

Physical Sciences Section

Pakistan J. Sci. Ind. Res., Vol. 14, Nos. 4-5, August-October 1971

FORMATION OF RESONANT STATES IN $K^-n \rightarrow \pi^0 \Sigma^-$ BETWEEN 1850 AND 2160 MEV

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(Received December 19, 1970)

Results are presented for a partial-wave analysis of the $J=1$ reaction $K^-n \rightarrow \pi^0 \Sigma^-$ covering a range of CMS energies from 1850 to 2160 MeV. The events used were obtained from the interactions of the type $K_d \rightarrow \pi^0 \Sigma^- p_s$. Values of the resonance parameters of the $Y^*_1(2030)$ were determined. In addition, it was found that $F_{5/2}$ amplitude resonates at ~ 1980 MeV whose parameters differ significantly from $Y^*_1(1910)$ but in better agreement with the new $Y^*_1(1940)$ reported by Barnes *et al.*⁵

ANOMALOUS BEHAVIOUR OF SOLUTIONS OF SIMPLE AROMATIC COMPOUNDS IN STRAIGHT CHAIN HYDROCARBONS AND MINERAL OILS

Part III.—Further Viscosity Measurements in Some Binary Systems, and Development of a Formula for Predicting the Free Energy of Mixing for Aromatic Compounds

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(Received June 26, 1971))

The previously reported measurements of viscosity depression and free energy of mixing have been repeated in case of benzene and toluene, now mixed with nonane and octane, respectively, in place of octane and heptane previously used. The previous results are generally confirmed, and mean values of 171 ± 20 and 102 ± 15 cal/mole for ΔG_m are obtained for benzene and toluene, respectively.

The data for nine aromatic compounds so far studied are analyzed, and a least-squares treatment gives the following relation as a first approximation:

$$\Delta G_m = 180 + 70 \times (\text{No. of phenolic groups}) - [95] \text{ for side chain.}$$

This fits the observed values of ΔG_m to within ± 18 cal/mole r.m.s., except in case of phenol, for which the observed value of ΔG_m is 295, i.e. 45 cal/mole higher than that predicted by the formula. Further studies on xylenes and similar compounds are in hand for elucidation of the remaining second-order effects.

INVESTIGATION OF THE CHARACTER OF THE JUMPS IN ACTIVATION ENERGY OF VISCOUS FLOW IN PURE LIQUIDS AND SOLUTIONS. PART IV

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(Received June 19, 1971)

Further study of the bulk and the boundary-induced effect in the activation energy jumps observed in pure liquids and aqueous solutions was undertaken by determining the flow activation energy of dilute aqueous solutions of ethylene glycol, using three viscometers of different capillary bore. It has been confirmed that the whole phenomena of discontinuity observed in pure liquids and aqueous solutions are more or less equally dependent on the two basic causes viz. bulk aggregation and boundary-layer, and the latter does not extend much beyond 0.4 mm i.e. 400 μ . The results show that almost half of the observed jumps, i.e. those at 15°C, 22°C, 27°C and 42°C, are not affected substantially by changing the diameter or by additions of glycol up to 15%, and can be presumed to be definite bulk phenomena.

THE E_{010} CAVITY RESONATOR, THE TEMPERATURE VARIATION OF RESONANT FREQUENCY, THE RESONANCE CURVES AND THEIR ANALYSIS

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(Received January 4, 1971)

An E_{010} circular cylindrical cavity resonator has been designed and constructed to investigate the dielectric properties of different dielectrics. Described in the paper are the temperature variation of resonant frequencies and the experimental techniques to draw the Q-curves of the air-filled and loaded cavity resonator at 10 cm wavelength band.

