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Heterotic Effects in F₁s and Inbreeding Depression in F₂ Hybrids of Sunflower

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(received June 12, 2014; revised February 25, 2015; accepted March 19, 2015)

Abstract. Genetically diverse female lines of sunflower were crossed with male testers to get heterotic hybrids. Studies were carried-out during 2008-2010 at Experiment filed of Agriculture Research Institute, Tandojam, Sindh, Pakistan. Six female lines like T-4-0319, PAC-0505, HO-I, Hysun-33, Peshawar-93 and CMS-03 and three testers i.e., PAC-0306, PAC-64-A and SF-187 were crossed in a line \times tester mating design, thus 18 F₁ and F₂ hybrids were developed for evaluation of heterosis and inbreeding depression for days to initial flowering, days to maturity, leaves/plant, plant height (cm), head diameter (cm), 1000-achene weight (g), seed yield kg/ha and oil yield kg/ha. The experiment was conducted in a randomised complete block design with four replications. The analysis of variance revealed significant differences among parents, F₁s and F₂ hybrids for all the traits studied. The existence of significant genetic variability among the plant traits is particularly useful because variations in these traits would allow further improvement in sunflower seed yield and oil traits. The F₁ hybrids HO-I \times PAC-0306 and HO-I PA \times C-64-A exhibited desirable negative mid and better parent heterosis for days to initial flowering, days to maturity and plant height. These hybrids also manifested desirable positive heterotic effects for leaves/plant, head diameter, 1000-achene's weight, seed yield and oil yield. Inbreeding depression for phenological, seed yield and oil traits showed that desirable high inbreeding depression was observed in hybrids HO-I \times P \times AC-64-A, HO-I \times PAC-0306 and HO-I \times SF-187 for days to initial flowering, similarly T-4-0319 \times PAC-0306, PAC-0505 \times SF-187 and HO-I \times PAC-64-A explicated maximum but rewarding inbreeding depression for days to maturity. The F₂ hybrids Hysun-33 \times SF-187 and Peshawar-93 \times PAC-64-A may be the most desirable ones in the sense that they recorded comparatively moderate inbreeding depression with enough number of leaves to be productive if F₂ hybrids are to be exploited for hybrid vigour. Low inbreeding depression for various traits indicated that such hybrids some how favour the usefulness of F₂ hybrids in sunflower.

Keywords: heterosis, inbreeding depression, oil traits, sunflower yield

G × E Interaction for Growth, Yield and Quality Characters of Strawberry (*Fragaria ananassa* Duch.) under Bangladesh Conditions

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(received November 27, 2013; revised April 2, 2014; accepted April 24, 2014)

Abstract. A multi location trial with five promising strawberry genotypes *viz.*, Sweet Charlie, Festival, Camarosa, FA 008 and BARI Strawberry-1 was conducted under different sub tropical climatic conditions of Bangladesh to study their G × E interaction. Location were Gazipur, Rajshahi and Chittagong during the period from August 2009 to May 2011. Combined analysis of variance indicated significant variation among the genotypes as well as location for almost all the characters studied. Genotype × environment studies indicated different response of genotypes over locations for most of the characters suggesting location wise environmental variation. Stability parameter revealed that a particular genotype did not perform consistently for all the characters. The genotype Festival considered as stable for most of the characters except days to flowering and ascorbic acid content of fruits, and considered as stable over different locations. For this reason, the genotype ‘Festival’ could be well thought-out and less receptive to the environmental conditions and might be recommended for all environments. On the other hand, environmental indices indicated that the environment of Rajshahi was found to be most favourable for strawberry cultivation followed by that of Gazipur and Chittagong.

