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Series B: Biological Sciences

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Grass Diversity in the Historical Kalash Valley, District Chitral, Hindukush Range, Pakistan

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(received October 31, 2016; revised December 22, 2016; accepted December 27, 2016)

Abstract. The present study was carried out to enlist the grass flora of Kalash valley, Pakistan their ecological characteristics and ethnobotanical uses. A total of 36 grass species belonging to 29 genera were identified. *Poa* was the dominant genus with 4 (11.11%) species followed by *Avena, Bromus, Hordeum* and *Lolium* represented by 2 (5.55%) species each. The remaining genera had one species each. Ecological characteristics revealed that 23 (63.89%) species were rarely occurring, 9 (25%) were common and 4 (11.11%) species were abundantly occurring in the valley. Life form spectra showed that therophytes were dominant with 24 (66.67%) species followed by hemicryptophytes with 8 (22.22%) species, chamaephytes 3 (8.33%) and geophytes had one (2.78%) species. Leaf size spectra revealed that 26 (72.22%) species were nanophylls, 4 (11.11%) were microphylls and 3 (8.33%) were mesophylls. 27 (75%) species were growing on dry places and 9 (25%) were growing on wet soils. Similarly, 33 (91.67%) were fodder species, 3 (11.11%) were food species and 2 (5.55%) species were used for thatching purposes in the valley. The present information will be useful for further ecological and biological researches on the grasses in this dry temperate region of Pakistan.

Keywords: grasses, ethnobotanical characteristics, Kalash valley, district Chitral

Pak. j. sci. ind. res. Ser. B: biol. sci. 2017 **60**(2) 69-73

Nutrient Priming in Different Maize Cultivars and Evaluation of Vigour Improvement Under Controlled Conditions

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(received February 9, 2015; revised November 14, 2016; accepted November 25, 2016)

Abstract. Laboratory and pot experiments were conducted to study the effect of seed priming on vigour and germination characteristics of different maize cultivars during the year 2011. The seeds of four maize cultivars *viz*. EV 7004Q, Islamabad Gold, Rakaposhi and Sohan-3 were primed using 0% P (dry seeded control), 0.6% P and 1.2% P solutions of KH_2PO_4 for 16 h. The experiment was laid out in Complete Randomized Design (CRD) having three replicates. All the seed priming treatments significantly improved the plant vigour in terms of enhanced germination percentage, reduced mean germination time (MGT), improved root, shoot lengths and dry matter production. Among the four cultivars of maize the Islamabad Gold performed best followed by Sohan-3. Highest germination (94.57%) and vigour index (VI) of 431.66 was observed in Islamabad Gold where 1.2% P applied compared to dry seeded control. Nutrient seed priming may be used to improve germination vigour and crop stand establishment under field conditions leading to good yield targets in maize under rainfed conditions.

Keywords: genotype, maize, priming, phosphorous, vigour index

Pak. j. sci. ind. res. Ser. B: biol. sci. 2017 **60**(2) 74-83

*Os*DOF18, A DOF Transcription Factor from Rice Confers Abiotic Stress Tolerance in *Escherichia coli*

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(received June 23, 2016; revised November 29, 2016; accepted December 03, 2016)

Abstract. DNA binding with one finger proteins (DOF) play vital role in many cellular including biotic and abiotic stresses. In present study, *Os*DOF18, a member of DOF gene family from *Oryza sativa* was cloned into GST expression vector (pGEX4T-1) and sequenced. The sequence was subjected to *in silico* characterisation including similarity search, multiple sequence alignment followed by phylogenetic study. The three dimensional structure was predicted by I-TASSER server followed by authentication using PROCHECK and QMEAN tools. Analysis of *Os*DOF18 by RT-qPCR confirmed the association of *Os*DOF18 with abiotic stresses including salinity and drought. DNA binding domain containing region was cloned and over-expressed in *Escherichia coli* for stress analysis. *Os*DOF18 protein improved the *E. coli* survivability against salinity and drought stresses. The results suggested *Os*DOF18 as a stress-related gene in rice that may be used in generating stress tolerant plants.

Keywords: abiotic stress, *Oryza sativa*, *Os*DOF18, *Escherichia coli*, RT-qPCR

Pak. j. sci. ind. res. Ser. B: biol. sci. 2017 **60**(2) 84-90

DPPH Radical Scavenging Assay, Biological Activities, Nutritional Composition and Quality Parameters of *Momordica charantia* Seeds Grown in District Charsadda, KPK, Pakistan

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(received January 19, 2016; revised October 26, 2016; accepted October 28, 2016)

