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DESULPHURIZATION OF LIGNITIC COALS USING AQUEOUS CUPRIC CHLORIDE

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Desulphurization of lignitic coal of Pakistan, using an aqueous solution of cupric ions as an oxidant at different temperatures was accomplished in sealed tubes. Desulphurization occured as reaction started. At the early stage of reaction, reduction of sulfur was rapid and thus with the passage of time it became slow. Increment in the level of desulphurization occurred with the increasing concentration of cupric ions and temperature. Reduction of sulfur drops of the levels of ash contents and enhances the value of Clorific Value (CV).

Key words: Desulphurization, Cupric ions, Reduction, Oxidant, Lignitic coal.

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ACIDITY OF THE EEFLUENTS PRODUCED DURING AIR BLOWING OF ASPHALT

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The effluents (distillate) obtained during air blowing of asphalt in presence of metallic salts, were evaluated for their amount, gravity and acidic content. The acidic gases decrease the life of the plant and cause environmental problems. During a 15 h air oxidation (blowing) period, it was observed that for feed-I, amount and acidity were effected by the catalysts. Variation in the amount and gravity of effluents during feed II and III air blowing was not so distinct as with feed I. This indicates that the extent of amount and acidic content of the effluents also depend on the composition of feed.

Key words: Asphalt, Air blowing, Catalyst, Acidity, Effluent.

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SIMPLE ONE-STEP SYNTHESES OF HETEROCYCLIC SYSTEMS FROM 2-PHENYL-4-THIENYLMETHYLIDENE-5*(4H)*-OXAZOLONE

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The title compound **1a** was synthesised and its *(Z)*-configuration was assigned. The present investigation was intended to study the behavior of **1a** towards nitrogen, carbon and oxygen nucleophiles. Thus, treatment of **1a** with *p*-toluidine in ethanol and/or acetic acid afforded the thienylaminomethylidene-5-(4H)-oxazolone **2** and alkenamide **3** together with the imidazolinone **4**, respectively. Hydrazinolysis and azidolysis of **1a** resulted in the vinylthiophene derivatives **5a,b** and the tetrazole **8**. The triazine **6** and oxadiazinone **7** were obtained upon the effect of phenylhydrazine and hydroxylamine on **1a** respectively. When compound **1a** was allowed to react with carbon nucleophiles namely, phenylmagnesium bromide and/or dry benzene under Friedel-Crafts conditions, it gave the acylated product **9** whereas the ester **10** was obtained from the reaction of **1a** with sodium ethoxide. In the absence of aromatic hydrocarbon and in acetylene tetrachloride as inert solvent containing anhydrous $AlCl_3$, **1a** underwent intramolecular alkylation and/or acylation to afford the respective thieno [3, 2-c] pyridine **11** and cyclopentadieno [b] thiophene **12**.

Key words : 4-Ylidene-5(4H)-oxazolone, Imidazolinone, Triazine, Tetrazole, Thienopyridine and cyclopentadieno [b] thiophene.

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SYNTHESIS AND ANTI-MICROBIAL ACTIVITY OF SOME HETEROCYCLES: *PART-II*

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Thieno[2,3-d]pyrimidines **(2)**, **(3)** and **(4)** have been obtained via the reaction of 2-amino-4, 5-dimethylthiophen-3-carbonitrile (1) with formamide, acetonitrile and benzonitrile respectively. Treatment of **(2)**, **(3)** and **(4)** with chloroacetaldehyde respectively afforded imidazo[1,2-c]thieno[3,2-e]pyrimidines **(5)**, **(6)** and **(7)**. Anti-microbial activity of the above compounds was determined.

Key words: Thieno[2,3-d]pyrimidines, Chloroacetaldehyde, Imidazo[1,2-c]thieno[3,2-e]pyrimidines.

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COMPARATIVE STATISTICAL APPROACH FOR THE ASSESSMENT OF POLLUTION OF HEAVY METALS IN RAWAL LAKE WATER AND MAIN STREAMS ENTERING RAWAL LAKE

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This study was conducted to assess the distribution of heavy metals (Cr, Co, Cd, Zn, Ni, Cu, Mn and K) in water and liquid waste samples at different stations of Rawal Lake and main streams entering Rawal Lake (Pakistan). The samples were analyzed by flame atomic absorption spectrophotometer. The results were discussed in view of quality standards set by Environmental Protection Agency. At most sites of Rawal Lake, concentration of Ni was relatively high and exceeded the permitted levels. Statistical methods of relevance to the trace metal data have been applied such as standard deviation, average concentration and correlation coefficients for investigating the distribution pattern of metals in water and liquid waste system.

Key words: Water pollution, Heavy metals, Statistical analysis, Rawal Lake.

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INVESTIGATION OF PB, ZN, MN, NI, CO AND CR IN INSOLUBLE DUSTFALL

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Dust samples collected from different locations in urban areas of Peshawar were analyzed for lead, zinc, manganese, nickel, cobalt and chromium using atomic absorption spectrophotometric technique. Elemental concentrations of the studied elements did not vary significantly at different sample locations. A comparison of the elemental contents with the local soil was also made. Soil, road dust, vehicle exhaust, metallic corrosion, tire wear, zinc compounds in rubber material, galvanized material, weathering and corrosion of building material are some of the possible sources of heavy metal pollution in Peshawar. Peshawar can be considered as one big urban centre with high population and traffic density.

