ABSTRACTS
ORAL PRESENTATION

O-1 Multilocational juvenile evaluation of *Hevea brasiliensis* genotypes in the pipeline for drought and cold tolerance

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The objective of the study is to identify *Hevea* genotypes having better abiotic stress tolerance and yield potential during their initial establishment phase in non-traditional marginal rubber growing areas. In this context, clonal nurseries with 30 *Hevea* genotypes in the pipeline along with check clones were established in cold stress prone region (Agartala, Tripura State) and drought stress prone region (Dapchari, Maharashtra State) as well as the traditional region (CES, Chethackal Pathanamthitta District of Kerala) that served as non-stressed control. Parameters such as girth, juvenile yield (test incision and test tap methods), leaf chlorophyll content and gas exchange parameters such as net CO_2 assimilation rate (A) and instantaneous Water Use Efficiency (WUE_i) were recorded during their respective stress periods and peak yielding months from these locations. Maximum girth was observed in clones P 177, P 126, P 68, RRII 417 and RRIM 600 under drought stress while clones *viz*., P 177, RRII 208, P 189, P 133 and P 89 were superior under cold stress condition. The clones P 177 and P 126 had superior girth at both the locations. Test incision yield in the second year after planting in the drought region indicated clones viz., P 114, RRII 118, P 168, P 71 and RRIM 600 as superior while clones P 116, RRII 118, RRIM 600, P 65, P 80 and P 114 were promising under cold stress conditions of Agartala. The clones, P 114, RRIM 600, RRII 118 and P 71 performed equally well under both the stress conditions. In terms of mean annual test tap yield during third year, pipeline clones viz., P 68 and P 168 excelled along with check clones RRII 417, RRII 105, RRIM 600, and RRII 430 under drought stress while P 116, P 89, P 71, P 189, P 178 and RRII 417 did better under low temperature stress. Clones P 71 and RRII 417 exhibited tolerance to both the stresses. In the traditional region, clones P 174 and P 68 along with RRII 430, RRII 417 and PB 260 exhibited superior annual mean test tap yield. Clone RRII 417 was the only clone that showed superior yield performance across all the three locations.

O-2 Nutritional and biochemical profiling of immature dropped kinnow fruits

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Kinnow (*Citrus reticulata)* is a versatile citrus fruit that could serve as a significant source of nutrition for both humans and animals. Immature dropped kinnow fruits (IDKF) are typically considered agricultural wastes but offer a great deal of potential for use as nutraceuticals. The present study was proposed to examine the proximate composition, minerals, vitamins, and antioxidant potential along with secondary metabolite profiling of IDKF. The proximate composition revealed 10.7% protein, 1.8% fat, 6.8% minerals, 7.4% sugars, and 68.4% of dietary fiber. Macronutrients such as Ca, K, Mg, and Na and micronutrients such as Zn, Cu, Fe, and Mn were observed during mineral analysis. Aqueous ethanolic extract of IDKF showed total phenolic and flavonoid contents of 5.5 g GAE, and 8.8 g QE per 100g IDKF, while total alkaloid and saponin contents were 0.69 mg atropine equivalent and 4.9 mg diosgenin equivalent per 100g IDKF. The antioxidant ability of IDKF was assessed with DPPH free radical scavenging activity of 364.04 mg AAE and ferric-reducing ability of 8.6 g TE per 100g IDKF. Amino acid profiling revealed that arginine, leucine, aspartic acid, serine, threonine, and glycine are among the most abundant amino acids in dried IDKF. This study reported 55 different metabolites using LC-MS analysis and found that IDKF is a rich source of flavonoids like kaempferol, limocitrol, kaempferol-3-o-rutinoside, tangeretin, and nobiletin followed by sinapic acid (phenolics) and limonin (limonoid). With technological interventions will not only increase the profitability of food processing firms but will also help to reduce the pollution burden on the environment.

O-3 Physiological and biochemical responses in Guar: Recovery from drought stress and intrinsic variation among germplasm

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Drought is an inevitable environmental constraint to crop productivity. *Cyamopsis tetragonoloba* (L.) Taub commonly known as guar is an economically important crop used as vegetable, feed and for its seed gum. It is a major leguminous crop of western Rajasthan, India. We examined the photosynthetic and biochemical parameters in leaves and their translocation in the pods in order to envisage the possible recovery towards the drought stress along with intrinsic variation among guar germplasm. A presumptive systematic approach considering biochemical and physiological attributes along with yield facet was evaluated. Five parameters *i.e.* chlorophyll and carotenoid content, relative leaf water content, leaf area, antioxidant activity were studied in leaves whereas chlorophyll and carotenoid content along with antioxidant activity were studied in developing pods after 40 days of sowing in 22 germplasm of Guar. Test weight and percentage of seed components i.e. hull, endosperm and germ % was also evaluated in order to know the effect of drought on translocation of photoassimilates to the developing pods. Results obtained from leaf-based studies indicated decline in all the tested parameters except antioxidant activity. More than 3-fold increase in antioxidant activity was observed in CAZG-109 (4.2 mM Trolox/g) under drought condition as compared to irrigated one. The total chlorophyll content under irrigated condition ranged between 0.356 to 2.199 mg g^{-1} FW with minimum % decrease in RL-39 genotype under drought stress. Leaf area was highest in PNB genotype which get reduced by 21.06 % under drought stress. The chlorophyll pigment response of the sink tissue (pods) was also altered under stress but changes were slightly different. Level of antioxidant activity was higher in developing pods under drought stress (8.66 mM Trolox/g in RGC-936). Test weight of CAZG-109 was highest among all the genotypes which correlates with antioxidant activity and germ percentage. Results showed that some of the guar germplasms are able to maintain yield in terms of test weight by maintaining growth and pod filling even under water limiting conditions. Therefore, the varieties which maintain higher photosynthetic ability and antioxidant activity were more tolerant to drought stress.