Abstract. The nutritional composition, physicochemical characteristics, antimicrobial activity and DPPH free radical scavenging activity of the oil extracted and proximate and elemental composition of seed cake of the local variety of *Momordica charantia* were examined as per AOAC or elsewhere mentioned procedures. Physicochemical properties of the oil exhibited colour (1.71 R/U, 1.19 Y/U) being reddish brown, the higher iodine value (105.5), saponification value (190.7), low acid value (1.3) and the higher proportion of unsaturated fatty acids (especially the omega-3 fatty acid) as compared to saturated fatty acids of the oil are an indication of its edibility and industrial utility. The oil also showed good inhibitory action against the selected fungal and bacterial strains as well as DPPH free radical scavenging activity. Results of the proximate composition of the seed cake showed it to be good source of total proteins (18. 17%), crude fibre 10.37%, percent oil (38.1%) and elements such as calcium (374.9 mg/100 g), copper (3.01 mg/100 g), iron (39.57 mg/100 g) and zinc (12.04 mg/100 g). It can be concluded from the study that oil and seed cake of the local variety of bitter gourd seed (BGS) oil possesses a good nutritional, antioxidant and antimicrobial potential.

Keywords: *Momordica charantia*, bitter gourd seed, physicochemical properties, fatty acid, antimicrobial potential

Pak. j. sci. ind. res. Ser. B: biol. sci. 2017 **60**(2) 91-95

The Effect of Beta Cyclodextrin on the Removal of Cholesterol from Buffalo Milk

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(received April 16, 2015; revised October 6, 2015; accepted December 1, 2016)

Abstract. This study was conducted to find out the efficiency of beta cyclodextrin (βCD) for the removal of cholesterol from buffalo milk. Standardised (3.5% fat) and homogenised buffalo milk was treated with βCD at three different concentrations i.e., 0.5, 1 and 1.5% (T_1, T_2 and T_3) and compared with a control without βCD treatment. Treatment of milk with βCD at all concentrations did not show any negative impact on pH and acidity of milk. 90% cholesterol was removed when buffalo milk was treated with 1.5% βCD. Treatment of milk with βCD did not reveal significant effect on fatty acid and triglyceride composition of milk as well as physicochemical and sensory characteristics ($P>0.05$). These results depicted that βCD can be used efficiently for the removal of cholesterol from buffalo milk.

Keywords: beta cyclodextrin, cholesterol, fatty acid profile, triglyceride profile, buffalo milk

Pak. j. sci. ind. res. Ser. B: biol. sci. 2017 **60**(2) 96-105

Influence of Carrot Pulp Fortified with Different Concentrations of Apple Pulp on Blended Jam

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(received November 13, 2015; revised October 6, 2016; accepted November 7, 2016)

Abstract. The aim of this study was to evaluate various combination and effect of storage period on the quality of carrot apple blended jam at ambient temperature (18-25 °C). The treatments were CA_0, CA_1, CA_2, CA_3, CA_4 and CA_5. All the treatments were examined for physicochemical properties i.e., total soluble solids (TSS), pH, reducing sugars (%), percent acidity, non-reducing sugars (%), ascorbic acid (mg/100 g), as well as for sensory properties at fifteen days interval for a total storage period of 90 days. Significant increase ($P<0.05$) were examined in TSS (67.45-70.40 °brix), acidity (0.64-0.80) and reducing sugars (16.64-27.78). While, significant decrease ($P<0.05$) were examined in pH (3.63-3.44), non reducing sugars (45.04-27.69), ascorbic acid (7.81-5.52 mg/100 g), colour (7.33-4.35), taste (7.40-4.12), texture (7.22-4.06) and overall acceptability (7.36-4.14). Statistical results concluded that treatment and storage has a significant effect on the quality and stability of carrot pulp and apple pulp blend jam. Results revealed that good quality jam could be prepared with equal amount of carrot and apple pulp, which showed with minimum damage to physiochemical and sensory attributes among the other treatment even after 90 days of storage.

Keywords: carrot, apple, blended jam, storage, physicochemical properties, sensory properties

Pak. j. sci. ind. res. Ser. B: biol. sci. 2017 **60**(2) 106-115

Accumulation of Heavy Metals by Living and Dead Bacteria as Biosorbents: Isolated from Waste Soil

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(received February 3, 2016; revised June 22, 2016; accepted July 12, 2016)

Abstract. In the present study *Enterococcus luteus*, *Escherichia coli* and *Staphylococcus aureus* have been used for biosorption of cadmium and chromium from aqueous solution of various concentrations. Bacteria were isolated from waste soil and identified through various morphological features, biochemical tests, and staining procedure. Biosorption capacity (both dead and live biomass) was observed through broth technique and absorbance values were measured using atomic absorbance spectrophotometer. Different parameters were optimised for metal biosorption, including incubation periods (24, 48, 72 and 96 h) and pH (4, 6, 7, 8, 9, and 10) at 37 °C. Agar well and agar disc diffusion methods were used for resistogram and antibiogram analysis. Through agar well diffusion method, *S. aureus* showed complete resistance against all concentrations of chromium and cadmium (50 to 300 µg/mL). *E. luteus* showed resistance on 50 µg/mL and 100 µg/mL of both metals while *E. coli* exhibited resistance against all cadmium concentrations (50 to 300 µg/mL) while sensitivity was observed in case of chromium (12.0 ± 0.0 mm to 24.0 ± 0.0 mm). Through broth method, *E. luteus* showed good cadmium absorbance capacity at acidic pH 4 and 6, *E. coli* at pH 4, 6 and 7 and *S. aureus* at pH 6, 7 and 8. In case of chromium, *S. aureus* showed maximum absorbance at pH 6; *E. coli* at pH 7 and 8 and *E. luteus* showed minimum absorbance for chromium at pH 6 and 8. All bacterial isolates showed maximum biosorption of both metals after 24 h of incubation. Results suggested that pH 6 and incubation period 24 h could be better for biosorption of cadmium and chromium removal. Dead biomass of *E. coli* and *S. aureus* was more efficient for cadmium removal while both dead and live biomass (*E. luteus*, *E. coli* and *S. aureus*) have potential for chromium removal. These microbes could be used as potential source of heavy metal biosorbent, biosorbent

