ABSTRACTS
POSTER PRESENTATION

P-1 Processing of rice bran for human consumption

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Considering the nutritional value of rice bran, together with the associated problem of phytic acid content and development of rancidity on storage, the present research was conducted to know the impact of four different approaches on maintaining the stability of rice bran for human consumption. The processed rice bran products had the following nutritional and anti-nutritional factors: moisture content (0.31-2.80 %, f.b.), crude fat (16.51-17.59%), crude protein (14.54-14.56%), total ash (10.08-10.15%), water soluble ash (34.34- 34.70% of total ash), acid insoluble ash (3.45-3.59% of total ash), crude fibre (8.8- 9.54%), total carbohydrates (48.91-49.30%), acid value (5.90-21.08 mg KOH/g crude fat), total phenols (183.25 -185.63 mg GAE/ 100g) and phytic acid (1.95-2.40 %) on dry weight basis. Drying at 80°C showed better reduction of moisture and acid value whereas exogenous phytase treatment was more effective in reducing the phytic acid. The processing may reduce the content of acid value by 85% and phytic acid by 43.6% comparison to control (untreated rice bran). Microbial analysis exhibited absence of both bacterial and fungal growth. Organoleptic evaluation showed average overall acceptability of the products to be in the order : kheer" (8.03), "khichdi' (7.80) and soup (7.53). Considering lower value for the content of free fatty acid and phytic acid, together with total absence of microbes and the better score for organoleptic evaluation, the rice bran product developed through treatment of 0.2% citric acid solution at ambient temperature for 18 hrs followed by drying at 80°C was found to be suitable for human consumption.

P-2 Bio-chemical quality analysis of mulberry tea and value added mulberry green tea

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The utility of mulberry leaf as health drink or blending of mulberry leaves with tea leaves would open up new avenues to both mulberry farmers and green tea growers in augmenting their income. In Assam, small tea growers are one of the potential sectors for developing quality mulberry green tea and mulberry herbal tea. Considering lack of research work for producing these teas both in regard of cultivars and processing techniques, a study was conducted to know the biochemical properties of processed mulberry leaf for production of mulberry tea and blended mulberry green tea. Soft shoots of three varieties of mulberry leaves *viz.* K2, S1635 and BC25 were processed in different ways for producing standalone mulberry tea. Green tea was processed from the clone S_3A_3. Processing methods of green tea were judged and modified for suitably blending with processed mulberry leaf for production of mulberry green tea. Manufacturing of blended tea was done in three ratios with five different processes. The results obtained from the biochemical and organoleptic tests indicated that the best process for producing a consumable mulberry drink, green tea and a blended product (mulberry : green tea in the ratio 75:25) is dipping in boiling water- cooling-rolling-Curl Tear Crush (CTC)-drying. Blending of mulberry : green tea at the ratio of 75:25 recorded 3.53% moisture, 18.67% crude fibre and 8.93% total phenol and 0.81 % caffeine content, respectively. However, the total ash, water soluble ash of total ash, acid insoluble ash, water soluble extract and alkalinity of water soluble ash as KOH were found to be 4.26%, 41.93%, 1.40%, 25.00% and 1.31%, respectively. The antioxidant activity and IC_{50} value for 50% DPPH scavenging was found to be 9.81% DPPH inhibition/10 mg and 50.91 mg, respectively.

P-3 To evaluate the relationship between nutritional value and shelf life of the multigrain dalia with its cooking quality

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Multigrain dalia formulation (MGF) were prepared by using the sprouted wheat and mixture of other grains such as barley, maize, sorghum and pearlmillet, in the ratio of 100.00, 75.00, 0.100 and 25.00, respectively. The mixture of barley, sorghum and pearlmillet was prepared using 50, 25, 25 parts of these grains respectively. The recovery of dalia from wheat and barley was 74.56 and 69.77% , while sorghum and pearl millet yield 47.94 and 49.00%. Cooking time for different MGD formulations ranged from 3.91 to 4.42 min. which was slightly increased with increasing proportion of mixture of barley, sorghum and pearlmillet. In view of very good overall sensory acceptability, rich in crude fiber, calcium and iron content, and low cooking time, 25.00% parts of sprouted wheat and mixture of three grains, respectively, of acceptable quality, gave quick cooking multigrain dahlia. For the preservation I used dalchini, sugar and turmeric coating on the dalia. These are natural substance which help to increase the shelf life of multigrain dalia.

P-4 Comprehensive nutritional profiling of chickpea crops using chemical analysis methods

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Chickpea (*Cicer arietinum* L.) is a pivotal leguminous crop known for its rich nutritional composition and agronomic versatility. Accurate assessment of its nutritional profile is paramount for optimizing crop management strategies and ensuring food security. This study employs traditional chemical analysis methods to comprehensively evaluate the essential nutrients in chickpea grains. A diverse selection of chickpea samples, spanning various genotypes, growth stages, and environmental conditions, were subjected to rigorous chemical analyses. Parameters including protein content, lipid composition, carbohydrate fractions, dietary fiber, mineral content, and moisture levels were quantified following established protocols. Statistical analyses were performed to elucidate potential variations in nutrient composition. The results unveil a comprehensive nutritional profile of chickpea crops, showcasing a notable variation in nutrient content across different genotypes and growth stages. Chickpea grains exhibited significant levels of proteins, with varying amino acid profiles. Lipid composition revealed a predominance of unsaturated fatty acids, contributing to the crop's dietary benefits. Carbohydrate fractions displayed distinct patterns, highlighting the presence of complex polysaccharides. The dietary fiber content was substantial, emphasizing the crop's potential as a source of functional food ingredients. Essential minerals, including potassium, phosphorus, and calcium, were found to be abundant. Moisture levels were within acceptable ranges, indicative of suitable post-harvest storage conditions. This study provides a detailed nutritional profile of chickpea crops using established chemical analysis methods. The findings underscore the crop's potential as a valuable source of essential nutrients and highlight the importance of considering genotypic and growth stage variations in nutritional planning. The comprehensive data generated serves as a valuable resource for breeders, nutritionists, and agronomists, facilitating the development of improved varieties and cultivation practices to enhance the nutritional quality of chickpea crops for global food security and sustainable agriculture.

P-5 Evaluation of physio-chemical characteristics of branded and unbranded rice varieties

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The present study was conducted in the laboratories of the Department of Agricultural Biochemistry to evaluate twenty varieties of rice, ten branded and ten unbranded, for physical and chemical characteristics such as moisture content, 1000 grain weight, grain length, grain breath, protein content, amylose content and starch content. moisture content ranged from 8.80-12.13% of various branded and unbranded rice varieties. The Scented variety IPB-1 showed the maximum moisture content 12.13% followed by 8.80% unbranded rice variety Endrasan. 1000 grain weight in variants varied from 23.27-15.44 gm of various branded and unbranded rice varieties. The branded variety Hybrid 6444 showed the maximum 1000 grain weight 23.27 gm followed by 15.44 gm in unbranded rice variety kalanamak. Grain length ranged 7.64-5.10 (mm) of various branded and unbranded rice varieties. Maximum Grain length was found 7.64 mm in branded variety Hydrabadi biryani rice followed by 5.10 mm in unbranded Raj rani rice variety. Grain breath ranged from 2.25-1.67 mm of various branded and unbranded rice varieties. Maximum grain breath was found 2.25 mm in unbranded rice variety NDR-359 followed by 1.67 mm in unbranded Ram Raj rice variety. Protein content varied from 8.12-7.03% of various branded and unbranded rice varieties. The unbranded variety of Kala Namak showed the maximum protein content 8.12% followed by 7.03% branded rice variety IPB-1 Scented. Amylose content varied from 25.32-19.72 % of various branded and unbranded rice varieties. The unbranded variety of Kala Namak showed the maximum amylose content 25.32 % followed by 19.72 % in unbranded rice variety Raj Rani. Starch content ranged from 85.85-76 % of various branded and unbranded rice varieties. The unbranded variety PR-13 showed the maximum starch content 85.85 % followed by 76 % unbranded rice variety Raj Rani.

P-6 Effect of zinc, boron and molybdenum on growth and yield character of Mung Bean (*Vigna radiata* L.)

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Fertilization of Mung bean (*Vigna radiata* L.) is one of the most crucial management techniques which affects crop growth and yield. Therefore, the present study was carried out at New Dairy Farm, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur during kharif 2019 and 2020 to assess the response of mung bean (*Vigna radiata* L.) to three levels of zinc (0, 10 and 25 kg ha^{-1}) and three levels of boron (0, 5 and 10 kg ha^{-1}) as soil application and three levels of molybdenum (0, 5.0 and 10.0 g/kg) as seed treatment. The experiment was laid out in randomized block design with replicated three times. The results revealed that the application of 10 kg Zn ha^{-1}, 5 kg B ha^{-1} as soil application and 5g Mo kg^{-1} as seed treatment recorded significantly increased the plant height (58.63, 60.15 and 57.86 cm), number of branches (3.25, 3.34 and 3.15), number of cluster $plant^{-1}$ (5.20, 5.41 and 5.13), pod $plant^{-1}$ (33.58, 34.89 and 32.61) and seed yield ha^{-1} (761.65, 774.54 and 747.85 kg ha^{-1}) whereas the interaction was found non-significant. The germination per cent was also significantly increased by 3.24% and 0.91% respectively with application of 5 kg B ha^{-1} and 5g Mo kg^{-1}, however their interaction was also found significant increased germination per cent of 6.75%. Similarly, the seedling length was also significantly increased by 10 kg Zn ha^{-1} and 5 kg B ha^{-1} and 5g Mo kg^{-1}. It was concluded that zinc, boron and molybdenum enhanced mung bean productivity.

P-7 Assam's Dolichos bean seeds' nutritional and antinutrient makeup

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One lesser-known legume, *Dolichos lablab* L., sometimes known as the poor man's bean, has received minimal attention from biochemists and dietitians. The rationale behind this study was to get a better knowledge of the nutritional and anti-nutritional content of ten raw and conventionally cooked dolichos bean seed varieties. The findings indicated substantial statistical differences in all the characteristics studied in raw and cooked bean seeds. The moisture content, total carbohydrate, crude protein, crude fat, crude fibre, and ash content of raw dolichos bean seeds varied from 6.40 to 11.66%, 54.95 to 63.71%, 21.50 to 31.40%, 0.70 to 2.00%, 7.50 to 11.50%, and 2.63 to 3.98%, respectively, while that of cooked bean seeds ranged from 72.00 to 88.00%, 56.93 to 66.32%, 20.40 to 30.50%, 0.63 to 1.90%, 6.80 to 10.66%, and 2.24 to 3.26%, respectively. The mineral content of raw bean seeds varied from 3.70 to 5.43 mg/100g, 1451.50 to 1701.50 mg/100g, 243.50 to 300.50 mg/100g, 5.76 to 10.40 mg/100g, and 315.00 to 501.00 mg/100g, respectively. Sodium, potassium, calcium, iron, and phosphorus levels in cooked bean seeds varied from 2.50 to 4.30 mg/100g, 1341.50 to 1598.17 mg/100g, 200.50 to 250.50 mg/100g, 4.66 to 9.30 mg/100g, and 266.16 to 420.50 mg/100g, respectively. The vitamin C content of raw dolichos bean seeds ranged from 0.23 to 0.47 mg/100g and 0.19 to 0.74 mg/100g, respectively, whereas in cooked bean seeds ascorbic acid was not detected. In raw bean seeds, the antinutritional factors trypsin inhibitor activity, tannin content, phenol content, and phytic acid content was high compared to cooked bean seeds. As an outcome of the current investigation, it can be stated that boiling significantly lowers antinutritional components, increasing the palatability of dolichos bean seeds.

P-8 Deciphering the role of heat shock factor in tomato root development

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Root development is a complex plant process that is monitored by environmental as well as plant developmental cues. Tomato, being an agronomically important crop, has been studied widely, although its root development is less explored. To understand the role of different transcription factors (TFs) in root development, a differential transcriptomic analysis of tomato was carried out in our lab. Transcriptome identified two HSFs that primarily expressed in roots. Till recent, HSFs are known to play role in abiotic stress but their role in plant development is poorly explored.

Here an attempt is made to fill this void and study HSF TF in tomato and its role in normal plant developmental process. The 26HSFs in tomato have conserved functional domains revealed by multiple sequence alignment (MSA). SlHSFs showed close evolutionary relationship with dicots compared to monocots. SlHSFA is transcriptional activator, expressed predominantly in 60 days old plant roots. *SlHSFA* is induced by IAA, BAP, JA and suppressed by ACC, SA and GA_3 in time dependent manner. The *SlHSFA* suppressed lines show longer primary root and a greater number of lateral roots compared to control tomato. Interestingly, the suppressor lines of *SlHSFA* show early seed germination. The vegetative phase shows enhanced growth in suppression lines. Further studies are going on to decipher the role of *SlHSFA* in root development through overexpression lines and CRISPR lines (T0 generation).

P-9 Antibacterial activity of seed and leaf extract of *Carica papaya*

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The present study deals with the antibacterial activity of aqueous and ethanolic extract of *Carica papaya* leaves and seeds through disc diffusion assay against food borne pathogens *Staphylococcus aureus, Listeria monocytogenes, E.coli, and V. cholera*. The ethanolic extracts of seeds were more effective at inhibiting the bacterial pathogens, while the aqueous extract of leaves did not show antimicrobial activity against the bacteria.

P-10 Antagonism and hyphal relationship between *Trichoderma* sp. and *Fusarium* wilt diseases in chilli

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Chilli is one of the most important spice and vegetable crops and is cultivated at world-wide. It suffers from an important fungal disease known as wilt of chilli caused by *Fusarium oxysporum* f.sp. *capsici*. An every year average loss due to this disease has been estimated 45 to 50 percent. Biocontrol agents play a significant role in eco-friendly management of the diseases. Biocontrol agent *Trichoderma* is considerably used in management of fungal diseases of crop plants, exhibiting mycoparasitism against a broad range of plant pathogen. Ten *Trichoderma* isolates from various location of India were characterized for their antagonistic activity against wilt pathogen of chilli. The isolates revealed differential reaction pattern against the test pathogen *Fusarium oxysporum* f.sp. *capsici*. However, the isolate, T7 was more effective, causing 62.96 percent inhibition of mycelial growth *in Fusarium oxysporum* f.sp. *capsici.* Scanning electron microscope analysis of hyphal interactions between antagonists and test fungi found that the mycoparasitic hyphae were usually attached longitudinally to the hyphae of the pathogen. Short branches, coiling of hyphae and hyphal depressions, seen during observation through Scanning electron microscope, indicated the mode of action in biological control of the wilt pathogen.

P-11 Enhancement of sports and athletes performance with the contribution of modern biological science

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The motivation behind this study is to examine the data entered in the context of biological limitations affecting Athlete sport. There is extensive information available about the factors that influence Athlete participation in sports, but little is known about the effects of biological factors on Athlete participation in sports. This article attempts to explore the biological factors that Sports Person face when participating in physical activity. Recommendations are made for changes in Athlete participation in sports. The situation has changed dramatically. More work is needed and I believe this position will be open to future analysts. Physical activity combined with adequate nutrition is thought to be protective against cardiovascular diseases, musculoskeletal diseases and intestinal dysbiosis. Reaching the maximum level requires a lot of effort, and energy must be delivered correctly to prevent the occurrence of muscle wasting, oxidative stress, heart disease and other diseases, including physical loss during competition. In addition, fluid intake, vitamins and nutrients during sports training are important to ensure an athlete's health. In this context, vitamins play an important role in many metabolic reactions and some muscle biochemical changes through physical activity. Since the body cannot produce micronutrients, vitamins are absorbed through food. The aim of this review is to emphasize the important role of vitamins in physical activity. First, we focus on the role of vitamins A, B6, D, E, and K in the prevention and treatment of cardiovascular diseases, muscle damage, and microbiome modification.

P-12 Allelopathic potential of stem aqueous extract of *Gnaphalium pensylvanicum willd.* against *Vicia faba* Roth and *Millilotus officinalis* and cytological changes in *Allium cepa* L.

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A laboratory bioassay was conducted to investigate the allelopathic potential of *Gnaphalium pensylvanicum* stem aqueous extract (SAE) on two weed species, *V. faba* and *M. officinalis*. The results demonstrated a significant inhibitory effect on seed emergence, as well as reductions in root and shoot length, and dry biomass, across varying concentrations (0.5%, 1%, 2%, and 4% SAE). Ultra-structural analyses of leaf and root morphology were performed using scanning electron microscopy (SEM), revealing notable variations including cell shrinkage, contraction, and damaged margins. The exposed epidermal cells exhibited a distinctly altered appearance compared to the control group. Additionally, the SAE-induced chromosomal aberrations, along with structural variations in the interphase and prophase nuclei, when compared to the control groups. Furthermore, an increase in SAE concentration led to a decrease in the mitotic index of treated onion root tips. Through Gas Chromatography-Mass Spectrometry (GC-MS) analysis of *G. pensylvanicum* stem, nearly 35 compounds were identified, suggesting their potential role in the allelopathic suppression of the weeds. These chemical compounds can potentially serve as a viable natural herbicide option within the context of sustainable agricultural practices.

