PRELIMINARY RESEARCHES REGARDING THE USE OF ANN TO PREDICT THE WHEEL-SOIL INTERACTION

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ABSTRACT. Soil-wheel interactions as a phenomenon in which both components are behaving nonlinearly has been considered a sophisticated and complex relation to be modeled. A well-trained artificial neural networks as a useful tool is widely used in variety of science and engineering fields. We inspired to use this facility for application of some soil-wheel interaction products since nonlinear and complex relationships between wheel and soil necessitate more precise and reliable calculations. A 2-14-2 feed forward neural network with back propagation algorithm was found to have acceptable performance with mean squared error of 0.020. This model was used to predict two output variables of rut depth and contact area with regression correlations of 0.99961 and 0.99996 for rut depth and contact area, respectively. Furthermore, the results were compared with conventional models proposed for predicting the contact area and rut depth. The promising results of ANN model give higher privilege over conventional models. The findings also introduce the potential of ANN for modeling. However, the authors recommend further studies to be conducted in this realm of computing due to its great potential and capability.

Key words: Contact area; Rut depth; ANN; Soil bin.

ROLE OF ORGANIC AND INORGANIC NUTRIENT SOURCES IN IMPROVING WHEAT CROP PRODUCTION

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ABSTRACT. Effects of organic manures on grain yield and yield components of wheat (*Triticum aestivum* L.) cultivar Minthar-03 were studied at (RARI) Regional Agricultural Research Institute Bahawalpur, Pakistan, during 2010-2011 seasons in chemistry division. The present study have six treatments i.e. control, NPK=150-120-60 kg/ha, control, NPK= 150-120-60 kg/acre, NPK+ poultry manure 50 kg /acre, NPK + press mud 500 kg/acre, NPK + city compost 300 kg/acre, NPK + humic acid 4 kg/acre. Combinations of NPK + PM 50 kg/ha having high plant height (102.53) while number of (343) tillers/m^2 was obtained high in combination with NPK + city compost 300 kg/ha which was at par with combination (NPK + press mud 500 kg/acre) having plant height 100.90. spike length, number of grains /spike, 1000 grains weight, grain yield t/ha was 13.35 cm, 61.85, 40.60 grams and 3.14 t/ha respectively obtained in treatment (NPK + press mud 500 kg/acre). While minimum amount of plant height (94.80), number of tillers/m^2 (223), spike length (10.35 cm), number of grains/spike (43.43), 1000 grains weight (35.33g), grain yield t/ha (38.41) was found in control where no dose of organic and inorganic fertilizer were applied.

Key words: Wheat; Organic nutrients; Humic acid; Press mud; City compost.

EFFECTS OF IRON AND ZINC SPRAY ON YIELD AND YIELD COMPONENTS OF WHEAT (*TRITICUM AESTIVUM* L.) IN DROUGHT STRESS

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ABSTRACT. In hot and arid regions, drought stress is considered as one of the main reasons for yield reduction. To study the effect of drought stress, iron and zinc spray on the yield and yield components of wheat, an experiment was carried out during the crop seasons of 2010 and 2011 on Shahid Salemi Farm in Ahwaz as a split factorial within randomized complete block design with three replications. The main plots with irrigation factor and three levels were considered: Level A) full irrigation, Level B) stopping irrigation at pollination step, and Level C) stopping irrigation at the seed filling stage. Subsidiary plots were considered with and without iron and zinc spray. Influencing the seed filling process, in interaction with iron, wich is an important leaf's chlorophyll cation, zinc increased the seed yield. The drought stress reduced the thousand kernels weight (TKW) and the number of seeds per spike increased about 24% and 8.5% more than the one of control treatment, respectively. Using iron, as compared with control treatment, causes the increase of thousand kernels weight from 45.71 to 46.83 grams and the increase of spike from 49.51 to 51.73. Zinc spray increased seed yield and thousand kernels weight. The results obtained from the present research showed that iron and zinc spray has fairly improved the effects caused by drought stress.

Key words: Drought stress; Iron; Spray; Zinc; Wheat.

