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Physical Sciences Section

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CICHORIUM INTYBUS L (KASNI) – TOTAL LIPID FRACTIONS AND THEIR FATTY ACID COMPOSITION

M. Saleem, Mushtaq Ahmad, M. Amin*, S. A.Khan and M.K. Bhattu

PCSIR Laboratories, Lahore-16

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Cichorium intybus L ('Kasni') seed oil (5.8%) was examined for its physico-chemical values and fatty acid composition by gas chromatography. The oil was fractionated by TLC into lipid classes; neutral lipids (56.74%) and polar lipids (43.26%). Fractionation of neutral lipids gave hydrocarbon wax-esters (6.46%), triglycerides (23.39%), free fatty acids (10.70%), 1,3-diglycerides (4.95%), 1,2-diglycerides (5.90%) 1-Monoglycerides (3.21%) and 2-Monoglycerides (2.13%). Polar lipids were separated into glycolipids (30.22%) and phospholipids (13.04%). All the lipid classes except phospholipids were studied for their fatty acid composition. Except for 2-Monoglycerides, all other lipid classes showed a similar fatty acids pattern, as the saturated fatty acids constituted 72-88% of the total. All the lipid classes have shown a fair amount of an odd numbered fatty acid (C₁₇: O).

Key Words: Lipids, *Cichorium intybus* L., Composition.

IR STUDIES OF SOLVENT-SOLUTE INTERACTIONS; ESTIMATION OF RAMAN ACTIVE FUNDAMENTAL FREQUENCIES OF ACETYLENE IN SOLUTIONS

Azhar M. Syed

PCSIR Laboratories, Karachi

(Received October 22, 1985; revised January 11, 1987)

Specific solvent-solute interactions involving C-H and C \equiv C groups of acetylene have been studied. Acetylene has two IR active and three Raman active fundamental vibrations. It has become possible to estimate the frequency shifts of Raman active fundamentals by the observation of binary combination bands in a range of solvents.

Key words: Raman active frequencies in solutions.

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PHOTOMETRIC DETERMINATION OF TRACE AMOUNT OF NITRATE AND NITRITE WITH 2-HYDROXYBENZOIC ACID – A NEW METHOD

S. Azhar Ali , Zahida Khalid and Khalid Mahmood*

Department of Chemistry, University of Karachi, Karachi

(Received February 3, 1986; revised March 17, 1987)

An improvement was found in the trace level determination of nitrate with 2-hydroxybenzoic acid as compared to 2-(acetyloxy)benzoic and 3-carboxy-4-hydroxy-benzenesulphonic acid which were reported earlier. Spectral interference was also found to be low in this method. Nitrite at trace level was determined indirectly by this method.

Key words: Photometry, Trace level, Nitration.

THERMODYNAMIC STUDIES OF POTASSIUM BROMIDE IN 10% GLYCEROL-WATER MIXTURE USING CONDUCTOMETRIC TECHNIQUE

Mostafa M. Emara, Hassan A. Shehata and Ahmed M. Wasfi

Department of Chemistry, Faculty of Science, Al-Azhar University, Nasr City, Cairo

(Received October 27, 1985; revised March 1, 1987)

The conductance of potassium bromide at (25-45)^oC in 10 % glycerol-water mixture in a concentration range (10^{-5} - 10^{-3}) M has been measured. The association constant, K_A , values have been determined, where the conductometric data were treated by the Fuoss and Edelson method. The K_A values were decreased as the temperature increased where the thermal motion, probably destroys the solvent structure and hence the mobility of the ions should increase. The activation energy derived in this work is a little lower than the value obtained in aqueous media. The thermodynamic parameters ΔG^o , ΔH^o and ΔS^o were also calculated. It is obvious that the entire process of the ionic association in this system is exothermic. The Walden product, $\Lambda_o \eta$, decreases with an increase in temperature at 25-45^o. The results are explained in the light of solute-solvent interaction.

Key words: Thermodynamics, Ionic-association, Conductance.