O-4 A comparative investigation on radiated and non-radiated chitosan for enhancing productivity, digestibility and defence responses in *Festuca arundinacea*

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Enhancing forage productivity and quality is crucial for sustaining livestock production and productivity. Simultaneously, there is parallel need for environment friendly alternatives for boosting forage productivity and quality. Among many molecules, chitosan has emerged out as a promising biological molecule (elicitor) with a diverse array of applications including its potential to enhance plant growth, boosting plant defense mechanisms, simulating oxidative stress and preparing plants for external challenges. In the current investigation, three different types of chitosan molecules *viz*., electron beam irradiated chitosan (EBIC), gamma irradiated chitosan (GIC) and normal chitosan (NC) were tested for their potential in enhancing productivity of Tall fescue (*Festuca arundinacea* Schreb.) grass, which is a prominent grass species in the temperate region and has impotence in providing lush green forge for longer duration of the year. The effective doses of chitosan in promoting growth and defense responses and the treatment methods, including seed treatment (ST), foliar treatment (FT), and a combination of both (STFT) were investigated in Tall fescue. The study revealed distinguished variations in growth indicators following the application of EBIC, GIC and NC @ 25ppm, 50ppm, and 100ppm through seed treatment, foliar treatment and combination of seed and foliar treatment. The Tall fescue plants treated with FT of GIC at 50ppm displayed improved productivity and elevated levels of defense-related enzymes involved in combating biotic and abiotic stresses and scavenging activity against reactive oxygen species (ROS). The substantial improvements in nutritional parameters and reduction in anti-nutrients *viz.* tannins, oxalate, total phenol, lignin and cellulose content was also recorded with FT of GIC @ 50 ppm. The treatment with gamma irradiated chitosan also improved dry matter digestibility (IVDMD) of the grass. These findings suggested that the foliar application of gamma irradiated chitosan (GIC) at 50ppm is effective in enhancing productivity, digestibility and stress-responsive effects in tall fescue grass.

O-5 *Piper longum* L. endophytes improve growth and stress tolerance in multiple plant species

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Piper longum is a medicinal plant which is widely used to treat respiratory and digestive disorders in Ayurvedic, Siddha and Unani medicine systems. This study involves investigation of endophytic microbial diversity in *P. longum* by culture-dependent approach. We have isolated 67 bacterial endophytes from various surface-sterilized parts of this medicinal plant. Four endophytes with multiple plant growth promoting traits have been characterized, and their effect has been studied on tomato and wheat seedlings. The endophyte-treated seeds show higher germination percentage, and exhibit enhanced vegetative growth (root and shoot length and number of leaves). Further, the endophyte-inoculated *P. longum* plants demonstrated better stress tolerance potential, as estimated by lesser ROS accumulation, and higher proline and phenylalanine content. Altogether, these results highlight the promising role of *P. longum* endophytes in contributing towards sustainable agriculture.

O-6 Effect of water deficit on physiological-biochemical indexes and photosynthetic characteristics of young plants of natural rubber

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Polybag grown young plants of *Hevea* clones *viz*. RRII 105, RRII 414, RRII 430 and RRIM 600 were subjected to drought stress by withholding irrigation continuously for 10 days and their relative drought tolerance potential was assessed. Water deficit stress significantly reduced photosynthetic assimilation rate (*A*) and stomatal conductance (*gs*) resulted in limited plant growth. However, the rate of reduction in *A* and *gs* was lesser in RRIM 600 followed by RRII 430. Leaf water potential (Ψ_L) become decreased and under low Ψ_L clones such as RRIM 600 and RRII 430 maintained a comparatively better assimilation rate. A significant level of reduction was observed in the case of total chlorophyll content under stress in all the clones. Contrary to this total carotenoid content under stress was found high in RRII 430 and RRIM 600 compared to RRII 414 and RRII 105. Sod and total peroxidase activities increased under stress and it was found in RRIM 600 and RRII 430. Antioxidants, glutathione and ascorbic acids were found increased compared to control plants. Xanthophyll cycle activity showed significant variation among the clones when exposed to water deficit stress. Estimation of xanthophyll cycle pigment composition in leaves showed that RRII 430 and RRIM 600 had a bigger xanthophyll pool size (V+A+Z) than RRII 414 and RRII 105 under stress condition. De-epoxidation rate was high under drought stress in all the clones with relatively a high magnitude in RRII 430 followed by RRIM 600. Level of neoxanthin (N), lutein (L) and zeaxanthin (Z) was found greater in stressed plants compared to control plants. Clones like RRIM 600 and RRII 430 had a higher ratio of xanthophyll cycle pigment to total carotene and total chlorophyll under drought condition. These clones showed better adaptation mechanisms and photoprotection mechanism mediated by xanthophyll pigments and capable of alleviating photoinhibitory damage during water deficit stress.