Keywords: heavy metals, resistogram analysis, antibiogram assay, biosortent

Pak. j. sci. ind. res. Ser. B: biol. sci. 2017 **60**(2) 116-118

Short Communication

Comparison of Direct Seeded and Transplanted Rice in Response to Zinc under Salt-Affected Soil

Muhammad Arshad Ullah[a]*, Imdad Ali Mahmood[a], Badar-uz-Zaman[a], Syed Ishtiaq Haider[a], Muhammad Suhaib[a], Arshad. Ali[a] and Muhammad Jamil[b]

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(received March 29, 2016; revised August 24, 2016; accepted September 09, 2016)

Abstract. An experiment was carried out to investigate the effect of different levels of Zn (0, 5, 10, 15 kg/ha) on growth and yield of direct seeded and transplanted rice (*Oryza sativa*) under naturally salt-affected soil having pH=8.32; ECe=6.41dS/m; SAR=26.71$(mmol_c/L)^{½}$ at the farm of Soil Salinity Research Institute, Pindi Bhattian during 2013. Plant height, number of tillers/plant, panicle length and number of grains/panicle were higher in transplanted rice than direct seeded rice at all Zn levels. Maximum paddy yield (2.61 t/ha) of direct seeded rice was attained with the application of 10 kg Zn/ha closely followed by 15 kg Zn/ha application (2.41 t/ha) which was statistical at par with paddy yield (2.45 t/ha) of transplanted rice in salt-affected field. However, overall paddy yield of direct seeded rice was 5 % higher than the transplanted rice.

Keywords: direct seeded, transplanted rice, saline soil, Zn

Pak. j. sci. ind. res. Ser. B: biol. sci. 2017 **60**(2) 119-121

Short Communication

A Comparison of Nutrient and Dietary Compositions of Cereals and Pulses Commonly Consumed in Pakistan

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(received January 1, 2015; revised October 20, 2016; accepted October 25, 2016)

Abstract. The present study was taken to evaluate the proximate content and dietary fibre composition of locally available cereal (wheat, maize, oat and barley) and the legumes (mash beans, lentils, mung beans and chickpea). In cereal samples, crude proteins in all cereals were found in the range of 8.75-10.93% but in legumes this range was significantly higher i.e. (19.91-22.06). Crude fibre analysis in cereal samples showed values between 1.89-10.6, but in legume samples it ranged between 2.64 to 4.41. Total dietary fibre was higher in oat and barley 19.0 and 18.34, respectively, whereas total dietary fibre contents in selected legumes ranged between 18.00 (chick pea) to 24.93 (mung bean).

Keywords: chemical composition, cereals, dietary fibre, legumes, human nutrition

Pak. j. sci. ind. res. Ser. B: biol. sci. 2017 **60**(2) 122-124

Short Communication

Nutritional Analysis and Determination of Antioxidant Activity Using Free Radical Scavenging Assay of Potatoes (*Solanum tuberosum*) from Two Regions of Pakistan

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(received August 12, 2015; revised October 16, 2016; accepted December 3, 2016)

Abstract. Present study was designed to evaluate the nutritional values of red skin potatoes collected from Gujranwala and Lahore regions of Pakistan. Potatoes (*Solanum tuberosum*) of Gujranwala and Lahore were found to contain moisture contents of 5.00 and 5.15%, respectively. Fat was 0.19% in *S. tuberosum* of Gujranwala whereas Lahore potatoes were found to contain fat 0.2%. Fibre content of *S. tuberosum* of Gujranwala was 16.47% while *S. tuberosum* of Lahore had 13.45% fibre. Protein contents of *S. tuberosum* of Gujranwala were 12.89% whereas for *S. tuberosum* of Lahore were 13.11%. The water extract showed significant free radical scavenging activities in DPPH radical scavenging antioxidant assay and antioxidant activity was increased in a dose dependent manner. These results suggest that potato (*S. tuberosum*) is not only a cheap source of very important nutritents but also has antioxidant activities which are helpful to maintain different physiological functions of body.

Keywords: potato, nutritional composition, DPPH assay