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SOIL ORGANIC CARBON DYNAMICS IN RELATION TO DIFFERENT LAND USES

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Abstract: Maintenance of organic carbon in soil (SOC) is critically important for sustained agricultural productivity and environmental quality. This review paper presents SOC dynamics resulting from different land uses. Global warming is a threat issue for whole of world. CO₂ emission from land use is a major factor responsible for climatic change. Enhancing soil carbon sequestration in agricultural land is a strategy of vital importance to decelerate the observed climate changes. However, soil physical disturbances have aggravated the soil degradation process by accelerating erosion. Thus, reducing the magnitude and intensity of soil physical disturbance through appropriate farming/agricultural systems is essential to manage soil carbon sink capacity of agricultural lands. Land use changes in the tropics are responsible for more greenhouse gas emissions. The dominant type of land use change is the conversion of forest to agricultural systems that promote CO₂ concentration in atmosphere. Soil organic carbon has been recorded abundantly in agroforestry systems than other land use systems.

Keywords: Soil carbon sequestration, Soil degradation, Carbon sink, Agroforestry

ASSESSMENT OF GENETIC PARAMETERS FOR VARIOUS MORPHO-PHYSIOLOGICAL AND QUALITY PARAMETERS IN INDIAN MUSTARD GENOTYPES (*BRASSICA JUNCEA* (L.) CZERN & COSS) UNDER DIFFERENT MOISTURE REGIMES

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Abstract: The present study entitled “assessment of the extent of variability in morpho-physiological attributes of Indian mustard (*Brassica juncea* L. Czern & Coss) under different moisture regimes” was undertaken in Randomized Complete Block Design (Rabi 2016-17) in three replications with 20 genotypes, under four environments viz, no irrigation under Rainout Shelter (E₁), rainfed (E₂), one irrigation : 45 DAS (E₃) and two irrigations: 45 and 65 DAS (E₄) and evaluated thirty – three morpho-physio-biochemical traits, respectively along with laboratory experiment for drought related thirteen physiological traits. High amount of variability in individual (E₁, E₂, E₃, E₄) and pooled over environments reflected worth of studied genotypes for most of the characters. Overall, most promising (E₁, E₂, E₃, E₄ and Pooled over environments) Rajendra Suphlam (for 24 traits), Rohini (for 14 traits), NRCDR-2 (for 12 traits), KMR-10-2, Maya and PKRS28 for 11 and RH-8814 for 10 traits. High heritability coupled with high genetic advance under selection suggesting major role of additive genetic component noticed in all four environments (E₁, E₂, E₃ and E₄) for Height of first primary branch, Primary branches per plant, Secondary branches per plant, Specific leaf weight and Catalase activity.

Keywords: *Brassica juncea* L., Variability, Heritability, Genetic Advance, Residual moisture