The shapes of the resonance curves have been analysed graphically with the help of the equation written by analogy with the equation derived to analyse the shape of the square-law response curve of the H_{01} resonator. The form in which of, the off-resonance frequency shift and IDI the galvanometer deflection at $f_0 \pm \delta f$ frequency are fitted may be written:

$$I/IDI = I/D_0 \left(1 + \frac{1}{2} \frac{\delta f^2}{f_0^2} \right)$$

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FORMAL REDOX POTENTIAL VALUES OF $\text{Co}^{3+}/\text{Co}^{2+}$ SYSTEM REGARDING THE USE OF COBALT(III) ACETATE AS VOLUMETRIC OXIDIMETRIC TITRANT

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(Received August 24, 1970; revised January 12, 1971)

The values of formal redox potential of $\text{Co}^{3+}/\text{Co}^{2+}$ system have been measured in hydrochloric, perchloric, acetic and sulphuric acids. The change in the values with changing concentrations of these acids have also been investigated.

STUDIES ON COORDINATION COMPOUNDS**Part III.—Nickel(II) Complexes of Acetamide**

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(Received March 18, 1971)

Acetamide complexes of the type $[\text{Ni}(\text{Acetamide})_4 \cdot 2\text{H}_2\text{O}]\text{X}_2$ (where X is chloride, bromide, iodide or nitrate ion) have been prepared. The IR spectra suggest a bonding through the carbonyl group. The magnetic studies indicate the presence of two unpaired electrons. From the visible spectra it seems that the compounds have a distorted octahedral arrangement. The $\nu(\text{NH}_2)$, the Dq value and the intensity of the 24000 cm^{-1} band is found to vary with the anion. The stability constant calculated from conductivity shows the same to have the following trend $\text{Cl} > \text{Br} > \text{I} > \text{NO}_3$.

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PHARMACOLOGICALLY ACTIVE BENZO[b]THIOPHENE DERIVATIVES

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(Received August 15, 1970; revised September 1, 1970)

5-Substituted-*N*-ethyl-*N*-2-(hydroxyethyl)-3-aminomethylbenzo[*b*]thiophen and its chloro derivative were isolated as methane sulphonates and citrates. 5-Substituted-*N*-ethyl-3-aminomethylbenzo[*b*]thiophen reacted with 1-bromo-2-fluoroethane in ethylmethyl ketone to give 5-substituted-*N*-ethyl-*N*-2-(fluoroethyl)-3-aminomethylbenzo[*b*]thiophen. Pharmacological testing of 5-bromo-*N*-ethyl-*N*-2-(fluoroethyl)-3-aminomethylbenzo[*b*]thiophen showed that there is an activity in the compound both at cytoplasmic as well as nuclear level.

SHORT COMMUNICATION
PHYSICAL SCIENCES SECTION

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CHEMICAL INVESTIGATION OF THE LEAVES OF CADABA FRUTICOSA

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SHORT COMMUNICATION
PHYSICAL SCIENCES SECTION

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CHEMICAL INVESTIGATION OF GERMINATED PEGANUM HARMALA SEED

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SHORT COMMUNICATION
PHYSICAL SCIENCES SECTION

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CHEMICAL CONSTITUENTS OF OROBANCHE AEGYPTICA

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Biological Sciences Section

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FRACTIONATION OF PECTINS

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(Received January 22, 1970; revised October 31, 1970)

Samples of pectins were extracted from ethanol-water-extracted orange peels and turnips (*Brassica napiformis*) in a stepwise manner with water, ammonium oxalate and ethylenediaminetetraacetate (EDTA) solutions. Pectin samples were examined for (a) uronic acid anhydride contents, (b) specific rotations, and (c) constituent sugars, and the results showed no marked difference in the chemical compositions of the polysaccharides. The hydrolysates of the pectin samples were found to contain degraded galacturnans, D-galacturonic acid and its oligomers, varying amounts of D-galactose and L-arabinose and traces of D-xylose and L-rhamnose. Some of the samples of polysaccharides were fractionated by (a) column chromatography on diethylaminoethylcellulose (phosphate form) column¹ and (b) electrolyte precipitation^{2,3} with sodium acetate, sodium chloride and potassium chloride. The polysaccharide was eluted in a single broad band from diethylaminoethylcellulose and was found to contain all the sugars present in the original polysaccharide sample. The fractions obtained by electrolyte precipitation were analysed and showed no marked difference in chemical composition. The results of this fractionation have been discussed in this paper.

