

**10th International Conference
On
Recent Advances in Agriculture, Engineering, Applied
& Life Sciences for Environmental Sustainability
(RAAEALSES-2024)**

Venue: Uttaranchal University, Dehradun, Uttarakhand, India

October 23-25, 2024

Abstract Book Cum Souvenir

Editors

Sarvesh Rustagi
Chhatarpal Singh
Rajendra Prasad
Sanjay Kumar Jha



Organized by



School of Agriculture, Uttaranchal University
Dehradun, Uttarakhand, India
(www.uudoon.in)



Agro Environmental Development Society (AEDS)
Majhra Ghat, Rampur, U.P., India
(Registered under the Society Registration Act XXI, 1860)
(www.aedsi.org)



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PRESIDENT'S MESSAGE

It is with great pride and optimism that School of Agriculture, Uttaranchal University Dehradun, Uttarakhand and Agro Environmental Development Society (AEDS), Rampur, U.P., India are going to organise 10th International Conference on “**Recent Advances in Agriculture, Engineering, Applied & Life Sciences for Environmental Sustainability (RAAEALSES-2024)**” at Uttaranchal University Dehradun, Uttarakhand during October 23-25, 2024. On this auspicious occasion, I extend my best wishes to all esteemed participants, organizers, and contributors, those who are taking part in this conference. In today's rapidly evolving world, where the balance between progress and preservation is increasingly fragile, this gathering stands as a beacon of hope. The pursuit of innovative solutions and sustainable practices is not only a scientific and technological endeavor but a moral responsibility that we carry for future generations and the planet we call home. May this conference be a meeting ground of minds and hearts, where knowledge flows freely, ideas blossom, and collaborations for the greater good are forged. I bless this conference with the spirit of unity, curiosity, and compassion, so that each participant finds both the wisdom and strength to contribute towards the collective goal of environmental sustainability. May this conference inspire ground breaking ideas, foster fruitful collaborations, and serve as a stepping stone to creating a future where science and sustainability are intertwined for the benefit of all living beings.

I extend my blessings to the organisers for a successful, enriching, and impactful conference. May your work continue to illuminate the path towards a greener, healthier, and more sustainable world.

With best wishes.

Mr Jitender Joshi
President

Established vide Uttaranchal University Act 2012 (Uttarakhand Act No. 11 of 2013) | Approved under Section 2(f) & 12 (B) of UGC Act 1956

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VICE CHANCELLOR'S MESSAGE

It is a matter of great pleasure and pride that School of Agriculture, Uttaranchal University Dehradun, Uttarakhand and Agro Environmental Development Society (AEDS), Rampur, U.P., India are going to organise 10th International Conference on "Recent Advances in Agriculture, Engineering, Applied & Life Sciences for Environmental Sustainability (RAAEALSES-2024)" at Uttaranchal University Dehradun, Uttarakhand on October 23-25, 2024. It is a privilege to offer my blessings for this conference, which reflects the dedication and intellectual contributions of faculties, scientists, researchers and professionals in the fields of agriculture and life sciences. The knowledge shared within these pages holds the potential to transform not only the future of agriculture but also the quality of life for generations to come. As we gather to celebrate innovation and research in these critical fields, may this conference serve as a catalyst for sustainable practices, scientific breakthroughs, and harmonious relationships between humanity and nature. The wisdom shared here represents the seeds of growth for healthier ecosystems, resilient food systems, and enriched human well-being. May those who read and engage with this compendium be inspired to carry forward these ideas with passion and purpose, fostering a world where agriculture and life sciences continue to play a vital role in shaping a sustainable and prosperous future.

I convey my best wishes for the grand success of this conference and also wish you all continued success in your endeavours and hope that the knowledge contained within this compendium leads to fruitful outcomes for society at large.

Prof. Dharam Buddhi
Vice Chancellor

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Ref. No. UU/SOA/Director/2024/33

Date: 9th October 2024



Message

I am very happy to know that School of Agriculture (SOA), Uttaranchal University, Dehradun and the Agro Environmental Development Society (AEDS), Majhra Ghat, Rampur jointly organizing the 10th International Conference on Recent Advances in Agriculture, Engineering, Applied & Life Sciences for Environmental Sustainability (RAAEALSES-2024) from 23rd to 25th October 2024 at Uttaranchal University campus.

I have always been proud of the School of Agriculture (SOA), which is a leading institution of agriculture not only in Uttarakhand but across the country. It has marked an important milestone in academic excellence and has made significant efforts to address the pressing challenges of food security with a focus on environmental sustainability.

The theme of environmental sustainability is significant in today's global context, as we face exceptional challenges related to climate change, resource depletion, and food security. The collaborative efforts of scientists, researchers, and industry experts at RAAEALSES-2024 will undoubtedly contribute to make sustainable solutions to these issues.

I praise the dedication of the organizing committee in bringing together a diverse group of thought leaders, and I am confident that this conference will inspire new approaches, share knowledge, and lead to impactful research that benefits both society and the environment.

As we release this souvenir, I hope it serves as a testimony to the intellectual and collaborative spirit of this conference. I extend my best wishes to all the participants and look forward to the fruitful outcomes of this esteemed gathering.

Wishing the event great success and fruitful deliberations.

Prof. (Dr.) Mahipal Singh

Director, School of Agriculture (SOA)

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Message

It gives me immense pleasure to extend a warm welcome to all the delegates, participants, and distinguished guests to the 10th *International Conference on Recent Advances in Agriculture, Engineering, Applied & Life Sciences for Environmental Sustainability (RAAEALSES-2024)*. This prestigious event is a significant platform for the exchange of innovative ideas and knowledge sharing across a wide range of disciplines, with a special focus on environmental sustainability.

In the recent evolving world, the climate change, environmental degradation, and the interconnected challenges of food security call for collaborative, multidisciplinary solutions. The RAAEALSES-2024 not only motivate a spirit of academic inquiry but also encourage for the fruitful collaborations between researchers, professionals, and other stakeholders who are devoted towards the advancement in science for the betterment of society.

I am confident that the deliberations during these three days will stimulate meaningful discussions, generate new ideas, and contribute towards sustainable development goals. I congratulate the organizing committee for their tireless efforts in bringing together such a diverse and accomplished group of participants, and I wish all the attendees an intellectually enriching and memorable experience.

Once again, I welcome you all to this conference and look forward to the valuable contributions you will make towards shaping a sustainable future.

Dr. Rajendra Prasad

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Date : 10 October, 2024



Ref No: UU/DA/2024/IC/01 .

Message

The 10th International Conference on “Recent Advances in Agriculture, Engineering, Applied & Life Sciences for Environmental Sustainability (RAAEALSES-2024)” will be held at Uttaranchal University Dehradun, Uttarakhand, from October 23–25, 2024, with the enthusiastic support of the School of Agriculture at Uttaranchal University Dehradun, Uttarakhand, and the Agro Environmental Development Society (AEDS), Rampur, U.P., India. For faculty, research scholars and industrial practitioners, this conference provides an essential forum for exchanging creative concepts to tackle the urgent environmental issues of today's society.

Our subject highlights how interdisciplinary cooperation may result in sustainable solutions by focussing on the interface of engineering, biological sciences, and agriculture. By working together, we may motivate one another and create practical insights that advance resilience and sustainability in our domains. I appreciate your participation in this conference. 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

Associate Professor,

School of Applied and Life Sciences,

Uttaranchal University, Dehradun, Uttarakhand, India.

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Agro Environmental Development Society (AEDS)
Majhra Ghat, Rampur-244922, Uttar Pradesh, India

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डॉ. छत्रपाल सिंह

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Message

As organizing secretary, I warmly welcome to all the dignitaries, delegates and participants in the 10th International Conference on “**Recent Advances in Agriculture, Engineering, Applied & Life Sciences for Environmental Sustainability (RAAEALSES-2024)**”. The conference is going to be organized by School of Agriculture, Uttaranchal University, Dehradun, Uttarakhand & Agro Environmental Development Society (AEDS) Rampur, U.P., at Uttaranchal University, Dehradun, Uttarakhand, from October 23-25, 2024. The AEDS is continuously working in the agriculture field 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 Jitender Joshi Ji, President, Uttaranchal University, Dehradun and respected Patron, Prof. Dharam Bhuddi Ji, Vice Chancellor, Uttaranchal University, Dehradun, Uttarakhand. Convenor, Dr. Sarvesh Rustagi Ji, Associate Professor, Department of Food Technology, School of Applied & Life Sciences and Director, National & International Admissions, Uttaranchal University, Dehradun for supporting and conducting 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 this 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, Engineering, Applied & Life Sciences and making this conference grand success.

Dr. Chhatarpal Singh

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Poster / Oral Presentation & Lead Lectures

Complaints management in seed business

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Abstract

Seed is the basic and most critical input for sustainable agriculture. The response of all other inputs depends on quality of seeds to a great extent. Seed is the vital input in crop production and is the cheapest among all other inputs for raising a good crop. In general farmers are supplied with good quality (germination, genetic purity and better performance) seeds. However sometimes due to some unforeseen problems like floods, erratic rainfall, unfavorable weather conditions, problems may arise leading to huge losses to the farmers. Under such adverse situation, the term “Spurious Seed” is indiscriminately used by the media and making unnecessary bad propaganda even without establishing sufficient proof. It is not the seed germination failure but sometimes poor performance of the product supplied may lead to complaints. In general, no sub-standard seed is sent to the market. However, complaints from the farmers are very common. Majority of the complaints are on the failure of seed germination and few of them are on the factors like flower dropping, poor grain setting, pests and disease problems. Timely management of the complaints is very important otherwise, problems will be precipitated leading to huge compensation and unnecessary involvement of the media.

Key words: *Quality seed, Spurious seed, Germination, Complaints, Management, Seed Business*

Antifungal activity of essential oils against the post-harvest fungal pathogens of guava (*Psidium guajava* L.)

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Abstract

Guava (*Psidium guajava* L.) is one of the great nutritional and medicinal fruit. Post harvest loss of guava fruits is common by fungal pathogen at various stage of harvesting period. The use of different chemical fungicides to avoid such loss has remained always the first choice but there remains adverse effect of these fungicides on human health and environment. Essential oils of different aromatic plants have been used effectively against such pathogens. This study evaluated the effectiveness of plants essential oils on associated fungal isolated pathogen of guava fruit. Altogether eight species of fungal pathogens were detected from the present research viz. *Alternaria alternata*, *Aspergillus flavus*, *Aspergillus neiger*, *Aspergillus versicola*, *Colletotrichum gloeosporioides*, *Monilia fruticola*, *Penicillium sp.*, *Pestalotia psidii*. Essential oils from three plants i.e., *Acorus calamus*, *Callistemon citrinus*, *Juniperus indica*, were investigated in this study to find out their effectiveness against the *A. alternata*, *C. gloeosporioides*, *P. psidii* fungi of guava fruit. Essential oils were extracted through hydro distillation methods using Cleavinger's apparatus. GC-MS analysis of essential oils was performed in order to

study the physiochemical properties of essential oils that could be involved in the antifungal activity. All the essential oils were found significantly inhibiting the mycelial growth of these pathogens. Among them, *A. calamus* has shown a best inhibition effect by completely inhibiting all tested fungi at 40 μ l/ml and 20 μ l/ml concentration. Similarly, at 40 μ l/ml oil concentration of *C. citrinus* plant, *A. alternata*, *C. gloeosporioides* and *P. psidii* was inhibited by 72.25%, 47.4% and 48.38% respectively. 40 μ l/ml oil concentration of *J. indica* inhibited *A. alternata* by 67.31%, *C. gloeosporioides* by 70.03% and *P. psidii* by 89%. Thus, the essential oil of these aromatic plants can be used as a natural fungicide instead of synthetic chemical fungicide to control postharvest micro pathogens as they have a promising potential to combat with infectious microorganisms.

Keywords: *Microscopic characters, Hydro distillation, Fungitoxicity, Biopesticides*

Species diversity of the Eriophyoid and their predatory mites associated with fruit trees in Hamadan County

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Abstract

This research was done to study of the diversity of the Eriophyoidea and their predatory mites associated with fruit trees in Hamadan County in years 2018 and 2020. The samples were collected from different regions in spring, summer and autumn. The mites of the foliage samples were obtained directly or by washing method, then cleared in Nesbitt's solution and microscopic slides prepared. Brillouin, Simpson and Shannon-Wiener indices were used to calculate species diversity and Margalef and Menhinick indices were used to determine species richness. From the number of 19541 samples collected, a total of 51 species belonging to 23 genera of Eriophyidae, Diptilomiopidae, Stigmaeidae, Phytoseiidae, Tydeidae and Iolinidae families were identified, of which 6 genera and 14 species were new record for Hamedan province and 9 species were new record for the world. *Acalitus iranicus*; *Aculus flechtmanni*; *Aculus* nsp.; *Diptacus hamedanicus*; *Eriophyes prunorum*; *Phyllocoptes hamedii*; *Quadracus reticulatus*; *Tetra pruni*, *Tetra* n sp. were new to the word *Acalitus phloeocoptes*; *Aceria avenensis*; *Aceria lobolinguae*; *Aculus fockuei*; *Aculus schlechtendali*; *Aculus latiloba*; *Anthocoptes stritiatus*; *Calepitrimerus bailyi* ; *Diptacus gigantorhynchus*; *Eriophyes mali*; *Rhinophytoptus nemalobos*; *Shevtchenkella juglandis*; *Neopronematus sepaosgariani*; *Neopronematus lundqvisti*; *Pronematus ubiquitus*; *Tydeus lambi* were new for Hamedan province fauna. Among the eriophyid mites that caused galls, *Aceria tristatus* and *Acalitus iranicus* species, had the highest relative abundance (%) with 52.53 and 24.27%, respectively; Among the vagrant eriophyid mites, *Rhinophytoptus nemalobos* and *Aculus fockuei* had the highest relative abundance (%) with 13.86% and 11.94% respectively; Among the predatory mites, *Typhlodromus bagdasarjani* and *Zetzellia mali* had the highest relative abundance (%) with 24.85 and 13.03%, respectively. Among the studied areas, the relative frequency of Eriophyid mites in Shahrestaneh, Sangestan, Yalfan and Heidareh with 19.29, 16.15, 12.34 and 11.64%, respectively, had the highest percentage and Ganjnameh, Gezel-Hesar and Saleh Abad had the lowest

frequency percentage with 0.12, 0.54 and 0.73% respectively. Also predatory mites in Sangestan, Shahrestaneh and Heidareh with 32.75, 17.83 and 15.49% respectively had the highest percentage, and Ganjnameh, Sadde Ekbatan, Gezel Hesar and Ghaleh jugh respectively with 0.35, 0.56, 0.95 and 0.95% had the lowest frequency percentage.

According to Simpson and Shannon-Wiener indices, the highest value of species diversity is respectively (928.928) and (3.301) in Sangestan and the lowest value is (0.471) and (0.664) in Ganjnameh. According to Margalef and Menhinick indexes, the highest value of species richness is (10.09) and (1.535) respectively in Sangestan and the lowest value is (0.284) and (0.088) in The Ghaleh jugh. According to Simpson and Shannon-Wiener indices, the highest amount of species diversity is (0.647) and (1.189) respectively in the nectarine tree and the lowest amount of species diversity is in hawthorn trees (0.5), (0.693) and Fig. (0.5), (0.693). According to the Margalef and Menhinick index, the highest species richness value is (1.144) and (1.078) in cherry tree, and the lowest species richness value is in hawthorn (0.281) and walnut (0.214), respectively.

Keywords: *Eriophyid mites, predatory mite, Diversity, Fruit trees.*

Challenges in muga silkworm (*Antheraea assamensis*) rearing: A comprehensive analysis of climatic and biological factors

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Abstract

The muga silkworm, *Antheraea assamensis* Helfer, a unique insect endemic to northeastern India, is renowned for producing golden silk. This silk, with its distinctive natural golden-yellow hue, holds a special status. *Antheraea assamensis* belongs to the family Saturniidae under the order Lepidoptera. The geographical isolation of this species highlights its specific geo-climatic requirements, which include a high-humidity temperate climate and forest vegetation comprising its primary and secondary host plants. The semi-domesticated muga silkworm is multivoltine, with rearing occurring in six different seasons throughout the year. Among these, two seasons, May-June and October-November, are considered commercial crop seasons, while the remaining seasons are designated for pre-seed and seed crops. The latter typically coincide with adverse climatic conditions, such as extreme summer and winter, leading to a significant reduction in productivity, sometimes as low as 10-20%. Several climatic factors, including heavy rainfall during brushing, hailstorms during the early stages, temperature fluctuations, and high rainfall, severely impact muga silkworm rearing. Despite being a single species with limited genetic variation among populations, the muga silkworm endures harsh climatic conditions but remains vulnerable to various diseases, pests, and predators. Consequently, the production of muga silk has

recently seen a dramatic decline. Enhancing the productivity of the muga silkworm necessitates a comprehensive understanding of its biology and host plants. A lack of knowledge in these areas presents a significant bottleneck to successful rearing. This study discusses the critical factors influencing muga silkworm rearing and highlights the need for advanced research to address these challenges.

Keywords: *Muga Silkworm, Climatic Impact, Northeastern India*

Study, survey and knowledge on tuberculosis 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.

Key Words: *Tuberculosis, India, Jammu and Kashmir, Doda, Drug resistant, Stigma.*

Cultivation of useful microbes for agro-environmental sustainability

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Abstract

Cultivating beneficial microbes is vital for achieving agro-environmental sustainability, as they maintain soil health, promote plant growth, and reduce environmental pollutants. Microorganism cultivation enhances soil fertility, crop yields, and environmental pollution reduction, promoting sustainable agricultural practices and agro-ecosystem impact. The increasing global demand for food and agricultural products necessitates sustainable practices to ensure environmental integrity. This study focuses on cultivating beneficial microbes to enhance agro-environmental sustainability. We isolated and characterized microorganisms from various agricultural environments, evaluating their potential for promoting soil fertility, improving crop yields, and reducing environmental pollutants. Our results

demonstrate that specific microbial strains significantly enhance soil nutrient cycling, increase crop yields, and mitigate environmental pollutants. The findings highlight the potential of beneficial microbes in promoting sustainable agricultural practices. By cultivating and applying these microorganisms, we can reduce synthetic fertilizer usage by 20% ($p < 0.05$), minimize environmental pollution by 25% ($p < 0.01$), and enhance agro-ecosystem services. This study contributes to the development of scientific approaches for environmental sustainability, emphasizing the importance of microbial applications in sustainable agriculture. Future research should focus on scaling up microbial cultivation, optimizing application methods, and exploring potential interactions with other agro-ecosystem components.

Keywords: *Microbial Cultivation, Agro-Environmental Sustainability, Sustainable Agriculture, Soil Fertility, Crop Yields, Environmental Pollutants.*

Age-related morphometrical changes in the thymus of Indian sheep during postnatal development

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Abstract

The present work was aimed to study the age related morphometrical studies in the thymus of Indian sheep during postnatal development. The fresh tissues were collected from the local slaughter house immediately after the sacrifice of the animal and then fixed in 10% neutral buffered formalin (NBF) solution. After fixation, the tissue samples were processed for routine paraffin sectioning technique and then stained with routine Harris' haematoxylin and eosin stain. Morphometrical studies revealed that in case of young sheep, the cortical region showed a greater number of small sized lymphocytes (3.63 μm), a lesser number of small sized reticuloepithelial cells (RECs) (6.27 μm). However, in medullary region, a smaller number of large sized lymphocytes (6.6 μm) and a greater number of large sized RECs (10.23 μm) were observed which indicates that the mean values of micrometrical parameters varied significantly between groups at 5% level ($p < 0.05$). Highly significant difference was found at 1% level ($p < 0.01$) within concentric (21.78 μm) and cystic (42.24 μm) types of Hassall's corpuscles. No significant difference was found at 5% level ($p > 0.05$) and 1% level ($p > 0.01$) between the mean values of micrometrical parameters of plasma cells (9.24 μm) of both cortical as well as medullary regions however, a greater number of plasma cells were observed in the cortical area. In case of adult sheep, comparatively a greater number of large sized lymphocytes (6.6 μm) were observed in the medulla to that of cortex (3.3 μm) indicating the significant difference at 5% level ($p < 0.05$). Large sized RECs were noticed in the medullary area (15.84 μm) than cortical region (5.94 μm) whereas, plasma cells were larger in the cortex (9.57 μm) as compared to that of the medullary zone (9.24 μm). Highly significant difference was found at 1% level ($p < 0.01$) within mean values of micrometrical parameters of concentric (28.38 μm) and cystic (50.82 μm) types of Hassall's corpuscles.

Keywords: *Hassall's corpuscles, Involution, Morphometry, Sheep, Thymus*

Eco-friendly wastewater treatment using green-synthesised nanoparticles: a sustainable pollution remediation technique

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Abstract

Water is vital for life on Earth, and its unavailability or poor quality has severe consequences for all aspects of human life, including food, health, and environment. Anthropogenic activities have caused widespread pollution of water resources worldwide. Although some remediation methods and techniques have been developed, considering the extent, quantity, and varied nature of pollutants, new and sustainable technologies are urgently needed to remediate polluted water and wastewater. In recent times, the use of nanomaterials for the treatment of wastewater has gained considerable importance owing to their high accuracy and precise remediation. Nanoparticles (NPs) exhibit enhanced chemical reactivity, high surface area, lower costs and energy requirements, and efficient regeneration for reuse, making them ideal materials for wastewater treatment. The conventional method of NP production is hazardous, and application of volatile chemicals results in secondary pollution, yet biogenic NPs are inexpensive and environmentally safe. Plants, bacteria, algae, and fungi produce a range of alkaloids, flavonoids, carbohydrates, polymers, proteins, and numerous antioxidants that are effectively used as capping and stabilizing agents in NP synthesis.

Keyword: Wastewater treatment, Green Synthesize nanoparticles, pollutants

Monstrosities as a cause of fetal dystocia in buffaloes

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Abstract

The present study was conducted on 15 buffaloes suffering from dystocia due to fetal causes. The etiology of fetal dystocia included different types of monstrosities. Out of 15 cases, 4 were manipulated at field level and 11 were directly referred to VCC, LUVAS Hisar by the local veterinarian/paravet staff. Among the manipulated (4) cases, 3 (75%) animals died at VCC while 1 (25%) animal survived. Two dystocia were resolved by fetotomy whereas, 2 animals underwent caesarean section. Likewise, among the referred (11) cases, 1 (9%) animal died at VCC while 10 (90%) animals survived. In these cases, 8 animals experienced per-vaginal delivery while 3 animals underwent caesarean section. Proper diagnosis and timely decision in dystocia due to fetal cause is very crucial for survival of dam. Cases of dystocia due to fetal cause should be referred to higher centre without any delay if facilities for fetotomy and caesarean section are not available.

Impact of sowing dates and bio-fertilizer doses on economics of Canola (gobhi sarson), at Dehradun region

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Abstract

The field experiments was conducted entitled, “Impact of sowing dates and bio- fertilizer doses on economic of Canola (gobhi sarson) at Research Farm of School of Agricultural Sciences, Shri Guru Ram Rai University, Under Irrigated condition” during *Rabi* season of 2020 -21 and 2021-22. The treatments was laid out in Factorial Randomized Block Design having with 18 treatments and 3 replication having two factors first factor included different dates of sowing i.e. 10 days before optimum date (S_1), Optimum date (S_2), 10 days after optimum date (S_3) and Second factors included sulphur application and inoculation of biofertilizers i.e. Organic Sulphur @ 40 kg/ha (D_1), Organic Sulphur @ 40 kg/ha + Azotobacter(D_2), Organic Sulphur @ 40 kg/ha +Phosphorus Solubilizing Bacteria (D_3), Organic Sulphur @ 40 kg/ha + Sulphur Solubilizing Bacteria (D_4), Organic Sulphur+ Azotobacter +Phosphorus Solubilizing Bacteria + Sulphur Solubilizing (D_5) and Absolute control (D_6). Amongst various date of sowing optimum date (D_2) was found superior with maximum yield, gross income, B:C ratio and net income obtained during the both the years. In case of biofertilizers maximum yield, gross income, B:C ratio and net income was recorded under organic Sulphur @ 40 kg/ha + Sulphur Solubilizing Bacteria (D_4) followed by D_5 during the both the years.

Keywords: Gross income, net income, B:C ratio and cost of cultivation etc

Effect of methyl cellulose prepared from Cow dung on ordinary Portland cement concrete’s tensile and compressive strengths

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Abstract

In the current work, cow dung was converted into methylcellulose (MC) in a heterogeneous medium using methyl sulfate (DMS) as an etherification agent. This study investigates the use of methylcellulose as an additive to improve the strengths of concrete, such as its tensile and compressive strength. Prepared methyl celluloses to binder ratio, starting at 2 grams by weight of cement was used to cast concrete sample. A test on concrete specimens, including the concrete cylinder, was conducted. The tensile strength of concrete was found to be enhanced by the addition of methylcellulose. The compressive strength of the cow dung methyl cellulose (CD) sample and control sample (CS) was 2130 KN and 2400 KN. The methylcellulose prepared from cow dung shows higher tensile strength than the control sample (CS). Methylcellulose probably works as a fibrous material to provide the concrete with more

tensile strength. Fibers have been demonstrated in multiple experiments to have a favorable effect on the tensile strength of concrete.

Keywords: *Cow dung (CD) Control sample (CS), Methylcellulose, Tensile strength, Compressive strength*

Assessing soil quality in paddy fields: the environmental impact of coal mining in Raniganj coalfield

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***Presenter**

Abstract

Raniganj Coalfield, the cradle of India's coal industry and a cornerstone of its energy production, lies at the heart of the Paschim Bardhaman district in West Bengal, with the Raniganj administrative block serving as its core. However, this storied region bears the heavy burden of coal mining, which, while fueling industrial growth leaves a trail of environmental degradation in its wake. The relentless extraction of coal from operational and abandoned mines wreaks havoc on natural ecosystems, disrupts groundwater systems, and contaminates soil, water, and air—rendering it one of the most environmentally destructive practices. In the Raniganj block, the monsoon season exacerbates these issues, as precipitation, surface runoff, and groundwater leaching become the primary culprits in contaminating agricultural soil and irrigated water. This study delves into the physical and chemical characteristics of paddy fields in the region, employing GIS technology to explore the impact of mining on soil quality, along with factors such as elevation, slope, drainage density, and land use. The findings reveal a soil pH range of 5.38 to 8.44, with organic matter and carbon content fluctuating between 0.33% and 0.99%, and electrical conductivity (EC) varying from 0.14 to 1.42 Ds/m. The availability of vital nutrients—Nitrogen (N), Phosphorus (P), and Potassium (K)—shows average accessibility values of 182.0 - 510.0 kg/ha, 25.0 - 115.0 kg/ha, and 128.0 - 955.0 kg/ha, respectively. Statistical analysis highlights a positive correlation between pH, EC, available N, P, K, and organic carbon, underscoring the complex interplay of these factors in soil health. While the pH, EC, and moisture content in the studied fields are within the optimal range for plant growth, the varied concentrations of accessible nutrients reflect both the resilience and fragility of these soils. The findings underscore the delicate balance between coal mining and agricultural sustainability in Raniganj, emphasizing the pressing need for informed and strategic interventions to safeguard and improve soil quality in this historically significant region.

Keywords: *Coal mining, Environmental degradation, Paddy fields, Raniganj Coalfield, Soil quality*

The fuel of our future: Hydrogen or Methane?

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Abstract

Amid growing concerns over climate change, the search for low-carbon fuels has led to increased interest in hydrogen and methane. Hydrogen, while offering zero-emission energy potential, faces significant challenges such as high production costs, energy-intensive processes (often reliant on fossil fuels), and difficulties in storage and transportation. These factors make hydrogen energy currently less efficient and environmentally favorable compared to methane. In contrast, methane—particularly from vast reserves like gas hydrates—provides a more viable short-term solution, offering lower costs, higher efficiency, and lower global CO₂ emissions. Moreover, modern technologies allow methane's conversion into syngas and chemicals, positioning it as not only a fuel but also a crucial resource for organic chemistry. Methane can also be synthesized from CO₂ and water using renewable or thermonuclear energy, supporting carbon-neutral energy cycles. While hydrogen may be the fuel of the distant future, methane remains a more practical and efficient option in the transition to a sustainable, low-carbon energy system. Together, hydrogen and methane offer complementary solutions in the journey towards global carbon neutrality.

Keywords: *Hydrogen, Methane, Low-Carbon Fuels, Climate Change, Energy Intensive, Gas Hydrates, Zero-Carbon Emission, Thermonuclear Energy, Transportation, Global Carbon Neutrality.*

Pearl millet incorporated sweet potato choco-filled cookies

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Abstract

Sweet potato and pearl millet are good source of dietary fiber and health protective antioxidants with potential protection against chronic oxidative stress commonly associated with pathogenesis of non-communicable chronic diseases (NCDs). Therefore, targeting sweet potato and pearl millet in ethnic or functional food design address chronic oxidative stress-linked NCD challenges such as early stages of type 2 diabetes and its associated complications has significant merit. Thus, the aim of this study was to standardize the formulation for the development of pearl millet incorporated sweet potato choco-filled

cookies. Among the eight different formulations based on completely randomized design, treatment five (T5) showed significantly higher nutritional and sensory characteristics. The protein content ranged between 2.61 to 4.75 mg/100 g dry weight (dw), starch 39.59 to 45.58 mg/100 g dw, fiber 0.21 to 0.51 mg/100 g dw, ash 3.52 to 6.48 mg/100 g dw. In addition, micronutrient analysis revealed the presence of good amounts of micronutrients such as calcium (0.99 to 3.40 ppm), iron (1.05 to 1.67 ppm), magnesium (0.27 to 0.34 ppm), zinc (0.16 to 0.27 ppm), and copper (0.04 to 0.09 ppm). Results indicated that T5 containing 40 % of sweet potato, 40 % of pearl millet, and 20 % of wheat flour showed higher nutritional and sensory attributes compared to other formulations in this study.

Effect of dietary nano-encapsulated amino acids and organic trace minerals supplemented berseem leaf protein concentrate on the growth performance and physio-immunological responses of *Labeo rohita* fingerlings

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Abstract

A 60-day feeding trial was conducted to evaluate the effect of nano-encapsulated amino acids and organic trace minerals supplemented berseem (*Trifolium alexandrinum*) leaf protein concentrate (BLPC)-based diet on the growth performance and physio-immunological responses of *Labeo rohita* fingerlings. One hundred eighty acclimated *Labeo rohita* fingerlings (avg. b. wt. 15.0 ± 0.5g) were randomly distributed into four experimental groups viz. Control (BLPC-based diet without supplementation of amino acids and trace minerals), T1 (Diet supplemented with deficient amount of histidine and methionine in crystalline form and zinc and cobalt in inorganic form), T2 (Diet supplemented with deficient amount of histidine and methionine in nano form and zinc and cobalt in organic form) and T3 (Diet supplemented with 50% of deficient amount of histidine and methionine in nano form and zinc and cobalt in organic form) in triplicate with the stocking density of 15 fish per tank. The fishes were fed with respective isonitrogenous (32% crude protein), iso-lipidic (5.8%) and isoenergetic (362 kcal digestible energy/100g) diet at satiation level twice daily. Results indicated that weight gain percentage (WG%), specific growth rate (SGR), feed efficiency ratio (FER) and protein efficiency ratio (PER) of T3 group were significantly higher (p<0.05) than Control and T1 groups and similar (p>0.05) to T2 group. FCR showed the opposite trend of growth of fish. T3 groups also showed improved protease, amylase and phagocytic (NBT value) activities. In conclusion, dietary supplemented nano amino acid and organic trace minerals mixture are more effective than their crystalline and inorganic counterpart for improvement of growth performance of carps. Moreover, dietary supplemental levels of nano amino acids and organic trace minerals could be the half of their crystalline and inorganic counterparts for improved growth performance, digestive enzyme activity and health status of fish.

Keywords: Berseem leaf protein concentrate, *Labeo rohita*, Growth performance, Immunity, Nano amino acids, organic trace minerals

Synthesis, characterization and antibacterial activity of manganese (IV) complexes of mixed-ligand dihydrazone

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Abstract

Manganese (IV) complexes of the composition, $[Mn^{IV}(nagh)(A)_2] \cdot 2H_2O$ (where (A= pyridine (py, 2); 2-picoline (2-pic, 3); 3-picoline (3-pic, 4) and 4-picoline (4-pic, 5)) and $[Mn^{IV}(nagh)(NN)]$ (where NN = 2, 2 bipyridine (bpy, 6) and 1, 10-phenanthroline (phen, 7)) have been synthesized. The primary ligand *bis*(2-hydroxy-1-naphthaldehyde) glutaryl dihydrazone ($naghH_4$) was reacted with manganese (II) acetate tetrahydrate without or with auxiliary ligands in the presence KOH in methanolic medium. Elemental analysis, thermogravimetric and molar conductance data have been used to judge the newly synthesized metal complexes. Based on data obtained from the magnetic moment, electronic, IR and electron paramagnetic resonance spectral studies, the structural assessment of complexes has been confirmed. Complex (7) has also been characterized by mass spectral data. Molar conductivity measurements in DMSO suggested that they are non-electrolytes. Electrochemical behaviour of few complexes were studied by cyclic voltammetry. IR spectral studies confirm that dihydrazone coordinates to the metal center with an anti-cis configuration. The dihydrazone-based ligand and its complexes have also been studied for their antibacterial activity against certain bacteria by Standard Agar well diffusion method.

Keywords: *Dihydrazone, Manganese (IV), Spectral studies, Auxiliary ligands, Antibacterial activity, Complexes.*

Sustainable transformation: Innovative strategies for water, agriculture, and community resilience in the Raniganj coalfield, West Bengal, India

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Abstract

The Raniganj coalfield in West Bengal, India, is a vital energy hub, yet its history of surface-cut mining has left behind a landscape marred by pitlakes filled with precipitation, runoff, and groundwater, which pose severe environmental challenges. These abandoned pitlakes degrade soil and water quality, leading to erosion, contamination, and diminished fertility, thereby jeopardizing local agriculture. Additionally, water bodies suffer from acid mine drainage and toxic contamination, creating significant ecological and health risks. However, innovative rehabilitation techniques like phytoremediation and

phycoremediation, which use plants and algae to detoxify pollutants, offer a promising path forward by restoring water quality. The reclaimed water can be repurposed for agriculture, addressing water scarcity for local farmers while these bioremediating plants and algae also contribute to carbon sequestration, aiding in climate change mitigation. Hydroponic farming, which relies on nutrient-rich water instead of soil, can thrive using this treated water, conserving land and maximizing crop yield and quality, thus ensuring food security and economic stability. These sustainable practices not only create new livelihoods, reducing youth involvement in informal mining, but also promote entrepreneurship, transforming the environmental liabilities of coal mining into assets that support sustainable agriculture and water management. This holistic approach revitalizes mining-affected landscapes, paving the way for innovative agricultural practices and ensuring a harmonious balance between industrial activities and ecological preservation. Aligned with key government initiatives like Jal Shakti Abhiyan, the National Action Plan on Climate Change, Swachh Bharat Abhiyan, Pradhan Mantri Garib Kalyan Anna Yojana, and Atal Innovation Mission, this strategy aligns with India's Viksit Bharat@2047 vision, striking a balance between environmental preservation and economic growth, fostering sustainable development and alternative livelihoods in the region. Ultimately, sustainable transformation: innovative strategies for water, agriculture, and community resilience in the Raniganj coalfield, West Bengal, India highlights the immense potential to convert environmental challenges into sustainable opportunities, promoting ecological balance, economic prosperity, and resilient communities.

Keywords: *Abandoned pitlakes, Carbon sequestration, Entrepreneurship, Food security, Hydroponic farming*

Ti₃C₂T_x@polypyrrole decorated molecular imprinted electrochemical sensor for antibiotic detection in environmental sample

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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 µg 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 Ti₃C₂T_x as a sensing platform. Ti₃C₂T_x 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 0.76 pM. Efforts have also been made to validate the fabricated sensor with real

samples obtained from environmental samples (soil), and the electrochemical results signify that the proposed sensor can be a reliable analytical tool for analyzing antibiotic residues.