APPLICATION OF AREA UNDER THE C.V-CURVE OF CYCLIC VOLTAMMOGRAMS IN THE QUANTITATIVE ANALYSIS

M. Mohammad , Viqar-un-Nisa, A.Y. Khan and R. Iqbal

Electrochemistry Group, Chemistry Department, Quaid-i-Azam University, Islamabad

(Received March 30, 1986; revised March 3, 1987)

The utilization of areas under the curves of cyclic voltammograms and sampled dc (TAST) were explored for quantitative analysis. Areas were measured by (a) graphic integration, (b) paper doll, (c) triangulation, (d) B x H formulae, and (e) rectangulation methods. This method (areas under curves) was found to be more sensitive and accurate at lower concentration (10^{-5} mM) compared to peak current measurements method.

Key words: Cyclic Voltammograms, Sampled d.c. Area under CV Curve. Convolution Sweep Voltammetry.

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SPECTROSCOPIC INVESTIGATION OF NAPHTHALENE AND PHENANTHRENE PICRATES

Hassan M. Faid-Allah and Ahmed M.G. Nassar

Department of Chemistry, Faculty of Science, Alexandria University, Alexandria, Egypt.

(Received October 30, 1986; revised March 18, 1987)

Charge transfer complexes of some mono- and disubstituted naphthalenes and phenanthrenes were prepared. Elucidation of the type of complexation using IR, $^1\text{Hnmr}$ and $^{13}\text{Cnmr}$ spectra was done.

Key words: NMR C.T. Complexes

INTERNAL DYNAMICS IN SOLID POLY-L-ASPARAGINE

Tasneem Zahra Rizvi

PCSIR Laboratories, Shahrah-e-Jalat-ud-din Roomi, Lahore-16. Pakistan.

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A proton magnetic relaxation study on poly-L-asparagine in the solid state has been carried out in the temperature range 10 K to 400 K at three different frequencies, 60, 30 and 18 MHz.

The temperature dependence curve of spin-lattice relaxation times exhibits a single minimum, typical of dipolar relaxation. The depth of the minimum predicts the presence of some extra NH_3^+ groups in the poly-peptide. Activation parameters characterizing the molecular dynamics have been determined.

Key words: Poly-L-Asparagine, Poly peptide, Molecular dynamics.

THE MICRO SCALE DETERMINATION OF NITRITE WITH THE WEISZ RING-OVEN TECHNIQUE

Sumra Naeem, Azra Imtiaz, * Shaukat Ali, ** Sadiq Hussain and Muhammad Hanif

PCSIR Laboratories, Sharah-e-Jalaluddin Roomi, Lahore-16

(Received February 20, 1986; revised December 8, 1986)

In the present investigations, a method has been recommended for the determination of nitrite using 8-hydroxyquinoline as coupling agent with nitrite to yield a pink coloured end product. The Weisz ring-oven technique has been made use of for these studies. The effect of various cations and anions alongwith phenol on its determination has been investigated. Nitrite can be determined within the range from 2.0 to 200.00 ng with a maximum error of - 8.5% in the case of the former. The tolerance limits of this determination in the presence of CO_3^{-2} , HCO_3^{-1} , Cl^- , NO_3^- , SO_4^{-2} , S^{-2} , SO_3^{-2} , NH^{+4} , CN , Mg^{+2} , Co^{+2} , Ca^{+2} , Cd^{+2} , Hg^{+2} , Pb^{+2} , Sn^{+2} , Sn^{+4} , and phenol have also been reported. The reaction is very fast and one determination can be made with 10-15 minutes. The method is recommended for routine use.

Key words: Weisz Ring-over technique, Determination of Nitrite Microscale delermination.

EFFECTS OF SOME LIGNOSULPHONATES ADDITIVES ON SOME PROPERTIES OF GYPSUM PANELS

A.M. Khater*, E.H. Khater, A.N. Mahdy** and M.F. Abadir**

Pilot Plant Lab., N.R.C. Dokki, Giza, Egypt

(Received February 20, 1986; revised October 10, 1986)

This paper deals with studying the main factors affecting some gypsum panels properties and the effect of adding some types of lignosulphonates on improving these properties.

