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EFFECT OF PLANT GROWTH REGULATORS ON VEGETATIVE AND REPRODUCTIVE GROWTH IN STRAWBERRY (*FRAGARIA XANANASSA*)

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Abstract: Strawberry (*Fragaria spp.*) belongs to the genus *Fragaria* and Rosaceae family (Staudt, 1989) is native to Europe, Asia, and some others to North and South America, and has 20 recognized species. The cultivated strawberry is a hybrid between two species, *Fragaria chilonensis* and *Fragaria virginiana*. The botanical name of the commonly cultivated strawberry is *Fragaria × ananassa*. The strawberry is an attractive, luscious, tasty, aggregate, nutritious fruit. Strawberry is commercially grown in temperate regions, but there are varieties, that can be cultivated in subtropical climate. Plant growth regulators or phytohormones are organic substances produced naturally in higher plants, controlling growth or other physiological functions at a site remote from its place of production and active in minute amounts. Control of gene expression has been demonstrated for the phytohormones at both transcriptional and translational levels. The paper reviews the influence of various phytohormones on strawberry growth, development and fruit yield. Plant growth regulators were found to be very effective in increasing the vegetative growth, flowering and yield of berry fruits in temperate, tropical as well as subtropical regions. In most of the studies, a high concentration of gibberellic acid increased vegetative growth and runner production in strawberries whereas Cycocel, a growth retardant was very effective in improving fruit quality. Naphthalene acetic acid is an auxin, which is very effective in controlling and directing a number of plant metabolic processes. Effects of ethylene and 1-MCP treatments on strawberry fruit quality have been analysed at the commercial ripening stage.

Keywords: Phytohormone, GA₃, NAA, CCC, Cytokinin, Ethylene, Strawberry

ENVIRONMENTAL DEGRADATION AND CHALLENGES RELATED TO LIVELIHOOD SECURITY AMONG THE POOR IN INDIA

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Abstract: Our environment is largely affected by poverty in various forms. Deforestation, water pollution, air pollution, climate change etc. are the environmental hazards caused due to poverty specially in a developing country like India. Due to environmental degradation, there is a climate change and global warming is increasing due to lack of capital to invest in environment friendly technologies. Environmental damage is seldom caused by the people living below poverty line but they bear the brunt of environmental damage and caught off in a downward spiral. On an average every Indian contributes 0.56 tonne per year of carbon- 0.19 tonne per capita among the poor and 1.32 tonne among the rich. India's position in the carbon emission is third which is 6.8% of the total global emissions. Poverty alleviation and environmental degradation are the most serious global issues that are closely interlinked but are often treated separately. The human activities and the issues of the environment are inter-related as the human interact with his surroundings. Deforestation is the biggest harm done to the environment by poverty in India. Another way of environmental degradation due to poverty is air and water pollution in the country. The growth of population puts more pressure on the environment. The limited resources of the environment find it difficult to fulfil all the needs of the people and more births from the poor communities puts further pressure on the environment. Rethinking regarding the approaches to environmental issues is required. The need is to have a sustainable use of the environmental resources and there must be a recognizable interconnectedness between human beings and the environment if true environmental and social justice is to be obtained. In India, public authorities and various government and non-government organizations can play an important role in creating awareness among the poor people to save and sustain our environment.

