iron) and mobilization from soil to plants and thus contribute for plant health and growth. Thus, the untapped potential of plant associated microbes constituting Plant Microbiome particularly in harsh environmental conditions can further be utilized to improve desired traits in fodder crops in a sustainable way.

Keywords: *Plant microbiome, biofertilizers, stress tolerance, sustainable fodder production.*

Performance Evaluation of Sweep type Manual Weeder in Clay Loam Soil Condition of Dediapada *taluka* of Narmada District

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Abstract

A manual weeder fabricated at workshop of College of Agricultural Engineering & Technology, Dediapada was evaluated in field. The manual weeder consists of two ground wheels made up of mild steel and each wheel having diameter 255 mm and width 20 mm. Three MS tines are attached to the main frame of weeder. A handle of length 1500mm made up of mild steel pipe of 25 mm diameter is welded to axle pipe joining two ground wheels. The height of tines with respect to main frame can be adjustable according to requirement and height of operator. The overall length and width of weeder are 1750 mm and 160 mm respectively. The manual weeder was evaluated in experimental field adjacent to college building. The texture of soil in field is clayey loam having bulk density 1.325 g/cc and moisture content 15 to16% wb. Gram crop was sown with row to row spacing of 45 cm. The speed of operation was 1 km/h. The effective field capacity and field efficiency were found to be 0.0274 ha/h and 76.40% respectively. Weeding efficiency and plant damage were found to be around 78% and 2% respectively. Five healthy male farm workers were selected for ergonomic evaluation of manual weeder. The results shows that the operation of weeding using manual weeder at selected speed of 1km/hr. comes under the workload category of Moderately heavy work according to heart rate, oxygen consumption and energy consumption of operator. In comparison to hand weeding, weeding by selected manual weeder saves time and cost of operation by 36.27%.

Keywords*: manual weeder, weeding efficiency, energy consumption*

Exploring the Relationship Between Plant-Type and Grain Quality Traits in Rice (*Oryza sativa* L.) Through Canonical Correlation Analysis

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Abstract

Rice (*Oryza sativa* L.) is a globally important staple crop, with both yield and grain quality being key targets in modern breeding programs; however, the genetic and phenotypic interrelationships between plant-type and grain quality traits remain complex and underexplored. This study aimed to investigate these relationships in *indica* rice by applying Canonical Correlation Analysis (CCA) to a panel of 110 genetically diverse germplasm accessions evaluated under a randomized block design with three replications. Phenotypic data were collected for 12 plant-type traits and 9 grain quality traits, and both canonical correlation and redundancy analyses were conducted using R statistical software to assess the linear associations and interdependencies between the trait groups. The first two canonical functions accounted for 61.32% of the total shared variance (34.91% and 26.40%, respectively), and although the

canonical correlations were not statistically significant ($p > 0.05$), the first function revealed moderate biological associations, particularly between flowering time and grain quality parameters. Traits such as kernel breadth, length–breadth ratio, and amylose content exhibited appreciable correlations with plant architecture traits including biomass yield and the number of productive tillers. These findings, while not statistically conclusive, suggest biologically meaningful interactions and support the use of CCA as a valuable exploratory tool for integrated trait selection, thereby contributing to the development of breeding strategies that simultaneously optimize yield and grain quality in *indica* rice improvement programs.

Keywords: *Plant type traits; Grain quality parameters; Simple correlation; Canonical correlation*

Soil health management through INM in Baby Corn

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Abstract

A field experiment conducted during *rabi* season of 2011-12 on College Farm, Navsari Agricultural University, Navsari on heavy black soil to study the effect of Integrated Nutrient Management on growth and yield of baby corn. The treatments comprising all possible combinations of five levels of Nitrogen (chemical fertilizer and vermicompost) with and without bio-fertilizer (*Azotobacter* and PSB) were tried in randomized block design with three replications. The cob and fodder yields were significantly affected with different integrated nutrient management treatments. Significantly the highest yield of corn (1.76 t ha^{-1}), fodder (32.08 t ha^{-1}), net realization (215384 ¹ ha^{-1}) and BCR (12.54) were recorded with the application of 100% RDN from chemical fertilizer along with bio-fertilizer. The crude protein, Vitamin-C and total sugar were recorded higher with application of 100% RDN from vermicompost. The highest available N (220 kg ha^{-1}), P_2O_5 (30.8 kg ha^{-1}) and K_2O (383 kg ha^{-1}) in soil was recorded by 100% RDN from vermicompost.

Combining Ability and Heterosis Studies in Okra [*Abelmoschus esculentus* (L.) Moench] For Plant and Yield Attributing Parameters through Half Diallel Analysis

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Abstract

The present experiment was conducted in okra to observe the extent of combining ability and heterosis for eight characters of plant and fruit yield traits through diallel analysis. The characters consist of plant height (cm), number of primary branches per plant, node at which 1st flower appears, number of nodes on main stem, internodal length, days to 50% flowering, pod yield per plant (g) and pod yield per hectare (q/ha). The experimental material comprised of 66 F1 hybrids developed from crossing 12 okra genotypes in diallel crossing excluding reciprocals. Both GCA and SCA variances were highly significant for all the characters indicating the importance of both additive and non-additive gene actions. However, the relative magnitude of GCA and SCA, variances revealed that the magnitude of GCA was less than SCA variance indicating that the non-additive component was of major importance in the expression of all the characters. The highest GCA effect for pod yield per plant and pod yield per hectare were recorded in IC-45802, Parbhani Kranti and VRO-3. The highest significant positive SCA effect was observed in the cross combinations *viz.,* IC- 45802×SB-8, IC-45802×Pusa A-4 and IC-282272×Sel-4 for pod yield per plant and pod yield per hectare. Out of eight charac-ters studied, plant height, number of branches per plant and number of nodes on main stem are growth determining features and decide the pod bearing surface of the plant. Therefore, Positive heterosis is desirable for these characters but negative heterosis is profitable for node at which 1st flower appears, intermodal length and days to 50% flowering. Out of 66 F1, 50, 32 and 38 hybrids showed significant heterosis positively over mid par-ent, better parent and standard check respectively for fruit yield per plant and fruit yield per hectare and the highest was reported in hybrids IC-45831 ×IC-43733 subsequently IC-45831 ×Pusa A-4.

Keywords: *Okra, Plant, Hybrids, Heterosis, Diallel cross, GCA, SCA*

Heavy Metals and Cadmium toxicity in soil and plants

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Abstract

Heavy metals such as cadmium, copper, lead, chromium, and mercury are substantial environmental contaminants, especially in places with considerable human activity. Heavy metal deposition in soils is an issue in agricultural production because it has a negative impact on food safety and consumer appeal, growth of crops due to phytotoxicity, and soil organisms' environmental health. Plants and their metabolic activities influence the geological and ecological redistribution of heavy metals via contamination of the air, water, and soil. Plants grown in metal-polluted environments have altered metabolism, growth decrease, poorer biomass production, and metal buildup. Metals affect a variety of physiological and biochemical processes in plants. This study focused on the hazardous effects of heavy metals in three key ecosystem components: soil, plants, and humans. The dangers of heavy metals especially Cadmium were thoroughly highlighted. The presence of Cd in agricultural soil not only impacts plant physiology and crop productivity but also poses significant risks to human health through bioaccumulation in edible plants. Understanding the mechanisms of Cd uptake, accumulation, and phytotoxicity is essential

for developing effective strategies for phytoremediation, soil management, and pollution control. Further interdisciplinary research is vital for mitigating heavy metal pollution and ensuring ecological and agricultural sustainability**.** There is an urgent need for long-term monitoring of soil and food crops, development of Cd-resistant crop varieties, use of biofertilizers, development of low-Cd-accumulating crop genotypes, application of biochar and organic amendments to immobilize Cd. Integrated monitoring systems for agroecosystems and Policies limiting Cd emissions and promoting sustainable agriculture and mycorrhizal inoculants and strict enforcement of effluent discharge standards.

Keywords: *Heavy Metals, Contamination, Cadmium toxicity.*

A Study of Organoleptic Properties of Unused and Expired Tablets: A Case Study of Deplatt and Cefixime Tablets

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Abstract

Pharmaceuticals wastes are considered as emerging contaminants. It includes many types. Among these, the expired and unused tablets are considered for main concerns. The unused and expired medicines, have become an emerging class of the environmental contaminants with the significant impacts for both ecological and human health. Among them, oral dosage forms like tablets are frequently accumulated and improperly discarded, leading to the unintended release to the environment. In the present study, a preliminary evaluation of the organoleptic properties of unused and expired tablets—specifically Deplatt (clopidogrel and aspirin based antiplatelet drug) and Cefixime (a third-generation cephalosporin antibiotic) was studied in order to assess its physical stability and potential degradation over the period of time in any environmental conditions. The organoleptic evaluation of these tablets helps in determining its disintegration and toxic effects, once it reaches the external environment. The organoleptic characteristics includes the evaluation of colour, odour, taste, layer, size, shape and therapeutic class. The physical tests such as hardness, friability, disintegration and dissolution study of both unused and expired Deplatt and cefixime tablets were conducted. The experimental results it was observed that, both Deplatt and cefixime tablets showed a slight change in its physical appearance. While color, odor and taste remained unchanged. The expired tablets showed increased hardness and disintegration time in both the tablets. The hardness of the expired Deplatt was found to be 0.334g and 0.301g in unused tablet. Similarly, the hardness of the expired cefixime observed was 0.763g and 0.723g in unused. Most significantly, drug dissolution sharply declined in the expired samples, with Deplatt showing only 0.0012% and Cefixime 0.125% dissolution in comparison with the unused tablets respectively. These findings highlight the potential inefficacy of the expired medicines and emphasize their role as emerging environmental contaminants when improperly disposed due to its less dissolution patterns once it expires.

So, effective management of disposal of unused and expired tablets has to done before discarding along with the domestic wastes.

