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INORGANIC MERCURY DETERMINATION IN LOCAL PUBLIC UTILITY WATERS BY FLAMELESS ATOMIC ABSORPTION TECHNIQUE

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(Received May 11, 1983)

Based on the acid-medium reduction of mercury, a flameless atomic absorption method of general utility is proposed for the determination of inorganic mercury in public utility waters. Practical evaluation is made of the parameters governing the expelled mercury absorbance in an optical cell fabricated from inexpensive materials. These include dimensions of the reduction vessel, eluent flow rate and the volume of the solution as related to the optimum sensitivity conditions. Surface and underground water samples, originating from various local water supply systems, ranging in depth from 30-60 feet and feeding, on the average, a population of 10,000 or more, were analyzed for mercury content. A lower detection limit of 100 ng/l mercury for the proposed method is established with an average precision of $\pm 2.5\%$ corresponding to 2S confidence level for replicate measurements. The method has potential of application to mercury assay in food stuffs and beverages.

SOLVENT EFFECTS ON THE THERMODYNAMIC FUNCTIONS OF PROTON DISSOCIATION OF PHENOLS AND ANILINES

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(Received October 6, 1983)

For a systematic series of phenols and aniline, the thermodynamic functions of proton dissociation have been determined in a 50 weight per cent water-methanol solvent system, using an e.m.f.-spectrophotometric technique.

For phenols, the change in free energy on transferring from water to the mixed solvent system has been found to arise from a change in entropy – and therefore to a change in solvation – assuming entropy effects are primarily due to solvation of anions.

For aniline, solvent effects are minor, possibly because of no anion solvation in either water or mixed solvent systems.

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STUDIES ON THE COMPLEXES OF SOME MONOPHOSPHAZENES WITH Fe(III), Co(II), Ni(II), Zn(II), AND Ag(I)

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(Received January 1, 1983; revised June 6, 1984)

A series of complexes of general formulae $MLCl_2$ for Co(II), Ni(II), Cu(II), and Zn(II), $AgLNO_3$ for Ag(I) and $FeLClCl$ for Fe(III) complexes where $L = 1-o\text{-tolyl-2,2-dianline}$, 2(N-phenyl-thioureas) monophosphazene (L_1) and 1-o-tolyl-2,2-di(o-tolyl),2-(N-tolylthiourea) monophosphazene (L_2) were investigated spectrophotometrically and conductometrically. The results indicate the probable formation of 1:1 chelates (metal:ligand). The values of the apparent stability constant of the different complexes have been determined by continuous variation, mole ratio, straight line and limiting logarithmic methods. Solid chelates have been isolated and their structures established by elemental analysis and IR spectral data. It is concluded that the ligands are generally NS bidentate.

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CHARACTERIZATION OF WATERS

Part I. Spring Waters in and Around Karachi.

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(Received July 23, 1983)

The quality of water from 16 springs located within 150 km radius of Karachi has been evaluated. The paper describes in detail the various physical and chemical characteristics. An attempt has been made to assign possible reasons for the variation in their chemical composition and to classify them according to their quality.

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THIN LAYER CHROMATOGRAPHIC AND SPECTROPHOTOMETRIC ANALYSIS OF ETHYL TIN COMPOUNDS

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(Received December 28, 1981; revised April 25, 1984)

A procedure has been described for the separation of tetraethyl tin, tri-, di-, and monoethyl tin chlorides by thin layer chromatography on silica gel G type 60, using the mixture of ethylacetate, acetic acid and pyridine as solvent system. The quantitative estimation of each of these compounds were made possible by measuring the colour intensity in the visible region using the solution of diphenyl thiocarbazon in chloroform (pH 8.4) as colour producing reagent. R_f values were found to be 0.81, 0.53, 0.36 and 0.24 for the tetraethyl tin tri-, di-, and monoethyl tin chlorides, respectively.

**A THERMODYNAMIC STUDY OF Nd (III) CHELATES WITH
BENZOYLACETANILIDE AND ACETOACETANILIDES IN
ETHANOL-WATER MIXTURE**

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(Received February 1, 1981; revised May 19, 1984)

Potentiometric equilibrium studies have been made at 20, 25, 30, 35, 40°C for benzoylacetanilide (BAA), acetoacetanilide and their neodimium(III) chelates in nonaqueous medium. The dissociation constants of these ligands were computed as well as the stability constants of their neodimium 1:1 chelates at different ionic strengths and temperatures. The free energy, ΔG , the enthalpy, ΔH and the entropy change, ΔS , for the process of the dissociation of such ligands and the formation of their Nd(III) chelates are reported in 70% (v/v) ethanol-water mixture and 0.1M KNO_3 ionic strength.