O-7 Amino acid profiling in chickpea crops through near-infrared spectroscopy (NIRS) a rapid and non-destructive approach

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Chickpea (*Cicer arietinum* L.) is a vital leguminous crop globally recognized for its nutritional significance and agronomic resilience. Amino acids, as the building blocks of proteins, play a crucial role in the nutritional quality of chickpea grains. Traditional methods for amino acid quantification in chickpea crops are time-consuming, labour-intensive, and often require destructive sampling. This study explores the potential of Near-Infrared Spectroscopy (NIRS) as a rapid and non-destructive technique for assessing the amino acid profile in chickpea crops. Spectroscopic data were collected from a diverse set of chickpea samples encompassing different varieties, growth stages, and environmental conditions. Chemometric models were developed to establish robust relationships between the NIRS spectra and amino acid concentrations, employing partial least squares regression (PLSR) analysis. The predictive capabilities of the models were evaluated using cross-validation and independent validation sets. Results demonstrated the feasibility of NIRS for accurate and simultaneous estimation of multiple essential and non-essential amino acids in chickpea crops, including but not limited to lysine, methionine, and arginine. The models exhibited high predictive performance with coefficients of determination (R^2) ranging from 0.85 to 0.94 for different amino acids. Moreover, the NIRS-based predictions were validated against conventional wet chemistry methods, showing strong agreement and confirming the reliability of the NIRS approach. This study underscores the potential of NIRS as an efficient and sustainable tool for amino acid profiling in chickpea crops. The non-destructive nature of NIRS allows for real-time monitoring of amino acid content during various growth stages, offering valuable insights for crop management strategies. Implementing NIRS-based amino acid analysis in chickpea cultivation can significantly enhance breeding programs, optimize nutritional quality, and ultimately contribute to global food security and sustainable agriculture.

O-8 Antioxidant and antimicrobial studies on silver nanoparticles of potato peels

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In recent years, the synthesis of nanoparticles from natural sources has gained significant attention due to their potential applications in various fields, including medicine and agriculture. In this study, silver nanoparticles (AgNPs) were synthesized using potato peel extract, and their antioxidant and antimicrobial activities were investigated. The antioxidant parameters, including 2,2-diphenyl-1-picrylhydrazyl (DPPH) scavenging activity, 2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) radical scavenging activity, ferric reducing antioxidant power (FRAP) and total phenolic content (TPC) were evaluated. Furthermore, the antimicrobial potential of the synthesized AgNPs was assessed against two Gram-positive bacteria, Bacillus subtilis and Staphylococcus aureus, as well as two Gram- negative bacteria, Escherichia coli and Plasmodium vulgaris. The results indicated AgNPs-containing potato peel extract showed a higher antioxidant activity as 65.87±1.8% by DPPH assay, 85.06±2.15% by ABTS assay, 25.06±0.29 mg TE/g by FRAP assay and TPC was 307.31±5.92. The antimicrobial activity was higher in potato peel silver nanoparticles extract as compared to potato peel extract alone. The zone of inhibition of 17mm and 19mm was observed with Gram positive bacteria using silver nanoparticles of potato peel extract and 14mm and 15mm was observed with Gram negative bacteria using silver nanoparticles of potato peel extract. It could be concluded that potato peel extract can be used effectively in the production of potential antioxidant and antimicrobial AgNPs for commercial application.

O-9 Biochemical changes associated with storage period in sweet potato

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The storage quality of sweet potato was checked for two consecutive years. Six different genotypes (NSP 2, NSP 5, NSP7, NSP 18, C-71, Bhukanti) of sweet potato were stored for 42 days (6^{th} week) in ambient condition. Comparing among the genotypes revealed the highest starch content in C-71 (61.52%). The highest amylose content was found in NSP 5 (11.92%). the maximum amount of amylopectin was found in C-71 (52.493%) at 21 days of harvest followed by NSP7 at 7 days of harvest (51.01%).The crude fiber content was found to be degraded gradually in storage condition. Bhukanti had the highest fiber content (3.097%) at par with NSP 5 (3.037%) at fresh harvest stage and lowest average crude fiber was found in 42 days after harvest was 0.813%.The highest protein containing genotype was NSP7 (2.30%) while the same genotype was the highest protein content bearer at fresh harvest stage (2.95%) at par with NSP 2 (2.88%) and C-71 (2.84%).Under fresh harvest condition C-71 was having the highest ascorbate content (34.96) at par with NSP 7 (31.16 mg/100g).The maximum amount of phenol was found in NSP 18 in 42^{nd} day of harvest (44.40 mg/100g) followed by NSP 2 (43.63mg/100g).The sweet potato genotype NSP5 was found to be the most suitable genotype for storage from freshly harvested upto 5^{th} week on the basis of total phenol content and NSP7 can also be a good genotype for storage as it contained lowest starch content and soluble sugar content on 42 days of storage as well as highest beta carotene content and lowest amylase activity at average room temperature of 11.92^{o}C.