Keywords: *Expired tablets, Organoleptic Properties, Unused Tablets, Deplatt and Cefixime*

Effect of bio-enriched paddy straw compost on reduction of chemical fertilizers in rice-wheat cropping system

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Abstract

Indiscriminate application of chemical fertilizers in long run affects the soil health, ecosystem and environment. In the present scenario, there is an increasing awareness among the stake holders (farmers, scientists, policy makers etc.) about the ill effects of chemical fertilizers on soil, plant and human health and the importance of biological inputs in agriculture. In the recent past, the Government of India has taken major initiative on organic farming, promotion of biological inputs and restoration of soil health. Considering the facts, the present study aimed to evaluate the effect of application of bio-enriched paddy straw compost on productivity of rice-wheat cropping system at reduced application rates of chemical fertilizers. The study was conducted at the research farm of ICAR-NBAIM, Mau during 2023 *kharif* and *rabi* seasons on rice and wheat crop, respectively. The bio-enriched paddy straw compost was prepared using ICAR-NBAIM rapid composting technology (Kush Bio-Fast decomposer). The mature compost was prepared in an accelerated manner within 60 days with enhanced quality (Total NPK of compost- 1.65, 0.44 and 1.63, respectively). There were five treatments: T1- Absolute control (No manures); T2- Compost 2.5 t/ha; T3- Compost-1.25 t/ha + 50 % Recommended NPK; T4- Compost 0.625 t/ha + 75 % Recommended NPK; T5- Positive control (Recommended NPK). There were four replications in each treatment and thus 20 plots of 35 m^2 each in the study. The results showed the yield (q/ha) of T4 (rice – 38.24; wheat-33.74) is at par with T5 (rice-39.48; wheat- 32.09) which represents 25 % recommended chemical fertilizers could be replaced with bio-enriched compost (0.625 t/ha). The study has importance as the continuous application of compost will reduce the dependency of chemical fertilizers substantially and therefore the soil health is restored, decreased cost of production and enhanced productivity and quality of the produce.

Keywords*: Rice, Wheat, Chemical fertilizers, Paddy straw, Bio-enriched compost, Yield*

Persistent Typhoid Burden Amid Advancements: A Systematic Review of *S. Typhi* Trends in India (2000–2024)

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Abstract

Salmonella enterica serovar *Typhi* (*S. Typhi*), the etiological agent of typhoid fever, continues to be a significant challenge to the public health system in a developing country like India. There is persistently high incidence of infection despite the availability of the typhoid conjugated vaccine and advancement in the health and hygienic practices. Moreover, the emergence of MDR and XDR strains has increased the threat to effective clinical management. We have done a systematic review of publications of last 24 years, for *S. Typhi* incidence and antimicrobial resistance in India. For this purpose, we followed the research publications during 2000-2024 with incidence and prevalence of *S. Typhi* and antimicrobial resistance India. We found that data from the Surveillance for Enteric Fever in India (SEFI) study (2017–2020) estimated a national average incidence of approximately 360 per 100,000 person-years, translating to around 4.5 million cases annually. Incidence was higher among children and in urban areas. These findings highlight that there is need to strengthen Typhoid Conjugate Vaccine (TCV) programs, enhance WASH (Water, Sanitation, and Hygiene) interventions, and maintain robust antimicrobial resistance surveillance to mitigate transmission and control drug-resistant *S. Typhi* strains.

Keywords*: S. Typhi, typhoid, antimicrobial resistance, systematic review, ep*

Parametric optimalization of submerged fermentation conditions for keratinase production *Bacillus* sp. ND6D using OVAT

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Abstract

This study presents an optimized protocol for keratinase production by *Bacillus* sp. ND6D using white chicken feathers as the principal substrate in Feather Broth Medium (FBM). The medium, initially set at pH/ 7.0, was systematically optimized across a range of physical and chemical conditions: temperature (15–75/ °C), agitation speed (0–200/ rpm), incubation duration (0–168/ h), and substrate concentration (0.1–3.0% w/v). The most favorable conditions—45/ °C, 140/ rpm, 72/ h incubation, and 2% feather concentration—resulted in keratinase activity of 1.590/ ±/ 0.018 KU/mL, protease activity of 0.467/ ±/ 0.003 PU/mL, and a protein yield of 1.976/ ±/ 0.017 mg/mL. Buffer optimization across pH 2.6 to 11.4 identified a broad activity range, with peak enzyme performance between pH 4.0 and 10.2. Supplementation with MgSO,, (20–50/ mM) and NaCl (up to 450/ mM) significantly boosted enzyme production and feather degradation. In contrast, organic carbon sources such as mannitol, galactose, trehalose, and xylose inhibited keratinase synthesis. Surfactant testing revealed varied effects, with Tween 80 and Triton X-100 exerting minimal inhibition. Enhancement in enzyme activity was further supported by increased inoculum volume and surface area, leading to 65.6% feather degradation and an 11% rise in keratinase output under scaled-up conditions.

These results underscore the potential of *Bacillus* sp. ND6D as an efficient agent for keratinous waste bioconversion under submerged fermentation systems.

Keywords: *Keratinase, Bacillus, submerged fermentation, OVAT*

Sustainable Approach Towards Soil and Crop Management: Biostimulant

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Abstract

The global agricultural sector is facing concurrent challenges of increasing productivity to meet the growing demands of the world population while improving resource use efficiency and minimizing environmental impacts on ecosystems and human health. The indiscriminate application of fertilizers and pesticides in conventional agricultural practices has led to detrimental consequences on both soil health and the environment. Over the past three decades, several technological innovations have been proposed to enhance the sustainability of agricultural production systems. A promising and environmentally friendly innovation would be the use of biostimulants. Biostimulants are products that contain natural or biologically active ingredients, whose primary function, when applied to plants, seeds, or the rhizosphere, is to stimulate physiological processes in plants that enhance nutrient uptake, growth, yield, nutritional efficiency, crop quality and tolerance to stress. They include various products such as humic substances, seaweed extracts, Protein hydrolysates, amino acids, microbial inoculants, Plant extracts, and plant growth regulators. Biostimulants represent an innovative and sustainable approach to soil and crop management, using natural or synthetic compounds to help plants grow better and become more resilient (Meena *et at*., 2025). Biostimulants in crop production have recently gained a lot of importance as the most sustainable and viable technology for producers who are looking for the production of quality produce, without compromising the yield and at the same time without causing undue stress on soil resources and the environment.

The industrialization of biostimulants- based seedlings has reduced the amount of chemical fertilizers in the ecosystem and thus proved eco-friendly; reducing soil, air, and water pollution given their multifunctional role, biostimulants represent a smart, innovative approach to sustainable .agriculture, offering a scalable and cost-effective alternative to conventional farming inputs. As agriculture faces challenges like climate change and resource depletion, biostimulants provide a promising solution to achieve sustainable productivity while mitigating environmental impacts.

Valorization of agro-residues for fungal biomass production

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Abstract

Increasing amounts of agro-residues from farming operations provide a problem for the environment as well as a chance for long-term biotechnological uses. The economic significance of agro-residues as inexpensive, renewable substrates for the development of fungal biomass is investigated in this work. We assessed the effectiveness of agro-waste materials, in promoting the growth of filamentous fungus, under carefully monitored fermentation conditions. The fungal strain demonstrated robust growth and biomass yield on agro-residues, indicating efficient nutrient assimilation and enzymatic activity. The results demonstrate the potential of agro-residues as sustainable feedstocks for the synthesis of fungal biomass on a large scale, which can then be used for the development of biocontrol, enzymes, and biofertilizers. In keeping with the fundamental principles of the circular the bioeconomy, this strategy helps reduce waste and gives agricultural byproducts additional economic value.

Keywords*: agro-waste, environment, fungal biomass, circular economy*

Uncovering the Role of Multitasking Microorganisms in Onion (*Allium cepa* L.) Disease Management and Growth Enhancement

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Abstract

Onion belongs to Amaryllidaceae family is a vegetable crop, possesses high nutritional values and globally known for its culinary and medicinal uses. However, its cultivation is affected by several biotic and abiotic factors which leads to significant quality and quantity yield reduction. There are several options available to manage the plant diseases amongst them synthetic fungicides are considered as reliable one due to their quick and desirable response. Chemical intensive management practices primarily cause environmental pollution, considerable health risks to human and animals, as well as contribute to development of resistant pathogen which is a major concern, nowadays. This calls for finding out the potential substitutes of chemical applications in agricultural sector. In this context, potent microbes could be considered as green strategy to manage plant diseases and for growth promotion. Therefore, a study was conducted at Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, during 2021-22 and 2022-23, to evaluate the efficacy of effective biocontrol agents including *Trichoderma harzianum* and *Pseudomonas fluorescens* as a sustainable approach for the management of onion diseases. Results revealed that priming of onion seed with *T. harzianum* + *P. fluorescens* before sowing and further three foliar sprays at bolting, flower initiation and seed development stage, exhibited significant enhancement in the growth and yield parameters of onion along with reduced severity of major diseases. The findings highlight the potential of *T. harzianum* and *P. fluorescens* as eco-friendly substitutes for synthetic fungicides to manage plant diseases, supporting sustainable onion production while mitigating environmental hazards.

Keywords: *Onion, biopriming, disease management, crop growth promotion, Trichoderma harzianum, Pseudomonas fluorescens*

Fatty Acid Profiling and oil content in Parents and their Hybrids of Castor (*Ricinus communis* L.)

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Abstract

Castor (*Ricinus communis* L.) is an important non-edible oilseed crop with diversified industrial usage. The experimental materials comprised of 26 diverse genotypes of castor collected from Castor-Mustard Research Station, S. D. Agricultural University, S. K. Nagar were used for Fatty acid profiling. The genotypes were evaluated in Randomized Block Design (RBD) with three replications. In the present study, twenty-six genotypes of castor were analyzed for total seed oil content using Nuclear Magnetic Resonance (NMR) spectroscopy and fatty acid profiling through gas chromatography with flame-ionization detector (GC-FID) to update the database of this important industrial crop. In the present study, the highest seed oil content was determined in GCH-7 genotype which was 48.17 %. Total saturated fatty acid and steric acid per cent was recorded higher in SHB-1005 genotype which was 2.90 % and 1.92 % respectively. Palmitic acid was recorded higher in VI-9 genotype which was 1.63 %. Among the all genotypes, the higher per cent of total unsaturated fatty acid, ricinoleic acid and was observed higher in genotype GCH-4 (89.82 %). Linolenic acid was observed higher in genotype GAUCH-1 whereas, mono unsaturated fatty acid (oleic acid) and poly unsaturated fatty acid (linoleic) was found higher in genotype GNCH-1 (3.82 %) and JI-96 (5.42 %) respectively. The present study can be very important in the selection of male parents for the development of high ricinoleic acid castor hybrid. This will ultimately help in increasing the production and quality of industrially important oil.

Keywords: *Castor, Ricinus communis (L.), Castor oil, NMR, Fatty acid profiling, GC-FID.*

Influence of rootstocks and scions on the performance of grafted brinjal (*Solanum Melongena* L.)