**ISOLATION AND IDENTIFICATION OF AN INSECT REPELLENT COMPOUND FROM
SAUSSUREA LAPPA C.B. CLARKE**

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(Received August 27, 1983; revised June 3, 1984)

The insect repellent activity of the rhizomes of *Saussurea lappa* C.B. Clarke was found to be due to dehydrocostus lactone.

Biological Sciences Section

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DEVELOPMENT OF ERUCIC ACID AND GLUCOSINOLATE-FREE RAPESEEDS (CRUCIFERS) IN PAKISTAN*

Part I. Current Status of Cultivated Crucifers of Pakistan

Shafiq Ahmad Khan, Parveen Aziz, Khizar Hayat Khan, Javed Iqbal Khan,
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(Received January 8, 1984)

The present status of the cultivated crucifers in Pakistan has been surveyed including their production and processing statistics. Three species namely *Brassica campestris*, *Brassica juncea* and *Eruca sativa* contribute mainly and almost equally for the production of rape and mustard seed oil crop of the country. The glucosinolate levels of the seed and the erucic acid contents of the seed oil have been determined.

DEVELOPMENT OF ERUCIC ACID – AND GLUCOSINOLATE-FREE RAPESEEDS (CRUCIFERS) IN PAKISTAN*

Part II. Selection and adaptation of low Erucic Acid Crucifers in Pakistan

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Low erucic acid germplasm, selected from the local as well as the imported varieties from abroad was cultivated for evaluation in Pakistan. The erucic acid levels of the parents and their generations were determined and it was found that both *B. campestris* and *B. juncea* have potentials to become erucic acid-free oilseed crops in Pakistan.

NUTRITIVE SURVEY OF URBAN AREAS OF LAHORE

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(Received January 18, 1984)

Nutritional survey in an urban area of Lahore was conducted. The details of income, number of family members and daily food intake of fifty families was noted by direct interview method. It was concluded from the results that 54% of the total families were deficient in proteins according to FAO standards. The diets of 10% families was deficient in protein only and 6% was deficient in calories while 44% of the families suffered from deficiency of calories as well as proteins.

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ALLELOPATHIC EFFECTS OF PAKISTANI WEEDS: *ERAGROSTIS POAEOIDES* P. BEAUV

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(Received March 19, 1981; revised January 1, 1984)

Eragrostis poaeoides P. Beauv., an annual weed of cultivated fields in Pakistan, possesses allelopathic potential. Aqueous extracts from inflorescences and shoots invariably inhibited germination and growth of *Pennisetum americanum*, *Setaria italica* and *Brassica campestris*. Root extracts had no effect on these species. Soil collected from its underneath; shoot mulch or extract added to sterilized nutrient-rich growth medium reduced biomass of the aforementioned test species. Cytological study revealed the reduction of cell size of the aforesaid species and loss of cell division in *Allium cepa* root tips. The toxicity depended upon the part assayed, test species used and parameter measured. The present investigation suggest not to allow the decay of litter in crop fields due to its allelopathy.

RESIDUAL LIFE OF MONOCROTOPHOS, FENITROTHION AND ENDOSULFAN ON COTTON FOLIAGE*

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(Received June 19, 1982; revised August 30, 1982)

Cotton crop grown under controlled conditions was treated with concentrates of monocrotophos, fenitrothion and endosulfan at 0.04%, 0.05% and 0.09% active ingredient respectively, in water. Samples of sprayed cotton plants were collected at 0, 1, 2, 4, 7, 15 and 30 days after treatment and analysed for pesticide residues by thin-layer and gas chromatographic techniques.

The residues of monocrotophos were highest (7-10 ppm) in the two day old samples and diminished rapidly thereafter to less than 0.5 ppm in 7 days. No residues were detectable after 15 days. The residues of fenitrothion were highest in zero to one-day old samples (8.5-11.5 ppm) and thereafter decreased to 1 ppm in 7 days, and after 15 days none were detectable.

