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Physical Sciences

Pak. J. Sci. Ind. Res. 2007 **50**(1) 1-4

# Colorimetric Analysis of Piroxicam

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(received March 3, 2006; revised October 10, 2006; accepted October 16, 2006)

**Abstract.** A simple and accurate spectrophotometric method is proposed for the analysis of piroxicam. A yellowish-green complex was formed between piroxicam and copper sulphate pentahydrate at room temperature, which was determined at 480 nm. A valid Bee-Lambert's plot over the range of 2 to 12 µg/ml and the calculated molar absorptivity is $3.98 \times 10^3$ l/mol/cm. Nine (9) out of eleven (11) brands tested passed the test with values ranging from 97 to 103%, while the other two brands having percentage values outside the specified range failed the test. This colorimetric method was successfully applied to the analysis of bulk pharmaceuticals and pharmaceutical dosage preparations and the results have been statistically analyzed. The proposed method is precise, simple, sensitive and fast, enabling the direct determination of piroxicam without previous extraction and use of expensive equipment and toxic/unaffordable reagents.

**Keywords:** piroxicam, copper sulphate pentahydrate, pharmaceutical preparations, colorimetry

Pak. J. Sci. Ind. Res. 2007 **50**(1) 5-9

# Zinc Electroplating-Hull Cell Studies

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(received September 18, 2006; revised November 20, 2006; accepted December 15, 2006)

**Abstract.** Influence of additives in acid zinc chloride plating bath was observed. Eight various types of additives were used and effect was studied using Hull cell test. The zinc plating was carried out using bath, zinc chloride 50-60 g/l, boric acid 20 g/l, potassium chloride 250-275 g/l, at pH 5.0-5.4, temperature 35-40 °C, cell voltage 1-1.1 V, cell current 1.5 A and plating duration five minutes. Appearance of the deposit was best at vanillin 2.5 g/l.

**Keywords:** zinc electroplating, Hull cell, appearance, additives

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# Extraction Behaviour of $Fe^{3+}$ From Chloride Solution by Technical Grade D2 EHPA: A Comparison with the Results Obtained by Analytical Grade

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(received July 17, 2006; revised December 9, 2006; accepted December 16, 2006)

**Abstract.** The solvent extraction of $Fe^{3+}$ from chloride solution by technical grade (t.g) di-(2-ethylhexyl) phosphoric acid, D2EHPA dissolved in kerosene has been investigated over a wide range of aqueous acidity as a function of phase contact time, concentrations of $Fe^{3+}$, HCl, $H^+$ and $Cl^-$ in the aqueous phase, D2EHPA concentration in the organic phase and temperature and the results have been compared to that reported for analytical grade (a.g). Equilibrium time is 60 min, compared to 50 min for a.g. Natures of $Fe^{3+}$ concentration dependences are not similar and the values of extraction ratio are usually hundred times greater for t.g. than for a.g. under similar conditions. The HCl dependence plots pass through a maximum and a minimum at 1.6 M and 1.1 M HCl, respectively, whereas, these are at 1.2 M and 0.3 M HCl, respectively, for a.g. At $[Cl^-]$ = 3 M, the shape of $H^+$ dependence plot for t.g. reagent differs widely from that for the a.g. The extraction is also found to be immenesely dependent on $[Cl^-]$ for both the grades of extractant, but the extent of dependence under similar condition depends on the grade of extractant used. The extractant dependences are lower for t.g. compared to those for a.g. Reactions are exothermic in higher temperature region, whereas, the extraction is almost independent of temperature in its lower regions. The apparent enthalpy change, $\Delta H$ value in the higher temperature region is decreased with decreasing $H^+$ concentration in the aqueous phase. But the opposite trend was observed with a.g. The loading capacity depends on the aqueous acidities and grades of D2EHPA. It is 13.05 and 6.83 g of $Fe^{3+}$ per 100 g D2EHPA (t.g.) at [HCl] of 0.13 and 3 M, respectively, compared to 8.38 and 3.14 g of $Fe^{3+}$ per 100 g D2EHPA (a.g.) at [HCl] of 0.05 and 1 M, respectively. Mechanism of extraction is complicated by the simultaneous extractions of $Fe^{3+}$, $FeCl^{2+}$, $FeCl_2^+$, $FeCl_3$, $HFeCl_4$, etc. in both cases. It is observed that 99.4 % of iron species extracted by D2EHPA (t.g.) in the organic phase can be stripped by 5 M HCl in three stages at organic to aqueous phase ratio of unity. Organic phase after one cycle can be recycled after adding 0.72 g $dm^{-3}$ mono-(2-ethylhexyl) phosphoric acid, M2EHPA.