NITROGEN AND PHOSPHORUS MANAGEMENT UNDER LONG-TERM EXPERIMENTS

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ABSTRACT. The investigations conducted at the Podu-Iloaiei Agricultural Research Station, Iaşi County, Romania, have studied the influence of different mineral fertilizers rates on wheat and maize yield and soil agrochemical characteristics. In bean-wheat-maize-sunflower-wheat crop rotation, the mean yield increases, obtained for each kg of a.i. of applied fertilizer, were comprised between 8.3 and 10.1 kg in wheat ($N_{120}P_{80}$- $N_{160}P_{80}$) and between 10.8 and 11.0 kg in maize ($N_{150}P_{80}$-$N_{200}P_{100}$). Generally, nitrogen use efficiency is low and, to achieve maximum yields, need for high doses of nitrogen which can increase the risk of environmental pollution. The N agronomic efficiencies and physiological efficiencies in wheat and maize declined with the increase of nitrogen rate. Wheat placed in rotation for five years, after sunflower at recommended dose ($N_{160}P_{80}$), physiological efficiency of nitrogen utilization was 43.4 kg grain per kilogram of nitrogen exported from soil, from fertilizer applied. Mean annual amounts of nutrients exported from soil by wheat in dry (14 yr.) and favourable (11 yr.) years in five year crop rotation have varied according to rates, between 34.5 and 100.7 kg at nitrogen and between 6.5 and 18.4 kg at phosphorus. The long-term use of bean - wheat - maize - sunflower - wheat rotation determined the diminution by 43.4% (2,772 t/ha) in the mean annual losses of eroded soil and by 38.5% (5.61 kg/ha) in nitrogen leakages by erosion, compared with maize continuous cropping.

Key words: Fertilization; Nitrogen; Phosphorus; Physiologic N efficiency; Nutrient losses; Wheat; Maize.

REZUMAT. **Gestionarea azotului şi a fosforului în experimentele de lungă durată.** Cercetările, efectuate la Staţiunea de Cercetare-Dezvoltare Agricolă Podu-Iloaiei, judeţul Iaşi, au urmărit influenţa diferitelor doze de îngrăşăminte minerale asupra producţiei de grâu şi porumb şi a însuşirilor chimice ale solului. În rotaţia fasole-grâu-porumb-floarea-soarelui-grâu, sporurile medii de producţie, obţinute pentru fiecare kg de îngrăşământ aplicat, au fost cuprinse între 8,3 şi 10,1 kg la grâu ($N_{120}P_{80}$-$N_{160}P_{80}$) şi între 10.8 şi 11.0 kg la porumb ($N_{150}P_{80}$-$N_{200}P_{100}$). În general, eficienţa utilizării azotului este redusă şi, pentru a obţine producţii maxime, este nevoie de doze mari de azot, care pot creşte riscul de poluare a mediului. Eficienţa agronomică şi fiziologică a azotului la culturile de grâu şi porumb a scăzut odată cu creşterea dozelor de azot. La cultura grâului, amplasată în rotaţia de cinci ani, după floarea-soarelui, la doza recomandată de $N_{160}P_{80}$, eficienţa fiziologică de utilizare a azotului a fost de 43,4 kg boabe pe kilogramul de azot exportat din sol, din îngrăşământul aplicat. Cantităţile medii anuale de nutrienţi exportaţi din sol, la cultura grâului, în anii secetoşi (14 ani) şi favorabili (11 ani), în rotaţia de cinci ani, au variat, în funcţie de dozele aplicate, între 34.5 şi 100.7 kg la azot şi între 6,5 şi 18,4 kg la fosfor. Utilizarea îndelungată a rotaţiei fasole - grâu - porumb - floarea soarelui - grâu a determinat, comparativ cu monocultura de porumb, diminuarea pierderilor medii anuale de sol erodat cu 43,4% (2772 t/ha) şi a scurgerilor de azot, prin eroziune, cu 38,5% (5.61 kg /ha).

Cuvinte cheie: fertilizare; azot; fosfor; eficienţa fiziologică a azotului; nutrienţi erodaţi; grâu; porumb.

INFLUENCE OF RHIZOBACTERIA INOCULATION AND LEAD STRESS ON THE PHYSIOLOGICAL AND BIOCHEMICAL ATTRIBUTES OF WHEAT GENOTYPES