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Abstract

Vegetable grafting has emerged as an effective and sustainable technique to enhance the growth and yield of brinjal. In countries like Japan, Korea and China, the majority of vegetable cultivation relies on grafted seedlings for improved productivity. A field experiment was conducted at UBKV during the pre-winter season (July–September) of 2024 to assess the graft compatibility of three brinjal cultivars-VNR-212, Mukta Keshi and Bhangar used as scions on two different rootstocks: the wild brinjal species *Solanum torvum* and the cultivated rootstock 'Surya'. Both grafted and non-grafted plants were evaluated in the experiment field during winter season of 2024-25 for key horticultural traits. The compatibility study revealed that the graft union between *S. torvum* and Bhangar took the longest time (9.37 days) to

form the graft union, while the Surya + VNR-212 combination achieved the quickest union (5.24 days). Similarly, the shortest period required to reach transplanting was observed in the Surya + VNR-212 combination, whereas the longest was recorded for *S. torvum* + Bhangar. Among all combinations, Surya + Mukta Keshi exhibited the highest graft survival rate (96.07%). Field performance results indicated that all grafted plants outperformed their non-grafted counterparts in terms of vegetative growth and fruit yield. Notably, the Surya+VNR-212 combination excelled in most growth and yield parameters and recorded the maximum number of fruits per plant (27.62) as well as highest fruit yield per plant (5.91 kg) and the total fruit yield (38.46 t/ha). However, Surya+Mukta Keshi recorded the maximum average fruit weight (284 g). In conclusion, the study strongly suggests that grafting is a promising approach to achieve better plant vigour, fruit yield and productivity in brinjal.

Keywords: *Vegetable grafting, brinjal, scion and rootstock, Solanum torvum, plant growth and fruit yield.*

Varietal Performance of Fodder Maize Under Differential Nitrogen Applications

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An experiment to study the response of nitrogen level to different varieties of fodder maize during *kharif* season of 2021 at Main Forage Research Station, Anand Agricultural University, Anand 388110 (Gujarat) to study main objectives of response of nitrogen levels on yield and quality of different maize variety. There was a total of four varieties with four nitrogen levels (40,80,120 and 160 kg/ha) including three replications. Experiment soil was low in organic matter and available nitrogen while medium available phosphorus status. Among the different varieties, V_4 reported significantly higher plant (264.42 cm), dry matter (17.38%) crude protein (4.81%) than rest of other fodder maize varieties. Significantly higher green fodder yield (835 q/ha) was reported in V_2 variety, it was7.74, 7.19 and 3.98 % higher green fodder yield than V_4, V_3 and V_1, respectively. Variety V_1 reported significantly higher dry matter yield (136 q/ha) and crude protein yield (6.96 %) than rest of varieties. Optimizing nitrogen fertilization can lead to increased green and dry fodder yields, as well as improved crude protein content and other quality parameters. Application of higher levels of nitrogen (N_4) reported significantly higher plant height (265.80 cm), dry matter yield (144 q/ha) and crude protein yield (6.51 q/ha). Increasing level of nitrogen increasing green fodder yield (939 q/ha) upto N_4. Treatment N_4 noted 38.29, 23.39 and 15.35 % higher green fodder yield than N_1, N_2 and N_3, respectively. Response of nitrogen level on dry matter was found non-significant. Results of the experiment also revealed that interaction effect of nitrogen with varieties also found significant in case of crude protein and crude protein yield. Significantly higher crude protein (5.90 %) and crude protein yield (9.65 %) was reported in treatment combination V_4N_1 than rest of treatment combinations.

Impact of Wild Cherry (*Prunus cerasoides*) Leaf Mulch on Seed Germination and growth of *Hordeum vulgare and Eleusine coracana*-Traditional agriculture crops in the Garhwal Himalaya

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Abstract

Prunus cerasoides (wild cherry), native to the Himalayan region, was studied for its allelopathic effects on *Hordeum vulgare* and *Eleusine coracana* under nursery conditions. The study was conducted at the Department of Forestry and Natural Resources, Chauras Campus, HNB Garhwal University, from December 2023 to May 2024. Dry leaf mulch powder was applied at concentrations of 10g, 15g, and 20g per polybag, each with three replications, along with a control (no mulch). Twenty seeds were sown in each replicate, and germination, root length, and biomass recorded after three months. Results indicated that higher mulch concentrations significantly inhibited germination ($P<0.05$), while effects on shoot length, root length, and fresh weight were not significant. The control had the highest germination rate (53.33%), followed by 10g mulch (51.66%), 15g (45.83%), and 20g (42.5%). The Duncan post hoc test confirmed significant differences in fresh weight, dry weight, and germination among treatments. Higher mulch levels were associated with reduced germination and growth, suggesting allelopathic suppression by *leaf mulch*. Conversely, lower concentrations enhanced germination slightly compared to higher doses. These findings highlight the need for cautious application of *P. cerasoides* mulch in agroforestry systems to avoid yield suppression and to support optimal plant growth to enhance crop productivity with suitable cultivation practices to minimize adverse impacts.

Keywords : *Agroforestry, Crop productivity, Eleusine coracana*, *Hordeum vulgare, Leaf mulch, Prunus cerasoides*

Differential transcriptome analysis reveals key genes and pathways associated mango jelly seed formation

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Abstract

Mango (Mangifera indica L.) fruits are highly perishable and have a limited shelf life, due to postharvest desiccation and senescence, which limits their global distribution. Mango contains several easily absorbed nutrients by the human body, together with distinct dietary fiber, vitamin C, carotene, soluble sugars, and diversified minerals. The Dashehari mango is one of the leading mango varieties in North India and jelly seed formation is an important constraint in quality fruit production of mango. The characteristic early symptoms of jelly seed are orange-yellow colouration of the mesocarp around the stone. Later, the disordered mesocarp develops into dark orange, whereas the surrounding tissue remains yellow. In

order to gain insight into the mango jelly seed biogenesis and to identify genes/pathway involved, we analyzed the differential transcriptome of jelly and non jelly mango pulp using RNA-Seq. Present study identifies large number of differently expressed genes (DEGs) between jelly and non jelly mango pulp. DEGs are mostly enriched in the pathway involved in fruit ripening such as cell wall and amino acids metabolism, hormone metabolism and signal transduction, carotenoid metabolism etc. Some of these pathways were associated with metabolites that contributed to mango flavour. These results indicated that the cell wall, hormone and carotenoid metabolism pathways might play crucial roles in jelly seed development. The jelly seed associated genes identified in this study will help in the elucidation of the molecular mechanism underlying jelly seed formation and in the design of strategies to increase shelf life of fruits and better quality retention during processing, which are conducive to obtaining greater economic benefits.

Keywords*: Mango, Jelly seed, ripening, cell wall*

Parasitic Misdiagnosis in *Trichogaster fasciata* (Banded Gourami): A Hidden Threat to Sustainable Inland Fisheries in Barak Valley, Assam, Northeast India

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Abstract

Northeast India is renowned for its rich freshwater fish diversity and supports extensive inland fisheries that are crucial for food security, nutrition, and rural livelihoods. Among the various species exploited for local consumption, *Trichogaster fasciata* (banded gourami) holds considerable economic and cultural significance. However, increasing reports of encysted parasites found in the musculature and body cavities of these fish have raised concerns. These parasites are frequently misidentified as maggots by fishermen and consumers, leading to public health fears, consumer rejection, and a decline in market value—posing direct socio-economic challenges. Using light and Scanning electron microscopic (SEM) observations for morphological and taxonomic identification, the encysted parasites were identified as *Clinostomum complanatum*, a digenean trematode. This parasite, distinguished by its dorsoventrally flattened body and syncytial tegument, typically inhabits the oral cavity, oesophagus, and stomach of piscine hosts. The life cycle of *C. complanatum* involves three obligatory hosts: freshwater gastropods serve as the first intermediate host, fish as the second intermediate host, and piscivorous birds as the definitive host. Although human clinostomiasis is rare, zoonotic transmission has been documented via the consumption of raw or inadequately cooked fish harboring viable metacercariae. In this study, a total of 289 *T. fasciata* specimens collected from the Barak Valley region of Assam, Northeast India were examined, revealing a prevalence rate of 49.5%. The findings underscore the necessity for precise parasitological diagnosis to mitigate public misconceptions, safeguard fish marketability, and implement evidence-based fish health management strategies. By elucidating the biology, epidemiology, and zoonotic potential of *C. complanatum*, this work contributes valuable insights towards sustainable aquaculture practices, public health protection, and biodiversity conservation initiatives in Northeast India.

Keywords: *Digenean trematode, Zoonotic transmission, Public health, Sustainable aquaculture, Biodiversity conservation.*

Major and minor Millets for food and nutritional security in India

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Abstract

The over-exploitation and improper management of natural resources like, soil, water and vegetation are causing serious threats to environmental degradation in the country. These vital natural resources are providing life-supporting systems for human beings and live-stock.

Traditionally, in the process of evolution of agricultural systems, water harvesting through pond technology emerged with a need base. The millets (Jowar, Bajra, Ragi, sawan, Kangni, Kodo) can play an important role in rainfed areas of the country which contributes about 60 percent of the total geographical areas in India. Especially, the minor millets are very rich nutrients with minerals for resistant to drought and stress in rainfed farming. The consumption pattern of small millets and finger millet was examined by using NSSO unit level data. The millet production in India has been a significant agricultural activity where millets are a group of small-seeded grasses that have been cultivated for centuries and played a crucial role in the country's food and nutritional security and rural economy improvement. They are known for their resilience to diverse climatic conditions and their nutritional value. Millets are recognized for their nutritional value, including high levels of protein, fibre, and micronutrients. India is one of the largest producers of millets in the world, with various types of millets being grown across different regions of the country The government has integrated millets into nutrition-related programs to improve dietary diversity and combat malnutrition. Further, the government of India, recognizing the nutritional and ecological importance of millets and has been promoting their cultivation through various schemes and programs like, NFSM (National Food Security Mission) and NICRA (National Initiative for Climate Resilient Agriculture) as millets are considered to be climate-resilient crops that require less water compared to major cereal crops like, rice and wheat. Millets are also contributing to food security, especially in regions prone to drought and erratic rainfall. In India, some of the states have introduced millets into the PDS (Public Distribution System) to make them more accessible and affordable to consumers. This helps to promote the consumption of millets, especially among vulnerable population in the country particularly in rainfed areas of different agro-climatic zones of India.