It was found that an increase in the (water/gypsum) ratio is accompanied by a decrease in compressive strength, density, impact strength and an increase in the setting time and water absorptivity. It was also found that (water/gypsum) ratio required for moulding decreases with increasing gypsum purity.

Adding some lignosulphonates was found to improve some mechanical and physical properties of the moulded gypsum. The degree of improvement was found to depend on the lignosulphonate purity, degree of sulphonation, weak proton content, molecular weight and the system pH.

Key words: Lignosulphonates, Gypsum, Panel.

STUDY OF FACTORS AFFECTING pH OF SOILS OF PAKISTAN

G. Saeed Khan and Ch. M. Rafiq

Soil Survey of Pakistan, P.O. Shahnoor, Multan Road, Lahore-18.

(Received December 10, 1980; revised February 19, 1987)

The pH of most of the soils of Pakistan has been found to correlate in a general way with environmental factors of the parent material and climate but more specifically with the soil factors of base saturation percentage, exchangeable sodium percentage, amount and kind of salts and soil aeration. The most dominant parent material is the calcareous Alluvium of mixed mineralogy. Calcareous loess is another important parent material. The greater part of Pakistan is arid and semi-arid but some areas do have sub-humid and humid climate. The calcareousness of the parent material and aridity of the climate is responsible for the alkaline reaction (pH) of most of the soils of Pakistan. Certain soils, in the north and north-eastern hilly areas, formed in acid igneous rocks and/or under subhumid and humid climate have acidic reaction.

Key words. Calcareous soils, pH of soils; Agro-ecological zone of soils.

EFFECT OF SUBSTITUTION ON THE ABSORPTION SPECTRA OF SOME PYRIDINE DERIVATIVES

Moustafa H. M. Abou-El-Wafa and Mamduh A. Hassan

Chemistry Department, Faculty of Science, Qena, Egypt.

The UV-visible spectra of some pyrido [3,2-d] pyrimidines and 2,3-disubstituted pyridines were studied in appropriate solvents. It is found that both band position and intensity are dependent on both type and position of substituents.

Key words: Absorption spectra, spectral studies, U.V. spectra.

Biological Sciences Section

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ALGIN BEARING SEaweEDS OF PAKISTAN COAST

Shahnaz M. Ismail and J.N. Usmani *

PCSIR Laboratories, Karachi - 39

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Five varieties of *Sarguassum* and one of *Cystoseira*, freshly harvested off the coast of Ras Mauri, Buleji and Sandspit were studied for their contents of alginic acid on dry basis. The study also includes the estimation of alginic acid in drifted brown seaweeds cast ashore at Sandspit and Hawkes Bay.

Key words: Alginic Acid; Sea Weeds; Nitrogen.

EFFECT OF SEASONAL VARIATIONS ON CHEMICAL COMPOSITION OF MANGROVE VEGETATION OF KARACHI

Radia Khatib, Ghazala Ahmad, Naseem F. Usmani, S. Shahid Hussain and Tanzil Haider Usmani

PCSIR Laboratories, Karachi-32

(Received May 19, 1986; revised February 25, 1987)

Study on the effect of seasonal variation on chemical composition of mangrove leaves and twigs revealed that the period between February and April was ideal for the bio synthesis of different plant constituents. Organic matter, cellulose, nitrogen and protein were observed in high concentrations in leaves than in twigs, whereas the fibre content was greater in twigs. On storage the plant material under investigation deteriorated and resulted in the reduction of the amino acid content. Out of the fifteen and eleven amino acids in leaves and twigs respectively, only five could be detected.

From the above results it appears that mangrove leaves contain more nutritive matter than twigs, and animal feed should be prepared from material collected during the months of February – April. Since the material on storage loses some of its nutritive value, it should not be used for preparing animal feed.

