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Content

REVIEW ARTICLE

- A review on effect of major PGRS in invitro propagation of endangered medicinal plant *Podophyllum hexandrum* (Indian may apple)
—**Shiva Kumar R., Balaji B. and Dharani E.**-----480-484

RESEARCH ARTICLES

- Immunologic adjuvant activity of Neem leaf extract on enhancing Humoral immune response
—**Cabral-Hipólito Nidia, Molina-Ramírez Brenda, Castillo-Maldonado Irais, Delgadillo-Guzmán Dealmy, González-Cortés Tania, Torres-León Cristian, Ramírez-Moreno Agustina, Flores-Loyola Erika, Hernández-Morales Cecilia, Prieto-Hinojosa Adria I. and Pedroza-Escobar David**-----485-490
- Evaluation of different fungicides against boll rot and foliar diseases of cotton under South Gujarat of India
—**Prashant B. Sandipan, P.S. Patel, R.K. Patel, Rameela I. Chaudhari and M.C. Patel**-----491-496
- Spatial variability of available soil nutrients and using Gis for nutrient management in hot arid regions of North-Western India
—**Prabhoo Singh, Ramesh Chand Bana and Anju Kanwar Khangarot**-----497-502
- Screening of Pigeonpea varieties against pod fly infestation under field condition in Nimar region
—**Sukhadev Patidar Sanjay Vaishampayan and Y.K. Jain**-----503-507
- Genetic variability, correlation and path analysis for cane yield and juice quality traits in early maturing sugarcane clones
—**Sudhir Sharma, Rakesh Kumar and Ramesh Kumar**-----509-514
- Correlation and path analysis in sesame (*Sesamum indicum* L.)
—**Rahul I. Gohil, P.K. Jagtap and H.K. Koli**-----515-519
- Effect of foliar application of liquid organics on growth, yield and quality of strawberry (*Fragaria × ananasa* Duch.) CV. Winter dawn
—**Nikita Patel, D.K. Sharma and B. Chakraborty**-----521-525
- Management of *Macrophomina phaseolina* induced charcoal rot of cowpea through Bioagents and fungicides under field conditions
—**Nitika Kumari, A.K. Meena, Vijay Shree Gahlot, Vinay Kumar Kardam and Hansraj Dhakar** --527-530
- Effect of foliar application of micronutrients on growth, yield and quality of onion (*allium cepa* L.)
—**Jagat Singh, Hans Raj, Neeraj Pawar, Vikas Hooda, D.S. Duhan and V.P.S. Panghal**-----531-534

A REVIEW ON EFFECT OF MAJOR PGRS IN INVITRO PROPAGATION OF ENDANGERED MEDICINAL PLANT *PODOPHYLLUM HEXANDRUM* (INDIAN MAY APPLE)

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Abstract: The Himalayan medicinal plant *Podophyllum hexandrum* is one of the most important medicinal plants under threat. Due to the presence of podophyllotoxin in its rhizome, it has its importance in the treatment of some dermatological infections and anti-cancer properties. Its rapid population decline and increasing global demand have forced alternative in vitro proliferation methods, such as somatic embryogenesis, in which different tissues are cultured using different PGRs such as auxin and cytokinin. Although these two hormones cannot act individually to initiate callus formation, auxins have been shown to trigger callus initiation in the early stages. Similarly, when auxin levels are very low, cytokinin affect the onset of callus. Therefore, for industrial production of podophyllotoxin, it is important to maintain the correct levels of auxin and cytokinin levels in the basal medium for large-scale growth. The optimal concentration range for callus culture, organ formation and somatic embryo formation is determined by the maximum growth observed in different experiments under different conditions.

Keywords: Micropropagation, Plant growth hormones, *Podophyllum*, Tissue culture, Somatic embryogenesis

