ISSN 0030-9885
Codens PSIRAA 42(1)1-58 (1999)

# PAKISTAN JOURNAL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Vol. 42, No. 1, February 1999



Published bimonthly by

Scientific Information Centre
PAKISTAN COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH
KARACHI

*Pak J Sci Ind Res 1999 42 (1) 1-4*

# Physical Sciences

## Hydrochloric Acid Leaching of Minerals from Nigerian Soil

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(Received 5 July 1995; accepted 18 October 1997)

Effects of particle size on the leaching of some metals (Mn, Cu, Fe and Zn) from soil was studied at room temperature and different hydrochloric acid concentrations. It was found that the metal concentration in the leachate decreases steadily with increasing leaching time up to a limit with exception of iron. However, the metal concentration observed at 75μm and 288μm did not differ largely after a long time of leaching. The highest metal concentration was obtained using a particle size of 75μm. A linear relationship was established between the plots of inverse of concentration in the leachate and inverse of leaching time. This observation confirms the validity of the proposed equation for the correlation of the concentration in the leachate with leaching time. The correlation of the predicted leaching concentrations with the experimentally determined ones showed only 11.0% deviation.

***Key words:*** Leachate, Soil, Minerals.

*Pak J Sci Ind Res 1999 42 (1) 5-10*

# Bulk Copolymerization of Acrylamide and Crotonic Acid

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(Received 4 August 1995; accepted 17 February 1998)

Bulk copolymerization of acrylamide and crotonic acid has been carried out. The results indicate that both monomers form copolymer in all monomeric ratios. The induction period is 40 minutes. The increasing concentration of acrylamide and benzoyl peroxide and increase in temperature and time enhance the rate of formation of copolymer. Monomer reactivity ratios of acrylamide and crotonic acid are determined experimentally using the rearranged form of copolymer composition equation. Molecular weight of the copolymer samples show that the copolymer of low molecular weight may be prepared at high temperature. All copolymer samples are white crystalline substances that become light brown at 200-210°C and burn when temperature reaches to 270°C.

***Key words:*** UV-radiation, Intrinsic viscosity, Conjugated double bands.

*Pak J Sci Ind Res 1999 42 ( 1 ) 11-23*

# ELECTRONIC SPECTRAL PROPERTIES OF SUBSTITUTED AZOURACIL COMPOUNDS

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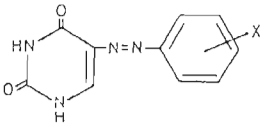
(Received 14 October 1997; accepted 31 March 1998)

Synthesis of 5-(substituted phenylazo) uracil compounds (I) have been reported. The analytical data and $^1$H-NMR are used to elucidate the structures. The electronic spectral properties of the organic compounds were investigated in presence of different solvents and at different pH's. The pK's values were determined and related with the molecular structure of the compounds. The electronic transitions were assigned. The phenomenon of tautomerism was explained. The shifts in peak locations in the electronic spectra of the organic compounds have been correlated with different solvent polarity parameters.



X = -H; 2-$CH_3$; 3$CH_3$; 3-OH; 2-COOH; 4-COOH; 2-Cl; 3-Cl; 4-Cl; 2-Br; 3-$NO_2$; 2,5-di$CH_3$; 2,5-diCl and 2,4-diCl.

***Key words:*** Electronic spectra, Azo compounds, Uracil compounds.

*Short Communication*

*Pak J Sci Ind Res 1999 42 (1) 24-25*

# DETERMINATION OF MINOR AND TRACE ELEMENTS IN INDIGENOUS SULPHIDE MINERALS

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(Received 22 September 1997; accepted 14 May 1998)

# Biological Sciences

*Pak J Sci Ind Res 1999 42 (1) 27-29*

# CAFFEINE INJECTION IN THE DARK PHASE PROLONGS THE NOCTURNAL RISE IN SEROTONIN *N*-ACETYLTRANSFERASE ACTIVITY AND MELATONIN CONTENT IN THE PINEAL GLAND OF MALE RATS

