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# Physical Sciences Section

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## EFFECT OF CHROMATE, NITRITE AND BENZOATE IONS ADDITIVES ON THE CORROSION BEHAVIOUR OF LOW CARBON STEEL IN ACID MEDIUM

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(Received December 12, 1992; revised January 3, 1994)

The effect of  $\text{CrO}_4^{2-}$ ,  $\text{NO}_2^-$  and  $\text{C}_6\text{H}_5\text{COO}^-$  ions on the inhibitive behaviour of low carbon steel electrodes in aqueous solutions of mono-, di- and tri-chloroacetic acids at pH 1 to 4 is calculated by studying potential-time variation, weight loss measurements and galvanostatic polarisation. It has been found that the steady state potentials which obey the relationship  $E = a - b \log C$ , where (a) is a proportional constant and (b) is the order of the reaction which can be obtained from the linear plot of  $\log C$  versus  $\log$  corrosion rate which depend on the type of the acids and C is the molar concentration of the acids, is shifted towards less negative values with the increase in the concentration of additive ions and from pH 1 to 2 and then increases again at pH = 3 to 4. The decrease in the rate of corrosion with increase of anion concentration is probably due to the fact that additive ions act as anodic inhibitors. The critical current density for passivation varies with the nature and concentration of the additive anion.

**Key words:** Steel, Chromate, Nitrate, Benzoate, Inhibition.

## NEW MIXED COMPLEXES OF Zr (IV) WITH MONO AND MULTIDENTATE LIGANDS

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(Received August 8, 1993; revised December 14, 1993)

Several new complexes of zirconium (IV) containing a number of monodentate and multidentate organic ligands have been synthesized and characterized. The complexes have the compositions,  $[\text{Zr}(\text{O})\text{Cl}_2(\text{en}) \cdot \text{H}_2\text{O}]$ ,  $[\text{Zr}(\text{O})\text{Cl}_2 \cdot 2\text{L} \cdot \text{H}_2\text{O}]$ ,  $[\text{Zr} \cdot \text{L}'_3\text{Cl}]$  and  $[\text{Zr}(\text{O})\text{Cl}_2 \cdot \text{L}'']$  [en = ethylenediamine; L = triphenylphosphine oxide, triphenylarsine oxide, pyridine or aniline; L' = 8-hydroxyquinolino, o-aminophenoxide, L'' = diethylenetriamino and triethylenetetramino]. The molar conductance data indicate that complexes  $[\text{Zr}(\text{C}_9\text{H}_6\text{NO})_3\text{Cl}]$  and  $[\text{Zr}(\text{C}_6\text{H}_4\text{NH}_2\text{O})_3\text{Cl}]$  are 1:1 electrolytes but all other complexes behave as 2:1 electrolytes. The experimental data are consistent with six-fold coordination of Zr (IV) ion in all the complexes excepting  $[\text{Zr}(\text{C}_9\text{H}_6\text{NO})_3\text{Cl}]$ ,  $[\text{Zr}(\text{C}_6\text{H}_4\text{NH}_2\text{O})_3\text{Cl}]$  and  $[\text{Zr}(\text{O})\text{Cl}_2 \cdot \text{tet}]$  which are seven coordinated.

**Key words:** Heteroligand, Zirconium, Complexes.

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## ULTRAVIOLET AND VISIBLE ABSORPTION AND SPECTRAL SHIFTS OF SOME SCHIFF BASES DERIVED FROM $N,N$ -ETHYLENEDIAMINE

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(Received June 3, 1990; revised November 14, 1993)

The electronic absorption spectra of the Schiff bases, in the present not  $[N,N$ -di( $X$ -benzylidenes) ethylenediamine], have been investigated in organic solvents of different polarities. The main visible band observed in all of the compounds examined, in ethanol, is assigned to the electronic transitions within the whole molecule of such compounds as an intramolecular charge transfer (CT) interaction. The position of this band is quite sensitive to nature of substituent  $X$ . On the other hand, an additional visible band appeared in each of compound II ( $X=O-OH$ ) and compound IV ( $X=N(CH_3)_2$ ). This can be attributed to an intermolecular CT transition in case of the former compound and to high stabilization of the polar excited state of later compound by an ethanol molecule. Furthermore, the  $pK_a$  values of the substituent  $X$ , have been determined and related to the geometric flexibility of such compounds.