ENHANCING CROP PRODUCTIVITY THROUGH AMELIORATION OF SUBSURFACE SOIL COMPACTION

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Abstract: Tillage bring change in the soil physical environment with the change of soil mechanical and water transmission characteristics of surface and sub surface soils depending on the type of implement used which ultimately effect crop productivity. But these changes persist for some time even after discontinuing the practice. To test this hypothesis a field study was thus conducted at the Research Farm, Department of Soil Science, Punjab Agricultural University, Ludhiana to evaluate the residual impact of different tillage practices on maize (*Zea mays* L) productivity in a sandy loam soil. The study comprised of three tillage practices i.e. CT (conventional tillage), NT (no tillage with residue) and DT (deep tillage), three N levels (N1=90 kg N ha⁻¹, N2= 120 kg N ha⁻¹, N3=150 kg N ha⁻¹) and two irrigation regimes i.e. IW/PAN-E = 0.6 (I1) and 0.9 (I2). The design of the experiment was split-split plot with 3 replications. Maximum thousand grain weight (TGW, g) of maize was recorded in DT (289.5) followed by NT (277.6) and least in CT (272.1). Significant increase in TGW (g) was observed in N2 treatment (285.2) than N1 (272.1). However, the impact of irrigation on TGW was not significant. Maize biomass (t ha⁻¹) was significantly higher under N2 (14.1) followed by N3 (13.5) and minimum in N1 (11.6). Maximum maize biomass (t ha⁻¹) was recorded in DT (14.9) and least under CT (10.9). Among different irrigation regimes, I2 (13.4) recorded non- significantly higher biomass than I1 (12.7). Maize grain yield (t ha⁻¹) was significantly higher under N2 (6.0) than N1 (5.1). Grain yield (t ha⁻¹) of maize was found to be significantly higher under DT (6.4) than NT (5.4) and CT (5.1). Among irrigation regimes, significantly higher maize grain yield was recorded at I2 (5.8 t ha⁻¹) level than I1 (5.4 t ha⁻¹). Irrigation water productivity (IWP, kg ha⁻¹ mm⁻¹) of maize was significantly influenced by N levels, maximum IWP was recorded at N2 (35.3) followed by N3 (34.8) and lowest under N1 (29.8). Maize IWP (kg ha⁻¹ mm⁻¹) was also significantly highest under DT (37.7) as compared to CT (30.2). Among irrigation regimes, IWP was observed to be significantly higher at I1 (38.7 kg ha⁻¹ mm⁻¹) than I2 (27.8 kg ha⁻¹ mm⁻¹). The tillage practices also left significant effect on soil penetration resistance at 20-30 cm soil depth with highest values under CT (2.9 M Pa) and lowest under DT (1.7 M Pa). Similarly, water transmission i.e. infiltration rate (IR) of soil were also found to be effected by tillage practices, where maximum IR was recorded under DT (2.6 cm hr⁻¹) followed by NT (2.2 cm hr⁻¹) and least in CT (1.4 cm hr⁻¹). Above findings indicates that deep tillage has significant residual effect on maize productivity and soil penetration resistance.

Keywords: Deep tillage, Maize, Residual effect, Penetration resistance, Water productivity

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MONITORING OF INSECTICIDE RESISTANCE ON BROWN PLANTHOPPER, *NILAPARVATA LUGENS* STAL. POPULATION OF PRONE AREA IN CHHATTISGARH PLAIN

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Abstract: Monitoring of insecticide resistance on brown planthopper, *Nilaparvata lugens* Stal. population of prone area in Chhattisgarh plain was carried out during kharif 2009 and 2010. The field collected insects were reared for 5 generations in Entomology greenhouse before conducting toxicity tests. Susceptibility of 7-9 day old nymphs was assessed by spraying the commercial formulations of different group of insecticides at various concentrations on TN-1 plants upto runoff stage and observed the mortality after 24, 48 and 72 hrs. of spraying. The level of insecticide resistance in field population of percent mortality presented in form of resistance ratio (RR) (mortality of field population (RR_R & RR_D) / mortality of greenhouse population) was worked out. During 2009, the highest RR of Raipur and Dhamtari BPH population was noticed (1:0.22) and (1:0.04) in buprofezin, respectively and lowest in chlorpyrifos + cypermethrin and fipronil (1:1.0) in Raipur while Dhamtari in fipronil. During 2010, the maximum RR of Raipur and Dhamtari population was recorded (1:0.15) and (1:0.04) in cypermethrin and buprofezin, respectively. However, minimum population of Raipur BPH was (1:1.0) in fipronil and carbaryl and (1:0.98) in Dhamtari, respectively within 72 hrs. of spraying. On the basis of two years pooled mean, the maximum RR of Raipur BPH was noticed (1:0.27) in cypermethrin while Dhamtari in buprofezin followed by imidacloprid (1:0.43), respectively. Whereas, the minimum population of Raipur exhibited in carbaryl (1:0.97) and Dhamtari (1:0.98) in fipronil within 72 hrs. of spraying. The RR indicates that the minimum was observed in buprofezin followed by cypermethrin and imidacloprid. On the basis of information generated on field population of BPH revealed that it had developed considerable level of resistance against buprofezin, cypermethrin and imidacloprid. However, buprofezin is having different mode of action for controlling of BPH.

Keywords: Rice, Newer insecticides, Insecticide resistance, Relative efficacy of insecticide, *Nilaparvata lugens*

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VARIABILITY AND CORRELATION STUDIES UNDER MOISTURE STRESS CONDITION IN INDIAN MUSTARD [*BRASSICA JUNCEA* (L.) CZERN. & COSS.]

