



ISSN 0030 - 9885

Coden: PSIRAA 36 (2-3) 51-122 (1993)

PAKISTAN JOURNAL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Vol. 36, Nos. 2-3, February-March 1993

Physical Sciences. Pages 51-81

Biological Sciences. Pages 82-109

Technology. Pages 110-122

Published monthly by

Scientific Information Centre

PAKISTAN COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH
KARACHI

Physical Sciences Section

Pak. j. sci. ind. res., vol. 36, nos. 2-3, Feb. -Mar. 1993

ORIENTATION DETERMINATION OF SINGLE-CRYSTAL BY COMPUTER GENERATED ALGORITHM

F. HABIBY, Z. AHMAD, H. HUSSAIN, A. UL HAQ AND A.Q. KHAN

Dr. A.Q. Khan Research Laboratories, Kahuta, P.O. Box No. 502, Rawalpindi, Pakistan

(Received February 16, 1993)

A computer generated algorithm is written to determine the orientation of single crystals by directly taking the pole intensity data from the diffractometer by completely eliminating the use of Wulff net ensuring greater precision. The advantages of using a diffractometer method over conventional laue method for orientation determination is also compared and discussed.

Key words: Diffractometer method, Laue method, Wulff net, Stereographic projection, Pole figure.

GUAIANIN N, A NEW SAPONIN FROM FLOWERS OF *GUAIAECUM OFFICINALE*

VIQAR UDDIN AHMAD AND NIKHAT SABA

H.E.J. Research Institute of Chemistry, University of Karachi, Karachi-75270, Pakistan

(Received December 14, 1991; revised February 3, 1993)

A new triterpenoidal saponin, guaianin N, (1) has been isolated from the butanolic extract of the flowers of *Guaiacum officinale*. It showed antibacterial activity against *Pseudomonas pseudomaliae* as well as brine shrimp toxicity [1]. Spectroscopic methods have been used to characterize compound 1 as 3-O-[β -D- glucopyranosyl ($\rightarrow$ 3) α -L-arabinopyranosyl]-oleanolic acid.

Key words: Guaianin N, Saponin, *Guaiacum officinale*, Zygophyllaceae.

Pak. j. sci. ind. res., vol.36, nos. 2-3, Feb.-Mar. 1993

SYNTHESIS AND REACTIVITY OF SOME ALKALINE PHOSPHORANES

I.M. ABDEL-ELLAH, R. S. FARAG AND A. N. EL-KHAZANDAR*

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

(Received August 9, 1992, revised February 1, 1993)

Tris-dimethylamino-methylene-phosphorane (I), has been synthesised and its chemical reactivity towards some aldehydes, ketones, acid chlorides and haloesters was studied. The structure of the isolated products was identified on the basis of micro-analytical data, IR spectra and ^1H n.m.r. spectra.

Key words: Alkylene phosphorane, Phosphorus ylides, Phosphine alkylene.

Pak. j. sci. ind. res., vol. 36,nos. 2-3, Feb. - Mar. 1993

HYDRATION INDUCED FLEXIBILITY IN CYTOCHROME-C

T.Z. RIZVI, A. SHAMIM* AND M.A. MIRZA*

Applied Chemistry Research Centre, PCSIR Laboratories Complex, Lahore 54600, Pakistan

(Received May 25, 1992; revised February 25, 1993)

Real and imaginary parts of dielectric constant have been measured in hydrated cytochrome C at various hydration levels in the frequency range 30 Hz-3 MHz at temperatures between $(-40^{\circ}) - (+30^{\circ})$. The data reveal the presence of a very weak and broad relaxation peak in the intermediate frequency range between two commonly observed Ω and α dispersions. This weaker dispersion has been attributed to Debye type relaxation of polar protein components. Considerable hydration induced flexibility has been observed in the polar components of the protein. Such studies could be beneficial towards understanding the important role of water in protein dynamics and functioning.

Key words : Cytochrome-C, Protein hydration, Dielectric relaxation.

