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Pakistan Journal of Scientific and Industrial Research
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Improving Salinity Tolerance in *Brassica* (*Brassica napus* var. Bsa and *Brassica campestris* var. Toria) by Exogenous Application of Proline and Glycine Betaine

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(received August 29, 2016; revised March 10, 2017; accepted March 14, 2017)

Abstract. The pot culture experiment was conducted to determine the influence of proline and glycine betaine on *Brassica* under saline conditions. Different salinity levels (0, 65, 130 mM) were created according to the saturation percentage of the soil. Proline (0, 4, 8 mM) and glycine betaine (0, 5, 10 mM) were exogenously applied to find out their effects on growth and physiological changes produced in *Brassica* under salinity stress. Salinity stress reduced the growth of the plants and induced the physiological and biochemical changes. Different growth parameters of plants such as plant height, shoot, root fresh and dry weight was decreased with the increase of salinity stress. Salinity has also reduced the chlorophyll content, protein content and nitrate reductase activity of the *Brassica*. But the application of proline and glycine betaine was more effective to reduce the effect of salinity. Collected data from the present experiment indicated that adverse effects of salinity were counteracted by proline and glycine betaine. Overall, it was observed that exogenous application of both proline and glycine betaine has reduced the effect of salinity.

Keywords: *Brassica napus*, *Brassica campestris*, proline, glycine betaine

Efficacy of Boron as Foliar Feeding on Yield and Quality Attributes of Maize (*Zea mays* L.)

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(received December 19, 2016; revised March 10, 2017; accepted April 18, 2017)

Abstract. Boron being an essential micronutrient plays a vital role in improving crop productivity and quality. Therefore a field study was conducted at agronomic research area, University of Agriculture, Faisalabad, Pakistan, during spring season 2014, to evaluate the effect of boron as foliar application on yield and quality of maize. The experiment was laid out in randomized complete block design with three repeats. There were nine treatments in the experiment including a control treatment, four treatments of foliar sprays of 0.5% borax and four treatments of water sprays (without borax) with different time intervals. Statistical analysis revealed that use of boron significantly affected maize yield and quality and the application of boron with three foliar sprays of 0.5% borax had significant positive effect on most of yield contributing parameters, giving plant height (217.00 cm), cob length (15.81 cm), cob diameter (6.10 cm), cob weight (147.00 g), number of grains per cob (481.00), 1000 grain weight (333 g), grain yield (5.26 t/ha), biological yield (14.75 t/ha) and harvest index (35.66%). However in case of quality, four foliar sprays of 0.5% borax displayed better results by producing higher seed protein (10.06%) and oil contents (4.72%), respectively. From the results of experiment it can be concluded that three foliar sprays of 0.5% boron triggers yield attributes while four foliar sprays of 0.5% boron encourages qualitatively to maize crop.

Keywords: maize, boron, foliar application, yield

A Brief Description of ‘Inqalab Mung’ Mungbean (*Vigna radiata* L. Wilczek) Variety Released for the Agro-Climatic Conditions of Khyber Pakhtunkhwa, Pakistan

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(received April 13, 2016; revised January 18, 2017; accepted March 15, 2017)

Abstract. ‘Inqalab Mung’ (DM-3) was developed through cross between VC1482 C and NM-92 at Agricultural Research Institute, Dera Ismail Khan, Pakistan. Various experiments for production technology and yield performance of Inqalab Mung were conducted from 2005 to 2008 in different seasons and locations. Result showed that 40 kg/ha seed rate with 30 cm row spacing, fertilizer dose @ 20:50 kg/ha N:P₂O₅ and inoculation with rhizobium strain Vm M1 were optimal for its maximum yield. Inqalab Mung outclassed among all candidate lines included in NUYT-2007 and 2008 with average yields of 961.5 kg/ha and the highest grain yield of 3620 kg/ha. Inqalab Mung has 28-36% high grain yield potential compared to the standard variety NM 98 and parent NM 92 along with resistance to charcoal rot, cercospora leaf spot and yellow mosaic virus (YMV). Provincial Seed Council (PSC), Khyber Pakhtunkhwa, approved DM-3 as ‘Inqalab Mung’ for general cultivation in KPK in 2014.

Keywords: mungbean (*Vigna radiata* L. Wilczek), Inqalab Mung, grain yield, bold seeded

Assessment of Vegetation-Edaphic Correlation of Wetland Complex of Soon Valley, Pakistan using Multivariate Techniques

Arooba Zia, Sheikh Saeed Ahmad* and Hafsa Bashir

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(received September 23, 2016; revised December 6, 2016; accepted December 20, 2016)

Abstract. Vegetation-edaphic correlation was studied to observe ecological relationship of plants. Because of the interrelationship of environmental variables various ordination techniques i.e., Two-way Indicator Species Analysis (TWINSPAN), Detrended Correspondence Analysis (DCA) and Canonical Correspondence Analysis (CCA) were employed to reveal the inherent pattern on visual inspection. Total 36 herbaceous species belonging to 16 families were identified in the area of Uchali wetland complex, Soon Valley, Khusab, Pakistan, with *Cynodon dactylon* as dominant species owing to its high tolerance to prevailing environmental conditions. Results of CCA exposed elevation, organic matter and pH to be the most influencing factors in growth and distribution of flora of the area. Different analyses such as biplots, data attribute plots and pie symbols plots were accomplished for the species of the study area. Because of the induced change, various non-native and invasive species were also recorded in the area which might contribute to further altering the range ecology of the area. Apart from promoting sustainable use of natural resources in Uchali Wetlands Complex (UWC); ecological integrity of the Ramsar sites must be conserved and improved through ecological interventions related to illicit cutting of forest, unsustainable utilization of water resources, municipal pollution, agricultural intensification, etc.