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Abstract: Diverse genotypes of Indian mustard *Brassica juncea*. L with three checks were evaluated in Completely Randomised Design for different morphological characters under two conditions Non-moisture stress (Env.I) and Moisture Stress (Env.II) during Rabi 2014-15. Significant differences were observed among the genotypes for all the characters studied under both the conditions. In Env.I, analysis of variance revealed that mean squares due to genotypes were significant for all the parameters except number of primary branches per plant and seeds per siliqua. On the other hand in Env.II, analysis of variance revealed that mean squares due to genotypes were significant for all the parameters except days to 75 per cent maturity, siliqua length and seeds per siliqua. All the characters under study had exhibited a broad range of variability. The phenotypic Coefficient of Variance values was found to be higher than their corresponding GCV values. High heritability coupled with high genetic advance was observed for all the growth parameters viz, siliquae per plant, length of main shoot and siliquae on the main shoot. Seed yield per plant had a positive correlation with length of the main shoot, siliqua length, seeds per siliqua, 1000-seed weight, biological yield per plant and harvest index under moisture stress condition whereas under non-moisture stress condition seed yield per plant had significant positive associations with siliquae per plant, seeds per siliqua and harvest index.

Keywords: Heritability, Correlation, Moisture Stress, Genetic advance

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MANAGEMENT OF CHILLI INSECT PESTS BY USING DIFFERENT DOSES OF EMAMECTIN BENZOATE 3.7%+ DIFENTHIURON 46.3% WP

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Abstract: The experiment was conducted in *Rabi* season of 2015-16 at College of Agriculturefarm, Indore (M.P.) in a Randomized Block Design (RBD) with seven treatments and three replications with variety Aakansha (hybrid), transplanted on 27th November 2015 with 60x45 cm spacing. Three doses of emamectin benzoate 3.7%+difenthiuron 46.3%WP @ 5.60+69.45gai/ha , 7.40+92.60 gai/ha and 9.25+115.75 gai/ha were marked as T1,T2 and T3, respectively.T4- Emamectin benzoate 5%SG @ 10gai/ha , T5- Difenthiuron 50%WP 300 gai/ha and T6- Lambda cyhalothrin 5%EC @ 15 gai/ha were alone insecticidal treatments including T7-Untreated check. Treatments were sprayed thrice at 15 days interval as foliar application with knapsack sprayer @ 500 liter water per hectare. Thrips and whitefly population were counted on five tagged plants from each plot and five leaves per plant i.e. Two leaves from top, two from middle and one leaf from lower portion of plant. Thrips were counted by jerking the twig on a white paper. Observations were recorded at one day before and 7 and 14 days after each spray. Leaf curling was recorded 10 days after each spray visually on five plants selected randomly in each. The green chilli yield data (q/plot) was recorded for economic assessment of treatments. The highest reduction in thrips and whitefly population was recorded with highest dose of emamectin benzoate 3.7%+ difenthiuron 46.3% WP @ 250 g.a.i / ha and found at par with the second highest dose of emamectin benzoate 3.7%+ difenthiuron 46.3% WP @ 200 g.a.i / ha in all the sprays. After first spraying minimum leaf curling was noted in highest dose of emamectin benzoate 3.7%+ difenthiuron 46.3% WP @ 250 g.a.i./ha (21.69%) and found at par with second highest dose of emamectin benzoate 3.7%+ difenthiuron 46.3% WP @ 200 g.a.i./ha (24.14%). Similar trend was recorded as 16.20% and 18.79% in second spraying and 9.61% and 11.86% in third spraying, respectively. The highest green chilli yield was obtained again with highest dose of emamectin benzoate 3.7%+ difenthiuron 46.3% WP @ 250 g.a.i./ha (171.11 q/ha and 44.40) and found at par with rest of its two doses

as 166.29 q/ha and 147.03 q/ha, respectively. Cost benefit ratio was calculated in same trend as 4.40, 4.30 and 3.82, respectively.

Keywords: Thrips, Whitefly, Emamectin benzoate, Difenthiuron, Management

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DISTRIBUTION OF IRON FRACTIONS AND THEIR RELATIONSHIP WITH SOIL PROPERTIES IN DIFFERENT SOIL SERIES OF HARYANA