The residues of endosulfan registered a gradual decrease from 13ppm to 3ppm in zero to seven days old samples, and only 0.2ppm was found after 15 days. No residues were detectable after 30 days.

ELABORATION OF AFLATOXINS ON RAW GROUNDNUTS IN PAKISTAN

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(Received November 15, 1981; revised March 17, 1984)

Analytical studies of the raw groundnuts from various places were carried out to determine the incidence of aflatoxins. Aflatoxin assays on fifty raw groundnut samples showed that three samples were contaminated. Samples below 16% moisture showed absence of aflatoxins. Isolation from samples showed that 37.5% isolates of *Aspergillus flavus* were toxigenic and capable of producing aflatoxin *in vitro*. None of the sample was resistant to the production of aflatoxin when growth of the toxigenic fungi was experimentally induced.

SUGARCANE PROCESSING AT THE VILLAGE LEVEL

Part IV — A Method for the Preparation of Sugarcane Syrup Rich in Trace Metals and Trace Metals of Gur (Jaggery, Panila)*

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(Received January 3, 1984)

A method for the preparation of syrup, free from impurities and without the use of chemicals, from sugarcane juice has been developed. The syrup can be used in place of sugar in milk, tea, coffee and other soft drinks. The trace metal contents of the syrup and gur, collected from the market were quantitatively determined with Atomic Absorption Spectrophotometer. Trace metals such as copper, chromium, lead, iron, nickel, zinc, sodium, calcium, magnesium, manganese and potassium have been estimated. With the exception of lead nearly all other metals have good effects on human health. Amount of lead varies from 0.18 ppm to 0.67 ppm, which is quite below the maximum limits prescribed by FAO/WHO. The amount of chromium varies from 0.04 ppm to 0.30 ppm. Chromium metal is the most beneficial of all the metals present. Due to the presence of chromium and other metals, whole cane syrup and gur is far superior to white sugar.

FATTY ACIDS FROM WAXES AVAILABLE IN PAKISTAN

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Locally available wax varieties-Chinese wax, Attock wax, 100 NHVI, 650 NMVI and BSHVI were subjected to liquid phase oxidation. The rate of formation of acidic components for Chinese wax and Attock wax was constant throughout the period observed (excluding the induction period) but dropped slowly to zero for 100 NHVI, 650 NMVI and BSHVI. Refining of the latter group of waxes resulted in enhancing this rate to varying degrees. The sweetening process gave the most encouraging results. The acidic components were esterified and resolved by liquid chromatography into various class compounds. The quantity of methyl esters and their carbon ranges were: Chinese wax, 47.06% and $C_{10}-C_{29}$; Attock wax, 48.50% and C_8-C_{31} ; 100 NHVI-S, 27.08% and C_9-C_{28} ; 100 NHVI-R, 36.41% and C_9-C_{28} ; 650 NMVI-S, 23.42% and C_8-C_{29} ; BSHVI-S, 32.41% and C_8-C_{30} .

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TREATMENT OF PHOSPHATE ROCK OF HAZARA FOR THE PRODUCTION OF PHOSPHATE FERTILIZER BY FUSION WITH ROCK SALT AND MAGNESIUM SULPHATE.

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(Received November 25, 1983)

Thermal treatment of phosphate rock of Hazara for the production of phosphate fertilizer with various fluxes were studied. Optimum conditions such as rock to charge ratio, temperature and time are reported. It was found that phosphate rock when treated at 900-1000°C with optimum rock/charge ratio gave conversion of 95% citrate soluble P_2O_5 .

CATEGORIZATION AND RECLAMATION OF SALT AFFECTED SOILS OF D.I.KHAN

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(Received June 28, 1980; revised May 19, 1984)

Sixty six soil samples were collected from the salt affected areas of D.I. Khan. Total soluble salts, pH and gypsum requirements were determined for the categorisation of these soils regarding their salinity status.

Out

DESIGN AND FABRICATION OF A LEAF AREA METER WITH PHOTODIODE

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(Received March 27, 1983; revised March 19, 1984)

A photodiode has been in one arm of simple bridge circuit. Leaf specimen, when placed on the stage, causes light flux to change. This change corresponds to area of leaf and is read from digital multi-meter. This fabricated instrument measures the area of leaves quicker than planimeter and with more accuracy.