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Chemical Extraction of Copper from Copper Sulphide Ores of Pakistan by Roast Leach Method

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(received October 14, 2009; revised August 16, 2010; accepted August 30, 2010)

Abstract. Copper ores, containing both complex sulphide minerals and those containing chalcopyrite mineral, were studied for the extraction of copper by leaching after roasting. Roasting at 650 °C for 30 min rendered the ore leachable in dilute sulphuric acid of 2.5% concentration. The process of metal extraction would be of hydrometallurgical importance for low to high grade sulphide and polymetallic complex sulphide ores occurring in Pakistan. The kinetic models of roasting reaction fit phase boundary as well as diffusion reaction mechanism.

Keywords: copper sulphide, copper hydrometallurgy, polymetallic ores, ore roast-leach method

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Quality Evaluation and Fatty Acid Composition of Palm Oil Cultivated in Two Regions of Pakistan

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Abstract. Mesocarp and kernel oil of palm trees cultivated in two areas of Pakistan, Sindh (Thatta) and Balochistan were analysed for lipid contents, quality parameters and fatty acid profile. Oil content of mesocarp and the kernel of palm trees of Thatta, were found to be 68.23% and 26.4%, respectively, and those of Balochistan 62.7% and 27.79%, respectively. Fatty acid composition revealed the presence of palmitic (42.8%, 37.63%), oleic (34.3%, 43.54%) and linoleic acids (15.38%, 11.12%) as dominant fatty acids in the two mesocarp oils, while lauric acid (45.15%, 44.92%) was found as the most significant fatty acid in palm kernel oil of the two regions, respectively. Physical and chemical parameters such as density, refractive index, melting point, colour, free fatty acids, peroxide value, iodine value, saponification value and unsaponifiable matter of these four oils are also reported.

Keywords: *Elaeis guineensis*, fatty acids, palm fruit mesocarp oil, palm kernel oil

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Biosorption of Lead Ions on Biosorbent Prepared from Plumb Shells (*Spondias mombin*): Kinetics and Equilibrium Studies

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Abstract. Plumb shell was used to prepare an adsorbent for biosorption of lead ions in aqueous solution at 25 °C. The adsorption capacity of the adsorbent at equilibrium was found to increase from 2.8 to 49.0 mg/g with an increase in the initial lead ion concentration from 50 to 200 mg/L. Using the equilibrium and kinetics studies, isotherm of the lead ions on the biosorbent was determined and correlated with common isotherm equations. The equilibrium data for lead ion adsorption fitted well into the Freundlich equation, with a value of 0.76 (R^2 = 0.9), with distribution coefficient of 4.90. The biosorption of lead ions on the adsorbent from plumb shells could best be described by the pseudo-second-order equation. The kinetic parameters of this best-fit model were calculated and discussed.

Keywords: plumb shell, biosorption, lead ions, isotherm, kinetics

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Study of Colour Measurements of Leather Dyed with Walnut Bark Natural Dye

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Abstract. Natural dye was extracted from walnut bark and applied on grey split leather for colour measurement study. Premordanting method of dyeing was used with different concentrations of dye at different temperatures for an interval of 45 minutes. Dyed leathers were subjected to colour measuring system and the tristimulus values (XYZ), ANLAB values (LAB) and Munsell renotations (hue, lightness and chroma) were noted. Acetic acid, formic acid, citric acid and tartaric acid were used as mordants before dyeing. Tartaric acid showed best results relating to colour measurements.

Keywords: mordant, colour measurement, natural dye, walnut dye, leather dye

Biological Sciences

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Production, Partial Purification and Characterization of Lipase from *Aspergillus flavus* KUF108

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Abstract. Fungi isolated from oil contaminated soils were screened for exogenous lipolytic activity. Optimization of fermentation conditions such as substrate, temperature, pH, moisture content, incubation period, carbon source, nitrogen source and metal ions for maximum lipase production was examined under solid state fermentation by the local isolate of *Aspergillus flavus* KUF108. Purification of crude enzyme was carried out by ammonium sulphate precipitation, dialysis and DEAE cellulose column chromatography. The lipase was found to be active at pH 5 and 50 °C, and stable between pH 5-6 and 40-60 °C. The apparent molecular weight of purified enzyme was 44 kDa.