Key words: *Resource, Millets, nutrition, climate, rainfed and poverty*

Autoregressive Integrated Moving Average Approach to Forecast Marine and Inland Fish Production in India

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Abstract

The work presented in this paper constitutes to modeling and forecasting marine and Inland fish production by using time series approach. The paper demonstrated how the historical data could be utilized to forecast fish production. The data for marine and inland fish production from 1980-81 to 2023-24 were available on the Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India website. The historical demand information was used to develop several autoregressive integrated moving average models by using Box-Jenkins time series procedure and the adequate model was selected according to the performance criterion: Akaike information criterion, Schwarz Bayesian criterion, maximum likelihood, and standard error. The model was developed and forecasted using the ARIMA technique. Only when the time series data is stationary can the ARIMA technique be applied. Because variations in the data make a time series non-stationary, this work also analyzes how to assess stationarity and convert non-stationarity into stationarity. Finally, the model was constructed using a predetermined set of orders for autoregressive terms, moving average terms, differencing, and seasonality. Its predictive capabilities were evaluated and contrasted with the actual value. The model parameters were estimated using the R programming language. The selected model is employed to generate projections for the period of six years i.e., from 2025 to 2030. The results of the marine and inland fish production were presented numerical and graphically. These estimations are exceedingly advantageous when it comes to adapting marketing and policy initiatives to account for forthcoming developments.

Keywords: *ACF - Autocorrelation Function, ARIMA – Autoregressive Integrated Moving Average, MAPE, PACF - Partial Autocorrelation Function, Residual Analysis, Marine and Inland Fish Production.*

Waste Water and Leachate Sampling to Monitor Antifungal Resistance in Human Pathogenic Fungi

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Abstract

The global antibiotic resistance epidemic is primarily caused by overuse and abuse of antibiotics, complex interactions between human health, animal husbandry, and veterinary medicine, and a lack of information on major public health pathogens. Environmental factors like water, sanitation, and hygiene also

contribute to resistance. Municipal solid waste disposal poses health risks and environmental issues. Leachate wastewater can be used for biotechnological applications in bioremediation processes. The SELECT method is a unique and cost-effective tool for generating antifungal MSC data, adopting a single species system with varied susceptibility profiles. Future adaptations may include mixed compounds or other antifungal classes. A renewed focus on innovative and traditional environmental approaches is needed to tackle the growing burden of antimicrobial resistance.

Key words: *Microbial resistance; antimicrobial drugs; sanitary importance; urban solid waste*

A study of Rhizospheric Mycoflora in Bundelkhand region of Uttar Pradesh

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Soil is the fundamental component of earth's ecosystem consisting of, minerals, gases, organic matter and diverse array of living organism (macro and microorganisms). The microorganism's population plays a crucial role in regulating plant growth. The study was conducted at Department of Botany, Institute of Basic Sciences, Bundelkhand University, Jhansi attempted to explore the diversity among mycoflora in the soil samples collected from different villages of four selected districted namely Jhansi, Lalitpur, Banda, and Mahoba. A total of twenty-eight fungal species belonging to 15 genera were isolated from collected soil samples from chickpea fields. Mycoflora were isolated by using serial soil dilution technique on potato dextrose agar media (PDA). Five species of *Aspergillus* (*A. oryzae A. candidus*, *A. flavus*, *A. fumigates* and *A. niger),* five species of *Trichoderma (T. variance, T. harzianum, T. pseudokoningii,T. koningii and Trichoderma viride*), three species of *Fusarium (F.solani,F.oxysporumand F. oxysporum*f. sp. *ciceris)* and two species of *Penicillium (P. chrysogenum and P.citrium)* were most dominant among all the genera isolated.

Key words :*Fungal species, rhizospher, serial dilution technique, soil mycoflora*

Effect of climatic factors on ripening behaviour of mango fruits

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Abstract

Mango (*Mangifera indica* L.) is one of the most commercially significant fruit in tropical and subtropical regions. Dashehari, Amrapali and Mallika are important and common popular mango cultivars in North India due to their unique taste, rich pulp content, delicious flavour, and attractive fragrance. However, fruit maturation and ripening time of these mango cultivars are different, For Dashehari ripening starts

in the second week of June. While for Amrapali and Mallika, it is second and fourth week of July respectively. In this study, we have observed shift in the ripening behaviour in the fruits of mango cultivars Dashehari, Amrapali and Mallika, its biochemical attributes as well as its correlation with weather parameter. Study reveals that shift in the weather parameter like relative humidity, maximum-minimum temperature during fruit maturation and ripening affects fruit ripening. During the year 2025, Dashehari fruits starts tree ripening in the first week of June, while for fruits of Amrapali and Mallika it was third week of June and first week of July respectively. A progressive increase in TSS was observed from 8.80 °Brix to 23.40 °Brix depending on the cultivar, indicating enhanced sugar accumulation during ripening. Fruit acidity decreased from 2.83% to 0.16% reflecting the transformation of organic acids to other molecules as ripening advances. These biochemical shifts, especially the sugar–acid balance, are crucial indicators of fruit quality and palatability. Comparing different cultivars, Mallika shows better sugar–acid balance during maturation and ripening. Understanding such biochemical changes provides valuable insights into optimal harvest timing for different mango cultivars as well as its marketability.

Keywords*: Acidity; Dashehari; Fruit quality; Ripening, TSS; Weather parameter.*

Management of mungbean flower thrips with newer insecticide molecules under field conditions of hot arid Rajasthan

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Abstract

Mungbean (*Vigna radiata* L.), due to its short duration and low water requirement, is one of the important crops of Jaisalmer. Agroecology of arid region has been changed due to numerous factors including IGNP and groundwater irrigation. Climatic factors have increased the activities of many insect-pests which were either minor or never occurred before. Among various insect pests, Flower thrips is an important insect pest of mungbean crop which demanding control interventions. Therefore, the purpose of this study was to evaluate the effectiveness of different pesticides against mungbean flower thrips. Thrips population was observed initially during the first half of August and reached their peak in the latter half of August. Among various insecticides tested, Diafentiuron reduced 74.7 and 75.2 percent population of thrips respectively, with yield of 12.88 q/ha and treatment Emamectin benzoate was least effective (efficacy of 43.6 and 45.6) with yield of 9.62 q/ha. This study provides the use of insecticides in effective pest management programme of mungbean thrips.

Key words*: mungbean, thrips, management, arid Rajasthan.*

Molecular detection and characterization of Chicken Parvovirus from poultry flocks of northern India

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Abstract

Chicken parvovirus (ChPV), classified under the family *Parvoviridae* and genus *Aveparvovirus*, is associated with runting-stunting syndrome (RSS) in chickens. RSS is an enteric disorder characterized by growth retardation, poor feed conversion ratio, uneven flock development, feathering defects, lameness, diarrhea, and increased mortality, leading to significant economic losses to poultry industries. Despite the detection of ChPV from several countries including India, the data on molecular characterization is limited which pose challenges in the assessment of the genetic diversity of ChPV. Moreover, to the best of our knowledge there is no published reports of ChPV detection from Haryana. Therefore, the present study was aimed for detection and molecular characterization of ChPV in poultry flocks from Haryana and adjoining states. In the present study, out of the total 217 pooled cloacal swab samples, an overall 26.27% (57/217) samples including 29.83% (37/124) diarrheic and 21.5% (20/93) non-diarrheic were tested positive for ChPV by PCR of partial length non-structural protein (NS1) gene. The NS1 is conserved region and therefore used as a target in nucleic acid based detection methods. The statistically highest positivity was observed among broilers (30.4%; 48/158) as compared to pullet/ layers (15.2%; 9/59). The chicken with symptoms of RSS and diarrhea were frequently detected with ChPV (34.15%; 14/41) than those with diarrhea alone (27%; 23/85) followed by apparently healthy (22.72%; 20/93) birds. Further, the phylogenetic analysis based on NS1 gene revealed clustering of ChPV sequences (n=7) from present study into two distinct clades with nucleotide identity of 95.13-96.46% among themselves. The sequences were found more closely related to sequences from Kerala, Telangana and USA with percent genetic identity of 93.8 -99.11%, 96.01-99.11% and 94.46-97.78%, respectively. The present study reports detection of ChPV from Haryana with broilers being the more affected compared to layer/pullets. These findings are useful to understand the molecular epidemiology of ChPV in northern India which would be helpful for future surveillance, diagnostic development, and region-specific control strategies against ChPV-associated enteritis in poultry.

Key words: *Chicken Parvovirus, Molecular characterization, RSS, enteritis, Haryana*

Impact of Lantana camara Invasion on Soil Quality Parameters in the Lower Shivalik region, India

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Abstract

Invasive species like *Lantana camara* have been reported to alter soil properties and natural vegetation structure. This study aimed to evaluate the impact of *Lantana camara* invasion on soil properties and structure of natural vegetation in the lower Shivalik. Four invasion categories identified were: (1) Complete invasion (CI: *Lantana camara* only), (2) Medium invasion (MI: *Lantana camara* + *Dalbergia sissoo*), (3) Partial invasion (PI: *Lantana camara* + local shrubs + *Dalbergia sissoo*), and (4) No invasion (NI: local shrubs + *Dalbergia sissoo* without *Lantana camara*). The proportion *Lantana camara* individuals was 100% in CI, 77% in MI, 29.41% in PI, and absent in NI sites. Soil bulk density decreased from 1.60 in NI to 1.25 in CI, while pore space increased, being highest (52.57%) in CI surface soil and lowest (41.25%) in PI subsoil. SOC content was highest in CI (1.376%) and of lowest (0.30%) in MI subsoil. Available N peaked at 420.5 kg ha^{-1} in CI and was lowest in MI (291 kg ha^{-1}), showing a decline with depth. P content was greatest in CI surface soil (32.0 kg ha^{-1}) and least in MI subsoil (21.24 kg ha^{-1}). K ranged from 169 kg ha^{-1} (MI subsoil) to 324 kg ha^{-1} (CI surface soil). Fe content was maximum (6.26 ppm) in CI and minimum (0.99 ppm) in PI subsoil. Zn varied between 0.42 ppm (CI subsoil) and 0.71 ppm (MI surface soil). Overall, *Lantana camara* invasion improved several soil physical and chemical properties due to increased biomass input and nutrient recycling. However, it negatively affected native biodiversity by reducing the frequency and productivity of indigenous species. This highlights the dual role of *Lantana camara* as both an ecosystem modifier and a threat to local plant diversity.