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ABSTRACT. Contamination of soils by lead (Pb) is of widespread occurrence as result of human, agricultural and industrial activities. A pot study was carried out to evaluate physio-biochemical responses (chlorophyll content, soluble protein, proline content and activities of enzymatic antioxidants) of 10 bread wheat genotypes to inoculation of plant growth promoting rhizobacteria (combination of *Azospirillum brasilense* and *Azotobacter chroococcum*) under Pb stress (0 and 65 mg kg^{-1}). Result revealed that lead stress averagely decreased grain yield of wheat cultivars by 41.4 %. Lead stress increased lipid peroxidation and induced a significant accumulation of proline in leaves. Protein content decreased from 8–25.4% in different cultivars in Pb-contaminated soils. Activities of antioxidant enzymes, such as, ascorbate peroxidase, superoxide dismutase and catalase were significantly increased in the presence of lead. An increase in total hydrogen peroxide (H_2O_2) content was noticed under lead stress in all cultivars, which was similar to production of malondialdehyde (MDA). However, promotion of growth was evident in most cultivars as a consequence of rhizobacterial inoculation, since plant growth promoting rhizobacteria could improve grain yield, proline content and membrane integrity, while significantly reduced the production of MDA and H_2O_2. Total chlorophyll content considerably declined with Pb stress. Between cultivars the best performance under lead stress was observed in Sardari, Shahriyar and Gaspard which had the highest yield and antioxidants activity. Obtained results showed that inoculation with *Azotobacter* and *Azospirillium* possibly through bioremediation strategy can stimulate plant growth under adverse environmental conditions, such as heavy metal contamination.

Key words: Antioxidant; Inoculation; Heavy metal; Proline; Reactive oxygen species.

SOIL PHYSICAL PROPERTIES AND GRAIN YIELD OF SPRING MAIZE (*ZEA MAYS* L.) AS INFLUENCE BY TILLAGE PRACTICES AND MULCH TREATMENTS

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ABSTRACT. Soil provides suitable media for plant growth and development during the whole crop life cycle. The agronomic management practices can improve the soil fertility and crop productivity on sustainable basis. To explore the effects of some agro-management practices on the spring maize, an experiment was conducted at the Agronomic Research Area, University of Agriculture, Faisalabad, Pakistan, during spring season 2010 and 2011, using randomized complete block design with split block design arrangements. The experiment comprised of four tillage treatments viz: zero tillage (T_1), minimum tillage (T_2), conventional tillage (T_3) and deep tillage (T_4) in the main plots, while the four mulch treatments i.e. control (M_1), black plastic mulch (M_2), wheat straw mulch 10 Mg ha^{-1} (M_3) and grass mulch 10 Mg ha^{-1} (M_4) in the sub plots. Irrigation was provided according to crop requirement and herbicides were applied to control the weeds. All the tillage practices significantly affected ($p<0.05$) the different soil physical properties i.e. soil bulk density, soil total porosity, water infiltration rate and root penetration resistance. Deep tillage practice and black plastic mulch significantly increased the grain yield (m^{-2}) of spring maize than the zero tillage, minimum tillage, conventional tillage, no mulch, wheat straw mulch and rice straw mulch in both years of study. The two years field results suggested that the mulches improved soil aeration and water infiltration rate, lower the soil bulk density and root penetration resistance than the control treatments.

Key words: Tillage; Nutrients; Tropical region; Grain yield; Spring maize.

EFFECT OF DIFFERENT SOWING TECHNIQUES AND MULCHES ON THE GROWTH AND YIELD BEHAVIOR OF SPRING PLANTED MAIZE *(ZEA MAYS* L.)

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ABSTRACT. A field trail was carried out to evaluate the effect of different sowing techniques and mulches on the growth and yield attributes of maize. The experiment was conducted at the Agronomic Research Farm, University of Agriculture, Faisalabad during spring season, 2011. The experiment was laid out in randomized complete block design (RCBD) with split plot arrangement having three replications with net plot size of 7.0 m × 4.5 m. Field experiment comprised of five sowing methods (S_1: ridge sowing, S_2: ridge sowing alternate double sided, S_3: bed sowing, S_4: furrow sowing and S_5 flat sowing) and three mulches (M_1: maize pith, M_2: wheat straw, M_3: rice straw) was conducted during 2011 spring season under the tropical condition. The results showed that cobs length, cob diameter, and number of grains per cob, 1000-grain weight, biological yield and grain yield were maximum under ridge sowing method (S_1) following the ridge sowing alternate double sided (S_2). Furrow sowing shows least response to the agronomic and yield related parameters of spring maize. Among the mulch treatments; wheat straw mulch (M_2) perform better and gave higher grain yield (6.21

Mg ha^{-1}) as compared to the rice straw mulch and maize pith. Sowing techniques and mulches showed statistically non significant results for quality parameters (starch contents, oil contents and protein contents). Interaction of all three quality parameters was also observed non significant.

Key words: Sowing techniques; Mulches; Hybrid maize yield; Tropical condition; Pakistan.