IMMUNOLOGIC ADJUVANT ACTIVITY OF NEEM LEAF EXTRACT ON ENHANCING HUMORAL IMMUNE RESPONSE

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Abstract: The immune response is divided into the innate and the adaptive immunity, both include humoral and cellular components. The immune responsiveness leading to a specific immunity, e.g., humoral immune response, depends on the antigen that the body sees as harmful or foreign. Unfortunately, not all the antigens are able to stimulate the immune system. So that, immunologic adjuvants are used to reinforce the immune response against a weak immunogenic antigen. Thus, the aim of this work was to evaluate the immunologic adjuvant activity of Neemaqueous leaf extract over humoral immune response of *Wistar* rats immunized with bovine serum albumin (BSA). Phytochemical composition of the extract was determined and cytotoxicity tests were performed on the extract to establish the concentrations to be tested. Later, 25 rats were divided into 5 groups of 5 animals each and immunized in a 30-day immunization scheme with bovine serum albumin as an antigen and several adjuvants. The groups were: 1) PBS, 2) BSA, 3) Aluminum adjuvanted BSA, 4) Neem adjuvanted BSA, and 5) Freund's complete adjuvanted BSA. At the end of the immunization the antibodies were purified, quantified and isotyped. Finally, the specificity of the antibodies was evaluated by immunoprecipitation against BSA. Neem extract showed no cytotoxicity ($LD_{50} > 400 \mu\text{g/ml}$), in the phytochemical profile carbohydrates, flavonoids and tannins were identified. No significant differences ($p > 0.05$) were found among antibody isotypes and concentration in the study groups. However, significant differences were found in the specificity of antibodies ($p < 0.05$) when compared Freund's complete adjuvant against other groups but Neem.

Keywords: Immunologic adjuvant, Neem, *Azadirachta indica*

Journal of Plant Development Sciences Vol. 14(5)

EVALUATION OF DIFFERENT FUNGICIDES AGAINST BOLL ROT AND FOLIAR DISEASES OF COTTON UNDER SOUTH GUJARAT OF INDIA

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Abstract: Cotton (*Gossypium* spp.) is one of the most important fiber crops playing a key role in economic and social scenario of the globe. It provides employment and sustenance to a population of nearly 42 Million people, who are involved directly or indirectly in cotton production, processing, textiles and related activities. Looking to the experiment, different fungicides were evaluated in cotton crop under field condition against the boll rot and different diseases. Total seven treatments including control were evaluated in this trial from which, treatment T₄ (24.17 PDI) followed by T₅ (25.67 PDI) recorded minimum Bacterial leaf blight infection in comparison to the treatment T₇ i.e. control (39.50 PDI) in RCH 2 BG II hybrid. For Alternaria leaf spot disease, treatment T₄ (5.33 PDI) were recorded significantly minimum Alternaria leaf spot disease in RCH 2 BG II hybrid as compared to the T₇ i.e. control (17.67 PDI) followed by T₅ (8.17 PDI) and T₆ (9.00 PDI) treatment. The lowest boll rot incidence was observed in the treatment T₄ (13.83 PDI) followed by the T₅ (16.17 PDI) and T₆ (17.33 PDI) treatment as compared to the control T₇ (29.83 PDI). The highest seed cotton yield was recorded in the treatment T₄ (2682.00 kg/ha) followed by treatment T₅ (2427.00 kg/ha) and treatment T₆ (2308.67 kg/ha), respectively.

Keywords: Cotton, *Gossypium* spp, Treatment, Control, Fungicide

Journal of Plant Development Sciences Vol. 14(5)

SPATIAL VARIABILITY OF AVAILABLE SOIL NUTRIENTS AND USING GIS FOR NUTRIENT MANAGEMENT IN HOT ARID REGIONS OF NORTH-WESTERN INDIA

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Abstract: Present investigation was conducted to assess the spatial variability of available soil nutrients and using GIS for nutrient management in hot arid regions of North-Western India. Altogether, one hundred fifty surface soil samples were collected using global positioning system (GPS) from the farmer's field of Nagaur district area covering five villages. Soils of the district were found to be slightly to moderate alkalinity in reaction with a low organic carbon (OC) content and low in cation exchange capacity (CEC). The analysis of the soil samples revealed that majority of the soil samples fall under low to medium soil fertility. The soil samples were analyzed for macro and micro nutrient viz, available nitrogen (N), available phosphorus (P), Available potassium (K), copper (Cu), iron (Fe), manganese (Mn) and zinc (Zn). Results of the soil analysis revealed that Available N and P were low throughout the region, while available K, was medium. Among the micronutrients, Cu and Mn were adequately supplied in most areas, but Zn and Fe were inadequate in large parts. The spatial variability available plant nutrients viz., N, P, K, Cu, Fe, Mn and Zn in hot arid regions of Rajasthan across the land uses in region, has been mapped in a geographic information system (GIS), and their adequacy determined as per the criteria followed in the soil testing laboratories. Present study also showed that the hot arid regions of north western India not only deficient in individual nutrients but they also suffer from all plant nutrients deficiencies which warrants attention for soil test based soil fertility management.