O-10 "Smart" drug delivery: A window to future of sustainable translational drug development

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The concept of sustainability is slowly gaining traction in the pharmaceutical Industry. Using therapeutics from natural sources in a sustainable and targeted way is one of the strategies that can be adopted. Smart Drug Delivery Systems (SDDS) are smart systems that exhibit desired biomedical functions in response to specific biological or pathological stimuli. There is a great deal of interest in SDDSs as an alternative to chemotherapy because of site-specific drug delivery and effective therapy at low concentrations of therapeutic agent. Smart carriers used for successful transportation of the loaded drug include liposomes, dendrimers, polymeric micelles, meso-porous silica nanoparticles and other inorganic nanocarriers. The targeting ligands, such as antibodies, small molecules, polyethylene glycol, and other proteins, recognize the target cells and successfully facilitate the release of the drug to the target organs, tissues, or cells in response to stimuli. Despite the potential therapeutic applications of smart drug delivery systems, their effectiveness is impacted by many factors. Therefore, to overcome the limitations and to enhance the efficiency and clinical applications; research should be conducted to properly select, design, and further modify smart carriers, therapeutic drugs, and the targeting ligand. Our lab has been exploring a stimuli responsive small molecule drug conjugates wherein we are targeting cancer and cancer stem cells. We are using the folate receptor to selectively target Cancer and Cancer stem cells. Our innovative approach to chemosenstize cancer cells for delivery of anticancer therapeutics have yeilded encouraging results.

O-11 Micropropagation techniques for quality plant production of horticultural crop

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Micropropagation, alternatively referred to as tissue culture or in vitro propagation, is a robust biotechnological methodology employed in the fields of horticulture and agriculture to efficiently generate many plants possessing desirable traits. The implementation of micropropagation techniques has played a significant role in enhancing the productivity of horticulture crops. These procedures facilitate the expeditious propagation of plants, preservation of genetic consistency, and generation of planting materials that are free from diseases and possess enhanced genetic traits. The advancement of culture media formulation, characterized by precise nutrient compositions, has played a pivotal role in the development of suitable culture media. The optimization of nutrient ratios and the incorporation of growth regulators have been employed by researchers to enhance different phases of plant growth, including shoot proliferation and root formation. The implementation of this practice guarantees the conservation of invaluable genetic resources and serves as a preventive measure against the depletion of genetic diversity. This technological advancement facilitates the dissemination of botanical specimens. The utilization of micropropagation techniques has facilitated the cultivation of plants that are free from diseases by employing meticulous sterilization methods and conducting thorough pathogen screening. This phenomenon leads to a decrease in the necessity for chemical interventions and hence enhances agricultural productivity. The practice of tailoring hormone regimens to specific plant species or cultivars has yielded notable advancements in shoot proliferation and roots, hence enhancing the speed and efficacy of micropropagation processes. The integration of micropropagation with precision agricultural techniques, such as controlled environment agriculture and hydroponics, has facilitated the continuous production of crops throughout the year and the provision of ideal growing conditions, resulting in enhanced yields. The impartation of knowledge and training in micropropagation techniques has played a pivotal role in facilitating their acceptance and use among horticulturists and growers. The utilization of workshops, courses, and educational resources has played a crucial role in ensuring the appropriate implementation of these strategies. The ongoing progress in micropropagation techniques remains crucial in addressing the increasing need for superior horticulture crops, while simultaneously upholding genetic diversity and sustainability in the field of agriculture. These technologies play a significant role in enhancing crop productivity, minimizing production expenses, and facilitating the advancement of robust and enhanced crop cultivars. The present study focuses on micropropagation of some of the horticultural crops highlighting the importance of production of quality planting materials for commercialization purpose.

O-12 Biochemical analysis of phycocyanin of Cyanobacteria as an indicator of mercury toxicity

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Excess use of pesticides, fungicides and extensive industrialization leads to the accumulation of toxic metals like mercury in aquatic environment. In this environment, this metal primarily affects the algal productivity by acting at the level of basic physiological process i.e., photosynthesis. Therefore in this investigation the effect of mercury (6-30 μM) was studied on photosynthetic electron transport as well as energy transfer on the economically important aquatic cyanobacterium, *Spirulina platensis* by incubating for 5 min in the presence of metal ion. Electron transport studies clearly demonstrated that photosystem II is more susceptible to low doses of mercury (6 μM) than that of photosystem I. Spectral measurements clearly indicated that the absorption capacity of phycocyanin is decreased when compared to other pigment proteins. In addition the energy transfer from phycocyanin to chlorophyll *a* in photosystem II gets altered due to toxicity of mercury. Both *in vivo* and *in vitro* studies proved that mercury is binding to the β-subunit of phycocyanin at 84th amino acid cysteine and altering the energy transfer in this cyanobacterium. Upon prolonged incubation β-subunit (22 kDa) is getting degraded due to the induction of proteases by mercury toxicity.

O-13 Environment impact assessment on habitations due to pollution: Methodology

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Pollution is of many times like air, sound, water, soil, transport and many more can cause nuisance to living organisms and other species that survive in nature. The pollution may cause several disorders to human beings. To assess the environment regular and due to pollution several procedures may be used. All the methods that are used in assessing the air, soil, water and noise and many of conservation methods will be discussed with their principles during the conference.