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(Received 1 December 1994; accepted 18 August 1997)

Caffeine, an important member of methylxanthines, induced a prolonged nocturnal rise in pineal melatonin content and an increase in its rate-limiting enzyme serotonin *N*-acetyltransferase (NAT) activity. The highest levels were reached five hours after subcutaneous caffeine injection to male rats in the dark phase, where the NAT activity increased from 920±70 pM pineal$^{-1}$h$^{-1}$ in the control group to 1190±120 pM pineal$^{-1}$h$^{-1}$ ($p<0.001$) in the treated group. The pineal melatonin content, as well, was elevated from 520±40 pg pineal$^{-1}$ in the control group to 1120±80 pg pineal$^{-1}$ ($p<0.001$) in caffeine treated group. These changes could be attributed to the depressive effect of caffeine on the activity of phosphodiesterase (PDE), the enzyme responsible for the hydrolysis of the intracellular second messenger cyclic adenosine monophosphate (cAMP).

***Key words:*** Caffeine, Pineal gland, Melatonin.

*Pak J Sci Ind Res 1999 42 (1) 30-33*

# *IN VITRO* EFFECTS OF ALACHLOR AND HALOXYFOP HERBICIDES ON WHEAT STRAW DEGRADATION BY SOME FUNGAL SPECIES

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(Received 26 May 1994; accepted 23 August 1997)

Using pure culture experiments, the effect of alachlor and haloxyfop at 100µg active ingredient $ml^{-1}$ on wheat straw degradation by six fungal species were investigated. The following parameters were examined: the weight loss, $CO_2$ evolution, C- and N-mineralization. The used rates of both herbicides inhibited wheat straw breakdown by five (out of six) fungal species. However, the decay of wheat straw inoculated with *Aspergillus niger* was accelerated by haloxyfop (at the two concentrations used) and alachlor (at 100 µg $ml^{-1}$ only).

***Key words:*** Herbicides, Wheat straw, Cellulose decomposition, Fungi.

*Pak J Sci Ind Res 1999* **42** *(1) 34-38*

# COMPARISION OF INFILTRATION MEASUREMENT TECHNIQUES IN BORDER IRRIGATION

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(Received 25 June 1996; accepted 7 October 1997)

Volume balance and cylinder infiltrometer method of infiltration measurements were carried out at Bangladesh Agricultural University farms to determine the infiltration characteristics in Border irrigation for better irrigation management. First, second and third irrigation trials were conducted in non-vegetative border and fourth trial was conducted in vegetative border (Maize crop). The rate of application of water in first, second, third and fourth trial were 12.42, 2.21, 5.19 and 5.19 l $s^{-1}$, respectively. A general equation of infiltration rate was developed for the study area and comparison was made between Volume balance method and Cylinder infiltrometer method. It was observed that for all the trials cumulative infiltration and infiltration rate by Volume balance method was higher than that of cumulative infiltration and infiltration rate by Cylinder infiltrometer method. It was also observed that the values of infiltration characteristic constants a and b by Volume balance method were higher than those of the values of a and b by Cylinder infiltrometer method.

***Key words:*** Infiltration, Infiltrometers, Border irrigation.

*Pak J Sci Ind Res 1999 42 (1) 39-43*

# CULTIVATION OF THE RED MICROALGA *PORPHYRIDIUM CRUENTUM* UNDER NATURAL OUTDOOR CONDITIONS

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(Received 3 April 1997; accepted 4 April 1998)

Growth and production of extracellular polysaccharides (EPs) by the unicellular red alga *Porphyridium cruentum* were studied in open vessels of different depths under outdoor natural climatic conditions of Pakistan and compared with cultures grown under indoor controlled conditions. In 2 cm deep cultures both growth and EPs production were found to be higher in indoor cultures than the outdoor cultures whereas in 8 cm deep cultures, both growth and EPs production were found to be higher in outdoor cultures. In this case, an increase of 58% in biomass and 163% in EPs production was observed in the outdoor cultures as compared to indoor cultures. During outdoor cultures, the depth of 8 cm was noted to be most optimum for both biomass and EPs production. Also, polysaccharides produced under outdoor conditions compared well with a number of currently used biopolymers regarding rheological properties.

