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Physical Sciences

Pak. J. Sci. Ind. Res. 2003 46(5) 311 - 316

LATEXES FROM *EUPHORBIA CADUCIFOLIA* - ISOLATION AND CHARACTERISATION OF RUBBER HYDROCARBON. *PART-I*

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Latex was collected by incising the stem of *E.caducifolia* plant which contains 26.90 - 28.60% solid material. The chemical composition of solid material shows resinous mass 68.30 - 72.70%, where as rubber hydrocarbon is around 6.20 - 7.60 and inorganic matters lie in the range 19.00 - 22.90% and 1.50 - 1.90%, respectively. The rubber hydrocarbon was characterised by different chemical and instrumental methods. Iodine value of hydrocarbon (310.91 - 350.80%) percentage of unsaturation (83.40 - 94.10%), elemental analysis (C = 87.48 - 88.04%, H = 11.20 - 11.82%), solubility, IR spectrum (840 cm^{-1}), ^{1}H-NMR spectrum (olefinic proton at 5.15 - 5.20%), ^{13}C-NMR spectrum (olefinic region 120 - 140 ppm), molecular weight (15275 - 88405), the value of T_g (- 63.02 - 60.81°C), refractive index (1.49200 to 1.49325) and specific gravity (0.93102 to 0.93628) identify rubber hydrocarbon as polyisoprene. The material is sticky and poor in strength and burning gives a smoky flame.

Key words: Latex, *Euphorbia caducifolia*, Hydrocarbon, ^{13}C-NMR spectrum.

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PREPARATION, CHARACTERIZATION AND MOLECULAR MODELS OF THE COMPLEXES OF QUADRIDENTATE TRIPODAL LIGAND TREN [TREN = TRIS(2-AMINOETHYL)AMINE] WITH Ag(I), Cd(II), Hg(II), Zr(IV) AND U(VI)

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The tripodal ligand tren, has been reacted with Ag(I), Cd(II), Hg(II), Zr(IV) and U(VI) in the EtOH medium. The solid product obtained immediately after the reaction, were formulated by comparing C, H, N, and S analysis data. Ag(I) and Cd(II) form simple five coordinated compounds and the others produce double salt like compounds. The bonding patterns of the compounds have been discussed on the basis of IR an UV visible spectral analysis. The geometry of the coordination sphere of the complexes are suggested on the basis of molecular models.

Key words: Tripodal ligand, Coordination sphere, Molecular model.

Pak. J. Sci. Ind. Res. 2003 46(5) 323 - 326

EXTRACTION AND CHEMICAL QUALITY CHARACTERISTICS EVALUATION OF ORANGE PEEL PECTIN

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Optimum conditions for the extraction and precipitation of pectin from orange peels were investigated. Changes in pH, temperature and extraction time, significantly, affected the extraction of pectin. Maximum pectin yield was 17.7%, which was obtained on soaking finely ground orange peels in sulphuric acid solution of pH 2.5 at 80°C for 120 min. Maximum pectin was precipitated from the extract by adding 95% ethanol at the rate of 200ml/l. Anhydrogalacturonic acid and methoxyl contents of pectin obtained under these optimum extraction conditions were 72.80% and 9.77% respectively, while equivalent weight value was 943. These chemical characteristics values were within the accepted limit of good quality pectin.

Key words: Orange peel, Pectin, Extraction yield, Quality.

Pak. J. Sci. Ind. Res. 2003 46(5) 327 - 332

CHEMICAL POLYMORPHISM IN ASTERACEAE

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The qualitative and quantitative composition of the essential oils of seven plants of asteraceae family were investigated. The essential oils were obtained by hydro-distillation of plants and analysed by Gas Chromatograph. The major essential oil components identified, broadly belong to monoterpenoids, sesquiterpeniods and caryophyllene were found to be common in all the investigated species.

Key words: Chemical polymorphism, Asteraceae, Essential oil, Hydro-distillation, Monoterpinoids, Sesquiterpenoids, Caryophyllene.