Pak j. sci. ind. res., vol.36, nos.2-3, Feb.- Mar. 1993

CATIONIC TERPOLYMERIZATION OF STYRENE, α - METHYLSTYRENE AND α - PINENE

A. RASHEED KHAN, TEHZEEB AKHTAR AND A.H.K. YOUSUFZAI

PCSIR Laboratories Complex, Karachi-75280, Pakistan

(Received June 10, 1992; revised February 17, 1993)

A study of cationic terpolymerization of styrene, α -methylstyrene and α -pinene in toluene has been carried out at 10-12° using anhydrous $AlCl_3$ as catalyst. It has been observed that these three monomers form terpolymer in all monomeric ratios. A terpolymers of 42963- 61850 molecular weight are obtained. The terpolymer samples are yellowish brown tacky substances soluble in most of the organic solvents. It is soft at room temperature. The refractive index of terpolymer samples ranges 1.494-1.495. The terpolymer may be used as tackifying agent in the preparation of all type of adhesives.

Key words: Terpolymerization, Tackifying agent, Binary mixture.

DISSOCIATION CONSTANTS OF ARYLAZO OROTIC ACID COMPOUNDS AND STABILITY CONSTANTS OF THEIR COMPLEXES

EKRAM A. KHALIL, MAMDUGH S. MASOUD AND ADEL M. EL-MERGHANY

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

(Received July 7, 1992; revised January 30, 1993)

Synthesis of new arylazo orotic acids with different functional groups has been carried out. pK_L and $\log K_c$ values were evaluated. Solvent effects on the thermodynamic parameters of dissociation were discussed. The data were explained from the electronic character of the substituents.

Key words: Synthesis, Arylazo orotic acid, Complexes.

THIOCYANATO COMPLEXES OF Co (II), Ni (II), Zn (II), Cd (II), Cr (III) AND U (VI) CONTAINING UNIDENTATE AND BIDENTATE AUXILIARY LIGANDS

M.T.H. TARAFDER, M.A. AFFAN AND M.Q. ISLAM

Department of Chemistry, University of Rajshahi, Rajshahi, Bangladesh

(Received January 31, 1990; revised January 20, 1993)

Several thiocyanato complexes of Co(II), Ni(II), Zn(II), Cd(II), Cr(III) and U(VI) containing some unidentate and bidentate auxiliary ligands have been synthesized and characterized by elemental analyses, magnetic and conductivity measurement, IR and electronic spectral studies. The complexes have the compositions $[\text{Co}(\text{SCN})_2.4\text{L}]$, $[\text{Ni}(\text{SCN})_2.2\text{L} \cdot \text{H}_2\text{O}]$, $[\text{Zn}(\text{SCN})_2.2\text{L}]$, $[\text{Cd}(\text{SCN})_2 \cdot \text{L}']$, $[\text{Cd}(\text{SCN})_2.2\text{L}] \cdot \text{H}_2\text{O}$, $[\text{UO}_2(\text{NCS})_2.3\text{L}]$ and $[\text{UO}_2(\text{NCS})_2\text{L}'] \cdot \text{H}_2\text{O}$ where $\text{L} = \text{NH}_2\text{-NH}_2$; $\text{L}' = \text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$ and $\text{C}_6\text{H}_4\text{-(NH}_2)_2$. The molar conductance data indicate that all the complexes behave as 2:1 electrolyte in DMSO. Magnetic and spectral data are in support of octahedral geometry for cobalt, nickel, chromium and uranium complexes whereas the zinc and cadmium complexes are probably tetrahedral in nature.

Key words: Donor, Acceptor, Interaction.

Pak. j. sci. ind. res., vol. 36, nos.2-3, Feb.-Mar. 1993

SYNTHESIS OF SOME NEW ANTIMICROBIAL 2-PYRAZOLIN-5-ONES OF PHARMACEUTICAL INTEREST

F.Z. EL-ABBLACK* AND M.A. METWALLY

Department of Chemistry, Faculty of Science, University of Mansoura, Mansoura, Egypt

(Received January 13, 1992; revised December 23, 1992)

This study was undertaken in an attempt to evaluate the reactivity of α -[3-methyl-1-phenyl-5-oxo-2-pyrazolin-4-(nitromethyl)-methyl] cresotaldehyde 4 as a key intermediate in the synthesis of different heterocyclic derivatives (5-11) with a view of evaluating antibacterial and antifungal activities of the products. Most of these products gave positive results.