O-14 Potential of natural farming for sustainable agriculture development under changing scenario of climate in North Western Himalayas

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Natural farming is the system of agro ecology based diversified farming which allows the functional biodiversity and takes into account various crops, trees and livestock and reduces the production cost by substituting chemical fertilizers and pesticides with various home-grown products such as Beejamritham, Neemastra etc. and by use of intercropping as well as mulching. An alternate farming practice for increasing the farmer's income is the zero-budget natural farming. Natural farming may not be for the yield increasing purpose but it will increase the farmers' income for sure by reducing the cost leading to long term sustainability. Natural farming takes into account various activities such as enhancing the soil conditions by managing soil biological activities, organic matter and enhancing the biomass activities. Zero budget natural farming emphasizes mainly on cost reduction, improvement in land quality and also on increasing the farmers' income. Natural farming also known as eco-agriculture or ecofriendly agriculture is a neoteric approach for improving the traditional as well as modern agricultural practice ensuring the environment safety and community health. Natural farming is the practice which needs public awareness and participation for preserving the environment to restrict any further damage. This practice includes sustainable agriculture, organic farming, agroecology, eco agriculture and permaculture. Various features of natural farming are achieving yields similar to chemical agriculture, increment in soil fertility, minimization of water requirement. In India, Natural farming is encouraged as BPKP (Bharatiya Prakritik Krishi Paddhati Programme) under centrally sponsored scheme-PKVY (Paramparagat Krishi Vikas Yojana). Organic manures and natural farming are effective in several crops and found to balance the source and sink relationship, leading to increase in the yield of crops. Exogenous application of organic manures is one approach to improve crop productivity. Due to chemical farming, the microbial activity and its diversity gets hampered. By use of natural farming, this problem can overcome. Natural farming is a sustainable approach and works perfectly in coordination with environments. Natural farming preserves the environment and develop better soil structure and reduce the soil compaction and erosion. Natural farming does not contaminate the environment and do not contribute to soil and water pollution and hence, ultimately saves the environment from the global warming like problems. The various food products obtained from the natural farming are safe and healthy and does not contain the residue of pesticides. Natural farming preserves the soil nutrients, soil fertility and quality because it does not involve the use of unbalanced chemical fertilizers. Natural farming can bring about the improvement in the biodiversity, soil properties as well as in the enzyme activity in different agro ecosystems.

O-15 Comparison of ethanol production in UP vs Maharashtra

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Uttar Pradesh has been dominating Maharashtra as the major sugarcane producer in the country from last many years. In current season 2022-23, a total of 107.29 lakh tonnes of sugar has been produced in Uttar Pradesh surpassing, Maharashtra which has produced 105.30 lakh tonnes. Despite operating with only 118 sugar mills this season, lower than the 210 mills operational in Maharashtra. The author has compared the two sugarcane dominating states in more than few parameters. Global concern about the climate change and the consequent need to minimize the emission of greenhouse gases have encouraged the use of bio-ethanol as a gasoline replacement or additive. Sugar mills can divert excess sugarcane to ethanol, which is blended with petrol, which not only serves as a green fuel but also saves foreign exchange on account of crude oil import. The first graph denotes, the growth rate in ethanol production over past five years has exponentially increased in Uttar Pradesh. During past few years, aggregate growth rate in sugar diversion to ethanol was in positive trend. From mere 1lakh ton in sugar season 2018-19 to 20.14 lakh ton in sugar season 2022-23. Nearly 2000 % growth rate. The comparative study between sugar mills of Uttar Pradesh and Maharashtra indicates that Uttar Pradesh has taken a way long lead in diversion of sugar to ethanol over Maharashtra. Presently 68 Sugar mills are producing B-Heavy Molasses along with 15 sugar mills are producing direct ethanol

O-16 Mitigating roles of green-synthesized zinc oxide nanoparticles in combating water stress in the *Brassica oleracea* seedlings

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Zinc oxide nanoparticles (ZnO NPs) are synthesized through an eco-friendly method by using leaf extract of *Tridax procumbens*. Characterizations of the green-synthesized ZnO NPs were done by viz. fourier transforms infrared spectrum, field emission scanning electron microscope, ultraviolet-visible spectrum and X-ray diffraction analysis, and. The present experiment revealed the potential role of green-synthesized ZnO NPs in the alleviation of polyethylene glycol (PEG) induced water stress. Several biophysical and biochemical parameters such as growth, photosynthetic pigments, sugar content, antioxidant enzymes, etc were performed to observe the effect of ZnO NPs in the *Brassica oleracea* seedlings exposed to water stress. The green-synthesized ZnO NPs were observed to increased germination rate, root and shoot length, chlorophyll content, sugar content when given as individual as well as in combination with PEG. Moreover, the green-synthesized ZnO NPs alleviated the harmful effect of PEG-induced stress by up-surging the photosynthetic yield and by improving the antioxidant activities. This research work determined the potential role of green-synthesized ZnO NPs which increase the growth performance and mitigate the water stress in *Brassica oleracea* seedlings.

O-17 24-Epibrassionide improves salt tolerance mechanism in *Brassica juncea* L. cv. Varuna by regulating endogenous nitric oxide levels and antioxidant metabolism

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24-Epibrassinolide (EBL) treatment has profound impacts on reducing salinity stress in plants. However, the effect on endogenous nitric oxide (NO) signalling is unknown. The impacts of EBL in response to salinity stress in *Brassica juncea* L. seedlings by regulating nutrient homeostasis, antioxidants metabolism, methylglyoxal detoxification system and cellular damage have been investigated in this study. EBL (10^{-6} M and 10^{-8} M) pre-treated seedlings were grown in alone and/or combination with defined levels of salinity treatments (100 mM and 200 mM NaCl) under laboratory growth conditions. Our results indicated that salinity stress significantly ($P \leq 0.05$) increased the Na^+ accumulation in a dose-dependent manner, which aggravated the nutrient homeostasis and pigment contents by inducing oxidative damage through elevated hydrogen peroxide, malondialdehyde, and methyl glyoxal production. The positive roles of EBL against salinity stress were reflected through decline in the nuclear damage, cell death, and maintenance of redox ratios of AsA/DHA and GSH/GSSG. EBL mediated up-regulation of γ-glutamyl cysteine synthetase activity increased the GSH pool, which boosted the antioxidant defense and methyl glyoxal detoxification system. The increased production of endogenous nitric oxide and S-nitrosothiols in EBL pretreated seedlings indicated the existence of possible cross-talk between these signalling molecules in mediating the salinity stress responses. Hence, this work demonstrated that EBR enhanced the nutrients and pigments contents by regulating nitric oxide homeostasis, osmolytes synthesis, and antioxidant defense in mustard seedlings under salinity stress.

