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Physical Sciences

Selective Nitrations of 2-(1′-Phenylpyrazol-4′-yl) Benzimidazoles

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(received January 10, 2009; revised August 7, 2009; accepted August 8, 2009)

Abstract. Nitration of 2-(1′-phenylpyrazol-4′-yl) benzimidazole ring system was found to be temperature dependent. Room temperature nitration occurred at the phenyl ring of pyrazole, while at 100 °C, a dinitrated product is obtained where the second nitro group is introduced at the 5-position of the benzimidazole ring. Nitration at 100 °C leads directly to the expected dinitration product. Mass spectral fragmentations for both the compounds is described.

Keywords: pyrazoles, benzimidazoles, nitration, mass spectra

Pak. J. Sci. Ind. Res. 2009 **52** (6) 293-295

Effect of Methylmethacrylate and Ethylenediamine on the Physicomechanical Properties of High Strength Portland Cement

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(received November 11, 2008; revised September 18, 2009; accepted September 30, 2009)

Abstract. In the study of the effect of methylmethacrylate ($C_5H_9O_2$) and ethylenediamine ($C_2N_2H_8$) on the physicomechanical properties of high strength Portland cement, addition of methylmethacrylate upto 5% strength showed negative effect on the bulk density, cold crushing strength and hydration of the cement; however, the negative effect was relatively less in case of lower concentrations ($\leq$ 2%). Addition of ethylenediamine upto 3% concentration showed remarkable increase in these properties.

Keywords: portland cement, additives, methylmethacrylate, ethylenediamine

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Kinetics and the Effect of Refining Methods on the Physicochemical Properties, Fat Soluble Vitamins and Nutritional Metal Content of *Hura crepitans* Oil

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(received March 16, 2009; revised May 21, 2009; accepted August 5, 2009)

Abstract. The effect of three refining methods, *viz.* alkali refining, degumming and bleaching was investigated on the physicochemical properties, fat soluble vitamins and nutritional metal content of *Hura crepitans* oil. The processes increased the glyceride content while there was reduction in the nutritional metal content of the oil. The effect of temperature (60-180 °C) and time (upto 90 min) was also considered using the bleaching method with surface active clay and activated charcoal. The adsorption of peroxides was adequately modeled by Arrhenius type of equation and described by the first-order kinetic. The activation energy for bleaching at 120 °C and 45 min was 244.60 cal/mole. Among all the refining methods, bleaching appeared to be the best technique for refining in terms of stability and improvement of physicochemical properties of the *H. crepitans* seed oil.

Keywords: oil refining methods, physicochemical properties, vegetable oil, *Hura crepitans* seed oil, vitamins, minerals

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Stability Studies on Refined Soybean Oil Stored in Various Conditions

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Abstract: The 12 months stability study of freshly produced refined soybean oil revealed that refined soybean oil stored in plastic containers in dark was more hydrolytically and oxidatively stable than that stored in other containers in light condition. There was no significant difference at $P < 0.05$ in free fatty acids and acid value of oil stored under light and dark conditions in tin and glass containers but there was significant difference at $P < 0.05$ in peroxide value of oil stored in light and dark conditions in all the storage containers. Light increased the degree of oxidative rancidity of refined soybean oil, the most in tin containers, followed by glass containers and the least in plastic containers.

Keywords: soybean oil, light and dark conditions, stability study

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Determination of Copper, Manganese, Nickel and Zinc in Different Cigarette Brands Available in Pakistan

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(received May 15, 2009; revised September 3, 2009; accepted September 7, 2009)

Abstract. Mean values of copper, manganese, nickel and zinc in different cigarette brands sold in Pakistan were found to be in the range of 8.61 to 94.67 µg/g, 26.40 to 98.20 ㎎/g, 0.61 to 8.58 ㎎/g and 16.92 to 99.60 ㎎/g, respectively, through Atomic Absorption Spectrophotometer (AAS). The results are discussed with reference to and in comparison with the mean average concentration of these elements reported in the cigarettes of other countries.

Keywords: cigarette, tobacco, smoking, heavy metals, health effect

Pak. J. Sci. Ind. Res. 2009 **52**(6) 312-315

Studies on Cu (II) and Ni (II) Sulphate Chelates of Benzyl, Salicylic and Acetyl Salicylo-Hydrazones

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(received October 8, 2008; revised August 6, 2009; accepted September 30, 2009)

Abstract: Six complexes of Cu(II) and Ni(II) sulphate of acetaldehyde, benzaldehyde and salicylic acid with salicylic hydrazide were synthesized and characterized. The hydrazone acts as neutral bidentate clones coordinating *via* the carbonyl oxygen and its azomethine nitrogen, while the sulphate ions are in the outer coordination sphere. The bioactivities of ligands were enhanced on complexation.

