Journal of Plant Development Sciences

(An International Monthly Refereed Research Journal)

Volume 11 Number 12 December 2019

Contents

Journal of Plant Development Sciences Vol. 11(12)

THE CRADLE OF THE FLOWERING PLANTS

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Received-04.12.2019, Revised-26.12.2019

Abstracts: Angiosperms (Magnoliophyta or Anthophyta), Cycads (Cycadophyta), Conifers (Coniferophyta), Gnetophytes or Gnetales (Gnetophyta) and Ginkgo (Ginkgophyta) are the five major lineages of the extant seed plant. Of these Angiosperms are the most species rich and include more than 13000 genera and 300000 species. The Conifers are second largest group of seed plants with ca. 70 genera and 600 species. The cycads include ca. 9 genera and 129 species. Gnetales include only 3 genera (*Gnetum, Ephedra* and *Welwitschia*) with 90 species. There is single species of *Ginkgo biloba*. Caytoniales, Bennettiales, *Pentoxylon*, Corystosperms and Glossopterids, are the extinct lineages of seed plants. These have been proposed as putative relative and possible progenitors of the Angiosperms (Soltis et al., 2005).

Keywords: Angiosperms, Cradle, Flowering plants, Seed

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MOLECULAR FARMING AS AN APPROACH FOR PRODUCTION OF USEFUL METABOLITES

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Received-02.12.2019, Revised-23.12.2019

Abstract: Recently, through modern biotechnology, it is now recognized that plants are potentially a new source of pharmaceutical proteins including vaccines, antibodies, blood substitutes and other therapeutic entities. Unlike mammalian-derived rDNA drugs, plant-derived antibodies, vaccines and other proteins are particularly advantageous since they are free of mammalian viral vectors and human pathogens. Advantages offered by plants include also low cost of cultivation and high biomass production, relatively fast "gene to protein" time, low capital and operating costs, excellent scalability, eukaryotic posttranslational modifications and a relatively high protein yield. Crop plants can synthesize a wide variety of proteins that are free of mammalian toxins and pathogens. Crop plants produce large amounts of biomass at low cost and require limited facilities. Since plants have long been used as a source of medicinal compounds, molecular farming represents a novel source of molecular medicines, such as plasma proteins, enzymes, growth factors, vaccines and recombinant antibodies, whose medical applications are understood at a molecular level. Bio-pharming promises more plentiful and cheaper supplies of pharmaceutical drugs, including vaccines for infectious diseases and therapeutic proteins for treatment of such things as cancer and heart disease. This paper provides a brief knowledge about molecular farming and their issues.

Keywords: Biotechnology, Pharmaceutical proteins, Vaccines, rDNA, Recombinant antibodies

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STANDARDIZATION OF MICRO-PROPAGATION TECHNIQUE FOR *ANTHURIUM ANDRAEANUM* IN ANDAMAN ISLAND

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Received-09.12.2019, Revised-28.12.2019

Abstract: Anthuriumsare popular cut flowers with attractive spathecolours and highly popular as cut flower and potted plant in International markets. The humid tropical coastal climate of Andaman and Nicobar Islands is very congenial for growing anthurium. Availability of planting material is a major constraint for commercial cultivation of anthurium in the Island. Micro-propagation is the option for rapid multiplication of planting material with production of true to type, disease free quality planting material. The present study was therefore undertaken to standardize the micro-propagation of anthurium using MS media. Callus induction, shoot & root multiplication using leaf and apical shoot buds of *Anthuriumandreanum*as explants was achieved with modified MS medium supplemented with 1.0 mg/l 2, 4-D and 1 mg/l BAP. Explants of youngleaves and apical shoot buds showed callus formation at 75 and 63 days respectively after inoculation and the callus formation percentage was maximum in apical shoot bud (48.42 %) whereas in leaves it was 35.25%. Maximum number of shoots and percentage of rooted shootsper explant observed in apical shoot buds 18.64 ± 1.89 and 95% respectively).