Key words: Antibacterial and antifungal activities, 3-Coumarin derivatives, Synthesis.

DETERMINATION OF COBALT, CHROMIUM, MANGANESE AND NICKEL IN PAKISTANI COALS BY ATOMIC ABSORPTION SPECTROMETRY

MOHAMMAD FAZIL, MOHAMMAD ABDUL BASIT AND S. KHAQAN HASAN

PCSIR Laboratories Complex, Karachi-75280, Pakistan

(Received March 6, 1990; revised December 2, 1992)

Some trace elements (cobalt, chromium, manganese and nickel) have been determined in the coal samples from Pakistani mines. Pakistani coals are mainly sub-bituminous with high contents of sulphur. The above elements do not appear to occur in high concentrations in Pakistani coals. Range of manganese concentration (9.7-42.0 ppm) was much lower than U.S. and world averages. Large scale combustion of Pakistani coals would thus not appear to lead to the unusual environmental pollution due to these trace elements.

Key words: Coal, Trace elements, Atomic absorption spectrometry.

Biological Sciences Section

Pak. j. sci. ind. res., vol. 36, nos. 2-3, Feb.-Mar. 1993

LIPID FRACTIONS AND FATTY ACID COMPOSITION OF *CYPRESS SEMPERVIRENS* AND *THUJA ORIENTALIS* SEED OILS

M. RIAZ, M. RASHID KHALID AND F.M. CHAUDHARY

PCSIR Laboratories Complex, Lahore - 54600, Pakistan

(Received August 15, 1992; revised March 21, 1993)

Cypress sempervirens seed oil (4.4%) and *Thuja orientalis* seed oil (17.2%) have been analysed for its physico-chemical characteristics and fatty acid composition. The fatty acids ranged from C_{16} to C_{24} in varying amounts.

Key words: Fatty acids, *Cypress sempervirens*, *Thuja orientalis*, Composition.

RESPONSE OF SEMIDWARF WHEAT CULTIVARS TO TIMINGS OF NITROGEN APPLICATION AT DIFFERENT GROWTH STAGES

M.Z. SOLAIMAN, M.A.H. CHOWDHURY*, A.K. BISWAS** AND M.A. HASHEM

Department of Soil Science, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh

(Received July 9, 1991; revised February 13, 1993)

A field experiment was carried out to investigate the impact of timing of nitrogen (N) application on yield, yield attributes (earbearing tillers, spikelets/spike, grains/spike, 1000-grain weight, plant height and grain yield/plant) and protein content of semidwarf wheat cultivars. There were four wheat cultivars viz. Aghrani, Akbar, Barkat and Kanchan and five patterns of nitrogen application (all of N at sowing; 1/2 of N each at sowing and early tillering; 1/3 of N each at sowing, early tillering and late tillering; 1/4 of N each at sowing, early tillering, late tillering and panicle initiation; 1/5 of N each at sowing, early tillering, late tillering, panicle initiation and flowering). Nitrogen was applied as urea @ 120 kg N/ha. Both the wheat cultivars and timing of N application produced significant effect on grain yield without effects on straw yield and protein content. Grains/spike, 1000-grain weight, plant height and grain yield/plant were influenced by cultivars but earbearing tillers and spikelets/spike were not significant. Earbearing tillers and plant height were influenced by timing of N application but other yield attributes were not affected. The interaction effect of cultivars and timing of N application on grain yield was significant but on other yield attributes and protein content effect was not found significant. The nitrogen application in three splits produced the best performances on grain yield of semidwarf wheat cultivars.

Key words: Protein, Timing of N application, Wheat cultivars, Yield and yield attributes.