**Keywords:** extraction equilibrium, iron(III) extraction, technical grade D2EHPA, chloride medium, stripping

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# Lycopene in Tomato and Tomato-Based Products: Levels and Their Contribution to Dietary Lycopene

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(received July 7, 2005; revised December 5, 2006; accepted January 8, 2007)

**Abstract.** Lycopene is a carotenoid that has antioxidant properties and imparts the red pigment in some fruits and vegetables. Tomato (*Lycopersicon esculentum* Mill.) is one of the predominant source of lycopene in a typical Nigerian diet. This study evaluates the lycopene contents of various commonly consumed tomatoes and tomato products and estimates its daily intake levels. A rapid and simple spectrophotometric method for analyzing lycopene content in tomatoes and tomato products was used. Lycopene content in various tomatoes and their products on a fresh weight basis ranged from 56 mg/kg to 371 mg/kg. Average daily dietary lycopene intake levels were assessed by means of food frequency questionnaire and were estimated to be 33.39 mg/day. Fresh tomatoes accounted for 54% of total lycopene intake. The lycopene/β-carotene ratio of tomato products is less than unity while that of fresh tomatoes is greater than unity.

**Keywords:** lycopene, antioxidant, tomato products, dietary intake, spectrophotometric technique

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# The Pollution Status of Some Selected Rivers in Ado-Ekiti, Nigeria

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(received September 25, 2004; revised December 21, 2006; accepted December 30, 2006)

**Abstract.** The pollution status of three rivers (Ureje, Awedale and Ologan) in Ado-Ekiti, Ekiti State, Nigeria was investigated by carrying out necessary physicochemical, microbiological and heavy metal (elemental) analyses on them. Twenty physicochemical parameters were determined, notable results were as follows; Temperature ranged from 25.01-26.01 °C; Colour, 29.30 - 35.16 true colour units (TCU), pH 6.15 - 6.58; total suspended solids (TSS), 0.10 - 1.00 mg/l; total dissolved solids (TDS), 100 - 284 mg/l; total solids (TS), 156 - 394 mg/l; acidity, 1.08 - 1.32 mg/l $CaCO_3$; total hardness, 100.2 - 106.8 mg/l $CaCO_3$; chloride, 0.61 - 0.71 mg/l; nitrate, 2.00 - 7.55 mg/l; sulphate, 2.50 - 3.16 mg/l; dissolved oxygen (DO), 5.80 - 7.10 mg/l; biochemical oxygen demand (BOD), 12.5 - 111.85 mg/l and chemical oxygen demand (COD), 17.70 - 183.12 mg/l. River Ologan showed highest values for colour, turbidity, alkalinity as $HCO_3^-$, nitrate, chloride, BOD and COD. For river Ureje, temperature, pH, conductivity, TDS, TS and total alkalinity were the highest. River Awedale was high in total hardness and sulphate. The elemental analyses also revealed that Cu, Cr, Pb, Mn and Cd were significantly high in river Ologan. Pb, Cr and Cd were non detected in Ureje while Cr and Cd were also non detected in Awedale. Majority of the results obtained for the physicochemical and elemental analyses far exceeded the WHO recommended values. Similarly the bacteriological analysis indicated the presence of coliform bacteria in all the rivers above the WHO recommended values. It can be concluded that all the rivers are heavily polluted with the degree of pollution being Ologan > Awedale > Ureje.