Keywords: G × E interaction, strawberry, environmental indices, adaptability, phenotypic index

Effect of K₂SO₄ and KNO₃ Foliar Application on Wheat Growth

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Badar-uz-Zaman

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(received December 30, 2013; revised October 20, 2014; accepted October 22, 2014)

Abstract. A field experiment was conducted to investigate the effect of different concentrations of K₂SO₄ and KNO₃ foliar application (2 and 4%) on the growth of wheat (cv. Watan) at Soil Salinity Research Institute (SSRI) farm, Pindi Bhattian, Punjab, Pakistan during Rabi season, 2007. Treatments were: soil application K₂SO₄, KNO₃, 2 and 4% K₂SO₄, 2% KNO₃ + 2% K₂SO₄, 4% KNO₃ + 2% K₂SO₄, 2% KNO₃ + 4% K₂SO₄, 4% KNO₃ + 4% K₂SO₄. Treatments were assigned using randomised complete block design with three replications. The crop was harvested at maturity, data on tillering, plant height, spike length, number of grains/spike, 1000-grain weight, straw and wheat yields were recorded. Tillering, number of grains/spike, 1000-grain weight and wheat yield significantly ($P \leq 0.05$) increased by different levels of doses. 2% K₂SO₄ and 4% K₂SO₄ improved the tillering capacity of wheat compared with the control. The combination of 2% KNO₃ + 4% K₂SO₄ attained the highest grain yield (2825 kg/ha) which was statistically at par with 2% K₂SO₄ (2795 kg/ha). The lowest grain yield (2129 kg/ha) was received by the control (soil applied K₂SO₄). Grain yield after spraying was up to 31% higher than in the control.

Keywords: foliar application, K₂SO₄, KNO₃, *Triticum aestivum*, soil salinity

Screening of *Penicillium* Species and Optimisation of Culture Conditions for the Production of Ergot Alkaloids Using Surface Culture Fermentation Process

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(received January 15, 2014; revised November 5, 2014; accepted December 8, 2014)

Abstract. The present study deals with the screening of fungal species and suitable fermentation medium for the production of ergot alkaloids. Various species of genus *Penicillium* were grown on different fermentation media by employing surface culture fermentation technique to achieve the most suitable medium and the best *Penicillium* sp. The results showed that medium M5 gave maximum yield with *Penicillium commune*. Different culture conditions such as effect of different carbon and nitrogen sources, their concentration levels, different pH values and sizes of inoculum on the production of ergot alkaloids were also studied to improve the yield. Maximum production of ergot alkaloids (4.32 mg/L) was achieved with 15 mL spore suspension at pH 5 in fermentation medium containing 35% (w/v) sucrose. All these results indicate that culture conditions are very much crucial to improve the yield of ergot alkaloids produced by *Penicillium commune* through surface culture process.

Keywords: ergot alkaloids, *Penicillium commune*, culture parameters, surface culture fermentation technique

Turkey-Hen Amino Acid Composition of Brain and Eyes

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(received February 11, 2014; revised June 19, 2014; accepted August 29, 2014)

Abstract. The amino acids composition of the brain and eyes of the mature Turkey-hen (*Meleagris gallopavo* L.), were determined on dry weight basis. Total essential amino acids ranged from 35.1-36.0 g/100 g as 49.5-49.8% of the total amino acids. The amino acid score showed that lysine ranged from 0.76-0.91 (on whole hen's egg comparison), 0.85-1.03 (on provisional essential amino acid scoring pattern), and 0.81-0.98 (on suggested requirement of the essential amino acid of a preschool child). The predicted protein efficiency ratio was 1.94-2.41, whilst essential amino acid index range was 1.06-1.08 and the calculated isoelectric point range was 3.97-4.18. The correlation coefficient (r_{xy}) was positively high and significant at $r = 0.01$ for the total amino acids, amino acid scores (on the whole hen's egg comparisons made) and the isoelectric point. On the whole, the eyes were better in 12/18 or 66.7% parameters of the amino acids than the brain of Turkey-Hen.