***Key words:*** Outdoor cultivation, *Porphyridium cruentum*, Extracellular polysaccharides.

*Pak J Sci Ind. Res 1999 42 (1) 44-46*

# CELL MEMBRANE THERMOSTABILITY AS A MEASURE OF HEAT-TOLERANCE IN COTTON

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(Received 20 May 1996; accepted 23 April 1998)

High termperature stress is a major constraint to increased productivity of cotton in Pakistan. A technique based on physiological characteristics is therefore required to screen the cultivars for heat-tolerance. The membrane thermostability test conducted on fully grown young leaves of cotton is an appropriate technique for screening breeding material for heat-tolerance. Genotypes tested showed wide variations in adaptation to high temperature stress and could be broadly grouped into three categories on the basis of cell injury level. Genotypes showing high membrane thermostability gave higher seed cotton yield.

***Key words:*** Cotton, Heat tolerance, Cell membrane thermostability.

*Pak J Sci Ind Res 1999 42 (1) 47-50*

# EVALUATION OF SOMACLONAL VARIANTS FOR YIELD AND SOME QUALITY PARAMETERS

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(Received 30 August 1997; accepted May 22 1998)

A field experiment was conducted to examine the variability of eight somaclones for agronomic and quality parameters. A significant reduction in plant height and days to flowering was noted. There was increase in kernel length and head rice recovery. TF4 was selected having stiff stem, early in flowering, semi dwarf with high fertility,better grain quality and greater yield potential than the parent variety. TF8, TF9 and SN12 yielded at par with the parentt variety i. e. Basmati 370. Profuse but unproductive tillers did not contribute to the yield. Linear relationship existed between increased L/B ratio and better grain quality. The grains of all the somaclones were fine type, slender in shape and long in size. The highest quality Index was exhibited by TF9 followed by TF11 and TF10 respectively.

***Key words:*** Rice, Somaclonal variant, Agronomy, Quality characteristics.

*Pak J Sci Ind Res 1999 42 (1) 51-53*

# Technology

## A Sensor for Monitoring Water Uptake by a Simulated Plant Root

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(Received 13 January 1993; accepted 30 September 1997)

An optoelectronic device for measuring very slow rates of flow through a simulated plant root was designed, constructed and tested in the laboratory of Agricultural Engineering Department, University of Newcastle upon Tyne, England, during the period from 1985 through 1987. 'Transducers' were used to monitor the advance rate of meniscus through a capillary glass tube. The transducers consisted of a small piece of plastic (Tufnol), a 6 mm filament bulb and a phototransistor unit. The time recorded by each transducer was printed out in a microprinter. The optoelectronic device reported in this paper can be used in the monitoring of soil water extraction by a physically simulated plant root which would ultimately allow plant water stress to be used directly in the control of irrigation.

***Key word:*** Optoelectronic device, Plant root, Transducer, Meniscus, Irrigation.

*Pak J Sci Ind Res 1999 42 (1) 54-58*

# INDUSTRIAL FEASIBILITY STUDIES OF AZAD KASHMIR GYPSUM

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(Received 21 June 1997; accepted 20 October 1998)

Gypsum occurs at four localities around Muzaffarabad i.e. Balak Bhanna, Sherwan, Shawai and Thangar areas between 2-4 kilometers northwest of Muzaffarabad, Azad Kashmir along the west bank of river Neelum and Katha Shawai. This gypsum is fine-grained and massive and belongs to Hazara formation. The reserves are enough to be used in different industires. Samples were taken from these four deposits and studied for their commerical and industrial suitability for the production of gypsum plaster. The physical studies proved that "Plaster of Paris" produced from these samples conform to the standard specifications for gypsum plasters.

**Key words :** Azad Kashmir, Gypsum, Plaster of Paris.