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

Prospects of Mushroom Cultivation in India with special reference to Uttarakhand

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Abstract

Mushrooms or macro fungi are the premier recyclers on the planet which lack chlorophyll, primarily saprophytes, recycle organic wastes and balance the ecosystem. Use of mushroom as food and, medicines is related to the history of mankind and as old as the civilization itself, whose references are available in Vedas and various other religious writings. They are cosmopolitan, found in snowy mountains to sandy deserts and in all types of soils/land and wood logs. They are reported worldwide, some of them have been domesticated in different parts of the world. In India button mushroom, oyster mushroom, straw mushroom, milky mushroom, shiitake mushroom, black ear mushroom and various other tropical, sub-tropical and temperate species are growing on marginal and commercial scale. Mushroom is an ideal food rich in proteins, minerals, constitute vitamins especially vitamin D and anti-oxidants. They are low calorie diet and rich in nutrients, on the other hand they have a lot of medicinal properties. In India basic raw material for mushroom cultivation (wheat and paddy straw) is available in abundance (more than 650 million tonnes per annum). The major part of it left out to decompose naturally or burnt in situ which causes pollution in the environment. By just diverting 1-2 % of this agrowastes towards mushroom production, we can produce approximately 3-5 million tonnes of mushroom and about 15-25 million tonnes of spent-compost, which can be directly applied to the field and has same fertilizer value as the farm yard manure. Presently mushroom cultivation is shaped in Agribusiness activity, creating new avenues of employment opportunities especially for youngsters and house wives and a potential foreign exchange earner to boost the economy of India. They are consumed as either a vegetable or pickle, ketchups, nuggets, murabba, candy, jams, and chips. Mushrooms fortified cookies, papads, biscuits, breads, cakes and drinks etc., are set to hit markets across the country. Morchella and Cordyceps, supports vitality of lungs, liver, heart and reproductive organs and improves strength and stamina, fetches the grower a high price. Inclusion of mushroom in the mid-day meal in schools (as known by some reliable sources), could boost a lot of its popularity and production. Mushroom cultivation in India is increasing, but increase in consumption of different mushrooms and their popularity in general public is only possible, if we must be pragmatic in our planning. Government and other agencies to give more attention on mushroom growers for developmental activity like good infrastructure, training programmes, selection of suitable sites, proper design of mushroom house, availability of clean water, spawn and proper guidance etc. Government, NGOS and other public agencies needs to take care for

each and every rural parts/village of the districts in the states all over the country for extension and awareness to encourage all about mushrooms cultivation.

Assessment of preservative potential of nanoencapsulated *Monarda citiodora* essential oil against fungal and aflatoxin B₁ contamination of stored chia seeds

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Abstract

The present study was aimed to enhance the effectiveness of chitosan loaded *Monarda citriodora* essential oil (MCEO-CsNe) against fungal infestation, aflatoxin B₁ (AFB₁) contamination, and lipid peroxidation mediated deterioration of stored chia seeds. The major chemical compounds of MCEO were identified through GC-MS analysis as caryophyllene (19.15 %) followed by citral (13.27 %), D-limonene (11.80 %) and cis-verbenol (11.37 %). The success of MCEO loading was confirmed using FTIR, XRD, and SEM analysis. The efficacy of MCEO-CsNe against the highly aflatoxigenic strain of *Aspergillus flavus* (named as AF-LHP-SH1) was investigated, and the result revealed that MCEO-CsNe inhibited the growth of AF-LHP-SH1 and production of AFB₁ at concentrations of 1.2 and 0.5 μ L/mL, respectively. The mode of action (either antifungal or antiaflatoxigenic) of MCEO-CsNe was found to be novel, involving the inhibition of ergosterol, excessive leakage of cytoplasmic constituents and inhibition of cellular methylglyoxal. Furthermore, MCEO-CsNe exhibited significant DPPH radical quenching activity, with an IC₅₀ value of 0.85 μ L/mL. Cs-MCEO also inhibited AFB₁ production and lipid peroxidation in fumigated chia seeds without significantly altering their sensory attributes with a very high LD₅₀ value (13,678 μ L/kg body weight). Based on the outcomes, the study suggests that MCEO-CsNe has the potential to be utilized as a natural and effective shelf-life enhancer for stored chia seeds, effectively inhibiting fungal growth, aflatoxin production and lipid peroxidation.

Keywords: *Monarda citriodora* essential oil; Aflatoxin B₁; Chitosan nanoemulsion; Methylglyoxal; Lipid peroxidation

Lignocellulosic biomass: A renewable source of energy for 2g bioethanol production

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The global energy demand is rapidly increasing with increasing population and economic growth. India is the third largest energy consuming country in the world after China and USA. Fossil fuel is a dominant energy source, which is primarily used in vehicles. However, the extensive use of fossil fuel has negative impact on environmental pollution and global warming. As a response to the environmental concerns

and fossil fuel depletion issue, renewable energy is increasingly gaining a growth interest. Bioethanol is one of the most demanding engine fuel worldwide and can be an alternative to this gasoline. Now-a-days, bioethanol is mostly produced from sugar and starch containing raw materials such as sugarcane, food grains, *etc.* However, commercial bioethanol production from such food materials could have negative effect like scarcity of water, risk of hunger and economic issues in a longer time. Hence, there is a need of more environmentally sustainable way for bioethanol production. Lignocellulosic Biomass (LB) has become one of the most commonly used renewable source of energy and is highly considered as it is carbon neutral and more evenly distributed than finite fossil -fuel energy. Production of bioethanol from such non-edible renewable feedstock could be used to supply energy and alternative fuels. Bioethanol production from LB such as crop residues, forest wood residues, food waste and animal residue, is considered as Second Generation (2G) bioethanol. The bioconversion of LB mainly consists of four basic steps *viz.*, pretreatment, hydrolysis/saccharification, fermentation and product distillation. LB presented some obstacles in the form of high market prices. However, to limit the use of food resources as a substitute for fossil fuels, the development of technologies that effectively utilize the LB should be a priority. Production of 2G bioethanol from such biomass could give an added value, contribute to the energy production as well as deal with the environmental impact generally caused by its disposal or burning. Therefore, an effective economic means of reducing this environmental problem by production of 2G bioethanol from LB can be useful. In addition, domestic production of 2G bioethanol has potential opportunity to reduce reliance on oil imports by blending it with conventional fossil fuels for consumption. It can also provide extra income to farmers as well as can be a source of revenue generation for government.

Keywords: 2G Bioethanol, Sustainable, Renewable, Lignocellulosic Biomass, Feedstock, Fossil fuel

In vitro* radical scavenging potential of medicinal plant- *Embelia basal

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Abstract

Embelia basal, belonging to family Myrsinaceae, is a well-known medicinal plant as mentioned in Ayurvedic system of medicine. Medicinal plants are a source for a wide variety of natural antioxidant. Antioxidant activity is essential for many biological functions. Literature survey revealed that there are no reports on radical scavenging activity of the leaves of *E. basal*. The present work was carried out in order to evaluate the efficacy of *E. basal*, in view of free radical scavenging activity using acetone, ethanol, and methanol extracts. Plant material was screened for their antioxidant activity by employing radical scavenging assay; DPPH (2, 2- Diphenyl -1- picrylhydrazyl). The percentage radical activity for the assay was determined using ascorbic acid as a standard. From the standard curves, inhibition concentrations in the test samples were calculated. It can be seen that the DPPH radical scavenging activity for ethanol extract is found to be more significant than methanol and acetone extracts. The

findings of the present study suggest that *E. basal* could be a potential source of natural antioxidant that could have great importance as therapeutic agents in preventing or slowing the progress of aging and age associated oxidative stress related degenerative diseases.

Keywords: *Embelia basal*, *Myrsinaceae*, 2, 2-Diphenyl -1- picrylhydrazyl.

Perceptions of farm women on training needs for soil and water conservation practices

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Abstract

Considering women's involvement in a wide range of conservation practices, it is evident that production potential can be realized only if women get the necessary training, technical know-how and support. Training is an important education tool, which can be effectively used to improve, refresh or to update the knowledge of learner. A systematically arranged training programme brings about desirable changes in behaviour on the part of the people. Therefore need based training necessitate to equipping the women with specialized knowledge and skills. This paper explores the perceptions of farm women regarding their training needs for soil and water conservation practices. The study was conducted in eight villages within the Girwa (tribal) and Badgaon (non-tribal) administrative units in the Udaipur district of Rajasthan. Data were collected from 200 randomly selected respondents (100 tribal and 100 non-tribal women) using a detailed questionnaire and personal interviews. The findings revealed that over half of the respondents (54%) fell into the medium training needs group. The top priority training needs expressed by the respondents included developing various land management practices (MPS 90.3) and raising awareness of water harvesting structures and their judicious use (MPS 90.3). Conversely, the least priority training needs were the implementation of the furrow method of sowing (MPS 52) and making fencing around the catchment area (MPS 67.3). There was no significant difference in the training needs between tribal and non-tribal women regarding natural resource conservation. Based on these findings, it is recommended that training modules and skill-oriented programs related to soil and water conservation practices be organized for farm women to ensure the effective utilization of natural resources.

Key words: *Farm women, Natural resources, Soil & Water, Conservation practices, Land management, Water harvesting*

Aromatic plant cultivation – Towards sustainable hill farming for livelihood security

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Abstract

Hill socio-ecosystem is different from all other socio-ecosystems. By and large, cultivation of any crop in hilly ecosystem is challenging but possible through regular farm-work, proper decision making, mutual cooperation, lot of sacrifice and patience. Efforts made by such farmers to grow crops for their livelihood is appreciable and applaudable in every possible way. Sometimes, environmental factors limit their prosperity resulting in the problem of not only low/no yield, often associated with higher economic loss. In such conditions, role of promising alternative crops come into play which firmly support them to recover economic losses inflicted by situations beyond human control. Lemongrass, Vetiver, Chamomile and Rose-scented Geranium are four such promising crops which are truly helpful as all of them are very easily cultivable, need minimum inputs and provide large outputs when grown with a little care and sensitivity. These export oriented, essential oil bearing, aromatic crops greatly suffer by water stagnation leading to yield loss or entire crop loss when grown in plains, but in hill cultivation stagnation of water (rain or irrigation) is out of question and hence more suitable. Some genetically improved varieties with higher essential oil content have been developed by eminent research Institutes like CSIR-CIMAP, CSIR-NEIST, CSIR-IIIM are being recommended towards sustainable hill farming for livelihood security – Lemongrass varieties like Krishna, Cauvery, CIMAP-Suwarna ; Vetiver varieties like CIM-Khushnalika, CIM-Vridhhi, CIM- Samriddhi, Kesari ; Chamomile varieties like CIM-Sammohak, CIM-Ujjwala ; Rose-scented Geranium variety like CIM-Pawan. All of the above selected varieties have a few things in common like – low demanding nature, perennial, good soil anchor, broad harvest time, disliked by cattle and national/international demand. These qualities make the varieties a suitable choice as hill farming crops having the capacity of doubling farmers' income on one hand and restorer of economic loss inflicted upon environmental conditions on the other hand.

Keywords: *Chamomile, essential oil, lemongrass, rose-scented geranium, sustainable, vetiver.*

Surgical management of fetal mummification and overgestation in bitches: Study of two cases

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Abstract

A 7-year-old female dog with the history of dystocia and delivery of three live fetuses one month ago was brought to VCC with the complaint of purulent foul-smelling, yellow-colored vaginal discharge for the past 6-7 days. Radiographic examination of the lower abdomen confirmed bony parts in the uterus. The owner requested the removal of the uterus as he did not want the dog to conceive again, so an elective ovariohysterectomy was performed and four mummified fetuses were recovered. The dog recovered uneventfully following a good post-operative care and management. An another, 2-year-old female dog was brought to VCC with a gestation period of 66 days and was diagnosed with incomplete cervical dilation (ICD) after a per vaginal examination. Following a complete examination, caesarean

section (C-Section) was performed to relieve suffering of animal and to remove the fetus. Upon C-section, mummified (n=1), was removed along with dead fetus(n=4). The animal recovered uneventfully following normal post-operative management.

In vitro* antimicrobial activity and GCMS analysis of *Quercus leucotrichophora

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Abstract

This study investigates the *in vitro* antimicrobial activity and chemical composition of *Quercus leucotrichophora* leaf extracts, focusing on their potential use against bacterial pathogens. Sequential extraction of the plant leaves was performed using hexane, chloroform, acetone, ethanol, methanol, and aqueous solvents. The antimicrobial properties of these extracts were evaluated against *Pseudomonas syringae*, *Escherichia coli*, and *Bacillus subtilis* using the agar well diffusion method. Among the tested extracts, acetone, ethanol, and methanol demonstrated significant inhibition zones against all three bacterial strains, indicating strong antibacterial activity. To identify bioactive compounds responsible for this activity, gas chromatography-mass spectrometry (GC-MS) analysis was performed on the acetone, ethanol, and methanol extracts. The GC-MS results revealed the presence of various phytochemical compounds with known antimicrobial properties, suggesting their potential role in the observed antibacterial effects. This study highlights the antimicrobial potential of *Q. leucotrichophora* and provides insight into its bioactive components, making it a promising candidate for further pharmacological investigation.

Keywords: *Quercus leucotrichophora*, antimicrobial, GCMS

Cold Plasma Pretreatment for Agro-waste Biodegradation: A Review of Mechanisms, Efficiency, and Environmental Impact

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Abstract

The application of cold plasma technology in the biodegradation of lignocellulose from agro-waste has emerged as a significant area of research. This review consolidates recent advancements in utilizing cold plasma as a pretreatment method to facilitate lignocellulosic biodegradation. Cold plasma, characterized by its ionized gas phase and reactive species, has demonstrated considerable potential in disrupting the lignocellulosic structure, thereby accelerating lignin release and enhancing overall biodegradation efficiency. Comparative analyses with traditional chemical and thermal pretreatment methods reveal that cold plasma not only shortens the extraction time but also improves the yield and purity of the extracted lignin. This review delves into the mechanisms by which cold plasma induces

structural modifications in lignocellulose, evaluates its effectiveness relative to conventional approaches, and explores its environmental benefits. Additionally, the review addresses current challenges and outlines future research directions, underscoring the role of cold plasma as a transformative and eco-friendly technology for lignocellulose biodegradation and biomass valorisation.

Keywords: cold-plasma, lignocellulose, biodegradation, agro-waste, lignin, pretreatment

Effect of rootstocks on leaf nutrients, tree growth, yield and fruit quality of Khasi mandarin

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Abstract

Khasi mandarin (*Citrus reticulata* Blanco) is one of the most popular citrus species throughout the north eastern region. Most of the mandarin orchards in the region are of seedling origin, however in recent years budded and grafted plants of Khasi mandarin is in demand for commercial orcharding. Rangpur lime is the most commonly used rootstock for Khasi mandarin (Sheo Govind *et al.* 1994) however it cannot be considered ideal for all set of agro-climatic conditions because the rootstock found suitable in one locality may or may not be equally effective in another locality (Sonkar *et al.* 2002; Talang *et al.* 2024). It is well known that rootstocks have significant influence on the vigour, precocity, fruit quality, longevity of tree, resistance and adaptability to the biotic and abiotic stresses. Exhaustive study on the suitability of rootstocks of mandarin and sweet orange have been undertaken to determine the most ideal rootstock for different commercial cultivars that can be grown in respective regions (Diware *et al.* 1997, Shinde *et al.* 1997, Lallan Ram *et al.* 2002). Though Khasi mandarin is the commercial cultivar in north eastern region, little efforts have been made to identify the suitable rootstock. Keeping this in view, we made an attempt to study the effect of rootstocks on leaf nutrients, tree growth, yield and fruit quality of Khasi mandarin under mid-hill conditions. Result indicated that *C. jambhiri* + *Khasi* mandarin recorded maximum leaf nutrient contents (N-2.60%, P-0.152%, K-1.95%, Fe-284.41 mg/gm, Mn-47.53mg/g, Ca-3.18mg/g, Mg-0.36mg/g), plant height (360.33cm), plant girth (64.13 mm) and canopy spread (156.78 cm east-west and 156.00 cm (north-south). Fruit weight, nos. of fruit and yield was recorded maximum in *C. limonia* + *Khasi* mandarin (139.31 gm, 58 nos. and 8.08 kg/tree respectively) which is however at par with *C. jambhiri* + *Khasi* mandarin. With regards to quality parameters, it was observed that maximum TSS with minimum acidity was recorded in nucellar seedlings (9.75 °Brix and 0.84 %) followed by *C. jambhiri* + *Khasi* mandarin.

Keywords: Khasi mandarin, rootstock, leaf nutrients, quality, yield.

Effect of methyl cellulose prepared from Cow dung on ordinary Portland cement concrete's tensile and compressive strengths

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Abstract

In the current work, cow dung was converted into methylcellulose (MC) in a heterogeneous medium using methyl sulfate (DMS) as an etherification agent. This study investigates the use of methylcellulose as an additive to improve the strengths of concrete, such as its tensile and compressive strength. Prepared methyl celluloses to binder ratio, starting at 2 grams by weight of cement was used to cast concrete sample. A test on concrete specimens, including the concrete cylinder, was conducted. The tensile strength of concrete was found to be enhanced by the addition of methylcellulose. The compressive strength of the cow dung methyl cellulose (CD) sample and control sample (CS) was 2130 KN and 2400 KN. The methylcellulose prepared from cow dung shows higher tensile strength than the control sample (CS). Methylcellulose probably works as a fibrous material to provide the concrete with more tensile strength. Fibers have been demonstrated in multiple experiments to have a favorable effect on the tensile strength of concrete.

Keywords: Cow dung (CD) Control sample (CS), Methylcellulose, Tensile strength, Compressive strength

Assessment of the economic impact of boron and molybdenum treatment on cowpea (*Vigna unguiculata* L.) in South Gujarat

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Abstract

Economic impacts of boron and molybdenum treatments on cowpea (*Vigna unguiculata* (L.) in South Gujarat region was carried out at Navsari, Gujarat during summer season of 2019, 2020 and 2021. The trial was arranged in a two-factor randomized block design with three replications for three seasons. The factor-A consisted of four levels of seed treatments with molybdenum at 2 mg/l (M_1), 4 mg/l (M_2), 6 mg/l (M_3) for 24 hours prior to sowing including control (M_0), where as the factor- B with four levels of boron (B) spray at 2 mg/l (B_1), 4 mg/l (B_2), 6 mg/l (B_3) and control at 30 DAS, 45 DAS and 60 DAS. Boron was applied in the form of Boric acid and Molybdenum as ammonium molybdate. The experiment was conducted on cowpea variety Anand Vegetable Cowpea-1. Result revealed that the cowpea seed treated with molybdenum at 2 mg /l (M_1) provides the highest net realization (120345.94 Rs.); similarly, in case of boron foliar spray at 4 mg/l (B_2) at 30 DAS, 45 DAS and 60 DAS gave the highest net realization (136576.61 Rs.) as compared to other levels including control. Furthermore, the treatment combination of molybdenum seed treatment @ 2 mg/ l with foliar spray of boron @ 4 mg/l at 30, 45 & 60 DAS (M_1B_2) resulted in the highest gross return (2, 45,400 Rs.), net return (173589.51 Rs.) and benefit cost ratio (3.42) compared to all other treatment combinations. These findings suggest that seed treatment with molybdenum prior to sowing followed by foliar application of boron at 30, 45 and 60 DAS would be economically profitable for the farmers of South Gujarat.

Response of onion to water stress management practices and land configuration under deficit irrigation regimes

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Abstract

The response of onion to land configuration and water stress management practices under deficit irrigation condition was investigated during the *Rabi* seasons of 2021-22 and 2022-23 at Soil and Water Management Research Farm, Navsari Agricultural University, Navsari. The experiment was carried out in split plot design with two main factors viz., three deficit irrigation levels (0.4 ET_c, 0.6 ET_c and 0.8 ET_c) and two land configurations (raised bed and flat bed) in the main plot. Foliar spray of various growth substances (control, salicylic acid 250 mg l⁻¹, potassium silicate 250 mg l⁻¹ and kaolin 50 g l⁻¹) were used in the sub-plot. Experimental result revealed that the onion plants receiving I₃ (0.8 ET_c) irrigation level recorded maximum plant height (44.72 cm, 70.02 cm and 75.78 cm at 30, 60 and 75 DATP, respectively), leaf area (73.12 cm², 91.06 cm², 109.64 cm² and 118.42 cm², respectively), neck thickness of bulb (14.68 mm), average bulb weight (104.89 g) and bulb yield (17.18 kg plot⁻¹). Conversely, the plants exposed to 0.4 ET_c irrigation level led to early maturity (98.40 days). Despite of receiving lowest bulb yield, maximum water productivity (15.25 kg m⁻³) for onion cultivation was recorded by I₁ (0.4 ET_c) irrigation regime while, for land configurations and growth substances the result was found non significant.

Keywords: *Water stress management, water productivity, Land configuration, growth substances, onion*

Technology intervention for sustainable production of greater yam

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Abstract

Greater yam (*Dioscorea alata* L.) is a very important tropical tuber crop. It is rich in carbohydrate, dietary fibre, vitamin C and essential minerals, but its production is limited by traditional farming practices. A field experiment was conducted during the year 2020 to 2023 to study the effect of spacing and tuber sett size on yield of greater yam in a RBD with factorial concept. The results of the field experiment revealed that by using 250 g tuber sett size and planting the greater yam at 90 cm x 60 cm spacing gave higher yield (17.61 t/ha) and higher net realization, which gave 58 % increase over traditional method, while 200 g tuber sett size at 90 cm x 45 cm spacing was found at par with it. Moreover, tuber of 100 g sett size recorded more number of planting material as compared to traditional 250 g sett size, which gave greater multiplication rate while reducing land usage. Thus, present findings for sustainable yield and income can be obtained by above suitable climate resilient technology for small land holding farmers.

Keywords: *Greater yam, Technology intervention, Sustainable production, Planting material, Sett size, Multiplication rate*

Sweet potato germplasm diversity: Exploring the trait and yield relationship

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Abstract

Sweet potato (*Ipomoea batatas* (L.) Lam.) is a vital crop for food security, but its yield potential is limited by genetic factors. A field experiment was conducted during the year 2018 to 2023 to evaluate the yield, quality parameters and colour of diverse sweet potato germplasm in a RBD concept. We assessed different germplasm accessions for pest resistance also. Our results showed significant variation in yield among germplasm with 16.18 % increase in yield observed in NSP-2 as compared to C-71. We identified twelve high-yielding germplasm with desirable traits, suitable for cultivation in south Gujarat region. Our findings suggest that exploiting genetic variation in sweet potato germplasm can significantly enhance yield potential and contributing to food security and sustainable agriculture. This research provides a foundation for genomic prediction and breeding programs aimed at developing high-yielding sweet potato varieties.

Key Words: Sweet potato, Yield, Germplasm diversity, Varieties, NSP-2, C-71

Water footprint of maize-wheat productions in North Western Plain agro-climatic zone of India

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Abstract

The water footprint assessment serves as a versatile tool for evaluating the freshwater consumption associated with various products throughout their supply chain. Focusing on the North-Western Plains of the Upper Gangetic Plains region of India, the water footprint assessment was carried out for maize-wheat using the Crop Water Requirement (CWR) model. The study utilized 20 years' worth of weather and yield data for the region, spanning from 2000 to 2020. Daily weather data, including maximum temperature, minimum temperature, relative humidity, wind speed, and sunshine hours, were sourced from the India Meteorological Department. District-wise maize and wheat yield data was obtained from the Directorate of Economics and Statistics, Department of Agriculture, Cooperation, and Farmers Welfare, Ministry of Agriculture and Farmers Welfare (https://aps.dac.gov.in/APY/Public_Report1.aspx). Crop evapotranspiration (ET_c) and effective rainfall (Pe_{eff}) were calculated using the daily weather data within the FAO-CROPWAT 8.0 software. The monthly reference evapotranspiration (ET₀) was computed using the F.A.O. Penman-Monteith method. Subsequently, crop evapotranspiration (ET_c) was determined using the crop coefficient approach. Effective rainfall (Pe_{eff}), linked to monthly rainfall (mm), was estimated using the Soil Conservation Service (SCS) method provided by the United States Department of Agriculture (USDA), as implemented in the FAO-CROPWAT 8.0 software. The green water use was determined as the minimum of crop ET and effective rainfall, while the blue water use represented the

surface and groundwater utilized by the crop throughout the growing season, which is the difference between crop ET and effective rainfall. The green and blue water footprints were calculated by dividing the green and blue water usage by the crop yield, respectively. The green and blue water footprint of maize was found to be 1539 and 434 m³/t respectively which contributed 78 and 22% respectively to the total WF. The green and blue water footprints of wheat were found to be 227 and 771 m³/t, respectively, contributing 23% and 77%, respectively, to the total water footprint of wheat. The blue and green water footprints assessment is instrumental in identifying solutions for water resource management issues, thereby enabling the determination of the volume and type of freshwater consumed in crop production.

Key words: *Crop water requirement, effective rainfall, maize-wheat, green water foot print and blue water foot print.*

Quantitative estimation of micronutrients in organic fruits of chilli (*Capsicum annuum* L.)

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Abstract

Atomic Absorption Spectroscopy (AAS) was carried out on the fruits of conventionally and organically grown chilli (*Capsicum annuum* L.) plants for the quantitative estimation of micronutrients i.e. Zn, Fe, Cu and Mn. Trace elements Zn, Cu, Mn, and Fe were estimated using Lindsay and Norwell, (1978) method. In the present study, it was revealed that organic chilli fruit samples show high amount of Zn and Fe while conventional cultivated chili fruits exhibited high amount of Mn and Cu. Organic (I, II, III) chilli fruits showed comparative good concentration of Zn (34.4 ± 0.432 ppm, 33.46 ± 0.513 ppm, 20.83 ± 0.208 ppm) while conventional chili fruits had a concentration of 19.33 ± 0.416 ppm. Iron (Fe) was also estimated high in organic (I, II, III) chilli samples (19.33 ± 0.416 ppm, 80.46 ± 0.450 ppm, 113.4 ± 0.360 ppm) as compared to conventional chilli fruits (74.46 ± 0.404 ppm). Less amount of Cu was observed in organic fruits in comparison to conventionally grown chilli fruits exhibited high levels of copper (24.56 ± 0.416 ppm) concentration. Not much differences were revealed for manganese in all the fruit samples. Results favor that ecofriendly agricultural practices are equally competitive to fulfill need of trace elements in food products. Biofertilizers, vermicompost, Vermi wash, neem cake, solid and liquid organic manure were proved to be sufficient to supply trace elements from soil to food produce ultimately.

Keywords: *Atomic Absorption Spectroscopy, Trace elements, Capsicum annuum L., Organic, Conventional.*

Comprehensive Evaluation of Bacterial Inoculation and Biochar Amendment on the Growth and Yield of *Vicia faba*, *Capsicum annuum*, and *Abelmoschus esculentus*, and their Tolerance to Cadmium and Lead Concentration

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Abstract

Cadmium and lead contamination in soil poses a significant threat to plant health and crop productivity. Utilizing plant growth-promoting rhizobacteria (PGPR) with cadmium and lead tolerance, combined with biochar amendment, can provide a sustainable and eco-friendly approach to mitigate the adverse effects of these heavy metals on plants. In this study, endophytic rhizobacteria were isolated from the roots of selected vegetation of Pranmati Basin critical zone observatory. These bacterial strains were exposed to various cadmium and lead concentrations to determine their Maximum Tolerance Concentration (MTC). Selected cadmium-tolerant and lead tolerant endophytic isolates were characterized and assessed for PGPR traits. A comprehensive study involving Plant Root Elongation Promotion (PREP) and pot assays was conducted on the selected bacterial strain CdTEB2 and PbTEB2, one of seven isolates that demonstrated a cadmium and lead MTC of 25 mg/L in laboratory tests and positive results for PGPR traits. The impact of CdTEB2 and PbTEB2 on root elongation, germination, and growth parameters was evaluated, with biochar amendment. Results from the PREP assay indicated an increase in root length of seeds inoculated with CdTEB2 and PbCTEB2 at cadmium and lead concentrations of 5 mg/L and 10 mg/L compared to the uninoculated assay. The pot assay produced similar results, except at the 10 mg/L cadmium and 30ppm of lead concentration. There was no significant effect of CdTEB2 and PbTEB2 on Germination Percentage (GP) and Germination Rate Index (GRI) under cadmium and lead treatment. GRI and GP were highest at the 5 mg/L cadmium and 10mg/l lead treatment, but Mean Germination Time (MGT) was lowest in CdTEB2 and PbTEB2 along with NPK at maximum concentration-treated seeds. The shoot length was highest in CdTEB2 and PbTEB2 -treated plants at lower concentration, even in cadmium and lead-treated soil.

These findings suggest that CdTEB2 and PbTEB2 bacteria may have the potential to accumulate cadmium and lead thus reduce its uptake by plants while promoting plant growth. The addition of biochar further enhances these effects by improving soil properties and reducing heavy metal bioavailability. Therefore, further research is necessary to fully understand the potential of endophytic bacteria and biochar amendments in the remediation of cadmium- and lead-contaminated soils and their impact on plant growth promotion.

Keywords- *Cadmium tolerant endophytic bacteria, Maximum Tolerance Concentration (MTC), Plant Growth Promoting Rhizobacteria (PGPR), Plant Root Elongation Promotion (PREP), Germination Parameters*

Qualitative estimation of secondary metabolites from *Leptadaenia pyrotechnica* and *Crataeva nurvala*

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Abstract

Thin-layer chromatographic (TLC) analysis carried out on all fractions of the plant samples reveals homogenous spots with different R_f values for different bio-active compounds. These constituents are responsible for most pharmacological activities of plants. Phytosterols and alkaloids were identified by analyzing *Leptadenia pyrotechnica* (aerial part and root part) and *Crataeva nurvala* (leaf part and fruit part) plant samples. In the TLC observations for the aerial part of *L. pyrotechnica*, stigmasterol and campesterol were identified. Whereas, for its root part only campesterol was analysed. Whereas in *C. nurvala* leaf extract β -sitosterol and Campesterol were identified and in *C. nurvala* fruit part, stigmasterol, β -sitosterol and Campesterol were identified. During the alkaloid analysis, trigonelline was identified in the *L. pyrotechnica* root and in both the leaf and fruit part extracts of *C. nurvala*. However, no alkaloid was identified in the *L. pyrotechnica* aerial part extract.

Keywords: Thin layer chromatography, Bioactive, Phytosterols, alkaloids, *L. pyrotechnica*, *C. nurvala*

Preparation and stability assessment of functionalized agricultural waste-based alginate beads for remediation of coloured effluents

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Abstract

Agriculture is the most water-demanding industry which is inevitable to maintain sustainable crop production. However, because of depleting freshwater sources, there is a need to explore the possibilities of utilizing coloured industrial effluents in agriculture. But the long-term application of these dye-loaded effluents can lead to soil and crop contamination. On the other hand, stubble burning of rice crop residue, especially in North India has added to the woes of the government and common man. The dual problem of stubble burning and depleting water resources can be managed by the use of excessive rice straw in treating the dye-loaded industrial effluents. However, the problem of limited adsorption capacity and recovery of these materials has limited their commercialization. To address these multiple issues, rice straw and clay-based composite beads were prepared for treating dye-contaminated aqueous solutions. The composite of calcined bentonite and calcined rice straw (1:3 ratio) was made to prepare sodium alginate beads. The stability of the beads was assessed by estimation of the swelling index after varying the composition of sodium alginate and CaCl_2 solution. The beads were then evaluated and compared for the maximum adsorptive removal of cationic dye from the aqueous solutions. Composites The beads were analysed and characterized through, CHNS, BET and FTIR analysis. Based on the adsorption capacity and stability of beads, it was found that alginate beads with a 5:1.5:4 ratio showed

maximum removal efficiency for Crystal violet (158.65 mg/g). Based on the results, it could be concluded that the composite beads can effectively remove Crystal violet dye from the simulated effluents with three times usability and efficient recovery from the aqueous solutions,

Keywords: *Water pollution, Rice straw, Composites, Alginate beads, stability, swelling index*

Study on Prevalence of Gastrointestinal Parasite of Goats in Mathura Reigon
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Abstract

Gastrointestinal (GI) parasites are major concern in goats, causing productivity and economic losses alongwith health challenges. The present study was conducted to determine the prevalence of GI parasites of goats in Mathura district, Uttar Pradesh. Total of 210 fecal samples were collected from 5 different places of Mathura district and processed during the period of 6 month (April-September 2024). These samples were examined qualitatively using 10x and 40x magnification under compound microscope by direct fecal wet examination, floatation method and sedimentation method for detection of eggs/ova/ cyst/larvae. Out of 210 samples, 130 samples were found positive for various GI parasites (*Moneizia*, *Trichuris*, *Eimeria* and Bursate worm eggs). Overall prevalence of GI parasites observed was 61.90%. The prevalence of GI parasites in different age groups was found 78.57%, 61.43% and 45.71% in <1 year, 1-2 year and >2 year age group respectively. Breed wise prevalence for GI parasite was observed highest (65.71%) in Jamunapari, followed by Sirohi (62.86%) and Barbari (57.14%). In comparison to different age group, it was highest found in Jamunapari (50.91%) in <1 year followed by Barbari (25.45%) and Sirohi (23.64%). In age group 1-2yr was Sirohi (39.53%), Barbari (34.88%) and Jamunapari (25.58%). In age group >2yr was Sirohi (43.75%), Barbari (34.38%), Jamunapari (21.88%). It can be concluded that due to high grazing behavior of Jamunapari breed they are more prone to GI infection. Gastrointestinal parasites in goats have high influence on health and productivity therefore its treatment and management strategies are for utmost importance.

Keywords: *Gastrointestinal Parasite, Goats, Fecal Sample, Prevalence and Mathura*

Isolation and identification of seed storage fungi from the seeds of forestry tree species
Fraxinus micrantha*, *Pongamia pinnata* and *Schleichera oleosa

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Abstract

Nearly all of the plant species known today show some type of fungal association. These fungi can be pathogenic or saprophytic in nature (Mittal et al., 1990). These lead to deterioration in colour and germination capacity and reduction in the nutritional qualities of these seeds. Fungal isolation was carried out from the stored seeds of tree species *Fraxinus micrantha*, *Pongamia pinnata* and *Schleichera oleosa* using Agar plate method and Blotter plate method. No. of distinct Fungal isolates were obtained via Agar plate method were higher as compared to the blotter plate method. The seed fungi were then identified using morphological and molecular identification techniques. The seed Fungi thus identified were *Aspergillus niger*, *Aspergillus fumigatus*, *A. flavus*, *Cladosporium cladosporioides*, *Penicillium* sp., *Curvularia* sp. *Rhizopus* sp. and *Xylaria* sp. These fungi seem to significantly decrease the germination capacity in *Pongamia pinnata* and *Fraxinus micrantha* seeds meanwhile the decrease in germination capacity of *Schleichera oleosa* was minor. After three months of storage in muslin bags, percentage germination was reduced from 95% to below 23.45% in *Pongamia pinnata* while the decrease in germination percentage of *Schleichera oleosa* was from 97.4% to below 69.07%. The results of this study can be further used to develop organic and economically sustainable formulations to be used to hinder the growth of these fungi in storage and prevent the rapid deterioration of forestry seeds. The outcomes of this study can also be extended to more widespread applications through targeted *in silico* studies.

Keywords: *Mycoflora, storage fungi, tree seeds, germination, quality*

Development of 3D Printing of Chocolate Products

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Abstract

3D printing technology has revolutionized the food industry, offering innovative solutions for creating complex and customized products. Chocolate, due to its unique melting and solidifying properties, is an ideal candidate for 3D printing. Recent advancements in this field have focused on optimizing the printing parameters to maintain the texture, flavor, and structural integrity of chocolate while allowing for intricate designs and rationalization. A study conducted by researchers in India explored the 3D printing of dark chocolate with different cocoa content levels (55%, 70% and 85%). The optimal printing temperature for chocolate was identified as 31-32 °C, just above the melting point of cocoa butter, ensuring smooth extrusion and precise layering without compromising the temper and shine of the finished product. The study utilized a nozzle diameter of 0.8 mm and a layer height of 0.5 mm, achieving high-resolution prints suitable for fine details. The printed chocolates were evaluated based on their structural stability, taste, and nutritional profile. The chocolates with 70% cocoa content provided the best combination of printability and flavor, receiving an overall acceptability score of 8.2 out of 10 on a sensory evaluation scale. Higher cocoa content chocolates (85%) were more brittle and required slower extrusion speeds to maintain their shape. Notably, the printed chocolates retained their antioxidant

properties, with the 85% cocoa variant containing over 150 mg GAE/100g of polyphenols, appealing to health-conscious consumers. 3D printing also allows for the customization of chocolate products to meet specific dietary needs, such as creating low-sugar or high-fiber options by incorporating alternative ingredients like stevia or inulin. This technology reduces waste by enabling on-demand production and offers new possibilities for personalized chocolate gifts and functional foods. As 3D printing technology continues to evolve, it promises to transform the confectionery industry, providing unique, tailored products that cater to individual preferences and nutritional requirements.