Keywords: TWINSPAN, DCA, CCA, multivariate techniques, vegetation, wetland complex

Bioactivity Studies on Two Wild Edible Mushrooms Extracts

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(received August 20, 2015; revised January 5, 2017; accepted January 11, 2017)

Abstract. The aqueous and alcoholic extracts of *Lentinus squarrosulus* and *Termitomyces robustus* were analysed for phytochemicals, antioxidant and antimicrobial activities. Polyphenolic profile of the ethanol extracts revealed the presence of phenolic acids and flavonoids at different concentrations. Total phenol and total flavonoid contents demonstrated concentration dependent increase and positive correlation with the antioxidant activities in the corresponding extracts in the range of TFC ($r = 0.794-0.993$; $0.904-1.000$) and TPC ($r = 0.317-0.999$; $0.621-0.995$) for *L. squarrosulus* and *T. robustus* extracts, respectively. Inhibition concentrations at 50% (IC_{50}) for each extract in terms of its reducing and scavenging ability ranged from 0.54 to 15.04 mg/mL for total antioxidant property (TAP), ferric reducing antioxidant property (FRAP), DPPH, OH and NO radicals. Mushrooms extracts exhibited significant antifungal activities against *Aspergillus fumigatus* and *Candida albican* compared to bonlate but weak antibacterial activities against *Bacillus substilis*, *Escherichia coli* and *Salmonella typhi* compared to streptomycin sulphate. The mushrooms possessed appreciable antioxidant and antifungal properties for promoting good health.

Keywords: phytochemicals, antioxidant, antimicrobial activity, mushrooms

Comparative Study of *Tribolium castaneum* H. (Coleoptera: Tenebrionidae) Occurred on Different Wheat Varieties in Pakistan

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The Islamia University of Bahawalpur, Pakistan

(received October 18, 2014; revised June 12, 2017; accepted July 11, 2017)

Abstract: Five wheat varieties *i.e.*, AASS, CHAKWAL, FARID, MIRAJ and GALAXY in Pakistan were compared to survey the red flour beetle population occurrence during one month period. Only sound grains were taken as medium of population growth for the red flour beetles. Study parameters included number of grains per unit weight, beetles population growth/survival percentage in relation to different wheat varieties and percent weight loss, if any in grains of these wheat varieties due to beetles feeding. Wheat varieties had significantly different number of grains per unit weight. Red flour beetles' population growth was checked in a 30 day time period. Beetles could not grow within the food medium of sound wheat grains of these varieties in this time span and most of these died. Survival percentage of beetles was measured in relation to different wheat varieties which did not vary significantly for these varieties. Within a given span of time percent weight loss due to beetle feeding in grains was nominal in all varieties and it also did not vary significantly between varieties. From these results it is concluded that red flour beetles being secondary stored grain insect pests were unable to multiply on sound grain wheat varieties and caused minimal weight loss in these varieties.

Keywords: wheat varieties, number of grains, weight loss, storage insects, red flour beetle, population growth

Impact of Pesticide Quality Control Programme in Southern Punjab, Pakistan

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(received October 27, 2016; revised April 24, 2017; accepted May 11, 2017)

Abstract. This study was taken to evaluate pesticide quality and their impact on crop. Total 14336 number of pesticide samples were received for quality evaluation from 2006 to 2012. The data was analysed statistically at 5% level of significance and treatment means were worked out. The results revealed that out of 14336 analysed samples, 13541 (94.5%) were declared fit for crop use whereas the remaining 795 (5.5%) were found to be unfit. The trend in generic and branded unfit samples between the years 2006 to 2012 revealed that the agencies marketing branded pesticides had better quality than generic ones.

Keywords: Pakistan, pesticides, quality control

Short Communication

Role of Potassium in Reducing Oxidative Damage in Maize under Salt Stress

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(received August 24, 2016; revised February 6, 2017; accepted May 10, 2017)

Abstract. Hydroponic experiment was carried out to assess the effect of K in reducing the oxidative damage in maize (Pioneer-3335) under salt stress. Seedlings were transplanted to three levels of K (3, 6 and 9 mM) with 100 mM NaCl stress. Plant growth parameters, membrane stability index, K^+ / Na^+ ratio and antioxidant enzymes activity were reduced due to salt stress. Addition of K significantly improved the morphological and physiological attributes along with the antioxidant enzymes (SOD, CAT and POD) activity. With increasing K levels an improvement in crop growth was observed but the treatment with 9 mM K was found to give the best results. Maximum shoot and root lengths (61.2 and 30.6 cm) were observed at 9 mM applied K level. The similar trend regarding shoot and root fresh weight was observed for maize genotype. Improved membrane stability was observed at 9 mM K level in (Pioneer-3335) (75.6%) under salt stress. Similarly, improved antioxidant enzymes (SOD, CAT and POD) activity was found in maize plants (35.5, 65.6 and 49.6 unit/g fresh weight) as compared to salt stress at 9 mM K level. The antioxidant enzymes activity was improved with the application of potassium under salt stress which ultimately induced oxidative stress tolerance in maize (Pioneer-3335).

Keywords: maize, salt stress, potassium, oxidative damage, antioxidant enzymes

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Evans, W.J., Johnson, M.A., Fujimoto, Cy. H., Greaves, J. 2000. Utility of electrospray mass spectrometry for the characterization of air-sensitive organolan-thanides and related species. *Organometallics*, **19**: 4258-4265.

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