Pak. J. Sci. Ind. Res. 2003 46(5) 333 - 343

SOME PHYSICAL PARAMETERS OF THE SANDSPIT BACKWATERS, KARACHI COAST

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Certain physical parameters like, salinity, temperature, dissolved oxygen, pH, rainfall, grain size analysis and organic content of the sediment from the Sandspit backwater, Karachi have been studied. The sampling was done on a fortnightly basis for a period of two years i.e. June 1987 to May 1988. The salinity of the backwater ranged between 16.99 to 45.00 ppt with an average value of 37.98 ± 4.32 ppt (S.D.) (n = 48). The open sea salinity varied from 34.30 to 39.48 ppt, with an average salinity value of 36.91 ± 0.97 ppt. (S.D.) (n = 48). The average temperature of the backwater was found to be 28.9 ± 3.9°C (S.D.) (n = 48) with a range of 19.5°C to 34.5°C. The average temperature of the open sea was found to be 27.2 ± 2.5 °C (S.D.) (n = 48). The lowest temperature was 22.0°C, whereas the highest temperature was 33.0°C. The monthly mean of daily maximum air temperature ranged between 25.6 to 36.4°C, while the monthly mean of daily minimum air temperature ranged between 10.5 to 28.4°C. Mean monthly temperature ranged between 18.1 to 32.3°C. The maximum rainfall was 85 mm in the month of August 1988, while the minimum rainfall recorded was 0.5 mm in the month of January 1989. The mean value of dissolved oxygen in the backwater was found to be 5.01 ± 0.97 ml/l (S.D.) (n = 48). The lowest value was 3.00 ml/l, whereas the highest value was 6.55 ml/l. The average value of dissolved oxygen for the open sea was found to be 5.25 ± 0.85 ml/l (S.D.) (n = 48). The average pH of the backwater was found to be 7.61 ± 0.46 (S.D.) (n=48), whereas, it ranged from 6.34 to 8.05. The samples collected from intertidal pool had greater percentage of sand fraction (79.70-89.84%) as compared to those collected from mud flat, which had 63.33 to 79.86 % of sand fraction. The organic content was found to vary from 3.19 to 8.32 %.

Key words: Salinity, Temperature, pH, Dissolved oxygen, Rainfall, Organic carbon, Karachi coast.

Pak. J. Sci. Ind. Res. 2003 46(5) 344 - 347

DISSOCIATION EXTRACTION PROCESS FOR THE SEPARATION OF ISOMERIC ORGANIC COMPOUNDS

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(Received October 20, 2001; accepted August 25, 2003)

Separation of mixture of isomeric organic compound was achieved by exploiting the difference in their dissociation constants by employing dissociation extraction technique. Mixture of 3-picoline and 4-picoline was partially separated with sodium dihydrogen phosphate to demonstrate the phenomenon of dissociation extraction. A theoretical treatment of separation of isomers is given which can be utilized to predict the separation factor of dissociated and undissociated species of isomers. Increase in temperature had a positive influence on the separation of isomers and also on the phase disengagement between the aqueous and the organic phases. A process is described to develop a suitable chemical material bed in the column for gas-liquid chromatograph that reduces the retention time and gives high resolution of picolines.

Key words: Dissociation extraction, Separation factor, Dissociation constants.

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THERMAL STABILISATION OF PVC WITH *JATROPHA* SEED, *KHAYA* SEED AND RUBBER SEED OILS. EFFECT OF BARIUM AND CADMIUM SOAPS OF THE SEED OILS ON THE THERMAL DEGRADATION OF PVC

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(Received March 21, 2001; accepted August 25, 2003)

Polyvinyl chloride was mixed with barium and cadmium soaps of *Jatropha* seed, *Khaya* seed and rubber seed oils and mixtures of the metal soaps and degraded at 190°C under oxidative and nonoxidative conditions. The effectiveness of the additives in stabilizing PVC against thermal degradation was evaluated by comparing (a) the kinetic data measured at 1% conversion for the degradation of PVC in the presence of the additives with the corresponding values obtained in the absence of the additives (b) the intrinsic viscosity and level of unsaturation in the polymer samples degraded for the undergraded polymer and (c) the thermogravimetric data obtained for the degradation of PVC in the presence of the additives at a constant heating rate of 10°C min^{-1} up to 500°C. It was found that the additives retarded the rate of dehydrochlorination of PVC (by up to about 50% and 1% conversion) and reduced the extent of decomposition of the polymer by as much as 60%. The mixtures of the metal soaps containing more than 70%(wt) cadmium soap showed marked synergistic stabilising effect on the degradation of PVC.