P-13 Regulating arsenic uptake in rice (*Oryza sativa* L.) through CRISPR/Cas9 based genome editing

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Arsenic (As) being a highly toxic metalloid is classified as a Class-I carcinogen by WHO and is widely distributed in the environment. Arsenic has four common oxidation states, among which inorganic forms (As III & As V) are highly toxic as compared to the organic forms (MMA & DMA). Arsenic is highly destructive to plants as it reduces plant growth and promotes the production of reactive oxygen species (ROS). Among all cereal crops, rice *(Oryza sativa* L.*)* is a major dietary source of As, especially in Asia where rice is often the staple food. Rice is highly efficient in As transportation and accumulation thereby contaminating the food chain. Thus, there is an urgent need to reduce As content at least in the edible parts of rice. This can be achieved by limiting the entry of As into plants and even if entered directing its deposition to tissues that have no dietary values or preventing its further transportation. So, in order to mitigate this global contamination, it's very important to understand the mechanism of As uptake and metabolism. Till date various genes associated with the uptake, translocation, and grain filling of As species in the rice plant has been characterized. Since the development of rice cultivars with comparatively low As content through conventional breeding approaches is very much challenging so, in this study new rice lines has been developed with low As accumulation by knocking out various metal transporters using CRISPR/Cas9 system.

P-14 *SlMYBHTH* governs lateral root growth by coordinating cross-talk between auxin and ethylene signaling during root development in tomato

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Root development is a complex process controlled by a balance of different hormones that regulate the development of primary roots and lateral roots (LR) and thereby root architecture. It is under the influence of developmental cues as well as environmental conditions and governed by several transcription factors and regulators that function in cell-specific manner. To obtain an insight into factors that govern root development in tomato, a differential transcriptome analysis comparing root with other tissues was performed and a member of MYB-GRAP sub-family, SlMYBHTH, was identified as a root-expressed transcriptional repressor protein with high expression in 60-days root tissue. Transgenic tomato *SlMYBHTH* suppression lines showed reduced primary root growth and LR number while over-expression lines showed reciprocal changes. Promoter-GUS studies in tomato hairy roots revealed expression of *SlMYBHTH* in LR primordia and root meristematic zones. Its expression was regulated by auxin in a dose-dependent manner with low concentrations stimulating expression and high concentrations inhibiting it. Ethylene negatively governed *SlMYBHTH* transcription in LR primodia and root meristematic zones. SlMYBHTH expression was also regulated at the post-translational level being stabilized in the LR primordia and root tip meristem but excluded from other tissues by proteasomal degradation. High concentration of auxin and ethylene regulated the SlMYBHTH protein degradation in an interdependent manner in root with both pathways being necessary and active for proteasomal degradation. Our studies uncover complexities by which auxin and ethylene regulate *SlMYBHTH* function in root growth.

P-15 Functional studies of the RbWRKY70 promoter involved in petal abscission in rose (*Rosa bourboniana*)

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Rose is an important ornamental crop of the family Rosaceae. Fragrant varieties of rose such as *Rosa bourboniana* are popular garden flowers, cultivated for their fragrance and in demand in the perfume industry. However, unlike the hybrid roses (*R. hybrida*), fragrant roses such as *R. bourboniana* have a very short life due to rapid petal abscission within 24-48 hours of anthesis. During a transcriptomic analysis of petal abscission zone cDNA a search for factors that regulate petal abscission in rose, one of the gene identified *RbWRKY70* was isolated and studied in *Arabidopsis* and rose through promoter-GUS fusion studies. The promoter could drive GUS expression in floral abscission zone in transgenic Arabidopsis and in rose petal abscission zone through agro-infiltration. The expression of RbWRKY70 promoter was lost in *ein2, ida2, hae/hsl2* but not affected in *coi1* mutant background. The studies indicated that the expression of RbWRKY70 promoter was ethylene dependent and JA independent. Since the closest homologue of *RbWRKY70* in Arabidopsis, *AtWRKY70,* is known to regulate salicylic acid responses, we studied whether SA affects petal abscission in *R. bourboniana*. Like ethylene, SA in millimolar concentrations activates petal abscission leading to abscission within 24-30 h. Our findings suggest that *WRKY70,* conserved across families, may regulate abscission through a cross-talk between SA and ethylene and may be used for manipulation of floral abscission in roses.

P-16 Characterization of strong early-acting wound-inducible promoters for insect resistance in chickpea

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Chickpea is an important pulse crop in Asian and African countries that suffers significant yield losses due to insects like H. armigera. The expression of insecticidal proteins under constitutive promoters in transgenic plants suffers from problems like developmental abnormalities and yield drag. To identify early wound-responsive promoters, a transcriptomic analysis of chickpea leaves 5/20 minutes following simulated herbivory was performed, using *H. armigera* oral secretions. Two wound-inducible genes WI1 and WI2, activated 100-1000-fold within 20 min of wounding were selected and a 2kbp sequence from promoters of both was used for study. Strong wound-inducible GUS expression was observed for WI1 in transgenic Arabidopsis but not for WI2. However transient expression in chickpea and tobacco leaves showed GUS expression for both upon wounding. In addition, using a construct expressing the full-length *cry1AC* under a previously identified wound-inducible promoter *RbPCD1pro* from rose, we have generated 12 stable transgenic chickpea lines that are currently in T2 generation. These have been screened for the presence of the promoter and *cry1AC* gene using specific primers. Further studies are in progress to confirm the scale of *cry1AC* expression upon wound induction at transcript and protein level.

P-17 Interactions among SLERF36, HDACS and co-repressors regulate developmental transitions in tomato

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Plants go through several developmental transitions in their life time such as seed germination, flowering, fruit ripening and organ/whole plant senescence. These transitions are associated with changes in basal hormonal levels and are regulated by transcription factors that govern these. We had previously identified an EAR motif-containing repressor-type ERF, SlERF36, as a key regulator of developmental transitions in tomato. *SlERF36* over-expression accelerated all transitions while its suppression delayed the transitions compared to control. Transcriptomic analysis revealed the GA pathway as the major target of SlERF36 action with GA2 oxidases as possible direct targets of suppression that cause an increase in GA. SlERF36 interacts strongly with tomato SIN3b, SIN3c and TPL6 but weakly with SIN3a suggesting recruitment of these co-repressors with histone deacetylases (HDACs) for its function. An analysis of the different HDACs that may interact with the co-repressors and help in SlERF36 function was performed through reciprocal SIN3-HDAC yeast two hybrid studies. The studies show that Sin3b interacts with SlHDAC3 while Sin3a interacts with SlHDAC4 and SRT2. Further analysis of VIGS study of HDACs will solidify the interaction of HDACs and SIN3 in tomato. An analysis of flag tagged lines of SlERF36 is in progress to identify the direct targets of SlERF36.

P-18 Manipulation of *SlMYB53* alters shoot branching and primary root development in tomato

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MYB transcription factors (TF) belong to one of the largest TF families that are associated with several developmental processes in plants. A MYB TF, *SlMYB53*, predominantly expressed in the root, was identified from tomato through a comparative transcriptome of roots against other aerial tissues. SlMYB53, comprising of 317 amino acids, is a transcriptional activator that shows sequence homology to TFs involved in suberin biosynthesis in *Arabidopsis*. To understand its role in plant development, transgenic lines overexpressing and suppressing *SlMYB53* were generated. Suppression lines showed an increase in shoot branching while root growth appeared to be unaffected in the over-expression and suppression lines under control condition. However, under a condition where gibberellin became limiting (after treatment with paclobutrazol), suppression lines showed an increase in the primary root length while lateral root development was unaffected. Promoter analysis using hairy roots (generated through *Agrobacterium rhizogenes*-mediated transformation) revealed cell-specific changes in the expression of *SlMYB53* promoter in the region of the root tip in response to different hormones. This region that includes zones of division and transition is considered a hotspot for hormonal crosstalk to control cell division and elongation and ultimately root growth. In the shoot (of stable promoter lines generated through *Agrobacterium tumefaciens*- mediated transformation), the promoter is expressed in the xylem parenchymatous cells, cells where several branching related genes are expressed. Our interest is to unravel the regulation of *SlMYB53* in plant development in tomato.

P-19 Tomato *WRKY75* negatively regulates plant growth by suppressing GA biosynthesis

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The life cycle of a plant is accompanied with several developmental transitions such as seed germination, onset of flowering and whole plant senescence. These transitions are governed by transcription factors (TFs) and are under the control of phytohormones like Gibberellic acid (GA). We have identified a root-expressed WRKY TF, *SlWRKY*75 that functions as repressor. Despite being primarily root expressed, *WRKY75* governs most plant development processes. *SlWRKY75* suppression lines and CRISPR-mediated knockout lines show early germination, faster growth, increased plant height and leaf area, as well as early flowering with more prominent effects in CRISPR lines. In contrast, *SlWRKY75* over-expression strongly suppresses growth with plants showing delayed germination, reduced height and leaf area and delayed flowering and senescence. Transcriptomic analysis of the knock-down lines reveal a higher expression of *SlGA20ox1,* involved in GA biosynthesis and reduced expression of *SlGA2ox3*, *SlGA2ox4* and *SlPROCERA* that reduce GA levels and responses. *SlWRKY75* directly binds to the *SlGA20OX1* promoter and negatively regulates its expression. Knock-down lines of *SlWRKY75* contain higher GA_3 and GA_4 levels than wild type providing evidence for a role for SlWRKY75 in regulating GA homeostasis. Our results demonstrate the ability of *SlWRKY75* to modulate whole plant development in tomato by negatively regulating GA biosynthesis and homeostasis and highlight its use in improving agricultural traits like early harvest.

P-20 Manipulation of SlERF8 alters the fruit set and ripening pattern in tomato

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Inflorescence and ripening of tomato fruit are two important developmental processes of the plant for the study of crop biology in view of industrial horticulture. Since the family encoding the AP2/ERF (APETALA2/Ethylene Responsive Factor) domain transcription factors can regulate various aspects of plant development and adaptation to the environment through hormonal pathways, the involvement of *SlERF8* (a ripening associated ERF identified in our lab during the course of studies on fruit ripening) in developmental parameters were observed through its transgenic lines. Suppression lines of *SlERF8* showed no significant changes in vegetative growth as compared with the control plants. However, they showed early seed germination, early flowering, increased inflorescence number, early onset of fruit ripening, increased fruit set and high total yield of the tomato as compared with the control plants. Yeast one-hybrid assay confirmed that *SlERF8* showed interaction with the promoters of GA-catabolic genes of *SlGA$_2$Ox$_3$*, *SlGA$_2$Ox$_4$*, and a GRAS family member, *SlDELLA*; and through transactivation assay *SlERF8* was found to be a transcriptional activator. Thus, the observed phenotypes in the suppression lines and the interaction of *SlERF8* with its probable targets indicated the high level of gibberellins in the suppression lines. Our so far study identified the role of *SlERF8* in the seed germination, inflorescence number, fruit set and total yield parameters.

P-21 Optimizing sugarcane growth through phytohormone-induced *in vitro* culture of mature nodal segments

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Nowadays, apical meristem from shoots was excised for in vitro sugarcane multiplication. Re-differentiation of mature axillary/eye buds is known to yield clonal plants at a multifold multiplication rate (15-25 times). Keeping the importance of faster multiplication of newly developed elite cultivars, this work explains the development of shoot cultures of sugarcane through proliferation from mature axillary bud explants and regeneration of complete plantlets. Multiple shoots were induced through forced axillary branching. Ninety five percent of nodal shoot explants taken from 8 month old elite sugarcane (CoLk 94184) produced multiple shoots within 2-8 weeks on Murashige and Skoog's (MS) medium supplemented with 1.5 mg/L benzylamino purine (BAP). The multiplied shoot differentiation was influenced by concentration of BAP in the medium. *In vitro* regenerated shoots were excised and sub-cultured on MS + 1.5 mg/L BAP for further shoot multiplication. 15-20 fold of shoot multiplication was achieved by regular sub-culturing. 95% of the shoots rooted when propagules (each consisting of cluster of 3 shoots) were transferred onto MS medium with 1.5 mg/L NAA. These findings will be applicable to generate maximum number of desired sugarcane explants (15-25 per stalk) Therefore, mature axillary bud regeneration is a more reliable method for the development of transgenic plants as well as for the eventual large-scale replication of superior sugarcane cultivars and we can also reduce the cost of sugarcane clone production by this method.

P-22 Understanding the role of SlDELLA in SlERF36-mediated organ expansion in tomato.

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Plants regulate their growth and development through manipulation of phytohormone levels and their signalling. In a previous study in our lab, a repressor type ERF gene, *SlERF36*, was found to be involved in regulating developmental transitions. *SlERF36* over-expression lines showed early germination, higher leaf area, early flowering and early senescence compared to control and antisense lines. *SlERF36* was found to control the GA pathway by suppression of GA2 oxidases (which degrade GA) leading to higher GA levels in over-expression lines and reduced GA levels in suppression lines. In order to study if GA signaling was also involved in SlERF36-mediated effects, experiments were performed by treating transgenic plants with either exogenous GA or paclobutrazol (an inhibitor of GA biosynthesis) and showed that there were GA level-independent effects of SlERF36. The transcript level of *SlDELLA* (an inhibitor of GA signalling) was down-regulated in the *SlERF36* over-expression lines. SlERF36 interacted with the promoter of SlDELLA as evident from yeast one-hybrid and luciferase assays. Virus-induced gene silencing studies are in progress to study the contribution of SlDELLA in SlERF36-mediated leaf and internode expansion. Elucidating SlERF36-SlDELLA interactions is important for understanding the regulation of SlERF36 mediated growth under stress conditions.
Key words: SlERF36, SlDELLA, GA2 oxidases.GA levels, tomato

P-23 Impact of elevated CO_2, O_3 and temperature on wheat varieties

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Wheat, a major cereal crop, is experiencing reductions in production and quality due to global climate change. Therefore, eight commonly grown wheat varieties (DBW 184, DBW 187, DBW 222, HD 2329, HD 2967, HD 3086, PBW 154, WB 02) of Indo-Gangetic plains areas were exposed to elevated levels of CO_2 (550 ppm), O_3 (+20 ppb above ambient), and Temperature (+2^{O}C above ambient) in Free Air Concentration Enrichment (FACE) facility. Results showed that elevated CO_2, O_3, and Temp differentially affect the growth and yield of all the wheat varieties, both individually and in combination. With respect to total biomass, photosynthesis, grain weight plant^{-1}, 1000 grain weight, harvest index, and lipid peroxidation, DBW 184 and DBW 187 exhibited better performance in all the treatments. DBW 184, DBW 187, DBW 222, and HD 2967 varieties exhibited improved performance in ECO_2 and ECO_2+EO_3. While DBW 184, DBW 187, HD 2329, and HD 2967 varieties performed better in EO_3 and ETemp. Moreover, DBW 184, DBW 187, HD 3086, and PBW 154 varieties performed better in ECO_2+EO_3+ETemp whereas variety HD 2967 showed a significant decline in yield. DBW 222 performed better under ECO_2 alone and in ECO_2+EO_3, but its growth was noticeably reduced by EO_3 and ETemp and in ECO_2+EO_3+ETemp. Similarly, HD 2329 variety showed improved growth in EO_3 and ETemp but a decreased yield in combined stresses. In contrast, HD 3086 and PBW 154 varieties exhibited poor performance under all individual factor treatments, yet they exhibited strong performance in combined treatment. It is concluded that DBW 184 and DBW 187 are best varieties in terms of growth and yield under future climate change scenario. This study provides a valuable understanding of variation in wheat crop yields in the future climate change. The information can be used to screen and develop climate-resilient wheat varieties.

P-24 Selenium and silica supplementation improve the growth, yield and nutrient quality of grain by reducing arsenic accumulation in rice (*Oryza sativa* L.)

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The present study demonstrates the role of selenium (Se) and silica (Si) for mitigation of arsenic (As) induced toxicity in rice (*Oryza sativa* L.). Two concentrations of Se (0.5 and 1 mgl^{-1}) and one concentration of Si (0.4%) have been tested against the response of As exposed rice plants (1 mgl^{-1}). The results demonstrated that supplementation of Si and Se significantly reduced the uptake and translocation of As in rice, resulting the decrease in its accumulation in grains. The accumulation of As in grain upon Se supplementation at 0.5 and 1 mgl^{-1} was 0.207 and 0.065 $mgkg^{-1}$, respectively, and upon Si (0.4%) it was 0.221 $mgkg^{-1}$ in comparison to As alone (0.802 $mgkg^{-1}$) treated rice plants. Arsenic exposure significantly reduced the plant growth with respect to plant height, number of tillers per pot, leaf area, yield and nutrient quality. Conversely, Se and Si supplementation increased growth and yield attributes, which was also evident by increasing the level of total carbohydrates, total starch, amylose and amylopectin content in rice grains. The study concluded that Se was more effective over Si to limit the As accumulation in rice grain. Further, supplementation of Se enhanced the amylose content of rice grain thus increased the amylose/amylopectin ratio (0.515) than As alone (0.465) treated plants which would be beneficial for the diabetic patients.

P-25 Effect of elevated temperature and soil arsenic on yield and nutrient quality of rice (*Oryza sativa* L.)