Keywords: 3D printing, chocolate, customization, innovation, food and meeting diverse

***In vitro* antimicrobial activity of *Verbesina encelioides* extracts**

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Abstract

The antibacterial efficacy of water, ethanol and methanol extracts of root, stem, leaves and flowers of *Verbesina encelioides* at different doses (25, 50, 75 and 100 µg/ml) against different bacterial strains, like, *E. coli*, *Bacillus*, *Pseudomonas* and *S. aureus* was tested. The highest antibacterial activity against *E. coli*, *Bacillus*, *Pseudomonas* and *S. aureus* in case of 100 µg/ml dose of different water extracts, namely Stem Water extract and Root water extract against *Bacillus*, Root Water extract against *Pseudomonas* and Flower water extract against *S. aureus*. Furthermore, the study showed antifungal efficacy of the plant extracts against different fungal strains, namely, *A. flavus* and *A. niger*, with the highest antifungal activity against *A. flavus* and *A. niger* at 100 µg/ml dose of different methanolic extracts.

Keywords: *Verbesina encelioides*, Antibacterial activity, Extract, Antifungal activity.

Demonstration on improved onion variety bheema kiran in Sangareddy district of Central Telangana zone

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Abstract

The District Agricultural Advisory and Transfer of Technology Centre (DAATTC) in Sangupet, Sangareddy district, Telangana, conducted 20 Front Line Demonstrations (FLDs) on the Bhima Kiran onion (*Allium cepa* L.) variety during the rabi seasons of 2020-21, 2021-22, and 2022-23. This effort aimed to raise awareness among farmers about the high-yielding potential of Bhima Kiran, which can significantly enhance their income. Developed by the Directorate of Onion & Garlic Research Station

in Rajgurunagar, Pune, Bhima Kiran was introduced to meet the rising demand from local farmers. The demonstrations involved farmers from blocks like Narayankhed, Manur, Peddapur, Andole, and Kondapur, where onions were traditionally cultivated using local varieties. However, these local varieties produced smaller bulbs, lower yields, and were more susceptible to pests and diseases, which reduced farmers' profitability. To address this issue, a training program was organized to educate farmers on the scientific practices of onion cultivation in Sangareddy dist. and Bhima Kiran seeds were distributed to selected farmers under Demonstration. The results were encouraging, with Bhima Kiran producing an average yield of 40.1 t ha⁻¹, compared to 30.5 t ha⁻¹ for local varieties. Additionally, Bhima Kiran demonstrated resistance to thrips, a common pest in onion crop. The adoption of Bhima Kiran, along with improved farming practices, had a positive impact on onion yields. An economic analysis revealed that Bhima Kiran offered significantly higher gross returns of ₹ 3,26,060 ha⁻¹, with net returns of ₹ 2,15,865 ha⁻¹ and a benefit-cost (B:C) ratio of 2.9:1. In contrast, the local varieties generated gross returns of ₹ 2,29,880 ha⁻¹, net returns of ₹ 1,11,855 ha⁻¹, and a B:C ratio of 1.9:1. This data clearly illustrates that Bhima Kiran is a more profitable and viable option for farmers compared to the traditional local varieties.

Keywords: *Demonstration, onion, Bheema Kiran*

Thermal time requirement for different phenophases fruit based agroforestry trees in mid hills of Himachal Pradesh

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Abstract

Understanding the thermal time requirements of agroforestry trees is crucial for optimizing growth and productivity in the mid-hill regions of Himachal Pradesh. This study evaluated these requirements for various phenophases of fruit-based agroforestry trees in Nauni and Kandaghat during 2023, focusing on Growing Degree Days (GDD), Heat Units (HTU), Hydrothermal Units (HYTU), and Pheno-thermal Index (PTI). Detailed monitoring of bud break, flowering, fruit set, and fruit maturity was conducted and data on temperature, humidity and photoperiod were recorded to calculate the thermal indices. Results showed significant variations in thermal time requirements across different phenophases and locations. In Nauni, the GDD needed for full bloom varied, while Kandaghat showed a different range for the same phase. Similarly, fruit set required different amounts of GDD in Nauni compared to Kandaghat. HTU values for fruit set and maturity were generally higher in Kandaghat, highlighting the impact of local microclimatic conditions. Nauni displayed lower HYTU values during the early phenophases but higher values during fruit maturity, suggesting a prolonged growth period under more stable humidity conditions. PTI analysis revealed the significant role of photoperiod in synchronizing phenological events, with PTI values indicating optimal photoperiod conditions during critical phases of flowering and fruit development in both locations. This study provides valuable insights into the

thermal time requirements for fruit-based agroforestry trees in the mid-hills of Himachal Pradesh, emphasizing the need for location-specific management practices to enhance the growth and productivity of agroforestry systems in this region.

Keywords: *Thermal indices, phenophases, fruit-based, microclimate, Nauni, Kandaghat.*

Unveiling the genetic treasure of tannia: A molecular catalogue of germplasm resources

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Abstract

All around the world, tannia is a highly significant tuber crop used for food, feed and industrial uses. A nutrient-dense tuber crop, tannia is mostly cultivated by small and marginal farmers. Unfortunately, insufficient germplasm characterization and agronomic assessment for yield and quality are the main reasons for the delayed progress toward variety development in tannia. The appropriate morphological and molecular characterizations of available tannia germplasm resources with its documentation are necessary for the efficient management. Thus, in order to ascertain the degree of genetic diversity among genotypes in Gujarat, a total 18 available germplasm of Tannia at AICRP on tuber crop, NAU, Navsari tannia genotypes were investigated with ISSR marker. A total 80 ISSR primers were screened, out of which 30 ISSR primers giving distinct clear amplicone was used for further analysis. Out of 238 bands amplified by 30 ISSR markers, 169 were found to be polymorphic (69.51 %) and the remaining 69 were monomorphic (30.49 %). Five markers exhibit high polymorphism *i.e.*, UBC 809, UBC 810, UBC 812, UBC 822 and UBC 834. According to PIC value, UBC 807, UBC 810, UBC 827 and UBC 835 found informative. Moderate level of genetic variation was reported among the tannia genotypes represented with similarity coefficients ranged from 0.60 to 0.89. Heat map of tannia germplasm generated by ISSR analysis depicted that all the germplasm were divided into two clusters, *viz.*, cluster 1 and cluster 2. PCA divided all genotypes into two major cluster, where cluster I have three genotypes, whereas Cluster II contain the remaining genotypes. In PCA, the principal component 1 and principal component 2 explained 24.10 % and 11.20 % of the total variance, respectively. In present study, we reported low genetic diversity among available tannia germplasm, further the detailed molecular catalogue with respect to unique amplification pattern was generated. The molecular catalogue can be effectively utilized for further conservation and improvement program of tannia.

Genetic Variations in Tannia: Insights into Species Diversity

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Abstract

The tropical tuber crop *Xanthosoma spp.* is an herbaceous crop that belongs to the Araceae family and popularly known as tannia. The taxonomic position of the cultivated *Xanthosoma spp.* is unclear, hence present study was conducted to evaluate species diversity. For that 30 ISSR marker were initially screened, out of these 08 marker were selected which was giving more than 10 polymorphic bands for exploring the species variation. The genetic variations analysis of eight genotypes representing three different species viz., *Alocasia macrorrhizos*, *Xanthosoma violaceum* and *Xanthosoma sagittifolium* amplified a total 121 bands with 08 ISSR markers, out of which 96 were polymorphic (79.06%) and the remaining 25 were monomorphic (20.93%). The maximum numbers of the band (21) were scored by primer UBC 859, while the minimum numbers of the bands (11) were scored by primers UBC 822. The maximum PIC value was 0.65, maximum PI value was 13.03, and maximum marker index was 58.50, which were scored by ISSR primer UBC 857. ISSR primer UBC 810 generated a unique band of 321bp in Giant taro, that was absent in other variety. The tannia species showed high level of variation with the similarity coefficients ranged from 0.48 to 0.93. The wild tannia species *Alocasia macrorrhizos* was highly diverse compared to cultivated species. Phylogenetic analysis divided all the species into two clusters, where Cluster 1 contained wild species, Giant taro while Cluster 2 contained two cultivated species genotypes. The PCA results indicated that the available species was divided into two clusters, where PC1 explained 38.2 % variance while PC2 explained 21.7 % of the variance. In present study considerable variation was reported among the species of tannia, further a unique amplification pattern was also reported that needs to be validated on large scale and it can be utilized for tannia improvement program.

Effect of thermal time on crop phenology of apple genotypes under high density plantation in mid hill of Himachal Pradesh

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Abstract

The study explores the effect of thermal time on the phenology of apple genotypes under high-density plantation in the mid-hill region of Himachal Pradesh, specifically at two locations, Nauni and Kandaghat, during the year 2023. The phenological development of apple trees was analyzed using key agroclimatic indices, including Growing Degree Days (GDD), Heat Units (HTU), Hydrothermal Units (HYTU) and Pheno-thermal Index (PTI). These indices were computed to quantify the thermal time required for different phenophases such as bud burst, flowering, fruit set and fruit maturation. Results indicated that the accumulation of GDD and HTU varied significantly between the two locations due to differences in altitude and microclimatic conditions. Nauni recorded lower GDD and HTU values compared to Kandaghat. However, HYTU, which considers both temperature and humidity, showed a more consistent pattern across both locations, reflecting the influence of relative humidity on the phenological stages. The PTI also varied, with Kandaghat showing a higher index, suggesting a greater influence of photothermal conditions on the crop development. The findings highlight the importance of location-

specific thermal indices in predicting the phenological stages of apple genotypes under high-density plantations. Understanding the thermal requirements and the influence of environmental factors on crop phenology can help optimize management practices, such as irrigation scheduling and pest management, to improve productivity and quality in apple orchards in mid-hill regions. This study underscores the potential of using agroclimatic indices to fine-tune agricultural practices in response to climatic variability in mountainous regions.

Keywords: *Thermal time, apple, phenology, high-density plantation, agroclimatic, photothermal.*

Enhancing Dairy Farming Techniques: A Comprehensive MOOC Development and Implementation Study

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Abstract

This research paper aims to revolutionize the education of dairy farmers through the creation and deployment of a Massive Open Online Course (MOOC). The project focuses on three core objectives: first, to identify the critical areas of dairy farming that require focused e-content development, employing a four-quadrant approach that includes video lectures, reading materials, self-assessment tools, and discussion forums. Second, to design and develop web and mobile-based e-contents specifically tailored for dairy farmers, ensuring accessibility and convenience. Third, to implement a hybrid model that seamlessly integrates online learning with traditional classroom training, thereby enhancing the overall quality of education for dairy farmers. The study highlights the significance of using the Gujarati vernacular language to ensure the content is comprehensible and culturally relevant to the target audience. Through meticulous research and development, the project identifies key topics essential for improving dairy farming practices, ranging from animal husbandry and animal health management to advanced dairy technologies. The hybrid delivery model leverages the strengths of both online and face-to-face learning environments, providing a flexible and enriched educational experience. Preliminary findings indicate that the use of MOOCs in dairy farming education can significantly enhance knowledge retention and practical application among farmers. The study concludes with recommendations for policymakers and educational institutions on adopting similar models to uplift the dairy farming community, thereby contributing to sustainable agricultural development.

Keywords: *Dairy Farming, E-Learning, Massive Open Online Course (MOOC), Four-Quadrant Approach, Online Learning Platforms*

Corelation and path analysis in vegetable cowpea (*Vigna unguiculata*)

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Abstract

Fifty genotypes of vegetable cowpea were analyzed to resolute correlation coefficient and path coefficient analysis for twelve characters like days to 50 per cent flowering, days to first green pod picking, number of primary branches per plant, plant height (cm), pod length (cm), pod width (cm), number of pods per plant, number of seeds per pod, number of pods per cluster, number of clusters per plant, ten pod weight (g) and green pod yield per plant (g). Magnitude of genotypic correlation was found slightly higher than phenotypic correlation for most of the traits. The green pod yield per plant had significant and positive correlation with number of pods per plant, ten pod weight, pod length and number of pods per cluster at genotypic and phenotypic levels. It has significant and positive correlation with number of clusters per plant at genotypic level only. It had positive and non-significant correlation with number of clusters per plant at phenotypic level. The phenotypic path coefficient analysis revealed that, number of pods per cluster, ten pod weight and number of pods per plant expressed positive and higher direct effect on green pod yield. Consequently, these traits may be simultaneously chosen to create high yielding vegetable cowpea varieties.

Keywords: *correlation coefficient, path coefficient analysis, vegetable cowpea*

Optimization of feedstock quality and bioethanol production through response surface methodology in jute (*Corchorus olitorius* L.)

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Abstract

Environmental issues have enforced us to rethink about reducing the carbon emission. One of the important sources of such emission is using fossil-based use of fuel. Therefore, nations are heading towards the use of clean and green fuel. Jute is one of the most potent candidates for second generation biofuel. Being lignocellulosic in nature, it has the immense potential to be utilized for production of bioethanol. In this study, the biomass quality and production as well as the reaction conditions for delignification of whole jute biomass has been optimized using response surface methods (RSM). We optimized the alkaline pretreatment and from whole jute biomass (*Corchorus olitorius* L cv. JROB-2) using response surface methodology through Box Behnken Design with three independent factors. Sodium hydroxide (NaOH) concentration (%), time (h) and temperature (!) were used as independent variables with percent delignification as response variable. Maximum delignification (80.42%) obtained with 2.47% (w/v) NaOH concentration, 55.8 °C temperature and 5.9 h time duration. This pretreatment resulted in removal of 79.8 % lignin and 34.2% hemicellulose from the biomass, thereby increasing cell wall porosity, fragmentation and surface roughness as well as also created sharp cell walls edges, all of which allowed better accessibility of cellulase enzyme during saccharification. Further, the biomass compositional analysis showed a reduction in lignin and hemicellulose content. Optimized saccharification condition yielded maximum saccharification (76.48%) when hydrolysis was performed at 6.9% biomass loading with enzyme concentration of 49.52 FPU/g substrate at 51.05 æ°C for 74.46

h. The optimum conditions standardized for both alkali pretreatment and saccharification were validated and no significant difference was found between the observed and the predicted value.

Keywords: *jute biomass, pretreatment, saccharification, response surface methodology, lignin, cellulose*

Present status and future prospects of shrimp culture in inland saline water in District Jhajjar, Haryana

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Abstract

Inland saline aquaculture of shrimp in low salinity waters is widespread in many regions worldwide. Owing to its ability to grow and survive in low salinity environments the Pacific white shrimp (*Penaeus vannamei*) has been cultured successfully in low saline areas as well in inland saline water. Haryana has hundreds of thousands of hectares of highly productive land. Out of these lands, 47 percent of areas which are affected by the problem of underground salinity and water logging offer great potential for aquafarming. Fisheries Department of Haryana has undertaken a programme on saline water *P. vannamei* culture in the year 2014-15. The present study was conducted to evaluate the current status and scope of *P. vannamei* farming in district Jhajjar, Haryana. Data were collected by survey of site, interaction with district shrimp farmers, direct observation, technique fisheries officer, Jhajjar with self-designed questionnaire. The study revealed that farmers of District Jhajjar have produced an average of 10 tonnes of *P. vannamei* / ha in a period of four months. The shrimps have grown to mean average body weight of 25 g with an average survival of 98.7% in 120 days. In the present study the majority of the physico-chemical parameters were within the optimum levels. Due to low level of potassium and magnesium in inland saline areas, these minerals are supplemented to maintain mineral balance in the shrimp ponds of Jhajjar during pre-stocking and as well as post-stocking phases. The present study concludes that with proper technical support and market linkages, Haryana can become a major producer of *P. vannamei* in future contributing to national economy and nutritional security. Shrimp farming in inland saline water in Jhajjar is more profitable as compared to agricultural or horticultural crops, because it fetches higher returns to farmers in a short span of 100-120 days.

Key words: *Shrimp farming, Penaeus vannamei, inland saline aquaculture, Haryana*

Revolutionizing Crop Production: Harnessing the Power of Precision Agriculture

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Abstract

Precision agriculture, often known as precision farming, is a technology that focuses inputs on arable crop production based on crop requirements in a localized manner. The intersection of crop production technology and precision agriculture is revolutionizing the agricultural landscape, enabling farmers to cultivate crops with unprecedented accuracy and efficiency. This examines the transformative impact of precision agriculture on crop production, highlighting its capacity to enhance crop yields and quality, optimize resource allocation and reduce waste, mitigate environmental degradation and promote sustainability, inform data-driven decision-making and farm management. The integration of advanced technologies, including, precision irrigation and fertilization systems, automated crop monitoring and yield prediction models, data-driven decision-making tools and farm management software, integration of robotics and autonomous farming systems. These innovations enable farmers to, enhance crop yields by up to 20%, and reduce water consumption by 30% and fertilizer usage by 25%, increase profitability by 10-15%. This research highlights the critical role of precision agriculture and digital farming technologies in addressing global food security challenges, promoting environmentally conscious farming practices, and ensuring a sustainable future for agriculture. This abstract provides a comprehensive overview of the current state and future directions of crop production technology and precision agriculture, emphasizing their critical role in addressing global food security challenges and promoting environmentally conscious farming practices.

Keywords: Precision agriculture, digital farming, crop production technology, sustainable agriculture, agricultural innovation, farm management.

Weed flora dynamics and growth response of barley under different weed control methods and nitrogen management

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Abstract

A field experiment was conducted to study the “Weed flora dynamics and growth response of barley under different weed control methods and nitrogen management” Rabi season 2021-2022 was conducted at SGT University, Gurugram, Haryana. The experiment was laid out in a Randomized Block Design (RBD) with the combinations of sixteen treatments with three replications. The treatments comprising four weed control measures weedy check, weed free, metsulfuron at 4 g/ ha at 30 DAS and 2, 4 – D at 0.5 kg/ ha at 30 DAS and four nitrogen levels Control, 30 kg N/ ha, 60 kg N/ ha and 90 kg N/ ha. The results revealed that the treatment Metsulfuron at 4 g/ ha significantly reduced the weed density and dry matter accumulation in comparison to the other treatments. This treatment also improved the growth

and yield attributes viz. plant height, dry matter, no. of effective tillers/plant, length of spikes, grains/spike and test weight. The treatment also recorded the highest grain yield, straw, biological yield and harvest index. The treatment metsulfuron at 4 g/ ha fetching the maximum net return of (61715 Rs. ha⁻¹) and B: C ratio (2.88). The result also showed that the 2, 4 – D at 0.5 kg/ ha second best treatment after Metsulfuron at 4 g/ ha. The result further revealed that the application of 90 kg N/ha recorded the lowest weed density and weed dry weight at 120 DAS. It also improved the growth and yield attributes (effective tillers, length of spike, grains per spike, test weight, grain yield, straw yield, biological yield, and harvest index) as compare to other level of N treatments. It also improved the grain, straw and biological yield and the N uptake by the crop. Application of nitrogen 90 kg N/ha recorded highest net return (82010 Rs. ha⁻¹) and benefit cost ratio (3.32).

Keywords: *Barley, Metsulfuron, 2, 4- D, Randomized Block Design, Nitrogen management*

Computers and AI: driving forces in modern bioinformatics

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Abstract

Computers have been instrumental in the birth and evolution of bioinformatics, revolutionizing our ability to analyze and interpret complex biological data. The advent of powerful computing systems has enabled researchers to store, manage, and process vast amounts of genomic, proteomic, and other biological information in specialized databases. These technological advancements have facilitated the development of sophisticated algorithms for sequence analysis, allowing scientists to align, compare, and annotate DNA, RNA, and protein sequences with unprecedented speed and accuracy. In structural biology, computers have become indispensable for predicting and analyzing protein structures, while in genomics, they've made possible the assembly and annotation of entire genomes. The rise of high-throughput technologies like next-generation sequencing and microarrays has been met with parallel advancements in computational tools to process and interpret the resulting deluge of data. In this context, machine learning has emerged as a powerful approach to extract meaningful insights from these large-scale datasets. For instance, deep learning algorithms have been successfully applied to predict gene function, identify regulatory elements in DNA sequences, and classify cancer types based on gene expression profiles. Convolutional neural networks, originally developed for image recognition, have been adapted to analyze DNA sequence motifs and predict protein-protein interactions.

Computers have also enabled the modeling and simulation of complex biological systems, ushering in the era of systems biology. Here, machine learning techniques such as reinforcement learning and Bayesian networks have proven valuable in modeling cellular pathways and predicting system-wide effects of genetic perturbations. The integration of machine learning and artificial intelligence has further enhanced our ability to recognize patterns and make predictions from biological datasets. For example, support vector machines and random forests have been employed in protein structure prediction, while natural language processing techniques have been used to mine the scientific literature for biological

knowledge. In drug discovery, machine learning models are now being used to predict drug-target interactions, optimize lead compounds, and even design novel molecules with desired properties. These approaches have the potential to significantly accelerate the drug development process and reduce costs. Additionally, in personalized medicine, machine learning algorithms are being developed to analyze patient data and predict treatment outcomes, paving the way for more tailored therapeutic strategies.

Machine learning has contributed, with dimensionality reduction techniques like t-SNE and UMAP enabling the visualization of high-dimensional genomic and proteomic data. By automating many aspects of biological research and facilitating global collaboration among scientists, computers have truly transformed the landscape of biological research, making bioinformatics an indispensable discipline in modern life sciences. The synergy between traditional bioinformatics approaches and cutting-edge machine learning techniques continues to push the boundaries of what's possible in biological research. As algorithms become more sophisticated and biological datasets grow larger and more complex, the role of computers and artificial intelligence in bioinformatics is set to become even more central, promising exciting advances in our understanding of life at the molecular level and beyond.

Keywords: *Bioinformatics, Computers, Machine learning, Genomics, Data analysis, Algorithms*

Speed breeding in wheat using doubled haploidy approach

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Abstract

Conventional breeding programs often require many years and generations to develop homozygous lines. To speed up this process, the production of doubled haploids (DHs) is a crucial biotechnological tool. This technique not only achieves homozygosity but also stabilizes transgenes or mutations in the genome in a significantly shorter time. The use of doubled haploids in wheat and barley has been invaluable for plant breeders, leading to the release of numerous new cultivars. Among the various techniques for efficient haploid production, chromosome elimination and in vitro anther culture are the most effective and widely used in wheat and barley, respectively. In wheat, chromosome elimination doubled haploidy using *Imperata cylindrica* has been employed to develop doubled haploid lines. The florets of F₁ plants are hand-emasculated 2-3 days before anthesis and pollinated with fresh pollen from *I. cylindrica*. The uppermost internodes of the pollinated wheat spikes are injected with a 100 ppm solution of 2,4-D 24 hours after pollination for two consecutive days. After harvesting, the spikes containing pseudoseeds with embryos are cultured on MS medium. Out of 245 florets of wheat F₁ pollinated with *I. cylindrica*, 78.4% formed pseudoseeds, 12.22% formed embryos, and 15.30% regenerated into haploid plants.

Overall, the doubled haploidy approach has significantly advanced the breeding of wheat and barley, providing a faster and more efficient pathway to develop new, stable cultivars. This method continues to be a cornerstone in modern plant breeding, offering promising prospects for future agricultural innovations.

Effect of organic manure and fertilizers on yield and quality of sweet pepper (*Capsicum annuum* L. var. *grossum*) cv. Orobelle under naturally ventilated polyhouse

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Abstract

A field experiment entitled “Effect of organic manure and fertilizers on yield and quality of sweet pepper (*Capsicum annuum* L. var. *grossum*) cv. Orobelle under naturally ventilated polyhouse” in the year 2021 at Experimental Farm Chhapang of Dr. Khem Singh Gill Akal College of Agriculture, Eternal University, Baru Sahib. The trial was laid out in Randomized Block Design with three replications and twelve treatment combinations comprising of four growing medias Vermicompost + Sand + (3:1), Sawdust + Vermicompost + Sand + (1:3:1), Cocopeat + Vermicompost + Sand + (1:3:1) and FYM + Sand + Soil + (1:2:1) and three fertigation levels 100kg NPK/ha, 150kg NPK/ha and 200kg NPK/ha. The result of the experiment revealed that among different growing medias Vermicompost + Sand (3:1) in fertigation levels 200kg NPK/ha and in different treatment combinations Vermicompost + Sand (3:1) + 200kg NPK/ha recorded maximum quantitative characters like fruit length, fruit breadth, fruit weight, number of fruits per plant, number of fruits per plot, fruit yield per plant, fruit yield per plot, fruit yield per hectare and harvest duration of capsicum under this investigation. So, it can be recommended to the farmers for better quality and yield of capsicum.

Keywords: *Growing media, Yield, Quality, Fertigation*

Socio-economic profile of fishery cooperative societies in the Niwas block of Mandla district, Madhya Pradesh

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Abstract

Fisheries activities in open water bodies are generally manage through cooperative society for collective benefits in term of livelihood, nutritional and social welfare of the fisherman or community. In the present study, the socio-economic status and fisheries activities of fishery cooperative societies existed in the Niwas block of Madhya Pradesh was carried out. The respondents in the present study involved all the 171 members from the six fishery cooperative societies. There are six cooperative societies namely Gouri Shakti Fisheries cooperative society (GSFCS), Maa Durga Fisheries Cooperative Society (MDFCS), Maa Narmada Adiwasi Fisheries Cooperative Society (MNAFCS), Maa Narmada Fisheries

Cooperative Society (MNFCS), Adiwasī Fisheries Cooperative Society (AFCS) and Maa Reva Fisheries Cooperative Society (MRFCS) in the Niwas block. More male members (67.25 %) than female (32.75 %) members. Regarding marital status, 90.30% are married and belong to age group of 31-40 years (28%). Education level shows 21% members are illiterate and 1.50% members are graduate passed. The members of fisheries cooperative society, mainly belongs to schedule tribes (57.50%) and OBC (30%). MNFCS despite having 104.60 hectare water bodies generated only one lakh annual income. On the other hand, MNAFSC could generate 3 lakhs from 19.93 hectare water area. Further, only 35.50% members have kachcha house and 95.33% members have Kishan Credit Card (KCC). Average fish production is 2100 kg/year of each society. For marketing, three societies namely MNAFCS, MNFCS and MRFCS sale fish in inter district level. For increasing income and livelihood government's aid in term of basic training, subsidy, and other program for better management of fishing should be availed by the society members.

Keywords: *Socio-economic, Fisheries cooperative society (FCS), Mandla, Niwas*

Sanitization of spinach leaves through DBD Cold plasma for shelf life enhancement and microbial safety.

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Abstract

This study aimed to examine the impact of a developed Dielectric Barrier Discharge Cold Plasma System on the surface treatment and quality parameters of fresh spinach. The developed system created a plasma setup that used dielectric barrier discharge at a 25 kHz frequency and a discharge voltage range of 32.00 kV–47.00 kV. Exposure period, discharge gap, sample weight, and output voltage were four independent variables that were changed in order to optimize the cold plasma system. Cold Plasma treated packaged Spinach samples in LDPE (100 gauge) and PP (100 gauge) and control samples were subjected for quality analysis at ambient temperature (Temp 32±4°C and RH 70±5%) and refrigerated temperature (Temp 4±1°C and RH 70±2%). Characteristics including physiological loss in weight (PLW), color, texture, chlorophyll content, and microbiological load were examined during the storage research at regular intervals. The ideal conditions were 20 g of sample weight, 3.5 cm discharge gap, and 4.00 min exposure time, which produced the desired results of color value of 7.82, texture of 9.38N, chlorophyll content of 2.94 mg/g, and microbial load of 2.79 log₁₀ CFU/g. It was found that cold plasma treated samples under optimized conditions and stored in PP at refrigerated conditions best retained quality parameters up to 9 days of storage period.

Keywords: *Cold plasma, spinach, storage, quality preservation*

Assessing the Economic Empowerment of Women Milk Producers through Participation in Dairy Cooperatives in Gujarat

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Abstract

Millions of people in rural Gujarat rely on dairying and animal husbandry as a reliable source of income. The majority of people living in rural areas work in agriculture and non-agricultural fields including dairy and animal husbandry. This study examines the economic empowerment of women milk producers through their participation in dairy cooperatives in Gujarat. Utilizing data gathered from 300 samples across diverse milk producer unions in Gujarat, the research investigates the impact of women's involvement in dairy cooperatives on economic development. Our findings indicate a positive correlation between women's participation in dairy cooperatives and economic empowerment. Through cooperative engagement, women milk producers experience enhanced access to markets, resources, and financial services, thereby fostering economic growth at both individual and community levels. The study underscores the pivotal role of dairy cooperatives in facilitating women's economic independence and contributing to the overall socio-economic development of rural communities in Gujarat.

Keywords: Dairy cooperatives, animal husbandry, economic development

Popularizing Pea crop for crop diversification and nutritional security of tribal farmers of Meghalaya

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Abstract

Pea (*Pisum sativum* L.) is one of the most potential leguminous field crop for crop diversification and enhancing productivity of rice based cropping systems in North Eastern Region. In Meghalaya after rice harvest in Nov-Dec, fields remain fallow till mid May so instead of taking up second crop after Kharif rice, farmers leave rice field fallow during Rabi season. Rabi pulses like Pea, Toria can be grown in large proportions in fallow land with appropriate package and practices. The average productivity of pulses in North East Hilly (NEH) states is 848 kg/ha which is higher than the national average of 764 kg/ha. However, the region has a shortage of 82% of its required pulses which indicates the NEH's capacity to produce pulses. Hence, ICAR, KVK, Ri-Bhoi introduced and demonstrated Pea var. IPFD 10-12 in 7 villages covering 10.0 ha area in Ri-Bhoi district of Meghalaya during Rabi season of 2022-23 with an objective to popularize and increase the production productivity of pea crop in the district. Technology package was followed from sowing to harvesting of the crop and the productivity and economic performance in improved cultivation package was calculated and compared with corresponding

farmers practices. The results of the demonstration revealed that average grain yield of var IPFD 10-12 was enhanced by 33.65 percent from 8.32 q/ha to 11.12 q/ha without application of fertilizer. There was no incidence of pests and disease recorded in farmer's field. The enhancement of net return fetched from Rs.24,460/ ha to Rs.63,500/ ha with a profitability ratio of 2.33 with an increase in cropping intensity. The horizontal spread was very fast on few pockets but non availability of quality seeds in remote areas hinderance further spread though it might help to raise income, food and nutritional security significantly for the tribal farmers.

Keywords: *Pea, crop diversification, rice fallows, cropping intensity, horizontal spread.*

Impact of thermal treatment on in vitro protein digestibility of pigeon pea protein isolate and protein-polyphenol interactions

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Abstract

Pigeon pea (*Cajanus cajan*) is the second most consumed pulse in India, primarily due to its high protein content (18–25%), availability and preference by Indian consumers. While it is a good source of carbohydrates, minerals, proteins and essential amino acids, pigeon pea is limited by low protein digestibility, largely due to polyphenols (0.3–1.83%) and other antinutritional factors like phytic acid, enzyme inhibitors, and lectins. These compounds can bind to proteins or digestive enzymes, negatively impacting protein absorption. Various food processing techniques, such as thermal treatments (pressure cooking, autoclaving, hydrothermal, infrared heating) and non-thermal treatments (germination) have been shown to reduce these antinutritional factors and improve *in vitro* protein digestibility (IVPD). Therefore, in this study, the effect of autoclaving treatment on *in vitro* protein polyphenol interaction and in vitro protein digestibility of protein isolates were analysed. Initially, the polyphenols present in pigeon pea variety Pusa Arhar 2018-4 was profiled using LC-MS. Longistylin A, Biochanin A and Biochanin B was found to be major polyphenolic compound present in the pigeon pea variety. Protein isolate was extracted from pigeon pea by isoelectric precipitation method and IVPD of control and autoclaved pigeon pea was found to be 82.41±0.31 and 88.14±0.11 respectively. The interaction between pigeon pea protein isolates and total polyphenol extract from pigeon pea was analysed using fluorescence spectroscopy and found that the polyphenol and protein isolate interacting with 1:2 ratio in control protein-polyphenol complex whereas autoclaving reduced the interaction to 1:1 ratio. Therefore, it can be concluded that, autoclaving can be an effective treatment to improve IVPD of pigeon pea protein isolate. Also, it reduces protein polyphenol interaction hence alleviating the negative impact of polyphenol on protein digestibility.

Keywords: *Pigeon pea, in vitro protein digestibility, polyphenol, Longistylin A, Biochanin A, Biochanin B*

Unmodified Gold Electrode for Arsenic As³⁺ Detection: A Cost-Effective and User-Friendly Approach

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Abstract

Arsenic contamination in water poses a significant health risk due to its high toxicity. This study presents a novel electrochemical sensor for the sensitive detection of reduced arsenic (As³⁺). The sensor employs a standard gold electrode and all the electrochemical measurements were performed using 2 mM [Fe(CN)₆]^{3-/4-} as a redox probe. By optimizing square wave voltammetry parameters, the sensor achieves a remarkable detection limit of 0.020 µM (1.5 ppb) with a high sensitivity of 34.84 µAµM⁻¹. The sensor demonstrates excellent linearity (R² = 0.99) within a calibration range of 0.1–1.0 µM. The unmodified gold electrode offers exceptional selectivity, reproducibility, and sensitivity for reduced arsenic detection. The sensor's ability to effectively detect arsenic in real groundwater samples with high recoveries (99.4–106 %) highlights its potential for practical environmental monitoring applications.

Keywords: *Reduced Arsenic, Sensitivity, Linearity, Repeatability, Reproducibility, Gold Electrode*

A small-category spraying drone can be a boon for marginal to semi-medium-scale farmers: A case study in Rajasthan

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Abstract

Drones, or Unmanned Aerial Vehicles (UAVs), are an emerging spraying technology that has been gaining significant acceptance among both developed and developing nations, particularly among farmers and pesticide applicators. Primarily, it is advantageous for being a contactless spraying, time-efficient, remotely piloted machine that can access difficult terrain in addition to flat land. In the present research work, a small-category spraying drone with a 10-liter capacity, a rotary-type hexacopter, was demonstrated in the state of Rajasthan on both flat and undulating terrain. According to the Directorate General of

Civil Aviation (DGCA), Government of India, the small-scale drone category has a payload capacity ranging from 2 kg to up to 25 kg. The drone was used for a range of important arid and semi-arid crops during the kharif and rabi seasons, including groundnut, pear millet, wheat, cumin, fenugreek, and isabgol, serving both marginal to large farmers. These crops are important staple food, cash crop and seed spices in the region. During the spraying process, the materials used primarily included liquid nano urea, agro-chemicals, and pesticides of the farmers' choice, tailored for the specific crops as part of the package of practices. It was found that a height of 1.2 to 2.5 meters above the crop canopy was optimal for spraying under wind speeds of less than 1 m/s and environmental temperatures conditions in these areas ranging from 5° to 40 °C. It was also observed that small-scale spraying drones are time-efficient and can greatly benefit marginal (<1 ha) to semi-medium-scale farmers (2-4 ha) because of their battery life, charging duration, flight time, and payload capacity.

Keyword: *Spraying Drone, UAV, Arid and Semi-Arid Regions, Cumin, Seed Spices.*

Climate change and Agriculture: Mitigation strategies

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Abstract

Climate change poses significant threats to agricultural ecosystems, impacting crop yields, soil health, and biodiversity. This study investigates the effects of climate change on environmental ecology in agriculture and explores effective mitigation strategies. Our research reveals that rising temperatures (projected to increase by 1.5 p C by 2050), altered precipitation patterns, and increased frequency of extreme weather events are expected to decrease crop yields by 2-5%, water availability will be decreased affecting irrigation and overall crop productivity, Soil fertility faces a threat, with erosion projected to increase by 30% by 2050, changes in biodiversity with the estimated 20-30% reduction in plant and animal species. Thus we should focus on Agroecology, permaculture, and regenerative agriculture are promising approaches. These ecological practices emphasize sustainable land management, biodiversity conservation, and soil health improvement. By integrating these methods, we can enhance soil carbon sequestration, promote ecosystem services, and maintain a diverse range of species. Furthermore, precision agriculture, which leverages data and technology for targeted farming practices, can optimize resource use and minimize waste. Vertical farming offers a space-efficient way to grow crops indoors, reducing the need for large land areas. Climate-smart agriculture combines scientific knowledge with adaptive practices to enhance resilience against climate variability. Our findings highlight and promote biodiversity and ecosystem services, improve water use efficiency and reduce waste, increase crop yields and improve nutritional quality. This study's innovative integration of ecological principles and technological approaches provides a novel framework for developing climate-resilient agricultural systems.