**Keywords:** water pollution, contamination, heavy metals, physicochemical parameters, Ado-Ekiti, Nigeria

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# Enrichment of Heavy Metals in Sediments as Pollution Indicators of the Aquatic Ecosystem

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(received August 8, 2006; revised December 16, 2006; accepted January 16, 2007)

**Abstract.** The sediment pollutant status of twenty three communities (villages) within the Ilaje local government area of Ondo state, Nigeria, was examined. These are communities, where oil spillage had occurred. Three other locations at Igbokoda were equally considered as a reference point. Nine heavy metals; copper (Cu),cadmium (Cd),cobalt (Co),iron (Fe),chromium (Cr),nickel (Ni),lead (Pb), zinc (Zn) and manganese (Mn) were determined in the sediments collected from the various communities. The lowest concentrations were observed with Co and Zn ranging from 0.11 to 0.82 mg/kg and 0.02 to 0.29 mg/kg respectively, while Co and Fe were at the highest concentrations ranging from 1004 to 2879 mg/kg and 806 to 3809 mg/kg respectively. Most of the metals in this study occur at concentration that calls for serious environmental concern especially for the water and its resources. Local differences were equally observed in relation to the depth of the ocean. Some of the metal controlling factors such as pH, organic carbon, and cations exchange capacity were implicitly considered and each was found to correlate respectively, with the metals examined. The results provided relevant benchmarks for addressing the protection of benthic organisms and for assessing the potential impact of sediment-associated chemical (heavy metals) on aquatic biota. The positive correlations as being displayed by some of the metals are indicative of similar source of pollutants.

**Keywords:** heavy metals, oil spillage, sediments, pollution, toxicity

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# Characteristics of *Silybum marianum* as a Potential Source of Dietary Oil and Protein

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(received March 24, 2006; revised December 12, 2006; accepted January 26, 2007)

**Abstract.** Seeds of *Silybum marianum* (milk thistle) plant were collected from Peshawar valley and evaluated. Study revealed 26.65% ± 0.25 fixed oil and 23.0% ± 0.38 protein. The oil extracted has linoleic acid (64.59%), oleic acid (23.59%), palmitic acid (12.62%), and stearic acid (5.9%) as major fatty acids. Proximate principals, minerals and oil quality indices were determined. The carbohydrate content is quite high (37.72 ± 1.64%), while it has low crude fibre contents (4.55 ± 0.23%). The seed oil shows the following physicochemical characteristics: 13.67 ± 0.23 meq/kg of peroxide value; 194.78 ± 0.23 of saponification value; 103.89 ± 0.56 g/100 g of iodine value and acid value of 1.93 ± 0.34%. The unsaponifiable matter (UNS) of the oil was 2.36% ± 0.45. The results of nutritionally valuable minerals indicates that seeds contains Mg 2,225 ppm, Ca 778.5 ppm, Cu 108.3 ppm, Fe 74.3ppm, Zn 69.4 ppm, Pb 44.3 ppm, Ni 35.5 ppm, Mn 23.5 ppm, Cr 6.8 ppm and Cd 3.2 ppm was found in lowest concentration. The qualitative analysis by thin layer chromatographic (TLC) technique for the protein hydrolyzate revealed ten amino acids. Among these aspartic acid, glycine, glutamic acid and cysteine were the major amino acids. Results of this preliminary investigation indicated that the oil might be edible as inferred from its chemical composition and fatty acid profile.

**Keywords:** *Silybum marianum*, protein, fixed oil, fatty acid, mineral elements, physicochemical properties

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## Short Communication

# Effect of Sand Roasting on the Fatty Acid Composition and Physicochemical Characteristics of Oil Extracted from *Arachis hypogea*

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(received June 14, 2006; revised November 6, 2006; accepted November 11, 2006)

**Absctract.** The fixed oil from the seeds of two varieties of *Arachis hypogea* was characterized and studied for its fatty acid composition by gas chromatography (GC). The effects of sand roasting on the physicochemical properties and the fatty acid composition were studied. The comparison of the oils before and after sand roasting showed that the oil extracted from the seeds before roasting contained palmitic acid (8.2 - 8.82%), stearic acid (3.7 - 3.9%), oleic acid (59.1 - 59.87%), linoleic acid (22.7 - 22.9%), linolenic acid (1.3 - 1.84%) and arachidic acid (3.6 - 3.7%). The oil extracted from the seed samples that were sand roasted had altered fatty acid composition and physicochemical constants. The percentage of stearic acid and linoleic acid was reduced after sand roasting, while there was increase in concentration of oleic acid. The peroxide and acid values increased while the iodine and saponification values showed decreasing trend. However, the changes observed were not to the extent of showing any adverse effect on the nutritional value of the oil extracted after sand roasting of the seeds of *Arachis hypogea.*