Keywords: *Aspergillus flavus*, lipase, solid state fermentation, agro-industrial waste, enzymatic characterisation

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Functional and Anti-Nutritional Properties, *in-vitro* Protein Digestibility and Amino Acid Composition of Dehulled *Afzelia africana* Seeds

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(received November 17, 2009; revised April 9, 2010; accepted April 13, 2010)

Abstract. Analysis of *Afzelia africana* seed flour showed that the seeds possessed high water absorption capacity (128.31%), good oil absorption capacity (588.49%) and fairly good emulsion property (35.25%). However, it had the least gelation concentration (6.00% w/v) and foaming properties (8.00%, 3.00%). Anti-nutritional factors were very low, with the highest being phytate (13.59%) and tannin the least (0.43%). Total amino acid composition was 796.6 mg/g protein. Essential amino acids (48.5%) were in high proportion with *in-vitro* digestibility of 71.5%.

Keywords: protein digestibility, amino acids, *Afzelia africana*

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Potassium Consumption by Rice Plant from Different Sources under Salt Stress

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Abstract. The study on usage of K^+ by two rice cultivars (Cv. Shaheen and KS-282) from KNO_3, KH_2PO_4 and K_2SO_4 (5 mM each), with 60 mM NaCl under hydroponics conditions, showed that fresh mass of shoot (FMS), fresh mass of root (FMR), root/ shoot ratio of fresh and dry mass, relative water contents (RWC) and relative growth rate (RGR) were affected significantly (P=0.01) inconsistent relating to K^+ sources under salt stress. The intake of K^+ was the highest with application of KH_2PO_4 than KNO_3 and K_2SO_4 application. The transport of K^+ was the highest with KH_2PO_4 than KNO_3 and K_2SO_4 application in Shaheen, whereas in *var*. KS-282 with K_2SO_4, transport of K^+ was higher than the other two sources. The utilisation of K^+ was higher with KNO_3 than KH_2PO_4 and K_2SO_4 application in Shaheen, whereas in KS-282, K^+ utilisation with KH_2PO_4 was higher than the other two sources. It was inferred that K^+ consumption in shoot and root system of rice was dependent physio-genetically on potassium sources.

Keywords: rice cultivars, potassium sources, potassium uptake, salt stress

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Short Communication

Cationic Effect on the Electrolyte Flocculation of Cassava Starch Emulsion

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(received July 30, 2009; revised August 2, 2010; accepted August 11, 2010)

Abstract. The study to investigate, whether cassava starch emulsions are prone to flocculation by electrolytes and the role of the cationic valency in the instability showed that the electrolyte treated samples exhibited various degree of creaming and increase in globule size which depended on the cationic valency of the electrolyte, whereas the untreated samples hardly exhibited any evidence of creaming or changes in globules structure after 24 h of preparation. The trivalent cationic electrolyte ($FeCl_3$) gave the most pronounced effect, while the monovalent cationic electrolyte (NaCl) gave the least effect on the creaming and globule size increase indicating that the instability is associated with the adsorption of the cationic moiety of the electrolyte on the globules to neutralize anionic charges on the globules surfaces.

Keywords: cassava starch emulsion, instability, cationic effect

Technology

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Structural Optimisation of a Subsoiler

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Abstract. An experimental study of a subsoiler, used for deep tillage in agricultural fields, was carried out to determine its maximum draft force. The working conditions of the subsoiler were simulated three-dimensionally. The simulation showed that a structural optimisation can be generated on a subsoiler framework body for reducing the weight. New design parameters of the framework were defined and finite element analysis gave an optimised redesign for the subsoiler with the framework weight reduced by approximately 27.62%.

Keywords: subsoiler, computer aided design, finite element analysis, structural optimisation, weight reduction

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Spectrophotometric Determination of Cetirizine Dihydrochloride in Pure and Pharmaceutical Formulations

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Abstract. A rapid, simple and sensitive spectrophotometric method has been developed for determination of antihistamine (cetirizine dihydrochloride) in pure and pharmaceutical formulations, based on the charge transfer complexation between cetirizine dihydrochloride as *n*-electron donor with dichloronitrobenzene as π-acceptor in basic medium. The resulting yellowish orange coloured complex had absorption maxima at 410 nm. Beer's law is obeyed in the concentration range I0 µg to 250 µg/mL. Molar absorptivity is 0.4805×10^4/mol/cm and relative standard deviation is 0.95%.

Keywords: cetirizine dihydrochloride, dichloronitrobenzene, spectrophotometry, pharmaceutical formulation