Keywords: amino acids, brain, eyes, turkey-hen

Effects on Physicochemical Characteristics of Yoghurt and Ice Cream with Fatty Acid Modification and Cholesterol Removal

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(received June 3, 2014; revised January 20, 2015; accepted January 30, 2015)

Abstract. This study investigated the effect of fatty acid modification and cholesterol removal on physico-chemical characteristics of yoghurt and ice cream. Fatty acid profile of milk fat was modified by feeding calcium salts of soybean oil fatty acids to cows and cholesterol was removed by β -cyclodextrin. β -cyclodextrin removed 76% and 60% cholesterol from yoghurt and ice cream. Modification of fatty acid composition did not have a significant effect on α -tocopherol content; while β -cyclodextrin treated milk had substantially lower α -tocopherol content. The concentration of α -tocopherol in control and β -cyclodextrin treated yoghurt was 45.62, 32.73 $\mu\text{g/g}$ and 210.34, 185.56 $\mu\text{g/g}$ for ice cream, respectively. Fatty acid modification and cholesterol removal significantly decreased the overrun in ice cream ($P<0.05$), with no effect on sensory characteristics of yoghurt and ice cream. These results evidenced that milk with higher content of unsaturated fatty acids and low cholesterol can be used in the formulation of yoghurt and ice cream with improved health benefits and suitable sensory features.

Keywords: β -cyclodextrin, yoghurt, ice cream, fatty acid, α -tocopherol

Assessment of Irrigation Water Quality in District Attock, Pakistan

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(received March 25, 2014; revised September 1, 2014; accepted November 13, 2014)

Abstract. Water samples (total 277) were collected during previous three years (2008-09 to 2010-11) from all tehsils of Attock district, Pakistan, used for irrigation purpose. Regarding sources of irrigation, 122 samples were collected from bores (turbine operated), 97 from wells, 19 from nullahs and 39 from dams. The analysis data showed that 120 samples (43%) were fit, 35 samples (13%) were marginally fit, while 122 samples (44%) were unfit. As regards minimum and maximum range, it varied in EC from 0.05 to 8.1 dS/m, calcium plus magnesium from 0.6 to 70 meq/L, sodium from zero to 40.6 meq/L, carbonates from zero to 0.04 meq/L, bicarbonates from 0.5 to 15 meq/L, chlorides from 0.2 to 70 meq/L, sodium adsorption ratio from zero to 49.85 and residual sodium carbonate from zero to 13 meq/L. Recommendations for wise and judicious use of marginally fit to unfit irrigation water were imparted to the farmers for raising different arable, fruit and vegetable crops.

Keywords: irrigation water, cations, anions, dissolved salts

Short Communication
**Nitrogen Status of Soil and Plants in Apple Orchards of
Quetta Valley, Pakistan**

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(received October 29, 2013; revised August 4, 2014; accepted August 8, 2014)

Abstract. The study was planned to assess the nitrogen status of apple orchards around Quetta valley, Pakistan, through soil and plant analysis. Two hundred and forty soil samples were collected from 40 different locations of 05 orchards at 0-15, 15-30, 30-45, 45-60, 60- 75 and 75-90 cm depths. The soil samples were analysed for total nitrogen by Kjeldhal's method. At the same time forty apple trees were selected for leaves samples and analysed for the total nitrogen content. Total nitrogen content in soil showed a sizeable variation ranging from 0.009 to 0.148%. Whereby, plant analysis registered minimum nitrogen content 1.06% and the maximum nitrogen content were 3.14% in apple plant leaves which confirms a great deficiency of nitrogen in apple orchards of Quetta valley.

Keywords: apple orchard, nitrogen content, fruit yield

Short Communication

Screening of Some Exotic Rice Germplasm Against Brown Spot (*Bipolaris oryzae*) Disease under Rainfed Conditions

Muhammad Yaqoob

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(received January 15, 2014; revised November 17, 2014; accepted November 26, 2014)

Abstract. Ten different lines including one approved variety and one susceptible check were tested against brown spot disease of rice under low water application conditions. The disease data were recorded on 1-9 rating scale. The results revealed highly significant differences among various rice genotypes against disease reaction ranging from highly resistant to highly susceptible in different genotypes. Three lines remained highly resistant, four resistant and two moderately resistant under rainfed conditions.

Keywords: *Oryza sativa* L, *Bipolaris oryzae*, rice genotypes