Keywords: *Climate change, agricultural ecology, mitigation strategies, Climate-Resilient Agriculture, technological innovations, ecological principles.*

Assessment of Genetic Diversity in Mandarin Accessions from the Eastern Himalayan Region of India: Insights from Fruit Quality Traits

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Abstract

The study highlights the critical role of genetic diversity in enhancing the nutritional quality of mandarins, a key crop in the Eastern Himalayan region of India. It underscores the need for addressing nutritional security, given the widespread nutrient deficiencies caused by energy-rich but nutrient-poor diets. Mandarins, known for their rich content of organic acids, phenolic compounds, vitamins, and dietary fibers, show significant variability in fruit quality traits across different accessions. By analysing 18 fruit traits across 17 orchards over two seasons, the study identified substantial genetic variation in traits like total phenol content and seed number, with minimal influence from environmental factors. The classification of germplasm into six distinct clusters emphasizes the genetic distinctiveness of certain accessions, which could serve as key resources in breeding programs. Interestingly, the study found no correlation between fruit size and biochemical traits such as total soluble solids (TSS), total phenolic content (TPC), total flavonoid content (TFC), or antioxidant activity. This suggests that larger fruits do not necessarily possess higher nutritional or biochemical qualities, making the selection of accessions for breeding more nuanced. The variability and genetic diversity observed provide essential resources for developing mandarin varieties with improved yields and enhanced nutritional properties, potentially contributing to agricultural sustainability and addressing nutritional security.

Keywords: *Genetic diversity, Mandarin accessions, Fruit quality traits, Eastern Himalayan region, Citrus breeding, Phenolic compounds, Nutritional security, Principal Component Analysis (PCA), Agricultural sustainability.*

The Impact of Trading and Poaching on Bird Populations in India

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Abstract

This review explores the significant impact of trading and poaching on bird populations in India. The widespread decline in avian species is attributed to habitat loss, poaching, and illegal trading. The study highlights the diverse factors driving these activities, including economic incentives, cultural practices, and the demand for exotic pets. The degradation of habitats due to pollution and human activities further exacerbates the decline in bird populations. The review underscores the urgent need for comprehensive conservation strategies and effective enforcement of wildlife protection laws to safeguard India's avian biodiversity.

Keywords: *Bird conservation, poaching, illegal wildlife trade, habitat loss, India.*

Microplastics and biodiversity: A comprehensive analysis of their ecological impact

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Abstract

Microplastics, defined as plastic particles less than 5mm in diameter, have become a pervasive environmental contaminant with significant repercussions for biodiversity and ecosystem health. This review examines the impact of microplastics across marine, freshwater, and terrestrial ecosystems, highlighting their effects on animals, plants, and other forms of biodiversity. The ingestion of microplastics by a diverse range of organisms, from plankton to terrestrial wildlife, poses physical and chemical threats, including digestive blockages, toxicity from adsorbed pollutants, and altered behavior. Microplastics also impact soil structure, water retention, and microbial communities, affecting plant growth and soil fertility. Furthermore, the review explores the complex interactions and cascading effects of microplastic pollution, emphasizing the need for comprehensive remediation strategies and regulatory policies to mitigate their environmental impact.

Keywords: *Microplastics, Biodiversity, Environmental Pollution, Ecosystem Health, Remediation Strategies.*

Advances in nanotechnology for fish nutrition

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Abstract

Nanotechnology has emerged as a groundbreaking method in aquaculture, greatly improving fish nutrition and health. This review examines the use of various nanoparticles, such as selenium, zinc, iron, silver, and chitosan, in fish feed to enhance nutrient delivery, absorption, and overall well-being. Incorporating nanoparticles boosts growth performance, immune function, and disease resistance, contributing to more efficient and sustainable aquaculture practices. Nonetheless, the application of nanoparticles also poses challenges, including potential toxicity, environmental concerns, and regulatory issues. It is essential to tackle these challenges to ensure nanotechnology's safe and effective implementation in fish nutrition.

Keywords: *Nanotechnology, Fish Nutrition, Nanoparticles, Aquaculture, Nutrient Absorption.*

The hidden poison-microplastic: Inflammatory catalyst of cancer development

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Abstract

Microplastics, tiny plastic particles less than 5 millimeters in diameter, have become a growing concern due to their widespread presence in various ecosystems and their potential health impacts, particularly their role in inducing inflammation and contributing to cancer development. This paper explores the mechanisms through which microplastics trigger inflammatory responses in biological systems, leading

to oxidative stress, cellular damage, and disruptions in cellular signaling pathways. These processes not only sustain chronic inflammation but also create a microenvironment conducive to tumor initiation and progression. The paper further discusses the global prevalence of microplastic pollution, the specific inflammatory pathways activated by microplastics, and the resulting implications for various types of cancer, including gastrointestinal, lung, liver, skin, and breast cancers. The study highlights the urgent need for standardized research methodologies, long-term studies, and effective remediation strategies to mitigate the health risks posed by microplastic exposure.

Keywords: *Microplastics, Inflammation, Carcinogenesis, Oxidative Stress, Cellular Signaling Pathways.*

Microbial Degradation of PCBs using Bacteria isolated from the Cement debris site

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Abstract

PCB congeners are non-polar and thermally stable compounds that pose significant environmental concerns. This study aimed to investigate the dissipation of PCB congeners by bacteria isolated from a cement debris site. The results indicated that the biodegradation of PCB congeners followed first-order reaction kinetics. When treated with *Bacillus cereus*, PCB levels decreased by approximately 43.66% for PCB-10, 35.94% for PCB-28, 27.69% for PCB-52, 14.99% for PCB-138, 15.12% for PCB-153, and 9.30% for PCB-180. In contrast, treatment with *Nitratireductor kimnyeongensis* resulted in reductions of 35.68% for PCB-10, 34.68% for PCB-28, 30.71% for PCB-52, 13.25% for PCB-138, 13.45% for PCB-153, and 7.4% for PCB-180 over 60 days. Similarly, *Rhodococcus ruber* treatment led to decreases of 44.06% for PCB-10, 36.15% for PCB-28, 28.1% for PCB-52, 15.46% for PCB-138, 15.72% for PCB-153, and 9.10% for PCB-180 after 60 days. However, the consortium treatment exhibited a relatively faster dissipation of total PCB residues, with reductions of approximately 44.19% for PCB-10, 36.95% for PCB-28, 36.61% for PCB-52, 28.91% for PCB-138, 28.90% for PCB-153, and 10.30% for PCB-180 after the 60-day period.

Keywords: *Biodegradation, Bacterial isolates, First-order kinetics, Polychlorinated biphenyl, Cement debris*

Threat Categorization and Conservation Prioritization of Floristic Diversity in Pangri Valley of Himachal Pradesh, North Western Himalaya

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Abstract

Extinction is the most irreversible phenomenon of all the major environmental calamities happened on earth crust. Biodiversity extinction rate is faster than the natural extinction with the results of changes land use pattern, unsustainable use of natural resources, pollution, habitat degradation, climate change, invasion of alien species, conversion of forest land for cultivation and residential as well as commercial purposes resulting in natural habitat degradation and is a direct cause of extinction and loss of biodiversity. In the present investigation, an approach has been developed to prioritize species at local level in Pangi valley, District Chamba by using six conservation attributes i.e., population size, habitat preference, distribution range, anthropogenic pressures, extraction trend, use pattern, endemism and nativity. Threat categories of floristic diversity were identified on the basis of Conservation Priority Index. Of the total 780 species of vascular plants recorded, 95 species were fallen under different threat categories i.e., 14 species Critically Endangered, 18 Endangered, 25 Vulnerable, 38 Near Threatened and other species were under Least Concern category. As per IUCN threatened list, out of total, 02 species were reported under Critically Endangered, 07 Endangered, 05 Vulnerable, 02 Near Threatened and remaining species under Least Concern categories. Out of total, 08 species were reported under Critically Endangered, 09 Endangered 08 Vulnerable by many researchers in Himachal Pradesh. Maximum 75 threatened species were identified between 2801-3800m; 31 were recorded in *Cedrus deodara* community, followed by 24 in *Betula utilis* community. The overexploitations and unsustainable use of natural resources and destruction of habitats contribute to the major loss of biodiversity. Therefore, regular monitoring of populations and habitats, development of conventional protocols, establishment of species in-situ conditions and habitats and replication of this approach in other parts of Indian Himalayan Region have been suggested.

Keywords: *Floristic Diversity, Distribution, Threat categorization, Conservation Prioritization, Pangi Valley*

Incremental life time cancer risk in residents of middle Ganga plain exposed to individual and cumulative intake of arsenic through rice-wheat based diet

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Abstract

Ground water and rice has been identified as a main source of inorganic arsenic (iAs), a class 1 human carcinogen. In which only rice accounts for approximately 60% of iAs intake in As affected areas. The provisional maximum tolerable daily intake (MTDI) of As is 2 µg kg⁻¹ bodyweight/day, but the level of

As is far excess in rice grown in As affected areas of WB and Uttar Pradesh, and it will enhanced the cancer risk. We have selected twenty-one households' families, seven from each districts viz. Lakhimpur Kheri, Prayagraj and Ballia for the collection of rice, and wheat samples to know the level of As in these cereals, which is responsible for As exposure in local families inhabiting As prone area of middle Ganga plain (MGP). The rice and wheat in different seasons from these families have been collected, and after analysis of arsenic, it was found that the mean level of arsenic in different cultivars of rice were two fold higher in comparison to wheat, being maximum in Ballia, where it was three fold higher. The mean range of arsenic in rice was 170-394 μgkg^{-1} , whereas its accumulation in wheat in-between 79-137 μgkg^{-1} in these districts. It was also noticed that arsenic antagonized the accumulation of Se in rice and wheat grain being lowest in Ballia i.e. H¹ 1 μgkg^{-1} . In conclusion, the accumulation of As in wheat and rice grains altered the nutrients quality and thus compromised the recommended daily intake of these nutrients in rice wheat based diet, and enhanced the cancer risk in middle Ganga plain. Detailed discussion on the incremental cancer risk will be discussed in the conference.

Keywords: Arsenic, Cancer Risk, selenium, rice and wheat

Characterization of the virus causing shoe-string disease in tomato plants and effective management through exogenous application of dsRNA

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Abstract

The tomato crop (*Solanum lycopersicum* L.) is under considerable threat from a newly emerging disease distinguished by a unique shoestring-like appearance of leaves and the production of immature, small, and deformed fruits, presenting a major obstacle to tomato cultivation in India. A new tomato mottle mosaic virus (ToMMV) isolate was identified in the affected plants using transmission electron microscopy (TEM) and molecular analyses. The current shoe-string isolate of ToMMV was notably discovered to induce a similar disease in most commercially available tomato varieties during experimental trials, demonstrating its aggressiveness. The ToMMV isolate being studied has been shown to infect several solanaceous plant species, while plants in the Cucurbitaceae family were not affected. The virus was also discovered transmissible through seeds, and a few seedlings from infected plants exhibited symptoms. The results highlight the important influence of ToMMV on tomato farming in India and stress the necessity for an efficient management strategy to limit the effects of this virus. Recently, RNA interference (RNAi) has emerged as a highly promising method for controlling viral infections by externally applying dsRNA. In this study, a dsRNA expression construct was created in the L4440 vector to target the coat protein (CP) gene and a segment of the movement protein (MP) gene of ToMMV. The dsRNA was purified from *E. coli* HT115 cells and applied topically to tomato cv. Pusa Ruby plants, resulting in a significant decrease in shoe-string symptom development. Additionally, quantitative reverse transcription polymerase chain reaction (qRT-PCR) analysis demonstrated a

substantial reduction (>90%) in virus accumulation in all the dsRNA-treated plants. Before virus inoculation, the preventive application of dsRNA exhibited the highest effectiveness in reducing symptom development and virus accumulation.

Keywords: *Shoe-string, tomato, tomato mottle mosaic virus (ToMMV), seed-transmissible, dsRNA, qRT-PCR*

Micro RNAs: Key regulators of gene expression and therapeutic potential in disease and medicine

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Abstract

MicroRNAs (miRNAs) are small, non-coding RNA molecules that play a crucial role in post-transcriptional gene regulation, influencing numerous biological processes. The present study provides a comprehensive review of miRNA biology, from their discovery and structure to their biogenesis and gene regulatory mechanisms. The significance of miRNAs in controlling gene expression, especially in mRNA stability and translation, is explored alongside their pivotal roles in embryonic development, cell differentiation, proliferation, and apoptosis. We also delve into the association of miRNAs with various diseases, particularly their dual roles as oncogenes and tumor suppressors in cancer, and their involvement in cardiovascular, neurodegenerative, and metabolic disorders. The review highlights the potential of circulating miRNAs as biomarkers for early disease detection and their implications in personalized medicine. Further, the therapeutic potential of miRNA mimics and inhibitors is discussed, alongside challenges in miRNA delivery systems and their application in overcoming drug resistance in cancer treatment. Emerging research in miRNA's role in stem cell differentiation and regenerative medicine is also examined. Technological advancements in miRNA research, including profiling methods and computational tools for target prediction, are reviewed. Finally, the paper discusses future directions, emphasizing novel miRNA discoveries, engineered regulatory networks, and ethical considerations in miRNA-based therapies. This review underscores the growing relevance of miRNAs in biomedical research and their potential in therapeutic applications.

Keywords: *microRNA, gene regulation, cancer, cardiovascular diseases, neurodegenerative diseases, metabolic disorders, stem cell research, regenerative medicine, miRNA profiling, miRNA biogenesis, miRNA delivery systems.*

**Estimation of essential metabolites and enzymes in conventionally and organically grown chili
(*Capsicum annuum* L.) fruits**

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Abstract

Organic manures and pesticides differently affect plant metabolism, physiology, and productivity. Crop nutrient composition depends on factors like soil, seed type, irrigation, and agricultural practices. The quantitative estimation of bioactive constituents (protein, carbohydrates, α carotene, Lycopene, Ascorbic Acid, Flavonoids, Phenolics and related enzymes etc.) may be utilized in the analysis of constituents found in organic and conventionally grown *Capsicum annuum* L. Kharpuri variety. The positive impact of organic fertilizers associated with high temperatures was discovered to be highly useful in enhancing the nutrient content and crop productivity of chili peppers. Excessive use of organic manure may contribute to more vegetative biomass accumulation than the increase in chili yield value. In both organic and conventional growing chili fruits exhibited high amount of presence of proteins, carbohydrates, alkaloids and carotenoids. According to the assay, the maximum protein content was found in organic III chili fruits followed by organic II and organic I. The lowest amount of protein content was recorded in conventional chili fruits.

Ascorbic Acid content was recorded high in organically grown chili fruits compare to conventional chili fruits. The highest amount was found in organic III chili fruits while lowest in conventional chili fruits. When compared to the organic samples, the conventional vegetables had higher values for most of the parameters. According to the findings of this study, some heavy metals cannot be avoided or eliminated through agricultural practices. According to some of the authors cited in this study, changes in farming practices and inadequate crop rotations used by producers can affect the availability of nutrients in the soil. It is necessary to improve the nutritional status of micronutrients in crops by employing appropriate crop management to increase crop productivity and quality. Crop rotation is one of the organic agriculture strategies used to increase resistance to many pathogens.

Keywords: *Organic farming, crop, metabolites, nutrients.*

**Colours from VIBGYOR trapped by Light-harvesting complexes (LHCs) are always
associated with pigments and developing new theory of evolution of organism**

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Abstract

Colours developed in organism according to need of that chromatic pigment in single or multicellular system though Light harvesting complex (LHC) present on membrane. Although this different chromatic

pigment mainly required for metabolism, but beautiful VIBGYOR colours -*violet, indigo, blue, green, yellow, orange, and red*, started expressing by linked or independent genes. Chromatic molecules and its related genes passed from prokaryotic system to eukaryotic-Plants and animal system thus expressing colours in biological system. Development of Light harvesting complex (LHC) started in organism with their origin and survival on earth. Effective LHC (for chromatic pigments) found in almost all living organism except obligate saprophytes and Parasites, irrespective to their habitat. In Prokaryotes (Blue green bacteria) Phycobilisomes, (green sulfur bacteria) chlorobium acts as LHC, where as in higher plants it is PSI, PSII and Phytochrome. In Human beings it is mainly by Rhodopsin Complex (RC), Cone Opsin Complex (COC), Melanopsin Complex (MC), Melanin Protection Complex (MPC). These all complexes are associated with one or more chromatic(pigments)molecules, how ever these chromatic molecules could be associated without LHCs in cellular system. Sun is ultimate source of energy, which transfer its energy and sunlight in every organism on earth via LHC. It must be taken in consideration foremost while classify the organism and study of evolution. Light harvesting complex (LHC) in organism could be proved a very important tool to distinguish/categorize organism and its systematic arrangements for evolutionary study. The capacity of development and evolution of LHC led to development of organism on earth. this study has been filed to government of India as copy right.

Keywords: *Light harvesting complex, VIBGYOR, Light, evolution, Colours*

Urban farming

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Abstract

Fruits and Vegetables sold in cities nowadays are produced by the sides of the roads and railway tracks using polluted waste water which leads to ill health and malnutrition of the urban people. Fruits and vegetables play a vital & important role in the balanced diet of human beings by providing vital protective nutrients. There are one of the ways to reduce the degree of illness and malnutrition in urban people is the production of vegetables in the cities itself using clean water and zero land. Ground lands have become very scarce in big cities nowadays and therefore big apartments are becoming the favorable places to live by the people. In order that the requisite quantity and kind of fresh fruits and vegetables are available every day to a family, it is advisable to have nutrition garden to grow them in the premises of the house or near the schools. The terrace land of the apartments (The zero land) can be utilized for producing the vegetables as per the requirements of the people of apartment. Best quality of the fresh produce can be had from one's own nutrition garden as the time interval between the harvest and the consumption becomes the least. A diet rich in fruits and vegetables has been shown to prevent cancer, neurological disorders and allergies. Nutrition garden by self can offer fresh and chemical free fruits and vegetables. The management of vegetable production program can be handled by the management committee of the apartment itself. An effort has been made in this paper to present the various possible ways of producing fruits & vegetables using zero land & fresh water in the urban and peri- urban areas.

Keywords: *Fruits, Vegetables, Urban gardening, Terrace farming, Nutrition garden*

Microgreens Cultivation for City Dwellers

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Abstract:

Young vegetable greens with roots, stems, and cotyledon leaves are known as microgreens. Microgreens are a powerful superfood because of the concentrated concentration of nutrients in their stem and leaves. The first real leaves to emerge from a 2-3-inch-tall seedling of a vegetable or herb are called microgreens. Plants come in an abundance of kinds, such as turnips, radishes, broccoli, carrots, celery, chard, lettuce, spinach, arugula, and cauliflower. Among them are amaranth, cabbage, beets, parsley, and basil can be cultivated as a microgreen to provide a healthy and nourishing in addition to your regular meals. Microgreens are ready for harvest and are packaged with a diet and strong flavours that mimic their developed equivalents. If you were to eat the microgreen shoots, for instance of radish, with a flavour and taste that closely resembles radish. In a similar vein, Beetroot microgreens taste just like coriander and beetroot. Compared to their mature counterparts, microgreens often have five times the amount of vitamins and carotenoids. These extraordinarily high nutritional levels reduce the chance of cancer, osteoporosis, Alzheimer's disease, and improve cardiac health. The first time microgreens were used as a garnish was in the early 1980s, but quickly became the healthiest trend as a result of their superpowers in nutrition. However, microgreens are still relatively new in India. The upscale dining establishments have begun to appear in major cities like Bengaluru, Mumbai, and Delhi incorporating microgreens into their sandwiches, salads, snacks, and desserts fake tails and other things. Microgreens are perfect for those who are having trouble desire to start eating but lack the time and space to manage a garden. Many fresh plants products provide vitamins, minerals and fibres. These nutrients can help with, preventing a range of diseases, managing weight, Boosting both mental and physical health well-being.

Keywords: *Vegetables, Microgreens, Exotic vegetables, Nutrition*

Advancements in agricultural market intelligence through Recent e-NAM digital innovations

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Abstract

This research paper examines the transformative impact of the National Agriculture Market (e-NAM) initiative on agricultural practices. It focuses on recent advancements in Agricultural Market Intelligence (AMI) and analyzes how e-NAM has influenced the development and growth of the agricultural sector. The paper explores key innovations within e-NAM, such as artificial intelligence, blockchain, and improved mobile application accessibility, and their role in reshaping market intelligence and agricultural dynamics. These innovations have empowered farmers and streamlined the supply chain, leading to significant changes in the sector. By analyzing the tangible impacts of e-NAM—such as farmer empowerment, reduced intermediaries, and enhanced market transparency—this research highlights the driving forces behind agricultural sector growth. It also addresses the opportunities and challenges associated with e-NAM's implementation. Through a detailed exploration of e-NAM's innovations, the paper offers insights into the potential for further development in the agricultural sector, providing recommendations and strategies to leverage technology-driven market intelligence for continued growth.

Keywords: *e-NAM, Digitization, Agricultural Market Intelligence, Artificial Intelligence, ICT.*

Antifungal Resistance Monitoring of Human Pathogenic Fungi Using Waste Water and Leachate Samples

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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 play a crucial role in propagating resistance. Municipal solid waste disposal poses significant health risks and environmental issues, with landfills containing toxic elements. Leachate wastewater can be used for biotechnological applications in bioremediation processes. A study using metagenomic sequencing technology analyzed the impact of leachate treatment on pathogen species and abundance in leachate and landfill effluent on groundwater pathogens and ARGs. The review discusses the SELECT method, a unique and cost-effective tool for generating antifungal MSC data. It adopts a single species system with varied susceptibility profiles, simplifying antifungal application and considering differences in eubacterial genetics and growth versus eukaryotic physiology and competition. 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.

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

Predatory potential of frog, *Euphlyctis adolfi* and toad, *Duttaphrynus stomaticus* against major insect pests of rice crop

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Abstract

Comparative predatory potential and functional response of frog (*Euphlyctis adolfi*) and toad (*Duttaphrynus stomaticus*) was studied against major insect pests of rice crop like *Nilaparvata lugens*, *Sogatella furcifera*, *Oxya hyla*, *Trilophidia annulata* and *Conocephalus longipennis* during 2022 and 2023 under laboratory conditions. *E. adolfi* demonstrated higher feeding potential, consuming 3.00 to 27.33 insects across all prey species under investigation while that of *D. stomaticus* was invariably lower as a consequence of poor capture success on larger and more evasive grasshopper species. Functional response analysis showed a Type II, hyperbolic response for both anuran species, although *E. adolfi* displayed significantly higher values of attack rate ($0.723\text{--}0.981\text{ h}^{-1}$) and lower handling time ($0.032\text{--}0.045\text{ h}^{-1}$) as compared to *D. stomaticus*. *E. adolfi* was 14.29-98.54% more efficient for attaining theoretical maximum rate of predation. Species-specific variability in predatory performance was attributed to differences in morphological adaptations, hunting strategies and ecological preferences. Our results underscore the value of conserving diverse anuran communities within rice agroecosystems to support sustainable Integrated Pest Management practices. *E. adolfi* emerged as an effective and eco-friendly predator anuran species having potential in managing insect pests of rice crop and reduce usage of pesticides thus, can act as potential biological control agent.

Keywords: *Duttaphrynus stomaticus*, *Euphlyctis adolfi*, Frog, predatory potential, rice crop

Quantitative estimation of flavonoid content of *Ficus benghalensis*-A medicinally important plant

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Abstract

Plants are widely used as a source of medicine by human being and natural products are used as traditional medicines since ancient times. Naturally, the plant parts are exploited in the preparation of Ayurvedic remedies in India. Plants are able to synthesize number of phytochemicals, referred as secondary metabolites. These molecules play variety of roles in the life span of plants. *Ficus*, the largest genera in the plant kingdom, belongs to the family Moraceae. All parts of *Ficus benghalensis* have medicinal

importance as the treatment of various ailments. Flavonoids are polyphenolic compounds and are powerful antioxidants that help to neutralize harmful free radicals and prevent oxidative stress which damage cells and DNA. This leads to aging and degenerative diseases like cancer and Alzheimer's or Parkinson's disease. Owing to these properties, the present study was designed to investigate the flavonoid contents of various extracts of *Ficus benghalensis* aerial parts. The hexane, ethyl acetate, acetone and methanol extracts were subjected to screening for their total flavonoid contents. The present study revealed the flavonoid contents of various extracts in terms of mg quercetin equivalent per gm of sample is (Standard plot $y = 0.0004x - 0.0691$, $R^2 = 0.982$). The values were found between 1.51 mg to 14.79 mg quercetin per gm of extract. The flavonoid content of Hexane extract (C 1) prepared at room temperature, was high as compared to other extracts while methanol extract (H 4) prepared at boiling temperature, contains minimum. The present investigation revealed that *Ficus benghalensis* contain significant amount of flavonoids. Further intention of this study is to correlate relationship of these secondary metabolites to possible biological activities and evaluate *Ficus benghalensis* as a potential source of natural bioactive chemicals.

Keywords: *Ficus benghalensis*, Moraceae, Flavonoid, Estimation.

Management of root rot of Clusterbean through novel combined formulations of fungicides

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Abstract

Clusterbean [*Cyamopsis tetragonoloba* (L.) Taub.] is popularly known as “Guar” or “Guwar” and belongs to family Fabaceae of kingdom Plantae. Root rot is the important disease of clusterbean caused by *Rhizoctonia solani* in Rajasthan and India. The present investigation aimed to find the most efficient and novel combined formulation of fungicides belonging to triazole and strobilurin groups for managing Root rot (*Rhizoctonia solani*) of clusterbean caused by under open field conditions. Efficacy of seven fungicides like Tebuconazole 50% + Trifloxystrobin 25 % WG, Carbendazim 50% WP, Propiconazole 25% SC, Hexaconazole 5% EC, Carbendazim 12% WP + Mancozeb 63%, Azoxystrobin 11% + Tebuconazole 18.3% w/w SC and Mancozeb 63% was evaluated in vivo. The field experiment was conducted for two consecutive years (2022 and 2023) at ARS, Keshwana (Jalore), India. The dry seed treatment was applied for managing the root rot disease of clusterbean. The seed treatment with Tebuconazole 50% + Trifloxystrobin 25 %WG provided maximum disease reduction (81.02%) with increased fruit yield (54.43%) over control, followed by Seed treatment with Hexaconazole 5% EC (79.00% and 45.08%, respectively). Root rot is one of the significant biotic stresses that limit crop productivity and grower's prosperity. Systemic fungicides, particularly triazoles, play a substantial role

in preventing infection by *Rhizoctonia* sp. Thus, Tebuconazole 50% + Trifloxystrobin 25 %WG and Hexaconazole 5% EC reduced disease intensity effectively with increased fruit yield and profitability.

Keywords: Clusterbean, Root rot, *Rhizoctonia solani*, Fungicides.

Dystocia due to fetal ascites in a Murrah Buffalo

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Abstract

A 6-year-old pluriparous Murrah buffalo at 9.5 months of gestation was brought to Veterinary Clinical Complex, Hisar with the history of straining and dystocia for last ten hours. Upon epidural anaesthesia with 4ml of 2 per cent Lignocaine Hydrochloride and adequate lubrication with liquid paraffin, per-vaginal examination was carried which revealed fully dilated cervix and foetus was in posterior longitudinal presentation, dorso-sacral position and both the hind limbs extended in the birth canal. After thorough examination, it was confirmed that foetal abdomen was enlarged due to accumulation of excessive fluid indicating to be a case of dystocia due to fetal ascites. A long obstetrical hook was introduced into uterine cavity of dam and anchored on the fetal abdomen just behind the costal arch. Upon gentle traction, the fetal abdominal wall was pierced to allow the oozing out of peritoneal fluid. About 25 litres of brown colored fluid mixed with blood was observed, thereafter, evisceration of abdominal contents was also performed to reduce the abdominal size and the dead foetus was delivered per-vaginal through traction on obstetrical chains. The dam was administered broad spectrum antibiotics, anti-inflammatory drugs and fluid therapy. The animal recovered successfully without any post-partum complications.

Keywords: Dystocia, Foetal ascites, Murrah buffalo

Dissipation kinetics and effect of household processing of chlorantraniliprole residue in bitter gourd

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Abstract

Pesticides are one of the major environmental pollutants that commonly occur in food, soil, water from agricultural use has been well documented around the world. Chlorantraniliprole a diamide insecticides is a novel, systemic pesticides that work by stimulating an insect's ryanodine receptor, generating fast muscular disfunction and paralysis, and eventual death by causing an unregulated release of internal calcium. To estimate the residues of chlorantraniliprole in bitter gourd a method was validated on GC-MSMS as per guidelines of SANTE. In this research dissipation pattern and the efficiency of different decontamination techniques for removing the residue of chlorantraniliprole from bitter gourd samples

were studied. For this chlorantraniliprole 18.5% SC was sprayed twice at ten days intervals, at the recommended dose (25 g a.i. ha⁻¹), and double the recommended dose (50 g a.i. ha⁻¹). QuEChERS method was used for extraction and residues were analyzed by GC-MS/MS. The initial deposit on bitter melon was 0.79 and 1.23 mg kg⁻¹ and residues persisted up to 10 and 15 days after last spray with a half-life of 1.52 and 2.29 days at recommended and double the recommended doses, respectively. Decontamination studies effectively reduce the residues ranging from 30 to 88 per cent. Peeling found most effective in reducing the residues followed by market available washers and simple household washings. The estimated level of RQ indicated (<1) chlorantraniliprole residues pose no dietary risk to consumers at the level detected.

Keywords: *Decontamination study, Dissipation, Residue, Vegetable*

Yield and profitability of Linseed affected through conservation tillage and mulching practices under Black soil zone of India

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Abstract

The study on performance of linseed under conservation tillage systems was limited. Therefore, the experiment was examined the ideal combination of tillage and mulching for black soil region during winter season of three consecutive years. The treatments were consisted Conventional tillage (Two ploughing followed by laddering); Reduced tillage (One ploughing followed by laddering); Conventional tillage + Rice straw mulching; Reduced tillage + Rice straw mulching; Conventional tillage + Green manuring (during Kharif season); Reduced tillage + Green manuring (during Kharif season); Conventional tillage + Rice straw mulching + Green manuring (during Kharif season) and Reduced tillage + Rice straw mulching + Green manuring (during Kharif season) and laid out under RBD. The experimental findings were stated that the green manuring (during kharif season) followed by conventional tillage + paddy straw mulching plot significantly improved the growth attributes of linseed as compared to the conventional tillage (Two ploughing followed by laddering) and reduced tillage (one ploughing followed by laddering). Whereas, rest treatments were recorded statistically at par. The individual years as well as pooled data of number of capsules per plant of linseed was significantly affected by the different conservation practices except first year. Whereas, Test weight and harvest index were non-significantly affected by the different conservation practices. The grain yield of linseed (1231.36 kg ha⁻¹) was recorded significantly higher in green manuring (during kharif season) followed by conventional tillage + paddy straw mulching plot over than without green manuring experimental plots (T1 to T4). The least grain yield was recorded under reduced tillage (one ploughing followed by laddering). The all the experimental plots treated with paddy straw mulching were improved grain yield as compared to without mulching (T1, T2, T5 and T6). The stover yield of linseed (20.51.63 kg

ha-1) was recorded significantly higher in green manuring (during kharif season) and minimum stover yield was recorded under reduced tillage (one ploughing followed by laddering). Maximum B:C ratio of the experiment was recorded in Green manuring (during the Kharif season) followed by reduced tillage (3.17) followed by Green manuring (during the Kharif season) followed by conventional tillage (2.91). Whereas, the lowest B:C ratio by conventional tillage + Paddy straw mulching (1.96).

Keywords: *Conventional tillage; conservation tillage; Yield; B:C Ratio*

GC-MS analysis of Plant samples of *Leptadaenia pyrotechnica* and *Crataeva nurvula*

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Abstract

Gas Chromatograph -Mass Spectrometry (GC-MS) is a practice that brings together the characteristics of gas-liquid chromatography and mass spectrometry to recognize diverse compounds from a plant sample. Bioactive compounds (phytosterol) were identified by analyzing *Leptadenia pyrotechnica* (aerial part and root part) and *Crataeva nurvula* (leaf part and fruit part) plant samples. An Agilent 6890 Gas Chromatography with 5975 B MSD was utilised in the scan method (m/z 3940), low mass (m/z 45) and high mass (m/z 450) for extracts. Software implemented to handle MS and chromatograms was Turbo Mass Ver 5.2.0; screening for volatiles and semi volatiles compounds. In GC-MS profile, approximately 150 compounds were identified from *L. pyrotechnica* aerial part extract and *C. nurvula* leaf extract.

Keywords: *GC-MS, Bioactive, Volatile, Phytosterols, Leptadaenia pyrotechnica, Crataeva nurvula*

Exploring the antibacterial potential and bioactive compounds of *Bacillus flexus*

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Abstract

The rhizosphere, a soil region influenced by plant root exudates, is a hotspot for diverse microbial communities that play crucial roles in plant health. This study investigated the bacterial isolates from the rhizosphere of potato plants in Khankhal Haridwar, Uttarakhand, India, aiming to evaluate their antibacterial activity and identify bioactive compounds via Gas Chromatography-Mass Spectrometry (GC-MS). Six bacterial isolates (RB1-RB6) were assessed for their activity against *Staphylococcus aureus* and *Escherichia coli* using the agar well diffusion method. Among these, *Bacillus flexus* RB4

exhibited the most pronounced antibacterial effect, displaying significant inhibition zones against both pathogens. GC-MS analysis of *Bacillus flexus* RB4 identified several bioactive compounds, including propanoic acid ethyl ester and acetic acid, known for their antimicrobial properties. Moreover, the isolates demonstrated various plant growth-promoting traits, such as Indole-3-acetic acid (IAA) production and phosphate solubilization, with RB1 showing the highest IAA concentration at 88.3 µg/ml. These findings underscore the potential of these bacterial isolates as biocontrol agents and plant growth promoters, contributing to the understanding of rhizosphere bacteria's functional roles in sustainable agriculture. Future studies should investigate the specific mechanisms underlying these activities and explore their applications in diverse agricultural systems.

Keywords: *Rhizosphere microbiota, PGPB, Antimicrobial activity, GC-MS, Bioactive metabolites.*

Alteration in physico-chemical profiling of jelly seed disordered *Mangifera indica* L. cv 'Dashehari'

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Abstract

Mango (*Mangifera indica* L.) is one of the major fruit crops in tropical and sub-tropical regions of the world and consumed as fresh fruits, several value-added products such as pulp, squash, candies, pickles, etc. India possesses a large diversity of mango where an estimated number of cultivars exceeds 1000. In North India, 'Dashehari' is one of the most popular and demanding mango cultivars faces Jelly seed disorder during fruit ripening, in which the pulp is comparatively soft with changed taste and flavour in affected part of fruits. This melody in mango significantly hampered the export as well as the price value of this cultivar. In the current study, the comparative physio-chemical investigation and occurrence of Jelly seed in 'Dashehari' fruit with harvesting time were performed in order to understand the biochemical dynamic associated with jelly seed disorder. The morphological and biochemical attributes like total soluble solids (TSS), titratable acidity, ascorbic acid and sugar content were observed. Data indicate that, with increasing the harvesting period (days after fruit set; DAFS), the considerable reduction in duration of ripening as well as increment in incidence of jelly seed disordered fruit occurs. Morphological observations revealed that there were no significant alteration among corresponding batch of fruits. The biochemical profiling revealed that the TSS, titratable acidity, ascorbic acid and sugar content were found to be altered in JS fruit when compared with corresponding batch of NJS. It is clear from this study that the issue with mango jelly seeds linked with several biochemical processes inside the fruit's result in the altered taste and excessive softening of pulp tissue. Moreover, we also conclude that the early harvesting of mangos greatly decreased the prevalence of JS in fruit.

Keywords: *Biochemical attributes, DAFS, Fruit quality, Jelly-seed disorder*

**Mass bathing altered the abundance and species diversity of microbiota at confluence point of
Ganga and Yamuna Rivers, Prayagraj**

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Abstract

Rivers are deeply embedded in Indian culture and religious beliefs, holding significant importance in the country. The Ganga river, India's national river, holds diverse significance-social, mythological, geographic, agricultural, and socio-economic. The Ganga basin is home to many historical and religious cities such as Rishikesh, Haridwar, Garhmukteswar, Kannauj, Prayagraj, Mirzapur, Varanasi, and Gangasagar. These cities serve as important pilgrimage centers where various religious activities take place throughout the year along the banks of the Ganga. During different festivals, billions of people visit these places for holy dips, known as 'Ganga snans'. Devotees offers different materials such as sweets, milk, flowers, leaves, old holy books, idols and lighten earthen lamps to the Ganga for their worship after taken the holy dip, thereby contaminating the river water. The present study performed during Kumbh-2019 at confluence point of Ganga and Yamuna and obtained data indicated that turbidity was high at bathing point at Sangam nose than non-bathing sites of Ganga and Yamuna, contrary, DO was significantly decreased. Illumina MiSeq high-throughput sequencing data of microbial community diversity and composition indicated that 90-97% of the reads to bacterial domain followed by, 1-4% for archaea and 2-3% for eukarya. The bacterial diversity and density were increased and correlated with the number of devotees taking dip at various events. The relative abundance of skin, oral and gut archaea and bacteria were high in Ganga, except gut bacteria which were more in Yamuna. The skin and gut associated archaea were highly impacted and positively co-related with number of devotees (0.818 and 0.870, respectively), while oral relatively low affected by mass bathing. Positive relation was also established with skin bacteria. Similarly, diversity of phage was also increased at bathing site than the non-bathing sites. Thus, the current study revealed that the Ganga exhibits special characteristic of water quality in terms of physico-chemical properties and unique microbial diversity, which may play a role in its reported self-cleansing ability. However, the increased pollution load has deteriorated its incorruptible nature. The impact of mass bathing on physico-chemical properties, level of elements, diversity and density of skin, oral and gut bacteria and archaea, diversity of phage in Ganga water has been extensively studied and will be discussed during the conference.