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Rice is one of the major cereal crop feeding millions of people across the world. It was also observed that changing climatic conditions also reduced its productivity and quality, which may be further accelerated by arsenic (As), if rice grown in As affected areas like Bengal Delta and Middle Ganga plain. During present experiment, it was found that eTemp alone or with lower dose (LAs; 250 μgl^{-1}) and higher dose (HAs; 1000μgl^{-1}) of As distinctively affect the vegetative and reproductive growth of rice. Elevated Temp negatively impacted the vegetative growth (both under and above ground parts) and the effect was more pronounced on the root than shoots growth, which was further accelerated by As exposure. The nutrient quality such as total carbohydrate, starch, amylose, amylopectin, protein and accumulation of macro and micro elements in rice grain were also affected by eTemp (with or without arsenic). High As exposure along with eTemp reduced the yield (~66%) of rice and differentially affected the accumulation of macro *i.e.,* N, P, K, Na and S and micro elements *i.e.,* Fe, Mn, Zn, Cu, Co in the rice grain. The current study could assist in the understanding of future rice yield, nutritional imbalancing along with level of As in rice for development of climate smart new rice cultivars suitable for cultivation in As affected countries.

P-26 Medicinal plants and their status in pilibhit tiger reserve, Uttar Pradesh

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The Indo-Nepal Sub-Himalayan Terai region of Uttar Pradesh state is most populated by dense forest cover and Pilibhit Tiger Reserve (PTR) is situated inside them. The PTR is situated in the foothills of Himalayas covering Pilibhit and Shahjahanpur districts of Uttar Pradesh. It forms part of the Terai Arc Landscape in the upper Gangetic Plain along Indo-Nepal border. The Terai forests are grassland constitute habitat for approximately 2,100 flowering plants in which most of the species bears important economic value like medicinal, food, beverages, ornamentals, shelter and other socio-religious purpose. Despite, there is no report has been known regarding the diversity, threat status and ethnobotany of the flora of this particular area. The present study has aimed to explore the diversity, threat status and ethnobotanical studies of vascular plants of the target protected area. The preliminary survey demonstrates that around 125 species of vascular plants have been utilized by tribals in variety of illnesses. Different parts of plants including roots, stems, leaves, flowers, fruits, seeds, and occasionally the entire plants are used since past decades. During survey and field study a detail questionnaire was prepared which consists of various information regarding particular medicinal plant and their uses. Results of the survey work conclude that 80 % of total collected specimens are useful as medicine in different forms and doses. But due to rapid urbanization and developments many potential medicinal plants are destroyed. Therefore threat status of all the collected specimens has also been assessed following IUCN. Further studies on their phytochemical constituents are under progress.

P-27 Phytoremediation of the sugar mill effluents and polluted water bodies

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Heavy metals from sugar mill effluent accumulate in plants and vegetables have negative health impacts. Long-term irrigation with effluents contaminated water enhances the deposition of heavy metals in soil and may enter the food chain, leading to considerable bioaccumulation and biomagnifications in flora and fauna. Due to their hazardous characteristics heavy metals are becoming a major source of environmental pollution. Phytoremediation has drawn increasing attention from researchers and experts around the world because conventional water remediation approaches are typically ineffectual and unfriendly to the environment. Moreover, it is also acceptable due to its cost-effectiveness and environmental friendliness. In this context, physico-chemical properties of sugar mill effluents as well as nearby polluted water bodies have been done which consists water temperature, pH, electrical conductivity (EC), total solids (TS), total suspended solids (TSS), total dissolved solids (TDS), biochemical oxygen demand (BOD), dissolved oxygen (DO), chloride, nitrate, and phosphate. It was observed that TDS, TSS, BOD, Chloride and Nitrate were significantly high in sugar mill effluents and contaminated water bodies as compared to control ie. water samples of garden pond. In the same time some notable metal accumulator plants Viz. *Eichhornia crassipes, Euphorbia prostrata, Lemna minor, Pistia stratiotes, Nelumbo lutea, Marsilea quadrifolia, Salvinia minima, Typha latifolia* along with other phytoplankton were found luxuriantly growing inside effluent polluted water bodies. Heavy metal accumulation abilities in some dominant and selected plants are under progress. Phytoremediation capability of these plants can be further assessed and increased by using cutting-edge phytoremediation techniques.

P-28 Efficacy of synthetic organic ligands on functional iron status of wheat (*Triticum aestivum*) plants

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Synthetic organic ligands serve as a potential Fe-supplier to overcome Fe-deficiency in crops. Our aim was to compare the effectiveness of selected synthetic ligands in improving functional Fe status in wheat (*Triticum aestivum* var. HD-2965) plants grown under controlled hydroponic systems.Improved functional Fe status has been found in Fe^{3+}-EDTA (50 µM) and Fe^{3+}-Citrate (25µM) supplied plants as indicated by high chlorophylls and carotenoids concentrations. Increased Fe-related enzymes like catalase, ascorbate peroxidases, guaiacol peroxidases tend to show improved heme-Fe activity in Fe^{+3}-EDTA treated plants. Significant interveinal chlorosis was observed in control and Fe^{+3}-EDDHA treated plants with decreased catalase and ascorbate peroxidases activity and increased H_2O_2 production, showing inefficient functional Fe in these plants. Thus, Fe^{+3}-EDTA and Fe^{+3}-Citrate have been considered to be an effective Fe-supplier in comparison to Fe^{+3}-EDDHA and $FeCl_3$ in wheat plant.

P-29 Morphology and oxidative physiology of zinc-deficient rice (*Oryza sativa*) plants

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Zn deficiency is one of the limiting factors for rice productivity, and it severely affects plant growth and development. NDR-359 and Virat cultivars of rice were evaluated for their Zn-efficiency, based on shoot morphology, growth, and apparent symptoms in shoots under Zn-deficient conditions. Zn deficiency symptoms, viz., chlorotic and necrotic patches, brown blotches and streaks on the leaves, and bronzing, were observed in Zn-deficient plants. Furthermore, chlorophylls and carotenoids, lipid peroxidation, hydrogen peroxide, and Zn-related enzymes were measured in both of these rice cultivars to determine their Zn efficiency. NDR-359 showed enhanced activity of ascorbate peroxidases, catalase, and guaiacol peroxidases with increased production of nitric oxide (NO) as compared to Virat. Thus, NDR-359 may be more tolerant to Zn shortages as indicated by less oxidative damage when grown under Zn-deficient conditions.

P-30 Pesticides-induced pollution and their mitigation: A review

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Pesticide producing industries pose a severe environmental hazard that needs urgent remediation. A large build-up of heavy metals like Cu, Ni, Cr, Pb, Zn, Fe, Mn, Cd, and Co was discovered in the effluent from the pesticide production companies. Most of the harmful heavy metal content was high in comparison to other water bodies of that area. These heavy metals are extremely dangerous for the both environment as well as human health. As a low-cost alternative for cleaning up soils and heavy metals contaminated water bodies, phytoremediation is gaining popularity. In order to decrease the detrimental effects of toxic components on aquatic ecosystems, phytoremediation methods may be able to use the capacity of aquatic plants to absorb mineral nutrients from the soil and water. Some aquatic plants are extremely effective in removing both organic and inorganic contaminants. These are *Eichhornia crassipes, Azolla* sp., *Salvinia* sp*., Typha latifolia, Mentha aquatica, Nelumbo lutea, Marsilea quadrifolia, and Prosopis juliflora* along with some other plants are prominent metal accumulators for the remediation of heavy-metal polluted water bodies. The phytoremediation potential of these plants can be further enhanced by the application of innovative approaches in detoxification of pesticides-induced water bodies.

P-31 Seasonal assessment of physico-chemical parameters of water bodies in Nawabganj Bird Sanctuary

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Nawabganj Bird Sanctuary is a wetland in Uttar Pradesh conserved as a Ramsar site and renowned for its diverse aquatic life and avian population. The present study examines the water quality of the wetland in relation to a variety of physical and chemical parameters on both temporal and spatial scales, which include water temperature, pH, electrical conductivity (EC), total solids (TS), total suspended solids (TSS), total dissolved solids (TDS), biochemical oxygen demand (BOD), dissolved oxygen (DO), chloride, nitrate, and phosphate. During the current analysis, it was observed that some parameters of the physico-chemical characteristics of water bodies were fluctuated due to seasonal variations. The winter season has a high value of dissolved oxygen and pH, while the summer season has a high value of BOD, TS, TSS, and TDS. The outcome shows that the necessary mineral nutrients are broadly dispersed and lie within the standard range of water. No pollution exists, and no organic waste is being brought to the location. It shows the main water source of the wetland is rainwater. Wetland habitat includes substantial amounts of nutrients, as wetlands support high levels of biodiversity and have many biomes.

P-32 Adaptive modulations in Cyanobacteria upon nutrient stress

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Cyanobacteria are prokaryotic oxygenic photoautotrophs exposed to various environmental stresses. Environmental stressors such as nutrient deficiency affect the growth and development of cyanobacteria. To overcome the effects of different stressors, they have evolved several adaptive mechanisms. Nutrients, like sulfur and iron, play a major role in photosynthesis, respiration, nitrogen metabolism, and other processes. The present study describes the impact of nutrient stress on cyanobacteria and the molecular mechanisms. For that, the cyanobacterium *Anabaena* was exposed to sulfur and iron stress conditions for eight days. The results showed that growth was diminished with the reduction of photopigments such as chlorophyll and phycobiliproteins. The negative effects of these stressors have been attributed to altered ion homeostasis in the cyanobacterium. The increased antioxidative enzyme activities such as superoxide dismutase, catalase, ascorbate reductase, and glutathione reductase were observed in the stressed cells as compared to control cells. Moreover, stimulated production of proline, sucrose, and glutathione contents in the cyanobacterium *Anabaena* were also noticed which suggested that enhanced osmolytes (sucrose and proline), thiol contents along with antioxidative enzyme must have played a significant role in the tolerance of *Anabaena*.

P-33 Biochemical appraisal of different plant parts of Bt and non-Bt cotton genotypes

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Cotton (*Gossypium* spp.) is one of the most important fiber and cash crop of India. It is also known as a king of appraisal fiber and white Gold. Bt.cotton is effective against the Bollworm pest complex of cotton. It provides a dominant role in the industrial and agricultural economy of the country. All chemical constituents affect the quality and quantity of fiber and oil content. Studying different biochemical compounds in Bt and Non-Bt cotton genotypes is important for the development of insect and pest tolerance cotton genotypes. To biochemical constitutes of Bt and Non-Bt cotton genotypes as well as to know the biochemical content of different plant parts. The present experiment on "Biochemical appraisal of different plant parts of Bt and Non-Bt cotton genotypes" was conducted at Main Cotton Research Station, Athwa farm, Navsari Agricultural University, Surat (Gujarat) during Kharif Season. In the experiment, four genotypes were chosen for screening. leaf, square, flower, boll, and seed samples were taken. Biochemical analyses such as primary metabolites, secondary metabolites, antioxidant enzymes, and oil quality parameters: total soluble sugar, reducing sugar, protein, proline, total chlorophyll, tannin, gossypol, total phenol, flavanol, peroxidase activity, superoxide dismutase activity, iodine value, peroxide value, and seed oil content were performed in the laboratory. 1.31 to 6.36 (mg/g), 29.03 to 151.13 (mg/g), 84.53 to 294.68 (mg/g), 3.039 to 5.524 (mg/g), 30.36 to 93.60 (mg/g), 19.16 to 56.41 (mg/g), 2.975 to 3.029 (mg/g), 5.42 to 8.82 (mg/g), 45.5% to 47.5%, 4.9% to 42.2%, 100.54% to 108.73%, 1.88% to 1.98%, and 15.5% to 18.35% respectively. Healthy plant have reducing sugar, and chlorophyll 3.37 (mg/g) and 1.32 (mg/g).

P-34 Seed nano-priming for sustainable agriculture

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Climate change, resource depletion, and loss of biodiversity pose significant threats to agriculture. A new agriculture revolution is needed in order to increase the production of crops, ensure the quality and safety of food, in a sustainable practice. Nanotechnology has the potential to play a crucial role in promoting agricultural sustainability. One promising application is nano-priming, an advanced seed priming technique that enhances seed germination, seedling growth, and crop yields while enhancing plant resistance to various biotic and abiotic stresses. Numerous studies have underscored the advantages of seed nano-priming, including improved seed germination rate, enhanced plant growth and development, increased agricultural productivity, and improved nutritional quality in food crops. In this review, we aim to provides an overview for the utilization of advance technology in agriculture and also discuss the challenges and potential benefits associated with the application of nanotechnology in seed nano-priming.

P-35 Study on *Fusarium sp.* interaction with pigeon pea and screening of its bio-control agents

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The Pigeonpea (*Cajanus cajan*) a perennial legume from the family Leguminosae. It is domestication in South Asia at least 3,500 years ago, its seeds have become a common food grain in Asia, Africa, and Latin America. Pigeon peas are widely cultivated in all tropical and semi tropical regions. As per as uses and nutritional values are concerned, pigeonpea is useful in various ways both as human food and animal feed. As human food pigeonpea is used as dhal' whole seed, and green vegetable to supplement cereal-based diets. Seeds are rich in proteins, amino acids, vitamins & important minerals. The seed by-products from the „dhal' mills are used as animal feed. Pigeonpea leaves are used as dry or green fodder. Stalks of pigeonpea are useful for making baskets, constructing huts, hedges, and binding material. The pigeonpea suffers a severe reduction in growth and productivity due to fusarium wilt. Fusarium wilt, a soil borne disease responsible for downfall of its yield and production. Fusarium wilt is known to affect numerous crops, such as tomato, cucumber, banana, cotton, melons, and many others. Different strains or formae speciales of *Fusarium oxysporum* are often specialized to infect specific plant hosts, contributing to the host-specific nature of the disease. The fungus can persist in the soil for extended periods, making crop rotation and other management practices crucial for disease control. The objective of this investigation is to discover an effective, environmentally responsible method of treating illness. Classical methods like fungicides are recommended for the control of this fungal pathogen but the ample uses of chemicals are harmful to nontargetted microorganisms, affect the soil and crop quality. Under these circumstances, biocontrol approaches, involving use of bioagents namely- *Trichoderma harzianum, Pseudomonas fluorescens* etc. gaining importance to manage the *Fusarium.* Management strategies for Fusarium wilt include using disease-resistant cultivars, practicing crop rotation with non-host plants, implementing proper sanitation measures, and employing soil fumigation or treatment with fungicides. Integrated management approaches that combine multiple strategies are generally recommended for effective control of the disease.

P-36 Biochemical and molecular evaluation of sapota varieties under South Gujarat condition

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Sapota has several health benefits *viz.*, rich source of vitamin A and C, energy provider by fructose and sucrose, anti-inflammatory due to rich in tannin, laxative due to rich in dietary fiber, rich in antioxidants and prevent certain cancers, good for pregnant women, controls body weight and keeps skin and hair healthy. The biochemical analysis of eight sapota varieties were carried out for reducing sugar, non-reducing sugar, ascorbic acid, titratable acidity, total soluble sugar and TSS content. The observed range was 9.08 to 12.91 %, 3.79 to 8.10 %, 2.33 to 5.25 %, 0.18 to 0.20 %, 13.34 to 20.87 % and 18.76 to 21.64 °Brix, respectively. Characterization is an important aspect for documentation of the performance of the studied cultivars which will subsequently help to introduce, select and improve existing sapota germplasms. SSRs are widely used in plant genetic research, as they are co-dominant with multi-allelic nature, high reproducibility and polymorphic in nature. In the this study, molecular characterization of 8 sapota varieties were carried out using 20 SSR markers. The analysis of the SSR markers revealed a total of 40 alleles, with an average of 4.0 alleles per locus. The maximum number of alleles (3) were recorded with SapSSR-15, SapSSR-9, SapSSR-21 and SapSSR-55 primers, while minimum (1) allele was observed for SapSSR-18, SapSSR-35, SapSSR-39 and SapSSR-57 primers. The PCA analysis divided eight sapota varieties into four clusters which were distributed across the coordinates. The first two principal components explained 43.17 and 17.52 % of the total variation, with the Eigen value 1.07185 and 0.416083, respectively. Molecular markers are considered as powerful tools for estimating genetic diversity and are not affected by environmental factors like morphological, biochemical and metabolic markers. Biochemical and molecular information generated in this study may be useful for genetic improvement of sapota fruit crop.