**Key words:** Electronic absorption spectra, Schiff bases,  $N,N$ -Ethylenediamine.

**Introduction**

general formulae of the synthesised Schiff bases can be cited as

## SYNTHESIS AND PROPERTIES OF MALEIC ANHYDRIDE - CROTONIC ACID-VINYL ACETATE TERPOLYMER

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(Received December 12, 1992; revised January 15, 1994)

Free radical terpolymerization of maleic anhydride (in the form of half ester of maleic acid) crotonic acid and vinyl acetate has been accomplished at 75-80° using benzoyl peroxide as initiator. It has been observed that three monomers polymerise simultaneously and form terpolymer in all monomeric ratios. Terpolymers of 8394-18434 molecular weight are obtained. These are white solid substances soluble in most of organic solvents that softens at 70-90°. The refractive index of terpolymer samples ranges 1.3610-1.3635. The terpolymers may be used in the preparation of hair spray as the film forming agent.

**Key words:** Plasticizer, Adhesion, Film forming agent.

# Biological Sciences Section

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## VARIATION IN CHEMICAL CONSTITUENTS OF MANGROVE FOLIAGE *AVICENNIA MARINA* (FORSK.) VIERH. (AVICENNIACEAE)

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(Received January 26, 1991; revised December 23, 1993)

Seasonal variation in the organic and inorganic constituents of green, yellow and decomposing mangrove, *Avicennia marina*, leaves were studied. The leaf samples were collected from two different locations and analysed for total organic matter, water, protein, lipid, carbohydrate, nitrogen, organic carbon, and calorific content. Total inorganic content and the macro and micro-elements including sodium, potassium, calcium, magnesium, phosphorus, iron, manganese and copper were also determined. Results showed differences among leaf types and also between the sampling sites. The heavy metal pollution in the creek area was also reflected in the leaf samples from Bakran creek.

**Key words:** Mangrove, *Avicennia marina*, Chemical composition, Seasonal variation.

## SEEDLING VIGOR AND GENETIC VARIABILITY FOR RICE SEED, SEEDLING EMERGENCE AND SEEDLING TRAITS

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(Received February 13, 1993; revised December 1, 1993)

Eleven local rice cultivars including Basmati 370 were evaluated for seedling vigor. Three groups of traits were evaluated viz; seed traits (seed density, seed volume, seed weight, paddy length and grain length), seed emergence traits (emergence %, emergence index and emergence rate index), and seedling traits (fresh root length, dry root weight, root to shoot ratio and relative root weight). Genetic variability and heritability estimates for seed weight, emergence percentage, root length, dry root weight, seed weight and relative root weight were observed significant, respectively. Seed density, relative root weight, emergence rate index and root to shoot ratio were relatively more amenable to improvement. Relative expected genetic advance was the function of heritability and coefficient of phenotypic variability, latter being more important.

**Key words:** Seedling vigor, Variability, Root/shoot ratio, Rice.

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## EFFECT OF GAMMA IRRADIATION ON GROWTH AND NUTRIENTS UPTAKE OF SORGHUM PLANTS

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(Received January 14, 1992; revised December 22, 1993)

A pot experiment was carried out using sandy and calcareous soils to study the effects of gamma irradiating doses for sorghum seeds on dry matter yield and elemental uptake. Three cuttings were taken during the experiment every 40 days. Results showed that 4 Kr. dose was the best dose that caused significant higher increase of dry matter yield and nutrients uptake for three cuttings under both types of soil. Gamma irradiation doses at 8 Kr. and above all had an adverse affect on dry matter yield and nutrients uptake, especially under calcareous soil.

**Key words:** Gamma irradiation, Plant growth, Nutrients.

## LIPID STUDIES OF *CARUM CAPTICUM* SEED OIL

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(Received August 15, 1992; revised November 18, 1993)

The total lipids of *Carum capticum* were fractionated by thin-layer chromatography into hydrocarbons (1.2%), wax esters (2.0%), sterol esters (1.8%), triglycerides (54.1%), fatty acids (5.7%), 1:3 diglycerides (5.7%), 1:2 diglycerides (6.7%), glycolipids (7.2%), 2-monoglycerides (3.9%), 1-monoglycerides (7.4%), phosphatidyl ethanolamines (1.5%) phosphatidyl cholines (1.1%) lysophosphatidyl ethanolamines (0.6%) and phosphatidyl inositols (1.1%).