O-18 Ethnopharmacological investigation of an important ethnomedicinal plant *Artemisia nilagirica* for anticancer potential

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The utilization of medicinal plants within traditional remedies is recognized for their cost-effectiveness, accessibility, safety, and their potential reservoir of bioactive compounds applicable to contemporary therapeutic paradigms. Within the realm of Indian traditional medicine, *Artemisia nilagirica* (AR) has been historically employed for addressing diverse ailments, including cancer. This study investigated the anticancer potential of AR through a comprehensive exploration of its ethanolic extract, bioactive fractions, and sub-fractions against various human cancer cell lines using bioactivity guided fractionation to yield ethanol extract (AR-01), butanol (AR-02), ethyl acetate (AR-03), hexane (AR-04), and water (AR-05) fraction. The cytotoxicity assessment of these fractions against three human cancer cell lines i.e., colon (DLD-1, HT-29), lung (A-549), and breast (MCF-7) using Sulforhodamine B (SRB) assay. The results unveiled notable cytotoxic effects of AR-03 and AR-04 fractions, particularly against colon cancer cells. Further fractionation of AR-03 and AR-04 yielded sub-fractions (AR-03A to AR-03E and AR-04A to AR-04C). Among these sub-fractions, ethylacetate and hexane subfractions AR-03E and AR-04A exhibited specific cytotoxicity against DLD-1 cancer cells. The cytotoxic selectivity of bioactive sub-fractions against DLD-1 cancer cell line could be explained by identified compounds *β-santonin, artemorin and caryophyllene oxide* as these compounds were commonly present in all the bioactive fractions and sub-fractions of AR-01. The experimental outcomes of this investigation substantiate the traditional application of *Artemisia nilagirica* as an herbal remedy for anticancer objectives. This study presents novel revelations concerning the cytotoxicity and selectivity of the ethyl acetate and hexane sub-fractions (AR-03E and AR-04A) against DLD-1 human cancer cells, opening avenues for potential therapeutic implications.

O-19 Antioxidative responses in two varieties of black gram (*Vigna mungo* L. var. DPU-88-31 and IPFD-99-13) to zinc deficiency and water stress

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An experiment was conducted to study the response of water stress along with Zinc (Zn) deficiency on growth, physiological responses and water relation in two varieties of black gram differing in their susceptibility to Zn deficiency. Study revealed that continuous water deficit (till 9d) along with Zn deficiency in both varieties of black gram showed stunted plant growth, decrease in root elongation, thinner lateral root formation, wilting and chlorosis, followed by tip and leaf margin burning in var. DPU-88-31 and plant death in var. IPU-94-1. Other parameters like relative water content, stomatal movement and electrolyte conductivity were also affected. Further study revealed that the efficient utilization of Zn stimulates the antioxidative enzymes (SOD, APX and GR) for counteracting water stress effects and higher RWC of var. DPU-88-31 which was moderately susceptible to Zn deficiency as compared to var. IPU-94-1 which was highly susceptible to Zn deficiency.

O-20 Phytochemical screening, antioxidant, and antimicrobial activities of *Coptis teeta* Walls. against human pathogens

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Coptis teeta Walls is an endangered plant endemic to the Mishmi hills of Arunachal Pradesh, India has great traditional uses against malaria, jaundice, dysentery, diarrhoea, tooth decay and other ailments. Various plant extract is subjected to evaluate the presence of phytochemicals, total phenol, flavonoid, antioxidant activity using DPPH, ABTS and FRAP methods and antibacterial activities against the human pathogenic bacteria. DPPHABTS and FRAP. The qualitative analysis showed presence of alkaloid, carbohydrates, saponin, phenols, flavanoids, tanin, terpenoids, cardiac glycoside, coumarin, starch, quinone, phlobatanin and steroids. Total phenolics content (TPC) and total flavonoid content (TFC) were found to be highest in acetone extract with 100.24±0.00 mgGAE/g and 269.13±0.05 mgQE/g respectively. The highest DPPH radical scavenging activity observed in acetone extract and lowest in n-hexane extract IC_{50} of 7.37 µg/ml and IC_{50} 76.11 µg/ml respectively. Whereas in ABTS assay IC_{50} was highest for both water extract 1.41 µg/ml and acetone extract 1.91 µg/ml which was lower than that of the ascorbic acid with IC_{50} 2.73 µg/ml. In FRAP assay highest antioxidant activities was found in methanol extract 113. 93 µM Fe(II)/g followed by acetone extract with 98.81 µM Fe(II)/g. The Antibacterial activity was evaluated by disk diffusion, well diffusion, MIC and MBC on two gram-positive bacteria namely *Streptococcus mutans*, *Streptococcus pyogenes* and three-gram negative bacteria namely *Vibro cholerae*, *Shigella flexneri* and *Salmonella typhi.* The results showed that ZOI for water, methanol and chloroform fraction at disk diffusion and well diffusion was highest at the concentration of 1.6mg/ml. and lowest at 400µg/ml. For all the extracts the MIC and MBC values was ranging from 0.625µg/ml – 5mg/ml and 1.25 mg/ml – 5mg/ml respectively, for all the tested pathogens.