**Keywords:** *Arachis hypogea*, leguminosae, physicochemical properties, fatty acid composition, gas chromatography (GC)

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## Short Communication

# Study on the Level of Trace and Toxic Elements in Soft Drinks and Juices Popularly Consumed in Bangladesh and its Influence on Dietary Intake

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(received September 6, 2005; revised November 22, 2006; accepted December 15, 2006)

**Abstract**. A study was carried out on trace element levels in locally available 42 brands of soft drink and fruit juice samples. The elements, Si, Cr, Mn, Fe, Zn, Sr and Ba were measured in 29 soft drinks and 13 fruit juices. The average concentrations of these elements, in soft drinks were 16.44, 0.11, 0.05, 0.12, 0.32, 0.17 and 0.01 mg/l, and in fruit juices were 15.42, 0.13, 0.09, 0.38, 0.60, 0.13 and 0.03 mg/l, respectively. Taking 0.5 l of soft drink and fruit juice together into account as the average weekly consumption by a Bangladeshi, and the mean concentrations of Si, Cr, Mn, Fe, Zn, Sr and Ba mg/l measured in both soft drinks and fruit juices, the calculated weekly dietary intake values of these elements were 7.4, 0.05, 0.03, 0.12, 0.22, 0.07 and 0.01 mg, respectively. The present dietary intake values were found to be much lower than the values reported in the literature and seemed to contribute not adequately to our total dietary intake. The average daily dietary intake of Cr from the investigated soft drinks and fruit juices was 7.7 µg, which indicates15% contribution to the National Research Council (NRC) recommended dietary intake value of 50-200 µg/day.

**Keywords:** trace elements, soft drinks, fruit juices, AAS, ICP-OES

Biological Sciences

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# Effect of Water Activity ($a_w$), Moisture Content and Total Microbial Count on the Overall Quality of Buns

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(received April 4, 2003; revised May 5, 2005; accepted May 23, 2005)

**Abstract.** A study was conducted on the effect of moisture content, water activity ($a_w$), and total microbial count on the overall quality of branded buns ($S_1$, $S_2$, $S_3$) and buns produced by cottage bakeries ($S_4$, $S_5$, $S_6$), over a period of 5 days. The samples were stored at 12-25 °C and evaluated for water activity, moisture content and total microbial count, fortnightly. The percent moisture content of $S_1$ (35.5), $S_2$ (33.0), $S_3$ (36.5), $S_4$ (34.3), $S_5$ (34.8) and $S_6$ (36.5) increased to 43.3, 37, 40.7, 44.2, 40.5 and 42.2%, respectively, while the $a_w$ values of these increased from 0.950 to 0.988 during storage. Minimum microbial growth was observed in $S_2$ (42.6 cfu/g), while maximum in $S_4$ (147.6 cfu/g). The branded bun $S_2$ had the highest overall acceptability with regard to its organoleptic quality. Statistical analysis showed that storage had a significant effect ($p < 0.05$) on $a_w$, moisture content, microbial growth and organoleptic quality of the two categories of buns studied.

**Keywords:** bun, water activity, microbial growth, cottage bakery, industrial bakery

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# Conversion of Fruit Waste into Protein-Rich Biomass by Fermentation

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(received April 11, 2005; revised June 29, 2006; accepted July 6, 2006)

**Abstract.** Microbial degradation of fruit waste was done to explore the potential of fruit wastes to produce digestible protein biomass for incorporation in the animal feed. Citrus waste (CW) and mango stones (MS) were selected for upgrading their nutritive values. Selected strains of the fungus (*Aspergillus oryzae*) were used to breakdown the substrate (fruit wastes) from the complex cellulosic matter into protein-rich biomass, which resulted in the production of 0.593 kg/kg biomass with 28.9% protein (MS), and 0.576 kg/kg biomass with 22.4% protein (CW). Qualitative evaluation of the fermented biomass protein showed a rich source of amino acid profile. The results show that microbially degraded fruit waste can be used as a supplement feed for animals. Nutritional and toxicological studies on monogastric animals (albino rats) showed no adverse effects on their digestive system, which exhibited 66% and 83% fertility in their teratogenic cycle.