Key words: Seasonal variation, Chemical composition, Mangrove.

AN EVALUATION OF WHEAT MUTANT LINES FOR RUST RESISTANCE AND OTHER AGRONOMIC TRAITS

S. Anwar Shah, T. Mohammad, S. Hassan and K. Rahman

Nuclear Institute for Food And Agriculture, (N.I.F.A), Tarnab, Peshawar

(Received October 12, 1986; revised February 23, 1987)

Mutation breeding with the objective to improving rust resistance in hexaploid wheat resulted in mutant lines resistant to stripe rust (*Puccinia striiformis*) and leaf rust (*Puccinia recondita*). Dry dormant seeds with 11-12 % moisture of the high yielding but rust susceptible cultivar Lu-26 were mutagenically treated with 250 Gy ^{60}Co gamma radiation and selected between the M_2 and M_4 generations for rust resistance under artificial epiphytotic conditions. Confirmed rust resistant or tolerant M_4 -mutant lines were first tested in a M_5 -microtrial and 19 promising mutant lines retested in a M_6 -trial for heading time, plant height and yield/ha in comparison with the parent cultivar and the rust resistant variety PAK-81. Improved rust resistance exerted in some mutant lines resulted in higher yields than the test cultivars, while heading dates were mostly delayed and four mutants had a significantly reduced plant height. Some of these mutants possess valuable agronomic traits and may either be used directly or as gene donors in crossbreeding for the development of improved wheat cultivars in Pakistan.

Key words: Screening, Wheat mutants, Resistance to rust.

EFFECT OF pH ON THE GROWTH AND BIOMASS OF *AZOLLA PINNATA* UNDER POT CONDITIONS

M. Akmal Siddiqi, Mohammad Athar, Shahbaz Ahmed and G.R. Sandhu

Soil Microbiology Laboratory National Agricultural Research Centre Park Road, Islamabad

(Received April 24, 1985; Revised September 21 1986)

Azolla pinnata was grown on four pH values ranging from 5 to 8 for six weeks. The observations on fresh and dry weight showed an increase with increased pH values, indicating that at high pH the biomass and N-content increased. The percentage of elements like P, Fe, Zn, Ca and Mg were also found to be high when compared to the plants grown at low pH.

Key words: *Azolla pinnata*, Pot condition, Biomass

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EFFECT OF ROW SPACING ON THE YIELD OF MUSTARD (*BRASSICA JUNCEA*) UNDER RAINFED CONDITIONS

Mushtaq Ahmed Chaudhry, Mushtaq Ahmed Khan and Mohammad Azim Malik

Soil Conservation, Barani Agricultural College, Rawalpindi

(Received October 9, 1986; revised February 19, 1987)

The effects of five row spacings (15.0, 22.5, 30.0, 37.5 and 45.0 cm) and broadcast on the yield of mustard (*Brassica juncea*), variety Rya L-18, were studied on clay loam soil under rainfed conditions at the research farm of the Barani Agricultural College, Rawalpindi. Prolonged drought spell prevailed during the growth period of the crop. The yield was observed at 15cm, 22.5cm, 30cm, 37.5cm, 45cm, wide rows and broadcast. The 15-cm apart row gave higher yield of mustard as compared to widely spaced rows.

Key words: Mustard, Rainfed, Row cropping

EFFECT OF *RHIZOBIUM* Spp., ON *MACROPHOMINA PHASEOLINA*

M. J. Zaki and A. Ghaffar

Department of Botany, University of Karachi, Karachi-32

(Received May 18, 1986; revised February 24, 1987)

In dual culture plate assays, indigenous *Rhizobium* strains isolated from nodules obtained from the fields of Karachi inhibited radial growth of *Macrophomina phaseolina*, *Rhizobium leguminosarum*, *R. meliloti* and *R. japonicum* causing growth inhibition. In *vitro* also led to a significant reduction in the severity of *Macrophomina* root rot of mungbean, okra and sunflower in green house experiments. These data suggest that a potential exists for reducing *Macrophomina* root rot by employing nodulating of *Rhizobium* strains which are highly antagonistic to *M. phaseolina*.