Keywords: *Bulk density, fertility, invasion, Lantana camara, soil organic carbon*

A Study on Engineering Properties of Coloured Bell Pepper

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Abstract

Bell pepper is one of the leading vegetables grown all over the world and is the most important commercial vegetable crop. Determination of engineering properties are essential in screening solids to separate foreign materials and in sorting out various sizes of fruits and vegetables and also helpful in designing and developing of post-harvest processing equipment. The present study investigates the engineering properties of three varies of bell peppers (Green, Red and Yellow). The results indicated that the average size (along the longitudinal axis) of Green Bell peppers was found to be 75.83±1.19 mm, whereas for Yellow and Red Bell pepper it was found to be 81.02±1.34 mm and 82.07± 1.13 mm respectively. The mean weight of ten fruits of each was found to be 141.62 ± 26.81 g, 147.75 ± 27.29 g and 154.50 ± 25.38 g for Green, Yellow, and Red Bell peppers respectively. The bulk density of Green Bell pepper was found to be 262 ± 2.13 kg/m^3 and for Yellow and Red Bell pepper it was found to be 286 ± 2.74 kg/m^3 and 297.82 ± 1.56 kg/m3 respectively. True densities of Green, Yellow, and Red Bell peppers were found to be 582.24±0.74 kg/m^3, 596±0.83 kg/m^3 and 597.65±0.61 kg/m^3 respectively. The firmness of Green Bell pepper was found to be 10.27 ±1.26 kg/m^2 whereas for Yellow and Red Bell pepper was found to be 10.77 ± 1 .51 kg/m^2 and 11.02 ± 1.68 kg/m^2 respectively. These properties are helpful for the development of not only processing equipment but also the development of eco-friendly packaging materials.

Keywords: *Athematic mean, Geometric mean, Bell Pepper, Bulk density, Capsicum, Engineering Properties*

Characterization of nutraceutical potential of aromatic *Joha* rice of Assam through untargeted metabolomics study for its application in functional dairy dessert formulation

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Abstract

Joha rice, an indigenous aromatic rice of Assam, India, is renowned for its unique flavour profile and potential health benefits. In this study, untargeted metabolomic analysis using High-Resolution Accurate Mass Spectrometry (HRAMS) was conducted on two sub-varieties of Joha rice, namely, Kola Joha and Kunkuni Joha and compared with Parimal rice (control). The objective was to identify and characterize the bioactive metabolites that may contribute to functional and nutraceutical health benefits relevant to traditional dairy dessert formulations. The analysis revealed a diverse array of metabolites in Joha rice varieties, several of which were present in significantly higher abundance compared to the control. Notable compounds included á-eleostearic acid, glycerophospho-N-palmitoyl ethanolamine, á,á-trehalose, linoleic acid and linoleoyl ethanolamide, known for their anti-inflammatory, neuroprotective, and antioxidant activities. Compounds such as trigonelline, choline, and L-norleucine were identified

with anti-diabetic and cognitive-enhancing potentials. Unique phytochemicals like ceriporic acid C, phytosphingosine, ferulic acid and 13(S)-HOTrE further revealed the nutraceutical relevance of Joha rice. Multivariate comparison highlighted distinct metabolite profiles in Kola and Kunkuni Joha, underlining their potential for varietal selection based on functional and nutraceutical attributes. This comprehensive metabolomic insight supports the utilization of Joha rice in functional food formulations, particularly in traditional dairy desserts like *kheer*.

Keywords: *Joha rice, metabolomics, HRAMS, bioactive metabolites, traditional dairy dessert, functional foods.*

Studies on novel processing technologies to reduce the anti-nutritional parameters in millets

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Abstract

Millets are nutrient-dense grains rich in carbohydrates, dietary fiber, protein, essential amino acids and micronutrients such as iron, calcium, zinc and magnesium. Despite their nutritional value, the presence of anti-nutritional factors like phytates, tannins, oxalates, and enzyme inhibitors reduces the bioavailability of these nutrients. To address this limitation, the study investigates the use of novel processing technologies like radio frequency (RF) and infrared (IR) treatments to reduce anti-nutritional factors in foxtail, little, kodo and pearl millets. These treatments were applied under standardized conditions and compared with conventional roasting. Reduction of anti-nutritional factors enhances the digestibility and absorption of nutrients, improving overall health by supporting better mineral uptake, reducing gastrointestinal discomfort and enhancing protein and starch utilization. The potential of RF and IR technologies to improve the nutritional quality and functional value of millets, promoting their application in health-oriented diets and value-added food products.

Keywords: *Millets, Anti-nutritional factors, Radio frequency, Infrared treatment, Nutrient and bioavailability*

Soil pH dynamics under flooded conditions and their impact on horticultural crop productivity

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Abstract

Climate change causes flooding to be a frequent stress which changes the soil's redox potential and pH, resulting in problems like nutrient imbalances, higher levels of toxic metals and reduced plant growth. Horticultural crop productivity is strongly affected by soil pH which impacts nutrient supply to plants and the activities of beneficial microbes. . Most of the horticultural crops thrive best when soil pH between 5.5 and 7.5. When Oxygen shortage happened in flooded soils causes reduction reactions to occur. Vegetable crops cultivated under flooded conditions, soil drops pH (more acidic) because of the accumulation of organic acids, soluble iron and manganese. This might hunk the roots from breathing and absorbing nutrients which harmful in tomato, cabbage and lettuce. In banana, which can handle short-term flooding by forming aerenchyma in their roots, but persistent acidification changes their nutrient levels and reduces their yield. When the soil pH is less than 5.5, the banana plant is more favourable for developing *Fusarium* wilt diseases. The pH of soil changes with depth under flooded conditions which additionally affects nutrient availability. Whereas, spice crops like turmeric and ginger are affected by floods and changes in soil pH reduces the amount of nutrients, especially phosphorus and causes toxic elements to be released which reduces growth and yield. This review points out the problems and benefits in controlling soil pH when crops are grown in flooded soil, helping to establish sustainable and adaptable horticulture as the climate changes.

Keywords: *Climate, Flood, Nutrients, Redox-potential, Soil pH and Toxic-metals*

Leveraging plant growth-promoting rhizobacteria as green boosters for yield and essential oil fortification in *Mentha piperita* L.

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Abstract

Plant growth-promoting rhizobacteria (PGPR) are emerging as key microbial allies for advancing sustainable agriculture, yet their mechanistic roles in regulating secondary metabolism in aromatic plants remain largely underexplored. Here, we demonstrate that inoculation of peppermint (*Mentha* × *piperita* L.) with nine metabolically distinct PGPR isolates significantly enhances plant growth and essential oil quality under controlled conditions. Peppermint plants treated with *Bacillus pumilus* strain

VS02 (T2) exhibited the maximum increase in biomass, leaf area, and chlorophyll content, alongside elevated trichome densities, a structure critical for monoterpene biosynthesis, over the control. Moreover, the metabolite profiling via GC-MS revealed substantial shifts in monoterpene composition for all the PGPR treatments over peppermint, suggesting bacteria-mediated modulation of isoprenoid biosynthesis pathways, potentially via microbial production of phytohormones, siderophores, and signaling molecules. These functional traits not only enhance nutrient acquisition but may also prime secondary metabolic pathways through complex plant–microbe signaling. This study highlights the potential of PGPR to enhance both yield and essential oil quality in peppermint through microbiome-mediated physiological and biochemical modulation. Thus, by replacing synthetic agrochemicals, application of plant growth promoting rhizobacteria aligns with climate-smart agriculture, contributing to carbon sequestration, nitrogen cycling, and reduced environmental toxicity. These findings offer novel insights into microbiome-assisted metabolic reprogramming in peppermint and highlight the broader relevance of PGPR in promoting ecological intensification of the crop.

Keywords*: Bacillus spp., menthol, peppermint, rhizobacteria, sustainable agriculture*

Remediation of antibiotics with biochar nano iron composite in aquaculture waste water

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Abstract

In this study, a novel biogenic Iron nanocomposite was prepared from paddy straw biochar and spirulina extract and was tested for remediation of antibiotics tetracycline in aquaculture waste water. Nano composite was treated with hydrogen peroxide to enhance the oxygen functional group in the composite. Physico-chemical properties of the adsorbents were studied using Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (EDS-SEM), transmission electron microscopy (HR-TEM), and CHNS elemental analysis. The performance of the adsorbent was affected by the contact time, adsorbent dose, initial TC concentration, temperature and pH. The results showed that the Freundlich isotherm model and a pseudo-second-order kinetics model best suited to the adsorption processes of TC with BC, H_2O_2-BC and H_2O_2-BCNP. The BC, H_2O_2-BC and H_2O_2-BCNP exhibited a removal efficiency of 59.80±0.38%),78.30±0.30% and 93.13±0.36%, respectively. This indicates the effectiveness of modification in facilitating TC adsorption. In order to support clean manufacturing, the biogenic nanocomposite material offer an optimal method for eliminating TC from water. In future, this low-cost, environmentally benign adsorbent could offer a practical solution for eliminating TC from wastewater.

Keywords- *Antibiotics; Biochar; Nanocomposite; Adsorption; Tetracycline;* H_2O_2

Climate Change and Land Use Land Cover (LULC) dynamics on Ecosystem Valuation and Trophic Structure Dynamics of Dimbhe Reservoir, Maharashtra, India

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Abstract

Climate change and changes in local land use land cover(LULC) are two of the most important drivers that are affecting ecosystem services. The study has been conducted to understand the impact of climate and land use/land cover change on the Dimbhe reservoir ecosystem and Trophic Structure Dynamics. From the trend analysis, it was found that mean maximum and minimum temperatures had increased and will increase with a significant trend in the future. Landsat images have been selected from 2002 to 2022 to estimate the temporal land use/land cover change in the Dimbhe reservoir ecosystem. Studies has confirmed a significant increase in agriculture, settlement and Dense Forest, whereas Barren land and open forest have declined. Waterbody has shown very little change. There were strong correlations between ecosystem valuation and fluctuations in important climatic parameters like temperature and precipitation. Total Ecosystem Services valuation has a significant increase in the year 2022 with respect to the base year 2002. The study also estimated the productivity of the reservoir to understand the capability of the reservoir to support fish growth; chlorophyll-a has been estimated as the productivity measure, and the amount of chlorophyll-a in the reservoir ranges from 0.46 to 7.12, indicating a low to the medium productive reservoir. The trophic structure and energy flow of the selected reservoir were analysed, the highest trophic level was 3.33 for carnivorous fish, i.e., *Channa striata* indicated that the food chain was short, and the available food energy was large. The value of Total Primary Production / Total Respiration (TPP/TR) was estimated at 0.667, indicating the developing stage of the Dimbhe reservoir. The findings suggested that the relative biomass of primary producers (Phytoplankton) will rise in the coming few years, and it may slightly rise or fall in the future scenario (2022 to 2062).