SCREENING OF VARIOUS LOCAL RAW FOOD COMMODITIES FOR AFLATOXIN CONTAMINATION. *Part -I*

M. JAFFAR, M. SALEEM*, NAJEEBA SALEEM* AND MAQSOOD AHMED*

Department of Chemistry, Quaid-e-Azam University, Islamabad, Pakistan

(Received December 31, 1990, revised April 1, 1993)

Fourteen food commodities (wheat, rice, maize, oat, sugar, pulse, gram, green gram, black gram, lentil, pepper, coriander, turmeric, gur and cumin) procured from various areas of Punjab, NWFP, Sindh, Baluchistan, and Azad Kashmir were screened for aflatoxins B₁ and B₂ contamination. The results showed an incidence of about 43% aflatoxin contamination at moderate levels in six raw foods. The highest aflatoxin B₁ concentration (88.3 µg/kg) was found in maize from Multan, followed by a level of 82.1 µg/kg/B₁ in green gram from Peshawar. Maize from D.I. Khan showed the lowest B₁ concentration (11.1 µg/kg). Pepper from Sargodha contained 41.7 µg/kg aflatoxin B₂. The results obtained are discussed in terms of seasonal and regional variations together with international standards laid down for the safe ingestion of aflatoxin contaminated raw foods.

Key words: Aflatoxins in foods, Aflatoxin analysis.

EFFECT OF CROP AGE AND SHEATH BLIGHT PATHOGEN ON THE CHANGES OF REDUCING SUGAR, NON-REDUCING SUGAR AND ORTHODIHYDROXYPHENOL CONTENTS OF RICE SHEATH

M. A. KASHIEM, AYESHA SIDDIQUA AND M. R. H. BHUIYA

Department of Biochemistry, Bangladesh Agricultural University, Mymensingh, Bangladesh

(Received May 11, 1991; revised January 23, 1993)

A study was made on the changes in biochemical constituents of different varieties and lines of rice with or without infection of *Rhizoctonia solani* at different stages of their growth. Reducing sugars, non-reducing sugars and orthodihydroxyphenols were different among the varieties/lines. Binasail, the moderately resistant variety of sheath blight and P-3, the tissue culture line contained statistically similar amounts of these constituents and were high than BR3, Iratom24 and BINA6. Reducing sugars and non-reducing sugars increased up to the panicle initiation stage and thereafter declined. Orthodihydroxyphenols decreased significantly with the progress of crop age. Reducing sugars, non-reducing sugars and orthodihydroxyphenols decreased significantly in comparison to the healthy plants after inoculation with *R. solani*.

Key words: Biochemical changes, Growth stages, Rice varieties/lines, *Rhizoctonia solani*.

GENETIC DIFFERENCES FOR SUSCEPTIBILITY OF CHICKPEA TO BRUCHID BEETLE (*CALLOSOBRUCHUS CHINENSIS* L.) ATTACK

K. AHMED, F. KHALIQUE, I. A. KHAN AND B. A. MALIK

Pulses Programme, National Agricultural Research Centre, P. O. NARC, Islamabad, Pakistan

(Received July 11, 1991; revised February 6, 1993)

Resistance of 39 chickpea varieties was assessed against *Callosobruchus chinensis* L. Rough, hard and wrinkled seed surface and thick seed coat showed non preference (resistance). Coefficients of phenotypic and genotypic variations were highly positively correlated with damaged seed and emergence hole. The finding can be used for hybridization to limit pesticide use.

Key words: *Callosobruchus chinensis*; Susceptibility, Emergence hole.

Pak j. sci. ind. res., vol. 36, nos.2-3, Feb.-Mar. 1993

HETEROSIS STUDIES OF SOME PROMISING RICE CROSSES

MUHAMMAD JAMIL MIRZA, F. A. FAIZ AND A. MAJEED*

Cotton Research Institute, Rahim Yar Khan, Pakistan

(Received April 2, 1991; revised December 2, 1992)

Estimation of heterosis were made with respect to plant height, panicle length, number of panicles per plant, yield per plant in 6 hybrids involving 5 varieties of rice. The crosses such as 1053-2-4 x 4048-3 and 1053-2-4 x 4439 appeared to be better by giving heterosis over mid and parent in this study. However, most of the crosses involving 1053-2-4 as one parent showed positive mid and better parent heterosis for grain yield and all or some other traits, therefore, it appeared as best combiner among the material studied.