THE EFFECT OF PHYTOPROTECTION PROGRAMS ON THE CONTROL OF THE MAIN APPLE PESTS

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ABSTRACT. In recent decades, positive changes have been occurred on the fruit crops protection, because of new synthetic or natural substances, more effective and less toxic. In 2011, at Fruit Growing Research and Development Station Iaşi, Romania, was tested a phitosanitary program that aimed especially to control the main pest of apple, being introduced the next generation of plant protection products, such as: Coragen, Proteus, Calypso, Decis 25 WG. The research was carried out for Idared, Golden delicious and Florina, on tow variants for each variety. Phytosanitary treatments applied for pest control were supplemented with fungicides used to combat major apple deseases. Until blooming tow treatments were applied for each variant, and after the petals fall, treatments were carried out at warning. Observation and measurements were performed after the treatments and they showed, at the end of each generation, the percentage of attacked fruits by the main apple pests. These produsts applied in a few treatments have provided a strong efficacy in combating major apple pests: codling moth (*Cydia pomonella* L.), fruit skin moth (*Adoxophyes reticulana Hb.*), leaf miner moth (*Phyllonorycter sp.)* and mites (*Panonychus sp.).* To combat lepidoptera, best result were obtained with Calypso 480 SC and Coragen insecticides, and also, products such as Decis 25 WG and Proteus, have ensured a good health in apple plantation.

Key words: Apple pests; Control; Insecticides efficacy; Phytosanitary treatments.

REZUMAT. Efectul aplicării programelor de fitoprotecţie asupra combaterii principalilor dăunători ai mărului. În ultimele decenii, au avut loc schimbări pozitive în protecţia culturilor de fructe, datorită noilor substanţe sintetice sau naturale, mai eficiente şi mai puţin toxice. În anul 2011, la Staţiunea de Cercetare-Dezvoltare pentru Pomicultură Iaşi, a fost experimentat un program fitosanitar, care a urmărit, în special, combaterea principalilor dăunători ai mărului, în care au fost introduse produse de protecţia plantelor de ultimă generaţie: Coragen, Proteus, Calypso, Decis 25 WG. Cercetările s-au efectuat la soiurile Idared, Golden delicious şi Florina. Tratamentele fitosanitare, aplicate pentru combaterea dăunătorilor, au fost complexate cu fungicide corespunzătoare principalelor boli ale mărului. Până la înflorit s-au aplicat câte două tratatmente cu aceleaşi complexe pentru ambele variante, iar după scuturarea petalelor, tratamentele s-au efectuat la avertizare. Observaţiile şi determinările s-au efectuat după aplicarea tratamentelor, la sfârşitul fiecărei generaţii, şi s-au referit la procentul de fructe atacate de către principalii dăunători ai mărului. Aceste produse, aplicate într-un număr redus de tratamente, au asigurat o eficacitate deosebită în combaterea principalilor dăunători ai mărului: viermele merelor (*Cydia pomonella* L.), molia cojii fructelor (*Adoxophyes reticulana Hb.*), molia mineră (*Phyllonorycter sp.)* şi acarieni (*Panonychus sp.).* În combaterea lepidopterei, cele mai bune rezultate au fost obţinute cu insecticidele Calypso

480 SC şi Coragen; de asemenea, produse cum ar fi Decis 25 WG şi Proteus au asigurat o stare bună de sănătate în plantaţia de măr.

Cuvinte cheie: combatere; eficacitate; fitoprotecţie; insecticide; dăunători.

EFFECT OF SALT STRESS IN DIFFERENT STAGES OF GROWTH ON QUALITATIVE AND QUANTITATIVE CHARACTERISTICS OF CUMIN (*CUMINUM CYMINUM* L.)

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ABSTRACT. Cumin (*Cuminum cyminum* L.) is one of the most important pharmaceutical plants. As a considerable portion of existing agricultural lands in arid regions is exposed to aridity and finally to salinity, we need to study the effects of salinity on the growth and production of agronomical products. For this purpose, an agricultural experiment in the form of split plots with three replications was conducted in 2011 at the Islamic Azad University, Gonabad Branch, Iran, in the longitude of 58°, 50', latitude of 34°, 54', and altitude of 940 m from the sea level. At the main plot, four salinity levels (2,5,8 and 11ds/m) and at the sub plot, the growth stages of stress implementation (including stress in establishment, flowering, and seed filling stage), were located at random. The results showed that the salinity rate had significant impact on fresh weight, dry weight, height , percentage of essence, seed and biological yield. With the increase in salinity from 2 to 11ds/m, a significant decrease in all vegetative and reproductive characteristics were observed. The most sensitive growth stages of plant to salt stress, during vegetative and reproductive period were the stage of establishment and flowering, respectively. There was no interaction between the growth stage of plant and salinity rate, except for seed yield and harvest index.

Key words: Salinity stress; Growth stage; *Cuminum cyminum* L.