Key Words: *Dimbhe Reservoir, climate change, Land use change, Ecosystem services, Valuation, Tropic structure*

Active and Intelligent Packaging for Enhancing the Shelf-Life of Perishable Horticultural Produce

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Abstract

Horticultural produces are highly perishable, requiring advanced post-harvest management to reduce spoilage and extend their shelf-life. Packaging is crucial in this process, serving multiple functions such as protection, containment and communication of products information. The development of smart packaging, which includes both active and intelligent packaging, represents a significant innovation in the preservation of fresh produce. Active packaging works by incorporating components such as oxygen scavengers, ethylene absorbers and antimicrobial agents that actively modify the internal environment to prevent spoilage. In contrast, intelligent packaging focuses on monitoring and communicating real-time information about the product's freshness, temperature, or gas levels, enabling consumers to assess quality at a glance. These technologies go beyond the traditional passive role of packaging, transforming it into an interactive system that enhances the shelf life and quality of horticultural produce. However, despite their promising benefits, the commercial use of smart packaging technologies in horticulture remains limited, with further research and industry adoption needed to unlock their full potential. Increased awareness and technological advancements could facilitate the broader application of smart packaging, contributing to significant reductions in post-harvest losses.

Keywords: *Active packaging, Intelligent packaging, Shelf-life extension, Smart packaging.*

Futuristic challenges and Strategies for waste Management in Livestock Farms

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Abstract

Livestock sector of Bharat includes animal husbandry activities of Large Ruminants (Cattle, Buffaloe), Small ruminants (Sheep and Goat), Poultry, Piggery etc playing a crucial role in nutritional security and good health of nation. Livestock industry developed with Agriculture as a source of fertility of soil by manure and energy by draught power. The increase in population and per capita income resulted in intensification, specialization of each farming enterprise. The dwindling land holdings increased the density of livestock resulting in more contamination of natural resources with animal wastes and manure posing a threat to global warming. Livestock and fodder related activities generate a major chunk of waste generated in each type of farming enterprise needs to be channelized for better utilization and reduce pollution to preserve/ mitigate the climate change. A large portion of the detrimental effects of intensive livestock production relate to poor management of livestock excreta, which contains large amount of organic matter and mineral nutrients (Sims et al.2005).The waste management is essential for sustainable and eco-friendly development of livestock sector. The excreta of livestock can be converted into manure, energy generation and biogas production which are better utilized as per the sustainable goals initiated by FAO. This paper initiates to find out the challenges and strategies to reduce/utilize the waste for better purpose.

Effect of Different Botanicals on Growth and Sporulation of *Myrothecium Roridum*, the Causal Agent of Leaf Spot in Sesame (*Sesamum indicum L.)*

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Abstract

Sesame (Sesamum indicum L.), an important oilseed crop in India, holds significant value due to its oil content, flavour, medicinal properties, and ritual uses. Belonging to the family Pedaliaceae and commonly known as 'Til', sesame is susceptible to several diseases, among which leaf spot caused by Myrothecium roridum Tode ex Fr. is one of the most prevalent and destructive. The present study was undertaken to evaluate the efficacy of different botanicals against the growth and sporulation of M. roridum under in vitro conditions. Disease occurrence was recorded in all surveyed areas, indicating its widespread prevalence. Fresh leaf material (100 g each) from Azadirachta indica, Eucalyptus spp., Datura fastuosa, Argemone mexicana, and Ocimum sp. was collected, washed thoroughly, rinsed with distilled water, air-dried, and macerated with 100 ml of distilled water using a Waring blender. The extracts were filtered through double-layered muslin cloth and centrifuged at 5000 rpm for 5 minutes. Botanical extracts offer an eco-friendly and sustainable approach to disease management, especially given the limitations of chemical fungicides- such as high cost, environmental hazards, and the development of resistance in pathogens. Among the tested botanicals, Azadirachta indica (neem) extract showed the highest inhibitory effect on the pathogen's growth and sporulation, while Argemone mexicana extract was the least effective. These findings support the potential of plant-based extracts as viable alternatives in integrated disease management strategies for sesame.

Keywords: *Sesamum indicum, Myrothecium roridum, leaf spot, botanicals, plant extracts, neem (Azadi*

Rhizobial Diversity of Chickpea Minicore (*Cicer arietinum* L) Lines.

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Abstract

Exploring rhizobial biodiversity is an important strategy to identify potential strains with more symbiotic efficiency and nodule occupancy, even under stressed field condition. Many studies have revealed that *Mesorhizobium* species may effectively nodulate chickpea and form a symbiotic nitrogen-fixing

relationship.There are various degrees of heterogeneity within natural chickpea rhizobial populations. A total of 395 endophytic bacteria were isolated from healthy surface sterilized root nodules collected from chickpea minicore lines. Out of 395 bacterial isolates, 11 isolates were obtained from wild chickpea genotypes and remaining 384 isolates were obtained from 214 chickpea minicore germplasm lines. All isolates were screen through different biochemical, physiological and molecular characterization. However all isolate found to belong different genera of rhizobia and non rhizobia.

Keywords: *Chickpea genotype, rhizobia, nodulation.*

Integrating artificial intelligence and machine learning for climate smart agriculture

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Abstract

The rapid growth of the global population, predicted to reach 9.7 billion by 2050, poses substantial challenges for the agricultural sector, mostly in terms of sustainability and efficiency. Agriculture is the primary source of food for the growing global population. Climate change threatens food security by disrupting crop yields, reducing the availability of water for irrigation, and increasing the prevalence of pests and diseases. Adapting agricultural practices to climate change is crucial to ensure a stable and sufficient food supply for current and future generations. Sustainable agriculture emerges as a crucial approach, advocating for the preservation of environmental quality, the enhancement of soil fertility, water conservation, and biodiversity protection. This form of agriculture is not just about altering techniques, but about transforming the entire food system to be sustainable in the long term. Artificial Intelligence (AI) and Machine Learning (ML) are at the early stage of transforming agriculture into a more data-driven and predictive domain. These technologies analyze huge amounts of data from satellite images, sensors, and IoT devices to provide insights into crop health, predict yields, and optimize the distribution of resources. Key applications include precision nutrient and irrigation management using real-time sensor data, weather forecasting and climate risk prediction through ML-based climate models, and early detection of pests and diseases via image-based deep learning. AI-driven platforms are also enabling site-specific crop advisories, predictive yield modeling, and monitoring of greenhouse gas emissions and soil carbon dynamics—essential for climate mitigation efforts. Furthermore, AI/ML models contribute to eco-friendly agriculture by reducing excessive chemical use, conserving water, and improving biodiversity through optimized resource allocation. The paper also explores recent advancements such as remote sensing integration, digital twins for crops, and the use of AI in breeding climate-resilient crop varieties. By adopting climate-smart agricultural practices, such as conservation agriculture, agroforestry, and precision farming, we can mitigate the environmental impact of agriculture and promote sustainable land and resource management

Keywords: *Artificial intelligence, climate smart agricultural, machine learning, precision farming*

Influence of Drought Stress on Fodder Quality Traits in BMR and Non-BMR Sorghum Genotypes

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Abstract

Drought stress, simulated through rainfed conditions, significantly affects the fodder quality of sorghum by altering its nutritional and structural composition. This study evaluated the impact of water deficit on key fodder quality parameters—crude protein (CP), crude fat (CF), neutral and acid detergent fibers (NDF and ADF), lignin (ADL), in vitro dry matter digestibility (IVDMD), total mineral content, and hydrogen cyanide (HCN)—in brown midrib (BMR: CSV 43, SPV 2017) and non-BMR (CSV 15, SPV 462) sorghum genotypes. Under rainfed conditions, all genotypes exhibited reductions in CP, CF, mineral content, and digestibility, along with increases in ADF, NDF, ADL, and HCN levels. However, BMR genotypes showed significantly less reduction in nutritional quality and smaller increases in fiber and HCN content compared to non-BMR types. Specifically, BMR sorghum maintained higher digestibility and lower lignin accumulation due to impaired CAD enzyme activity, contributing to better forage quality under drought. The rise in HCN content under stress may be linked to oxidative stress responses. Overall, the study demonstrates that drought stress adversely affects fodder quality, but BMR genotypes possess superior resilience, making them more suitable for cultivation in water-limited environments.

Integrated nutrient management in vegetables as intercrop under apple orchard

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Abstract

An experiment was conducted in ICAR-CITH RS, Mukteshwar, Uttarakhand on Effect of Intercropping with integrated use of fertilizers, manures, and biofertilizers under normal density apple orchard. The results obtained from investigation revealed that treatment comprising FYM + Vermi-compost + Bio-fertilizer + Inorganic was found best in terms of highest fruit length (63.06 mm and 63.90 mm), fruit diameter (71.13 mm and 71.59 mm), fruit weight (151.94g and 156.35g), fruit firmness (12.43 lb/ inch^2 and 13.35 lb/ inch^2) fruit TSS (13.46 æ%B and 12.39 æ%B) and yield (32.83 kg/tree and 29.38 kg/ tree) of apple per tree as compared to other treatments intercrop with pea and cauliflower respectively. Highest (77.07 cm) height, number of branches/plant (13.34), pod length (9.30 cm) and yield (51.37 q/ h) of pea intercrop were recorded in treatment comprising of FYM + Vermi-compost + Biofertilizer + inorganics in pea intercrop in apple orchard. Maximum (44.90 cm) height, leaves per plant (17.51), curd diameter (19.41 cm), curd weight (427.41) and yield (163.09 q/ha) recorded in cauliflower intercrop treated with FYM + Vermi-compost + Biofertilizer + inorganics in apple orchard. Conclusively, treatment

FYM + Vermi-compost + Biofertilizer + inorganics with intercrops pea and cauliflower was found best for improving the apple quality and treatment FYM + Vermi-compost + Biofertilizer + inorganics also found effective to improve the growth parameters and yield of pea and cauliflower.

Key words: *INM, Pea, Cauliflower, Intercrop and Apple orchard*

Advanced Nano-Engineered Sensing Platform for the Rapid Detection of Pesticides Using Screen-Printed Electrodes

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Abstract

Pesticides are designated chemicals used widely to control or kill pests in agriculture and/or households. Over a hundred different pesticides are used worldwide. Due to the toxic nature of pesticides, it is necessary to take precautions in handling and proper disposal. Among all types of pesticides, organophosphates and carbamates are the most common and affect the normal functioning of the brain. However, the excessive use of these chemicals beyond the legally tolerable amount can be seen at many places, and their residues are present in food items, soil, and water. For the accurate detection of pesticides, there is an urgent need for a reliable technique to overcome the limitations of conventional methods. our study involves the most common pesticides, which are widely used to kill pests. Biosensors could be used as an alternative approach to detect a very low quantity of pesticide residues in the given samples. Among various types of biosensors, polymer-based, enzyme-based, and aptamer-based electrochemical biosensors have been successfully established for the detection of distinct pesticides. We have developed an electrochemical sensing platform for the detection of the most widely used pesticides. Nanoparticles were employed to enhance the electroconductivity of the sensing platform, which are widely used as promising and emerging materials because of their unique chemical and physical properties. The electrochemical biosensor decorated with these advanced nanomaterials on the integrated electrode facilitates accurate detection of the major pesticides. The sensitivity of the biosensor was increased by using an effective sensing platform. Nanomaterial-based electrochemical sensing platforms were applied for the screening of pesticides and for determining the presence of pesticides in real samples. Thus, these sensors provide a more valuable and reliable laboratory method in comparison to previously reported methods and can be effectively transformed into commercialization.