Key words: Heavy metals, Dustfall, Pollution.

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THE PRECARIOUS STATUS OF THE INDUS DOLPHIN (*PLATANISTA MINOR*) BETWEEN GUDDU AND SUKKUR BARRAGES IN 1999

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The history of ecological studies on the Indus River Dolphin (*Platanista minor*) is reviewed and constraints on counting the dolphins are critically assessed. In spite of its limitations the downstream transect count technique is the best practical solution at the present time. It is suggested that more reliable objective recording techniques need to be developed in order to assess accurately the size of the population and the use of recording hydrophones (PODS) is suggested. Since the Dolphin Reserve was set up in the early 1970s, the number of dolphins steadily increased. Although since the mid-1990s the number seems to have reached a plateau but this may be due to the variability of the counts.

Key words: *Platanista minor*, Indus dolphin, Ecological study.

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POTASSIUM ADSORPTION BEHAVIOUR OF THREE MALAYSIAN RICE SOILS

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Potassium (K) deficiency exists in different rice growing areas of Malaysia. A study on K adsorption was carried out in three Malaysian rice soils (Guar, Hutan and Kangar series) using six levels of K (0.00, 28.77, 33.57, 38.37, 43.16 and 47.96 mmol kg^{-1}). The data on K adsorption were fitted into Langmuir, Freundlich, and Temkin adsorption equations. Adsorption data were also correlated with pH, cation exchange capacity and organic matter content of the soils. Potassium adsorption increased linearly with increasing level of added K in all the three soils. The rate of increase was the highest in Guar series followed by Kangar and Hutan series, respectively. Potassium adsorption in two soils (Hutan and Kangar) fitted into Langmuir equation while the adsorption data in Guar series did not fit into this equation. Adsorption data in none of the soils fitted well in Freundlich and Temkin adsorption equations. Correlation between K adsorption and pH was significant ($r = 0.881$), whereas, correlation of K adsorption with either organic matter content or cation exchange capacity was non-significant. The results of this study indicated that K adsorption is mainly dependent on soil pH. In soils with higher adsorption capacity, more K fertilizer may be needed to get immediate crop response.

Key words: Potassium, Adsorption, Malaysian rice soils, Langmuir equation.

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NUTRITIONAL EVALUATION OF DIETS OF LOW-INCOME RURAL POPULATION FROM NWFP, PAKISTAN

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Results are presented for the levels of protein, fat, fiber, ash, iron, iodine, CHO and total energy in different food groups and whole diets collected from ten families. The data revealed that protein content was higher in meat group (14.6%) followed by cereal (5.8%), leafy vegetable (2.1%), root vegetable (1.7%) and lowest in salad (0.7%) groups. Maximum fiber (0.8%) and ash (2.8%) were found in leafy vegetable and meat groups respectively. The average nutrient contents consumed by members of 10 families revealed that the dinner time diets contain more nutrients than the breakfast and lunch time diets. The results indicated that except for carbohydrate contents, nutrients were present in comparatively larger quantities in the diets of higher income group than the other group. Fat contents were on adequate levels in both the groups (above 80% of RDA).

Key words: Diet, Nutritional composition, Population groups, Pakistan, Northern Province.

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GENETIC VARIABILITY, PARTIAL REGRESSION, CO-HERITABILITY STUDIES AND THEIR IMPLICATION IN SELECTION OF HIGH YIELDING POTATO GENOTYPES

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Partial regression coefficient, genotypic and phenotypic variabilities, heritability, co-heritability and genetic advance were studied in 15 Potato varieties of exotic and local origin. Both genotypic and phenotypic coefficients of variations were high for scab and rhizoctonia incidence percentage. Significant partial regression coefficient for emergence percentage indicated its relative importance in tuber yield. High heritability (Broadsense) estimates coupled with high genetic advance for plant height, number of stems per plant and scab percentage revealed substantial contribution of additive genetic variance in the expression of these traits. Hence, the selection based on these characters could play a significant role in their improvement. The dominance and epistatic variance was more important for character expression of yield ha^{-1}, emergence and rhizoctonia percentage. This phenomenon is mainly due to the accumulative effects of low heritability and low to moderate genetic advance. The high co-heritability coupled with negative genotypic and phenotypic covariance revealed that selection of varieties having low scab and rhizoctonia percentage resulted in more potato yield.

Key words: *Solanum tuberosum*, Coefficient of variability, Heritability, Regression.