P-37 Development of drought tolerance high yielding wheat lines through induced mutagenesis

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Wheat (*Triticum aestivum* L.*)* is most widely cultivated food crop. It is a staple food used by more than 40 countries and for over 35% of the global population. Wheat crop is facing problem in terms of yield and production due to shortage of water and resulted drought stress in wheat crop. Drought is responsible for inhibition or reduction of normal physiological and metabolic processes, which led to the death of the plant. Aim of present study was to develop drought tolerant wheat lines using chemical mutagens *viz.* EMS and SA. Mutagenesis is a process by which genetic information of an organism is changed in a stable manner, resulting in a mutation. Two wheat genotypes HD-3226 and HI-1620 were selected for mutagenesis. Polyethylene glycol (PEG) frequently used to screen out drought tolerant varieties at early stage of seedlings under laboratory conditions. Sodium azide treatments was given at seedling stage and showed the delay germination (4-6 days) in both wheat genotypes in compare to EMS treatments. In HD-3226 genotype, average mean value of morphological mutation frequency across all treatments in water was 4.14% (EMS) and 4.42% (SA) while 4.20% (EMS) and 4.88% (SA) in 15% PEG treatments. In HI-1620 genotype, average mean value across all treatments in water was 4.05% (EMS) and 4.17% (SA) while 4.13% (EMS) and 4.84% (SA) in 15% PEG treatments. In M_2 generation, plant height, leaf length and width, tiller number, grain yield and biological yield significantly increased under drought stress condition. Total twenty four mutants were selected from M_2 generation on morphological parameters under stress condition. In M_3 generation, mutant- EMS-0.5% HD-3226 15% PEG, P-41 (46.03g) showed highest grain yield per plant and mutant- EMS-0.25% HI-1620 15% PEG, P-4 (49.67g) showed highest grain yield per plant as comparison to wild type. Molecular markers are an effective technique for determining genetic variation within and between species and population. Total fifteen ISSR markers were used for variation confirmation in selected mutant plant of both genotypes. PIC values were varies from 0.00 (UBC 823) to 0.89 (UBC 848) with average of 0.35 (EMS) and 0.42 (SA) while 0.21 (UBC 853) to 0.81 (UBC 881) with average of 0.47 (EMS) and 0.39 (SA) in HI-1620 genotype and HD-3226 genotype, respectively. Transcription factors (TFs) play a major role in the gene regulation under moisture stress regime. DREBs are important plant transcription factors (TFs) that regulate expression of many stress-inducible genes. *Ta*AREB3 is a new member of AREB transcription factor family, which isolated from wheat. *Ta*DREB2A gene was up-regulated in all selected four mutants of wheat under water stress condition as comparison to control-wild type while *Ta*AREB3 gene showed similar expression in both control-wild type and water stressed mutant plants of both wheat varieties thus results indicate that *Ta*DREB2A gene is responsible for water stress tolerance in selected mutant plants. The current study may be helpful for development of high yielding wheat genotypes in future as these lines may be used in wheat breeding programmes.

P-38 Isolation and biological activity of terpenes from essential oils

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Essential oils are highly concentrated volatile substances extracted from various parts of certain plant species, each with specific therapeutically and energetic effects. These volatile oils are very complex molecular substances, Essential oils, called volatile oils or ethereal oils, are natural metabolic secretions of plants, which have various terpenes biomolecules. The essential oils of aromatic plants such as *Mentha arvensis* L.*, Palargonium gravelens* L.*, Thymus vulgaris* L.*,* and *Ocimum gratissimum* L. have very rich in source of the terpenes biomolecules and the identification and isolation of lead terpenes phytomolecules such as menthol, geraniol, thymol and eugenol have been done from essential oils of the aromatic plants through fractional column chromatography techniques and thereafter it have been processed for detailed biological evaluation antimicrobial activity (antifungal and antibacterial) through Individual study of the terpenes biomolecules of that aromatic plants by in-vitro/in-vivo method and toxicity study.

P-39 Effect of sucrose concentration *in-vitro* for rapid multiplication of *Gerbera jamisonii*

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Gerbera is an important cut flower crop having wide range of flower colours including pink, brick, orange, yellow, cream-white, red, terracotta and various other intermediate colours. Bicolor flowers are also available in double varieties. It is commonly propagated by divisions of suckers or clumps. Propagation by division of suckers or clumps give true type plants with very slow rate of multiplication. New varieties are being introduced in the market every year. To popularize these varieties and to meet the growing demand and quality product there remains needs for technology for fast multiplication. This experiment conduct of cost effective in-vitro multiplication of *Gerbera Jamesonii,* this is in-vitro Sucrose concentration was investigated on augmentation of shoots proliferation. It is that among the various concentration of the sucrose ie 0.0 gm/l, 40 gm/l, 30 gm/l, 20 gm/l, 10 gm/l tested. Sucrose at 20 mg/l in the used medium of MS + Agar 3 gm/l + BAP 2.0 mg/l + IAA 1.0 mg/l at pH 6.5 produced more per cent regenerated cultures variety Tamara -24.00, average no of multiple shoots variety tamara-12.66, average length of multiple shoots Tamara-4.25 The results indicate that medium MS + Agar 3 gm/l + BAP 2.0 gm/l + IAA 1.0 gm/l + AdS 25 mg/l + 20 gm/l Sucrose adjust pH 6.5 gave the best results inthe verities of Gerbera.Sucrose 20 gm/l has been found effective for growth and development of microshoots. *Gerbera Jamesonii* micropropagated plantlets needs to be hardening before transferring them to open poly-house conditions. Gerbera cultivation in polyhouse is more profitable. The medium for hardening Gerbera plantlets should have good water holding capacity, drainage and aeration. Study was conducted for acclimatization of of Gerbera in three different substrates namely soil, soil+sand+FYM and coconut husk. Coconut peat as a substrates gave maximum percentage of plant survival of 80% for Tamara-variety. Coconut husk or peat gave higher numbers (5.84) leaves/plant higher plant height (5.37 cm). Coconut husk was found as an effective substrate for acclimatization of micropropagated plantlets of followed by soil and soil+sand+FYM.

P-40 Clonal variation in carbon storage and carbon dioxide sequestration in mature phase of rubber plantation and agroforestry system

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Global concern on increasing levels of greenhouse gases specifically carbon dioxide in the atmosphere has led to the search for various mitigation options. In this context, carbon sequestration through managed rubber plantation is gaining importance. Rubber tree plantations improve the soil's physical and chemical properties, and they sequester atmospheric carbon in the biomass or the soil. However, the potential role of these plantations in sequestering carbon in the soil and plant biomass has not been fully evaluated. This study evaluated rubber tree plantations at central experimental station Chethackal and RRII field. Data were taken from standing rubber plantation in two different experiments *viz,* 18 year old-mature phase and tree intercrop trial. The results showed that annual CO_2 sequestration from 2010-20 in mature phase ranges from 11.53 to 29.0 T CO_2 /ha/yr. Clonal variation in the amount of CO_2 sequestered is evident from this results. Among the 8 clones evaluated PB 260 marked with highest quantity of sequestered CO_2 (29.0 t/ha/yr) and RRIM 600 showed the lowest (11.53 t/ha/yr). Results from tree intercrop trial (2012-20) showed that an average of 13.3 t CO_2/ha/yr was fixed in intercropping of one row mahagany and one row pathimugam with rubber which is higher than CO_2 sequestered in three row mahagany and one row pathimugam and pure crop (control).

P-41 Understanding the role of water stress-induced reactive oxygen species generation in xylogenesis in poplar plants

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Water and water stress-induced reactive oxygen species (ROS) formation play a crucial role in the growth and development of xylem tissue. Two contrastingly different clones, namely Wimco-109 and Wimco-83 of *Populus deltoides* plants were vegetatively propagated and grown in silica sand medium under greenhouse conditions to determine their responses to water stress. Plants were grouped into three lots: the first was a well-watered control, and the second and third lots were subjected to drought stress by supplying 200 ml (mild water stress) and 100 ml (severe water stress) of water in a 24-hour period. Plants were analysed for their growth by measuring stem diameter, height, xylem anatomy, plant water relation-related parameters (water potential and water content—water saturation deficit, specific water content, and succulence), and ROS production. Enhanced production of hydrogen peroxide, lipid peroxidation, and non-protein thiol was observed in severely water-stressed plants. Higher lignification and lesser vessel area were observed in Wimco-83. Contrastingly, the xylem anatomy of Wimco-109 shows a larger vessel area and higher superoxide anion production. In conclusion, Wimco-109 survived better under drought conditions.

P-42 Effect of fertilizer and spacing on biochemical attributes in tannia (*Xanthosoma sagittifolium*)

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Different spacing and fertilizer doses were tested for up boosting various biochemical parameters in tannia. The three spacings were S1 = 90 × 90 cm, S2 = 90 × 60 cm and S3 = 90 × 45 cm and three fertilizer doses were F1 = FYM 20 t/ha + 80-60-80 NPK kg/ha, F2 = FYM 20 t/ha + 160-120-160 NPK kg/ha and F3 = FYM 20 t/ha + 240-180-240 NPK kg/ha respectively. There were total nine treatment combinations, namely S1F1, S1F2, S1F3, S2F1, S2F2, S2F3, S3F1, S3F2 and S3F3. The leaf samples were collected at 45 days after planting (DAP), 75, 105, 135 and 165 DAP and corms at mature harvesting stage for different analysis. The present study depicted that, among the treatments for leaf S2F3 produced the highest amount of minerals like, total nitrogen (0.849 % at 45 DAP, 0.887 % at 75 DAP, 0.972 % at 105 DAP, 0. 949 % at 135 DAP and 0.911 % at 165 DAP), phosphorus (38.643 mg/100g at 45 DAP, 40.262 mg/100g at 75 DAP, 36.856 mg/100g at 105 DAP, 36.801 mg/100g at 135 DAP and 33.498 mg/100g at 165 DAP), potassium (152.654 mg/100g at 45 DAP, 158.598 mg/100g at 75 DAP,162.564 mg/100g at 105 DAP, 167.862 mg/100g at 135 DAP and at 160.666 mg/100g 165 DAP), crude fiber (2.137 % at 45 DAP, 2.248 % at 75 DAP, 2.319 % at 105 DAP, 2.392 % at 135 DAP and 2.308 % at 165 DAP), lignin (0.602 % at 45 DAP, 0.692 % at 75 DAP, 0.750 % at 105 DAP, 0.802 % at 135 DAP and 0.757 % at 165 DAP) and dry matter content (52.130 % at 45 DAP, 53.025 % at 75 DAP, 49.073 % at 105 DAP, 48.280 % at 135 DAP and 47.841 % at 165 DAP), treatment S2F1 produced the highest amount of carbohydrate (4.647 % at 45 DAP, 4.837 % at 75 DAP, 5.057 % at 105 DAP, 5.458 % at 135 DAP and 4.256 % at 165 DAP). In a nut shell present study depicted that spacing treatment did not have specific effect for most of the biochemical parameters, in leaves F3 treatment produced the highest total nitrogen, phosphorus, potassium, crude fiber, lignin and dry matter content as well as F1 treatment was best for carbohydrate.

P-43 Biochemical and nutritional evoluation of chickpea (*Cicer arietinum* L.) at different sprouting conditions

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Sprouting tends to enhance the nutritional value of the pulses. Pulses contain certain anti-nutrients which lock up important minerals and also inhibits our digestive enzymes. Sprouting increases the nutritive value. Further, it provides the amino acids more readily available and increase antioxidants which helps in detoxifying body. The present investigation was undertaken on chickpea (*Cicer arietinum L.*) in order to estimate the nutritional characterization at different levels of sprouting (0hrs, 24hrs, 48hrs, 72hrs, 96hrs). Chickpea varieties were collected from pulse research station, Vadodara. Collected varieties were screened based on the basic nutritional attributes. Screened chickpea varieties were employed with different sprouting treatments and nutritionally characterized. During analysis of chickpea sprouts data indicated that total soluble sugars (%), crude protein (%), free amino acid (%), vitamin – C (mg/100g), total phenols (%) and total antioxidant activity (%) were significantly increased with increasing the hours of sprouting. And which was maximum at T4 (96 hrs sprouting) Enzymes like alpha amylase and protease were increase with increasing sprouting. Maximum activity was found at T4 (96 hrs sprouting) and T3(72 hrs sprouting) respectively. And increasing hours of sprouting decreased soluble protein (%), phytic acid (mg/100g), trypsin inhibitors (TIU/g) which were lowest at T4 (96 hrs of sprouting). Micronutrients like Fe, Zn, Mn were increased with increasing with sprouting time. Accumulated highest at T4 (96 hrs sprouting). Were as macro element Ca was decreased and it was lowest at T2(48 hrs sprouting). Protein proofing by SDS-PAGE of chickpea sprouts indicates reduced pattern of bands with increasing sprouting. Bands with molecular weight 91 kDa (Rm = 0.078), 70 kDa (Rm = 0.203), 51 kDa (Rm = 0.338) decreased in intensity with increasing sprouting and disappeared at T4 (96 hrs sprouting). Results suggest that sprouting has potential role in improving the nutrition of pulses.

P-44 Comprehensive nutritional profiling of chickpea crops using chemical analysis methods

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Chickpea (*Cicer arietinum* L.) is a pivotal leguminous crop known for its rich nutritional composition and agronomic versatility. Accurate assessment of its nutritional profile is paramount for optimizing crop management strategies and ensuring food security. This study employs traditional chemical analysis methods to comprehensively evaluate the essential nutrients in chickpea grains. A diverse selection of chickpea samples, spanning various genotypes, growth stages, and environmental conditions, were subjected to rigorous chemical analyses. Parameters including protein content, lipid composition, carbohydrate fractions, dietary fiber, mineral content, and moisture levels were quantified following established protocols. Statistical analyses were performed to elucidate potential variations in nutrient composition. The results unveil a comprehensive nutritional profile of chickpea crops, showcasing a notable variation in nutrient content across different genotypes and growth stages. Chickpea grains exhibited significant levels of proteins, with varying amino acid profiles. Lipid composition revealed a predominance of unsaturated fatty acids, contributing to the crop's dietary benefits. Carbohydrate fractions displayed distinct patterns, highlighting the presence of complex polysaccharides. The dietary fiber content was substantial, emphasizing the crop's potential as a source of functional food ingredients. Essential minerals, including potassium, phosphorus, and calcium, were found to be abundant. Moisture levels were within acceptable ranges, indicative of suitable post-harvest storage conditions. This study provides a detailed nutritional profile of chickpea crops using established chemical analysis methods. The findings underscore the crop's potential as a valuable source of essential nutrients and highlight the importance of considering genotypic and growth stage variations in nutritional planning. The comprehensive data generated serves as a valuable resource for breeders, nutritionists, and agronomists, facilitating the development of improved varieties and cultivation practices to enhance the nutritional quality of chickpea crops for global food security and sustainable agriculture.

P-45 Characterization of *Rhizobium* strains from wild legumes for their cross-infectivity to *Vigna radiata* L.

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The major limiting nutrient affecting soil productivity is nitrogen (N); although, there is a high percentage of nitrogen (78%) available in the atmosphere, however plants are unable to fix it. In crop fields, nitrogen is supplied by chemical fertilizers; although, the application of chemical fertilizers increased the crop yields from past many years but their excessive use has resulted in many harmful impacts on the environment & animal health. Rhizobium play important role in maintaining soil productivity through biological nitrogen fixation (BNF) and in restoration of the destroyed cultivable areas. Wild native legumes grow in variety of ecological niches so harbour phylogenetically different micro symbionts. The natural Rhizobia of wild legumes have been shown to have higher tolerance to prevailing adverse conditions. The cross-infection of Rhizobia from wild legumes may prove a useful means for improving BNF in agriculturally important legumes. Isolation of effective and promiscuous Rhizobia from wild legumes to inoculate other legume crops is a new strategy to improve the efficiency of the Rhizobium-legume symbiosis. Experiments to isolate Rhizobia from wild legumes and test for cross- infectivity are conducted and further screening of Rhizobia isolates based on plant growth promoting (PGP) traits are performed. This study will help understand the mechanism behind cross-infectivity of the broad host range Rhizobium harboured by wild legumes which will further help to develop an eco-friendly Rhizobium based bioinoculant for their application in improving the productivity of *Vigna radiata* L.

P-46 Screening of lichen and their secondary metabolites against plant pathogenic bacteria and fungi

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Lichens are symbiotic organism of mycobionts and photobiont. The lichens are used from centuries throughout the world as food, medicine, spice and for production of dye and perfume. The mycobiont component of lichens produces numerous compounds that act as valuable natural resource. The lichen *Heterodermia obscurata* (Nyl.) Trevis and *Usnea pangiana* Stirton were collected from Himalayan region and were identified at Lichenology Laboratory, CSIR-NBRI, Lucknow, on the basis of their morphological, anatomical and chemical characters. The antibacterial and antifungal activities of the methanol and acetone extracts, and isolated compounds of the lichens was tested against plants pathogens. The activities of the crude extracts were tested at a concentration of 5 mg/ml (50µg/disc) through disc diffusion assay. The Minimum Inhibitory Concentration (MIC) was tested at two-fold serial dilutions at concentration ranging from 10 to 0.001 mg/ml in 96 well plate. The methanol extracts of *U. pangiana* showed the highest Zone of Inhibition (ZOI) against bacteria *Pseudomonas syringae* (13.3mm) and antifungal activity was (12.8mm) against *Aspergillus niger.* The study showed impressive results in the methanol extract of *U. pangiana* in comparison to *H. obscurata.* From the methanol extract of *U. pangiana* major compound usnic acids and minor diffractic acid were purified through gravity column chromatography by using the different ratios of hexane and ethyl acetate solvents. The purified compounds were identified and characterised by LC-ESIMS and 1 H and 13C NMR. The usnic acid has showed the highest antimicrobial activties than the diffractic acid as expressed by less MIC values. The significant MIC of usnic acid were 5.7µg/ml and 15.8µg/ml against *A. niger* and *F. oxysporum* respectively. As the information on the pharmaceutical importance of lichens is limited the present study is an important contribution in this area.