**Key words:** Lipids, Methylation, Thin-layer chromatography, Gas liquid chromatography.

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## HETEROSIS STUDIES ON QUALITY TRAITS IN INTRASPECIFIC CROSSES OF *GOSSYPIUM HIRSUTUM* L.

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(Received April 2, 1991; revised December 4, 1993)

Heterosis was studied in 12 intrahirsutum hybrids for six quality characters. Heterotic response varied from 1.1 - 26.1%, 2.00 - 32.1%, 0.28 - 10.5%, 0.9 - 3.6%, 9.1 - 14.1% and 0.6 - 2.3% for seed index, lint index, ginning outturn, staple length, fibre fineness and fibre strength, respectively. Likewise positive heterobeltiosis ranging from 1.1 - 20.7%, 1.9 - 21.2%, 0.3 - 9.1%, 0.7 - 2.1%, 8.1 - 11.11% and 1% respectively was also observed from the above characters.

**Key words:** *Gossypium hirsutum* L., Heterosis, Heterobeltiosis, Quality characters.

## PREPARATION OF DIETARY FIBRE FROM MUSTARD SEED MEAL

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(Received May 13, 1993; revised November 21, 1993)

Investigations were carried out to reduce cellulose and hemicellulose from mustard seed meal by different methods to prepared dietary fibre. Reduction in hemicellulose was found to be 28.31% when detoxified mustard seed meal was autoclaved at 15 lbs/inch<sup>2</sup> for 30 mins. A significant reduction in cellulose and hemicellulose was also observed on treatment with sodium bicarbonate and sodium carbonate. A further reduction in these fibrous components was found on autoclaving the sodium bicarbonate or sodium carbonate treated meal. Reduction in cellulose contents was 26.45% after fermentation of detoxified meal with *Trichoderma viride* for 72 hrs. Protein digestibility of the meal was improved with the application of these treatments.

**Key words:** Mustard seed meal, Dietary fibre, Cellulose, Hemicellulose.

*Short Communication*

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**Effect of a Synthetic Pheromone When  
Applied to Different Models on Male Mating  
Behaviour in *Musca domestica***

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# Technology Section

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## FORTIFIED CORN-FLOUR FEED AS INFANT FORMULAE SUBSTITUTE

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(Received June 26, 1992; revised December 29, 1993)

The corn-flour feed varieties commonly consumed in Nigeria were fortified with dry white crayfish (*Pinnens notialis*), red crayfish (*Macrobrachium macrobium*) and Tilapia. Eight different brands of popular infant formulae and the fortified corn meals were analysed for fats, protein, carbohydrates and nutritionally valuable minerals. Results obtained showed low fat, protein and carbohydrate values in the corn flour infant meal. However, on fortification, corn-flour meal - crayfish blends (4:1) compared favourable well with commercial infant formulae in terms of the fat, protein, carbohydrate and mineral elements. These results including the cost analysis of the fortified meal vis-a-vis the commercial infant feeds were discussed.

**Key words.:** Corn-flour, Infant, Fortified-meal, Crayfish, Tilapia.

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## PROCESSING OF EMERALD BEARING ROCKS OF GUJAR KILLI EMERALD MINE BY WASHING AND SCREENING

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(Received October 11, 1992; revised December 12, 1993)

The recovery process of talc and emeralds, contained in the emerald bearing altered talcose schists of Gujar Killi were found to be feasible at the bench and pilot plant scale. The various units required for the washing and screening plant were tested. A detailed investigation of size analyses of the head and ground samples, liberation and association of emerald/gangue particles, pulp density, product size analysis and optimisation of grinding were undertaken. A tentative block diagram was developed as a result of laboratory tests. The study conducted for the Gem Stone Corporation of Pakistan is encouraging and can be applied to the mechanical recovery of talc and emerald in the Gujar Killi emerald mine.

*Key words.* Emerald, Talc beneficiation, Pakistan.