Keywords: Livelihood, Environmental degradation, Deforestation, Poor communities

STUDY THE EFFECT OF PHOSPHORUS, SULPHUR AND PSB ON GROWTH ATTRIBUTING CHARACTERS OF MUSTARD

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Abstract: A field experiment was carried out at Agronomy Instructional Farm, School of Agricultural Sciences, Career Point University, Kota, Rajasthan during Rabi season of 2019-20 and 2020-21 to Studies on the Effect of Phosphorus, Sulphur and PSB on Mustard [*Brassica juncea* (L.)] growth, Yield and Quality. The experiment was laid out in Split plot design with four levels of phosphorus (RDF-N constant, 20 kg, 40 kg, 60 kg) and two levels of sulphur (40 kg, 60 kg) and phosphate solubilizing bacteria (control and inoculation) with three replications. The experiment results revealed that the growth parameters such as plant height (154.66, 199.61), fresh weight of shoots(127.28, 189.15), Dry weight of shoots(16.46, 24.56), Number of green leaves per plant(17.79, 20.82), number of branches per plant(23.29, 26.81) maximum was recorded under the treatment T4 (RDF (N constant) + 60 Kg Sulphur ha-1 + PSB Inoculation). However, it was at par recorded under treatments T15 (60 kg P₂O₅ ha-1 + 40 kg Sulphur ha-1 + Inoculation with PSB), at 60 days and 75 days after sowing in 2019-20 and same treatments shows tremendous result in 2020-21. During the year 2019-20 and 2020-21 earliest 50 per cent flowering (52.63, 55.82 days) was observed and Minimum days taken to maturity were recorded (102.72, 106.03) in the treatment T4 (RDF (N constant) + 60 Kg Sulphur ha-1 + PSB Inoculation) which was statistically at par with treatment T12 (40 kg P₂O₅ ha-1 + 60 kg Sulphur ha-1 + Inoculation with PSB). Treatment T4 was statistically significant especially when compared to treatments where no inoculation with PSB was done.

Keywords: Mustard, Phosphorus, Sulphur, PSB, RDF

MULTIVARIATE ANALYSIS IN INDIAN MUSTARD

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Abstract: Principal component and hierarchical cluster analyze were carried out with ten quantitative traits in 50 hybrids of Indian mustard [*Brassica juncea* (L.) Czern&Coss.]. Principal factor analysis identified three principal components which cumulatively explained about 63.7% variability. PC 1 explained the most variability, accounting for 30.6%, PC 2 for 12.7%, and PC 3 for 11.4% of the overall variation. PCA correlation circle revealed that main shoot length, number of siliqua on the main shoot, secondary branches per plant, primary branches per plant and seed yield per plant were positively correlated with each other. Hierarchical cluster analysis was performed to see the grouping pattern of parents of hybrids. Fifty hybrids were grouped into three clusters. Maximum of 27 hybrids were grouped in cluster II and showed characteristic of lesser main shoot length. Cluster 1st and 3rd had nine and 13 hybrids, respectively. Pedigree of hybrids showed that Cluster I and Cluster II comprised of majority of hybrids having female parents OA-RH 8812 and OA-RH 0749 while Cluster III comprised of OA-RH 0555 and OA-RH 30. Female parent, OA-RH 0630 was distributed among all clusters. Male parents were uniformly distributed among all clusters and no clear-cut pattern was found. Hence, in the future hybrid development programme we may use one female parent from each group in addition to the OA-RH 0630.

Keywords: *Brassica juncea*, Hybrid, Plant, Siliqua

EFFECT OF ENVIRONMENTAL FACTORS IN RELATIONSHIP TO BACTERIAL LEAF BLIGHT (BLB) DISEASE DEVELOPMENT UNDER SOUTH GUJARAT OF INDIA

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Abstract: Cotton (*Gossypium spp.*) is one of the most important economic products of the group of fibers due to volume and value of production. Its cultivation is also of great social importance, due to the number of jobs generated directly or indirectly. The fiber, the main product of cotton has many industrial applications. Examples are manufacturing of yarn for weaving of various kinds of fabrics, cotton batting for hospital use, felt clothing, blankets and upholstery, photographic films and plates for radiography and others. The Main objective of present study is to study the progress of the Bacterial blight disease of cotton (BLB), caused by *Xanthomonas campestris* pv. *malvacearum* (Smith) Dye, in relation to the weather factors. It is a common disease affecting the growth, development and the yield of cotton crop under this region. A field trial was laid to study and to determine the influence of environmental factors viz., rainfall, rainy days, temperature and humidity on development of disease. The disease was first appeared in the third week of July (2.0 % PDI) i.e. in 29th Met. week. The incidence of Bacterial blight disease (BLB) was noticed from 29th to 51st standard week with the maximum disease intensity in the second week of October (42.5% PDI) i.e. in 41th Met. week. Bacterial leaf blight (BLB) has positive correlation with the maximum temperature and sunshine hour for the disease development.