O-21 Patenting and technology transfer trends in green agriculture

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The basic technical terminology as per the Nwachukwu Citation of 2023 defines the term 'Green Agriculture', as a sustainable farming based on environment conservative philosophies, policies and practices to prevent the degrading of the ecosystem and as such, a traditionally subsistent agricultural-mindset that aims at achieving food security. The deployment of methods/processes/means of achieving the 'Green Agriculture' goals (often cited as Green Solutions) is commonly referred to as the 'Green Technologies'. The most common reason for an emerging interest in the development of Green Solutions is its potential exploitation in environment friendly sustainable agriculture, where the Green Technologies could play a significant role in striking a right balance between the development agenda of economy and sustainability agenda of the environment. A FAO report of 2009 estimates that by 2050 the world would be requiring more than 60 % more food, feed and biomass from the same amount of land. The pressure of rising population, income, dietary preferences and urbanization in developing countries such as India would require extraordinary steps to meet such huge demands by substantially increasing the crop yield and optimizing the use of input resources. It is here that the study and understanding of trends in the Patenting of 'Green Solutions' / Green Technologies and their commercialization hold the key for future.

O-22 Effects of altitude on phytochemical content and antioxidant activity of *Achyranthes aspera* L. roots

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Phytochemicals such as phenol and flavonoid plays an important role in plant defense system. Increasing altitudes increases the intensity of UV radiation and decreasing temperature that results in stressful conditions for the plants. *Achyranthes aspera* L. is a well-known medicinal plant that grows along an altitudinal range of below 500 m to above 1000 m. Considering the immense medicinal value of *Achyranthes aspera* L., the study was aimed at evaluating the effect of altitudes on the production of secondary metabolites and antioxidant activity in the roots of the plant collected from three different altitudes of Garhwal Himalaya. The total flavonoid content was determined using aluminium chloride colorimetric test. A 2, 2-diphenyl-1picrylhydrazyl (DPPH) assay was used to determine antioxidant activity. A significant increase was observed in total phenol content, total flavonoid content, and antioxidant potential with increasing altitude in chloroform, methanol, and distilled water extracts. The highest phenol content was observed in the sample collected from Tehri (Above 1000 m) and similar trends were reported for flavonoids and antioxidant activity as well. The study confirms that change in altitudes affects the quantity of secondary metabolites in *Achyranthes aspera* L. as well as its antioxidant potential. Thus, it increases their stress tolerance and also strengthens their therapeutic potential.

O-23 Extraction of hesperidin from immature dropped kinnow fruits by using different solvents

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The immature droppings of kinnow (*Citrus reticulata*) fruits (IDKF) are now recognized as economically valuable products due to various phytochemical properties. Hesperidin, a popular flavonoid, is present in significant concentrations in citrus fruit and associated with numerous health benefits. In the current investigation, the most effective method for hesperidin extraction from IDKF was determined utilizing various solvents such as DMSO, ethanol, NaOH, HCl, and methanol. Extraction with DMSO:ethanol (1:1 v/v) and 50% ethanol resulted in lesser hesperidin yield i.e., 0.4% and 0.2%, respectively, and also the process was very time-consuming. Extraction with NaOH-HCl resulted in a 2.55% yield of hesperidin but is less preferred due to the use of harsh chemicals. However, the best results were obtained by extracting IDKF with acidified methanol (1:10 w/v) to produce the creamish-white hesperidin powder. The hesperidin extraction from acidified methanol (5%) was standardized at different temperatures *viz.*50, 60, 70, 80, and 100°C for 2.5 hr for better yield. The results showed that the maximum yield i.e., 3.56% was obtained at 70°C, followed by a yield of 1.135% at 50°C, 2.7% at 60°C, 3.075% at 80°C, and 1.976% at 100°C. Similarly, another parameter i.e., an acid concentration was also optimized from 3% to 7%, but it didn't show any significant effect on hesperidin yield. This method consumed less energy and ensured the good quality and stability of the extract. These results indicated that extraction using acidified methanol can be adopted for large-scale hesperidin production with some modifications to maximize the utilization of resources and improve the purity of extracted hesperidin.

O-24 Development and quality evaluation of protein rich pasta from pigeon pea

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Pigeon pea (*Cajanus cajan*) is one of the major pulses grown in India which is mainly consumed in the form of dehusked split pulse as 'dal' and also used in preparation of traditional dish 'sambhar'. In the present study cold extrusion technique has been employed for diversification of its uses and developing protein rich pasta by replacing semolina with pigeon pea flour (0-100%) in the formulation. The cooking quality, colour parameters, nutritional property and sensory acceptability of all the pasta samples were evaluated. The cooking time of the pigeon pea based pasta samples was found to be more than the control sample. Incorporation of pigeon pea flour enhanced the water uptake ratio, volume expansion ratio and gruel solid loss, the lightness and yellowness of pasta. The Yellowness Index of pasta samples ranged from 23.11 - 43.01. The pigeon pea flour incorporation lowered the phytic acid content of pasta samples because of its lower phytic acid content (262 mg/100g) than semolina (881.40 mg/100g). The study indicated that pigeon pea flour could be incorporated up to 60% level with good sensory acceptability (overall acceptability score of 7). The crude protein content, total dietary fibre content and cooking time of this pasta sample was 17.27±0.25 %, 5.53% and 5 min, respectively.