CHEMICAL INVESTIGATIONS OF SEEDS OF ABRUS PRECATORIUS LINN

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(Received July 1, 1970; revised October 2, 1970)

In the present work petroleum ether, 70% alcoholic, and ammonium oxalate extracts of scarlet seeds of *Abrus precatorius* were studied. The oil obtained was saponified and the chemical compositions of saponifiable and unsaponifiable portions were studied. Carbohydrates and amino acids present in the alcoholic extract were separated and the quantities were determined. Polysaccharides present in the ammonium oxalate extract were hydrolysed and the sugars obtained were separated and identified on paper. The uronic acid anhydride content of polysaccharides was determined.

ASSAY OF METHYL PARATHION AND FENITROTHION IN CROP EXTRACTS USING VAPOUR-PHASE SEPARATION IN CONJUNCTION WITH GAS CHROMATOGRAPHY

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(Received December 19, 1970)

Methyl parathion and Fenitrothion were separated and assayed by electron capture gas chromatography using stationary phase of 5% DC-200 on Celite at 180°C. Crop extracts contained substances which interfered with the gas chromatographic assay of these insecticides. Vapour-phase separation removed these interfering materials so that 0.1 p.p.m. of Methyl Parathion and Fenitrothion could be assayed in spinach, cabbage, apple, and potato and 1.0 p.p.m. in sugar-cane and cotton.

CAROTENOIDS CONTENT OF CITRUS FRUITS

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(Received January 26, 1970; revised November 2, 1970)

Carotenoid content of peels, flesh and juices of eight citrus fruits have been determined. Feutrell's Early has been found to be the richest source. Higher percentage of carotenoids resides in the peels than in the flesh, which contains carotenes either in equal or greater amounts than the former. Peels possess more saponifiable carotenoids (xanthophyll esters) than flesh. The distinct redder appearance of red blood is due to pigments other than carotenoids as its carotenoid content is less than that of others. The spectra of the carotenoids of peels and flesh of all varieties except lemon and grape-fruit are similar but different from those of pure β -carotene.

BIOSYNTHESIS OF PORPHYRINS BY BACTERIA**Synthesis of Porphyrins From δ -Aminolaevulic Acid by Cell-free Lysate of *Micrococcus colpogenes***

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(Received October 20, 1970; revised December 19, 1970)

The results of the synthesis of porphyrins from δ -aminolaevulic acid (ALA) by the whole and lysed cells of *Micrococcus colpogenes* are presented. Whereas the lysate metabolized ALA at a rate faster than the whole cells, the amount of coproporphyrin formed by it was much less than the amount formed by the cells. Under aerobic incubation the lysate formed mainly uroporphyrin. Anaerobic incubation of the lysate resulted in marked increase in the formation of coproporphyrin, but the ratio of coproporphyrin to uroporphyrin formed by it was still less than the ratio of the porphyrins formed by the whole cells. Porphyrins with intermediate number of carboxyl groups between uroporphyrin and coproporphyrin were detected only in the case of incubation mixture containing the lysates. The difference in the metabolic operation of the pathway due to the difference in the organization of a system has been discussed.

COMPARISON OF GAS CHROMATOGRAPHY COLUMNS FOR PESTICIDE RESIDUE ANALYSIS

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(Received December 19, 1970)

Four column packings, 10% DC-200 or 15% QF-1 on 80-100 mesh celite and mixtures of the two, were tested for electron-capture gas chromatographic assay of 25 insecticides or alteration products.

Detection of insecticides on the 15% QF-1 column was usually more sensitive than on 10% DC-200 column and relative retention times on the two columns differed.

A packing made by mixing equal amounts of celite coated with 10% DC-200 or 15% QF-1 more nearly resembled the 15% QF-1 packing than the 10% DC-200 packing. A second packing of similar composition made by mixing the silicone polymers before applying to celite more closely resembled the DC-200 packing but generally detection was less sensitive.

Since the retention times on the columns differ they provide additional ways of identifying and separating insecticides.