Keywords: Bacterial blight, *Xanthomonas, Campestris* pv. *malvacearum*, Weather factors

STUDIES ON VARIABILITY, CORRELATION AND PATH COEFFICIENT ANALYSIS FOR CANE YIELD, ITS COMPONENTS AND QUALITY CHARACTERS IN SUGARCANE MIDLATE CLONES

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Abstract: Twenty-two sugarcane midlate clones were evaluated for agro-morphological and quality characters in randomized block design (RBD) at CCS, Haryana Agricultural University Regional Research Station, Karnal during 2019-20. Analysis of variance showed that mean squares due to genotypes were highly significant for all the characters studied, indicated the presence of sufficient genetic variability and appropriateness of the material selected for the present study. Phenotypic coefficient of variation (PCV) was higher than genotypic coefficient of variation (GCV) for all the characters representing more environmental impact on these characters for total variation. High heritability (broad sense) coupled with high genetic advance was observed for stalk length. High heritability (broad sense) coupled with moderate genetic advance as percent of mean was observed for cane yield, stalk length, stalk diameter and CCS (t/ha), therefore, it indicates that simple selection will be effective for genetic improvement of these characters. Genotypic and phenotypic correlation coefficients for cane yield exhibited significant and positive relationship with number of tillers at 120 DAP, number of shoots at 240 DAP, NMC at harvest, single cane weight and CCS (t/ha). These traits play a greater role as an important contributing character for higher cane yield and quality. Lack of association of quality characters namely sucrose percent, brix percent and purity with grain yield at genotypic and phenotypic level in present study suggests that we can improve quality content without affecting cane yield. The path coefficient analysis indicated the maximum positive direct effect on cane yield was shown by CCS (t/ha) followed by number of shoots at 240 DAP, single cane weight, number of millable cane and germination at 45 DAP, extraction percent and stalk length. Therefore, in order to increase cane yield, effective selection can be accomplished for the characters having high direct effects.

Keywords: Sugarcane, Heritability, Genetic advance, Correlation coefficient, Path coefficient analysis

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INDIA'S COMPARATIVE ADVANTAGE IN FRUITS AND VEGETABLES

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Abstract: India ranks second in production of fruits and vegetable in the world, after China. Nearly 15 and 11 per cent of the world's fruits and vegetables respectively were produced by India. Indian agricultural commodities occupied considerable share in the world market. The present study ascertained the comparative advantage of fruits and vegetables for a period of 2000-01 to 2020-21. Comparative advantage is calculated through the Balassa Index. Secondary data on fruits and vegetables exports of India and world, total merchandise export of India and world were collected for the above period. The secondary data was collected from FAO trade year books, APEDA, DGCIS, and www.fao.org. The results revealed that fruits namely mango and grapes and vegetables namely onion during the above period showed comparative advantage. Therefore, emphasis should be laid on increasing the production, productivity and export quality of those fruits and vegetables.

Keywords: Balassa index, Comparative advantage, Fruits, Vegetables, India

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EFFECT OF DIFFERENT CHEMICALS ON CRACKING OF POMEGRANATE (*PUNICAGRANATUM*L.) CV. MRIDULA

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Abstract: The experiment including fifteen treatments of different chemicals was conducted on seven years old plants at Experimental Orchard of the Department of Horticulture, CCS Haryana Agricultural University, Hisar during the year 2020 to study the effect of CaCl₂, CaSO₄, borax, salicylic acid and chitosan on fruit cracking of pomegranate. The result of the experiment indicates that the foliar application of CaCl₂, CaSO₄, borax, salicylic acid and chitosan had a significantly positive effect on most of the recorded parameters. The minimum number of fruits cracked (13.3), number of fruit cracking per cent on number basis from June on ward at monthly interval (9.9%) and number of fruit cracking per cent on weight basis from June onward at monthly interval (5.8%) was recorded with 0.3 per cent borax.

Keywords: Pomegranate, Fruit cracking, CaCl₂, CaSO₄, Borax, Salicylic acid, Chitosan

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GENETIC VARIATION, HERITABILITY, CORRELATION AND PATH ANALYSIS FOR LEAF YIELD IN CLONALLY SELECTED MULBERRY GENOTYPES (*MORUS* SPP.)