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Abstract: A laboratory experiment was conducted to determine the distribution of iron fractions and their relationship with soil properties in different soil series of Haryana. Surface soil samples (0-15 cm) were collected from each soil series using Global Positioning System (GPS). The soil samples were processed and analyzed for the determination of total Fe and Fe fractions (exchangeable, organic bound, calcium carbonate bound and residual). Iron fractions were analyzed by sequential extraction procedure. Results showed that total amount of the Fe ranged from 689.47 to 913.50 mg kg⁻¹ with a mean value of 813.74 mg kg⁻¹ in soil series of Aeolian Plain while it ranged from 979.18 to 1560.56 mg kg⁻¹ with an average value of 1133.00 mg kg⁻¹ in soil series of Alluvial Plain. In soil series of Aravali Hills, the total Fe content was 972.44 mg kg⁻¹. Iron associated with Ex- and CaCO₃- fractions was found to represent a minor fraction (< 0.40%) of total soil Fe. On an average OM-Fe was less than 0.74%. The majority of the soil Fe was found to be associated with residual fraction which was nearly 98% of total soil Fe. Iron as percentage of total soil Fe in different fractions was in the order: Res- > OM- > CaCO₃- ~ Ex- in Aeolian Plain, Alluvial Plain and Aravali Hills soils. Ex-Fe fraction was positively and significantly correlated with soil organic carbon. OM-Fe fraction showed positive and significantly correlation with EC, OC, CEC and clay. Results reflected that soil properties influence the distribution of different Fe fractions in soils.

Keywords: Sequential extraction, Organic bound, Calcium carbonate bound, Residual

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SHARE OF IPM COMPONENTS INVOLVED IN PADDY PLANT PROTECTION AT DIFFERENT VILLAGES OF JANJGIR-CHAMPA DISTRICT IN CHHATTISGARH

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Abstract: The study was carried out at the prone area of different villages in Janjgir-Champa districts of Chhattisgarh. During 2009 and 2010, the Average pooled cost of IPM components involved with respect to paddy plant protection was ranged from Rs. 147.06 to 3663.14. The maximum cost of the chemical practices (Rs. 3663.14) was recorded followed by cultural practices (Rs. 851.19) and minimum (Rs. 147.06) in biological practices with the cost of share was 82.73, 19.22 and 3.32 percent, respectively. Descending order of the average cost of different practices of IPM components can be ranked as biological practices < physical practices < cultural practices < chemical practices. On the basis of information collected from the contact farmer through personal interview, some possible reasons comes out which may be the maximum respondent use of chemical practices on paddy cultivation which causes several problems such as development of insecticide resistance, environmental pollution and undesirable effects on non-target organisms.

Keywords: Cost of paddy cultivation, Plant protection cost, Cost of IPM component, Share of IPM cost

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EFFECT OF PLANT GEOMETRY AND FERTILITY LEVELS ON PRODUCTION AND PRODUCTIVITY OF HYBRID MAIZE (*ZEA MAYS L*)

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Abstract: A field investigation was carried out during two consecutive seasons of Kharif 2013-14 and 2014-15 at Students' Instructional Farm, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur to study the "Effect of plant geometry and fertility levels on production and productivity of hybrid maize (*Zea mays L*)." The treatments included three plant geometry 67× 25 cm, 67 × 22.5 cm and 67× 20 cm and four fertility levels viz., RDF (100%), RDF (75%) + Azospirillum + GM., RDF (75%) + PSB + GM and RDF (50%) + Azospirillum + PSB + GM. These treatments were evaluated in split plot design with four replications. The investigation result showed that maximum shelling percentage, 100 seed weight, grain yield, stover yield and harvest index was recorded with the plant geometry 67 × 22.5 cm and fertility level of RDF (75%) + Azospirillum + GM. The plant geometry 67× 20 cm and fertility level of RDF (50%) + Azospirillum + PSB + GM was recorded minimum value of shelling percentage, 100 seed weight, grain yield, stover yield and harvest index

Keyword: Plant geometry, Fertility, Yield, Maize

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PERFORMANCE OF SUGARCANE VARIETIES AND INTEGRATED NUTRIENT MANAGEMENT ON PRODUCTIVITY, PROFITABILITY AND QUALITY OF SUGARCANE UNDER NORTHERN HILL ZONE OF CHHATTISGARH