P-47 Biochemical and molecular characterization of plant growth promoting rhizobacteria inducing systemic antiviral resistance against plant viruses

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Use of rhizobacterial strains for growth promotion and induction of resistance in plants against pathogens is an effective and eco-friendly approach. Strains were isolated from the rhizosphere of healthy plants and used either as a foliar spray or a root/soil drench treatment for induction of resistance in plants. Rhizobacterial isolates UN2, RO2, and H1 could induce systemic antiviral resistance against Tobacco mosaic virus (TMV) and Sunnhemp rosette virus (SRV) in the assay hosts *Nicotiana tabacum* cv. Xanthi-nc and *Cyamopsis tetragonoloba* and a percent reduction in the local lesion number by 90-95% was evident on site and remote-site leaves when the rhizobacteria were administered as a foliar spray on the basal leaves. The root/soil drench was ineffective. A decrease in viral load was noted when the three isolates were tested against TMV on its systemic host *N. tabacum cv.* White Burley. The rhizobacterial isolates exhibited no antimicrobial activity *in vitro* against *Bacillus subtilis*, (ATCC 6633) *and Escherichia coli* (ATCC 11775). UN2, RO2, and H1 isolates produced auxin (61.08, 11.82 and 55.88 µg mL^{-1}, respectively), cellulase, lipase, and solubilized phosphate, with a solubilization index of 1.69, 1.53, and 1.88, respectively. UN2, RO2, and H1 isolates shared a 99 % sequence identity in their 16S rRNA partial gene sequence with *Klebsiella pneumoniae* H3, *Klebsiella pneumoniae* KP18E, and *Comamonas sp*. FM3, respectively. A phylogenetic tree was constructed using these rhizobacterial isolates, along with other representative sequences from the NCBI database. Induced antiviral resistance, auxin production, and phosphate solubilization could make this isolate potentially useful in plant growth promotion and biological control of plant viruses.

P-48 Cultural and morphological characterization of *Purpureocillium* sp.

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Identification of *Purpureocillium* sp. was done on the basis of cultural and morphological characterization of isolates. The isolates were subjected to PDA plating and the cultural characters like color or pigmentation, growth rate and diameter of colony (mm) were recorded. Also isolates were subjected to light microscopy and the morphological observations like conidiophore, phialides, conidial chain, conidia shape and size (µm) were recorded. Cultural and Morphological characterization of efficient strains revealed that the *Purpureocillium* sp. strains collected from different regions was differed from each other. They were identified as *Purpureocillium* sp. and coded as P-1, P-2, P-3 and P-4 strains. Cultural characteristics recorded were the colony diameter of different isolates were from 87 - 89 mm with pigmentation initially pale or lemon yellow in colour later turns to dark green in colour with early to late sporulation. Morphological characters observed were septate mycelium, hyaline conidiophore, formation of phialides, conidia are round to oval in shape and measured about 2.9-4.3 x 2.1-3.9 µm in size.

P-49 Growth and effect of *Purpureocillium* sp. on different media

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Purpureocillium sp. is a common saprophy tic, filamentous fungus. It has been isolated from a wide range of habitats including cultivated and uncultivated soils from forests, grassland, deserts, estuarine sediments and sewage sludge. It has been found in nematode eggs and occasionally from females of root knot and cyst nematodes. In addition, it has been frequently detected in the rhizosphere of many crops. These species can grow at a wide range of temperatures from 8°C to 30°C with optimal growth in the range of 20° to 25°C. It has a wide pH tole range and can grow on a variety of substrates. Diversity in growth characters of *Purpureocillium* sp. was studied on six different media at room temperature (27± 1°C). Observation on growth and dry mycelial weight were recorded when the maximum growth was attained after 8 day in all the media tested. The effect of different culture media on the growth of fungi differed significantly. Maximum dry mycelium weight of *Purpureocillium* sp. was recorded in potato dextrose broth (6.06g) which was found to be significantly superior compared to all other broths tested. Sabourd's dextrose broth (5.72g) was moderately good followed by Rose Bengal broth (5.5g). The least mycelial weight was recorded in Czapeck's liquid medium (2.5g) indicating its inability to support the growth of *Purpureocillium* sp.

P-50 Genome-wide analysis identification and functional characterization of laccase gene family in *Artemisia annua*

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This study utilizes computational methods to investigate the Laccase gene family in the plant species *A. annua*. A total of 42 AaLacs were found through the detection of three conserved domains: Cu-oxidase, Cu-oxidase2, and Cu-oxidase3.The physicochemical parameters indicate that AaLacs are proteins consisting of 541-1075 amino acids. The stability of these proteins is high, as shown by an instability score below 40. Phylogenetic and motif analyses have shown structural variations in AaLacs, indicating potential functional divergence. A total of 22 AaLac *cis*-regulatory elements were chosen based on their involvement in drought stress, metabolic, defense mechanisms, and stress responses. Comparing Arabidopsis and AaLac proteins revealed that AtLac, namely 11 *AtLacs*, alleviates stress responses. Computational expression study of *AtLacs* revealed that *AtLac84* is likely to have a role in response to drought stress. Therefore, the ortholog *AaLac1* was chosen for expression analysis. Further, The real-time PCR data demonstrates that *AaLac1* amplifies the ability of shoot and root samples to withstand drought stress. Thus, *AaLac1's* function in drought tolerance also shows potential that genetic transformation can improve stress responses *A. annua*.

P-51 Potential role of seed priming in mitigating heat and drought stress responses in pulses

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Over the past two decades, the threat of global climate change mainly due to high temperature, irregular precipitation pattern and fluctuations in sea level is a serious concern for researchers, as these factors have a negative impact on agriculture production and challenging food security worldwide. As per earlier findings, agriculture is deeply linked to climate change, and the main factor of abiotic stresses (heat, and drought) decline the crop yield potential in range of about 30-70% worldwide. The *Rabi* pulses mainly lentil, chick pea and field pea are generally grown in residual soil moisture and late sowing. Therefore, crops face heat stress and water stress at the reproductive stage. The seed priming is an effective and less-tedious technique which has shown appreciable results in many fields experiment in pulses, particularly under abiotic stress conditions. Seed priming can be done through various techniques i.e., hydropriming, Osmo priming, halopriming, hormone priming, heat priming, and chemical priming. Seed Priming has a critical function in improving germination and growth in a variety of crops under various abiotic conditions. It activates numerous stress-responsive genes, enabling an early germination and greater abiotic stress tolerance. Previous research implicated that seed priming, which improve stress tolerance of germinating seeds is a cross-tolerance manifestation. Stress tolerance is achieved either by increasing many germination-related metabolism and enzymatic activities or imposing an abiotic stress on seeds that represses radicle protrusion, but stimulates stress responses, inducing cross-tolerance. These strategies make up a 'priming memory' in seeds, which can be intensified upon later stress exposure and gives the greater stress tolerance. In the context of heat stress in pulses, seed priming alleviates damage extent by increasing production of heat shock proteins (HSPs), molecular chaperones, antioxidants, reduced malondialdehyde and carbohydrate at reproductive stage. Similarly, in drought condition, Osmo priming and hydropriming of pulses, which gives appreciable results to withstand stress by improved germination, increased crop stand establishment, soluble sugar, amylase activity, and chlorophyll content.

P-52 Potential role of terrace farming to reduce soil erosion

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Soil erosion is a major hazard in rainfed areas as it causes loss of soil fertility and deterioration of soil, which adversely affects crop production. Extreme precipitation increases the rate of soil erosion through detachment of soil particles by heavy rainfall, and this also leads to soil runoff. It causes land degradation, loss of organic matter from the soil, reduces water and nutrient holding capacity of the soil, thus negatively affecting the crop productivity and ultimately leading to risk of food security. To reduce this, terrace farming is executed in hilly areas. Terrace farming is one of the oldest and promising measures of soil conservation. It decreases the intensity of waterflow and significantly reduces soil loss, increases soil fertility and helps in soil conservation. Terrace structure act as a barrier constructed against the slope that slows down the runoff and helps in the retention of rainwater by increasing the water holding capacity of soil, this ensures groundwater recharge. Terraces also reduces the risk of landslides. Through reduced soil erosion and controlled water flow, the fertile top layer of soil is preserved which leads to high crop productivity and potentially better yields.

P-53 Impacts of nematode-infected plants on human health: A comprehensive analysis

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Root knot nematodes (*Meloidogyne incognita*) are microscopic roundworms and found in diverse environments. They are a significant threat to global agriculture by parasitizing the root systems of various crops. The nematodes establish a symbiotic relationship with the host plant, causing gall on the roots, disrupting nutrient uptake, and water absorption. These physiological alterations lead to stunted growth, reduced yield, and ultimately compromise the economic viability of affected crops. In addition to direct damage, root knot nematodes often act as vectors for other plant pathogens, exacerbating the overall impact on crop health. Several control measures have been used by different researchers to mitigate nematode infestations, such as chemical nematicides, resistant crop varieties, and integrated pest management strategies. However, the efficacy of these approaches varies, and sustainable solutions are important to ensure long-term agricultural productivity. On the other hand, their implications for human health have been a topic of increasing concern.

This abstract provides a comprehensive overview of the potential risks of nematode-infected plants to human populations. Nematode-infected plants can affect human health in a adverse ways. Firstly, these parasites can directly affect food security by reducing crop yield and quality, leading to inadequate nutrition for communities depending on these crops. Secondly, nematodes can serve as carrier for plant pathogens, which may contaminate the food supply, having risks of food borne infections. Moreover, certain nematode species produce toxins that may accumulate in plants, which have harmful effects on consumers in long run. Additionally, the use of chemical pesticides to control nematodes raises concerns about their residues in crops, which might have adverse effects on human health. Furthermore, nematode-induced damage to plant roots can initiate changes in soil composition and structure, affecting the overall environment and potentially groundwater quality. This can have negative effects on human populations, especially those relying on agriculture for their livelihoods. In light of these, it is imperative to intensify research works to understand the complicated relationships between nematodes, plants, and human health. Yes, by developing sustainable agricultural practices, promoting crop diversification, and enhancing soil health management are vital strategies to mitigate the adverse effects of nematode infestations. Collaboration between scientists, policymakers, and farmers is crucial to ensure food security and safeguard human health in nematode-affected regions. This abstract highlights the multifaceted impact of nematode-infected plants on human health, emphasizing the importance of a holistic approach to agriculture that considers the interrelation of our ecosystems and human well-being.

P-54 Overexpression of Brassinosteroid biosynthetic gene (cyp450) increases abiotic stress tolerance in chickpea (*Cicer arietinum* L.).

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Chickpea (*Cicer arietinum* L.) is widely cultivated in the world. It is the second most important food legume and highly proteinaceous in nature. In India, chickpea is cultivated in almost all parts of the country (68% area), mainly as a rain-fed crop. It is estimated that, on average, chickpea suffers a loss to the tune of 25–30% due to various abiotic and biotic stresses. Climate change has become a major challenge in chickpea production and productivity. Chickpea crop is highly vulnerable to abiotic stresses such as heat, frost and drought at various growth stages during the season. Severe yield losses due to abiotic stresses have been recorded, especially when the crop is exposed to adverse conditions during the reproductive phase, causing loss in chickpea production. Brassinosteroids (BRs) are plant steroid hormones that play significant roles in plant growth and development and also regulate many aspects of abiotic stress responses. Thus, while the role of BR in plant growth and development is well known, but the growth traits that can be simultaneously stimulated by BR and how these growth traits increased with abiotic and biotic stress tolerance, is currently not known. We chose to address these questions through the overexpression of Cytochrome P450-like gene in the economically important crop plant chickpea. This gene encodes a rate limiting mono-oxygenase that mediates 22α-hydroxylation reactions in the BR biosynthetic pathway. Previous study shows that the transgenic B. napus plants with Cytochrome P450-like gene were characterized with increased seed yield, higher root biomass and root length, better tolerance to dehydration and heat stress, as compared to WT. Overall, a net positive impact on plant productivity and performance will be achieved the manipulation of a single BR biosynthetic gene. These findings will also provide a strong base for developing BR-based breeding programs for crop improvement.

P-55 Intervention of microbial enzymes in paper industries

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The paper industry is one of the high-demand and fast-growing sectors in India. The paper industry depends on virgin fibers with lots of chemicals, water, and high-cost equipment. Paper is formed by using wood fibers, followed by a chemical-mediated process that is linked to increased environmental pressure. The major consequences are deforestation, and pollution of water bodies including increases in heavy metals, BOD, COD, DO, TSS, and TDS directly and indirectly affect the crop field, plants, terrestrial animals, aquatic animals, and human health. Efforts are being made to switch over to eco-friendly approaches avoiding chemicals. The virgin or wood-based fibers can be replaced with secondary fibres or agro-waste and enzyme-mediated processing can serve as a sustainable alternative to conventional procedures. Enzymes are used as alternative agents to overcome the problems of the polluting technologies. Microbial enzymes have better catalytic efficiency and stability along with production efficiency. Hence enzyme-based applications in pulp and paper manufacturing unit is a subject matter of biotechnological research. Efforts for innovations in enzymes have led to a reduction in the market price of enzymes with a substantial increase in usage in industries. Cellulase, amylase, pectinase, lipases, laccases, protease, and xylanase enzymes, as well as a consortium of these enzymes, are commercially available and have replaced the chemically mediated processes such as retting, pulping, bleaching, deinking, and refining. Enzymes can efficiently be used for bioretting, biopulping, biobleaching, biodeinking, and biorefining. The sustainable enzymatic process has resulted in decreased environmental load because of the reduction in the BOD, COD, and heavy metal load values to tolerable levels. Enzymes offer significant potential in the production of paper owing to their high efficacy, bio renewability, mildness, non-polluting nature, high selectivity, low cost, and enhanced paper quality.

P-56 Ameliorative response of indole-3-acetic acid under ferulic acid stress exposed to *Solanum lycopersicum* L. Seedlings

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Over past few years, overall productivity of major crops is reduced due to various abiotic and biotic stress factors prevailing around the world. Allelopathy is a phenomenon involving plant growth interference through production and release of secondary metabolites by donor plant which further cause positive or negative response on recipient plant system. The current investigation was undertaken to assess the ameliorative roles of indole-3-acetic acid (IAA) against ferulic acid (FA) toxicity in *Solanum lycopersicum* (tomato) seedlings. The results revealed that plants treated with FA showed reduction in growth consequently due to hampered physiological and biochemical attributes. However, exogenous IAA application in FA stressed plants showed mitigation through improved plant growth. IAA possibly have strengthened plant defense system to combat against oxidative injury caused by FA. Results concluded that exogenously applied IAA could promote growth under allelopathic stress conditions by modulating plant adaptive mechanisms.

P-57 Potential of fungi in promoting sustainable agriculture and food security: An overview

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The fungi are very important microorganisms that have potential applications in a wide range of fields, such as agriculture, food industries, textile industries, paper and pulp industries, pharmaceuticals, and many others. A fungus can be beneficial or detrimental to plants, depending on how it interacts with them. Fungi play an important role in agriculture sustainability. The use of harmful chemical fertilizers and pesticides must be limited in sustainable agriculture. The useful fungal communities contribute to the promotion of plant growth either directly or indirectly via various plant growth-promoting mechanisms, such as the release of plant growth regulators, facilitating the dissolution of minerals like phosphorus, potassium, and zinc, biological nitrogen fixation, or the production of siderophores, NH_4, Hydrogen cyanide, and other secondary metabolites. Fungi with multifunctional Plant growth promoting characteristics have the potential to serve as biofertilizers and biocontrol agents, replacing chemical fertilizers and pesticides used in different agricultural practices. Fungi can also act as bioprotectants and biostimulants, alleviating diverse abiotic stress within plants. Fungi employ an array of mechanisms to prevent infection or restrict the growth of insects, pests, and weeds, which include direct antagonism or hyperparasitism, antibiosis, competition, and induced resistance. *Trichoderma, Alternaria, Aspergillus, Candida, Fusarium, Penicillium, Pichia, Pythium, Talaromyces, and Verticillium* are fungal species which are recognized as significant antagonistic species. Since fungi have a high reproductive rate (both sexually and asexually), a short generation time, and target specificity, they have proved to be useful biological control agents against plant pathogens.

P-58 Melissopalynological analysis and its implications on sustainable development

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The palynological analysis of honey indicates the botanical and geographical origin of honey in relation to the vegetative composition and climate in the region. This palynological analysis on honey samples were collected from the Kanpur and adjoining areas to understand the pollen composition in relation to the forest and land use areas. The pollen data generated from the forested area composed of *Bombax ceiba, Salmalia malabarica, Acacia nilotica, Terminalia chebula*, and *Syzygium jambolanum* in the pollen assemblage was characterized and preferred plants for honey.The abundance of *Brassica campestris, Coriandrum sativum* and *Solanum* tuberosum in the pollen assemblage procured from the agricultural areas was identified and characterized as preferred plant taxa for honey. The continuous presence of allergenic pollen taxa such as *Azadirachta indica*, *Cannabis sativa* and *Cynodon dactylon* in honey samples was observed. This study will be helpful to understand the details of the preferred plants by honey bee for the apiculturists and to understand the allergenic plant sources for the general people.