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Abstract - Fourteen clonally selected mulberry genotypes were evaluated to estimate the genetic variability, correlation, and path analysis for important leaf yield contributing characters. Analysis of variance revealed significant differences for all the traits under study. In general, PCV estimates were higher than GCV estimates for all the eleven characters studied. High heritability (>60%) accompanied by high genetic advance (>20%) recorded in number of branches/plant, petiole length, leaf area, stem girth, leaf specific weight, leaf moisture retention, leaf thickness, and leaf yield/plant is due to additive gene effects and selection based on these may be effective. correlation studies indicated that total leaf yield/plant had a positive and significant association with all the studied characters except petiole length. Path coefficient analysis revealed that leaf thickness had the highest positive direct effects on leaf yield/plant, suggesting their importance while imposing selection for correlation of leaf yield in mulberry.

Keywords: Correlation, Genetic variability, Heritability, Mulberry, Path analysis

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ASSESSMENT OF QUALITY OF THE RAW DRUG MARKET SAMPLES OF *PSEUDARTHRIA VISCIDA* (MOOVILA) COLLECTED FROM KERALA HERBAL MARKETS

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Abstract: Plants, especially medicinal plants play an important role in the plant resource spectrum of Kerala. Out of estimated 4600 flowering plants in Kerala, about 900 possess medicinal values. Many medicinal plants are either endangered or on the verge of extinction due to over exploitation. *Pseudarthria viscida* (L.) Wight and Arn is an important medicinal plant from the family Fabaceae which is one among the famous “Dasamoola” (10 roots) plants and is a major component in many ayurvedic preparations. Its roots are used in the treatment of a wide variety of ailments being anti helminthic, antifungal, anti inflammatory, antioxidant, antitumor, aphrodisiac, astringent, bitter, cardiogenic, digestive, diuretic, emollient, febrifuge, hypotensive as well as rejuvenating in nature. Increasing demand for this drug has naturally lead to adulteration or substitution in market raw drug samples. This study presents the results of quality analysis of the raw drug market samples of *Pseudarthria viscida* roots collected from different herbal markets of Kerala. Fifteen percent of the analysed samples were found as spurious.

Keywords: Adulteration, *Pseudarthria viscida*, Moovila, Thin layer chromatography (TLC)

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EFFECT OF SOIL AND FOLIAR APPLICATION OF BORON ON YIELD AND QUALITY PARAMETERS OF CAULIFLOWER (*BRASSICA OLERACEA* VAR *BOTRYTIS* L.)

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Abstract: A field experiment entitled “Studies on soil and foliar application of boron on soil properties, growth, yield and quality of cauliflower (*Brassica oleracea* var. *botrytis* L.)” was carried out in farmer’s field during Kharif 2018. The experiment was laid out in a RCBD with nine treatments which were replicated thrice. Yield and quality parameters significantly influenced by combined soil and foliar application of different sources and levels of boron. The results of the experiment indicated that significantly higher curd diameter (16.91 cm), curd weight (0.988 g), yield plot⁻¹ (23.81 kg), yield ha⁻¹ (36.74 t) and higher quality parameters viz., Total soluble solids (6.06°Brix) and ascorbic acid (61.24 mg 100g-1) content was recorded in treatment which received combined application boron (T₉). Lowest values were recorded under control treatment which received only recommended dose fertilizer (T₁). Hence the combined soil and foliar application significantly influence the yield and quality of cauliflower.

Keywords: Boron, Cauliflower, Foliar application, Soil application, Yield

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CORRELATION AND PATH ANALYSIS IN INDIAN MUSTARD

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Abstract: The present study was carried out with 50 Indian mustard hybrids to examine the association among yield component traits and their direct and indirect influence on seed yield per plant. The characters, viz. number of seeds per siliqua, number of secondary branches per plant, number of primary branches per plant, number of siliqua on main shoot, siliqua length, main shoot length and 1000-seed weight, showed significant correlation at both the genotypic and phenotypic levels. Number of secondary branches per plant had the greatest direct effect on seed yield per plant, followed by number of seeds per siliqua, 1000-seed weight, plant height, main shoot length and number of siliqua on main shoot.