Keywords: sulphate chelates, salicylic hydrazides, acetyl salicylo-hydrazones, hydrazones

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Effect of Additives on the Yield and Quality of Palm Oil

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(received August 20, 2008; revised October 10, 2009; accepted October 13, 2009)

Abstract. In the study of the effect of additives namely *Manihot esculenta* Crantz, (cassava), *Erythrina senegalensis* (ukwa) and *Oxytenanthera* species (bamboo) leaves, on the yield and quality of traditionally processed palm oil, the raw leaves were found to contain some anti-nutrients like tannins, oxalates, trypsin inhibitors, alkaloids and phytic acid at tolerable levels. The additives increased the yield from 300 ml (of the control) to 450 ml with a standard deviation of 60.6 ml. The peroxide value was in the range of 0.4-1.0 meq/kg, free fatty acid varied between 0.847-1.12 mg KOH/g, iodine value between 51.01-52.54, saponification value between 7.84-93.97 KOH/g of oil and moisture content, between 1.4-1.8%. Analysis of variance (ANOVA) showed significant differences, ($P<0.05$) in the yield, relative density, peroxide value, iodine value and saponification values. However, there were no significant differences ($P>0.05$) in the moisture contents, free fatty acid, specific gravity, smoke point, flash point and fire points. The standard deviation results revealed that the palm oil produced using ukwa leaf differed from the others in terms of smoke, flash, and fire points. Cassava leaves was the best of the studied additives in terms of yield with the physical properties comparing favourably with the control. Chemical properties were similar to the control with the exception of the saponification value.

Keywords: palm oil, additives, yield, *Manihot esculenta*, *Erythrina senezalensis*, *Oxytenathera* sp.

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Biological Sciences

Cotton Leaf Curl Rajasthan Virus Infecting Tomato in Pakistan

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(received June 11, 2009; revised September 10, 2009; accepted October 21, 2009)

Abstract: Tomato plants showing phenotypically symptoms of tomato leaf curl disease (ToLCD) were collected in Faisalabad, Pakistan. These exhibited a severe downward leaf curling with enation on the lower side of the leaf. In order to identify the begomovirus components associated with the disease phenotypes, DNA extracted from them was screened by PCR using specific primers for ToLCNDV DNA A and DNA B and a universal beta satellite primer pair (designed to detect all beta satellite). Tomato sample was found positive for ToLCNDV DNA A and beta satellite. The fragments amplified were cloned and sequenced. The begomovirus sequence obtained showed the highest levels of sequence identity (99%) to cotton leaf curl Rajasthan virus (CLCuRV), a virus previously identified in cotton showing symptoms of cotton leaf curl disease (CLCuD). The sequence of beta satellite showed 99% identity to the beta satellite associated with CLCuD. This is the first time CLCuRV has been identified in tomato and indicates that this host can serve as a reservoir for the agent causing CLCuD. Partial repeat constructs for *Agrobacterium*-mediated inoculation have been produced to show infectivity of these clones (to fulfill Koch's postulates), for studying their host range and potential threat to crops.

Keywords: begomovirus, geminivirus, whitefly, tomato disease, beta satellite, CLCuRV in tomato, CLCuD

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Effects of Delayed Mating on Reproductive Performance of *Ephestia cautella* [Walker] [Lepidoptera: Pyralidae]

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(received January 26, 2009; revised September 30, 2009; accepted October 10, 2009)

Abstract. The effect of age at mating of male and female warehouse moth, *Ephestia cautella* (Walker), soon after the emergence or delayed for 1-5 days was studied on the number of eggs laid (fecundity), egg viability, longevity and adult emergence. It was found that with the delay in mating after emergence of male, female or both, the number of eggs laid decreased proportionately. Egg viability decreased when female or both male and female were delayed from mating for more than 4 days. Male insects, that were delayed from mating, lived longer than the females delayed from mating. Average male and female longevity in all the treatments was 10 and 7 days, respectively. Delayed mating had significant effect on females than on males. Unmated males lived longer than the mated males. Thus methods that can delay and disrupt mating may be effective behavioural strategies for managing *E. cautella*.