P-59 Bioinformatics intervention in crop improvement: An update

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Due to the overgrowing world population, modern plant biotechnologist faces two major challenges: first, to feed the growing population, and second, to protect crops from various biotic and abiotic stresses. To overcome these problems, interdisciplinary approaches are needed to investigate the solutions. With the help of omics knowledge, tools, and technology, we have recently witnessed a shift in paradigm to increase crop productivity. In this context, bioinformatics can help determine which genotype combination will produce the desired phenotype and accelerate the identification of new varieties through genetic and genomic selection. In addition to increasing the number of genome sequencing of crops, the use of *in-silico* tools continues to make significant advances in crops production and their improvement by providing scientists with access to genomic data with putative genes governing several desirable attributes.

Additionally, Bioinformatics plays a significant role in genome-wide identification of several candidate genes responsible for crop improvement against various stresses together with crop yield. Using such Insilco approaches has been the key to achieving multiple goals quickly. Hence, Bioinformatics is an interdisciplinary field that bridges modern biology with informatics. It is concerned with the creation, progress and execution of algorithms and several tools that facilitate a greater understanding of several candidates' genes and their biological processes to serve agricultural and healthcare sectors, as well as several spinoffs. In our lab, several transcription factors like Nuclear Factor Y (NF-Y), DoF, and WRKY were studied for millet improvement programs through bioinformatic intervention and further validated by wet lab experimentation which can be targeted for development of transgenics crops.

P-60 Extraction of gibberellin from a natural source and it's shelf-life enhancement activity

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Ethylene is a gaseous phytohormone produced in fruits and vegetables that plays an important role in ripening. Its action thus leads to a significant amount of agricultural waste due to over ripening. Gibberellin is also a phytohormone with the potential to act as an ethylene inhibitor, slowing down the ripening process and thereby reducing food and agricultural wastage. Although gibberellin is produced naturally within the plant, it is not sufficient to inhibit the fruit-ripening activity of ethylene. Therefore, we have extracted gibberellin from a fungal source, specifically *Aspergillus niger*, by utilizing an agricultural by-product as a substrate for solid-state fermentation at various pH levels. Subsequently, we extracted the obtained gibberellin using ethyl acetate and a rotary evaporator from the fermented culture. The amount of gibberellin was quantified through UV-Vis spectrometry, revealing a peak absorption at 238 nm for pH 4.5. Additionally, we examined the efficacy of standard gibberellin on fruits such as kiwi and avocado, testing concentrations ranging from 100 to 300 ppm. The maximum shelf-life extension was observed at a concentration of 300 ppm after evaluating various parameters, resulting in a 5–6 day increase in the shelf life of the fruits. Our future objectives include standardizing a protocol for gibberellin production to achieve the highest possible concentration and transforming the obtained gibberellin into a more commercially viable and acceptable form.

P-61 Plant tissue culture approaches in relation to crop improvement

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Plant tissue culture is also one of the applications of biotechnology used to improve crops and to increase the speed or efficiency of the breeding process, improve the accessibility of existing germplasm, and create new variations for crop improvement. Micro-propagation of selected plant species is one of the best and most successful examples of the commercial application of tissue culture technology. Large-scale micro-propagation laboratories are providing millions of plants for the commercial ornamental market and the agricultural, clonally-propagated crop market. Meristem culturing and in vitro grafting help in developing disease-free plants. Improvement of somatic embryo-genesis, coupled with embryo desiccation and encapsulation technology, may lead to the utilization of 'artificial seeds' for mass cloning of plants. Further induction of somatic embryo-genesis in plants helps in cloning and transformation. Somaclonal variation is cheaper than other methods of genetic manipulation. At present, it is also more universally applicable and does not require 'containment' procedures. It has been most successful in crops with limited genetic systems and/or narrow genetic bases, where it can provide a rapid source of variability for crop improvement. Embryo culture is the practical approach to obtaining inter-specific and inter-generic hybrids among otherwise difficult-to-cross parents. It has been successfully used to transfer desirable genes from wild relatives into cultivated varieties of several field and vegetable crops. In recent years, the development of plant cell, and tissue culture techniques has a considerable potential for the improvement of several fruit trees. Somatic embryo-genesis is a developmental process of somatic cells, which resembles morphologically zygotic embryo-genesis. It is an important pathway for the regeneration of plants from the cell culture system and a method commonly used in the large-scale production of plants and synthetic seeds.

P-62 Control and prevention of infectious disease of fish

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A fast expanding sector of agriculture worldwide is aquaculture. About 44% of the world's total fish production comes from it. Despite encountering numerous obstacles in the aquaculture environment, this significant rise of production is achieved. Infectious disease is the main factor restricting output since it results in yearly losses of several billions of dollars. It is vital to address health issues based on methods that have been scientifically verified and advised in order to lessen the impact of the fish disease. This review aims to highlight some of the most effective strategies for infectious disease prevention and control in aquaculture. Vaccination is one of the most important procedures among the efficient prevention and control techniques. Fish vaccines can come in a variety of forms, including DNA vaccines, recombinant technology vaccines, killed vaccinations, attenuated vaccines, and synthetic peptide vaccines. Fish vaccinations can be administered orally, intravenously, or subaerobically.Despite the negative effects of antibiotics on the emergence of drug resistance in microorganisms, they are nonetheless used in aquaculture. There is widespread usage of biological and chemical disease control methods, including the use of probiotics, prebiotics, and medicinal plants. Aquaculture biosecurity techniques can protect a facility against specific disease-causing agents that are not present in the system. Strict quarantine procedures, egg disinfection, traffic control, water treatment, clean feed, and mortalities disposal are all examples of farm-level biosecurity measures. In conclusion, it is advised to take a preventive approach before any disease outbreaks occur rather than attempting to treat every sickness case.

P-63 Enhancing drought tolerance in chickpea by overexpression of the glutaredoxin (Grx) gene

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As temperatures continue to rise, drought conditions are becoming more severe and frequent in many regions around the world. This poses a significant threat to the cultivation and yield of chickpea crops to worldwide. Glutaredoxins (Grxs) are ubiquitous, heat-stable, cysteine-rich proteins and glutathione-dependent thiol-disulfide oxidoreductases. The overexpression of the CC-type Grxs gene in plants improves drought and salinity stress tolerance. This study examines the potential function of the glutaredoxin (CaGrx) gene in response to drought stress in chickpea. The CaGrx gene from chickpea was overexpressed in Kabuli-type chickpea by the Agrobacterium-mediated gene transformation method. Integration of the CaGrx gene in the Kabuli chickpea genome was confirmed by PCR using gene-specific primers. The transgenic chickpea T_1 generation has improved drought tolerance due to a higher expression of antioxidant enzymes such as glutaredoxin (GRX), glutathione reductase (GR), glutathione peroxidase (GPX), glutathione-S-transferase (GST), superoxide dismutase (SOD), and catalase (CAT). Also, the CaGrx overexpression lines of T_1 generation showed improved physiological performance, including net photosynthesis (P_N), transpiration (E), water use efficiency (WUE), stomatal conductance (gs), PSII (Fv/Fm), and non-photochemical quenching (NPQ) during drought, which help to maintain the photosynthetic apparatus and protect the plants from oxidative damage. Overall, the study found that CaGrx overexpression improves chickpea drought tolerance, and the CaGrx gene could be used to develop drought-tolerant crop plants.

P-64 Development of high-frequency *in vitro* regeneration system in Indian lotus (*Nelumbo nucifera* gaertn.)

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An efficient protocol for in vitro whole plant regeneration of Indian lotus (Nelumbo nucifera Gaertn.) was successfully achieved from direct and indirect methods. A direct regeneration system was established using explants shoot apical meristems and immature seeds (plumule) cultured on SIM supplemented with 17 different combinations and concentrations of PGRs (BAP+NAA). Both explants obtained the highest shoots with BAP and NAA. After that, plantlets were transferred to LRIM containing 17 different concentrations of NAA or IBA and BAP. The highest number of roots from explants shoot apical meristems were obtained with NAA and BAP. The highest number of roots from immature seed explants were obtained with IBA. In this study, all the experiments were incubated in a culture room under white fluorescent light at 25 ± 1°C with a 16/8hour, light/dark period. Well-developed plantlets were shifted to the greenhouse at 28 ± 2 °C with a 16/8-hour, light/dark period. High-frequency ISE has been established through callus culture. The leaf segments (1.0-1.5 cm) were cultured onto CIM supplemented with 10 different combinations of 2,4-D+BAP. The high-frequency callus formation was obtained with all developmental stages at the proembryo, globular, heart, torpedo, and mature embryos. After shoot and root induction, well-developed plantlets were transferred to the greenhouse at 28 ± 2 °C with a 16/8-hour, light/dark period.

P-65 New approaches and modern techniques for crop improvement

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Crop species improvement has been a major focus since agriculture began thousands of years ago. Wheat, corn, rice, and potatoes are expected to lead the way in feeding the world's growing population. The introduction of genes into wheat laid the groundwork for the so-called "Green Revolution." To meet the challenge of high plant performance under varying environmental circumstances, all available technological tools and resources must be used effectively. New Approaches and Modern Techniques examines crop productivity in light of advances in crop biotechnology, including information on modern genomic technologies as well as unique genetic and breeding approaches. The emphasis is on breakthroughs in crop biotechnology, important ideas impacting current crop improvement program practice, new methodologies, modern techniques, and molecular plant breeding, all of which contribute to discoveries in this sector. Traditional crop improvement breeding approaches frequently entail measuring phenotypic performance and genetic markers. Using metabolic quantitative trait loci and metabolic genome-wide association studies, on the other hand, can improve the selection of elite breeding lines. Metabolomics data can disclose the regulatory mechanism underlying metabolic pathways that express agronomically important features, allowing for future crop development such as nutritional quality increase. Metabolomics-assisted crop development is predicted to aid in meeting future food security needs and developing plants that can withstand environmental and climate difficulties. The discovery of metabolic indicators during plant stress response suggests that it has the potential to be a key driver in crop development.

P-66 Effect of weed management on growth yield of green gram

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Among the pulses, green gram (*Vigna radiata* L.) is one of the most important and extensively cultivated crops in India. The average productivity of this crop is very low in India. The low production of this crop is mainly due to crop-weed competition. Weed management is an important key factor for enhancing the productivity of green gram.To evaluate the effect of different pre and post emergence herbicides, field experiment was conducted during *rainy* season of 2022 in weed control (E) block of NEB, CRC of G.B Pant University of Agriculture and Technology, Pantnagar. Ten weed control treatment *viz,* Pendimethalin (30% EC) 750 g.a.i/ha, Fenoxprop-p-ethyl (9.3%EC)67.5g.a.i/ha, Fluazifop-p-butyl(13.4%EC)125g.a.i/ha, Imazethapyr (10%SL)75g.a.i/ha, Propaquizafop (10% EC) 100g.a.i/ha, Quizalofop-ethyl (5%EC) 50g.a.i/ha, Fluazifop-p-butyl (11.1%)150g.a.i/ha +Fomesofen(11.1%EC) 250g.a.i/ha, Sodium Acifluorfen (16.5)%+Clodinofoppropargyl (8% EC) 80+165g.a.i./ha, weed free and one untreated. The following treatment was evaluated in RBD with 3 replication. Mung-6 was sown with opened furrows by a tractor-drawn opener at 30 cm apart. Postemergence application of Imazethapyr (10%SL)75 g.a.i/ha and Sodium Acifluorfen (16.5)%+ Clodinofoppropargyl (8% EC) 80+165g.a.i./ha recorded significantly lowest weed density and dry weight of grassy, broad leaf weeds and sedges and it also recorded highest weed control efficiency and grain yield of mung bean over control. However, all the herbicide treatments recorded significantly lower density and dry weight of weeds than weedy check. None of the herbicide treatments was effective as weed free (hand weeding) in the reduction of weed density and their dry weight.

P-67 Assessing the adaptation of the trees in the degraded ecosystem for potential towards urban forestry: an ecological profiling approach

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Urban trees are susceptible to various challenges, including biotic and abiotic stresses that differ significantly from those experienced by trees in favorable surroundings. Although it is believed that urbanization in developing nations would be inevitable and result in environmental change, this viewpoint must be tackled cautiously to improve the instances for the adaptation of urban trees. Candidate tree species with high climatic adaptation and strong stress tolerance should be explored and chosen to increase urban forests' resilience to degraded ecosystems. In the last few decades, the urban climate has been substantially changed due to mismanaged urbanization, leading to urban heat island effects and global warming. The ability of a tree species to adapt to the changing climate is correlated with its potential to its plasticity and endurance in harsh environments and deprived soil nutrient status. The ability of the trees to flourish, even in stressful conditions, is essential for successful urban forestry. Choosing and employing suitable tree species and genotypes is pertinent to increase quality and save expenses in creating and administrating urban areas. Therefore, the present work aimed to explore the strength of candidate tree adaptation in degraded land systems to ameliorate the soil quality and improve the overall ecology of the associated region, reflecting its potential for a sustainable urban forestry system.

P-68 The evaluation of varietal trial with processing clones at different days of potato (*Solanum tuberosum* L.)

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The present investigation entitled varietal trial with processing clones in 75, 90 and 110 days crop was carried out during winter season in the year 2022-23 at the Vegetable Research Farm, Department of Vegetable Science, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. The Experiment was laid out in randomized block design with five replications. The characters was taken *viz*. Seed wt.(t/ha), Emergence (%), Foliage Senescence (%), total yield (t/ha), processing yield and tuber dry matter (%) with three hybrids (AICRP-P-77, AICRP-P-86, AICRP-P-91) with five checks (AICRP-P-24, K.chipsona 5, AICRP-C-1, K.chipsona 1, Lady rojeta at 75,90 and 110 days. Results revealed that the highest per cent was recorded in genotype Lady rojeta (96.33) at 75 and 90 days except 110 days. The gave highest total and processing tuber yield were recorded in genotype AICRP-P-86 (35.54 t/ha & 28.12 t/ha), (38.87 t/ha &32.03 t/ha) and (41.1 t/ha & 35.3 t/ha) respectively at above days, followed by AICRPa –P-77 (29.54 t/h & 21.48 t/h).highest tuber dry matter in per cent (18.93) was obtained in genotype K.chipsona 1 at 75 days and K.chipsona 5 (21.52) & (21.76) at 90 and 110 days. The best genotype AICRP P-86 can be used for total and processing yield purpose.

P-69 The impact of fungicide application for the management of late blight on potato (*Solanum tuberosum* L.)

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The present investigation entitled varietal trial with processing clones in 75, 90 and 110 days crop was carried out during winter season in the year 2022-23 at the Vegetable Research Farm, Department of Vegetable Science, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. The Experiment was laid out in randomized block design with five replications. The characters was taken viz. Percent severity of late blight at 7,14,21and 28 days, Total Yield (t/ha), Total no of tubers (numbers/ha), Blighted tuber yield (t/ha), Number of blighted tuber (numbers/ha) with four treatment T_1 (prophylactic spray of mancozeb followed by cymoxanil+mancozeb @ (0.3%) and one more spray with mancozeb @ (0.25 %), T_2 (prophylactic spray of mancozeb followed by ametoctradin + dimethomorpj (0.2%) and one more spray with mancozeb, T_3 (prophylactic spray with mancozeb @ 0.25% followed by azoxystrobin + tebuconazol (0.1%) and one more spray of mancozeb), T_4 (Control). Results revealed that the significantly reduced severity of blight was recorded as (4.61%) on the first date of observations in T_1 followed by T_3 compared to control (12.64 %) , which are continuously decrease to last dates i.e. 28 days after appearance. Minimum severity of late blight (4.26 %) was also recorded in T_1 compared to control (12.64%). Maximum yield was also recorded in T_1 (31.65 t/ha). In susceptible variety minimum severity of blight recorded (23.08%) to (24.32%) at different days in T_1 compared to control (33.14%). The best B:C ratio were found In T_1 , 1:1.04 and 1:0.81 in resistant and susceptible variety respectively. This treatment can be recommended for the former practices.

P-70 Antioxidant defense and generation of reactive oxygen species in plants under abiotic stress conditions

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Adverse abiotic stress conditions, such as drought, salinity, heavy metals, waterlogging, extreme temperatures, oxygen deprivation, etc., greatly influence plant growth and development, ultimately affecting crop yield and quality. Plant cells produce oxygen radicals and their derivatives, so-called reactive oxygen species (ROS), during various processes associated with abiotic stress. Moreover, the generation of ROS is a fundamental process in higher plants and employs to transmit cellular signaling information in response to the changing environmental conditions. One of the most crucial consequences of abiotic stress is the disturbance of the equilibrium between the generation of ROS and antioxidant defense systems triggering the excessive accumulation of ROS and inducing oxidative stress in plants. Notably, the equilibrium between the detoxification and generation of ROS is maintained by both enzymatic and nonenzymatic antioxidant defense systems under harsh environmental stresses. Although this field of research has attracted massive interest, it largely remains unexplored, and our understanding of ROS signaling remains poorly understood. In this we have documented the recent advancement illustrating the harmful effects of ROS, antioxidant defense system involved in ROS detoxification under different abiotic stresses, and other important signal molecules such as reactive nitrogen, sulfur, and carbonyl species. In addition, state-of-the-art molecular approaches of ROS-mediated improvement in plant antioxidant defense during the acclimation process against abiotic stresses have also been discussed.