Key words: Seed bacterization, Biological control, *Rhizobium-Macrophomina* interaction.

AFLATOXIN CONTAMINATION OF POULTRY FEED AND ITS INGREDIENTS Part. I. Cotton Seed, Cotton Seed Cake and Cotton Seed Meal

Mansoor A. Ahmad and Butool A. Khan

Applied Biology and Marine Resources Division, PCSIR Laboratories, Karachi-39

(Received March 16, 1986; revised February 17, 1987)

Five hundred and twenty-six samples of cotton seed, cotton seed cake, and cotton seed meal were collected during the period of study and had 44.6%, 49.3% and 70.6% positive samples for aflatoxin B₁ (AFB₁) respectively. Cotton seed meal had maximum average content of 160.6 µg/kg AFB₁, while cotton seed and cotton seed cake had 115 µg/kg and 114 µg/kg AFB₁ respectively. Eight samples of cotton seed meal and aflatoxin B₁ in excess of 1000 µg/kg. The highest amount of AFB₁ (1629 µg/kg) was found in a sample of cotton seed meal collected in 1984. The samples were analysed by the methods laid down in Association of Official Analytical Chemists.

Key words: Aflatoxins, Cotton seeds, *Aspergillus flavus*.

Technology Section

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COPOLYMERS FROM α -PINENE

Part IV: Cationic Copolymerization of α -Methylstyrene and α -Pinene

A. Rasheed Khan, Tehzeeb Akhtar and A.H.K. Yousufzai

PCSIR Laboratories, Karachi-39

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The copolymerization of α -methylstyrene and α -pinene in benzene has been accomplished at 10-12° using anhydrous $AlCl_3$ as the initiator. It has been observed that α -methylstyrene combines with α -pinene to form copolymer at all monomeric ratios. The physical and chemical parameters of α -methylstyrene dominate in the product. A copolymer of 1900-4200 molecular weight is obtained. It is a semi solid (at room temperature), highly tacky, yellowish substance that softens at 32-40°. The copolymers have several industrial possibilities.

Key words: Intrinsic viscosity, Stretching vibration, Binary mixture.

**BENCH SCALE BENEFICIATION STUDIES OF CHROMITES OF ZHOB VALLEY (BALUCHISTAN)
AND MALAKAND (NWFP)**

K. Hussain, A. Hafeez and N. Sheikh

PCSIR Laboratories, Lahore-16

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Low grade chromites of Zhob Valley and Malakand, in the assay range of 30-35 % and 12-32 % Cr_2O_3 , were upgraded to concentrates containing 48 % and 47 % Cr_2O_3 respectively. Gravity based processing of chromites was done by using spiral and table concentrators and the process variables were optimized. The overall recovery varied for 50-80 % depending upon the nature of the ore. The final concentrates produced met the grade specifications required for the chemical and metallurgical industries.

Key words: Table and spiral concentration; Recovery; Grade.

PILOT SCALE BENEFICIATION OF ZHOB VALLEY AND MALAKAND CHROMITE ORES

K. Hussain, N. Sheikh and A. A. Qureshi

PCSIR Laboratories, Lahore - 16

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Low grade chromites of Zhob Valley, containing 30-35 % Cr_2O_3 , and of Malakand area having 12-35 % Cr_2O_3 , were upgraded to concentrates assaying upto 48 % and 47 % Cr_2O_3 respectively. In the beneficiation sequence Humphry's spirals were used for roughing operations and the final concentrates were produced on Wilfley Tables. Test variables, optimized on the laboratory stage, were used to run the pilot plant tests. Testing was based on 30 tonnes of the ore samples and the test results were found to be reproducible with an overall recovery of 55 to 83 % Cr_2O_3 . Chemical analysis of the concentrates confirms their suitability for the chemical and metallurgical operations.

Key words: Table and spiral concentration; Recovery; Grade.