Key words: Thermal stabilisation, PVC synergistic effect, Metal soaps, Seed oils.

Biological Sciences

Pak. J. Sci. Ind. Res. 2003 46(5) 354 - 357

A Study on the Feeding Responses of a Filter - Feeding *Cyclops* sp. on Various Concentrations of *Chlorella vulgaris*

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The feeding responses of *Cyclops* sp. fed on *Chlorella vulgaris* at various concentrations were studied. The filtration rate of *Cyclops* ranged from 3.0 to 6.43 µl/h/individual. The range of food concentrations was 515 to 2039 cells/µl. The critical food concentration was 1435 cells/µl. The ingestion rate was recorded a maximum of 9971 cells/h/individual at the concentration of 771 cells/µl. This study also relates filtration rate with pH and dissolved oxygen.

Key words: *Cyclops* sp., *Chlorella vulgaris*, Feeding responses.

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Effect of Cooking Method and Length of Cooking Time on Nutritive Value of Various Bean Broths

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Nutritive value of various bean broths was evaluated. Black grams, chick-peas, lentil, red and white kidney beans were subjected to different cooking methods for different time periods. Cooked broth was analyzed for total solids, °Brix, protein, minerals and total soluble sugars to assess the nutritive value. Variable amounts of these nutrients were obtained in these broths depending upon the cooking method and cooking time. These nutrients in broth showed a significant increase with cooking time. Total solids and °Brix, in these bean broths varied from 8.10 - 30.00 and 5.40 - 20.00 g/l, whereas the amount of protein, minerals and soluble sugars ranged from 4.10 - 17.00, 2.20 - 5.80 and 1.20 - 4.80 g/l, respectively. However, maximum amount of nutrients in broth was obtained by pressure cooking of beans.

Key words: Beans, Nutritive value, Cooking method.

Pak. J. Sci. Ind. Res. 2003 46 (5) 363 - 366

MORPHOLOGICAL STUDIES OF THE SCHISTOSOMULUM OF *SCHISTOSOMA MANSONI* AND *SCHISTOSOMA MARGREBOWIEI* IN LUNGS OF MICE

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Morphological studies on the *Schistosoma mansoni* and *S. margrebowiei* schistosomulum development in the lung of definitive host mouse have been reported after 2 to 21 days post-infection. The greatest proportion of schistosomula were observed within the capillaries attached to the alveoli and few in the branches of the pulmonary arteries and veins. The length and shape of schistosomulum sections were highly variable due to the randomness of the plane of sections through the worm. The differences in the diameter of the body and cuticle of the *S. mansoni* and *S. margrebowiei* schistosomulum were non-significant ($P > 0.05$).

Key words: *Schistosoma mansoni*, *S. margrebowiei*, Schistosomulum, Lungs, Mice.

Introduction

The larval stage of *Schistosoma* (parasite) is called cercaria. These cercariae deposit a mucoid (PAS-positive) secretion from the postacetabular secretory glands as they loop over the skin of their mammal host during exploration at the site of penetration, enter into the horny and keratogenous zones during their passage through the skin and across the cellular epidermis. The mucoid post-acetabular secretion is adhesive, lubricative and serves in protective functions. The pre-acetabular secretion is primarily enzymatic (Stirewalt and Kruidenier 1961). Histolytic enzymes are secreted from the penetration glands and the cercariae burrow through the tissues. The tail of the cercaria is shed on penetration and the tail-less cercaria is then known as a schistosomulum. The schistosomulum is now no longer able to survive in fresh water (McLaren and Hockley 1977). The process of transformation takes less than one hour to complete *in vivo* (Cousin *et al* 1981).