Keywords: *Ephestia cautella*, mating delay, longevity, adult emergence, eggs

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Evaluation of Five Indigenous Medicinal Plants of Sindh, Pakistan for their Antifungal Potential

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(received May 18, 2009; revised October 7, 2009; accepted October 12, 2009)

Abstract. Candidiasis and systemic mycosis due to opportunistic pathogens is frequently reported in Sindh, especially in rural areas. In search of local antifungal medicinal plants, methanol, petroleum ether and aqueous extracts of five native medicinal plants *Trachyspermum ammi*, *Hyoscyamus niger*, *Carum roxburgianum*, *Linum usitatissimum* and *Centella asiatica* were screened against five *Candida* strains including three strains of *Candida albicans* and one strain of *C. glabrata* and *C. tropicalis*, each. Antimicrobial screening of five filamentous fungal strains of clinical origin comprising of three strains of *Aspergillus niger*, one species of *A. flavus* and *Penicillium* each, revealed 100% activity of methanolic extract of *T. ammi*; petroleum ether extract of *T. ammi* and *H. niger* and methanolic extracts of *H. niger*, *C. asiatica* and *C. roxburgianum* produced 60, 20, 50, 50 and 10% inhibition, respectively, whereas, *L. usitatissimum* was inactive. Reference antibiotics were Nystatin and Amphotericin-B for yeast species and filamentous fungi, respectively. Least minimum inhibitory concentration (125 mg/disc) against *Candida* sp. was produced by the methanolic extract of *T. ammi* and *H. niger* and 500 and 1000 mg/disc against *Aspergillus* species, respectively. Results indicated that *T. ammi* and *H. niger* may be considered as potential future antifungal agents.

Keywords: mycosis, candidiasis, *Trachyspermum ammi*, *Hyoscyamus niger*, *Carum roxburgianum*, *Linum usitatissimum*, *Centella asiatica*, filamentous fungi

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Potassium Dynamics Under Exhaustive Cropping of Sudan Grass (*Sorghum vulgare*) in Some Indian Soils

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(received May 28, 2008; revised August 29, 2009; accepted October 10, 2009)

Abstract. In order to study the effect of different levels of K exhaustion on potassium dynamics, Sudan grass was grown in clay pots containing 5 kg of three types of soils each namely Alfisol, Vertisol, and Inceptisol from India. Potassium was applied at the rate of 0, 50, 100, and 200 mg/kg before starting the experiment and after each of the first three cuttings. Seven cuts of Sudan grass were taken over a period of 280 days, at 4-6 week intervals. Potassium content of Sudan grass increased with increased amounts of K applied as fertilizer. The highest values for K concentration in Sudan grass were recorded in the 1st and the 2nd cuts and gradually decreased up to the last cut, but the rate of decrease was much lower in moderately exhausted soils (AK_{200}, BK_{200}, and RK_{200}). In Inceptisol and Vertisol as the intensity of exhaustion increased the contribution of non-exchangeable K (NE-K) to meet the plant demand also increased, but in Alfisol a reverse trend was noticed (decrease in replenishment rate). Total amount of NE-K utilized by crop was high in K_0 and low in K_{200} treatment in all the soils, but the proportion of percent share of K_0/K_{200} was the highest in Inceptisol (4.5), medium in Vertisol (3.50) and the lowest in Alfisol (2.29).

Keywords: K dynamics, K depletion, exhaustive cropping, Sudan grass, Indian soils, *Sorghum vulgare*

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Advanced Wheat Genotypes Response to *Helicoverpa armigera* Hubner Infestation

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Abstract. In the evaluation of the response of 20 wheat genotypes in terms of spike and grain damage caused by *Helicoverpa armigera* Hubner, a significant genotypic variability was found to exist among the wheat genotypes for all the traits studied. Grain yield ranged from 2931 (DN-10) to 4333 (AUP-9701) kg/ha, whereas, spike and grain damage ranged from 19.95 to 80.47 and 3.90 to 22.16% in various wheat genotypes, respectively.

Keywords: *Triticum aestivum*, *Helicoverpa armigera*, variety, grain yield, losses

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Technology

The Effect of Unsaturated Polyester Resin from Recycled PET as Compatibilizer for Styrene-Butadiene (SBR)/Acrylonitrile-Butadiene (NBR) Rubber Blend

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(received March 3, 2009; revised September 16, 2009; accepted September 30, 2009)

Abstract. Unsaturated polyester resin (UPR) from recycled PET flakes was prepared by depolymerization with propylene glycol and polyesterified with adipic acid. The effect of addition of 5, 10 and 15 phr of unsaturated polyester resin (UPR) on the compatibility and physicomechanical properties of styrene-butadiene rubber (SBR) and acrylonitrile-butadiene rubber (NBR) blends were studied. DSC, TGA, MDR, FTIR and chemical methods were used to determine the degree of compatibility. The mechanical and physical properties of the blends were found to improve with addition of 10 phr UPR for SBR/NBR blend.

Keywords: polyester resin, PET flakes recycled, Styrene-butadiene rubber, acrylonitrile-butadiene rubber, depolymerization, unsaturated polyester resin, rubber blends

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