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RESPONSE OF RICE TO NITROGENOUS FERTILIZER AND IRRADIATED SEWAGE SLUDGE

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(Received 2 January 2001; accepted 30 July 2002)

A greenhouse pot experiment was conducted to study the effect of γ-irradiated sewage sludge, applied alone or along with ^{15}N-labelled ammonium sulphate (1.0 atom % ^{15}N excess), on rice yield and N uptake. Six-kg portions of a clay loam were amended with sewage sludge to obtain N addition rates of 30, 60, 90 and 120 mg kg^{-1} soil. In other treatments, nitrogen was applied at 120 mg kg^{-1} as ^{15}N-labelled ammonium sulphate or 120 mg kg^{-1} as $^{15}NH_4$-N + sludge-N in the ratios of 1:3, 1:1,or 3:1. All the treatments were given before transplanting rice. Three healthy seedlings (4-week old) of rice (*Oryza sativa* L., var. Bas-Pak) were transplanted pot^{-1} and the plants harvested at maturity. Application of sewage sludge caused a significant improvement in rice yield. Grain yield increased by 188% at sludge-N of 120 mg N kg^{-1}. The yield benefit at similar rate of fertilizer N was 304%, the increase being more at higher rates of application. The increase in rice yield was dependent on uptake of N and sewage sludge significantly improved the availability of N to the plants. The additional plant N in sludge treated soil was partially attributable to enhanced mineralization of soil N and N_2 fixation by free-living microorganisms. Application of inorganic N led to a significant increase in the availability of N to plants from soil organic matter and sewage sludge. Results of combined application suggested that substantial savings of fertilizer N can be made by using sewage sludge on rice fields.

Key words: Sewage sludge, Rice, N uptake, ^{15}N, Fertilizer N, γ-irradiation

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ANTIBACTERIAL ACTIVITIES OF *THYMUS SERPYLLUM* ESSENTIAL OIL

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The antibacterial activity of the essential oil of *Thymus serpyllum* Linn. varied against gram positive bacteria (*Bacillus megaterium*, *B. subtilis*, *Lactobacillus acidophilus*, *Micrococcus leuteus*, *Staphylococcus albus*, *S. aureus*, *Vibrio cholera*) and gram negative bacteria (*Escherichia coli*, *Salmonella typhi*, *Shigella ferrarie*). The oil showed activity even at 50µg concentration. The antibacterial activity was comparable with standard antibiotics, Amoxil, Streptomycin and Kanamycin at same concentration against some of the gram positive and gram negative bacteria. At higher concentrations all the bacterial strains were more sensitive to oil than the standard antibiotics. The minimum inhibitory concentration (MIC) and minimum bactericidal/bacteriostatic concentration (MBC) of oil ranged between 90-170 µg ml^{-1} against the susceptible bacteria.

Key words: *Thymus serpyllum*, Essential oil, Antibacterial activity, Gram positive and gram negative bacteria.

Short Communication

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Nutrient Indexing of Maize in the Submontane Region of Indian Punjab

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Key words: Maize, Nutrient indexing, Punjab soil.

Maize is major kharif crop of the submontane region of the

medium content of organic carbon (0.07 to 0.67%). They had very low content of calcium carbonate (0-1.25%). As evident from the data in Table 1, the available S content in soils ranged from 0.5-18.0 mg kg^{-1} with a mean value of 7.1 mg kg^{-1}. On the basis of 10 mg kg^{-1} as the threshold value for available S (Kanwar 1963), 78 per cent of the samples had deficient content of available S. Such a high magnitude of S deficiency may be ascribed to the low organic carbon content and low suphate retention capacity owing to the coarse texture of majority of these soils. Contents of available Zn, Cu, Fe and Mn varied between 0.14-1.74, 0.06-1.5, 1.89-14.50 and 1.03-

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PYROGALLOL AS A REAGENT FOR SPECTROPHOTOMETRIC DETERMINATION OF AMMONIUM-NITROGEN (NH_4^+-N) IN AQUEOUS SOLUTION

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Pyrogallol (1,2,3-trihydroxybenzene) is proposed as a reagent for the spectrophotometric determination of ammonium-nitrogen (NH_4^+-N) in aqueous solution. Pyrogallol forms instantaneous pale-yellow complex with aqueous NH_4^+-N. The pyrogallol/ammonium-nitrogen (P/NH_4^+-N) complex has absorption maximum (λ_{max}) at 400nm and molar absorptivity (ε) of 9.706×10^2 $lmol^{-1}$ cm^{-1}. Beer's law is obeyed up to 5 µg NH_4^+-N ml^{-1}. The correlation coefficient (r) is 0.9983. The optimum pyrogallol concentration and optimum pH are found to be 0.06%(mv^{-1}) and 7.00, respectively. The method sensitivity is 0.063 µg NH_4^+-N ml^{-1}. The extent of ionic interference in the use of the proposed method has also been quantitatively evaluated. The most tolerated ions were K^+ and Cl^- (7.90×10^{-3} mol l^{-1} maximum) and the least tolerated ion was Al^{3+} (3.12×10^{-7} mol l^{-1} maximum). Recovery of NH_4^+-N from spiked water samples shows good result (98.77% to 101.94%). The proposed method has been applied to the determination of NH_4^+-N in some potable waters. Results are in good agreement with those obtained by a standard spectrophotometric method (Nessler's method).

Key words: Ammonium-nitrogen determination, Aqueous solution, Spectrophotometry, Pyrogallol.