COMPARATIVE TOXICITY OF GAMMA-BHC, BROMOPHOS AND CARBARYL TO FIVE SPECIES OF INSECTS

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(Received November 21, 1970)

The relative toxicity of the three insecticides, gamma-BHC, Bromophos and Carbaryl varies from one species of insect to another. These insecticides were tested against five species of insects *A. domestica*, *T. castaneum*, *P. americana*, *B. germanica* and *C. analis*. Results showed that all the three insecticides are about equally toxic to *A. domestica* and *T. castaneum* but against *C. analis* gamma-BHC is much more toxic. Bromophos is the most toxic insecticide against *B. germanica*. Against *P. americana* gamma-BHC, is about three times as toxic as Bromophos and Carbaryl.

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STUDIES ON THE RESIDUAL TOXICITY AND VAPOUR ACTION OF PETKOLIN-M

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(Received December 19, 1970)

Biological tests using *T. castaneum*, *Callosobruchus analis* and *Periplaneta americana* show that the toxic action of Petkolin-M as a residual film persists longer in closed than in open containers and it also persists longer against *T. castaneum* and *C. analis* than *P. americana*. A toxic vapour action of Petkolin-M was deduced and confirmed in tests which showed that vapour action against *P. americana* persists longer than *T. castaneum* and *C. analis*. It is concluded Petkolin-M is a mixture of at least two toxic substances, one more toxic as a residual film to *C. analis* and *T. castaneum* and the other more toxic as a vapour to *P. americana*.

PRELIMINARY SCREENING TESTS OF ANTIFERTILITY COMPOUNDS INHIBITING THE REPRODUCTION IN HOUSEFLY, MUSCA DOMESTICA (L.)

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(Received July 27, 1970; revised January 14, 1971)

Sterilization of male can in certain circumstances be more efficient than killing as a method for control of insects. A number of chemicals (chemosterilants) show promise of producing sexual sterility in insects without some of the practical limitations of radiation. The present publication encompasses the result of screening of 42 compounds produced by PCSIR Laboratories. The results obtained indicate that three compounds affected the reproductive potential of housefly appreciably. They are β -dimethylaminopropiophenone hydrochloride, 3,4,5-trimethyl benzamide and acid from iodopalilantin.

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THE RESIDUAL TOXICITY OF PETKOLIN IN COMPARISON WITH PHOSALONE AND DDT

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(Received October 7, 1970; revised December 19, 1970)

The residual life of Petkolin, Phosalone [O,O-diethyl-S-(6-chlorobenzoxazolone-3-ylmethyl) phosphorodithioate] and DDT alone and Petkolin + 15% Phosalone mixture was determined by using three to four-week old adults of red flour beetle, *Tribolium castaneum* (Herbst).

At 90°F and a R.H. (relative humidity) of 55% ± 5% filter papers treated with Petkolin, Phosalone, DDT and Petkolin + 15% Phosalone mixture remained toxic for 4, 4, 161 and 28 days respectively.

Petkolin was compatible with Phosalone in the present formulation and the residual life of the mixture was longer than that of both the component insecticides.

EFFECT OF CYANURATES OF DIFFERENT METALS AGAINST ASPERGILLUS NIGER BY TOXIC AGAR DIFFUSION METHOD

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(Received April 13, 1970; revised October 19, 1970)

Primary, secondary and tertiary cyanurates of sixteen different metals and of ammonium were tested for their fungicidal properties against *Aspergillus niger* Van Tiegh. The primary cyanurate of copper and all the three cyanurates of cadmium and mercury were found effective in 0.1% concentration. The secondary and tertiary cyanurates of copper, and primary, secondary and tertiary cyanurates of nickel and lead inhibited *A. niger* at 0.5% concentration. The fungicidal action of all these cyanurates was tested by toxic agar diffusion method.

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CARBARYL DEGRADATION BY PSEUDOMONAS PHASEOLICOLA AND ASPERGILLUS NIGER

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The hydrolytic cleavage of Carbaryl to yield 1-naphthol as a result of the detoxication activity of a bacillus, *Pseudomonas phaseolicola* and a fungus *Aspergillus niger* is indicated in the following studies. In addition, the degradation activity of the bacillus yields a minor metabolite possibly of a phenolic character. Such hydrolytic activity as described above is of significance and of methyl carbamates has been demonstrated for the first time involving soil microflora.