Key words: Anthurium, Andaman and Nicobar Islands, Micro-propagation, Callus, Explant

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INFLUENCE OF PLANT GROWTH REGULATORS ON GROWTH, YIELD AND ITS QUALITY OF TOMATO (*LYCOPERSICON ESCULENTUM* MILL.)

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Received-02.12.2019, Revised-19.12.2019

Abstract: On the basis of experiment conducted during rabi season of 2018 – 2019 at Vegetable Research Farm Kalyanpur, Department of Vegetable Science of C. S. Azad University of Agriculture and Technology, Kanpur with the summary of results it can be concluded that plant height (cm)., number of primary and secondary branches per plant., number of fruits per plant., fruit length (cm)., fruit diameter (cm)., fruit weight (g)., fruit yield per plant (g) and yield per hectare (q) were increased with GA_3 @ 40 ppm concentration however number of flowers were increased with 2, 4-D @ 5 ppm while the TSS and weight of 100 seed were increased by 2, 4-D @ 10 ppm concentrations. Among NAA treatments NAA 25 ppm produced higher (69.95 cm) plant height followed by NAA 20 (67.16 cm) and15 ppm (66.39 cm) which were significantly greater over control (59.36 cm). The NAA at 25 ppm concentration produced 69.95 cm plant height which was significant over NAA 20 and 15 ppm while NAA 20 and 15 ppm did not differed significantly.

Kewword: Influence of plant growth, Yield, Quality

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IMPACT OF INDOLE -3- BUTERIC ACID AND INDOLE -3- ACETIC ACID ON SURVIVAL PERCENTAGE OF *TERMINALIA ARJUNA* (ROXB.) STEM CUTTINGS

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Received-07.12.2019, Revised-26.12.2019

Abstract: IBA and IAA concentrations were examined to determine the Survival percentage of *Terminalia arjuna* (Roxb.) by vegetative propagation via rooting in stem cuttings. The experiment was laid out in a completely randomized design (CRD) with three replications. One-year old leafless branch cuttings were treated with 0, 500, 1000, 1500 and 2000 mg L^{-1} concentrations of IBA and IAA and planted in poly bags grown under phyto-environmentally controlled mist chamber. Results shown that minimal survival percentage was recorded in untreated cuttings (control), and significantly increased with an increase in concentration of IBA and IAA. Among two auxins, IBA emerged most effective on survival percentage, inducing rooting, sprouting and associated traits. Auxins concentration 2000 mg L^{-1} was recorded maximum 66.88% of plants survived and achieved over 70% rooting in cuttings. It also triggered more number of roots, higher root length, shoot

proliferation, maximum shoot and root biomass. This paper discusses the role of growth harmones (IBA and IAA) impact on survival percentage of stem cuttings influencing rooting and has a practical implication for the development of protocol for asexual propagation and establishing clonal plantations of *Terminalia arjuna*.

Keywords: Auxins, Clonal multiplication, Multipurpose tree, Plus trees

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ASSESSMENT OF GENETIC VARIATION AND DIVERSITY IN RICE GERMPLASM BASED ON PRINCIPAL COMPONENT ANALYSIS

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Received-04.12.2019, Revised-25.12.2019

Abstract: The present investigation was carried out to determine the relationship and genetic diversity among 47 rice genotypes based on the 27 agro morphological and quality traits using principal component analysis. Analysis of variance revealed significant and ample variation for all the studied traits in the germplasm lines. In this study, first eight principal components have more than one eigen values and more than 4% variations which explained the total 80.01% cumulative variance among 27 traits. PC1 had the contribution from traits *viz.*, grain weight/plant, harvest index, panicle weight, and head rice recovery, which accounted for 29.16% of the total variability. Plant height and grain dimension parameters were contributed 12.11% to the total variability in PC2. The remaining 38.74% variability was consolidated by PC3, PC4, PC5, PC6, PC7 and PC8. Scatter diagram plotted against PC1 and PC2 revealed that genotypes Basmati I, IGKVR-1244, MTU1010, Dhaur, Badalphool, Parra, Dhaura, Jaya, Beo-I, and Dhamna panda were very divergent for the traits under study. Thus, the results of principal component analysis revealed the wide genetic variation in rice genotypes. Identified accessions may be used as donors to improve the yield and quality traits in varietal development program.