Key words: *Oryza sativa*, Hybrid vigour, Yield components.

Pak. j. sci. ind. res., vol. 36, nos. 2-3, Feb.-Mar. 1993

PHYSICAL QUALITY CHARACTERISTICS OF WHEAT AT FARMGATE AND PROCUREMENT CENTRES IN PUNJAB AND COMPARISON WITH FAIR AVERAGE QUALITY SPECIFICATIONS

MUBARIK AHMED, S. SHAHID SHAUKAT, TARIQ MAHMOOD AND MOHAMMAD SAJJAD AHMED

Tropical Agricultural Research Institute, PARC, Karachi University Campus, Karachi-75270, Pakistan

(Received November 29, 1989; revised February 28, 1993)

The quality characteristics of Punjab wheat assessed through two surveys, conducted in 1988 and 1989 harvest seasons, revealed that the mean percentage of total foreign matter, moisture content, unthreshed, weeviled, broken and other food grain were 1.27, 8.28, 0.24, 0.05, 1.6 and 1.32 in 1988 and 1.62, 7.66, 0.39, 0.09, 1.43 and 1.69 in 1989 respectively. A substantial number of samples did not meet the F.A.Q. (fair average quality) specifications of Pakistani wheat. The mean insect density in samples containing insects was 2.3/kg and 3.7/kg in 1988 and 1989 respectively which comprised of 6 stored grain insect species.

Key words: Wheat, Physical quality characteristics.

SULPHUR IN FOLIAGE AND SOIL OF THE KORANGI INDUSTRIAL AREAS AND UNIVERSITY CAMPUS

M. ZAFAR IQBAL AND QAMAR-UZ-ZAMAN

Department of Botany, University of Karachi, Karachi-75270, Pakistan

(Received March 26, 1992; revised January 7, 1993)

The concentration of total sulphur in leaves of some plant species, *Ficus religiosa*, *Tamarix indica* and *Prosopis juliflora* from different sites located in Korangi industrial area of Karachi and the University campus was determined. The level of total sulphur in the leaves of all the species was highest at Oil refinery and Muhammadi Foundary as compared to the University campus and Ittefaq Foundary. The soils of these sites also showed significant differences ($P < 0.05$) in available sulphur. The highest value (11833 mg kg^{-1}) was found at Oil refinery followed by Muhammadi Foundary (6458 mg kg^{-1}) and Ittefaq Foundary (5833 mg kg^{-1}), while the lowest concentration (1667 mg kg^{-1}) was recorded at the University campus.

Key words: Industrial area, Plant foliage, Soil, Sulphur.

Pak. j. sci. ind. res., vol. 36, nos. 2-3, Feb.-Mar. 1993

EVALUATION AND COMMERCIAL EXPLOITATION OF ESSENTIAL OIL OF *JUNIPER BERRIES OF PAKISTAN*

MUHAMMAD RAFIQUE, M. HANIF AND F. M. CHAUDHARY

PCSIR Laboratories Complex, Lahore - 54600, Pakistan

(Received May 29, 1992; revised March 11, 1993)

The essential oil of *Juniperus excelsa* M.B. [1] (Syn. *J. polycarpus*, *C. koch*; *J. macropoda* Boiss, HK) berries has been studied for its physico-chemical properties and chemical composition. The oil contains 25 components, the major ones being pinenes (72.5%), myrcene (12.4%), limonene (2.28%), camphene (2.51%). In order to improve the flavour of the oil, it has been rectified, whereby the pinenes contents of the oils has been reduced to 8%, thus making the oil more valuable and acceptable to the market.