ROTENONE AND ITS USE IN ERADICATION OF UNDESIRABLE FISH FROM PONDS

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(Received December 19, 1970; revised January 7, 1970)

Rotenone, its origin and use are described. Results of application of the chemical to three ponds of the Fish Seed Multiplication Farm at Jamalpur, Mymensingh, for eradication of undesirable species are given. Rotenone takes time to reach the deep bottom of ponds in absence of any effective agitation of water. It was observed that snakes, frogs and crustaceans are not readily affected by this plant derivative as they can escape the action through terrestrial respiration. A list of fishes and other aquatic organisms in order of their susceptibility to rotenone is presented. A concentration of 1.0 p.p.m. at summer temperature, around 30°C in this region, was found adequate to kill fishes.

**INTRODUCTION OF NEW TERMINOLOGY IN THE SKELETON OF THE FISHES
BELONGING TO THE ORDER HETEROSOMATA (PLEURONECTIFORMES)**

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(Received November 13, 1970; revised January 2, 1971)

A detailed osteology of the flat fishes (Heterosomata) shows false orbit locating the migrated eye. The term pseudoorbit is suggested for such a false orbit. The five families of the order Heterosomata have the characteristic feature of possessing the pseudoorbit. A detailed study of the pseudoorbit in each family shows variation in the surrounding bones forming the boundary of the pseudoorbit.

**COMPARATIVE STUDIES OF PROTEIN BANDS OF HAEMOLYMPH AND
FAT BODY OF THE COCKROACH, *BLABERUS CRANIFER* (BURMEISTER.)
Part IV.—Eggs***

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(Received June 27, 1970)

Egg proteins were recovered by homogenization and extraction of oothecae with distilled water. Water-soluble proteins were separated by paper electrophoresis. The number of well-defined bands varies from one to four. B and I is coincident in eggs, haemolymph and fat body.

STUDIES ON THE ENRICHMENT OF SOIL WITH AZOTOBACTER VINELANDII

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(Received May 9, 1970)

The production of nitrogen fixing *Azotobacter vinelandii* has been described. Total nitrogen fixed in the fermentation medium was 14.05 mg/100 ml with sucrose and 13 mg/100 ml with molasses as carbon source. Inoculation of the soil with the culture of these bacteria caused a significant increase in the nitrogen concentration of the soil. Nitrogen determinations in the inoculated soil supplied with a dilute solution of molasses as carbon source, showed that the nitrogen increased from an initial value of 30 mg/100g to 160 mg/100 g of the soil. When molasses was replaced with sucrose solution, the increase in the nitrogen up to 260 mg/100 g of soil was recorded. Results on the studies conducted with nitrogen-fixing bacteria in the open fields are also reported.

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Special Paper

A REVIEW ON CHEMICAL AND MEDICINAL ASPECTS OF ALLIUM CEPA

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SHORT COMMUNICATION
BIOLOGICAL SCIENCES SECTION

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THE FATTY ACIDS OF INDIGENOUS RESOURCES FOR POSSIBLE INDUSTRIAL APPLICATIONS.

PART II. – INVESTIGATION OF SOME SPECIES OF BORAGINACEAE FAMILY

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SHORT COMMUNICATION
BIOLOGICAL SCIENCES SECTION

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**MORPHOLOGICAL VARIATIONS IN MUNG (PHSEOLUS AUREUS) INDUCES BY
BY GAMMA IRRADIATION**

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SHORT COMMUNICATION
BIOLOGICAL SCIENCES SECTION

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STUDIES ON PROTEOLYTIC ACTIVITY OF BACILLUS SUBTILIS

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SHORT COMMUNICATION
BIOLOGICAL SCIENCES SECTION

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THE INFLUENCE OF RAINFALL ON THE POPULATION OF NEMATODES IN BANANA FIELD

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Technology Section

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UTILIZATION OF CORN-SUGAR IN CANNED VEGETABLES

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(Received September 1, 1970; revised November 24, 1970)

The effects of corn sugar (Cerelose brand) on the colour properties, texture qualities and flavour acceptability of five different canned vegetables were studied. Canned vegetables were processed with brine solutions containing various proportions of sucrose and Cerelose at two different levels of sugar solids (2.5 and 5.0%). Measurements of drained weight, texture and colour were made after the equilibration of the canned vegetables at 40°F and 90°F for various periods. The drained weights and shear press readings of certain vegetables were increased when corn sugar was used in the brine. Hunter colour values L (lightness), aL (redness) and bL (yellowness) of all the vegetables were affected when sucrose was replaced by dextrose in the brine. Dextrose caused slight to moderate effects when used at 25% replacement of sucrose and greater effects when used in quantities up to 100% replacement. The flavour of the canned vegetables was affected but little by the presence of dextrose in the brine.