Keywords: Genetic diversity, Germplasm, Principal component analysis, Rice, Variance

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INFLUENCE OF SULPHUR AND ZINC ON GROWTH, YIELD, QUALITY AND ECONOMICS OF INDIAN MUSTARD (*BRASSICA JUNCEA*) UNDER RAINFED CONDITIONS

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Received-05.12.2019, Revised-27.12.2019

Abstract: A field experiment was conducted during the winter seasons of 2013-14 and 2014-15 in Chitrakoot – Satna, Madhya Pradesh, India, to study the effects of 5 sulphur levels (0, 15,30,45 and 60 kg S ha^{-1}) and 4 zinc levels (0, 2.5, 5.0 and 7.5 kg Zn ha^{-1}) on rainfed Indian mustard (cv. Pusa Tarak). Progressive increase in P and Zn levels increased the yield attributes and seed yield, but the increase in seed yield was significant only up to 45 kg S ha^{-1} and 5.0 kg Zn ha^{-1}. Seed yield increased significantly up to 45 kg S ha^{-1} and 5.0 kg Zn ha^{-1} application. Significantly higher seed yield (1685.2 kg ha^{-1}) was recorded with 45 kg S x 7.5 kg Zn ha^{-1} followed by 60 kg S x 7.5 kg Zn, 30 kg S x 5.0 kg Zn and 45 kg S x 5.0 kg Zn^{1} and these treatments combination were comparable from each other. Oil and protein content also increased up to 30 kg S and 5 kg Zn ha^{-1}.

Keywords: Mustard, Quality, Seed yield, Sulphur, Zinc

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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT PRACTICES ON QUALITY OF RICE VARIETIES UNDER NORTH HILL ZONE OF CHHATTISGARH

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Received-04.12.2019, Revised-23.12.2019

Abstract: The experiment was conducted during *kharif* 2018 at Research-cum-instructional farm of Raj Mohini Devi College of Agriculture and Research Station, Ajirma, Ambikapur, Chhattisgarh to study the "Response of quality rice varieties to integrated nutrient management practices under North Hill Zone of Chhattisgarh". The experiment was conducted in split plot design with three replications. The study comprised 05 rice varieties (V_1: Trombay CG dubraj mutant-1, V_2: Tarunbhog mutant-1, V_3: Safri 17-48-2, V_4: Trombay Raipur rice and V_5: Zinco rice) as main plot and 05 management practices {P_1: 20×10 cm spacing + 100% RDF (80:50:30 kg NPK ha^{-1}) through inorganic (standard check), P_2: 20×10 cm spacing + 100% RDF through inorganic and organic {Topdressing of (Vermicompost @ 2q/ha + DAP @ 25 kg/ha) at 25-30 DAT and remaining NPK through inorganic}, P_3: 20×10 cm spacing + 150% RDF through inorganic and organic{Topdressing of (Vermicompost @ 2q/ha + DAP @ 25 kg/ha) at 25-30 DAT and remaining NPK through inorganic}, P_4: 15×10 cm spacing + 150% RDF through inorganic and organic {Topdressing of (Vermicompost @ 2q/ha + DAP @ 25 kg/ha) at 25-30 DAT and remaining NPK through inorganic} and P_5: 20×10 cm spacing + 150% RDF through inorganic}. The results revealed that variety Safri 17-48-2 recorded higher value in paddy length (9.39 mm), L:B ratio (3.72), kernel length (7.49 mm before cooking and 12.69 mm after cooking), hulling (72.99) and milling percentage (68.14) but in case of kernel breadth recorded highest in variety Zinco rice before cooking and Tarunbhog mutant-1 after cooking. Among the different management practices 20×10 cm spacing + 150% RDF through inorganic + organic {Topdressing of (Vermicompost @ 2q/ha + DAP @ 25 kg/ha) at 25-30 DAT and remaining NPK through inorganic} resulted higher hulling (71.52), milling (66.27) and head rice recovery (50.90) percentage followed by treatment of 20×10 cm spacing + 150% RDF through inorganic and rest of the quality parameters not affected significantly.