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Abstract: A field experiment was conducted during cropping seasons of 2015–16 and 2016-17 at Instructional cum research farm RMD CARS Ambikapur to evaluate sugarcane mid-late varieties (Co 86032, Co 62175, CoT 8201) under 6 levels of nutrient management (N₁) RDF (250:80:80 NPK Kg ha⁻¹), (N₂) 125% RDF (N₃) 150% RDF, (N₄) RDF+FYM @10 t ha⁻¹, (N₅) RDF+ Poultry manure @ 2 .0 ha⁻¹ (N₆) RDF +Vermicompost @2.5 t ha. Higher growth in terms of shoots (121.46 x10³ ha⁻¹), millable cane length 238.05 (cm), total dry matter yield (41.80 t ha⁻¹) and yield attributes Viz. number of millable cane (87.62 x10³ ha⁻¹), cane weight cane yield (109.25 t ha⁻¹) and CCS yield (11.61 t ha⁻¹) were recorded highest with Co 86032, respectively. Variety 'Co 86032' showed non significantly values on quality parameters of brix%, pol %, purity % in juice across the planting season. Variety 'Co 86032' gave the maximum net returns (Rs 256867.61 ha⁻¹) and benefit: cost ratio (3.64). Genotype Co 86032 gave better yield, Significantly higher shoots (122.65 thousand/ha), millable cane length (250.79 cm), dry matter yield (43.14 t ha⁻¹), cane girth (8.35 cm), number of millable canes (93.15 x10³ ha⁻¹) and cane yield (113.74 t ha⁻¹) net returns (Rs 273943.00 ha⁻¹) and benefit: cost ratio (4.07) obtained with the application of 150% RDF respectively.

Keywords: Sugarcane, Nutrient, Management, Northern hill

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COMPARATIVE STUDY OF EFFECT OF CASING MATERIAL ON THE PRODUCTION OF MILKY MUSHROOM STRAINS, APK-2 AND CI-9

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Abstract: The study was undertaken to assess the effect of different casing ratio and thickness on yield parameters of both strains APK-2 and CI-9. Casing material consisting of Farm yard manure, Garden soil and Vermi Compost were tried with different ratio 3:2:1, 3:2:2 and 3:2:3. The casing ratio 3:2:1 resulted best for NOPF (11.67 and 12.67 days) and first harvesting (18.33 and 20.33 days) in strains APK-2 and CI-9 respectively. Maximum NOPF (58.67 and 60.33 per bag), NOFB (20.67 and 22.33 per bag) were showed in casing ratio 3:2:1 for both the strains APK-2 and CI-9. Maximum yield was harvested in casing ratio 3:2:3, 574.33 and 599.33 g/kg of dry substrate with 47.86 % and 49.94 % B.E., in strains APK-2 and CI-9, respectively. The casing thickness 1.25cm took least time to for pinhead formation (13.00 and 14.00 days) and for first harvesting (21.67 and 20.67 days), in strains APK-2 and CI-9, respectively. Also the casing thickness 1.25 resulted in maximum number of fruiting bodies harvested from (20.00 and 21.33) and maximum yield 619.67 and 636.33 g/kg of dry substrate with 51.63 % and 53.02 % B.E., from APK-2 and CI-9, respectively.

Keywords: Mushroom, Production, Crop, Laboratory

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FOREST & ECOSYSTEM VALUATION: A CASE STUDY OF MELGHAT LANDSCAPE

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Abstract: The present study attempts to quantify the value of tangible and intangible benefits of Melghat landscape. For timber and growing stock (GS) quantification market cost approach was adopted and value of GS in Melghat was calculated as Rs. 80221 crore. Carbon sequestration was calculated based on IPCC carbon factor 0.47. The NTFP and grazing benefits were calculated from departmental sale records and domestic consumption. To work out land value the compartments were divided in land zones as per market value and adjoining lands market value was assigned to the forest compartment land. The recreation benefits were quantified based of travel cost method (TCM) and benefit cost approach by analysing consumer's surplus from similar landscape. Water conservation value was worked on the basis of rainfall data and removing losses of runoff and evapo-transpiration through empirical equations. The soil conservation and other values worked out from studies available in similar landscapes. The faunal biodiversity value was based on 'willingness to pay principle'. This report quantifies Total Economic Value of landscape as Rs. 1,70,020 crores, which means Rs. 57.26 lakhs/ha, which is much higher than Net Present Value (NPV) cost Rs.7.5 lakhs per hectore prescribed by Ministry of Environment & Forests. The revision in NPV cost on landscape basis giving weightage to floral diversity and faunal peculiarity is very much required for conservation of forests. If feasible, precious forests should not be sacrificed so that this generation will bequest better forest to further generations for sustenance.

Keywords: Ecosystem services, Carbon sequestration, Melghat landscape, Forest