Keywords: *Ganga, Mass bathing, Religious activity, Microbial contamination, Water Quality*

Dufour effect on MHD dissipative flow past a porous vertical plate through porous media in presence of heat sink

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Abstract

The present study investigates MHD heat and mass transfer flow past an infinite vertical porous plate, through a porous media in presence of radiation, diffusion-thermo effect, and heat sink. The flow is subjected to a uniform magnetic field applied transversely in the fluid region. The novelty of the present work is to analyze the diffusion-thermo effect on the flow phenomena in the presence of heat sink and thermal radiation. This effect plays a significant role in various engineering process. The governing equations are solved by perturbation technique to get expressions for velocity, temperature, and concentration fields. The influence of various flow parameters on the flow domain is studied graphically and in tabular form. The result shows that heat flux generated due to temperature gradient enhances the fluid velocity whereas the fluid temperature falls under this effect. The current results have been compared with the existing results in some special cases and it has been found that the findings of the present study are consistent with earlier findings.

Keywords: *Diffusion-thermo, heat transfer, MHD, porous media, thermal radiation*

Morphological and Physiological Approaches to Evaluate Rhizobacteria Mediated Disease Management in Cereals Exposed to Bacterial Phytopathogens

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Abstract

Globally, Sorghum (*Sorghum bicolor*) production has increased to 60-70 million metric tons, making it the fifth most important cereal crop. Sorghum is highly rich in carbohydrates and minerals and it is slowly digestible and resistant starch components with other staple cereal crops. This present study aimed at plant growth-promoting rhizobacteria (PGPR) including *Azotobacter*, *Pseudomonas*, and *Bacillus sp.* isolation from the rhizospheric soil of Brinjal and Sorghum and to investigate their biocontrol activity against *Burkholderia* causing leaf stripe disease in sorghum. The gram-positive bacterial strain *Bacillus* and the gram-negative strains *Azotobacter* and *Pseudomonas* are short rods that demonstrated PGPR ability under in vitro conditions. These bacterial strains are capable of producing phytohormones such as IAA, iron-chelating compounds, siderophores, ammonia, and HCN. They also solubilized the insoluble tricalcium phosphate (TCP) and demonstrated P solubilizing efficiency in a plate assay. (Zaidi et al 2009) Furthermore, the antibiotic resistance of these isolates was investigated, revealing that *Azotobacter* was resistant to erythromycin, streptomycin, tetracycline, and ampicillin, while *Pseudomonas*

sp. exhibited the highest resistance to ampicillin. This was observed by (Mollina et al ;2000) and (Graham et al ;2016) All three bacterial strains were identified at the genus level as *Azotobacter*, *Pseudomonas*, and *Bacillus*, based on microbiological and phenotypic characterization, as well as biochemical reactions. Additionally, the antagonistic effect of these isolates against *Burkholderia sp.* showed that *Pseudomonas fluorescens* is a representative antagonist given by (Cartieaux et al. 2003) which was confirmed by Antagonism Assay by well diffusion method.

Keywords: *Phytohormones, Sorghum, Rhizobacteria, HCN*

Insecticide-Tolerant Phosphate-Solubilizing Rhizobacteria Isolated from Potato Growing at Himalayan Foothills

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Abstract

The potato crop holds immense global importance as a staple food, being a major source of nutrition and economic value. However, the extensive use of pesticides in potato farming raises concerns about their impact on soil health and microbial communities. This study investigates the interaction between pesticides and phosphate-solubilizing bacteria (PSB) in the potato rhizosphere, with a focus on identifying pesticide-tolerant strains that could serve as effective inoculants. The research focuses on improving potato growth and phosphorus (P) uptake in soils treated with insecticides by isolating and evaluating bacteria from the potato rhizosphere. The research evaluated the effects of two commonly used insecticides—chlorpyrifos and carbofuran—on the growth of PSB and P content in potato. Eighteen PSB strains were isolated, showing varying phosphate-solubilizing activity. The study showed higher concentrations of pesticides significantly reduced the phosphate-solubilizing activity of bacteria. Among the isolates, five demonstrated tolerance to chlorpyrifos and carbofuran, even at concentrations above the recommended doses. The isolates were identified as *Bacillus licheniformis* and *Bacillus subtilis* through biochemical tests, phenotypic analysis, and gene sequencing. Bacterial strains increased soil phosphorus availability and enhanced potato growth in greenhouse conditions, although the positive effects decreased at higher pesticide levels. These bacterial strains, when used as inoculants, improved soil P availability and potato growth under greenhouse conditions, though the benefits diminished at higher pesticide concentrations. This study is the first to report *Bacillus licheniformis* and *Bacillus subtilis* as pesticide-tolerant phosphate-solubilizing bacteria, highlighting their potential role in sustainable potato farming by mitigating the negative effects of pesticide use.

Keywords: *Potato, Phosphate solubilization, Pesticide, Bacillus licheniformis and Bacillus subtilis, MALDI-TOF-MS*

Hailstorm: India braces for impending disaster and a threat to agriculture

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Abstract

The studies on hailstorms in the context of climate change and their effects on agriculture are limited, often overlooked. This research aims to shed light on the increasing occurrences of hailstorms in India as a consequence of climate change and the significant threat they pose to the country's agriculture. Hail, as a solid form of frozen precipitation, can cause extensive damage to property and crops. Given that India is primarily an agrarian nation, heavily reliant on agriculture, these hailstorm events can have devastating impacts. To investigate the frequency and intensity of hailstorms, weather data spanning 42 years from 1972 to 2014 was analysed, sourced from the annual publication "Disaster Weather Events" by the National Climate Centre and the Indian Meteorological Department (IMD) in Pune. The hailstorm data for 38 years (from 1972 to 2011, excluding 1977 and 1984) was utilized for monthly frequency analysis. The findings revealed that Maharashtra recorded the highest number of hailstorm events (31 years), followed by Punjab (22 years) and Himachal Pradesh (20 years). The probability of occurrence was notably high in Maharashtra (91-95%) and much lower in Gujarat (6-10%). Additionally, the unseasonal rains and hailstorms during February-March 2014 resulted in severe damage to both standing and matured rabi crops, such as mustard, wheat, barley, gram, and orchard crops in several northern states. The study emphasizes the urgent need for an adequate radar network across the country to better forecast hailstorm occurrences over larger areas. Timely warnings and agricultural meteorological advisories, both before and after hailstorm incidents, could significantly help farmers protect their crops and minimize losses.

Keywords: Hailstorm, Agriculture, Disaster, Climate change, Indian Meteorological Department

Cold Plasma Pretreatment: A Catalyst for Improved Drying Kinetics and Quality in Chilli

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Abstract

Chilli is difficult to dry due to the outermost irregular surface, which hinders moisture transfer. Chemical dipping pretreatments and thermal blanching methods are often employed to enhance its drying process. However, chemical pretreatments hold the issues of chemical additives residue and thermal blanching methods tend to result in a high loss of bioactive compounds. Cold plasma is an ionized gas that contains different electrons, ions, and reactive neutral species. Recent research suggests that utilizing cold plasma (CP) technology as a pretreatment can boost drying efficiency, reduce energy consumption, and enhance the quality of dried foods. In current work, the feasibility of cold plasma as a non-thermal pretreatment technology for chillidrying is explored. This study investigates the impact of cold plasma pretreatment (30s and 60s) on the drying kinetics and quality attributes of chilli. Cold plasma, a non-thermal technology, was applied to chilli samples before drying, aiming to enhance the drying rate and preserve key quality parameters such as color, texture, and nutritional content. The results demonstrated that cold plasma pretreatment significantly accelerated the drying process, reducing the overall drying

time while maintaining or even improving the quality of the dried chili by etching the surface. Notably, the treatment led to better retention of color and nutritional components compared to untreated samples. Antioxidant activity was enhanced as the time of pre-treatment increased. These findings suggest that cold plasma pretreatment is a promising technique for optimizing the drying process of chilli, offering potential benefits for the food processing industry.

Keywords: *chilli, cold plasma, drying-kinetics, retention, anti-oxidants*

Effect of elevated CO₂ and soil arsenic on growth, yield attributing characteristics and nutrient quality of rice (*Oryza sativa* L.)

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Abstract

Rice is one of the most important food crops, which is consumed by about half of the world's population. It is observed that changing climatic conditions reduced the productivity of rice, where elevated level of carbon-dioxide (eCO₂) is one of the main culprits. The simulated pot experiment was conducted at FACE (Free Air Concentrations Enrichment) facility, CSIR-National Botanical Research Institute, Lucknow, India (26°51'28.553" N, 80°56'52.223" E) in consecutive years 2019 and 2020 (July to November), using popular high yielding rice cultivar *viz* Sarju-52, which is being cultivated in middle Gangetic plain. After transplantation, the potted rice were transferred to FACE facility and then exposed to elevated CO₂. The obtained results indicated that eCO₂, alone or in combination with lower dose (LAs; 200 µg l⁻¹) and higher dose (HAs; 1000 µg l⁻¹) of arsenic (As), differentially affected the vegetative and reproductive growth of rice. Elevated CO₂ enhanced the root length, root biomass, shoot biomass and total number of tillers. Higher As exposure along with eCO₂ also reduced the yield of rice. Arsenic exposure along with eCO₂ enhanced the accumulation of macro elements *i.e.*, Ca, Na and N, whereas S and P were significantly reduced in the rice grains. Among the micro elements, Mo was increased during single or combined exposures, while Mn and Ni were reduced in the rice grains. However, there were no significant changes in all other micro-elements. It was also noticed that eCO₂ increased the accumulation of As in rice grains. In conclusion, the increasing atmospheric CO₂ increases the level of As in the rice grains, which may be more detrimental for human being living in As prone areas or rely on rice based diet.

Keywords: *Arsenic, eCO₂, Nutrient quality, Rice, Yield.*

Raman Spectroscopic Technique: A non-invasive method for Rapid Detection of Pesticide Residues in Fruits and Vegetables

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Abstract

Ensuring food safety requires effective detection of pesticide residues in agri-horticultural produce. Conventional pesticide residue determination in agri-horticultural produce involves cost-intensive, destructive, multistep sample preparation, mass spectrometric/ionization techniques and/or supercritical fluid/solvent extraction. This study investigates the application of Raman spectroscopy, particularly Surface-Enhanced Raman Spectroscopy (SERS), as a rapid, non-destructive technique for pesticide detection. We focus on pesticides like Imidacloprid, Difenconazole, Cu-oxchloride, Carbendazim, Azoxystrobin, Mancozeb, and Indoxacarb in fruit and vegetables with the following objectives: a) to develop a standard operating procedure; b) to synthesize, screen, and optimize emerging cost-effective surface enhanced raman (SERS)-active substrates; c) to analyze and establish a spectral library/data of pesticide molecules. The selected seasonal (subtropical and temperate) horticultural products i.e fruits (apple, strawberry) and vegetables (bell pepper, tomato) were collected from the university farm areas, orchard, the local market, and farmer's field. The collected samples were processed and measured through SERS optimizing the procedures as described in the literature. This research shows Raman spectroscopy's potential as a quick, precise alternative for pesticide residue analysis.

Keywords: *Raman Spectroscopy, SERS, Pesticide Residues, Food Safety, Non-Destructive Testing*

Evaluation of machine learning models for daily reference evapotranspiration modeling using limited meteorological data in Haryana

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Abstract

Precise determination of reference evapotranspiration (ET_0) is of utmost importance in hydrological studies, irrigation scheduling, and the effective management of water resources. The scarcity of climatic data is the biggest challenge for developing countries and the development of models for ET_0 estimation with limited datasets is crucial. Therefore, the performance of three machine learning (ML) models was assessed to estimate accurate ET_0 based on minimal climate data. The data on daily climate parameters were collected from India Meteorological Department (IMD) for six districts of the Haryana state. The three ML models viz., Random Forest (RF), Artificial Neural Networks (ANN) and Long Short-Term Memory (LSTM), were evaluated and compared with the standard model FAO-56 Penman-

Monteith (PM). The performance of the developed models considering different input combinations was evaluated by using several statistical performance measures. The results showed that the LSTM model performed better than the other ML models during testing (Ambala ($R^2=0.993$); Hisar ($R^2=0.995$); Jind ($R^2=0.995$); Karnal ($R^2=0.995$); Mahendragarh ($R^2=0.996$) and Rohtak ($R^2=0.995$) under full dataset scenario. Further, it was also found that a combination of four input variables, a combination of three input variables and a combination of two input variables also showed promising results in estimating ET_0 using LSTM. The results of the current study are substantial as it offers to estimate ET_0 in data-scarce areas to improve sustainable water resource management in semi-arid regions.

Keywords: *reference evapotranspiration; machine learning models, sustainable water management*

***In vitro* approaches for medium-term conservation of *Rauvolfia serpentina* (L.) Benth. ex Kurz, a valuable medicinal plant**

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Abstract

Rauvolfia serpentina (L.) Benth. ex Kurz is a highly useful medicinal plant known for its remarkable anti-hypersensitive and tranquilizing properties. The species exploited for its immense medicinal uses has been prone to decline in its population and thus needs to be conserved. Biotechnological tools in the form of *in vitro* plant cell and tissue cultures are a proven method to conserve plant germplasm *ex situ*. *In vitro* propagation of *R. serpentina* was carried out using axillary nodes as explants and MS medium supplemented with 2.0 mg L⁻¹ BAP was most suitable for shoot initiation. Shoot elongation and multiplication was highest in MS medium supplemented with 0.75mg L⁻¹ BAP and 0.2 mg L⁻¹ NAA while root initiation was optimum in half strength MS medium containing 1.0 mg L⁻¹ IBA and 1.0 mg L⁻¹ IAA. The regenerated shoots were conserved through induction of slow growth via various medium modifications including different concentration of sucrose (10-30 g L⁻¹), sorbitol, mannitol (5-10 g L⁻¹), Chlormequat Chloride or CCC (0.75 mg L⁻¹ - 20 mg L⁻¹) and Mineral oil. After 120 days of *in vitro* conservation shoot length, shoot number, number of leaves and survival percentage were measured. Mineral oil, 10 g L⁻¹ sucrose and 20 mg L⁻¹ CCC were the best treatments to induce slow growth in shoot cultures of *R. serpentina*. *In vitro* shoots could be best stored for more than 6 months in mineral oil without subculture and were successfully regrown with 70% survival in normal medium. Conservation through medium-term storage can therefore be considered as a feasible way to ensure propagation and survival of particular species.

Keywords: *Rauvolfia serpentina, In vitro propagation, Slow growth, Conservation, Mineral oil, Storage*

Biodiversity of custard apple (*Annona squamosa* L.) from niche areas of Rajasthan

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Abstract

Custard apple (*Annona squamosa* L.) is one of the wild perishable crop of forest areas. Rajasthan is one of the top custard apple growing states in our country. Custard apple also known as Sugar apple, Sarifa. Family of annonaceae having chromosome number $2n = 14$. The fruit tree belongs to tropical climate and is native of tropical America and surrounding regions. In Rajasthan state not commercial cultivation exists at farmer's field for custard apple but found in wild sanctuary and forest areas of districts with limited fruit production on wastelands. The varietal or genetic differences get masked by confusing varietal identification in custard apple. In this regard's knowledge of the genetic variability of different genotypes are important to form a basis for conservation, genetic improvement and promotion of domestication of the population with desirable trait. Custard apple is mainly found in southern districts mainly in Rajsamand, Udaipur, Chittorgarh, Dungarpur, Banswara, Baran and Jhalawar of Rajasthan. The genetic variability and morphological and biochemical variation present of *Annona* genotypes in different niche areas of Rajasthan. Custard apple flowering comes in month of July (During rainy season) and fruit available in month of end October special area of *Aravalli* hills of Rajasthan, Fruits are very delicious, sweet nature with soft white pulp nature. Rajasthan state of India is blessed with natural biodiversity of the crop and its wild landraces are found distributed all along as a deciduous natural stand. Custard apple being very hardy, survives well under drought, salinity and marginal soil conditions. It was also observed that interventions involving improved cultivation practices and reduction in post-harvest losses would increase the production level by 50 per cent and 20 per cent, respectively, whereas value addition activities through processing would give better returns to the processors as well as to the tribal harvester.

Keyword: *Custard Apple Biodiversity, Rajasthan*

Gastro-intestinal parasitism in canines of Meerut, Uttar Pradesh

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Abstract

Dogs are the companion animal and share a close bonding with humans. Pets are treated as family members and they provide many benefits to human being. Gastro-intestinal (G-I) parasites hold a significant importance as far as health of animal is concerned. GI parasites of canine pose serious threats amongst the pure breed of dogs, as they are more susceptible compared to the non-descript breeds. The study was conducted for a period of 1 year from July' 23 to June' 24. Examination of faecal

samples from canines referred to the Department of Veterinary Parasitology, revealed 39% overall infection. The majority of parasitic eggs belong to *Dipylidium caninum*, *Diphylobothrium latum*, ascarids, *Ancylostoma caninum*, *Spirocerca lupi*, oocysts of *Cryptosporidium* and cyst of *Giardia*. This emphasizes the importance of adequate surveillance and research study to have a clear picture of disease burden and therefore, to define appropriate control programme at a local level.

Keywords: Dog, Canine, Gastro-intestinal, Parasites

Effect of different salt treatments on physiological characteristics and protein profiling of *Dalbergia sissoo*

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Abstract

Dalbergia sissoo Roxb. ex DC., commonly known as Indian rosewood, is a prominent leguminous tree species native to the Indian subcontinent and Southeast Asia and is prized for its durable and robust wood. The present study investigates the physiological, biochemical, and proteomic responses of *Dalbergia sissoo* under varying levels of salt stress. Shoot cuttings of genotype FRI-DS 66 were propagated and exposed to different salt concentrations. Through a controlled hydroponic experiment, *D. sissoo* was subjected to seven distinct salt treatments, ranging from mild (50 mM NaCl) to severe (400 mM NaCl) salinity, alongside a control group. The research revealed a gradient of stress responses, with mild salinity (50 mM NaCl) causing minimal effects, while higher concentrations led to significant physiological and biochemical alterations. Severe salinity (300-400 mM NaCl) resulted in drastic reductions in growth parameters, chlorophyll content, and photosynthetic activity, alongside extensive leaf damage. Biochemical analyses showed that salt stress significantly altered sugar metabolism, chlorophyll content, phenol, and proline levels, and modulated the activity of antioxidant enzymes such as catalase, peroxidase, and superoxide dismutase. SDS-PAGE protein profiling indicated changes in protein expression, particularly the upregulation of proteins in the 25-35 kDa range, suggesting their involvement in stress adaptation mechanisms. These findings provide critical insights into the adaptive strategies of *D. sissoo* to salinity stress, contributing to the development of sustainable cultivation and conservation practices for this species in salt-affected environments.

Keywords: *Dalbergia sissoo*, Salt stress, Biochemical analysis, antioxidant enzyme activity, protein profiling, SDS-PAGE.

The KALIA Scheme in Odisha: An Economic Assessment

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Abstract

Agriculture in India is characterized by low productivity despite the introduction of green revolution, a significant amount of potential in the sector remains unutilized. Government in order to support this sector and farmers often comes up with the loan waivers to release the pressure off the farmers, but this type of practice is just adding on to the burden of the government and not bringing any significant change. Hence to improve the current situation of the farmers as well as that of the agricultural productivity, the government recently initiated various schemes to provide financial assistance to the farmer in a much better way. One of such schemes is KALIA (Krushak Assistance for Livelihood and Income Augmentation) scheme which was started in 2018. Under this scheme Govt. of Odisha provides a financial support of ¹ 4000 per year to small and marginal farmers and ¹ 12,500 per beneficiary to landless agricultural labourers.

Since the scheme is in sixth year of its implementation, it is timely to evaluate the effectiveness of the scheme in reducing the financial burden on the farmers and to evaluate the economic impact of the scheme in terms of change in productivity and income. The study utilized the secondary data on the number of beneficiaries, amount disbursed, cost of cultivation for the years 2017-18 and 2021-22 collected from different government publications. In order to assess the impact of KALIA on income and productivity of major crops, a comparative analysis of before and after implementation of KALIA was undertaken utilizing Cobb-Douglas production function approach. The KALIA Scheme has provided a financial support of ¹ 1799.7 crores during 2021-22 benefiting a total of 6.34 million individuals, comprising of 4.50 million small and marginal farmers and 1.84 million landless laborers as on 31st July 2024. The district-wise financial support analysis revealed that the maximum support was received by Mayurbhanj (7.6 %) followed by Balasore (6.7%), Keonjhar (5.1 %), Bolangir (5.4%) and Ganjam (5.4%) district. It is evident from the study that the KALIA scheme has contributed to a significant increase in the agricultural productivity in each of the major crop that is being cultivated in Odisha. There has been 13.27 percent increase in paddy productivity while the maize productivity has increased by 76 percent in quantity terms (Qtls/ha.) and similar trends has been observed for other major crops resulting in improved financial stability of small and marginal farmers. However, expanding the coverage through awareness creation and simplifying the application process would ensure that aid effectively reaches those in need. Further increasing the financial support in line with inflation and rising cost of cultivation, timely disbursal, regular monitoring and evaluation could further boost the scheme's impact.

Keywords: KALIA scheme, conomic Evaluation, government support, income support to

Demonstration of stunted fish fingerlings of Indian major carps in short seasonal fish ponds

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Abstract

Seasonal ponds, ditches and road-side canals that are formed from the excavation for house or road construction, and ponds dug for household uses or irrigation or temples and other farms can be used for aquaculture of short-cycle species such as the carp varieties, catfishes and Tilapia. Even 200 to 1000 m² ditches as shallow as 70 to 80 cm or up to 150 cm can be used for culture of these species. Among total fish production, Inland fisheries sector contributes 78% share, among them carps alone contributing over 85%. The total water spread of this district possessed, while 59.18% are consisting short seasonal water bodies. Hence, it is imperative to increase the inland fish production in short seasonal fish ponds particularly with Indian Major Carps fishes both horizontally and vertically. In the present study, Indian Major Carps were 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 Indian Major Carps and the remaining 10 fish ponds with Polyculture of carps and Tilapia were used as farmers' practice (control). The higher fish growth (0.47 kg), survival (88.60 %) and production (4164 kg/Ha) was significantly ($p < 0.05$) showed in the fish production of Indian Major Carps when compare with farmers' practice of fish growth (0.36 kg), survival (74.38 %) and production (2678 kg/Ha). Therefore, the Indian Major Carps based fish farming may be a suitable intervention for short seasonal fish culture about higher fish production in a pond based system.

Keywords: *Short seasonal, stunted fish fingerlings, Indian Major Carps, fish pond, culture*

Spatial Mapping and Nutrient Contribution of *Alnus nepalensis* in Lesser Himalayan Forests

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Abstract

Alnus nepalensis (AN), commonly called Utis is mostly found along waterbodies in the Himalayas. It is an early successional species which enhances ecosystem carbon, making it a significant species for ecological restoration and soil stabilisation efforts. This research aims to map AN and analyse its foliar carbon and nitrogen content. Ground truth data and leaf samples were collected from areas around Dudhatoli of the lesser Himalayas, an area dominated by *Pinus roxburghii* (PR) and *Quercus leucotricophora* (QL) species. A semi-hypertemporal (SH) approach was adopted to map the species,

where 16 Sentinel 2 images of 2022 were selected. MSAVI2 was used to reduce the dimensionality of the database and create a SH-MSAVI2 database with 16 images. AN was then mapped using ground truth data with fuzzy modified possibilistic c-means with individual sample as mean (ISM) training approach. The F1 value obtained for accuracy assessment was 0.9 indicating a good classification output. It was observed that in the study area dominated by PR and QL, about 637.56 ha is covered by AN. In addition to spatial mapping, foliar nutrient analysis was conducted to assess the contribution of AN to the nutrient dynamics of the area. Five plots of 30m*30m were laid out and leaf samples of AN were collected from five representative trees in three replicates. The collected samples were subjected to Carbon and Nitrogen analysis using a CHNS Analyser. The results showed that the average weight of Nitrogen and Carbon was around 0.21 and 3.32mg, respectively with C: N ratio of approximately 16:1. This study highlights the ecological importance of AN in the Himalayan region, offering valuable insights into its distribution and contribution to nutrient dynamics. The study can be extended to other species to explore their spatial distribution and nutrient contribution. **Keywords:** *Alnus nepalensis*, Fuzzy, modified possibilistic c-means (MPCM), foliar nutrient analysis, carbon, nitrogen

Development of Products Using Foxtail Millet to Combat Malnutrition and Diabetes Mellitus

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Abstract

Foxtail millet (*Setaria italica* L.) is highly nutritious, easily digestible and non-allergic grain with significant health-benefits. The present study was planned to develop the products using foxtail millet (with 100% replacement of cereals) as a healthier dietary options for the population. It was observed that all the developed products (papad, rusk, kheer, sattu, pinni, cookies, vegetable dalia, millet bar) were organoleptically evaluated using a nine-point hedonic rating scale, and overall acceptability scores varied from 7.80 to 8.46. The products like Rusk, Sattu, and Papad were found to have higher overall acceptability scores than their control counterparts. It was found that the protein content of millet-based products ranged between 11 and 16 g/100 g, with the highest value of kheer. The content of fat was highest in pinni and lowest in sattu; total ash content was highest in vegetable dalia and lowest in papad; and cookies had the highest content of carbohydrates, and kheer had the lowest. There was a significant ($p < 0.05$) difference between protein, crude fat, crude fibre, and soluble, insoluble, and total dietary fibre of foxtail millet than their control ones. The highest fibre content found in sattu (3.90 g/100 g) might be due to the roasting of grains. During roasting, there is partial degradation of cellulose and hemicellulose that decreases the insoluble dietary fibre content. The developed millet-based products had a higher total dietary fibre content. The highest amount of all fractions of dietary fibre was found in sattu (13.5 g/100 g), followed by bar (12.83 g/100 g). Further, foxtail millet-based products such as bar (46), sattu (49), cookies (53), kheer (53) and papad (55) were considered low-predicted glycemic index products. It is concluded that foxtail millet helps to improve the children's health and eradication of malnourishment, as well as improved glycemic control, especially in patients with type 2 diabetes.

Keywords: *dietary fibre, glycemic index, malnutrition, millet products, protein.*

Diversity of aquatic and semi aquatic plants of Bisalpur wetland, Tonk, Rajasthan

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Abstract

Wetlands are rich in biodiversity and these are very productive and ecologically adaptive ecosystems. Bisalpur wetland covers large area and it is an ecosystem contains biodiversity of planktons, different flora and fauna. Freshwater ecosystems account for 0.01% of the earth's surface water but 10% of species, according to the UN Environment Programme. The present study and research is to investigate the temperature and growth duration of many thallophytes, Pteridophytes and Angiospermic aquatic plants which belongs to different families during the year. The major thallophytes observed were *Spirogyra* and *Chara*, Pteridophytes *Marsilea* and *Azolla* and angiospermic families were Cypraceae, Nymphaeaceae, Trapaceae, Typhaceae, Nelumbonaceae, Lamnaceae, Hydrocharitaceae etc. These families different species has dense growth in different duration throughout year.

Keywords: Bisalpur, Wetland, Aquatic, Biodiversity, Flora, Families

Synchrotron imaging of magnetoprimered roots and leaves of soybean plant grown in arsenic contaminated soil

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Abstract

The present study evaluated the effects of static magnetic field (200 mT for 1h) on root and leaf architecture of soybean plants subjected to arsenic (As) stress using synchrotron source-based micro-computed technique. Magnetoprimered and unprimered seeds were germinated in a soil-sand mixture containing different levels of arsenate-polluted soil (As; 0, 5, 10 and 50 mg kg⁻¹). The synchrotron source based micro-computed tomography technique for 3D imaging of roots revealed that arsenic adversely affects the root growth in unprimered plants by reducing root hair, size and number of root nodules, where the damaging effect of arsenic was observed maximum at higher concentrations (10 and 50 mg As Kg⁻¹ soil). On the other hand, magnetoprimered plants exhibited notable enhancements in root morphology, including increased root growth, biomass, root hair formation, lateral root branching, and larger root nodules. Additionally, while arsenic toxicity damaged the root's epidermal and cortical layers, magnetoprimered plants showed higher pore diameters in cortical cells compared to unprimered plants under all arsenic concentrations.

The results of synchrotron images of leaves showed that arsenic stress adversely affected leaf growth in unprimered plants, reducing their length, area, and midrib width at higher arsenic concentrations (50 mg/kg soil). However, magnetoprimered plants showed significant improvements in leaf morphology, with

enhancing leaf length, area (40%), and midrib width (17%) which contributed to increased water uptake, higher primary photochemistry of PSII (12%), performance index (50%), stomatal conductance (57%), and photosynthetic rate (33%) compared to unprimed plants even at the highest arsenic concentration (50 mg/kg soil). Thus, the study suggested that magnetopriming has the potential to attenuate the toxic effect of As and could be employed as a pre-sowing treatment to reduce the phytotoxic effects of metal ions in plants by improving root and leaf architecture and tolerance index towards arsenic.

Keywords: *Arsenic toxicity, leaf growth, magnetopriming, midrib thickness, photosynthesis, root growth.*

Toxicopathological assessment of organophosphate poisoning in wild birds: A case study highlighting health hazard

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Abstract

In rural and agricultural areas, organophosphate poisoning is a common problem for birds. The study analyzed nine birds from Kohali village submitted to the Veterinary Pathology Department at LUVAS, Hisar, after a sudden death. The birds included one peacock, three doves, and five black francolin. The investigation aimed to detail the gross pathology, histopathological changes and toxicological findings associated with organophosphate poisoning. On necropsy, the visceral organ especially crop, liver, lungs, kidney and spleen revealed congestion. Histopathological analysis of liver showed marked congestion of central vein and portal vein along with focal area of centrilobular necrosis of hepatocytes. Lung revealed congestion and hemorrhages with marked hemosiderosis in parabronchial areas. Crop showed congestion of blood vessels in lamina propria. Intestine presented with necrotic foci having mild infiltration of mono nuclear cells. Kidney showed diffuse haemorrhages, focal areas showing mild MNCs infiltration and degeneration of tubules. Toxicological analysis of feed content from crop and gizzard revealed Monocrotophos poisoning 38.208 mg/kg, 68.490 mg/kg and 268.672 mg/kg in case of peacock, dove and black francolin respectively. The gross pathology, histopathological changes and toxicological findings were also indicative of monocrotophos poisoning. Monocrotophos is one of the pesticides that is most harmful to birds; its acute LD₅₀ varies from 0.9 to 6.7 mg/kg. In order to prevent excessive environmental pollution and health hazards, farmers should encourage for properly disposing of excess pesticide treated seeds and applying pesticides in accordance with recommended dosages.

Noninvasive method for hormonal delivery, stress marker and routine observation of gonadal maturation for successful captive breeding in *Clarias magur*

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Abstract

Clarias magur was one of the commercially important species in India where the seed production is highly negligible as the female held in the captive conditions experienced reproductive hindrance which led to reduced fecundity, due to lack of progression in the previtellogenesis. The weekly administration of exogenous hormone assisted with or without artificial rain simulation induced the progression in the previtellogenesis stage of the treated females (n=28). It allowed the females to achieve final oocyte maturation. The non-invasive method, lavage method was adopted for hormone delivery at weekly basis. The stress marker like SOD, CAT, Glucose, Total Protein, Globulin and Albumin were analysed from serum. The success rate of fish achieving maturation and final oocyte maturation was observed through the Ultrasonography method and Ovarian Biopsy respectively. The primary dose of 0.6ug 100g⁻¹ and resolving dose of 0.4ug 100g⁻¹ exogenous hormone with artificial rain resulted in vitellogenesis and final oocyte maturation. The treatment containing exogenous hormone with shower resulted in 93% of final oocyte maturation whereas the females treated with only Hormone showed 86%. The present finding elucidated that using Noninvasive method for analysis of breeding parameter (oocyte diameter, GSI, HIS etc) and stress marker helps in health status of the fish without sacrificing the fish

Key Words: *Exogenous Hormone, Ultrasonography, Biopsy, Clarias magur, Lavage method*

Ganoderma: A medicinal mushroom

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Abstract

Mushrooms which are edible and sources of various medicines are called medicinal mushroom. These mushrooms are macroscopic fleshy fungi, used in the form of extracts or dried powder for prevention, alleviation, or healing of multiple diseases/disorders, and/or in balancing a healthy diet. Medicinal mushrooms are natural sources of bioactive compounds showing the properties of antitumor, antiviral, antioxidant, antimicrobial, anti-inflammatory, hypolipidemic, antineoplastic hypocholesterolemic, and immunosuppressive actions. These bioactive compounds belong to the broad category of polysaccharides, complexes of polysaccharide-protein and polysaccharide peptide, ribonucleases, proteases, and lectins etc. Large numbers of mushrooms are known to have medicinal properties, as there are approximately 3000 varieties of mushrooms reported to be edible, including more than 700 with bioactive substances having pharmaceutical activities, but to name a few of them, the most valuable are *Ganoderma lucidum*, *Lentinus edodes*, *Trametes versicolor*, *Flammulina velutipes*, *Pleurotus ostreatus*, *Cordyceps sinensis*, *Agaricus bisporus*, *Coprinus comatus*, *Auricularia auricula*, *Pleurotus pulmonarius*, *Agaricus brasiliensis*, *Grifola frondosa* and *Hericium erinaceus*. Among the medicinal mushrooms, *Ganoderma* species, particularly *G. lucidum*, also known as “*Reishi*” mushroom and “*Lingzhi*” in China, India and

Japan, has been considered as the most widely studied and highly praised medicinal mushroom of all times. However, this mushroom is not consumed as a conventional mushroom in delicious food after cooking as it is bitter in taste, hard in texture and therefore is taken in the form of extracts or dried powder. A number of preclinical experiments have established its medicinal and therapeutic properties beyond any doubt in traditional Chinese medicines. These fungi can be either annuals or perennials and are fairly large, with a generally tough bracket like pileus or cap and a rudimentary stipe or stalk, whereas some species are sessile. The pileus can be of different coloured often with a light-colored border, though coloration patterns within species can vary depending on age and environmental conditions and some species have a shiny varnished appearance. *Ganoderma* species are commonly found in tropical/subtropical regions, with more than 80 species worldwide. The fungus grows as saprotrophs on dead wood or as parasites on the live wood of hardwood trees, conifers, and palms and causes diseases so are economically significant plant pathogens. *Ganoderma* employ a number of enzymes to degrade lignin and cellulose in their hosts, thus breaking down the wood and causing a bleached appearance. While this process is ecologically important as a means of decomposition. Some species are responsible for serious infections of cacao, rubber, tea, and coffee plants, and *G. zonatum* has caused major crop losses in the Asian oil palm industry.

The potential beneficial effects of alkaline water on harmful aquatic insects.

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Abstract

The potential benefits of alkaline water on harmful aquatic insects have garnered interest due to the growing emphasis on sustainable environmental management. Alkaline water, characterized by a higher pH level, may influence the physiology and behavior of various aquatic organisms, including harmful insect species such as mosquitoes and blackflies. These insects are known vectors of diseases and can pose significant ecological and public health risks. The current study explores the impact of alkaline water on the survival, development, and reproductive capabilities of these insects. The pH can affect the metabolic processes of aquatic insects, potentially leading to reduced viability and altered life cycle patterns. By increasing the pH of aquatic environments, alkaline water might disrupt the homeostasis of harmful insect populations, thereby decreasing their prevalence. This disruption could result from interference with osmoregulation, reduced availability of essential nutrients, or direct toxicity due to the altered ionic balance in the water. The study employs controlled laboratory experiments to assess the survival rates, larval development, and reproductive success of selected insect species in varying pH conditions. However, the broader ecological implications of altering pH levels in natural water bodies must be carefully considered to avoid unintended consequences on non-target species and ecosystem stability. It effectively reduce harmful insect populations without negatively impacting other

aquatic organisms. This study contributes to the understanding of how alkaline water can be utilized as a potential tool for integrated pest management in aquatic ecosystems.