P-71 Fungal-pectinases mediated approaches for processing of fruit juices

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Fruits' complex pectin structures make it difficult to squeeze juice from their extremely sticky, jellified pulp. Fruits, which are essential to the human diet and are available in both raw and processed versions on the market, offer a wide range of flavors. Most significantly, fruits offer vital elements (vitamins, minerals, phytonutrients) that improve well-being, strengthen the immune system, and shield against disease. The demand for fruits and processed goods has greatly increased as a result of the rapid development of the human population and rising health consciousness, and the industry for fruit processing has grown quickly with an annual production of more than 887 million metric tonnes (MMT) of fruits. Pectinase plays a crucial role in the commercial food processing industry by aiding in the breakdown of pectin and facilitating various processing stages like liquefaction, clarifying, and juice extraction. Pectinases derived from thermophilic or mesophilic microbes are chiefly used. Fungal pectinases are the predominant producers among microbial pectinases due to their high activity, cheap cost and energy efficiency of production, and extracellular enzyme secretion. The beverage sector has been employing cell wall dissolving enzymes, primarily pectinases, for fruit softening and fruit juice products. The pectinolytic subclassed enzymes of Pectin methylesterase, pectin lyase, and polygalacturonase catalyse the enzymatic breakdown of pectin found in the middle lamella of plant tissues, resulting in the full hydrolysis of the galacturonan polymer into its component galacturonic acid. This enhances the clarity and output of different fruit juices. Fruit juice manufacturing uses acidic pectinases widely, either separately or in combination with other hydrolysis enzymes. Various fungal species from *Aspergillus, Trichoderma, Penicillium, Fusarium,* and *Candida* have been employed to produce pectinases using solid state and submerged fermentation. The purified or partially purified pectinases have been employed for clarification of various fruit juices in solutions or by using bioreactors. Fruit juices that have undergone pectinase-mediated enzymatic treatment are clearer and contain less sugar, and their turbidity and viscidity are also reduced. Because of the delicate processing methods used, the fruit's unique flavor is also kept. In addition to retaining the juice's distinctive hue and preventing darkening, the treatment also makes the juice clear and transparent by removing the unwanted haze from pectin fibers. Fruit juices handled in this way are intended to have a longer shelf life without the addition of preservatives and are therefore healthier.

P-72 Role of phytofabricated gold nanoparticles for enhancing sustainable *Spinacia oleracea* L. production

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Nanotechnology has recently fascinated the major thrust in agricultural research as a means to enhance crop production and ensure food security. The present work was designed to fabricate spinach assisted gold nanoparticles (S-AuNPs) by exploiting the proteins of spinach leaves (*Spinacia oleracea* L.) and to evaluate their potential on seed germination, growth profile, physiological traits and biochemical attribute including photosynthetic pigments, reactive oxygen species (ROS) and antioxidant status of spinach. Seeds treated with low S-AuNPs concentrations (50-200µM) improved the growth parameters (shoot length, number of leaves/plant, and shoot dry weight) and physiological traits such as stomatal density, transpiration rate, stomatal pore length and width of spinach plant. Moreover, biochemical constituents like photosynthetic pigment (chlorophyll a, chlorophyll b, total chlorophyll and carotenoid) and free radical scavenging enzymes were also improved thus enhanced the yield of plant. However, higher concentrations of S-AuNPs (250 and 300µM) had adverse effects, reducing the aforementioned morphological parameters and inducing the production of ROS, causing cellular oxidative stress and negatively impacting growth and photosynthetic efficiency. The study found that 150µM S-AuNPs concentrations were most effective since they led to the greatest increases in the parameters that were being examined.

P-73 Investigation and evaluation of ornamental ferns of Uttar Pradesh, India

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An investigation of ferns for evaluation of ornamental value and economic perspective was conducted in two major cities viz. Varanasi and Lucknow of Uttar Pradesh, India. The survey was conducted with a view to gain knowledge regarding the source of origin of the ferns, their supply chain and distribution to different florist shops and plant nurseries through the flower and foliar markets. Collected plant samples were identified by their morphological characteristics. Ferns can be used as ground covers, specimen plants and for group background and border planting in landscapes. They can also be used as fillers in bouquets and flower arrangements. Ferns have a huge scope in ornamental horticulture, which involves the production, marketing and maintenance of ornamental ferns. In the florist industries and other markets demand for the ferns is increasing day by day. People have a fondness for ferns for their aesthetic beauty and decorative significance. The importance of fern horticulture can also be emphasized in providing employment opportunities to rural people, farmers and women through fern cultivation, harvesting, processing, transportation, product preparation, marketing and economic returns.

P-74 Comparative evaluation of phytochemical profile and nematicidal activity of aerial, and root part extracts of *Hedychium flavescens*

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A comparative study of volatiles and nematicidal activity as well as *in silico* molecular docking study was conducted for the aerial, and root part extracts of *Hedychium flavescens*. Extracts were prepared in DCM solvent using cold percolation method. A total number of 112, and 109 compounds were identified in aerial (HFAE), and root part (HFRE) extracts, respectively by using GC-MS technique. The nematicidal potential of the extracts was evaluated in terms of egg hatchability inhibition, and nematode mortality assay against the damaging pest, root knot nematode (*Meloidogyne incoginta*). Extracts showed different level of intensities for egg hatching inhibition, and nematode mortality assay. However, HFRE was more active and showed 50-90% inhibition at different concentrations. The molecular docking study was conducted to screen the nematicidal activity of the major and potent compounds against Acetylcholinesterase enzyme (AChE). Results showed good binding affinities and attributed the strongest inhibitory activity to β-sitosterol. This study has demonstrated that the extracts can serve as a viable alternative to chemical pesticides, thereby offering a green, safer and more environmentally friendly pest control option.

P-75 Investigating retention of bioactive compounds in immature dropped kinnow fruit through pre-treatment and drying temperature modulation

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Immature dropped fruits with low economic viability are abundant in bioactive compounds and nutrients, thus offer a potential for value addition. The present study was formulated to investigate the effect of pre-treatments such as steam blanching, citric acid, and both together as well as drying temperatures from 40 to 80°C on retention of bioactive compounds from immature dropped kinnow fruit (IDKF). The results showed that pre-treatment of IDKF with citric acid followed by drying at 50°C, were effective with highest antioxidant potential (DPPH and FRAP activity), total phenolic content (TPC) of 6.42 g GAE/100g, and total flavonoid content (TFC) of 10.58 g QE/100g along with the lowest color difference. In contrast, steam blanching of IDKF followed by drying at 80°C resulted in the lowest content of TPC, TFC, and minimum antioxidant activity. The crude bioactive rich extract of IDKF on pre-treatment with citric acid and drying at 50°C, demonstrated antimicrobial activity against Gram positive bacteria. The present report is significant as it addresses food waste reduction and the preservation of nutritional content in agricultural product for further applications in the food and pharmaceutical sectors.

P-76 Phytochemical screening and nematicidal efficacy of essential oils from leaves of *Elsholtzia fruticosa*

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The present study was aimed to assess the chemical composition and nematicidal properties of essential oil extracted from *E. fruticosa.* Genus *Elsholtzia* belongs to the family lamiaceae**.** *Elsholtzia* plants have been used for a very long time as a folk remedy to treat symptoms like colds, fever, and pneumonia and are well renowned for their wide range of applications and potent therapeutic properties. They include a variety of molecules that have been isolated and are now known to be the active ones, including flavonoids, terpenoids, volatile components, etc. that have important biological functions. One of the species, *E. fruticose* has been found to contain around many distinct compounds, with flavonoids and terpenoids serving as its primary constituents. These compounds are responsible for imparting *E. fruticose* with pronounced antimicrobial, anti-inflammatory, and antioxidant properties. The GC-MS analysis of the oil revealed the presence of a total of 43 components accounting for a total of 97.8% of the total composition with pinocarvone (42.41%), β-pinene (11.82%), sabinene (4.53%) and *cis*-pinocamphone (4.17%) as the major bioactive components. Understanding the chemical composition of *E. fruticosa* holds significant promise for its potential applications in various fields, including pharmaceuticals, agriculture, and natural product development. The nematicidal activity of the essential oil was tested against the nematode, *Meloidogyne incognita*. A time and dose dependent increase in the mortality was observed being 72.4% mortality at 1µl/ml and reaching to a mortality of 96.6% at 5µl/ml after 72 hours. In case of inhibition in egg hatching, a same dose and time dependent trend was observed showing 75% inhibition at 10µl/ml. At lower concentrations, higher egg hatching percentage was observed with mean value of 26.54% at 2 µl/ml demonstrating a lower inhibition of egg hatching. The results show potency of the oil against the root knot nematode and thus can be used ecofriendly in the agriculture field widely.

P-77 Antifungal efficacy of basil essential oil against leaf spot disease of lemongrass (*Cymbopogon flexuosus* Nees ex Steud.)

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Lemongrass (*Cymbopogon flexuosus* Nees ex Steud.) is an important aromatic and medicinal herb having great industrial demand because of its lemon-like aroma. It belongs to the family Poaceae and is commonly cultivated in Kerala, Karnataka, Uttar Pradesh. Jharkhand, Chhattisgarh, Jammu, Madhya Pradesh, Uttarakhand, and North Eastern States of India. India is one of the largest producer and exporter of lemongrass essential oil. In Uttar Pradesh, it is commonly cultivated in Jhansi, Mahoba, Jalaun, Hamirpur, Sitapur, Hardoi, Raebareli, Lucknow, and Unnao districts. Leaf spot disease is a common problem faced by lemongrass farmers, which results in economic losses. To minimize the impact of loss due to leaf spot, disease-infested plant samples (caused by *Fusarium equiseti*) of lemongrass were collected from the Hardoi district of Uttar Pradesh in 2022. Diseased crop reduces the quantity as well as the quality of fragrant raw material. Antifungal efficacy of the basil oil was done against *F. equiseti* under in-vitro conditions by using the poison food technique. The minimum inhibitory concentration (MIC) of basil essential oil against *F. equiseti* was recorded at 2800 ppm concentration on potato dextrose agar (PDA) medium; while the minimum cidal concentration (MCC) was recorded at 3600 ppm concentration. The findings of this research after a detailed investigation can be used for the alternative of synthetics.

P-78 A robust in-vitro protocol for shoot multiplication of disease-free and genetically uniform plantlets of sugarcane variety CoLk 11206 using shoot-tip meristem

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Sugarcane (Saccharum spp. hybrid complex) is a monocotyledonous crop that belongs to the family of grasses, Poaceae. It is a tall perennial tropical grass that tillers at the base, grows 3-4 meters tall and about 5 cm in diameter. India is the largest producer of sugar in the world. In India, sugarcane is cultivated in ~5.0 m ha area with a total production of >400 MMT sugarcane, and 35.8 MMT of white sugar. Varieties of sugarcane are highly heterogeneous and generally multiplied by stem cuttings with each cutting or sett having two or three buds and the rate of propagation is very slow, usually 1:10 in a year. Micropropagation is a technique through which, genetically identical plants of selected genotype multiplied vegetatively and rapidly by aseptic in vitro culture of meristematic regions under controlled nutritional and environmental conditions. Unlike the conventional propagation method, it is the only realistic means of achieving rapid and large scale production of disease free, quality planting materials in sugarcane and an alternative approach for fast multiplication of a variety in its original form. Considering the diverse limitations of conventional methods and the potential of tissue culture techniques, researchers have developed protocols for sugarcane in vitro propagation using shoot tip explants. Every new variety or genotype needs an efficient protocol to get rapid in vitro propagation. Rapid clonal propagation of sugarcane planting materials depends on the genotype and the combination of plant growth regulators used. The nutritional requirement for in vitro propagation of sugarcane should be according to the genotype and explant used. Therefore, a combination of plant growth regulators required for in vitro propagation responses varies from variety to variety. Hence, the objective was to develop an in vitro complete plantlet establishment and multiplication protocol for large-scale multiplication of a popular sugarcane variety CoLk 11206. Shoot tip portion (tops-Agola) ~30 cm of sugarcane was collected from field grown plants at the Research Farm of ICAR-Indian Institute of Sugarcane Research, Lucknow. In the present study, optimal combinations of NAA (naphthalene acetic acid), BAP (6-benzyl amino purine) and Kin (Kinetin) in Murashige and Skoog (MS) media were standardized for enhanced multiplication of shoot-tip derived in vitro cultures of sugarcane. Culture establishment and shoot initiation were achieved on full-strength MS medium supplemented with 0.5 mg/l each of BAP and Kinetin. The best multiplication rate in terms of the number of shoots per culture (5.93) and shoot length (2.42 cm) was recorded on MS medium with BAP (0.5mg/l) and NAA (0.25mg/l), followed by 5.86 shoots/culture on medium supplemented with 0.5 mg/l BAP. A robust and optimized protocol will be helpful for the mass production of plantlets of sugarcane variety.

P-79 Post harvest management and food processing in agriculture

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The major objective of post-harvest management systems continues to be minimizing agricultural produce loss or waste. With the current population growth and reduction in agricultural land and other resources, post-harvest management has taken center stage. Currently, the greatest worldwide problem is to guarantee food security in a way that is safe for both the environment and humankind. The FAO estimates that by 2050, there will be 9 billion people on the planet, and that in order to feed them, food production must increase by 70%. Therefore, a full grasp of the functions of the agro-ecosystem is necessary. In recent years, there has been a significant growth in the output of agricultural crops; nevertheless, there has been a lack of research and acceptance of post-harvest technology, leading to significant losses after harvest. Fruit crops experience 16–36% post-harvest losses each year as a result of mechanical. Horticultural produce, for example, is a highly perishable commodity that requires greater strategy and attention to ensure processing and value addition are promoted. The processing value chain is now essential to enhancing food safety and bolstering national food security. Pre-harvest factors, harvesting, market preparation (pre-cooling, sorting, grading, packaging, and on-farm storage), transportation, storage, value addition/processing, and by-product waste management make up the majority of the value chain in post-harvest management of horticulture commodities.

P-80 NRT-1/ PTR transporter gene–bridging the gap between the uptake and NUE in wheat under multiple stresses

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Wheat (*Triticum aestivum* L.) is one of the major cereal crops belonging to the Poaceae family, contributing to approximately 30% of global grain production. The extensive use of nitrogenous fertilizers increases the production costs and has severe environmental issues. It is necessary to understand the mechanism underlying nitrogen use efficiency (NUE) in order to bred nutrient smart wheat. Nitrate Transporters (NT) plays very crucial role in the uptake of nitrate and decides the efficiency of nitrate assimilatory pathway in plants. Here, we conducted de novo transcriptome sequencing of contrasting wheat *cvs*. exposed to differential nitrogen treatment, elevated CO2 and HS in order to identify novel NT genes and to understand their expression pattern under multiple stresses. We identified 28 putative transcripts showing homology with NTs and further cloned a putative NRT-1 of ~2042 bp through RT-PCR amplification. The cloned NRT1 gene has an open reading frame (ORF) of 603 amino acids with 5' end of CCT and 3' end of TTC. BLASTn search showed maximum homology of 99.5% with the *Triticum aestivum* protein NRT1/PTR family 6.3-like gene. Conserved Domain (CD) search analysis showed that it belongs to the Major Facilitator Superfamily. NRT1 protein was observed to be localized in the plasma membrane. The predicted potential phosphorylation sites in NRT1 were enriched with amino acids such as threonine (48). There is a need for functional validation of cloned NRT-1 gene in order to establish their role in nitrate assimilation. Twigging the NRT-1 will pave the way for the development of nutrient smart wheat with improved tolerance against eCO_2 and terminal heat.

P-81 Ozone phytotoxicity in plants: A menace for crops and natural vegetation

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Rapid economic developments have increased tropospheric ozone (O_3) since preindustrial times which is a phytotoxic air pollutant. It is a secondary air pollutant formed by interaction of primary pollutants in the presence of sunlight. Due to its phytotoxic nature, it negatively affects crops, as well as natural vegetation. Ozone enters the plants via stomata generating excess reactive oxygen species (ROS) leading to oxidative stress. Increased ROS production acts as signaling molecules under O_3, inducing MAP kinase activity which activates the signal transduction pathways. These molecular cascades result in up- or down-regulation of genes, remodeling of the protein expression pattern, induction of O3 tolerance mechanisms, and altered metabolic processes. Expression analyses have revealed that the genes involved in redox homeostasis, defense pathway, hormonal regulation, respiration, photosynthesis, secondary metabolism, or senescence are affected. While proteomic analyses has manifested that the proteins responding to O3 are chiefly involved in stress response, defense, signaling pathways, protein synthesis, electron transport chains, energy metabolism and photosynthetic carbon reduction cycle which may serve as molecular markers for O_3 stress. Moreover, physiology of the plants is also affected leading to a decline in gas exchange parameters, photosynthetic efficiency of photosystem II (F_v/F_m) with simultaneous depression in stomatal conductance, changes in thylakoid stacking, reduction of starch bodies and increase of plastoglobules in chloroplasts. Ozone causes visible foliar symptoms in sensitive plants, and this response varies with the species, genotype, or even cultivars. Characteristic symptoms of O_3 injury in the form of diffuse discoloration, chlorotic and necrotic spots, interveinal chlorosis, leaf stippling, and reddening are observed. Antioxidative enzymes involved in defense pathways, ascorbic acid, thiols, pigments, secondary metabolites, and heat shock proteins have been identified as O_3 stress biomarkers. All these changes/manifestations lead to reduced growth and development, foliar injury, and senescence, compromising the plant's productivity and nutritional quality.