O-25 A comprehensive account on contamination and microbial detoxification of Cr(VI) in different extreme environmental conditions

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Chromium (Cr) compounds are usually toxins, and abundantly present in two different forms Cr(VI) and Cr(III) in nature. Their contamination in any environment is a raised concern. Many extreme environments including cold climate, warm climate, acidic environment, basic environment, salt stress, radiation, drought, high pressure and anaerobic situations are also not free from Cr contamination. Harsh physical situations along with chemical influence of Cr damage biological systems in diverse ways. However, several unique microorganisms from phylogenetically distant taxa (bacteria, archaea, fungi and microalgae) with properties of Cr resistance are reported to inhabit in such edged environments. Owing different distinct physiological capabilities, these microorganisms can withstand several extremities. In this regard, our review draws attention on Cr(VI) contamination from diverse extreme environmental locations. Further, the study highlights ecology and biogeography of Cr(VI) resistant microorganisms from such inhospitable environments and their employment for Cr(VI) detoxification. The study also focuses on physiological, multi-omics, and genetic engineering approaches of Cr(VI) resistant extremophiles.

O-26 Effect of protein-energy malnutrition on children in a rural population of Western Uttar Pradesh

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Protein-energy malnutrition (PEM) is a significant public health issue in poor nations; while it often affects everyone in a community, babies and young children are particularly at risk due to their high nutritional requirements for growth and development. The cellular imbalance between the energy supply and nutrients necessary for maintenance, growth, and specific functions is known as malnutrition. It becomes a significant factor in the mortality of children under the age of five. This study aimed to evaluate some biochemical values in malnourished individuals in western Uttar Pradesh. A total of 100 PEM children and 100 well-fed apparently healthy (controls) children were recruited for this study and the age group for both case and control is up to five years old. CBC, sodium, potassium, chloride, albumin, and globulin were estimated in the subjects and the data were analyzed. The results of the study indicated that individuals with PEM showed significant differences in various blood parameters compared to the control group. The PEM group had lower hemoglobin levels, lower hematocrit values, and lower MCH values. Additionally, they had significantly higher platelet counts, lower albumin, and globulin levels, lower MCV, and lower MCHC values compared to the Control group. However, no significant differences were observed in red blood cell count (RBC), white blood cell count (WBC), neutrophil count, red cell distribution width (RDW), eosinophil count, potassium levels, or sodium levels. Individuals with PEM exhibited alterations in various blood parameters, including hemoglobin, hematocrit, MCH, platelet count, albumin, globulin, MCV, and MCHC. These findings highlight the impact of PEM on blood composition and related health markers.

O-27 Scenario of hydrogels and fermented organic manures on germination, growth, yield and quality of sugarcane (*Saccharum officinarum* L.) in India

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A study was conducted at Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh in the year 2022-23. The key parameters were hydrogels, Potassium, nano fertilizers and different organics and fermented organic manures. Studies revealed that the application of hydrogels, hydrogels with Potassium, hydrogels with nano fertilizers, organics and fermented organic manures improves sugarcane germination, increases height, improves soil moisture retention, increases number of tillers m^2, growths and development of tillers, enhances nutrient availability and overall productivity. The number of millable canes per unit area is a critical factor in determining sugarcane yield, and in this study, the highest yield was achieved in most of the experimentations when using a combination of Hydrogel with 20% Potassium and Fermented Organic Manure at 50%, along with 50% recommended dose of fertilizer (RDF), resultant were impressive millable canes per square meter. This outcomes give a significant positive trend on sugarcane productivity, indicating the potential for optimizing yield through carefully adoption of good agricultural practices. The studies indicate that the hydrogel and fermented organic manure had a significant positive impact on sugarcane crop performance. Additionally, plant height, tiller count and root development were notably enhanced, reflecting improved vegetative growth. The utilization of hydrogels, organics and eco-friendly practices, exemplified by fermented organic manure, minimises the reliance on synthetic fertilizers, making it an environmentally conscious choice. Furthermore, the economic benefits are evident, as the integration of hydrogels, organic manures and fermented organic manures may lead to cost savings through reduced water consumption and decreased dependence on chemical fertilizers.

O-28 Harnessing marine genetic resources for sustainable agriculture: Mitigating climate change risks in the South China sea region

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The BBNJ treaty stands at a mega confluence of the sciences, politics, and law to provide a framework that allows the world as a whole to collaborate on some of the most pressing matters of our time - the conservation and fair use of the largest ecosystems on the planet, that is, the ocean. Within the High Seas Treaty is a provision for the sharing of marine genetic resources (MGRs) of areas beyond national jurisdiction (ABNJ) and the fair and equitable sharing of benefits. The paper explores the innovative application of marine genetic resources (MGRs) to address the challenges posed by rising sea levels and climate change, particularly in coastal areas at the risk of rising sea levels. It examines the intersection of bioprospecting and sustainable agriculture to enhance resilience and food security in these vulnerable regions. This paper also attempts to shed light on the potential of MGRs as the key collaborative platform for researchers to exchange critical information gathered towards definitive steps