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Physical Sciences

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Effect of Thermal Shocking and Quenching on the Degradation Behaviour of a Thin PZT Disc

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Abstract. Thin lead zirconate titanate discs were subjected to thirty five thermal shocks from two different temperatures in deionized water and their relative dielectric constant, coupling factor and impedance values were measured with a view to investigating the behaviour of thin piezoelectric (PZT) discs at frequency of maximum and minimum impedance. Noticeable differences were observed in the electrical properties of the material, probably due to the change in dipole lengths and their orientations during thermal shocking. The results can be useful in modeling and designing of smart components for predicting their behaviour during such expected shocking conditions prior to fabrication.

Keywords: piezoelectric material, thermal shock, deionized water, dielectric constant, impedance, PZT

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Comparison of Ion Chromatography with Ion Selective Electrodes for the Determination of Inorganic Anions in Drinking Water Samples

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Abstract. Fluoride, chloride and nitrate anions were determined in drinking water samples using techniques of ion selective electrodes (ISE) and non-suppressed/suppressed ion chromatography (IC). Detection limit, percentage recovery and run time were evaluated for the two methods. Detection limits for ISE [0.02, 0.20 and 1.7 ppm (µg/mL) for fluoride, chloride and nitrate, respectively], were better than those for non suppressed IC (2.0, 1.0 and 2.0 ppm for fluoride, chloride and nitrate, respectively). Suppressed IC was used to measure fluoride. Statistical analysis of the data revealed no evidence of systematic difference between ISE and non suppressed IC for chloride and nitrate. Fluoride concentrations in all water samples were lower, while chloride and nitrate concentrations in some samples were higher than the maximum contaminant levels established by the United States Environmental Protection Agency.

Keywords: drinking water, nitrate, chloride, fluoride, ion selective electrode, ion chromatography

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Physical and Chemical Evaluation of Oils of Two Varieties of *Carthamus tinctorius* Grown in Pakistan

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Abstract. On evaluation of oils of two spineless varieties of *Carthamus tinctorius*, Thori-78 and Pawari-95 growing in Sindh, Pakistan, the quality of the oil was found to be similar, only the oil content differed. The hexane-extracted oil content of Thori-78 and Pawari-95 was 28.33±1.15 and 33.07±1.12, respectively. The oils contained 90.97% and 89.55% unsaturated fatty acids and 8.44% and 9.69%, saturated fatty acids, respectively. Linoleic acid was 75.42±0.59% and 76.40±1.0% and oleic acid was 15.55±0.30% and 13.15±0.49% by weight, respectively, and were the predominant fatty acids present in the oil.

Keywords: safflower oil, Thori-78, Pawari-95, linoleic acid, oleic acid

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Analysis of Caffeine and Heavy Metal Contents in Branded and Unbranded Tea Available in Pakistan

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Abstract. In the investigation of caffeine and heavy metal contents in four branded and six unbranded tea samples collected from local markets of Lahore, Faisalabad and Peshawar, the amount of caffeine and heavy metals in all the branded tea samples were in agreement with the international standards. In unbranded tea samples, though the amount of caffeine was within standard limits but two of the samples collected from Peshawar had high concentrations of lead being, 13.69 and 15.78 mg/kg, consumption of which can lead to serious problems.

Keywords: tea, caffeine, heavy metals

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Measurement of Atmospheric Concentrations of CO, SO_2, NO and NOx in Urban Areas of Karachi City, Pakistan

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Abstract. In the assessment of variation trends in ambient air quality at five selected regions of Karachi city, four air pollutants namely carbon monoxide, sulphur dioxide, nitrogen oxide and nitrogen dioxide were monitored, along with metrological parameters, for eight consecutive days. The results suggested that all the pollutants were mainly due to the emissions from motor vehicles and industries, owing to the absence of regulatory laws/standards about ambient air quality in Pakistan. The results have been discussed with reference to recommendations of the World Health Organization for the same.

Keywords: air pollution, industrial emission, vehicular emission, atmosphere

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Seasonal and Year Wise Variations of Water Quality Parameters in the Dhanmondi Lake, Dhaka, Bangladesh

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Abstract. The quality of the surface water through 16 physicochemical variables was monitored at three sites of Dharmondi Lake of Dhaka, Bangladesh, over 5 years during 2002-2007. The concentration of heavy metals (Pb, Cd, Cr, Co, Ni, Cu) was below detection limits with few exceptions. No clear seasonal variation trend for Fe, Mn, Zn, PO_4^{3-}, SO_4^{2}, Cl^- and F^- was observed which differed from year to year. Slight increasing tendency in case of sulphate, phosphate, chloride concentrations and electrical conductivity was observed but it was not clear in other parameters. The levels of all parameters were found well below the standards for drinking water.