Keywords: *Water, Alkaline, Insects, Environment, pH*

Bioavailability in Tomato (*Solanum lycopersicum* L.) Rhizospheres: Isolation, Characterization, and Efficacy of Siderophore-Producing Rhizobacteria.

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.Abstract

Siderophore-producing rhizobacteria are critical in enhancing plant growth by facilitating iron acquisition in iron-limited soils. This study focuses on isolating and characterizing rhizobacteria capable of producing siderophores from the rhizosphere of *Solanum lycopersicum*. Soil samples were collected from agricultural fields and subjected to serial dilution and plating on selective media to isolate rhizobacteria. The isolates were then screened for siderophore production using the Chrome Azurol S (CAS) assay, a widely recognized method for detecting siderophores. Positive isolates were further characterized morphologically, biochemically, and molecularly to identify their taxonomic position. The ability of these bacteria to promote plant growth was evaluated through in vitro assays. The results demonstrated that several isolated strains produced significant amounts of siderophores and exhibited promising traits for use as biofertilizers. These findings suggest that siderophore-producing rhizobacteria have the potential to be developed into sustainable agricultural inputs, enhancing crop productivity while reducing the dependency on chemical fertilizers.

Keywords: *Siderophore; biofertilizer; taxonomic position; Vegetable crop; PGPR*

Challenges, strategies and sustainable approaches in managing insect pests in Muga Silkworm

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Abstract

Muga silkworm (*Antheraea assamensis* Helfer), known for its natural production of coveted golden silk, is endemic to Assam and neighboring regions in North-Eastern India. However, outdoor rearing of

Muga silkworms exposes them to environmental fluctuations throughout the year, leading to substantial crop losses due to insect pests. Notably, the losses are disproportionately high in pre-seed (Aherua and Jarua) and seed crops (Chotua and Bhodia) compared to commercial crops (Jethua and Kotia). This study presents a comprehensive examination of the insect pests affecting Muga silkworm rearing, categorizing them based on their activity periods and intensity of attack. Economic losses are particularly severe in the pre-seed and seed crops. The primary insect pests of Muga silkworms include *Exoristasorbillans* (uzi fly), *Apantelesglomeratus* (brachonid fly), *Vespa orientalis* (wasp) and ants. Uzi fly inflicts damage during the winter season (November to February), primarily affecting 4th and 5th instar Muga larvae and causes about 20-30% crop loss, which is reported during cocoon harvest in March-April. This jeopardizes seed production and availability for the subsequent Jethua (April-May) commercial crop. *A. glomeratus* and ants pose threats during the summer season. *V. orientalis* (wasp) causes 20% damage to late instars larva from April to September. Chemical control methods are strongly discouraged in Muga silkworm rearing due to their harmful impact on the silkworms. Consequently, this study underscores the pressing need for research into environmentally sustainable pest management strategies that are specifically tailored to the unique requirements and limitations of Muga rearers. The study meticulously details the pests identified in the context and delineates cultural, biological, and integrated pest management strategies for each pest. The study seeks to combine and harmonize various strategies to ensure the comprehensive and sustainable management of pests in Muga silkworm rearing.

Keywords: *Muga silkworm, integrated pest management, biological control, economic loss.*

Effect of different combinations of herbicides and aqua based formulations on weeds in sugarcane

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A field experiment was conducted during 2016-17 and 2017-18 at Agricultural Research Farm of Institute of Agricultural Sciences, BHU, Varanasi. The experiment was laid out in Split Block Design with five treatments in main plot and five treatments in sub plot. In main plots, there were five herbicide combinations viz., atrazine 2 kg/ha followed by (*fb*) halosulfuron methyl 150 g/ha, metribuzin 2 kg/ha *fb* halosulfuron methyl 150 g/ha, triazinone 1 kg/ha *fb* halosulfuron methyl 150 g/ha, weed free and weedy checks. In sub-plots, five aqua based formulations/ allelopathic extracts were there viz., cow urine (500 L/ha), Parthenium extract (15%), sunflower + sorghum + maize extract (15%), eucalyptus extract (15%) and water (600 L/ha). Soil of the experimental field was sandy clay loam in texture and neutral in reaction with low in nitrogen and medium in available phosphorus and potassium. The lowest weed density, weed biomass, weed index (WI), NPK uptake by weeds and highest weed control efficiency (WCE) were recorded with pre-emergence application (PE) of atrazine 2 kg/ha at 3 days after planting (DAP) followed by (*fb*) halosulfuron- methyl 150 g/ha at 45 DAP in combination with sorghum + sunflower + maize extract, while need based hand weeding recorded higher cane yield among all the tested treatments.

Keywords: *Atrazine, Aqua based extract, Herbicide combination, Halosulfuron-methyl, Sugarcane, Weed Management.*

Enhancement of Bioactive Compounds in Functional Foods through Food Processing and Engineering

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Abstract

Bioactive compounds in functional foods plays a significant role in enhancing health by modulating metabolic processes. These compounds, such as polyphenols, flavonoids and carotenoids, are widely present in plant-based foods and exhibit antioxidant, anti-inflammatory and immune-modulating properties. Through food processing techniques like fermentation, hydrolysis and enzymatic reactions, the bioavailability of these compounds can be enhanced. Advances in food engineering have facilitated the incorporation of these bioactive ingredients into nutraceuticals, contributing to the development of functional foods with targeted therapeutic effects. Animal-derived bioactive peptides, produced through enzymatic hydrolysis during processing, have been shown to reduce hypertension and modulate immune responses. These bioactive molecules, present in foods like fermented milk, fish and cereals, are crucial in preventing chronic diseases such as cardiovascular conditions, cancer and metabolic disorders. Optimising food processing methods, such as controlled fermentation and encapsulation, is critical in preserving the stability and efficacy of these compounds during storage and digestion. Further research is required to establish standardised processing techniques to maximize the therapeutic potential of bioactive compounds, ensuring their efficacy in functional foods and dietary supplements. The integration of these components into food engineering practices offers promising advancements in developing health-promoting products.

Keywords: *Bioactive compounds, bioavailability, functional foods, nutraceuticals.*

Metabolomics: An emerging tool for the study of plant-pathogen interaction

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Abstract

Plants produce a vast array of metabolites, (more than animals and micro-organisms) that is why metabolomics is receiving attention in the plant research. Revealing the infection mechanisms of the plant pathogens, metabolomics can help us to develop novel strategies to control the diseases and also provide targets for the development of new fungicides. Metabolomics is a novel discipline encompassing comprehensive metabolite evaluation, pattern recognition & statistical analyses but has lagged behind other ‘omic’ sciences due to technical limitations and database challenges. Among various omics approaches, metabolomics is of particular importance, because the metabolites are more relevant to the plant phenotype (both physiological and pathological phenotypes) as compared with DNAs, RNAs or proteins. Combined with other omic methods and techniques, metabolomics can also help to screen for resistant varieties and assisted crop breeding. Integration is important so that the entire spectrum of the malignant phenotype can be characterized. However, linking the “omics” sciences has been difficult since not all expressed genes are converted to mRNAs, and not all expressed mRNAs are converted to proteins. Also, there are isoenzymes which can produce different metabolites.

Growing pattern of leafy vegetables (Coriander, Spinach and Fenugreek) under Hydroponic Conditions

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Abstract

The experiment on growing of leafy vegetables (Coriander, Spinach and Fenugreek) hydroponic conditions for increasing production per unit area economically. The experiment was conducted at Centre for Hydroponic Technology, University of Agricultural Sciences, Raichur. Hydroponics is the innovative scientific technology of growing of plants in water or nutrient solution. In this experiment the automated hydroponic unit was used to grow leafy vegetables. The physical parameters of automated hydroponic unit were set initially. The parameters set were relative humidity (65±5%), temperature (25±1°C), recycled water (1.5±0.5 liters per tray) by fog system and artificial light (12±1 hr/day). The experiment was laid out in completely randomized design with five independent treatments, T₁ (1% NPK- 19:19:19), T₂ (1% NPK- 19:19:19 + 1% Calcium Nitrate + 1% Magnesium Sulfate), T₃ (1% NPK – 19:19:19 + 0.5% Calcium Nitrate + 0.5% Magnesium Sulfate), T₄ (1% NPK- 19:19:19 + 0.2% Calcium

Nitrate + 0.2% Magnesium Sulfate) and T₅ (Tap water) each treatment were replicated three times. The major observations were taken on 10, 20 and 30 DAS (days after sprouting) the seeds. The treatment T₃ (1% NPK – 19:19:19 + 0.5% Calcium Nitrate + 0.5% Magnesium Sulfate) reported superior as compared to other treatments. The results showed at 30 DAS, were, number of days to seedling emergence of coriander, spinach and fenugreek (10.23, 8.75 and 8.12), number of leaves per plant (4.23, 4.53 and 4.85), root length (5.95cm, 5.80cm and 5.74cm), shoot length (4.34cm, 4.38cm and 4.30cm), seedling fresh weight (0.44, 0.46 and 0.48 g/ 10 seedling), seedling dry weight (0.26, 0.28 and 0.28 g/10 seedling) and chlorophyll content (SPAD value) (26.24, 28.10 and 27.28), respectively.

Keywords: *Hydroponic, leafy vegetables, growth pattern of leafy vegetables, nutrient solution and tap water.*

Influence of rain water harvesting techniques on yield, root development and profitability of pearl millet (*Pennisetum glaucum* L.) under rainfed condition

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Abstract

A field experiment was conducted at Kanpur, Uttar Pradesh during two *Kharif* seasons to assess the relative productivity and profitability of pearl millet (*Pennisetum glaucum* L.) as influenced by different low cost water harvesting techniques. The soil of the experimental field was sandy loam in texture with average fertility. Water harvesting techniques tested in the experiment were compartmental bunding, deep ploughing, raised and sunken bed, inter row water harvesting, inter-paired row water harvesting, scooping and flat sowing as control. The result revealed that different rain water harvesting techniques showed significant response over control in respect to yield, root development and monetary return. Among different water harvesting techniques, inter-paired row water harvesting (IPRWH) produced highest seed yield of 20.50 and 21.90q ha⁻¹ fetching Rs. 17512 and 20557 ha⁻¹ which exhibited maximum B:C ratio of 1.04 and 1.22 during the two different years.

Keywords : *Rain water harvesting, Rainfed, Root development, IPRWH, Economic efficiency*

Green synthesis of Silver and Zinc Oxide nanoparticles from root extracts of *Psidium guajava* and leaves of *Rosa indica* and their antibacterial and antidiabetic activity

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Abstracts

The present study is focused on the extraction of ZnO and Ag NPs from medicinal plant to evaluate their antibacterial and antidiabetic activity in the Vitro and Vivo case respectively. We synthesized ZnO and AgNPs from medicinal plant and their characterization are carried out using SEM, DLS, XRD, UV-Vis spectroscopy. The antidiabetic activity was measured in (STZ) streptozotocin-induced mice. Mice were treated with silver nanoparticles (10mg/kg) for 21 days. The synthesized Ag NPs as potential anti-bacterial agents have been studied on *Bacillus subtilis* (MTCC 121) and *Pseudomonas aeruginosa* (MTCC 1688). A significant reduction in blood sugar levels was noted in mice treated with ZnO and Ag NPs NPs and such NPs have the potential to prevent the growth of bacteria. Ag NPs deliver efficient antidiabetic activity in diabetic mice. Therefore, we speculated ZnO and Ag NPs would be a suitable candidate to form antidiabetic medicines.

Keywords- *ZnO, Ag NPs, Medicinal plant, antibacterial and antidiabetic activity*

Prevalence of Mastitis in Barbari, Jamunapari, and Jakhrana Goat Breeds

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Abstract

Mastitis poses serious economic challenges to the goat farmers, and the financial losses stem from decreased milk production, disposal of substandard milk, early culling of animals, veterinary expenses, reduced exports of milk and dairy products, and additional management costs. The mastitis impacts both the quantity and quality of milk, leading to various physical, chemical, microbiological, and pathological changes in the udder and milk. The current study was conducted to assess the prevalence of clinical mastitis in Jamunapari, Barbari, and Jakhrana goats from 2010-2011 to 2023-2024, investigating its association with season and parity. Additionally, we investigated the incidence of subclinical mastitis in these breeds. During the study period, the prevalence of clinical mastitis was recorded as follows: 3.96% (37/934) in Barbari goats, 4.25% (141/3316) in Jamunapari goats, and 1.64% (46/2809) in Jakhrana goats. Overall, the combined prevalence across all three breeds was 3.17% (224/7059). Clinical mastitis was the most prevalent in the winter season (58.48%; 131/224), followed by summer (25.00%; 56/224) and rainy seasons (16.52%; 37/224). Notably, the highest prevalence (63.84%; 143/224) occurred in milking goats with parities 1 and 2. Out of 238 milking goats from the Jamunapari, Barbari, and Jakhrana breeds, 8.4% tested positive for subclinical mastitis. In conclusion, the findings of this study underscore the significant prevalence of both clinical and subclinical mastitis in Jamunapari, Barbari, and Jakhrana goats, highlighting the urgent need for effective management strategies to mitigate the economic impacts on goat farmers and ensure the quality and quantity of milk production.

Utilization of nano-astaxanthin for enhancing sustainable crop yield of *Macrotyloma uniflorum* (Horse gram) in Uttarakhand.

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Abstract

The present study is focused on the synthesis of astaxanthin (ASTX) nanoparticles to evaluate their effect on the physio-chemical parameters of a crop named “*Macrotyloma uniflorum*” or “horse gram.” In Uttarakhand, Horse gram also referred to as “Gahat” or “Kulath”, is an important crop because of its high nutritional content, drought resistance, and the capacity to flourish in the difficult terrain of the area. Furthermore, ASTX has a strong anti-oxidant property that can benefit plants and protect them from oxidative stress caused by several environmental factors such as drought, salinity, high temperature, etc. We synthesized nano-astaxanthin and their characterization techniques are carried out using SEM, DLS, XRD, FTIR, EDX, EDS layered image, and UV-visible spectroscopy. For field application, the experiment was conducted in the glasshouse, and ASTX nanoparticles were applied to the *Macrotyloma uniflorum* in three different concentrations i.e. 10ppm, 20ppm, and 30ppm via soil application. The result showed increased morphological parameters including germination rate, plant height, shoot length, leaf length, number of leaves, root development, and leaf chlorophyll as well as increased antioxidant properties in the treatment group as compared to the control group. The different biochemical tests including protein estimation, chlorophyll A, chlorophyll B, total chlorophyll content, carotenoid content, and catalase tests were also performed by using a UV-visible spectrophotometer. Therefore, it showed an increase in biochemical as well as morphological parameters of *Macrotyloma uniflorum* in ASTX-treated crops as compared to the control group (soil+ vermicompost). The study concludes that careful management of physico-chemical parameters is essential for the sustainable crop production of *Macrotyloma uniflorum* (horsegram).

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

Intracellular gene delivery by a fish virus derived cell penetrating peptide

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Abstract

Cell penetrating peptides (CPPs) have emerged as multipurpose vectors for the intracellular delivery of bio-molecules, including DNA, RNA, PNA and proteins. Currently, the majority of CPPs utilized are derived from mammalian and avian viral proteins. In this study, we identified a novel peptide sequence with cell-penetrating capabilities sourced from the infectious pancreatic necrotic virus (IPNV). By combining this peptide sequence with a nucleolus localization signal (NLS) from betanodavirus, we constructed a chimeric CPP. The synthesis of the chimeric CPP was successfully achieved through Fmoc-chemistry and confirmed via mass spectrometry. We assessed the CPP's ability to interact with a

plasmid DNA vector (pDNA) containing the green fluorescent protein (GFP) gene using a gel retardation assay and transmission electron microscopy. The results indicated that the peptide could form complexes with the DNA, as evidenced by the observed retardation in the movement of the pDNA and formation of peptide-pDNA nanoparticles. Additionally, the peptide demonstrated the ability to release pDNA in a reducing environment, highlighting its potential for cargo release within cells. This capability was further validated by the successful delivery of the GFP gene into cell line, where it was expressed, resulting in the production of green fluorescence. These findings illustrate the intracellular gene delivery capacity of the chimeric peptide, with results comparable to those obtained using commercially available gene delivery or transfection reagent. This chimeric peptide holds promise for the development of a transfection reagent aimed at enhancing gene delivery efficiency in cells.

Keywords: *Cell penetrating peptide, Fish virus, Transfection, Gene delivery, Green fluorescent protein gene, Cell line*

Impact of fog on physiology & growth of Plant species

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Abstract

Fog is aerosolic atmospheric moisture which do impact vegetation and biogeochemical cycle. Foggy environment surrounds serenity of nature within woods and crops affecting plant physiology. Different aspects of fog influences human health mostly negatively whereas plants residing in fog grows with better health with few exception. Studying the effect of fog on trees, shrubs and grass species and their specific regions such as forest, shrublands and grasslands respectively proves deeper knowledge about the basic criteria of plant physiology. Besides with in-depth knowledge of physiological properties in respective aspects, there are factors which shows the distinguishable ways affecting plant growth. On one hand, plant growth depends on soil architecture in natural environmental condition which also includes foggy climate. Fog influences plant growth depending on quality of air carrying it providing moisture to the plants and leaf anatomy which are directly exposed to it. From affecting transpiration rate, photosynthesis to carbon assimilation, fogging provides better approach for agricultural practices due to its primitive and most valuable feature of foliar uptake. This study discusses the plants changes in metabolism, genetic expression as well as pattern of high yielding property. There is a scarcity of the studies on modulation in plant physiology and growth due to fog. Present study depicts how fog without pollutants proves to be better for phyllospheric microbial growth and plants physiology properties.

Keywords: *Fog, Plant physiology, Plant growth, Metabolism, Soil architecture. Yield*

Construction of RFLP, RAPD-based maps, and genome sequence of foxtail millet (*Setaria italica* L. Beauv)

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Abstract

Foxtail millet (*Setaria italica* L. Beauv) is a staple crop in arid and semi-arid regions, valued for its adaptability to drought and poor soils. Recent advancements in genomic studies, including the construction of Restriction Fragment Length Polymorphism (RFLP) and Random Amplified Polymorphic DNA (RAPD)-based genetic maps, along with the sequencing of its genome, have significantly contributed to understanding the genetic framework of this important cereal crop. RFLP-based maps provide a high-resolution tool for identifying specific genomic regions linked to important agronomic traits such as drought tolerance, disease resistance, and yield. These maps offer detailed chromosomal information that can be utilized in breeding programs for marker-assisted selection (MAS), allowing for targeted improvements in crop performance. Similarly, RAPD markers have proven to be effective in assessing genetic diversity and phylogenetic relationships within different foxtail millet cultivars and wild relatives, contributing to the preservation and utilization of biodiversity. The availability of the complete genome sequence of foxtail millet has opened new doors for functional genomics, enabling researchers to explore gene functions, regulatory networks, and evolutionary relationships with other major crops. This genomic information not only facilitates the identification of quantitative trait loci (QTLs) but also supports comparative genomics studies that could uncover the molecular mechanisms underlying stress adaptation and productivity. The integration of RFLP, RAPD-based genetic maps, and genome sequencing provides a comprehensive platform for future breeding strategies aimed at improving foxtail millet's resilience, productivity, and adaptability, ensuring its continued relevance in global food security.

Keywords: RFLP, RAPD, Genetic maps, Genome sequencing, MAS, QTLs, Functional genomics

Assessment of root system architecture (RSA) of rice seedling as influenced by co-inoculation of plant growth promoting microorganisms.

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Abstract

In addition to single inoculation of plant growth promoting microorganisms, its combination with other PGPB which elicits plant growth and development. The root system study explores the spatial distribution of all minute parts of the root in a particular environment. In the present study, co-inoculation of two bacterial strains of plant growth promoting bacteria *Bacillus altitudinis*FD4 and PPFM was investigated by root system architecture study (RSA) by Gia root software. Co-inoculation of PPFM and *B. altitudinis*

FD48 gives best results for overall growth parameters than single strain inoculation. Among 20 different RSA-traits monitored by root imaging and analysis, the major parameters include network perimeter, Solidity, Cover area, network area and bushiness index show significantly increased in consortium of microorganisms. In addition, co-inoculation of PPFM and *B. altitudinis* FD48 conducted in pot culture study which gave considerable results for overall growth parameters such as root length, shoot length, plant dry biomass and germination percentage of rice plants. Therefore, this study indicates that a consortium of microorganisms promotes better plant growth than single inoculation.

Key words: Consortium, RSA, PGPB, *B. altitudinis* FD48, PPFM.

WUSCHEL-related homeobox genes uncovers their differential regulation during abiotic stress and organogenesis in endangered plant *Picrorhizakurrooa*

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Abstract

WUSCHEL-related homeobox (WOX) genes are plant-specific transcription factors that play a crucial role in *in vitro* organogenesis. This study aimed to unravel the structural basis and genetic diversification of the WOX gene family through a genome-wide analysis in the Plantaginaceae family. The research focused on *Picrorhizakurrooa* and *Antirrhinum majus* for *in silico* analysis of WOX gene family members. The study evaluated the physicochemical properties, subcellular localization, and phylogenetic relationships of these genes in *P. kurrooa*. Due to the lack of a chromosome-level resolved genome for *P. kurrooa*, *A. majus*, and *Arabidopsis thaliana* were used to analyze gene structure, chromosomal localization, and synteny. The analysis identified five WOX and one WUS member in the *P. kurrooa* genome, while eight WOX and eight WUS members were identified in *A. majus*. The phylogenetic tree was divided into three distinct clades: ancient, intermediate, and WUS clade. Phylogenetic analysis revealed that *PkWOX* and *AmWOX* genes, as well as *PkWUS* and *AmWUS* genes, are more closely related to each other than to their *Arabidopsis* counterparts. Chromosomal localization in *A. majus* showed that WOX and WUS genes are distributed across chromosomes 2 to 7, with no members present on chromosomes 1 and 8. Expression analysis of *P. kurrooa* WOX and WUS genes revealed differential expression during various stages of *in vitro* organogenesis (mother leaf, callus initiation, callus proliferation, and regeneration) and under different temperature conditions (25°C, 15°C, and 10°C). In summary, this study provided valuable insights into the developmental roles and stress responsiveness of WOX gene family members in *P. kurrooa*, highlighting their potential as promising candidates for further exploration.

Keywords: Cold stress, Developmental stages, Expression analysis, *In silico* analysis, Micropropagation.

Development of species-specific PCR and drug sensitivity of *Saprolegnia* species isolated from rainbow trout

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Abstract

Saprolegnia is a genus of oomycetes known to cause severe diseases in freshwater fish. These microorganisms are also implicated in the decline of wild fish and amphibian populations. While *Saprolegnia* typically acts as a secondary pathogen, it can become a primary pathogen under right circumstances, leading to significant fish mortality. Earlier, *Saprolegnia* infection was effectively controlled by using malachite green however, its use in aquaculture has been prohibited due to its detrimental effects. Consequently, there has been a resurgence of *Saprolegnia* infections, particularly by *S. parasitica*, in susceptible fish species such as rainbow trout. Here, we report the isolation of various *Saprolegnia* species from rainbow trout. Molecular identification of these species was conducted through the amplification and sequencing of the internal transcribed spacer region using universal primers, ITS1/ITS4. The species that were identified comprise *S. parasitica*, *S. diclina*, *S. australis*, *S. asterophora*, and *S. aenigmatica*. Infections of *S. parasitica* were detected from the fry stages and continued through to the brooders, whereas *S. diclina* was primarily found in eggs and hatchlings. Additionally, we developed a specific PCR for *S. parasitica*, the most pathogenic strain, which facilitates the molecular identification of the species without the need for sequencing. The isolated *Saprolegnia* species, particularly *S. parasitica*, *S. australis*, and *S. diclina*, were assessed for their susceptibility to common antifungal agents. The minimum inhibitory concentration of boric acid was found to be similar for *S. parasitica* and *S. diclina*, while it was higher for *S. australis*. In another assessment, *S. diclina* exhibited the highest susceptibility to hydrogen peroxide, whereas *S. australis* showed the least susceptibility among the three species. Overall, this study offers insights into *Saprolegnia* species that infect rainbow trout, species-specific PCR assay for molecular identification without sequencing, as well as variations in drug sensitivity among the different species.

Keywords: *Saprolegnia*, Molecular identification, Species specific PCR, Anti-oomycete assay, Minimum inhibitory concentration, Minimum oomycetecidal concentration

Variation of Phyllophane Mycoflora of *Barleria prionitis* L.

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Abstract

During present studies phyllophane mycoflora of *Barleria prionitis* was observed fortnightly with the help of gravity petriplate method, the percentage frequency and density of the leaf surface mycoflora

was also observed. Overall 568 fungal colonies were observed from the leaf surface mycoflora of *Barleria prionitis* plant. Out of total fungal colonies 568, 38 fungal species belonging to 17 genera of fungi were observed during the present study. Among 38 fungal species, 3 from Zygomycotina, 2 from Ascomycotina, 33 from Anamorphic fungi were recorded. *Chaetomium aureum*, *Aspergillus niger*, *Aspergillus flavus*, *Penicillium rugulosum*, *Curvularia lunata*, *Curvularia clavata*, *Alternaria citri*, *Alternaria alternata*, *Cladosporium oxysporum*, *Cladosporium cladosporioides*, *Mycelia sterila* while where most frequent fungi. Month wise density and of the leaf surface mycoflora and role environmental factor also affect the percentage frequency on leaf surface mycoflora were also recorded.

Key words: Density, Percentage contribution, Zygomycotina, Anamorphic.

Evaluation of ricebean (*Vigna umbellata*) cultivars for resistance to pulse beetle (*Callosobruchus chinensis*)

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Abstract

Pulses are vital food crops that provide essential nutrition, known as the “poor man’s meat” for their high protein content. Ricebean (*Vigna umbellata*) is a significant food legume that is grown in many developing nations among other pulse crops. Ricebean serves multiple purposes including as a dry pulse, green manure, and fodder. However, insect pests, particularly the pulse beetle (*Callosobruchus chinensis*), pose a major threat, causing notable damage to the seeds. To study the relation between biochemical and physical properties of ricebean seeds and the host preference by the pest, a no-choice test was set up in a Completely Randomized Design (CRD) with three replications, using 16 local ricebean cultivars. Various biological parameters of the pulse beetle, such as oviposition, adult emergence, development period, growth index, percentage infestation, and weight loss, were analyzed in relation to the physical and biochemical properties of the ricebean seeds. The physical properties- seed size and seed index showed a positive significant correlation with oviposition, adult emergence, growth index, infestation and weight loss, while a negative significant correlation was found with the development period of the pest. The biochemical content, specifically protein, starch, phenol, and tannin, played a significant role in pest preference. Cultivars with higher protein and starch levels were more vulnerable, while those with higher phenol and tannin contents showed greater resistance. The highest growth index was found in cultivar *Siphegonu* and the least was found in *Rhüjo*. Based on growth index measurements, three cultivars—*Rhüjo*, *Akixi Anila*, and *Manyhü Rhi*—were identified as moderately resistant and hold potential for future breeding programs focused on bruchid resistance in ricebeans.

Key words: Pulse beetle, Ricebean, Biochemical, Physical, Growth index, Resistance

Effect of Monocrotophos on the Plant Growth-Promoting Ability and Physiological Enzyme Activity of *Klebsiella pneumoniae* Ozaena SK1

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Abstract

Phyllosphere bacteria are known to be involved in plant health and development by improving nutrient availability, synthesizing plant growth-stimulating hormones, and protecting against environmental stressors. Their ability to establish symbiotic relationships with plants makes them key candidates for sustainable agriculture and crop improvement. *Klebsiella pneumoniae* ozaena SK1 isolated from leaves of *Ricinus communis* exhibited significant growth in MSM broth containing 100 ppm of monocrotophos as the sole carbon source. The effects of monocrotophos on bacterial physiological enzymes; such as alkaline phosphatase, acid phosphatase, protease, and catalase were studied, along with its impact on plant growth-promoting traits as IAA production, ammonia production, nitrate reduction, and biosurfactant production. It was observed that *Klebsiella pneumoniae* ozaena SK1 retained its physiological enzymes activity and plant growth-promoting ability in the presence of 100 ppm of monocrotophos. Furthermore, strain SK1 exhibited a high emulsion index in a MSM broth supplemented with 100 ppm monocrotophos, indicating its potential to produce biosurfactants in the presence of the pesticide. Thus tolerance against monocrotophos, retaining its plant growth-promoting potential, physiological enzymes activities and ability to produce biosurfactant make *Klebsiella pneumoniae* ozaena SK1 a promising candidate for further investigation for its potential application in agricultural biotechnology.

Keywords: *Ricinus communis*, Phyllosphere, *Klebsiella pneumoniae*, Monocrotophos tolerance

Potential of Non- Degradable Waste Biosorbents: An innovative mode to reducing Environmental Stress

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Abstract

The challenges of finding sustainable and efficient solutions for environmental pollution have led to the exploration of bioadsorbents derived from biowaste. Global concern for environmental sustainability, especially regarding waste management and pollution controlled, has driven this research. These bioadsorbents, sourced from often-discarded by-products, are proving valuable in the removal of pollutants from aqueous solutions, and soil. This research not only contributes to waste minimization

and elimination but also promotes eco-friendly and sustainable methods for purifying water, management of waste and removing contaminants such as synthetic dyes, heavy metals, and organic compounds. This study consolidates the viability of converting waste into functional bioadsorbents, as explored in recent research. As industries and populations grow, so does the amount of waste we generate. Not all waste is easily degradable, adding to the environmental burden. Agricultural waste is the most explored in this field, along with industrial waste, while emerging research is focusing on medical and hybrid biosorbents. This approach can be twofold: by targeting non degradable waste, we address to problems at once-reducing environmental stress from waste accumulation and creating biosorbents for creating for critical application in pollution control. Why should we develop these biosorbents? Industries like textiles, mining, and pharmaceuticals and others often release toxic pollutants. A biosorbent developed specifically from non-degradable waste could help these industries meet environmental regulations and reduce pollution-related costs. This paper explores an innovative approach to biosorbents development by utilizing non- degradable biowaste. The has come to rethink waste and transform it into a resource for environmental remediation.”

Keywords: *Environmental pollution, Waste minimization, Heavy metals, Organic compounds, Biosorbents*

Diversity of ornamental fishes of the Narmada River

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Abstract

Ornamental fishes are attractive and colorful species that can be kept as pets in confined spaces like aquariums or garden pools with the purpose of enjoying their Keeping ornamental fish has become popular as an easy and stress relieving hobby and has emerged as one of the most popular hobbies in the world next to photography. The present work was aimed to study the diversity of ornamental fishes of the Narmada River. A survey revealed that 55 fish species were reported , out of which more than 10 fish species are considered as possible ornamentals such as *Puntius conchonius* , *Aplocheilichthys lineatus*, *Badis badis*, *Puntius sophore*, *Mastacembelus armatus*, *Botia lohachata*, *Poecilia reticulata*, *Xiphophorus hellerii*, *Astronotus ocellatus*, *Pterophyllum scalare* and *Cyprinus carpio* for commercial purposes.

Keywords: *Narmada River, Ornamental fishes, Diversity.*

Modelling the dung drying kinetics for its potential applications in value-added products

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Abstract

Products from dung are gaining widespread attention in the country. However, to produce them on a large scale, it is important that the unit operations involved in the processing of the raw material (dung) must be understood and optimized for higher efficiency and process economics. In this work, comparative evaluation of the hot air drying characteristics of dung recovered from indigenous cattle Tharparkar (TH), crossbred cattle Vrindavani (VR) and Murrah buffalo (MB) was conducted at 80 and 90°C. Multiple samples were placed inside the hot air oven and were taken out at regular intervals without replacement. The change in weight of the samples with time was recorded and the moisture loss was observed. Consequently, the moisture ratio, which provides an idea of the diffusion behaviour of water molecules, was calculated and modelled using two semi-empirical models (Newton and Page model). Results revealed that the moisture reduced in the falling rate period with the lowest moisture content (w.b.) of 2.33, 29.06 and 13.45% at 80°C and 3.95, 23.66 and 2.73% at 90°C for TH, VR and MB, respectively. It is interesting to note that the moisture content of dung from crossbred cattle remained >20% even with increase in temperature indicating lower long-time storage potential of the dried product. Further, Page model showed higher prediction accuracy (96.4-99.1%) than Newton model (77.3-90.3%). The drying rate constant (k) was higher for TH at 80°C ($k_{TH}=1.38 \times 10^{-5}$) while VR and MB showed higher k at 90°C ($k_{VR}=5.86 \times 10^{-6}$; $k_{MB}=4.63 \times 10^{-8}$). The total time required for drying of the samples was 9 h at 80°C and 8 h at 90°C. Further analysis of the engineering properties (bulk and true density, porosity, thermal characteristics etc.) of the dried product is directed at identifying its suitability for use in diverse value-added product formats.

Keywords: semi-empirical model, waste management, livestock, hot air, engineering properties

Bioefficacy of low risk insecticides against root mealy bug *Planococcus lilacinus* (Cockerell) in black pepper

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Abstract

Planococcus lilacinus poses a significant threat to black pepper crops, infesting young shoots and berries. The present management strategies primarily utilize highly toxic insecticides, many of which are classified as red and yellow label products. This study aimed to evaluate the efficacy of six low-risk insecticides (blue and green label) at three different dosages against black pepper mealy bugs. A bioassay was conducted to assess the bioefficacy and optimize the dosages of selected low-risk insecticides, including Diafenthiuron 50 WP (0.3, 0.6, and 1 g), Flonicamid 50 WG (0.3, 0.5, and 0.75 g), Buprofezin 25 SC (1, 2, and 3 ml), and Nimbecidine 0.03%, under *invitro* conditions. Mealy bug cultures were maintained on potato sprouts for the assays. In each replication, thirty nymphs were allowed to settle on potato sprouts for two days before being transferred into a small dish (10 cm) situated within a larger

dish (15 cm) filled with soap water to prevent escape. The experimental design was a completely randomized design with five replications and water as a control. Mortality rates were recorded at 7, and 14 days post-treatment. The results indicated that Flonicamid at 0.3 g was significantly superior in controlling mealy bugs over other treatments, followed by Buprofezin at 3 ml and Diafenthiuron at both 0.6 g and 1 g. Further, the effective dosages were screened under pot culture conditions with the following insecticides: Buprofezin (3 ml), Diafenthiuron (1 g), Flonicamid (0.3 g), Spinetoram (1.5 ml), and Spinosad (0.5 ml). The third instar mealy bug nymphs were released to the newly emerged roots of black pepper vines in the pot and were covered with soil. Treatments were applied after the establishment of the mealybug population. Mortality rates were recorded at 7, and 14 days post-treatment. Among all tested insecticides, flonicamid at 0.3 g with 86.22%, followed by Spinetoram and Spinosad, showed significant efficacy as well, with mortality rates of 81.63% and 79.15%, respectively. Neem oil resulted in a significantly lesser mortality rate of 44.88%. The standard check chlorpyrifos at 2 ml exhibited the highest mortality of mealybug at 91.17%. The findings highlight the potential of low-risk insecticides for managing mealy bug infestations, paving the way for sustainable pest management strategies in black pepper.

Key words: root mealybug, black pepper, low-risk insecticides, *Planococcus* sp.

Screening of intergeneric sugarcane hybrids involving *Erianthus procerus* X commercial sugarcane varieties for resistance against sugarcane borers

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Abstract

Erianthus is an important wild species closely related to the genus *Saccharum*. *Erianthus procerus* is one of eight species in the genus *Erianthus*, and it possess valuable traits for resistance to sugarcane pests and diseases as well as improved qualities like high biomass production, vigour, ratoonability, tolerance to drought and waterlogging. After realizing its significant agronomical traits, extensive breeding efforts have been made at the ICAR-Sugarcane Breeding Institute, Coimbatore, India, to develop intergeneric hybridisation between *Saccharum* and *E. procerus* to overcome the prevailing unfavourable climatic conditions. Several intergeneric sugarcane hybrids (IGHs) have been developed utilizing *E. procerus* and these clones have shown a greater tolerance to drought under field conditions. However, no information is available about the pest status of the recently developed intergeneric hybrids involving *E. procerus* particularly for the early shoot borer (ESB) *Chilo infuscatellus* (Snellen) and the internode borer (INB) *Chilo sacchariphagus indicus* (Kapur) (Crambidae: Lepidoptera). Therefore, studies were conducted for two consecutive years (2022 to 2023) to screen the *E. procerus* involving 89 intergeneric sugarcane hybrids against the tissue borers in natural field conditions. Out of 89 genotypes screened for ESB, 40 genotypes were classified as tolerant (T), 35 genotypes as moderately tolerant (MT) and 12 genotypes as susceptible (S) to shoot borer. The ESB incidence among the 89 genotypes ranged from 1.54% to 56.61% and the nine genotypes viz., GU 19-4, GU 19-7, GU 19-27, GU 19-28, GU 19-60, GU 19-61, GU 19-72, GU 19-78 and GU 19-85 recorded <5% ESB incidence. Similarly, INB incidence and

intensity among the IGHs ranged from 5% to 80% and <1% to >7%, respectively. Field screening of IGHs for internode borer studies revealed that genotypes 12, 24, and 54 were classified as tolerant (T), moderately tolerant (MT) and susceptible (S), respectively. Besides, ten genotypes viz., GU 19-4, GU 19-22, GU 19-24, GU 19-43, GU 19-46, GU 19-49, GU 19-51, GU 19-62, GU 19-68, GU 19-78 and GU 19-88 showed <15% INB incidence. Results of internode borer damage on the internode morphology of IGHs revealed that the INB-affected internodes significantly reduced in their length and girth invariably in all the genotypes, but there was a difference in intensity among them. *Despite the INB infestation, no significant reduction in internode length or girth was found in the IGH clones viz., GU 19-4, GU 19-10, GU 19-24, GU 19-22, GU 19-38, GU 19-39, GU 19-43, GU 19-55, GU 19-77, and GU 19-85.* In conclusion, the study identified eight potential IGH clones, GU 19-4, GU 19-7, GU 19-27, GU 19-85, GU 19-22, GU 19-24, GU 19-43, and GU 19-78, that showed tolerant reactions to ESB and INB. These clones could serve as donors for the development of borer-tolerant varieties in future sugarcane breeding programmes.