Key words: *Juniper Berries (Juniperus excelsa* M.B.), Essential oil, Composition, GLC.

Technology Section

Pak. j. sci. ind. res., vol. 36, nos.2-3, Feb.-Mar. 1993

USE OF PRESSMUD AS A SOURCE OF PHOSPHORUS FOR CROP PRODUCTION

M. IBRAHIM, N. AHMAD AND A. KHAN

Ayub Agricultural Research Institute, Faisalabad, Pakistan

(Received August 31, 1992; revised February 18, 1993)

Pressmud, a by-product of the sugar industry, was compared to triple super phosphate (TSP) as a source of phosphorus for crop production. Four levels of P_2O_5 (0, 40, 80 and 100 kg/ha) were applied from pressmud and TSP. Maize and wheat crops were grown during 1989 - 1991. Phosphorus from both sources was applied to maize at the start of the experiment in 1989, and the residual effects were studied on the following crops. Phosphorus levels from pressmud increased maize fodder yield with increasing levels of P, but P from TSP had no effect on yield. P levels from both sources increased wheat grain yield (2nd crop), while residual P levels from both sources did not affect the yield of succeeding crops. During the first year, TSP gave higher dry matter yield of maize fodder (2184 kg/ha) and wheat grain (3881 kg/ha) as compared to pressmud, which resulted in yield of 1998 kg/ha maize fodder and 3791 kg/ha wheat grain, respectively. In third crop (maize), pressmud gave better dry matter yield (6122 kg/ha) than TSP (5598 kg/ha). The yield of the 4th crop (wheat) from both the sources was almost equal, which also indicate the decreasing effect of TSP with time whereas the effect of pressmud was just reverse. It was concluded that pressmud can be used as a source of phosphorus for crop production for longer period of time.

Key words: Pressmud, Phosphorus, *Zea mays*, Wheat.

STUDIES ON PHYSICO-CHEMICAL TREATMENTS OF CHROME TANNERY EFFLUENTS

MOHAMMAD IQBAL, ABDUL WADOOD QURESHI AND NISHAT RIZVI

PCSIR, Leather Research Centre, D-102, South Avenue, SITE, Karachi-16, Pakistan

(Received September 5, 1990; revised December 2, 1992)

Treatment of the composite tannery effluent with flocculating and coagulating agents, such as lime with activated carbon, ferric chloride, aluminum sulphate and potash alum, caused considerable reduction in BOD₅, COD, Chromium, and suspended solids value. Microbial study of the effluent after each chemical treatment was also carried out.

Key words: Effluent, Coagulating agents, Activated carbon.

Pak. j. sci. ind. res., vol. 36, nos. 2-3, Feb.-Mar. 1993

EVALUATION OF GRANULAR ACTIVATED CARBON SAND BASED FIXED BED TREATMENT OF NATURAL WATERS FOR TRACE METAL REMOVAL

M. JAFFAR AND U. EHSAN

Department of Chemistry, Quaid-i-Azam University, Islamabad, Pakistan

(Received October 10, 1990; revised March 22, 1993)

Laboratory evaluation and system operation are assessed for the feasibility of use of granular activated carbon (GAC) in GAC-sand beds for trace metal removal from natural waters. Carbons of different particle size, toughness and specific surface area are used in two fixed bed PVC columns (150 x 15 cm) operating in a 2-stage mode for 2 x 30 mins. contact time. Operation criteria are evaluated in terms of bed space velocity, flow rate, function mode and regeneration of spent carbon. The operation aspects are based on adsorption isotherm studies at the pH of working samples. The technique is applied to treat natural water samples containing normal and excessive amounts of Fe, Cr, Zn, Cu, Pb, Cd and Hg. With an activated carbon having specific surface of 1220 m²/g the trace metal removal ranges between 41.6 - 54.6% at ambient temperature and for given chemical characteristics of waters. The technique affords a convenient and direct procedure for lab-scale trace metal removal from natural waters for specific applications and has the potential of application on any desired scale.

Key words: Active carbon fixed bed filtration, Trace metal removal by granular carbon,