Keywords: lake water, seasonal variability, pollution trend, water quality, heavy metals

Biological Sciences

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Salt Tolerance Evaluation of Rice (*Oryza sativa* L.) Genotypes Based on Physiological Characters Contributing to Salinity Resistance

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Abstract. Seven newly developed rice cultivars i.e., KS-133, DR-83, DR-64, BR-601, Gomal, JP-5 and Gomal-6, were evaluated for salinity tolerance in a glasshouse along with three varieties of known salinity tolerance i.e., KS-282 (tolerant), IR-6 (medium tolerant) and Basmati-385 (susceptible). Based on the survival percentage at 50 mol/m^3 sodium chloride salinity imposed at seedling stage, rice cultivars KS-133, Gomal, and DR-83 showed high survival comparable to that of salinity tolerant cultivars like KS-282, and were thus placed in tolerance range. Survival percentage of JP-5, Gomal-6 and DR-64 remained in medium tolerance range (35 to 38%) as that of IR-6. The rice cultivar BR-601 showed only 13% survival and was found to be as sensitive towards salinity as Basmati-385. The results of rice survival in saline medium showed good uniformity and the check varieties showed results corresponding to those found elsewhere. Sodium (Na^+) and potassium (K^+) concentrations in the third leaf showed variations among different rice cultivars under salinity. There was an inverse correlation between varietal leaf Na^+ *vs* survival percentage (r = -0.808) and Na^+ *vs* leaf chlorophyll (r = -0.857). The correlation between K^+ and final survival percentage was direct (r = 0.744) and also leaf chlorophyll *vs* survival (r = 0.952). The shoot fresh and dry weights were greater in the rice genotypes having higher final survival percentage under saline conditions. Therefore, in addition to final survival percentage, the higher shoot fresh and dry weight under salinity could be also used as criterion for evaluation of salinity tolerance of rice.

Keywords: salinity, rice, chlorophyll, salinity tolerance

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Parasitic Contamination in the Table Vegetables Planted in Shiraz Plain, Iran

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Abstract. Contamination with parasites of the vegetables grown in Shiraz plains and irrigated by urban and industrial sewage-laden Shiraz Rookdhaneh Khoshk River and seasonal Soltanabad River was studied. It was found that 31.5% of the farms irrigated by the river water directly, 30.9% of the farms irrigated by water of nearby located shallow wells and 33.7% of the farms using water from the wells at a distance of one kilometer from the River were contaminated by *Ascaris* ova. 32.20% vegetables of farms irrigated by the wells located near Soltanabad river were contaminated with insects and larvae and 24.5% with *Ascaris* worm. After *Ascaris* ova, the larvae of different insects, *Strongyloides* parasite, *Sterocoralis* and *Trichostrongylus* were the contaminants most present.

Keywords: parasites, irrigation, vegetables, Shiraz rivers, *Ascaris*

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Microbiological Quality of Drinking Water and Beverages in Karachi, Pakistan

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Abstract. Microbiological assay of 780 water samples and 1220 beverage samples (412 branded and 808 unbranded), collected from 490 different schools, both government (98 schools) and private (392 schools), situated in different areas of the city of Karachi, was conducted for bacterial heterotrophic plate count, total coliforms, faecal coliforms, *E. coli*, faecal streptococci, *Pseudomonas* and *Salmonella* species. The counts ranged from 0 to 2.5×10^5 cfu/mL and from 0 to 10^6 cfu/mL in water and beverage samples, respectively. About 36% of water samples and 48% of unbranded beverage samples were contaminated with the indicator and the pathogenic bacteria; all the branded beverage samples were found fit for human consumption from microbiological viewpoint.

Keywords: drinking water, beverages, microbiological quality

Short Communication

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Feeding Inter-Relationship of *Caranx hippos* (Linneaus), *Chrysichthys nigrodigitatus* (Lacepede), *Ethmalosa fimbriata* (Bowdich) and *Mugil cephalus* (Linneaus) in Lagos Lagoon, Nigeria

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Abstract. Study of the feeding inter-relationship of *Caranx hippos, Chrysichthys nigrodigitatus, Ethmalosa fimbriata* and *Mugil cephalus* in the Lagos Lagoon, Nigeria, revealed that algae and diatoms formed the main food items of the four fish species; other food items were crustaceans, molluscs and detritus. Utilization of nearly identical food items suggested inter-specific competition for food.

Keywords: feeding habits, *Caranx hippos, Chrysichthys nigrodigitatus, Ethmalosa fimbriata, Mugil cephalus*, Nigeria

Technology

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Production and Characterization of Chitosan from Shrimp (*Penaeus semisulcatus*) Shell Waste of UAE

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(received June 11, 2009; revised December 1, 2009; accepted December 16, 2009)

Abstract. Chitosan was prepared from shrimp (*Penaeus semisulcatus)* shell waste by a chemical process involving demineralization, deproteinization and deacetylation; conversion of chitin to chitosan (deacetylation) was achieved by treatment with concentrated sodium hydroxide solution (55%) at room temperature (25 ºC). The present study was undertaken to evaluate the influence of deacetylation process during chitosan production on the physicochemical and functional properties of shrimp shell chitosan. Four experimental chitosan samples were prepared with deacetylation for 40 h, for 50 h, with and without stirring as well as for 60 h and were subjected to physicochemical and functional characteristic analysis. Change in duration of deacetylation process yielded some differences in each characteristic; deacetylation for 40 h led to lower viscosity, solubility, water/fat binding capacity and degree of deacetylation and for 60 h resulted in increase in solubility but decrease in viscosity. Stirring during deacetylation process led to lower viscosity, higher degree of deacetylation and higher fat binding capacity of the product. In contrast non-stirred sample produced product with lower degree of deacetylation and higher viscosity. It was concluded that duration of deacetylaylation process should be monitored constantly for optimal chitosan production depending on its intended usages in food, pharmaceutical and biomedical industries.

Keywords: shrimp shell waste, deacetylation, chitosan, chitin