Keywords: *Pesticide, Nanotechnology, Electrochemical Biosensors, Detection*

Smart Sensing: A Molecularly Imprinted Electrochemical Platform for Astaxanthin Detection

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Abstract

Astaxanthin (ASTX) is a xanthophyll pigment found predominantly in marine microorganisms and is the colorant that gives salmon its distinctive pink-red color. With its high antioxidant properties, it can protect cells from damage induced by reactive oxygen species (ROS). ASTX NPs in agriculture facilitate the uptake of nutrients by plants more effectively and sustain chemical balance, mainly under heavy metal stress, which helps plants to withstand harsh environmental conditions. The detection of ASTX is vital, as it serves as a biomarker of biological activity, soil fertility, and environmental health, highlighting its contribution to enhancing plant resistance. Existing detection technologies, including HPLC-DAD and LC-MS, are efficient, but it is costly, labour-intensive, and require skilled personnel. To overcome this, a novel biosensor is fabricated by employing Screen-Printed Electrodes (SPE) modified with molecularly imprinted polymers and metal-organic frameworks. Further, the electrochemical sensor facilitates quicker and cheaper detection of ASTX within a few seconds. Electrodeposition of metal-organic frameworks onto the SPE, followed by MIP coating, is the main approach used to selectively detect ASTX in the environmental sample. The developed biosensor was optimized for pH, temperature, concentration, and reproducibility studies. As a result, it showed a linear range of 0.2 nM to 500 nM, and a lower detection limit of 0.2 nM. The fabricated biosensor has future applications in both environmental monitoring and modern diagnostics.

Keywords: *Astaxanthin, Electrochemical Sensing, Screen-Printed Electrode, Molecularly Imprinted Polymer, Metal-Organic Framework, Environmental sample analysis*

Effect of rice residue and weed management practices on productivity of wheat in rice - wheat cropping system

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A field study titled *"Effect of rice residue and weed management practices on productivity of wheat in rice-wheat cropping system"* was conducted during the *Rabi* seasons of 2022–23 and 2023–24 at the Research Farm, Division of Agronomy, Faculty of Agriculture, SKUAST-Jammu, Chatha. The soil was sandy clay loam, slightly alkaline, low in organic carbon and available nitrogen, medium in phosphorus and potassium, and with safe electrical conductivity. The experiment was laid out in a split-plot design with three replications, involving five residue management (RM) practices—RM1: Conventional tillage, RM2: Surface retention (Happy Seeder), RM3: Residue incorporation (Super Seeder), RM4: Surface seeding 7 days before harvest (DBH), and RM5: Surface seeding just before harvest (JBH)—and three weed management (WM) treatments—WM1: Pinoxaden + Metribuzin (PoE), WM2: Clodinafop-Propargyl + Metsulfuron-Methyl (PoE), and WM3: Weedy check. Wheat variety DBW-222 was sown with a seed rate of 100 kg ha{ ¹ for RM1 and RM3, and 125 kg ha{ ¹ for other RM treatments. A fertilizer dose of 100:50:25 kg ha{ ¹ (N:P:K) was applied for RM1, while other RM treatments received an additional 25 kg N ha{ ¹. Among RM practices, RM3 significantly enhanced tiller count, dry matter accumulation, and crop growth rate (CGR), along with effective tillers and grains per spike, and was statistically comparable with RM4 and RM2. RM3 also recorded the highest grain and straw yield.

Among WM treatments, WM2 outperformed WM1 and WM3 in terms of growth, yield attributes, and productivity, highlighting the effectiveness of integrated residue and weed management in enhancing wheat performance under rice-wheat systems.

Key words :- *Rice residue management, Weed control, Wheat productivity, Rice–wheat cropping system, Conservation agriculture*

Edible coating for fresh cut immature tender *Artocarpus heterophyllus* (Jackfruits)

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Abstract

Artocarpus heterophyllus commonly known as Jackfruit, is a popular meat analogue in Jharkhand and is therefore consumed before seed formation. It is a seasonal vegetable which lasts only for a month. However, jackfruit is a bulky vegetable that is hard to peel and cut and therefore there is a need to prepare a convenient product that saves on time and energy in busy lifestyle. Therefore, there is need to tap the possibility of utilizing tender jackfruit for preparing RTC (Ready to Cook) JF for convenient consumption. Edible coating is one such promising technology that helps in preserving nutritional composition of JF alongwith preparing JF in a RTC form thereby saving on time to cut and prepare. Hence, in present study, Unripe jackfruits (ICAR-RCER JS-4/2) were harvested and cut into uniform shaped pieces. Edible coating experiment was designed with different pre-treatments (Acid Dip: 2% Citric acid + 2.5g/L KMS followed 1% $CaCl_2$ for 4 min) and different coating agents *viz.*, guar gum (0.5-1.5%), pectin (1.33-3.99), starch (2-6%) and their combinations. Total number of treatments were 32. Coated samples were stored at low temperature (4-8°C) for a shelf-life study of 15 days. Observations for PLW, pH, TSS, color change and texture were recorded at an interval of one days. On the basis of principal component analysis (PCA), treatment no. 30 was found to be the best coating treatment which comprised of Guar gum + Starch (75:25) (1% concentration) without pre-treatment having PLW, BI, Texture and Appearance values as 11.29%, 74.56, 106.34 N and 4 respectively

Keywords: *Jackfruits, edible coating, PLW, texture, Ready to cook, RTC, preservation*

Impact of Seed Priming and Growth Regulator Applications on Seed Quality and Production Economics in *Verbena hybrida* Under Mid-Hill Conditions of North India

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Abstract

Verbena (*Verbena hybrida* L.), a popular winter annual of ornamental and commercial significance, is increasingly in demand in both domestic and international seed markets. Ensuring uniform seedling emergence and enhanced seed quality is essential for successful crop establishment and high productivity. Seed priming, a pre-sowing hydration technique has shown promise in improving seed germination traits by triggering early physiological and metabolic processes. To evaluate the effectiveness of seed priming and paclobutrazol application on quality of harvested seeds in *Verbena hybrida*, a two-year study was conducted at the Research Farm and Laboratory of the Department of Seed Science and Technology, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan (HP). The experiment assessed the quality of harvested seeds obtained from the field experiment and economics of different priming treatments using GA*f* , PEG-6000, hydropriming and foliar application of paclobutrazol. Results revealed that GA*f* priming at 100 ppm for 24 hours along with foliar application of paclobutrazol at 5.0 ppm significantly enhanced the seed quality in term of higher germination percentage, speed of germination, seedling length & dry weight, seedling vigour, lowest electrical conductivity and also gives higher net returns and B:C ratio. This interaction of GA*f* priming and paclobutrazol emerged as the most effective treatment combination, thus, it can be recommended after multilocation testing for improving the quality of harvested seeds and for getting higher net returns in *Verbena hybrida* under mid-hill conditions of North India.

Keywords: *Seed priming, Verbena hybrida, Gibberellic acid, PEG, Paclobutrazol*

Sustainable Futures: Communities Leading the Way in Zero Waste

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Abstract

The global waste crisis, driven by unsustainable "take-make-dispose" systems, demands a transformative shift toward zero-waste and circular economy models. This chapter explores how communities, policies, and industries are leading the transition by embracing holistic strategies for resource conservation, emission reduction, and economic resilience. Centered on the 5Rs and 7Rs hierarchies and the Zero Waste International Alliance (ZWIA) framework, it highlights principles like refuse, reduce, reuse, recycle, and rot, alongside innovative additions such as repair and rethink. Case studies from San Francisco, India, Denmark, and educational institutions illustrate impactful implementation of mandatory composting, waste segregation, and eco-industrial collaboration. The chapter also addresses challenges—ranging from infrastructure gaps to consumer behavior—and offers solutions including education, subsidized eco-design, AI-driven waste tracking, and biodegradable materials. With supportive policy tools like extended producer responsibility (EPR), zero-waste mandates, and global plastic agreements, the path forward integrates technology, governance, and community action to achieve a sustainable, waste-free future.

Keywords: *Zero Waste, Circular Economy, Sustainable Development, 5Rs, Resource Recovery, Community Initiatives.*

Assessment of genetic variability in F_2 population of Okra (*Abelmoschus esculentus* L. Moench) for productivity traits

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Abstract

The present investigation was conducted at the Department of Vegetable Science, Kittur Rani Channamma College of Horticulture, Arabhavi, Belagavi (Karnataka). Two F, populations of Okra, KRCCHO-1 and KRCCHO-2, were evaluated under unreplicated yield trials during Kharif season. Analysis of variance revealed highly significant differences (P = 0.01 and P = 0.05) between the two populations for all the traits studied, indicating a high degree of variability. Both GCV (Genotypic Coefficient of Variation) and PCV (Phenotypic Coefficient of Variation) were found to be high for traits such as plant height, total number of nodes, number of flowers, pod yield, and number of pods per plant in both populations. Additionally, number of branches at final harvest showed high GCV and PCV in the KRCCHO-1 population. Very high heritability, along with high Genetic Advance as Percent of Mean (GAM), was recorded for plant height, days to first flowering, number of flowers, and days to first harvest in both populations. KRCCHO-1 also exhibited very high heritability coupled with high GAM for number of internodes per plant and number of pods per plant, suggesting that these traits can be effectively improved through direct selection. The results of correlation and path analysis indicated a positive and significant relationship of yield per plant with traits such as total number of pods, pod weight, plant height, number of flowers, internodal length, stem girth, number of ridges, and days to first harvest. These traits exhibited positive direct and indirect effects on yield per plant, implying that direct selection for these traits would be beneficial in improving yield. Notably, plants showing a higher number of pods and superior pod yield per plant were identified as follows: KRCCHO-1: Plant numbers 16, 27, 1, 114, 248, 11, 36, 3, and 143 and KRCCHO-2: Plant numbers 106, 105, 144, 1, 16, 96, 107, 2, 62, and 10. These plants have been forwarded to subsequent generations for stability assessment.