Schistosomula leave the skin via the blood or lymphatic vessels and ultimately pass through the right side of the heart via the venous system to be distributed to the lungs via the pulmonary arterial system. The increase in numbers of schistosomula within the pulmonary capillaries from day 2 to day 7 post infection (p i) indicates their effectiveness as a physical barrier for further migration (Wheater and Wilson 1979). The arrival of schistosomula in the lungs via the pulmonary artery is a prelude to a sequence of developmental changes which are presumably necessary for further migration. Following arrival in the lungs of mice, schistosomula undergo a phase of elongation up to four times the length observed in the skin, with a concomitant reduction in diameter and no increase in mass (Wilson *et al* 1978). This process of elongation may be a necessary prelude to the passage of schistosomulum through the narrow lumina of capillaries in the lungs (Carbtree and Wilson 1986a). Schistosomula retain this capacity for elongation until they reach the hepatic portal system where it is believed to facilitate migration through capillary beds in the lungs and systemic organs (Miller and Wilson 1980). The aim of the present research paper is to describe the morphological changes in the development of the schistosomula in the lung of the mouse during schistosome infections.

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Materials and Methods

Age-matched female mice of the Bantim and Kingman Tylers Original (BKTO) strain, weighed approximately 20 - 35g, each were infected with 200 cerariae of either *S. mansoni* [Puerto Rican strain maintained in albino *Biomphalaria glabrata* snails and random-bred TO mice following the methods of Taylor *et al* (1969) or *S. margrebowiei* (originally obtained from Lochinvar National Park, Zambia] and maintained in *Bulinus natalensis* intermediate host snails (the original stock was obtained from the Experimental Taxonomy Unit of the British Museum of Natural History, London, UK). Before administering the cercariae, the experimental animals were anaesthetized with sodium pentobarbitone (Nembutal) and the abdominal hair was clipped. The cercariae were applied to the abdominal skin by using ring. All mice were killed at day 2, 3, 4, 6, 8, 10, 16 and 21 and autopsies were performed immediately after the animals were killed by dislocation of neck region. The lungs from each animal were fixed in Heidenhain's Susa fixative, washed, dehydrated with ethanol, infiltrated and

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North Carolina Design - 11 Analysis for Estimating Genetic Parameters in Cotton (*Gossypium hirsutum* L.)

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Genetic information is very important in formulating effective plant breeding programmes. North Carolina Design - 11 analysis was used to determine general combining ability (GCA), specific combining ability (SCA) and additive and dominant genetic variances for six quantitative traits in Upland cotton. In *per se* hybrid performance, parents CRIS - 241 and CRIS - 121 when crossed with other parents formed higher bolls per plant and produced more yield and lint %. It is usually predicted that *per se* hybrid performance is also reflected to SCA of the parents. This assumption did not always hold true, however, parents CRIS - 241 and CRIS - 121 that were good in *per se* hybrids and in GCA also formed good SCA when crossed with CRIS - 134 and CIM - 448, respectively. These results thus suggested that CRIS - 241 and CRIS - 121 are better parents simultaneously for *per se* hybrids, GCA and SCA. Genetic variation due to males (GCA), females (GCA) and males x females (SCA) were significant for all the traits except females for boll weight which indicated that both additive and dominant genes were important for characters under study. Similar to genetic variation due to GCA and SCA, estimates of additive and dominant genetic variances were also substantial suggesting that these characters can be improved either by hybridization and selection or suitable for hybrid cotton. The proportional contribution of GCA and SCA combining ability variances to total genetic variance further revealed that about equal proportions of additive and dominant genetic variances were available for all the traits except boll weight where additive variance was much higher than dominant variance.

Key words: General and specific combining abilities, Genetic parameters, Cotton.

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PERFORMANCES OF NEWLY DEVELOPED COTTON STRAINS FOR ECONOMIC AND FIBRE TRAITS IN NATIONAL COORDINATED VARIETAL TRIALS

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To find out the responses of new cotton, strains were conducted at Central Cotton Research Institute, Multan along with a commercial variety NIAB - 78. The highest seed cotton yield was noted in CIM - 443 followed by CIM - 435. The longest staple length was noted in strain CIM - 435 followed by CIM - 443. The strain CIM - 443 was significantly better in ginning outturn percentage and number of bolls/plant followed by CIM - 435. The boll weight was the highest in CIM - 435. The newly developed strain CIM - 443 showed the best characteristics, among all the tested strains.