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A STUDY OF THE PROFILE DISTRIBUTION ON MANGANESE IN SOME SOILS OF EAST PAKISTAN AND ITS PEDOGENIC SIGNIFICANCE

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(Received October 21, 1970; revised December 19, 1970)

This communication deals with the translocation and concentration of manganese in the soil profiles from a 'hilo' topographic area in East Pakistan. A higher proportion of manganese was present in the free oxide form in the soils of uplands compared to that in the lowland soils. Of all forms of manganese only soluble manganese was found to be influenced by vegetative cycle. Pedogenic significance of the vertical and horizontal distribution pattern of manganese in these soils has been discussed.

PETROLOGY OF THE TERTIARY COASTAL SECTION AT COX'S BAZAR

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(Received August 29, 1970; revised December 19, 1970)

Petrographic and mineralogical studies of the coastal sections of Upper Miocene sediments at Cox's Bazar have been carried out. It is suggested that the sediments have been derived predominantly from a metamorphic source area. Further it is concluded that the sediments were laid down under shallow water condition probably in a shelf zone.

THE TITANIUM CONTENT IN REPRESENTATIVE SOILS OF A PLEISTOCENE TERRACE IN EAST PAKISTAN AND ITS PEDOGENIC SIGNIFICANCE

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(Received October 21, 1970; revised January 5, 1971)

Titanium in soil, silt and clay fractions of a number of soils from the Barind tract was determined. The mean TiO_2 content in the soils ranged from 0.6 to 1.2 per cent with a mean value of 0.8%. The per cent TiO_2 in the clay fraction was higher than that in the silt fraction. These soils showed signs of the development of argillic horizons.

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RUPTURE MECHANISM OF JUTE FIBRE

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CHEMICAL MODIFICATION OF THE CRIMP STRUCTURE OF WOOL FIBRE AND ITS EFFECT ON FELTING AND COMPRESSION

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(Received August 26, 1970; revised October 28, 1970)

The crimp structure of wool fibre was modified by treatment with phenol-formaldehyde and the helical configuration became sinusoidal, resulting in increase in felting and decrease in compressional load. No change, however, took place in the crimp form of Merino wool (sine form) and, therefore, felting behaviour or compressional load remained unaffected. The possible factors which influence felting have been discussed and it was found that crimp form is the main factor affecting felting. The relationship between felting and compressional load has been established and shown to be mainly due to crimp form. The mechanism of felting was best explained by a modification of Martin's theory.

FACTORS AFFECTING THE SOFTNESS OF SILK-WOOL FABRICS

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For the purpose of estimating their tactile properties by means of hands and lips, 26 varieties of fabrics have been manufactured from different woolwefts which are plain-woven into the same silk warp. The lips test seems slightly more reliable than the hand test. In addition, the softness of the unrelaxed fabrics exhibits high positive correlations with their softness after wet-relaxation and felting. But the correlation between the softness of a fabric and that of its raw wool assembly is not very high because the former is additionally dependent on the variations of weave density, yarn evenness, tex, twist factor and ply number; besides, an interaction between twist factor and tex appears to modify the softness of the singles' fabrics. Nevertheless, the weft/cm alone accounts for 84.0% of the variations of fabric softness within their present ranges of variation.

SHORT COMMUNICATION
TECHNOLOGY SECTION

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**SOME OBSERVATIONS ON BREAKING EXTENSION PERCENTAGE AND
TENACITY OF WHITE JUTE (CORCHORUS CAPSULARIS)**

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**MOISTURE REGAIN AND CHEMICAL CHARACTERISTICS OF
PAKISTANI WHITE AND YELLOW SILK**

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