**Keywords:** citrus waste (CW), mango stones (MS), normal basal diet (NBD), *Aspergillus oryzae*, fruit waste biodegradation, fruit waste fermentation

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# Combining Ability Estimates in Nine Eggplant Varieties

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**Abstract.** Combining ability effects were estimated for yield, yield components and plant height in a 9 x 9 diallel analysis excluding reciprocals. The variances for general combining ability (GCA) and specific combining ability (SCA) were highly significant indicating the presence of additive as well as non-additive gene effects in the traits studied. The relative magnitude of these variances indicated that additive gene effects were more prominent for all the character under study. The eggplant genotype P4 proved to be the best general combiner for yield followed by P1 and P5. In general the cross P4 x P5 proved better for yield and also number of fruits per plant, whereas the cross P7 x P9 for fruit diameter and individual fruit weight.

**Keywords:** eggplant (*Solanum melongena* L.), combining ability, general combining ability (GCA), specific combining ability (SCA)

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# Ethnobotanical Studies of Economically Important Plants of Gilgit and Surrounding Areas, Pakistan

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**Abstract.** Ethnobotanical study was conducted for economically important plants of Gilgit and surrounding areas and 13 localities visited during the field trip and 170 plant specimens ( Accession No. 123483 to 123673 ) were collected along with ecological and ethnobotanical information from local inhabitants. The collected plant material was dried, pressed, preserved, accessioned, identified and deposited in the Herbarium.A total of 34 plant species were found to have well defined traditional uses over generations. A total of 22 families (including 20 families of Angiosperms and 2 of Gymnosperms) were studied from Gilgit, Chinar Bagh, Kargah Nallah, Gorikot, Doian, Jaglot, Astore, Hunza, Aliabad, Rakaposhi, Karimabad, Nasirabad and Nomal valley, Pakistan. It was recorded that majority of plants are being utilized in indigenous medicine for remedy of various diseases**.**

**Keywords:** ethnobotanical studies, medicinal plants, economic importance of plants, Gilgit (Pakistan)

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## Short Communication

# Prevalence of Gastrointestinal Helminthes in *Gallus domesticus* in Nigeria

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(received October 08, 2005; revised October 16, 2006; accepted December 12, 2006)

**Abstract.** A parasitologic investigation was carried out on the gastrointestinal contents of one hundred domestic fowls (*Gallus domesticus*) in Lagos and Ibadan, southwestern, Nigeria. Seventeen species of helminth parasites were recovered with a total prevalence of 52%. The parasites recovered were cestodes (eight species) and nematodes (nine species). No trematode parasite was recorded. Fowls that were continuously housed, strictly controlled and intensively reared were less liable to infections. This investigation revealed that in Lagos and Ibadan, Nigeria, there is a great spectrum of parasitism of the digestive tract of chickens.

**Keywords:** parasitosis, gastrointestinal contents, cestodes, nematodes

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# Technology

# Effect on Physicochemical Characteristics and Phytic Acid Content of Soybean During Soynut Processing

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**Abstract.** The nutritional benefits, and therapeutic value of soybean lures the technologists to develop viable technologies, for the production of ready-to-eat and health promoting snack foods with all nutrients intact. One, such technology for fried soybean (soynut) has been successfully developed, and evaluated for its nutritive quality, consumer acceptability and content of phytic acid (an anti-nutritive factor). Soynut contains 33.74% protein, 26.69% lipids, 4.40% minerals and 504 kcal energy/100g. The product was subjected to consumer evaluation with about 90% of the consumers accepted the product showing their preferences for colour, texture, taste and mouth feel. Various processing steps like boiling, subsequent soaking, and frying, significantly reduced the phytic acid content of soybean i.e. 11.31%, 21.64% and 35.12% respectively, as compared to raw soybean.

**Keywords:** soynut, physicochemical characteristics, phytic acid content, soybean