Key words: Genotypes, Response, *Gossypium hirsutum* L. NCVT.

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NUTRITIONAL QUALITIES OF SMOKED SHRIMP FROM THE SUNDARBANS MANGROVE AREA, BANGLADESH

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Quality aspects of a traditional smoked product from the shrimp *Metapenaeus brevicornis* in the Sundarbans mangrove area have been discussed. Studies on the physical properties, proximate composition, mineral content and amino acid value show that the quality of traditional smoked product is quite good. During 90 days of storage period the product was found to lose its characteristic properties and overall acceptability. However, smoked shrimp retained its overall acceptability up to 60 days of storage.

Key words: Smoking, Shrimp, Proximate composition, Micronutrient, Amino acid

Pak. J. Sci. Ind. Res. 2003 46(5) 383 - 388

EFFECT OF RADIATION ON THE PHYSICO - CHEMICAL CHARACTERISTICS OF TOMATO DURING STORAGE

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Tomato samples, collected from Peshawar market, were irradiated with different doses of gamma radiation, 0.2, 0.3, 0.4, 0.5, 1.0, 2.0, 3.0 and 4.0 kGy and a control sample was kept for comparison. The irradiated samples were analysed every day for physico-chemical analysis i.e. pH, acidity, optical density, ascorbic acid (vitamin - C) and % ripening. Ascorbic acid and acidity were determined titrimetrically while optical density was measured with the spectrophotometer. Physical separation, ripening and spoilage were determined by visual examinations. The results showed that the ascorbic acid contents were higher in control as well as in samples irradiated with lower doses while it decreased to a level of 12.3 mg/100 g for high doses. The acidity and optical density also decreased during storage. The ripening process was delayed at higher doses.

Key words: Tomato, Irradiation, Physico - chemical analysis.

Technology

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RETENTION OF NUTRITIONAL QUALITY OF SOYBEAN DURING EXTRUSION COOKING

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Trypsin inhibitor (TI) is one of the major anti-nutritional components of soybean and must be inactivated before its protein content can be safely and efficiently utilized for food and feed purposes. However, retention of the protein quality is also a prime consideration while inactivating TI. This research was conducted to study the effect of extrusion process conditions (temperature, screw speed and moisture content) on trypsin inhibitor activity (TIA) and nitrogen solubility index (NSI) and to develop a model for prediction of TI inactivation during extrusion cooking based on its reaction kinetics. A laboratory size single screw extruder was used for extrusion cooking of full-fat soybean implementing a (4x4x4)x2 full factorial design. TIA was measured using a standard procedure and NSI by AACC procedure. The reaction rate constant for loss of TIA was calculated based on its activation energy from literature and experimental TIA data. The statistical models correlating product temperature with operating conditions and activation energy were combined with mathematical equations for predicting TIA during the cooking process. TIA and NSI of the soybean (William 82 variety) were found to be 47.0 TIU mg^{-1} and 78% respectively. Trypsin inhibitor inactivation ranged from 90% of that of raw soybean at low screw speed (75 rpm) and high barrel temperature (170°C) (LSHT) to 50% for higher screw speed (150 rpm) and low barrel temperature (140°C) (HSLT). Reduction in NSI for similar extrusion conditions ranged from 95% at LSHT to 50% at HSLT of that of raw soybeans. Variations between predicted and measured TIA values were less than 1% for the given conditions. Results indicated that reduction in TIA and NSI occurred mainly in the compression and metering sections of the extruder and that they paralleled each other, thereby making it difficult to retain high NSI while inactivating TI. However, the efficiency of extrusion cooking for TI inactivation has been proved. The model can be used for determining optimum conditions for extrusion cooking of soybean for food and feed purposes.

Key words: Soybean, Trypsin inhibition, Extrusion cooking, Nitrogen solubility index.