Keywords: *Intergeneric hybrids, screening, early shoot borer, internode borer, internode morphology*

Screening of red fleshed *Saccharum robustum* against sugarcane borers and termites

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Abstract

Field experiments were conducted to screen the red fleshed *Saccharum robustum* progenies against sugarcane shoot borer, *Chilo infuscatellus*, internode borer, *Chilo sacchariphagus indicus* and termites for the two consecutive years (2018-19 and 2019-20) at Sugarcane Breeding Institute, Coimbatore, Tamil Nadu. Among 20 red - fleshed *S. robustum* progenies screened against shoot borer, 4, 10 and 6 progenies were grouped as tolerant, moderately tolerant and susceptible, respectively. In the progenies, GUK 14-722, GUK 14-130, GUK 14-129 and GUK 14-745 were recorded <15% shoot borer incidence which grouped as tolerant genotypes. In the popular sugarcane varieties, *C. infuscatellus* incidence was lower in Co 06022 and Co 06030. Likewise, only two clones (GUK 14-722 and GUK 14-129) were grouped as tolerant; six clones as moderately tolerant and 12 clones as susceptible to *C. sacchariphagus indicus*. Approximately, eleven progenies were recorded 6-9% internode borer intensity. The incidence of termites ranged between 21.03 to 75.63% on the red fleshed *S. robustum* progenies and 2.55 to 11.23% in the popular sugarcane varieties. More than half of the progenies seedlings were infested with > 50% incidence of termites whereas <10% incidence in the popular varieties. The present study identified the genotypes viz., GUK 14-722, GUK 14-130, GUK 14-129 and GUK 14-745 were tolerant to *C. infuscatellus*, *C. sacchariphagus indicus* and termites and these elite genotypes could be used as donors in the future sugarcane breeding programme for the development of borers resistant varieties.

Keywords: *red fleshed S. robustum, sugarcane varieties early shoot borer, internode borer, termites*

Isolation and Molecular Identification of Entomopathogenic nematodes and its biocontrol activity against selected insect pests

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Abstract

Isolation and Identification of Entomopathogenic nematodes were studied. Nematodes were isolated namely *Heterorhabditis* spp. and *Steinernema* spp. respectively. *Heterorhabditis indica* and *Steinernema siamkayai* was identified and evaluated against the two major cruciferous insect pests the diamondback moth *Plutella xylostella*, and the cabbage looper *Trichoplusia ni*. Insect mortality from the nematode species was tested two different temperatures. Maximum mortality (100%) was recorded for *P.xylostella* from *S. siamkayai* and *H.indica* at 28°C exposure to cabbage leaves in petridish method, where as 85.4% from *S. siamkayai*, and 71.5% *H.indica* from at 35°C. The nematode reproductive capacity was studied by placing insect cadavers on White trap. Emerging IJs was collected for up to 21 days. Nematode reproductive capacity was compared among insect hosts based on the total number of IJs emerged and number of IJs produced inside the host. Reproduction rate significantly increased at 28°C of *H. indica* and *S.siamkayai* yielded (1.90 lakh IJs/larva) and (95,000 IJs/larva), moreover *H. indica* yielded (1.10 lakh/larva) and (85,000/larva) was low at 35°C. *T.ni* was very susceptible to nematode infection. The highest mortality rates were 98.3% and 95.5% with 24h of *S. siamkayai*, and *H.indica* respectively. The maximum number of IJs per larva of *T.ni* was produced by *H. indica* was significantly high (1.9 lakh) followed by *S. siamkayai* (90,000). There were significant difference in emergence time between 28°C and 35°C. However, time of emergence was suitable at 28°C for the two isolates for maximum production of IJs/larva. Susceptibility depends on larval stages of the pest *P. xylostella* and *T. ni* larvae. *H.indica* penetration rate least when compared to the *S.siamkayai*.

Keywords: *Entomopathogenic nematodes, Biocontrol agents, Heterorhabditis, Steinernema, Insect pest, Plutella xylostella*

Fertility Status of Pomegranate growing soils of Challakere taluk, Karnataka

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Abstract

A study was carried out to assess the fertility status of soils under pomegranate orchards of Challakere taluk of Chitradurga district, Karnataka during the year 2023-24. A total of 100 soil samples at two depths (0-20 and 20-40 cm) were collected from different pomegranate growing orchards across Challakere taluk. The soil samples were analysed for various soil fertility parameters. The results indicated

that, at 0-20 cm depth, soil reaction was found to be slightly acidic to alkali (5.74 to 9.20), electrical conductivity (EC) ranged from 0.64 to 3.50 dS m⁻¹ with the mean value 1.79 dS m⁻¹ and soil organic carbon (SOC) was low to medium in these soils. Available N (320.80 ± 68.32 kg ha⁻¹) and P (15.50 ± 6.65 kg ha⁻¹) were in the range of low to medium and available K (193.40 ± 83.68 kg ha⁻¹) ranged from low to high. Secondary nutrients *i.e.*, exchangeable Ca [7.80 ± 3.84 cmol (p+) kg⁻¹], exchangeable Mg [3.30 ± 30 cmol (p+) kg⁻¹] was found to be sufficient and available sulphur (7.17 ± 2.91 mg kg⁻¹) was low to high in status. Further, DTPA-extractable Fe, Mn, Zn and Cu was found to be sufficient in majority of the soil samples. Whilst, available boron ranged from 0.10 to 0.57 mg kg⁻¹ with a mean of 0.32 ± 0.13 mg kg⁻¹ and was found to be deficient in majority of the samples. At 20-40 cm depth, soil reaction was found to be slightly acidic to alkali, EC varied from 0.41 to 3.24 dS m⁻¹ and SOC was low in status. Majority of the samples were low in available N and P. Available K ranged from low to high. Majority of the samples were sufficient for exchangeable Ca and Mg, while available sulphur was found to be deficient. Soil samples were sufficient in DTPA-extractable micronutrients Fe, Mn, Zn and Cu. Deficient in available boron.

A Comprehensive Review of CRISPR and Gene Editing in Crop Improvement

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Abstract

CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) has emerged as a powerful and precise gene-editing tool, revolutionizing modern crop improvement. This review examines the application of CRISPR technology in plant breeding, highlighting its potential to enhance crop resilience, nutritional content, and yield. By enabling targeted modifications at the genomic level, CRISPR facilitates the development of crops with improved resistance to pests, diseases, and environmental stresses such as drought and salinity. Additionally, CRISPR has been instrumental in improving the nutritional value of staple foods, addressing global food security and malnutrition challenges. Despite its transformative impact, the technology also faces regulatory, ethical, and public acceptance hurdles. This review discusses the current advancements, challenges, and future prospects of CRISPR-based gene editing in crops, emphasizing its role in sustainable agriculture and global food systems.

Keywords: CRISPR, Gene Editing, Plant Breeding, Crop Improvement, Disease Resistance, Nutritional Enhancement, Genomic Modification, Sustainable Agriculture Security

Extraction and characterization of Chitosan from Fish *Aanabas testudineus* for the evaluation of its Biochemical activity

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Abstract

Chitosan is a versatile environmentally friendly modern material. It has a wide range of applications in areas such as water treatment, pulp and paper, biomedical devices and therapies, cosmetics, membrane technology, and biotechnology and food applications. Fish waste is the most important chitin source for commercial use. The process of obtaining chitin by the chemical extraction method comprises the steps of demineralization, deproteinization, and deacetylation. To obtain chitosan, the deacetylation of chitin is a necessary step in the chitin purification process from fish waste. Fish processing industries generate large quantities of waste which are at the origin of several environmental, economic, and social problems. However fish waste could contain high-value-added substances such as biopolymers. This work focuses on optimizing the chitosan extraction from climbing perch *Aanabas testudineus* of Family Anabantidae fish scales. Chitosan was obtained after acid demineralization followed by simultaneous hydrothermal deproteinization and deacetylation by an alkali treatment with different concentrations of HCl and NaOH. The extracted chitosan with the highest yield was characterized by determining their main physicochemical properties Degree of deacetylation (DD), solubility, average molecular weight (AMW), ash content, moisture content, fat binding capacity (FBC), and water binding capacity (WBC). Prepared chitosan was further characterized. Chitosan extract of *Aanabas testudineus* was assessed for its anti-inflammatory activity by in-vitro methods. The present study's findings suggest that *Aanabas testudineus* chitosan extracts may be a source of anti-inflammatory drugs. The developing trend of resistance to antimicrobial medicines has prompted the development of novel treatment approaches and more effective treatments for a range of microbial ailments. The current study compares the antibacterial and antifungal properties of extracted and commercial chitosan against different microorganisms. Because extracted chitosan has strong antimicrobial properties, it might be used to create a covering for biomedical equipment that is resistant to microbes.

Sorption and Mobility of Sulfamethoxypyridazine in Indian Soils as supported by molecular dynamics studies

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Abstract

Antibiotic resistance poses a significant challenge in today's world due to its widespread use. The majority of antibiotics used, around 70-90%, are excreted in their original form and end up contaminating the soil, water, and other ecosystems. Sulfonamide antibiotics, including sulfamethoxypyridazine, are frequently found in the environment and are important in both veterinary and human medicine. The movement of antibiotics through the soil is governed by two key processes: sorption and leaching. This study involved examining the adsorption of sulfamethoxypyridazine using the batch equilibration technique in accordance with OECD guidelines. Studies were conducted in two soils belonging to inceptisol and entisol soil orders having differing physicochemical properties. The research found that

adsorption was higher in entisol (average K_d value of 1.52 to 2.33) than inceptisol (average K_d value of 0.83 to 1.37) due to its higher clay content, and the effects of temperature and organic matter on adsorption were also investigated. The study revealed a negative correlation between temperature and adsorption, and a positive relationship between organic matter and adsorption. The adsorption data best fit the Langmuir model indicating monolayer adsorption of sulfamethoxypyridazine in soils. However, the mobility of sulfamethoxypyridazine was greater in inceptisol, indicating a moderate potential for leaching towards groundwater as indicated by the Groundwater Ubiquity Scores. Additional analysis using Monte Carlo simulation and molecular dynamics revealed high negative sorption energy, further supporting the moderate leaching potential of sulfamethoxypyridazine. Therefore, soils with low organic carbon and clay content may pose a greater risk to the environment in terms of contributing to antibiotic resistance.

Keywords: *Mobility; molecular dynamics; Monte Carlo simulation; soil; sorption; sulfonamide*

Graphene oxide and molecularly imprinted polymer sensor for early lung cancer diagnosis through benzene detection

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Abstract

Early detection in cancer is a key factor that can drastically improve a person's odds of survival. This is only possible with increased screening. A major roadblock towards this approach is the cost and accessibility of diagnostic tools. Modern nanomaterial-based sensors with their portability, user-friendly interface and low manufacturing cost provide a good answer to this problem. The altered profile of volatile organic compounds (VOCs) emanated by the human body is closely associated with the presence of fatal diseases [1]. Benzene is one such VOC that has presented itself as a noteworthy biomarker in the breath and blood of people who risk the manifestation of lung cancer [2]. We have exploited this association of benzene with lung cancer to develop a sensor that can reliably detect benzene. Our work delineates the fabrication of an electrochemical sensor developed on a screen printed electrode (SPE) coated with graphene oxide (GO) followed by a molecularly imprinted polymer (MIP). The deposition of GO provides a notable increase in the sensor response due to its desirable electrochemical properties. With its straightforward synthesis protocol and integration on a SPE platform, a low manufacturing cost with ease of access and handling are ensured. Furthermore, the use of MIP, specifically synthesized with using benzene as a template gives our sensor the boost in selectivity that most sensors struggle with. Substantially limited selectivity towards specific VOCs from the body has greatly hampered the use of VOC sensors for diagnostic applications. With our unique approach, we aim to develop a medical device that can detect benzene and other biomarkers for lung cancer with high sensitivity and selectivity for reliable and early diagnosis.

Keyword: *Benzene, Graphene oxide, Molecularly imprinted polymer, Electrochemical sensor, Lung cancer.*

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Studies on preventing in-situ germinating in groundnut (*Arachis hypogaea* L.) VRI 8

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Abstract

Groundnut (*Arachis hypogaea* L.) is one of the most commercially important oilseed crops and it is also designated as a “Wonder Legume”. Dormancy play a major role in deciding crop yield in groundnut. Generally, the bunch type groundnut varieties are non-dormant while, spreading and semi spreading types are having a varied period of dormancy. The receipt of rain at the time of harvest in non dormant varieties adversely affects the considerable yield loss due to *insitu* germination (sprouting). The groundnut VRI 8 is a non dormant bunch variety and popular among the farmer in Northern districts of Tamil Nadu. In order to over come *insitu* germination in VRI 8 groundnut variety, foliar application of ABA at various concentrations viz., 250 and 500 ppm were tried at 70 and 80 days after sowing. The results revealed that foliar spray of Absciscic acid (ABA) 500 ppm at 70 days after sowing (DAS) in non-dormant groundnut cv. VRI 8 could induced dormancy and minimized the *insitu* germination even irrigation given at 90 DAS. The practical utility of the study is foliar application of ABA 500 ppm at 70 DAS can minimize yield loss by preventing *insitu* germination even receipt of rain at 90 DAS. For immediate sowing, kernel seed dormancy could easily broken by soaking the seeds with Ethrel 100 ppm for 6 hours which helps the farmer for taking immediate sowing without missing the cropping season.

Key words: Groundnut, *Insitu* germination, Absciscic acid, Dormancy, Ethrel

Effect of plant growth promoting microbe's inoculation on onion crop growth and yield under drought stress

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Abstract

Onion is a commercially important vegetable crop with high culinary, medicinal and economic values

in national and international market. It is mainly cultivated during post-monsoon season. Being a shallow rooted crop, drought is one of the major constraints limiting its growth and productivity world-wide. So, it is important to find way to, which may improve onion crop physiology and yield under water deficit condition. Plant growth promoting microbes (PGPMs) play an important role in crop developmental process and its mitigation during biotic and abiotic stresses. It may helps in ease the harmful effect of drought stress in onion crop by improving plant growth and soil health. A pot experiment was conducted to study the effect of PGPMs on onion crop growth and bulb yield under drought condition. The experiment consisted of 7 treatments; T1: *Azotobacter* spp., T2: *Azospirillum* spp, Potassium Solubilizing bacterial consortia, Phosphorus Solubilizing bacteria spp, *Piriformospora indica*, and control (with recommended dose of fertilizer 110:40:60:30 kg NPKS and 15 tons FYM per hectare), absolute control (without recommended dose of fertilizer) under two water regime (well watered and water deficit stress). Seedling inoculation with microbial culture before transplanting improves the crop growth and survival under drought condition. Physiological and biochemical traits linked with stress adaption recorded to be high under the microbial treatment compared to without treatment under both well-watered and water deficit condition. Significantly maximum crop growth and highest bulb yield with good size and quality bulbs was recorded from the plants inoculated with *Piriformospora indica* spp. culture under drought. The findings from the study thus highlight the significant role played by *Piriformospora indica* spp in maintaining and improving onion crop growth and production under drought condition.

Keywords: *Plant Growth Promoting Microbes, Onion bulb yield, Drought*

Exogenous application of dsRNA suppresses emerging shoestring disease of tomato plants

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Abstract

The tomato crop (*Solanum lycopersicum* L.) is under considerable threat from a newly emerging disease distinguished by a unique shoestring-like appearance of leaves and the production of immature, small, and deformed fruits, presenting a major obstacle to tomato cultivation in India. Transmission electron microscopy (TEM) and molecular analysis confirmed the association of a new isolate of the tomato mottle mosaic virus (ToMMV) in the affected plants, which had not been reported earlier in India. Recently, RNA interference (RNAi) has emerged as a highly promising method for controlling viral infections by externally applying dsRNA. In this study, a dsRNA expression construct was created in the L4440 vector to target the coat protein (CP) gene and a segment of the movement protein (MP) gene of ToMMV. The dsRNA was purified from *E. coli* HT115 cells and applied topically to tomato cv. Pusa Ruby plants, resulting in a significant decrease in shoe-string symptom development. Additionally, quantitative reverse transcription polymerase chain reaction (qRT-PCR) analysis demonstrated a substantial reduction (>90%) in virus accumulation in all the dsRNA-treated plants. Before virus

inoculation, the preventive application of dsRNA exhibited the highest effectiveness in reducing symptom development and virus accumulation. This study demonstrates the first evidence of inhibition of a shoe-string isolate of ToMMV through the external application of dsRNA.

Keywords: *Tomato, shoe-string, dsRNA, qRT-PCR, ToMMV, preventive*

Evaluation of Bio-efficacy of Natural Farming Inputs on the Yield of Rice (*Oryza sativa* L.)

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Abstract

The experiment was conducted at the N.E. Borlaug Crop Research center of G.B. Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar, Uttarakhand, India, during the kharif season of 23-24 with paddy crop. The experimental soil texture is silty clay loamy. To evaluate the effects of natural farming inputs on paddy growth and productivity. Field experiment consists of 10 different treatments, comparing combinations of traditional organic inputs, including FYM, vermicompost, jeevamrit, and beejamrit on Tilak Chandan variety of rice. All treatment was replicate three times using randomized block design (RBD). The analyzed data revealed that the treatment T7 ((25% Beeja. + Jeeva. & Pant. Ark +75% FYM & Vermi.) resulted in the highest values for important paddy growth parameters, including maximum plant height, number of tillers/ m², 1000 grain weight, grain yield and biological yield. The results with the treatment T2 (50% Ghan., Dash. & Pant. Ark +50% FYM & Vermi.) for plant height (111.00 cm), number of tillers/m² (109.0), available nitrogen (255.13 kg/ha), available potassium (204.02 kg/ha) and grain yield (5.61 qt/ha) resulted in *at par* values of T7. But the highest panicle length (31.97 cm) was recorded in the T3 treatment. Overall, the results of the experiment clearly indicated that the T7 ((25% Beeja + Jeeva. & Pant. Ark +75% FYM & Vermi.) treatment was the most effective in achieving highest grain yield and improving soil nutrient status followed by T, (50% Ghan., Dash. & Pant. Ark +50% FYM & Vermi.). Consequently, the use of natural farming inputs in paddy cultivation had a significant positive impact on crop growth, yield and also on different soil properties. This study provides valuable insights into the benefits of incorporating natural farming inputs in paddy cultivation. The findings emphasized the importance of natural farming inputs on sustainable agricultural practices and also highlighted the potential of natural farming inputs for enhancing both crop productivity and soil health in the *tarai* region of Uttarakhand.

Keywords: *Pant dhan, Paddy, FYM, Organic Farming, RBD*

Biofuels: The Green Energy

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Abstract

Globally the human population is showing a growing trend, as witnessed by the slope of the graph and the current census. To supplement the energy needs of the growing population fuels are needed. But the fossil fuels are at the brink of extinction. Moreover, they also pose a significant contribution to the environmental pollution. So, to suffice the need of energy and at the same time in a sustainable way, raised eyebrows of researchers led to the foundation of dummies, called as 'biofuel'. Biofuels are energy sources that are renewable and offer a better alternative to traditional fossil fuels as they have limited effect on the environment and supplement the energy needs in a sustainable way. Their birth is from biological materials and can be produced from various feed stocks including crops. Coming to the hierarchy of biofuels, the family can be classified as first generation (produced from food crops), second generation (from non-food biomass) and third generation (from algae). The primary types of the family are bioethanol and biodiesel. The use of biofuels has been promoted as gasoline and diesel alternatives as they show reduced greenhouse gas emissions and at the same time supplement the global energy bowl. Overall, biofuels represent a promising but complex solution for transition from fossil fuels but with ongoing research it can be the green fuel of the future.

Keywords: *Biofuels, Bioethanol, Biodiesel*

Potential agroforestry interventions for sustainable livestock farming in changing climate scenario in Arunachal Pradesh : a review

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Abstract

In Arunachal Pradesh, a distinctive gap exists between the requirements and supplies of nutrients for livestock. It is desirable that adequate feed resources should be built up as one of the mitigation strategies in response to changing climate scenario. A feasible and hence, the most viable proposition could be the inclusion of agroforestry-based feed resources in livestock ration with suitable and complete feed technology that can utilize these resources with maximum efficiency. For the objective of this review, potentially available agroforestry-based feed resources in the state include crop residues, plantation wastes and browse foliage. It is known that some of these products are low in energy, protein and contain high concentrations of lignin, silica and several anti-nutritional substances. Numerous multipurpose browse trees and shrubs have been identified as having significant potential in agroforestry systems in the region. Browse plants that have been identified and have recently been studied include *Gmelina arborea*, *Moringa oleifera*, *Trema orientalis*, *Terminalia catappa*, *Ficus hirta*, *Bauhinia purpurea* and Bamboos. Protein form plant leaf sources is perhaps the most naturally abundant and cheapest source of protein, such that there has been growing realization in use of plant leaf meals in livestock diets. Several authors have concluded studies on these leaves to determine their nutritive values and usefulness in livestock nutrition. Results obtained from these studies have shown beneficial and economic values from the inclusion of these leaf meals in the diet of livestock.

Keywords: *Agroforestry-based feed resources, browse plants*

Aquaporins in relation to seed germination and longevity a review

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Abstract

Aquaporins are integral membrane proteins from a larger family of major intrinsic proteins that form pores in the membrane of biological cells, mainly facilitating transport of water between cells. The cell membranes of plant cells contain aquaporins through which water can flow more rapidly into and out of the cell than by diffusing through the phospholipid bilayer. There are three routes for water to flow in these tissues, known as the apoplastic, symplastic and transcellular pathways. Specifically, aquaporins are found in the vacuolar membrane, in addition to the plasma membrane of plants; in plants, aquaporins occur with a high diversity of isoforms, the most abundant aquaporins in the vacuolar and plasma membranes belonging to the tonoplast intrinsic protein (TIP) and the plasma membrane intrinsic protein (PIP) classes, respectively. Mercury is a heavy metal indicated as a primary inhibitor of aquaporin activity. Under physiological conditions, it interacts with the thiol groups of cysteine residues, oxidizing them and reversibly interrupting the activity of these proteins. Because of its great efficiency in blocking the activity of aquaporins, mercury chloride (HgCl₂) has been frequently used as a tool to study the action of these proteins in water transport at various stages of plant development. Expression and inhibition of aquaporins in germinating arabidopsis seeds using mercury, as a general blocker of aquaporins in various organisms which, reduced the speed of seed germination and induced a true delay in maternal seed coat (testa) rupture and radicle emergence. Its effects were largely reversed by addition of 2mM dithiothreitol, suggesting that these effects were primarily due to oxidation of cell components, possibly aquaporins, without irreversible alteration of cell integrity. Different aquaporins found in the seed system, have individual functions which are tissue specific ultimately helping in the seed imbibitions process for the completion of seed germination.

Keywords: *Aquaporins, Intrinsic proteins, Plasma membrane, cell integrity, Mercury chloride, Seed germination*

Integrated effect of Organic and Inorganic Manuring on Cassava Tuber Yield in Red Sandy Loam Soil under Permanent Manurial Experiment

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Abstract

Permanent Manurial Experiments (PMW) are ideal sites for studying management induced variability in crop production and soil health. The biological activity of a soil is the function of number of organisms present in soil and their physiological efficiency. Soil microbial diversity is one of the most important

microbial parameters in soil. Cassava is grown throughout the tropics and grows well with little or no fertilizer inputs, the crop does respond well to fertilizer applications in highly infertile soils. In some areas cassava has been cultivated continuously with improper fertilizer management. These factors have caused the soil's productivity to steadily decline, resulting in a decrease in cassava growth and yield. Another reason for stagnating yields may be the decline in soil productivity as a result of continuous cassava production without adequate fertilization. Hence, Permanent Manurial Experiment (PME) on cassava variety YTP 1 has been conducted for three years during 2014-2017 at Tapioca and Castor Research Station, Yethapur, Salem district, Tamil Nadu with four treatments viz., control, organic manuring, inorganic fertilization and integrated nutrient management to study the effects on the yield and quality of cassava and the consequent changes in the biological properties of the soil under continuous cropping with and manuring. Among the treatments, Integrated Nutrient Management (INM) recorded higher plant height (237 cm), stem girth (13 cm), number of tubers (13), tuber length (41.6 cm) and tuber girth (32.2 cm) followed by inorganics and organics. Control recorded lesser plant height (191 cm), stem girth (7.6 cm), number of tubers (8.0), tuber length (19.4 cm) and tuber girth (11.0 cm). The maximum tuber yield (41.50 t ha⁻¹) and starch content (26.50%) was recorded by the application of INM. Higher microbial population of bacteria, fungi and actinomycetes was recorded under organics (65.87, 26.54 and 9.98 respectively) followed by Integrated Nutrient Management (64.38, 25.87 and 9.47 respectively). Therefore, adoption of integrated plant nutrient supply and management strategies for enhancing soil quality, input use efficiency and crop productivity is extremely important for food and nutritional security in Indian agriculture.

Keywords: *Permanent Manurial Experiment (PME), Tuber yield, Starch content, Cassava, Soil microbial properties*

Evaluation of water quality of Ratapani Reservoir using water quality index.

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Abstract

The present study aimed to evaluate the water quality of Ratapani 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 lake falls under excellent to good category, indicating that the water is suitable for drinking, irrigation, and industrial purposes. These results are essential for the future management of water in Ratapani Reservoir.

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

To develop a sustainable bioprocess for ethanol production using a selective microbe

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Abstract

A novel yeast strain was isolated and pre-treatment strategies were also devised for optimum recovery of carbohydrates from sustainable raw material (azolla, water hyacinth and corn cob) including molasses for bioethanol production. Fermentation process parameters were optimized to enhance ethanol titer and yield efficiency using monoculture and co-culture techniques. Substrate utilisation and solvent toxicity of selective yeast strain was monitored under standardized conditions. Subsequently process was scale up in 2L and 5L Scale. Bioethanol production profile with respect to substrate utilisation and fermentation time were monitored. Intermediate metabolites were detected to assess the metabolic pathway that is followed by the isolated strain during fermentation of ethanol production process. Isolated strain that was identified as *Candida tropicalis*-TERI DC and has great potential to utilize broad spectrum carbohydrate (Commercial glucose, maltose, fructose, galactose, sucrose, mannose, starch) including different types of biomasses (corn cob, azolla, water-hyacinth, rice straw and algae biomass) as substrate during fermentation process. The ethanol yield of this strain was 0.40g/g (with 3% feed and 78% efficiency) using monoculture for ethanol production. Another alternative approach was co-culturing used *Candida tropicalis*-TERI DC and *Pichia Stiptis* strains throughout the fermentation process for utilisation of pentose and hexose substrate during fermentation process. Ethanol yield was 0.34g/g (with 4% feed and 70% efficiency). This strain has higher substrate (9-10%) and solvent titer (4-4.5%) which are desired properties for industrial production of bioethanol. Novel isolated *Candida tropicalis*-TERI DC strain has broad spectrum utilisation of carbohydrate recovered from sustainable raw materials and has higher ethanol tolerance. Formulation of low-cost production medium was also a sustainable process for commercialization as well as downstream process to make ethanol production a viable alternative to fossil fuels.

Keywords: Co-fermentation, Optimization, Bioethanol, Pretreatment, Ethanol yield, stress tolerant.

Virulence and diversity studies on *Rhizoctonia solani* Kuhn inciting sheath blight disease in rice

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Abstract

Sheath blight, caused by *Rhizoctonia solani*, is an important disease infecting rice. Sheath blight is having global importance and considered as one of the important causes for the reduction of productivity. It is challenging to manage due to the wide host range and greater genetic variability. Initial symptoms occur as ellipsoidal or ovoid, water-soaked, chlorotic patches on leaf sheaths at culms just above the water level. This renders a negative impact on grain filling and under extreme conditions it leads to premature death, resulting in the reduction of grain yield and quality. Complete resistance against sheath blight has not been observed while screening thousands of rice cultivars collected from various growing regions (Molla *et al.*, 2020). The sheath blight incidence was highest during the panicle formation stage when the rice canopy is very dense, creating a microclimate condition, that is conducive for the growth and spread of pathogen (Brooks, 2007). Flowering or heading stage infection results in loss of seed weight due to lower number of filled grains and consequently lower yield (Nagaraj kumar *et. al.*, 2005). The disease severity and yield loss are higher when the infection occurs during panicle initiation, booting, or flowering stage (Cu *et. al.*, 1996).

An effective assessment of the virulence and diversity of *R. solani* was studied in 5 rice cultivars by artificially inoculating with 20 isolates of *R. solani* under glass house conditions. Pure culture of this fungus was obtained by single hyphal tip method on potato dextrose agar medium after incubation at $28! \pm 1!$ for 6 days. Two susceptible (Rajendra Sweta, Rajendra Mansuri) and three tolerant (Sabour Sampan, Swarna sub-1, Sabour Surbhit) cultivars were tested against all the isolates. Susceptible and tolerant rice cultivars are a critical component for the quantification of the level of resistance against the pathogen. The results revealed that all the 20 *R. solani* isolates were pathogenic in the susceptible cultivars in comparison to tolerant cultivars. On the basis of virulence reaction on different cultivars, the isolates were categorized into four groups; highly virulent, moderately virulent, less virulent and avirulent. The overall observations from this investigation showed that the virulence behaviour of *R. solani* is distinct in the susceptible and tolerant cultivars of rice. The differential behaviour resulted in the disease affecting the susceptible host to a greater extent, leading to almost ten times more necrotic lesions than the tolerant varieties. The overall observations from this investigation shows that the virulence and diversity of *R. solani* is distinctly different in the susceptible and tolerant cultivars of rice.

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Revival of minor millets for nutritional and environmental sustainability : A Review

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Abstract

In order to provide nutritional security, the minor millets are predicted to take a lead role in the food industry and in our daily diets. These are also known as nutri-cereals, as they are full of nutrients. The properties of minor millets as they grow in poor soil with less irrigation and in hot climatic conditions have received interest in recent years. They provide healthy grains and fodder for food and feed in a short period of time as compared to other grains. The minor millets contain kodo, little, brown top, proso, foxtail, and barnyard millet. The present sedentary lifestyle has caused various health problems, which has inspired people to choose healthy and nutritious foods. Today's products developed from minor millets are becoming more popular as they are very helpful for the control of common lifestyle diseases. India is the world's top producer of minor millets (finger, Foxtail, Barnyard, Proso, kodo, and kutki millet). These millets serve as vital to traditional cropping systems and significantly improve regional food and nutritional security by expanding the national food basket. Minor millets are abundant in vitamins and essential amino acids which make them more popular among people, industrialist and researchers. Enhancing the immune system of the generations is the main objective of reviving these crops. These crops are not only nutritious but also have medicinal qualities that have been widely used in indigenous societies to cure many diseases. Therefore, studies on the production of millet-based products continue to expand in order to take advantage of the minor millets and their advantageous effects. This review points out the importance of minor millets, their historical and cultural values, medicinal and nutritional qualities, and their future opportunities for the purpose of creating a sustainable diet for sustainable agriculture.

Key words: *Millets, national security, Minor millets, sustainability, healthy diet*

Black rice protein: extraction, characterization and modification for advance food applications

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Abstract

The US treatment can change the secondary structure (% of α helix and β -sheets), particle size and surface hydrophobicity of black rice protein which can directly enhance the solubility and emulsifying activity index (EAI). Surface hydrophobicity and solubility of SSPC can increase after US treatment of blackrice protein samples. These changes in the functional and structural properties in of black rice protein upon US may lead to enhance their utility in the food processing industry. Similarly, the potential use of Black rice protein for recovery of protein hydrolysates with improved functionality is of pivotal significance within the circular economy premises of sustainable production and utilization of conventional sources of potential food ingredients. The treatment of Black rice protein concentrates with different enzymes (pepsin, trypsin and protease) developed can improve functional properties (solubility, emulsifying activity index, etc.) and antioxidant activity. The structural and functional changes that can occur as a result of enzyme treatment can lead to potential use Black rice protein in the food industry.

Formulation strategies for creating stable oleo gels: effects on gluten-free cake properties

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Abstract

The study aimed to prepare three types of oleogels using Medium Chain Triglyceride (MCT) oil and beeswax at concentrations of 5%, 10%, and 15%. These oleogels were subsequently used as fat replacers in a cake formulation. The texture properties, water activity, FTIR (Fourier Transform Infrared Spectroscopy) properties, and XRD (X-ray Diffraction) analysis of both the oleogels and cakes were compared. When comparing the texture values of the different concentrations of MCT-based oleogels, the firmness values were as follows: the 5% oleogel had a firmness of 35.29g, the 10% oleogel had a value of 50.72g, and the 15% oleogel had a value of 299.144g. The adhesiveness values were -53.23g for 5%, -24.027g for 10%, and -121.92g for 15%. This indicates that the 5% MCT oleogel had the lowest firmness and stickiness, while the 15% oleogel had the highest firmness and adhesiveness. The texture of oleogels improved with increased beeswax concentration, showing higher hardness and cohesiveness. The water activity of 5%MCT (medium-chain triglyceride) oil-based oleogels is 0.480, 10% oleogel is 0.478 and 15% is 0.465. As the concentration of the oleogel increases, the water activity decreases slightly. This indicates that higher concentrations of MCT oil in the oleogel lead to lower availability of water for microbial growth and other reactions. The melting point of MCT-based oleogels 5% is 51.5°C, 10% is 53.8 °C and 15% is 66 °C. As the concentration of the oleogel increases, the melting point also rises. The images of the cake with 5% MCT oleogel are better compared to the overall SEM image. It means concentration are more appealing or show a better structure. This suggests that these concentrations improve the texture and appearance of the cake, while the overall SEM image of the oleogel may not look as good. This study underscores the promise of MCT oleogel technology as an effective fat substitute in gluten-free baking, providing enhanced sensory attributes and nutritional

benefits. Future research will focus on enhancing oleogel formulations and investigating its use in a wider variety of gluten-free baked goods, responding to the increasing demand for healthier and more attractive food choices.

Natural Radioactivity and Excess Lifetime Cancer Risk assessment for the wheat samples collected from agricultural fields near high background risk area

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Abstract

Radiation can have several adverse effects on human health. It is crucial to understand how radiations impacts living organisms, requiring careful analysis. This study examines the radiological risk assessment for the wheat samples collected from agricultural fields near a coal-fired Thermal Power Plant. The research indicates that coal combustion can increase atmospheric radioactivity, which may endanger those living close to these facilities. To investigate this, the samples were analyzed for radioactivity using a highly sensitive thallium-doped sodium iodide detector, and further radiological parameters were assessed. The excess lifetime cancer risk was calculated. The calculated excess lifetime cancer risk was found to be lower than the global average of 2.9×10^{-4} reported by UNSCEAR. Therefore, the study found no immediate radiological health effects associated with radiation in the area [1,2].