P-82 Essential oil estimation and quality evaluation of *Aegle marmelos* leaves offered in various place of worship

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Aegle marmelos, commonly known as Bael or Bengal, holds significant cultural and religious importance in Hindu mythology, where its leaves are offered to Lord Shiva in various places of worship across India and other Asian countries. These leaves, revered for their symbolism, also possess therapeutic properties utilized in traditional medicine. However, the unregulated collection and storage of offered leaves lead to hygiene concerns, environmental challenges, and waste management issues. This study aimed to address these issues by systematically evaluating the utilization of waste offered *Aegle marmelos* leaves through the extraction of essential oils, their characterization, and quality assessment. The research also focused on investigating the phytochemical composition and bioactivity of these oils. The study involved the collection of offered leaves, followed by hydro-distillation to extract essential oil, resulting in an average yield of 0.69018%. Gas Chromatography (GC) and Gas Chromatography-Mass Spectrometry (GC/MS) analysis revealed that the essential oil primarily consisted of 85% limonene, a major constituent with diverse phytochemical and pharmacological properties. Limonene, a prominent component of essential oils, has gained importance for its potential to protect human health, animal health, and food safety against pathogenic and spoilage microorganisms. In this context, *Aegle marmelos* leaf oil demonstrated significant antimicrobial properties when tested against various microorganisms, including gram-positive (*Staphylococcus aureus, Streptococcus hominis, Listeria monocytogenes*), gram-negative (*Escherichia coli, Salmonella typhimurium*), and fungal (*Candida albicans*) strains. The study collected *Aegle marmelos* leaves from six different regions, each offering unique variations in essential oil composition. This research not only sheds light on the systematic utilization of waste offered leaves but also highlights the antimicrobial potential of *Aegle marmelos* leaf oil, providing valuable insights into its applications for health and hygiene.

P-83 Abiotic and biotic stresses in the plants

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In agricultural crops, plant productivity is reduced due to a wide variety of environmental stresses, which are used to reduce and limit the growth of the plants. Environmental stress occurs in two main types for plants, categories that can be classified by their effects on the plants. These are (1) abiotic stress and (2) biotic stress. It is widely recognized that abiotic stress can cause the death of major crop plants throughout the world and these stressors include radiation, salinity, floods, drought, extremes in temperature and heavy metals among others. However, biotic stress refers to threats posed by a variety of pathogens including fungi, bacteria, oomycetes, nematodes, and herbivores such as rodents and insects. The nature of plants is sessile, which means they have no choice but to rely on these environmental cues to grow and survive. In order to overcome these threats of biotic and abiotic stresses, plants have evolved numerous mechanisms that enable them to overcome these challenges. The cells are able to sense the external stress environment, get stimulated, and then produce appropriate cell responses in response to that stimulation. By using a number of signal transduction pathways, they are able to convey stimuli received from the sensor located on the surface of the cell or in the cytoplasm to the transcriptional machinery located in the nucleus, thereby triggering the transcription process. These signaling pathways serve as a crucial link in the process of detecting the presence of stress and triggering the proper biochemical and physiological responses.

P-84 Nutritional and molecular evaluation of millets

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Millets are a group of small-seeded, annual cereal grains that have been cultivated for thousands of years, primarily in semi-arid regions of Africa and Asia. These hardy, drought-resistant crops include various species like pearl millet, finger millet, foxtail millet and sorghum, among others. These small-seeded grains are rich in essential nutrients, making them a significant component of a healthy diet. Millets are abundant sources of complex carbohydrates, dietary fiber, vitamins and minerals like magnesium, phosphorus and iron making them an excellent source of energy and aiding in the prevention of various nutrient deficiencies. By using advanced techniques such as molecular markers, researchers can gain insights into the genetic diversity, evolutionary history and breeding potential of millet species. This molecular analysis helps us understand the genetic makeup of different millet varieties, their adaptability to environmental conditions and their potential for crop improvement. It plays a crucial role in developing more resilient and nutritionally enhanced millet varieties, ultimately contributing to food security and sustainable agriculture. Analyzing the molecular properties of millets is crucial for realizing their full potential in today's agriculture.

P-85 Nutritional profiling of black rice variety *Upendra*

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Black rice is considered rich in nutrition and nutraceutical properties. Upendra rice**,** deep black colour grains, developed by a progressive farmer using selection method was evaluated for nutritional profiling against traditional as well as the Improved Black Rice lines developed by Assam Agricultural University with a view to identify the best available black rice for commercialization and also for using in future rice breeding programs. The five varieties of rice that were analysed are - Upendra, Manipuri black, Black rice-7, Keteki Joha and Ranjit sub-1 in both unpolished and polished form. Upendra, Manipuri black and Black rice-7 are pigmented rice varieties. Keteki Joha (aromatic rice variety) and Ranjit sub-1 were taken for analysis as check variety. The amylose content (in %, dry weight basis) was found to be significantly different in all the analysed varieties, with a range of 6.70±0.007 (in Upendra) to 18.21±0.007 (in Ranjit Sub-1). The starch content (in %, dry weight basis) was found to be significantly different in all the analysed varieties, with a range of 66.40±0.000 (in Manipuri Black) to 75.60±0.000 (in Upendra). The amylopectin content (in %, dry weight basis) in unpolished rice was found to be significantly different and showed similarities for the polished rice. The total phenol content (in %, dry weight basis) was found to be significantly different in all the analysed varieties, with a range of 0.23±0.000 (in Ranjit Sub-1) to 1.41±0.003 (in Upendra). The varieties showed similarities among themselves for crude fibre, total soluble sugar, crude protein and crude fat content. The pigmented rice varieties are known to be the potent source of antioxidants because of its high content in polyphenol. The information obtained on nutrition will increase its face value and consumption finally leading to health benefits. It will also help the progressive farmers and entrepreneurs to start business.

P-86 Sequel of salinity stress against morphological and physiological specifications in *Vigna radiata* L. (Wilczek)

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There are mainly two stresses as abiotic and biotic found in environment in which abiotic stresses consist of high temperature, freezing, chilling, salinity, ionic, osmotic and oxidative. Salinity spread on around 80% of total land area, in which about 70% plants are affected by salt stress. The prevalent effect of salinity on plants is ionic toxicity which in turn causes osmotic stress, the disbalance of high Na^{+} and deficiency of K^{++} causes salinity in plants and hence reduces its ability of high yield. The main resultant of salinity is expression of 'reactive oxygen species' that creates osmotic stress as well. Manganese (Mn) is an indispensable micronutrient for growth of plants and acts as cofactor to various enzymes. Mn is also very crucial for nitrogen and carbohydrate metabolism, redox activation of few enzymes. Zn acts as a structural stabilizer for proteins and membrane associated DNA-binding proteins that is known as "*Zn-fingers*". Zn is in correlation with carbohydrate metabolism, protein synthesis, nucleic acid and cell division as well. The salt stress directly attacks on the ability of yield by declining the net weight of seed vigor and capacity of plant to produce more seeds. The legumes are found more tolerant towards salinity stress because they got a specific ability to fix atmospheric nitrogen into nitrates with the help of microbes like; *rhizobia*, due to which they can fix nitrogen into the soil and thus soil becomes more productive. In present study, we have chosen *Vigna radiata* L. (mungbean), its variety '*shikha*' against 150mMole NaCl for quantification of various factors like shoot length, catalase, peroxidase, and found that the length of shoots, electrolyte leakage, relative water content, catalase, peroxidase shows a reduced trend when treated with Mn and Zn individually, whereas all these parameters show an increment in trends when studied cumulative effects of Mn-Zn.

P-87 A study of physiological and biochemical responses of *Cymbopogon martinii* in fly ash-amended soil

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The surge in industrial activities has led to a significant increase in industrial waste generation, posing environmental and public health challenges. Fly-ash (FA) is a waste product of coal based thermal power stations, exhibit many deleterious effects to the ecosphere and contaminates nearby agricultural fields that may lead to financial loss of farmers in addition to health risk. An approach to minimize the ill effects of fly-ash contamination could be the commercial cultivation of essential oil-bearing plants in FA affected zones. In the present study, an aromatic grass, *Cymbopogon martinii* was exposed to FA (0, 25, 50,75 and 100%) amended soil for 90 days. Plant growth and essential oil yield was increased up to 1:1 FA: soil amendment. The physiological and biochemical alterations were examined in the test plant and found the significant decrease in the chlorophyll content at >50% FA amended soil compared to a control with no FA contamination. The upregulation of osmo-regulant (proline) and non-enzymatic antioxidant (cysteine) were also observed at FA levels ≥ 50% and up to 75% FA level in soil respectively. Scanning electron microscopy confirmed the concentration dependent alteration in microscopic structures of leaves. Results of the study suggest, the *Cymbopogon martinii* could be beneficial crop for farmers in FA contaminated soil.

P-88 Effect of climate change on menstruation

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Menarche is the first incidence of a woman's menstruation. It is an event that denotes reproductive capacity of a female reflecting the transition from childhood into womanhood. The mean age for menarche is 12 years as per global medical community, which has been declining in recent years. Many factors affecting the timing of menarche among girls including climate change. It is also affecting life cycle process including puberty and menstruation. It has been evident that climate change influencing planet's environment, human health and animal life. The studies intersection of climate change and menstrual health is showing that women's health is much affecting due to climate disaster and climate migration. It could be observed in the disaster relief camps especially in the developing countries, where women and girls are facing lack of basic facilities such as hygienic toilets, availability of sanitary napkins, minimum food and nutrients etc. The current paper is dealing with the association between climate change and its effects on women's health and more specific on the menstruation, the process of the shedding of the uterine lining on a regular monthly a predictable schedule. As per available data a woman menstruates about 38 years of her life leading to various changes in life of female. It affects female life as physically, mentally, and emotionally. Adolescent girls who have menstrual issues such as cramps, tiredness, backache, swelling abdomen and painful breasts, miss their school and college and resulting the restricted growth and associated risks. During these period women needs nutritional diet, caring and hygiene as a basic practice for preventing illness and maintaining good health. It is true that governments, national and international NGOs are engaged in promoting menstrual health and hygiene, which is an important means for safeguarding women's dignity, privacy, bodily integrity and consequently their efficacy. The present study is an analysis of the data collected from secondary sources as well as qualitative data collected from the young women in Lucknow, India.

P-89 Exploring the allelopathic potential of *Fumaria indica* (Hausskn.) Pugsley: A study utilizing root aqueous extracts, rhizosphere soil, and amended soil

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Allelopathy is the biological interaction where plants release allelochemicals to hinder neighboring plant growth and alter their physiological traits. Despite the extensive recognition of this phenomenon, a notable scarcity of research that has examined the phytotoxic impacts associated with the Fumariaceae family has received limited attention. In our investigation, we evaluated the allelopathic effects of *Fumaria indica* through rhizosphere soil and root residue-amended soil on the germination and growth of Pisum sativum (crop) and Vicia sativa (weed) plants. Growth of the test plants was notably affected in the rhizosphere soil compared to the control. Soil sample analysis using SEM-EDS confirmed the presence of essential nutrients, which proved that nutrient unavailability is not the reason for the growth inhibition of test plants in the rhizosphere soil. Gas Chromatography-Mass Spectrometry (GC-MS) analysis of rhizosphere soil revealed the presence of 15 different volatile compounds, strongly indicating the allelopathic nature of *Fumaria indica*. In the earthen pot experiment introducing root residues into the soil also had discernible effects on plant growth, with increasing residue concentrations leading to reductions in chlorophyll and carotene contents. Proline content exhibited a direct proportional relationship with the concentration of root residue in the soil. Scanning electron microscopy of a 10-day-old seedling grown in a 4% aqueous extract demonstrated morphological changes in both root and leaf. Soils amended with root residues exhibited notably higher levels of phenolic compounds, suggesting their role as potential phytochemicals. GC-MS analysis of methanolic root powder extracts identified 33 chemical compounds, likely responsible for the plant's allelopathic nature. Compounds such as 1,2-Benzenedicarboxylic acid, Phthalic acid, 9-octadecenoic acid, and Protopine were common in both rhizosphere soil and root powder GC-MS lists. This study emphasises that Fumaria indica releases allelochemicals into the soil, significantly impacting the germination and growth of test plants. These allelopathically active substances hold promise for environmentally friendly weed and invasive species management, offering a pathway to reduce chemical pollution while supporting sustainable agricultural practices.

P-90 *In-Vitro* and *In-Silico* investigation of *Mentha Spicata* essential oil against leaf spot disease caused by *Colletotrichum siamense* in Turmeric

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Turmeric (*Curcuma longa* L.) is one of the most important medicinal plants having several bioactive properties and used as spices, worldwide. India is the largest producer consumer, and exporter country of the turmeric in the world. However, turmeric crops get affected with fungal diseases namely, leaf spot caused by *Colletotrichum* spp. In the current study, antifungal properties of *Mentha spicata* essential oil was evaluated against *Colletotrichum siamense* under in-vitro condition using poisoned food technique. The minimum fungicidal concentration (MFC) of the *M. spicata* oil against the tested fungal strain was recorded 0.25 % (v/v) after seven days. Further, to unravel the mechanism of action; *In-silco* studies of carvone- a major component of *M. spicata* essential oil, was investigated against Chitin synthase, UDP-glycosyltransferase and Glucosamine-6-phosphate synthase due to its major role in fungal cell wall synthesis. The preliminary findings of the current investigations could be used as an alternative to the synthetics, after detailed in vitro, in vivo as well as field trials.

P-91 Zinc and iron management in alluvial soil on some biochemical responses of tomato

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The study was made on the various zinc and iron management levels as well as interactions with iron doses effects in soil on growth (length and dry weight) and some selected biochemical parameters (pigments, protein contents, and activity of catalase and peroxidase) in tomato (*Lycopersicon esculentum*). The amendment of zinc and iron fertilizers was applied as I- Native soil (Control), II- $ZnSO_4$ 5 mg kg^{-1}, III- $ZnSO_4$ 25 mg kg^{-1},IV- $ZnSO_4$ 50 mg kg^{-1} and V- $ZnSO_4$ 100 mg kg^{-1} in soil and further their interactive doses with $FeSO_4$ and $ZnSO_4$ was made as I- Native soil (Control), II- $FeSO_4$ 25 mg kg^{-1}, III- $FeSO_4$ 25 mg kg^{-1} + $ZnSO_4$ 25 mg kg^{-1}, IV- $FeSO_4$ 50 mg kg^{-1} + $ZnSO_4$ 5 mg kg^{-1} , V- $FeSO_4$ 25 mg kg^{-1} + $ZnSO_4$ 50 mg kg^{-1}. The experiment was conducted in triplicates. The maximum value of the dry biomass, pigments (chlorophyll a, chlorophyll b and total chlorophyll) and protein content was monitored at the application of 50 mg kg^{-1} $ZnSO_4$ with 25 mg kg^{-1} $FeSO_4$ in soil. The enhanced dry weight, total chlorophyll, and protein contents was observed at each treatment levels. Maximum positive responses was found at the application of $ZnSO_4$ 50 mg kg^{-1} and $FeSO_4$ 25 mg kg^{-1} in the soil.

P-92 Effect of heterospecific semiochemicals on the reproductive attributes and biochemical aspects of *Zygogramma bicolorata* (Coleoptera: Chrysomelidae)

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Parthenium hysterophorus is a noxious weed that causes several health problems to humans and cattle. In India, biological control of *P. hysterophorus* began in 1983 with the introduction of *Zygogramma bicolorata* Pallister, a chrysomelid beetle. Both larvae and adults are voracious feeders of the parthenium weed that results in its destruction by excessive defoliation and reduction in flower and seed production. Apart from *Z. bicolorata*, aphid species, such as *Aphis gossypii* and *Aphis fabae,* and the coccinellid beetles, *Coccinella septempunctata, Coccinella transversalis* and *Menochilus sexmaculatus,* have also been found on the parthenium plant. The present study is an attempt to answer whether the presence of heterospecific semiochemical footprints of coccinellid beetles on the weed would influence the reproductive attributes and biochemical parameters (lipid, protein, glucose) of *Z. bicolorata*. Semiochemical tracks of *C. transversalis* and *M. sexmaculatus* were given to the mating pairs of *Z. bicolorata* and their biochemical parameters and reproductive attributes (fecundity/viability) were recorded. *Zygogramma bicolorata* exposed to heterospecific semiochemical tracks of coccinellid beetle accumulated less concentration of lipid, glucose and protein content in their body compared to control. Results revealed that heterospecific semiochemical tracks have a significant effect on the reproductive attributes of *Z. bicolorata.* Amongst all the given conditions, females in presence of semiochemical tracks, of *C. transversalis* displayed the lowest fecundity and percent egg viability than control. Present findings, therefore, suggest that the presence of heterospecific semiochemical tracks of coccinellid beetles may impede the biological control of the weed by *Z. bicolorata*.