Keywords: Geographic information system, Global positioning system, Macronutrients, Micronutrients, Soil laboratory

Journal of Plant Development Sciences Vol. 14(5)

SCREENING OF PIGEONPEA VARIETIES AGAINST POD FLY INFESTATION UNDER FIELD CONDITION IN NIMAR REGION

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Abstract: The present study indicates that pod fly under the condition of Khargone region had severely affected the pigeonpea crop. Pigeonpea pod fly was appeared late in crop season. Pigeonpea pod fly (*Melanagromyza obtusa*) was identified at harvesting stage in different varieties. Highest pod damage in Pusa 16 (23.33%) and lowest damage in TJT- 501 (14.67%). Grain damage by Pod fly highest in Pusa 16 and lowest in TJT-501 and followed by JKM-189 (T₅), Rajeevlochan (T₆), Rajeshwari (T₄), GJP-1 (T₃), Pusa 992 (T₂), and Pusa 16 (T₁) last week of January 2021.

Keywords: Pigeonpea, Screening, Pod fly, *Melanagromyza obtusa*, Infestation

Journal of Plant Development Sciences Vol. 14(5)

GENETIC VARIABILITY, CORRELATION AND PATH ANALYSIS FOR CANE YIELD AND JUICE QUALITY TRAITS IN EARLY MATURING SUGARCANE CLONES

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Abstract: Nineteen early maturing sugarcane clones were evaluated in randomized block design with three replications at research farm of CCS Haryana Agricultural University, Regional Research Station, Uchani, Karnal during *springseason*, 2020-21. The objective of the investigation was to study genetic variability, correlation and path analysis for seventeen characters among nineteen diverse early maturing sugarcane clones. Significant differences were observed among the genotypes for all the characters studied. GCV values were highest for number of tillers at 120 DAP, commercial cane sugar (t/ha), number of shoots at 240 DAP, single cane weight, cane yield and number of millable canes at harvest. High heritability coupled with high genetic advance as per cent of mean was observed for number of tillers at 120 DAP, commercial cane sugar (t/ha) and germination per cent suggesting that these characters are governed by additive gene action and selection for these characters will be effective for further improvement in cane yield. The characters commercial cane sugar (t/ha), single cane weight, purity per cent at 8 months, cane length, number of millable canes at harvest and number of shoots at 240 DAP showed high significant and positive association with cane yield at both genotypic and phenotypic level. Path coefficient analysis revealed that commercial cane sugar (t/ha) exhibited high positive direct effect on cane yield followed by brix per cent at 10 months, commercial cane sugar at 8 months, purity per cent at 8 months, brix per cent at 8 months, cane length and number of millable canes at harvest. These characters merit special attention in formulating selection strategy in sugarcane for developing high yielding and early maturing sugarcane clones.

Keywords: Sugarcane, Genetic variability, Heritability, Genetic advance, Correlation, path Coefficient analysis

Journal of Plant Development Sciences Vol. 14(5)

CORRELATION AND PATH ANALYSIS IN SESAME (*SESAMUM INDICUM* L.)

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Abstract: Genetic variability forms the basis for crop improvement hence detailed appraisal of the accessions for different morphological, agronomic and quality traits is necessary in order to identify useful traits either for direct or indirect use in improvement programs. The present experiment was carried out at Niger Research Station, Navsari Agricultural University, Varanasi, (Vansda) during summer 2019. The magnitudes of genotypic correlations were higher as compared to the corresponding phenotypic correlations which indicate that there was an inherent association between the characters at genotypic level. Seed yield per plant was found to be highly significant and positively correlated with plant height, branches per plant, capsules per plant, capsule length and harvest index at both genotypic and phenotypic levels while days to maturity and capsule width had highly significant correlation with seed yield per plant at genotypic level indicating that these attributes were mainly influencing the seed yield in sesame. Thus, selection practiced for the improvement in a character will automatically result in the improvement of other character even though direct selection for improvement has not been made for the yield character. While, non-significant positive correlation with seed yield per plant was observed for leaf area and 1000 seed weight at both genotypic and phenotypic levels. Highly significant negative correlation observed for days to 50 % flowering and total oil content indicated that selection for such negatively correlated trait would be very crucial affecting the progress under selection and it would be hard to apply simultaneous selection for these characters for development of new variety. Path coefficient analysis revealed highest positive direct effect on seed yield was recorded for branches per plant followed by days to maturity, harvest and 1000 seed weight. Thus, these traits turned out to be the major components of seed yield per plant.