Keywords: Aromatic rice, Chhattisgarh, Nutrient, Zinc

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TIME SERIES ANALYSIS MODEL TO FORECAST RAINFALL FOR AMBIKAPUR REGION CHHATTISGARH

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Received-07.12.2019, Revised-26.12.2019

Abstract: Precipitation is an important guiding standard for agricultural production; however, it is highly difficult to forecast due to random sequential and seasonal features. Various research groups attempted to predict rainfall on a seasonal time scales using different techniques. This paper describes the Box-Jenkins time series seasonal ARIMA (Auto Regression Integrated Moving Average) approach for prediction of rainfall on monthly scales. ARIMA (1,0,1)(0,1,1) model for rainfall was identified the best model to forecast rainfall for next 4years with confidence level of 95 percent by analyzing last 27 year's data (1990-2016). Previous years data is used to formulate the seasonal ARIMA model and in determination of model parameters. The performance evaluations of the adopted models are carried out on the basis of correlation coefficient (R^2) and root mean square error (RMSE). The study conducted at Ambikapur, Chhattisgarh (India). The results indicate that the ARIMA model provide consistent and satisfactory predictions for rainfall parameters on monthly scale.

Keywords: Rainfall, ARIMA, Correlation Coefficient (R^2), Root Mean Square error (RMSE)

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EFFECT OF INTEGRATED NITROGEN MANAGEMENT ON ECONOMICS OF *DESI* WHEAT

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Received-08.12.2019, Revised-27.12.2019

Abstract: To explore the extent of substitution of nitrogen fertilizer in wheat to find out the suitable combination of fertilizers and organic manures for higher economic return present study entitled, "Compensating nitrogen fertilizer requirement of *desi* wheat through *Azotobacter* and vermicompost" was conducted at the Agronomy Research Farm of Chaudhary Charan Singh Haryana Agricultural University, Hisar during the *rabi* season of 2017-2018 to study the effect of *Azotobacter* and vermicompost on economics of *desi* wheat. The soil of the experimental field is sandy loam in texture, slightly alkaline in reaction, low in organic carbon and nitrogen, medium in available phosphorus and potassium. The experiment consisted of 10 treatments viz., T_1 (Control) , T_2 (Vermicompost @ 6 t ha^{-1}) , T_3 (*Azotobacter* + Vermicompost @ 6 t ha^{-1}), T_4 (30 kg N ha^{-1} + *Vermicompost* @ 3 t ha^{-1}), T_5 (40 kg N ha^{-1} + *Vermicompost* @ 2 t ha^{-1}), T_6 (50 kg N ha^{-1} + *Vermicompost* @ 1 t ha^{-1}), T_7 (30 kg N ha^{-1} + *Azotobacter* + Vermicompost @ 3 t ha^{-1}), T_8 (40 kg N ha^{-1} + *Azotobacter* + Vermicompost @ 2 t ha^{-1}), T_9 (50 kg N ha^{-1} + *Azotobacter* + Vermicompost @ 1 t ha^{-1}) and T_{10} (60 kg N ha^{-1}). Among various combinations of nitrogen fertilizer, vermicompost and *Azotobacter* treatments, T_{10} recorded significantly higher gross returns, net returns and benefit: cost ratio of *desi* wheat.

Keywords: Wheat, B:C, Economics, *Azotobacter*, Vermicompost, Fertilizer