Keywords: *Okra, variability, Genotypic Coefficient of Variation, Phenotypic Coefficient of Variation, heritability, Genetic Advance*

SEM-based studies of adaptive features in *Garra paralissorhynchus,* Vishwanath & Shanta, 2005 from Chindwin drainage of Manipur, India. (Teleostei: Cyprinidae)

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Abstract

Fish in torrential ecosystem have evolved unique adaptations to cope with the strong currents such as streamline bodies, strong fins and specialised mouthparts for feeding and adhesion. The oromandibular region of *Garra* species is a suite of adaptations that allows them to thrive in challenging reverine environments. This study illustrated how the adaptive features such as labrum and pulvinus of the gular disc in *G. paralissorhynchus* from Chindwin drainage of Manipur is related with its torrential habitat. SEM results highlighted that labrum have a cluster of papillae which is devoid of spines with hook-like tips and each is arranged in a rosette pattern. It can be inferred from this, that its role is to control the pressure gradient while the fish is anchored to the substratum with the suction mechanism of the pulvinus. On the other hand, pulvinus is rich in mucus pores and this prevents the fish from mechanical abrasions aside from adhesion.

Keywords: *Oromandibular, SEM, Labrum, Rosette pattern, Pulvinus.*

Comparative Evaluation of Antibiotics and Plant Bioactive Compounds analysis against Clinical Bacterial Isolates in Dehradun

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Abstract

The emergence of antibiotic-resistant bacterial strains necessitates the exploration of alternative antimicrobial agents, including plant-derived bioactive compounds. This study aims to evaluate and compare the antimicrobial efficacy of conventional antibiotics and plant bioactive compounds against clinical bacterial isolates.This prospective cross-sectional study was conducted from February 2024 to December 2024 at three collaborating institutions in Dehradun, Uttarakhand, India. A total of 325 patients were enrolled, and biopsy samples were collected following proper consent procedures. Six bacterial isolates were obtained through standard microbiological techniques: *Staphylococcus* sp. strain (PQ056991), *Bacillus* sp. (PQ656336), *Bacillus sonorensis* (MF662250.1), *Kocuria flava* (PQ656347), *Bacillus licheniformis* (PQ656358), and *Enterococcus gallinarum* (PQ656359). Antimicrobial susceptibility testing was performed using the disc diffusion method for seven synthetic antibiotics and twelve plant bioactive compounds.The study revealed varying degrees of antimicrobial

activity across all tested compounds. Among synthetic antibiotics, Levofloxacin (5mcg) showed the highest efficacy with zone diameters ranging from 17-29mm, followed by Clarithromycin (15mcg) with zones of 19-34mm. Plant bioactive compounds demonstrated significant antimicrobial potential, with Garlic extract showing zones of 10-28mm, and Lemon extract displaying 15-36mm inhibition zones against various bacterial isolates. Both synthetic antibiotics and plant-derived bioactive compounds exhibited substantial antimicrobial activity, suggesting the potential for plant compounds as alternative or complementary therapeutic agents. The findings support the continued investigation of phytochemicals in combating bacterial infections, particularly in the context of emerging antibiotic resistance.

Keywords: *Antimicrobial activity, plant bioactive compounds, antibiotic resistance, disc diffusion method, clinical bacterial isolates*

Moringa oleifera Lam.: An Emerging Modern Miracle Tree

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Abstract

Moringa oleifera Lam., commonly known as the drumstick tree, is a fast-growing, drought-tolerant species valued for its extensive applications in nutrition, medicine, agriculture, and environmental management. This critical review explores the plant's morphological characteristics, phytochemical profile, and industrial relevance across its various parts including leaves, seeds, pods, flowers, bark, and roots. Notably, *M. oleifera* thrives in marginal soils and arid environments, and its significant carbon sequestration potential underscores its utility in addressing food insecurity and climate change. The nutrient-dense leaves, rich in proteins, vitamins A, C, and E, and essential minerals like calcium and iron, serve as effective dietary supplements against malnutrition. The seeds yield a high-quality edible oil with potent antioxidant and anti-inflammatory properties and are employed in biodiesel production and water purification. Additionally, the roots and bark exhibit pharmacological activities such as antidiabetic, antibacterial, and analgesic effects. However, limitations including the presence of antinutritional factors, concerns regarding dosage safety, and regulatory challenges remain barriers to widespread utilization. This review synthesizes global research findings, positioning *M. oleifera* as a sustainable bioresource and highlighting the need for further clinical validation and policy integration to enable its broader application in food, health, and environmental sectors.

Keywords*: Moringa oleifera: phytochemicals: nutraceuticals: medicinal plants: climate resilience: food security: wastewater treatment.*

Morpho-physiological and biochemical screening for drought tolerance under simulated moisture stress conditions in cowpea (*Vigna unguiculata* L. Walp.)

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Abstract

Cowpea (*Vigna unguiculata* L. Walp.) (2n = 2x = 22) is one of the important legumes grown in semi-arid and arid regions of the world for its importance as food and animal feed. Cowpea is a drought tolerant crop; however, some of genotype with good agronomic traits have been reported to be drought-susceptible. Thus, identification of drought tolerant cowpea genotype with good agronomic characters is necessary. The present study was carried out with 23 cowpea genotypes adopting Completely Randomized Design (CRD) in controlled environment to identify drought tolerant cowpea genotype under artificial moisture stress condition. Induced drought conditions were created with two osmotic potentials (-0.75 bar and -1.5 bar) using different concentration of polyethylene glycol (PEG-6000) solution. Data were recorded for morphological parameters like root length, shoot length, germination percentage, total dry weight, total fresh weight and biochemical parameter like proline content. Various indices like vigour index (VI), drought tolerance efficiency (DTE %), relative reduction percentage (RR%) and increase percent in proline content were estimated. PCA analysis was also done. Statical analyses confirmed ten genotypes to be better performing under water stress condition and showed potential for use in future breeding programs aimed at studying drought tolerance in cowpea genotype.

Keywords: *CRD; Drought; Biochemical; PCA; Proline*

Enhancement of Antioxidant Potential of Wheat Bran via Enzymatic Treatment: A Cost-Effective Alternative to Commercial Enzymes

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Abstract

Abstract

Wheat bran (WB), an agro-industrial byproduct, is a rich source of phenolic compounds with antioxidant properties; however, these bioactives are mostly bound within the complex plant cell wall matrix. This study evaluated the efficiency of enzymatic treatment for the release of antioxidant phenolics from WB

using three enzymatic sources: commercial cellulase from *Trichoderma reesei*, Novozyme 188, and a crude enzyme extract from a novel laboratory-isolated strain *Trichoderma* sp. RCK65. The crude extract from *Trichoderma* sp. RCK65 significantly enhanced total phenolic content (TPC) to 1.47 mg GAE/g WB—an approximate 3.7-fold increase compared to untreated WB (0.4 mg GAE/g). In contrast, commercial cellulase showed only a 1.7-fold increase, while Novozyme 188 had no significant effect. Correspondingly, antioxidant assays (DPPHÏ%, ABTSÏ%+, and FRAP) revealed a 5.3-, 2.4-, and 2.2-fold enhancement, respectively, with *Trichoderma* sp. RCK65 treatment. UPLC analysis confirmed compositional shifts in phenolic acids post-treatment, with ferulic acid (648.17 ìg/g WB) emerging as the dominant compound in enzyme-treated WB, compared to trans-cinnamic acid and 4-hydroxybenzoic acid in untreated samples. These findings highlight the superior efficacy and cost-effectiveness of using crude enzyme extracts from *Trichoderma* sp. RCK65 for the valorization of WB through enhanced recovery of antioxidant phenolics, offering a promising biotechnological approach for functional food and nutraceutical applications.

Keywords: *Wheat bran, phenolic compounds, Trichoderma sp. RCK65, enzymatic treatment, antioxidant activity, UPLC.*

Functional Characterization of PGPRs as a Phosphate-Solubilizing and Siderophore-Producing Rhizobacterium in Tomato.

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Abstract

Phosphorus is essential for plant instigation, even so, its vacuity in the soil is often discrete due to its presence in insoluble forms. Phosphate solubilizing bacteria (PSBs) are vital in converting these insoluble phosphorus compounds into forms that plants can readily absorb. Additionally, siderophores are compounds produced by certain bacteria that chelate iron, making it more available to plants, which is crucial for their growth and metabolism. In a study conducted in the Uttarakhand region, researchers aimed to identify and assess bacteria from the rhizosphere of *Solanum lycopersicum* L. that possess phosphate solubilizing and siderophore-producing abilities. Total 50 unique bacterial strains were collected and evaluated for capacity to make insoluble to soluble phosphate and originate siderophores. Among these, isolate RBS-11 exhibited the highest phosphate solubilization, followed closely by RBS-7. The most proficient isolate, RBS-11, not only released significant amounts of phosphorus but also showed robust siderophore production. 16S rRNA gene sequencing revealed that isolate RBS-11 is *Burkholderia dolosa*. This bacterium's dual function in phosphorus solubilization and siderophore production highlights its potential as an effective biofertilizer, enhancing nutrient accessibility in soil.

Keywords: *Phosphate solubilization; IAA; siderophore; 16S rRNA gene; crops; PGPR*

Isolation and identification of endophytic bacteria from *Crassula ovata* and assessment of their plant growth promoting traits

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Abstract

Numerous research studies revealed that the endophytic bacteria that are known to reside in plant tissues and promote the growth of plant. Since ancient time, people have utilized the jade plant, which also known as *Crassula ovata,* as a medicinal herb to treat a variety of infections and condition linked to diabetes. In our research study, eight endophytic bacterial strains were isolated on Jensen media, on the basis of their growth three of them used for further analysis. In the morphological characterization VR1showed Gram positive whereas VR5, VR8 showed Gram negative. All three strains showed plant growth promoting activities such as VR1 showed positive result, VR5 and VR8 showed negative result for phosphate solubilization. All three strains shown positive result for ammonia production. VR1 and VR8 showed positive result whereas VR5 showed negative for nitrate reductase test. These three strains were identified by 16Sr RNA gene sequencing, results revealed that VR1, Accession no. PV012478 nearest phylogenetic strains *Enterobacter cloacae*with 99% similarity, VR5, Accession no. PV0212476 nearest phylogenetic strains *Enterobacterhormaechei subsp. Xiangfangensis* with 100% similarity and VR8, Accession no. PV186758 nearest phylogenetic strains *Enterobacter hormaechei* with 99% similarity. These three strains can be used to make the biofertilizer for xerophytic plants in near future.

Keywords-*Bacteria, Endophytes, Crassula ovata, Plant growth promotion, Accession number.*

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