Keywords: Path coefficient, Correlation analysis, Sesame

Journal of Plant Development Sciences Vol. 14(5)

EFFECT OF FOLIAR APPLICATION OF LIQUID ORGANICS ON GROWTH, YIELD AND QUALITY OF STRAWBERRY (*FRAGARIA* × *ANANASADUCH.*) CV. WINTER DAWN

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Abstract: An investigation was carried out under open field condition to study the effect of four different liquid organics (seaweed extract, Novel Plus, *panchagavya* and cow urine) at concentration of 1.0 % and 3.0 % in spray solution on growth, flowering, yield and quality of strawberry. The foliar application of 3.0 % Novel Plus organic liquid nutrient found significantly improved the plant spread, leaves per plant, leaf area, length of petiole, crowns per plant. This foliar treatment also increased the number of flowers, number of fruits, fruit weight and length, percentage of marketable fruits per plant, yield per plant and marketable yield significantly over control plants which received no sprays. However, the best quality fruits in terms of TSS, ascorbic acid and sugar content were harvested from the plant receiving foliar spraying of 1.0 % Novel Plus.

Keywords: Liquid organics, Foliar application, Strawberry, Seaweed extract, Novel Plus

Journal of Plant Development Sciences Vol. 14(5)

MANAGEMENT OF *MACROPHOMINA PHASEOLINA* INDUCED CHARCOAL ROT OF COWPEA THROUGH BIOAGENTS AND FUNGICIDES UNDER FIELD CONDITIONS

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Abstract: The charcoal rot of cowpea (*Vigna unguiculata* (L.) Walp) is caused by *Macrophominaphaseolina*. It affects many crops worldwide causing devastatingly high yield losses. No single control measures are found to be much effective owing to its soil-borne nature. In order to manage the disease, a field experiment was conducted to determine the effectiveness of biocontrol agents viz., *Trichoderma harzianum* and *Pseudomonas fluorescens* and fungicides viz., tebuconazole 2DS, tebuconazole 50% + trifloxystrobin 25% WG, carbendazim 12% + mancozeb 63% WP and captan 70% WP were used alone as well as in combinations. When fungicides were applied as seed treatment and soil drench together, tebuconazole 50%+ trifloxystrobin 25% WG was proved to be most effective against charcoal rot by decreasing disease incidence and increasing grain yield followed by carbendazim 12% + mancozeb 63% WP. Seed treatment and foliar spray when applied alone, were found to be effective against *M. phaseolina* but the results revealed that they were less effective than combination treatment of fungicides. Bio-agents minimized the incidence of disease but to a lower extent than fungicides. A relatively more disease control was observed by *T. harzianum* followed by *P. fluorescens*.

Keywords: Charcoal rot, *Macrophominaphaseolina*, *Pseudomonas fluorescens*, Soil-borne, *Trichoderma harzianum*

Journal of Plant Development Sciences Vol. 14(5)

EFFECT OF FOLIAR APPLICATION OF MICRONUTRIENTS ON GROWTH, YIELD AND QUALITY OF ONION (*ALLIUM CEPA* L.)

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Abstract: A field experiment was conducted as “On-Farm-Trial” on farmers’ fields by CCSHAU, Krishi Vigyan Kendra, Rohtak, Haryana during *Rabiseason* of 2018-19 and 2019-20. Trial was conducted at ten farmers’ field at different locations of district Rohtak. The *Rabi* onion variety Hisar Onion 4 was used for experimentation. The micronutrients were applied to the onion crop through foliar spray of “Multiplex General” which contains Zinc 3.0%, Boron 0.5%, Iron 1.5% and Copper 0.5%. Foliar spray above micronutrients mixture @ 250 ml in 100 litres of water per acre was done at 45 & 60 days after transplanting of the crop along with control treatments. Foliar application of micronutrients significantly increased the plant height (66.23cm) over control. In case of yield and its attributes, micronutrients application produced bigger size bulb which reflected in increased bulb diameter (6.17 cm) and weight (53.32 g) than that of untreated control and likewise the maximum and significantly higher yield *i.e.*, 302.7 q/ha was reported in the treatment where micronutrients were applied at 45 and 60 days after planting (T_2). The quality parameters such as total soluble solids (TSS) 13.92^oBrix and 11.60^oBrix, dry matter 14.44% and 13.21%, have been reported in treated and control plots, respectively in onion variety HO-4.

Keywords: Foliar application, Onion, micronutrients, TSS