Keywords: Correlation, Indian mustard, Hybrid, Siliqua

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DELINEATION OF AGRICULTURAL WATERSHEDS USING DIGITAL ELEVATION MODEL AND GEOGRAPHICAL INFORMATION SYSTEM

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Abstract: In practice, watershed is a close boundary in which surface water drains from high slope to low sloppy area. Describing the geographic boundaries of watersheds and sub-watersheds helps in gathering and evaluating data for watershed management. This paper presents the delineation of the agricultural watershed boundary using Shuttle Radar Topographic Mission (SRTM) DEM downloaded from the USGS Earth Explorer. The delineation of watershed was done within the boundary of Agricultural College and Research Institute, TNAU, Madurai located in southern part of Tamil Nadu, India. From DEM, flow direction, flow accumulation, stream network and basin map was prepared for the study using the Hydrology Tools in ArcGIS.

Keywords: Watershed, Digital elevation model, Earth

GROWTH BEHAVIOR OF *Gmelina arborea* IN DIFFERENT FERTILITY LEVELS OF AGROFORESTRY SYSTEM

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Abstract: A field experiment was conducted at a research farm, department of forestry, JNKVV, Jabalpur during the *rabi* season 2020-21 and 2021-22 to find out the growth of *Gmelina* trees at different fertilizer levels under agroforestry systems. The experiment was laid out in a factorial randomized block design (FRBD) with 4 replications and 2 factors and 3 fertilizer treatments consisting of F₁ (75%NPK@ 45:30:30 kg ha⁻¹), F₂ (100%NPK@ 60:40:40 kg ha⁻¹), and F₃ (125%NPK@ 75:50:50 kg ha⁻¹) the nutrient utilization have to influence the growth of *Gmelina* tree different fertilizer levels. The result revealed that the growth of dbh and height was found highest in F₃ (8.04, 8.3 and 8.17 cm) and (3.84, 3.94 and 3.80 m) respectively, first, second year and pooled data. This parameter directly impacts on derived parameters like basal area and volume, thus maximum fertilizer levels found in basal area and volume in F₃ (2.6, 2.75 and 2.67 m² ha⁻¹) and (10.8, 11.7 and 11.3 m³ ha⁻¹) respectively in both year and pooled data.

Keywords: Agroforestry system, Plantation, Timber, Tree

BIOCONTROL EFFICACY OF VARIOUS *TRICHODERMA* SPECIES AGAINST FUNGAL PATHOGEN *ALTERNARIA SOLANI*, CAUSING EARLY BLIGHT OF TOMATO UNDER *INVITRO* CONDITIONS

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Abstract: Tomato (*Solanum lycopersicum*) is the most popular vegetable crop grown worldwide and it ranks second most important solanaceous vegetable after potato (Pritesh & Subramanian, 2011). The production of tomato limited by foliar disease early blight which is generally associated with an air borne pathogen *Alternaria* species. The management of disease is challenging task as the chemical control through fungicides leading to the hazardous effect on human health and environment. The biocontrol potential of various *Trichoderma* species was tested under laboratory conditions to test the efficacy of various *Trichoderma* species such as *Trichoderma viride*, *T. harzianum*, *T. virens*, *T. hamatam* and *T. aureoviride* against *Alternaria* pathogen. The dual culture technique was followed to evaluate the efficiency of biocontrol agents. The observations were recorded up to 7 days after inoculation. The results showed that all the *Trichoderma* agents have significantly reduced the pathogen growth but comparatively among all the *Trichoderma* species, the *T. viride* has showed highest percent inhibition of mycelial growth i.e., 85% followed by *T. harzianum* (77%), *T. virens* (75%), *T. hamatam* (68%). Whereas *T. aureoviride* has showed less percent inhibition of mycelial growth which is 60% at 7 DAI compared to control.

Keywords: Early blight, *Alternaria*, Biocontrol, *Trichoderma*