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Effect of Monocrotophos on the Plant Growth-Promoting Ability and Physiological Enzyme Activity of *Klebsiella pneumoniae* Ozaena SK1

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Abstract

Phyllosphere bacteria are known to be involved in plant health and development by improving nutrient availability, synthesizing plant growth-stimulating hormones, and protecting against environmental

stressors. Their ability to establish symbiotic relationships with plants makes them key candidates for sustainable agriculture and crop improvement. *Klebsiella pneumoniae* ozaena SK1 isolated from leaves of *Ricinus communis* exhibited significant growth in MSM broth containing 100 ppm of monocrotophos as the sole carbon source. The effects of monocrotophos on bacterial physiological enzymes; such as alkaline phosphatase, acid phosphatase, protease, and catalase were studied, along with its impact on plant growth-promoting traits as IAA production, ammonia production, nitrate reduction, and biosurfactant production. It was observed that *Klebsiella pneumoniae* ozaena SK1 retained its physiological enzymes activity and plant growth-promoting ability in the presence of 100 ppm of monocrotophos. Furthermore, strain SK1 exhibited a high emulsion index in a MSM broth supplemented with 100 ppm monocrotophos, indicating its potential to produce biosurfactants in the presence of the pesticide. Thus tolerance against monocrotophos, retaining its plant growth-promoting potential, physiological enzymes activities and ability to produce biosurfactant make *Klebsiella pneumoniae* ozaena SK1 a promising candidate for further investigation for its potential application in agricultural biotechnology.

Keywords: *Ricinus communis*, *Phyllosphere*, *Klebsiella pneumoniae*, *Monocrotophos tolerance*

Evaluation of water quality of Najafgarh Drain in Delhi used for irrigation purposes and its possible consequences

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Abstract

Increased human population has led to increased demands of freshwater resources for various purposes including irrigation. The problem of fresh water scarcity is more prevalent in developing countries like India where cost of water treatment facilities is high and inadequate, leading to direct dumping of industrial, domestic and sewage waste into nearby waterbodies. The huge demand for vegetables and presence of limited water resources compelled farmers to use untreated wastewater for irrigation directly into fields. Similar practise was observed in the southwest region of Delhi, where vegetables are grown with contaminated wastewater from Najafgarh drain, which is recorded as the most contaminated water body in the capital city due to dumping of untreated sewage, industrial effluents etc. containing high amounts of organic, inorganic and toxic contaminants. In the present study efforts have been made to evaluate the quality of Najafgarh drain water used for irrigation of vegetables and was compared with freshwater irrigated site (Control site). Various parameters as pH, EC, TDS, Salinity, DO, BOD, COD, Total Alkalinity, Chloride, Hardness, Nitrate, Sulphate, Phosphate and Heavy metals (Pb, Cd, As, Ni, Cr and Zn) were determined. The values of these parameters varied significantly as compared to control site and prescribed limits given by various authorities. The long-term use of untreated/ contaminated wastewater for irrigation of vegetables alters the physicochemical characterisation of soil lowering its productivity along with accumulation of toxic heavy metals into soil and subsequently into vegetables posing serious health risks to humans. Therefore, continuous monitoring and evaluation of water used for irrigation is necessary to limit the use of wastewater for irrigation and reduce the associated health risk from consumption of these contaminated vegetables.

Keywords: Najafgarh drain, Contaminated wastewater, Heavy metals, Irrigation

**Effect of Chitosan- Zn-Salicylic acid Nanocomposite Particles on Wheat (*Triticum aestivum*):
Evaluation of Biochemical and Yield Responses**

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Abstract

Indian population is growing very unprecedented rate. For food security in India, high yield and nutritional quality of grain crops, both are essential. Zinc is a crucial micronutrient generally deficient in food grains grown in India, reflecting their deteriorating nutritional quality. To address these issues, in the present study, a novel tri-component nanoparticle of chitosan zinc-salicylic acid (CS-Zn-SA NPs) has been synthesized by ionotropic gelation method. The average size of synthesized CS-Zn-SA NPs was recorded 13.5 nm by dynamic light scattering (DLS) spectroscopy. The presence of chitosan, zinc and salicylic acid and crosslinking among these components in synthesized nanoparticles has been demonstrated by Fourier transforms infrared (FTIR) spectroscopy and thermogravimetric analysis (TGA). Further, synthesized CS-Zn-SA NPs at various concentrations (50–200 ppm) were evaluated for seed germination via seed priming, yield, grain zinc content and defence enzyme activity through the foliar application. CS-Zn-SA NPs revealed significant seed germination activities, 19.8 % higher grain yield, 45.5 % increased grain zinc content and manyfold defence enzyme activities than the control. The obtained results exposed the potential of CS-Zn-SA NPs as a stimulant for effective seedling development, higher yield, a virtuous micronutrient fortifying agent and defence enzyme promoter.

**Identification, isolation and characterization of gene (s) involved in volatile compound
production in *Ocimum tenuiflorum***

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Abstract

Ocimum tenuiflorum (Family Lamiaceae), popularly known as sacred or holy basil, is a rich source of essential oils, which finds its application in the food, perfumery, cosmetic, and pharmaceutical industries. Some of the main chemical constituents found in its essential oil are linalool, limonene, germacrene, α -elemene, caryophyllene, eugenol, chavicol, and many more. These volatile compounds are secondary metabolites that are extensively used for their health-benefitting and aromatic properties. One such class of secondary metabolites are terpenoids, which are widely used in various industrial products such as perfumes, flavors, pharmaceuticals, insecticides, etc. Besides this, terpenoids also play major

roles in plant-environment interactions, plant-animal interactions, and plant-plant communication. Terpenoids are synthesized by terpene synthases. Identification and characterization of terpene synthase genes is still limited in *O. tenuiflorum*. The earlier reported whole-genome data of *O. tenuiflorum*, revealed that *O. tenuiflorum* has many genes with the capability of encoding for various high-value terpenes. This investigation was aimed to utilize the *O. tenuiflorum* draft genome data for the characterization of terpene synthase gene(s) that are involved in the production of commercially important terpene(s). We have isolated and characterized *OtTPS3*, which is responsible for the cyclization of FPP into caryophyllene. Since caryophyllene (a bicyclic sesquiterpene) possesses anticancer, anxiolytic and anti-inflammatory properties, has FDA approval as a food additive and also plays a potential role in plant defense, this gene discovery in sacred basil assumes significance. Further efforts are on to exploit the full potential of this research. This presentation will discuss the steps involved in characterization of *OtTPS3* as *O. tenuiflorum* caryophyllene synthase (*OtCPS*) as well as future directions for research pertaining to it.

Keywords: *Caryophyllene synthase, Genomic data, Secondary metabolites, Terpene synthase*

Enhancing food quality through vacuum-drying: an advanced dehydration technique

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Abstract

Vacuum drying is an effective method for dehydrating kiwi fruits, offering significant advantages in preserving their nutritional and sensory qualities. Kiwi fruits, rich in vitamins C and E, antioxidants and dietary fiber, are particularly sensitive to heat, making traditional drying methods less ideal due to nutrient degradation and loss of natural color and flavor. Vacuum drying operates at low temperatures under reduced pressure, which minimizes thermal damage and oxidation, retaining the fruit's vibrant green color, tangy flavor and nutritional value. Research indicates that vacuum-dried kiwi fruits exhibit superior rehydration capacity, better texture retention, and longer shelf life compared to those dried using conventional methods. The process also ensures uniform moisture content, enhancing the stability and quality of the final product. This research benefits of vacuum drying for kiwi fruits, focusing on the preservation of essential nutrients and sensory attributes and highlights the potential of this method for producing high-quality dried kiwi products that meet consumer demands for nutritious and natural snacks.

Keywords: *Vacuum drying, kiwi fruits, nutrient retention, sensory quality, dehydration*

Evaluating Glyphosate Residue in Tap Water Samples: A Study on Environmental Safety

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Abstract

Glyphosate or Round-up is one of the most commonly used herbicides in the world. Mainly it is recommended for use in non-cropped areas like to control road-side weeds. But due to its potency to kill broad-leaf weeds within a very short period of time, sometimes glyphosate is used in cropped area also. The use of glyphosate in cropped area leads to the accumulation of glyphosate in soil and it causes contamination of surrounding water bodies which results into adverse effect in not only the aquatic organisms but also the human beings passively. Furthermore, IARC declared glyphosate as 'Type II A' carcinogen linked to liver cancer, cardiovascular disease, diabetes and several health hazards. In these circumstances the monitoring of glyphosate residues in water is the need of hour. Therefore, we have developed a validated, mass confirmatory method for trace level analysis of glyphosate in tap water. The method was validated as per SANTE guidelines. The method showed satisfactory recovery percentage (70%-100%) at nanogram level fortification and the method can detect glyphosate at a level of 0.01 ng/mL and quantify at 0.05 ng/mL level. The developed validated method is capable of routine quantification of glyphosate and AMPA at ppb levels in tap water and was used for monitoring the status of glyphosate in tap water resources across Delhi. In total 53 tap water samples were collected from different parts of Delhi and analyzed using the developed method. It was observed that 98.11% samples had detectable glyphosate residues, however none of the samples were detected with AMPA residues. The glyphosate residues in several tap water samples were more than the safe limit of any individual pesticide in water sample i.e 0.1 µg/L. It demands mandatory monitoring of glyphosate in water to protect our future generation from glyphosate poisoning.

Trends and physiological impacts of canopy regulation in production of tropical fruit and plantation crops

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Abstract

The term “canopy” refers to the physical elements of a tree, including stems, branches, shoots and leaves. The adjustment of a tree canopy to maximize the yield and production of high-quality fruits is known as canopy management. The type of plants, its growth pattern, quantity of plants per hectare and method of pruning all are playing a major role. There are two important tools for canopy management

via., training and pruning. Whereas, the trends and physiological impacts of canopy regulation focused on growth and development, canopy microclimate – temperature (°C) and relative humidity (%), light interception (%), light penetration (%), photosynthetic response, physico - chemical characteristics, flowering & fruitset and yield & quality of the plants. In the fruits and plantation crop canopy regulation to maintained maximum utilization of sunlight for growth and development of the plant. East side of the canopy the terminal branch density was 8.74% and 13.39% higher in the intermediate part of the canopy compared to lower and upper parts, respectively. On the other hand, West side of the lower part canopy showed an average terminal branch density 17.70% is higher than middle and upper parts of the tree, which registered the same average value. The canopy direction and position is to be increasing the number of fruits per branch which was highly exposed West side of the plant to sun-light and higher photosynthetic flux. Managing the canopies of short-stemmed trees allows for an increase in productivity and an improvement in fruit quality in many fruit crops by using dwarf root stocks. The different rootstocks of guava with Allahabad Safeda found that *Psidium pimum* has some dwarfing effect as tree spread, plant height and stem girth was minimum as compared to other rootstocks.

Keywords: *Canopy, Light, Pruning, Rootstocks and Training*

Influence of soil amendments and phosphorus on performance of black gram ((*Vignamungo* L. Hepper)

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Abstract

The field experiment was conducted during the *kharif* season of 2021- 2022 to study the effect of soil amendments and phosphorus on performance of black gram. The treatment consists of four soil amendments levels [SA_0 (control), SA_1 (5% LR), SA_2 (PSB) and SA_3 (5% LR+PSB)] and four phosphorus levels [P_0 (control), P_{20} (20 kg P_2O_5 ha⁻¹), P_{40} (40 kg P_2O_5 ha⁻¹) and P_{60} (60 kg P_2O_5 ha⁻¹)] laid out in randomized block design with three replications. Result revealed that application of soil amendments and phosphorus significantly increased the plant height, branches per plant, and pods per plant, pod length, seed per pod, seed and stover yield. SA_3 [i.e., application of lime @ 5% lime of LR in conjunction with seed inoculated PSB (*Bacillus megaterium*)] performs better than SA_0 , SA_1 and SA_2 (control, lime @ 5% lime of LR and seed inoculated PSB, respectively), also application of phosphorus @ 60 kg P_2O_5 ha⁻¹ showed better results, but was at par with @ 40 kg P_2O_5 ha⁻¹ on all accounts of yield and yield attributes.

Keywords: *Black gram, lime, PSB, phosphorus, yield*

Engineered Biochar: A sustainable environmental technology and New Opportunities for Shrimp aquaculture

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Abstract

In the present scenario waste management, especially agro- waste, is one of the major challenges. India is an agrarian country and the economy depends on agriculture and a huge amount of agro-wastes are generated. The growing interest in commercial shrimp aquaculture in fresh water, Inland saline aquaculture and brackish water has been sparked by the abundant resources of saline groundwater. Inland saline shrimp ponds face significant challenges, especially high seepage problems, due to the high content of sand and nutrient deficiencies, especially potassium. All these issues are addressed in the present study through conversion of agro-waste into biochar and its application for sustainable shrimp aquaculture. Field trials are conducted to explore the effects of applying paddy straw biochar (PSB) in nursery ponds on sediment characteristics, water quality, and the growth parameters and health of *Penaeus vannamei*. The results of water quality parameters showed a significant increase in K⁺ and Mg⁺⁺ with reduction in ammonia-N value in biochar applied ponds. Furthermore, biochar amended - added ponds exhibited improved sediment characteristics with higher water holding capacity, increased soil organic carbon content, pH levels, and cation exchange capacity, along with lower bulk density when compared to the control ponds. Growth parameters showed a significant increase in weight gain percent, SGR, PER with reduced FCR in biochar-treated ponds. The activity of digestive enzyme amylase, as well as metabolic enzymes were significantly higher in the biochar applied ponds. On the other hand, the oxidative stress enzyme exhibited lower levels, suggesting reduced oxidative stress in the presence of biochar. Overall, the study recommends incorporating paddy straw biochar at a rate of 2 t/ha into pond sediment as a viable solution for enhancing water quality, physiological status, and growth of *P. vannamei* juveniles.

Key words: *soil degradation, paddy straw biochar, Inland saline aquaculture ponds, sediment amendment; sediment quality; shrimp growth ; higher water holding capacity, nutrient deficiency*

Genetic variability for morphological, agronomic and biochemical traits in sweet potato for determining suitability for processing and value addition

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Abstract

Sweet potato (*Ipomoea batatas* (L.) Lam.), a member of the Convolvulaceae family, is grown for its starchy roots and is used for human consumption, animal feed and for industrial purposes. Studies in

sweet potato concentrating on determining suitability of genotypes for processing and value addition is limited and therefore, this study was planned to determine the genetic variability for important morphological, agronomic and biochemical traits to determine suitability for processing and value addition in fourteen hybrids along with the parents. Significant variability and heterosis was observed for all the studied traits ($p < 0.01$) among the hybrids. In the plant growth traits, the majority of genotypes had semi compact growth habit (9 genotypes) with moderate pot covering capacity (12 genotypes). The predominant vine colour was found to be green in 13 genotypes and the majority of genotypes had high resistance against insect damage. Similarly leaf traits, tuber traits showed significant variability. The biochemical characterization included estimation of starch, total sugars, fat, crude fibre, ash, carotenoid, crude protein and dry matter content. The samples were analysed using standard procedures and the data was analysed using robust statistical methods. The study showed that sweet potato genotypes have wide genetic diversity in terms of proximate nutrients. Genotypes with high total sugar and starch content can be recommended for production of high value-added (alcohol, noodles, snacks, flour) and processed products such as jam, candies, biscuits etc. In addition, they were found to be a rich source of protein which can be promoted among the malnourished areas. The study revealed that the quantitative and qualitative traits would effectively discriminate between the different genotypes thus helping in identification of superior genotypes for crop improvement. Summarizing our results and considering both the morphological and biochemical data, it is evident how the combination of these two different approaches was very effective in differentiating or clustering the different clonal genotypes, as expected by their geographical origin or their phenotypic characteristics.

Keywords: *sweet potato, variability, heterosis, processing, value addition*

Enzymatic hydrolysis and structural characterization of potato cultivar viz. un-malted and malted Kufri Pukhraj

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Abstract

Potato cultivar viz. Kufri Pukhraj is undesirable for utilization in household due to high amount of sugars. Thereby, sweetness present in it can be exploited for enzymatic hydrolysis before their processing into commercial products. Different malting processes were compared in order to increase the sugar levels and the best way of malting was observed as traditional method of burying the potatoes in the soil for 15 days for maximum conversion of starch into sugars. For further liquefaction and saccharification commercial diluted and undiluted α -amylase (specific activity 5000IU/mL/min) and glucoamylase (1000IU/mL/min) were used, respectively. Among undiluted and diluted enzymes, maximum sugars were released using undiluted enzymes. The malted potatoes released maximum sugars i.e. 13.6%

total sugars and 10.6% reducing sugars after liquefaction using α -amylase at 70°C for 60 min. The optimized saccharification temperature and time was 50°C for 24 h that released maximum sugars from malted potatoes. Fourier transform infrared spectroscopy was evaluated as an easy and simple analytical method for determination of starch residues after enzymatic hydrolysis. FTIR spectroscopy revealed that the un-malted potato powder differ significantly from malted potato powder as well as starch hydrolysis samples because the un-malted potato powder showed transmittance bands nearly at 1000, 1200, 1600 cm^{-1} region. However, the malted potato powder and starch hydrolysis samples showed transmittance bands at 1100, 1450, 1600, 2950 and 3400 cm^{-1} region.

Keywords: FTIR; liquefaction; malting; potatoes; saccharification

Digital Agriculture in India through Convergence and Innovations in AI and IoT Sensor Technologies: Opportunities, Risks & Knowledge gaps

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Abstract

By 2050, the global population is expected to surpass ~10 billion, placing immense pressure on agriculture to meet the growing food demand. Currently, in India, the population exceeds 1.4 billion, and this challenge is compounded by limited arable land, declining water resources, and the impacts of climate change. Precision farming, powered by Artificial Intelligence (AI), Machine Learning (ML), and the Internet of Things (IoT), is emerging as a crucial solution to optimise resource utilisation, improve crop yields, and ensure sustainable food security.

Precision farming leverages IoT-enabled sensors to collect real-time data on agricultural land, including soil moisture, pH, NPK levels, temperature, humidity, and light irradiance. Combined with satellite and drone imagery, this data feeds AI models to provide actionable insights for optimising water, fertiliser, and pesticide use. AI-driven analytics enable predictive decision-making for crop production, disease prevention, and yield optimisation, enhancing farmers' profitability.

At CSIR - Central Scientific Instruments Organisation (CSIO), indigenous IoT nodes and gateways have been developed to support real-time data collection and processing in precision farming tailored to Indian conditions. These technologies offer scalable solutions to enhance agricultural productivity, resilience, and profitability, making Indian agriculture more sustainable in the face of growing challenges.

Keywords: precision farming, AI in agriculture, IoT in agriculture, climate change, sustainability, Indian farming, crop yield, soil health, agricultural supply chain

Integrated Morpho-Physiological and Biochemical Profiling of *Asparagus racemosus* under Different Hydroponic Systems: Towards System Standardization

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Abstract

Hydroponic systems have revolutionized the cultivation of medicinal plants, providing precise control over environmental variables critical for plant growth and development. *Asparagus racemosus*, a widely utilized medicinal herb in traditional medicine systems, stands to benefit from the application of hydroponic techniques (Mangala et al., 2023). This study investigates the performance of *Asparagus racemosus* under various hydroponic systems, aiming to integrate morpho-physiological and biochemical profiling towards system standardization. The experiment involved subjecting *Asparagus racemosus* plants to three different hydroponic setups: circulating method (closed system), Sand culture, and Aeroponics compared it with the pot culture (Sardare et al., 2013). Morphological parameters including stem length, root length, and biomass were measured to assess plant growth responses. Furthermore, biochemical profiling was conducted to analyse the content of chlorophyll, carotenoids, catalase, peroxidase, protein, total phenol and amount of total sugar. This comprehensive approach aimed to elucidate how different hydroponic systems influence not only morphological but also the biochemical profiling of *Asparagus racemosus*. The results unveiled significant variations in morpho-physiological and biochemical parameters among the different hydroponic systems. While all systems supported growth and development, the Soilless culture system that is quartz sand culture emerged as the most favourable for *Asparagus racemosus* cultivation. This system exhibited superior root and shoot growth, enhanced photosynthetic activity. The findings highlight the importance of system standardization in hydroponic cultivation for medicinal plants like *Asparagus racemosus*. By identifying the Soilless culture system as the optimal hydroponic setup, this study provides valuable insights for growers aiming to maximize yield and quality in medicinal herb production. Moreover, the standardized protocol established in this study lays the foundation for consistent and reliable cultivation practices, essential for meeting the demands of pharmaceutical and nutraceutical industries. In conclusion, the integrated morpho-physiological and biochemical profiling of *Asparagus racemosus* under different hydroponic systems represents a significant step towards system standardization. By understanding how various hydroponic setups influence plant growth and medicinal quality, this research contributes to the advancement of technology-driven agriculture, paving the way for sustainable and efficient cultivation practices in the production of medicinal herbs.

Through the establishment of precisely regulated environmental parameters, hydroponic cultivation has demonstrated its capacity to enhance the growth, morphogenesis, and yield of medicinal plant species. This technique presents a favourable approach for the acquisition of bioactive compounds essential for pharmaceutical applications, thus facilitating the advancement of medicinal plant research and upscale production efforts.

Keywords: Hydroponic cultivation, medicinal plants, *Asparagus racemosus*.

Objective: To standardize the hydroponic system for *Asparagus racemosus*.

Transcriptomics Integrated with metabolomics reveals the Dynamics of *In Vitro* organogenesis in *Ferulaassa-foetida* L.

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Abstract

In vitro organogenesis in plants offers significant potential for micropropagation, genetic transformation, and the study of developmental processes. Understanding the molecular mechanisms that regulate *in vitro* dedifferentiation and redifferentiation in *Ferula assa-foetida* is crucial for optimizing its regeneration system. Our findings confirmed organogenesis *via* somatic embryogenesis, characterized by distinct stages including globular, heart, torpedo, and cotyledonary phases. Further, the interplay between phytohormones and phytoconstituents plays a substantial role in influencing various stages of regeneration. Additionally, distinct patterns of gene expression and protein accumulation shed light on the cellular reprogramming involved in *in vitro* organogenesis, deepening our understanding of the redifferentiation process. In this study, we examined the morphological changes occurring during dedifferentiation and redifferentiation in leaf explants of *F. assa-foetida*. A comparative analysis of chemical compositions at different developmental stages was performed using LC-MS techniques. Notably, the unique distribution of phytoconstituents (flavonoids, terpenoids, and soluble sugars) was identified as a key regulator of organogenesis. Metabolomics study further revealed an association between secondary metabolite biosynthesis and the redifferentiation process. Moreover, phase transitions were found to modulate distinct proteins, indicating coordinated transcriptional and translational regulation during regeneration. A network of genes-including Somatic Embryogenesis Receptor-like Kinase (SERK), Wuschel (WUS), Scarecrow (SCR), and Cup-Shaped Cotyledon (CUC)-was differentially expressed at various stages of organogenesis. These genes play pivotal roles in phytohormone biosynthesis, transport, and signal transduction pathways during phase transitions. These findings provide insights into cellular reprogramming throughout *in vitro* organogenesis, enabling improvements in regeneration protocols, functional studies, and overall plant enhancement strategies for *F. assa-foetida*.

***Triphala* extract reduces anti-apoptotic protein (Mcl-1) expression through the activation of caspase 3 in hepatocellular carcinoma cells.**

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Abstract

Triphala is an equal mixture of the three myrobalans *Terminalia chebula* (Haritaki), *Terminalia bellerica* (Bibhitaki), and *Embelica officinalis* (Amalaki) according to the Ayurvedic Formulary of India (AFI). Triphala is an herbal supplement that is high in antioxidants and has a number of advantageous qualities. Numerous investigations conducted in recent years have shown that triphala has anti-mutagenic and radioprotective properties. Therefore, the aim of present study was to examine, if an ethanolic extract of triphala had any inhibitory effects on hepatocellular carcinoma cells. Gas Chromatography-Mass Spectrometry (GC-MS) analysis was used to identify and quantify various photochemicals of triphala extract. Further, in two human liver cancer cells (HepG2 and Hep3B), triphala extract was examined for its cytotoxic potential by MTT [3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide] assay. Apoptosis was promoted by triphala extract, which also suppressed the production of anti-apoptotic proteins and triggered Poly-ADP ribose Polymerase (PARP) cleavage. It's significant that triphala extract has cytotoxic effect against liver cancer cells. The current study demonstrated that ethanolic extract of triphala has anticancer properties against hepatocellular carcinoma cells. As a result, triphala may offer as a potential alternative to conventional therapy for cancer patients.

Keywords: *Triphala, Hepatocellular carcinoma (HCC), HepG2, Hep3B, MTT assay, Apoptosis.*

Phytoplankton diversity of Simsang River, a subtropical river of Meghalaya, Northeast India with remarks on seasonal variations

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Abstract

This study investigates the seasonal fluctuations in phytoplankton diversity in the Simsang River, a subtropical river located in Meghalaya, India characterized by unique hydrological and climatic conditions. Phytoplankton play a critical role in aquatic ecosystems, serving as the foundation of the food web and influencing biogeochemical cycles. Water samples were collected seasonally over one year to analyze phytoplankton communities in relation to environmental parameters such as temperature, pH, nutrient levels, etc. Our findings reveal significant seasonal variations in species composition and abundance, with distinct peaks during the monsoon months due to increased nutrient influx and favorable growth conditions. Specifically, significant seasonal change in the phytoplankton group abundance was seen where Chlorophyceae was dominant during the monsoon season while Cyanophyceae and Euglenophyceae in the pre-monsoon season and Bacillariophyceae in the winter season. On account of phytoplankton dominance, Chlorophyceae, Cyanophyceae, Bacillariophyceae and Euglenophyceae quantitatively dominated as compared to other counterparts. The diversity indices indicated a higher richness during the monsoon season whereas the pre-monsoon months showed dominance by a few taxa. Simsang River's phytoplankton communities displayed high Shannon Weiner indices (1.33) and high Pielou's evenness indices (0.94). High Pielou's and Shannon Weiner indices denoted even

distribution of phytoplankton communities and high phytoplankton diversity respectively. It was also seen that there was a significant relationship between the abundance of phytoplankton species and limnological water parameters. This study highlights the importance of understanding phytoplankton dynamics in freshwater ecosystems, providing insights into the ecological health of the Simsang for effectively managing and conserving freshwater ecosystems in Meghalaya.

Keywords: phytoplankton, seasonal fluctuation, Simsang River, biodiversity indices

Advanced Farming Systems in Aquaculture: Strategies to Improve Resource Efficiency and Reduce Environmental Impact

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Abstract

The global aquaculture industry faces pressing challenges in resource efficiency and environmental sustainability. This study presents innovative farming systems and strategies to mitigate these issues. Advanced farming technologies, such as Recirculating Aquaculture Systems (RAS) Biofloc Technology and Aquaponics, are showcased for their potential to optimize resource utilization and minimize waste. Key strategies include - Precision aquaculture using sensors and data analytics, Optimized feed formulation and feeding strategies, Eco-friendly feed sources and alternatives, Low-impact aquaculture infrastructures, Climate change mitigation and adaptation measures. These approaches demonstrate significant improvements in - Water conservation and reuse (up to 90%), Energy efficiency (up to 50%), Waste reduction (up to 80%), Increased productivity (up to 30%), Enhanced food safety and quality. Cutting-edge technologies, including artificial intelligence, IoT sensors, and biotechnology, are integrated to enhance efficiency and sustainability. Best practices, such as regular monitoring, collaborative research, and farmer education, ensure successful implementation. This study provides a comprehensive framework for advancing aquaculture sustainability, addressing - Environmental impact mitigation, Resource conservation, Climate resilience, Social responsibility. The findings will inform policymakers, industry stakeholders, and researchers, driving the development of environmentally conscious and resource-efficient aquaculture practices. By adopting advanced farming systems, the industry can meet growing fish demands while minimizing its ecological footprint.

Keywords: aquaculture, sustainability, resource efficiency, environmental impact, advanced farming systems.

***Insilico* identification of lncRNAs-miRNAs in jelly seed transcriptome of mango (*Mangifera indica* L.)**

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Abstract

Mango also known as “king of fruits” is a major fruit crop in the world because of its taste, aroma, flavor, and high nutritional values. Jelly seed disorder, a mesocarp specific malady, severely affects the mango fruit flavor and pulp characters of many cultivars and hybrids. Jelly seed disorder is one of the major problems in mango production in North India and other mango-producing countries in the world with its increasing incidence. Various regulatory roles of miRNAs and long non-coding RNAs lncRNAs have been investigated in several plants so far, there is yet an absence of such study in physiological disorder of mango. This is the first study to provide information on non-coding RNAs (ncRNAs) in jelly seed transcriptome of mango with the aims of identifying miRNAs and lncRNAs and discovering their potential functions by interaction prediction of the miRNAs, lncRNAs, and their target genes. In this analysis, about 11 miRNAs and over 2000 lncRNAs were identified and the target genes of these ncRNAs were characterized. miR394, miR5015, miR854 and miR5021 targets lncRNA controlling genes expression related to metabolic pathways. Present study also identified lncRNAs derived miRNA involved in carotenoid biosynthesis pathways and lncRNA acts as endogenous target mimics of miR394a and miR5021c to alter expression of phytoene synthase and Glutathione peroxidase. Our results provide essential regulators of anthocyanin biosynthesis and redox homeostasis and opened the door to understanding the role of lncRNAs-miRNA in the regulation of genes involved in carotenoid biosynthesis in mango ripening and jelly seed development.

Keywords: *Mango, Jelly seed, lncRNA, miRNA,*

Evaluation of Different Substrates for the Cultivation of Shiitake Mushroom, *Lentinula edodes* (Berk.) Pegler

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Abstract

The present study was carried out with an objective to study effect of different media on the radial growth, to evaluate various substrates for spawn production, to evaluate various substrates for cultivation, to study about morphological characterization and to record the occurrence of diseases during the cropping period of *Lentinula edodes*. The various culture media like CDA, WSEA, SEA, CMA, SDA and PDA were evaluated for their effect on radial growth of *L. edodes*. The result revealed that maximum RG (80.00 mm) and RGR (8.88 mm/day) was observed in SDA and the minimum RG (51.00 mm) and RGR (5.66 mm/day) was observed in SEA. Different grains substrates viz. Wheat, Sorghum, Barley Ragi, Bajra, maize and rice were evaluated for the spawn production of shiitake. The sorghum grains were most suitable substrate whereas rice grains were least effective for spawn development of *L. edodes*. The seven substrates such as WS + Eucalyptus sawdust, WS + Sal sawdust, WS + Deodar sawdust, WS + Teak sawdust, WS + Chir sawdust, WS + Poplar sawdust and WS + Poplar sawdust +

Chir sawdust were tested for the growth and yield of *L. edodes*. WS + Poplar sawdust was the effective substrate among all other substrates. The result revealed that min. spawn run period of 34.66 days, the min. bump formation period of 58.33 days and the min. basidiocarp formation period of 68.00 days, was observed in WS + Poplar sawdust substrate. The highest yield observed was 260.00 g with B.E. of 25.33% in WS + Poplar sawdust. The max. stripe length and diameter was also recorded in WS + Poplar sawdust substrate. The various pathogens like *Penicillium spp.*, *Trichoderma spp.*, *Penicillium spp.* and *Aspergillus niger* were observed during cultivation of *L. edodes*.

Keywords: mushroom, *Lentinula edodes*, sawdust, substrate

MicroRNAs: Key Regulators of Gene Expression and Therapeutic Potential in Disease and Medicine

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Abstract

MicroRNAs (miRNAs) are small, non-coding RNA molecules that play a crucial role in post-transcriptional gene regulation, influencing numerous biological processes. The present study provides a comprehensive review of miRNA biology, from their discovery and structure to their biogenesis and gene regulatory mechanisms. The significance of miRNAs in controlling gene expression, especially in mRNA stability and translation, is explored alongside their pivotal roles in embryonic development, cell differentiation, proliferation, and apoptosis. We also delve into the association of miRNAs with various diseases, particularly their dual roles as oncogenes and tumor suppressors in cancer, and their involvement in cardiovascular, neurodegenerative, and metabolic disorders. The review highlights the potential of circulating miRNAs as biomarkers for early disease detection and their implications in personalized medicine. Further, the therapeutic potential of miRNA mimics and inhibitors is discussed, alongside challenges in miRNA delivery systems and their application in overcoming drug resistance in cancer treatment. Emerging research in miRNA's role in stem cell differentiation and regenerative medicine is also examined. Technological advancements in miRNA research, including profiling methods and computational tools for target prediction, are reviewed. Finally, the paper discusses future directions, emphasizing novel miRNA discoveries, engineered regulatory networks, and ethical considerations in miRNA-based therapies. This review underscores the growing relevance of miRNAs in biomedical research and their potential in therapeutic applications.

Keywords: microRNA, gene regulation, cancer, cardiovascular diseases, neurodegenerative diseases, metabolic disorders, stem cell research, regenerative medicine, miRNA profiling, miRNA biogenesis, miRNA delivery systems.

Beneficial element availability, uptake mechanism and physiological role in horticultural crops

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Abstract

Plants need essential elements to ensure successful growth and development during vegetative and reproductive stages. Essential elements are classified as macro and micronutrients, depending on the amounts contained in plant tissues (Pilon-Smits *et al.*, 2009). Certain other elements, such as Al, Si, Co, Na, Se, Ce, I, La, Ti, and V do not meet the ‘essentiality’ criteria for mineral nutrients. But have a ubiquitous presence in both soil and water and can be widely taken up and used by plants. Such elements, which may enhance biomass and yield but may not be required for species to survive, are termed as functional/beneficial elements (Marschner 2012). Beneficial elements, when supplied at low dosages, they will help to improve their growth, development, yield and quality by stimulating different molecular, biochemical and physiological mechanisms triggering adaptive responses to challenging environments (Gómez-Merino and Trejo-Téllez, 2018). The available form of beneficial elements are., Al_3^+ , $\text{Al}_2(\text{SO}_4)_3$ and $\text{Al}(\text{OH})_2^+$ (Aluminium); CeO_2 , CeCl_3 , $\text{Ce}(\text{NO}_3)_3$ (Cerium); Co, CoCl_2 (Cobalt); I, IO_3^- , KI, KIO_3 (Iodine); LaCl_3 (Lanthanum); Na_2SeO_4 (Selenium); $\text{Si}(\text{OH})_4$, K_2SiO_3 (Silicon); NaCl (Sodium); TiO_2 (Titanium) and NH_4VO_3 (Vanadium). In the uptake mechanisms of various beneficial elements, their favourable aspects, and the role of these elements in conferring tolerance against abiotic and biotic stresses (Kaur *et al.*, 2016). Whereas, the physiological role of Al in the tea plant showed increasing the antioxidant enzyme activity, which may contribute to increased plant growth (Ghanati *et al.*, 2005). The Co can have a number of beneficial effects, particularly in leguminous plants. In pea plants, the application of 8 ppm of Co to the soil increased growth, nodule number and weight, plant nutrient levels, as well as seedpod yield and seed quality. Co is a component of cobalamin (vitamin B₁₂), which is required for the activity of several enzymes in nitrogen-fixing microorganisms such as Rhizobium and cyanobacteria (Gad, 2006). In Sultana grapevine (Karimi *et al.*, 2020), foliar application of Se at 5mg L⁻¹ considerably decreased vines leaves electrolyte leakage and lipid peroxidation values compared to non se-treated plants under salinity stress condition. Pepper seedlings (5 weeks old) were grown in hydroponic culture with 6 levels of NH_4VO_3 . V uptake was higher in roots than in the shoot of pepper seedlings. Low level of V (10, 20 mg L⁻¹) enhanced the growth status conversely higher V (30, 40, and 50 mg L⁻¹) level reduced the growth. The leaf gas exchange, pigments molecules and root growth also affected by higher V concentrations (Altaf *et al.*, 2021). The beneficial elements are well supported evidence on different horticultural crops and more in deep research is still needed in order to know the action.

Keywords: Aluminium, catalase, proline, peroxidase, and stress

The Next Generation of Bio-Diagnostic Devices: Using Smart Nanomaterials

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Abstract

Electrochemical biosensing devices combine biological recognition components with electrochemical transducers to identify and diagnose the presence of specific biological analytes. Over the past few years, smart nanomaterials are widely used to amplify the signals in varieties of Bio-diagnostic and sensing devices. The specific biological analytes which have been used are neurotransmitters (Anandamide, Serotonin, and Acetylcholine), bacterial proteins causing neonatal sepsis and gastric cancer, psychoactive drugs, glycated albumin, and glycated haemoglobin. These analytes exhibited remarkable selectivity, specificity, strong binding, low limit of detection, and rapid response to develop Bio-diagnostic Devices. In order to enhance the conductivity of electrochemical sensors designed for various analytes, metallic nanoparticles were utilized on Screen Printed Electrodes on biorecognition Elements including molecularly imprinted polymers (MIPs), Aptamers and Functional Enzymes. A high level of demonstrated linear range of 100 pM–1 nM, with upto 0.01 nM detection limit, and high Selectivity of Analytes were detected. Furthermore, advanced nanomaterials were integrated for sensitive TGF detection, which is crucial in various physiological processes and assessing molecule for controlling immunotherapeutic drug efficacy, offering a valuable tool for disease diagnosis and progression monitoring through Smart nano bio-diagnostic devices.



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