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TEMPERATURE DERIVATIVES OF VISCOSITY, DENSITY AND REFRACTIVE
INDEX FOR THE WATER-ETHANOL SYSTEM

Part III.—Measurement of Coefficient Dilatation and its Temperature Derivative for
6% to 14% Aqueous Ethanol and their Correlation with Jumps in Flow Activation Energy

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The present communication presents measurements of coefficient of dilatations, β , at temperature interval of $\Delta T = 1^\circ\text{C}$. and temperature derivative, $\Delta\beta/\Delta T$ on 5.8% and 10.4% (by weight) aqueous ethanol in the range of 20°C to 45°C . Mean graphs of measured values of $\beta \times 10^4$ show good reproducibility of the order of ± 0.015 units of $\beta \times 10^4$.

Periodic features in the graphs of β and $\Delta\beta/\Delta T$ are observed with average period of $4^\circ\text{C} \pm 0.5^\circ\text{C}$ (5.8%) and $5^\circ\text{C} \pm 0.9^\circ\text{C}$ (10.4%), which is compared with the previous results on 8.7% and 13.5% aqueous ethanol. The amplitude of the oscillations in $\Delta\beta/\Delta T$ apparently decrease progressively with the increase of ethanol concentrations. Below 33°C , the minima of $\Delta\beta/\Delta T$ roughly correspond with E_η jumps, and apparently show a shift of 0.12°C with respect to E_η jumps for every 1% change in ethanol concentration. This would fit in the analysis of standard data on density of water (Qurashi, 1963).

Above 33°C the behaviour is complex, but at a lower ethanol concentration it seems to follow the behaviour below 33°C .

TEMPERATURE DERIVATIVES OF VISCOSITY, DENSITY AND REFRACTIVE INDEX OF WATER-ETHANOL SYSTEM

Part IV.—Measurements on the Activation Energy of Viscous Flow for Aqueous Ethanol Solutions from 11% to 24% at Intervals of 2.5% Ethanol

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(Received July 9, 1966)

The detailed study of the activation energy of viscous flow ($E_{\eta} = -T^2 \Delta \ln \eta / \Delta T$) is now extended to concentrations from 11% to 24% ethanol. The measurements are made at intervals of 1°C on solutions whose concentrations differ by 2% to 3% ethanol. The temperature positions of the various jumps, classified as small, medium or large, can be readily connected by smooth curves, which link up with the earlier graphs for the range of 0% to 5% ethanol.

Some of the energy jumps are found to show subsidiary steps that grow in size as the concentration changes. Many such anomalous branchings are observed at concentrations lower than 6%, whereas the region from 11% to 16% shows a remarkable degree of stability. It appears probable that there are several significant structural changes corresponding to the branching out of these energy jumps, and finer studies in the range of 0% to 5% ethanol are in hand to elucidate this further.

MEASUREMENTS AND UTILISATION OF SOLAR RADIANT ENERGY IN PAKISTAN*

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(Received March 23, 1965)

The paper contains a brief history of the Pakistan National Actinometric Network, describes the instrumentation and summarizes the data collected during the first few years.

Gradual increase in the maximum global radiation has been observed during 1953 to 1956 and is attributed to the dissipation of volcanic dust that was sent up into the stratosphere by the eruption of Mt. Spurr (Alaska) on 9th July 1953. The global radiation received at 1719 m = asl (Quetta) is reduced by about 17.5 percent in its passage through a turbid atmosphere 1956 m. thick before it is received at 123 m = asl (Multan) not far away on the same latitude ($30^{\circ}12'N$). At Quetta diffuse radiation is responsible for 27.4 percent of global radiation.

The empirical relationship $Q/Q_0 = a + b \cdot S/S_0$ is found to hold for each of the four stations in West Pakistan, and the constants show the following logarithmic relationships with the station altitude h :

$$a = 0.6 - 0.05 \log_e h$$

$$b = 0.4 + 0.07 \log_e h$$

A few attempts towards designing of solar cookers and space-heaters made at the Geophysical Institute, Quetta, are also described.

ALKYLATION REACTIONS OF THE MANNICH BASES

Part. II.—1-(N, N-Dimethylamino)-3-Keto-5-Phenylpent- Δ^4 -ene and 1-(N, N-Dimethylamino)-3-Keto-5-Phenylpentane, in Aqueous Medium

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(Received February 11, 1966)

Alkylation of indole, pyrrole, phthalimide with 1-(N,N-Dimethylamino)-3-keto-5-phenylpent- Δ^4 -ene¹ and of pyrrole, nitromethane, phthalimide, cyanoacetamide and piperazine with 1-(N,N-Dimethylamino)-3-keto-5-phenylpentane are described.

INVESTIGATION OF EPHEDRA GREASE FROM MARKER ALKALOIDS, QUETTA

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(Received November 17, 1965)

Ginnol or 10-nonacosanol, nonacosane, n-octacosanol and β -sitosterol have been isolated and identified from the grease left as a by-product in the manufacture of the alkaloid, ephedrine, by Marker Alkaloids of Quetta.

ALKYLATION REACTIONS OF MANNICH BASES IN AQUEOUS MEDIUM

Part III.—Some Reactions of Gramine

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(Received April, 21, 1966)

Reactions of gramine with indole, 2-methylindole, pyrrole, pyrrolidine, piperidine, piperazine, isatin, cyclopentanone and cyclohexanone are described.

THE 5-AND 8-CHLORINATION OF QUINOLINE AND SOME OF ITS DERIVATIVES

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(Received March 19, 1966)

Quinoline (0.1 mol.) and silver sulphate (0.05 mol.) in 98% sulphuric acid, and dry chlorine at room temperature give 5-chloroquinoline (17%), 8-chloroquinoline (21%) and 5:8-dichloroquinoline (32%); approximate proportions were determined from the isolated products. With an excess of quinoline the monochloroquinolines are the predominant products and with silver sulphate and dry chlorine for a prolonged period 5:8-dichloroquinoline is the major product. Further chlorination of 5-chloroquinoline and 8-chloroquinoline gives 5:8-dichloroquinoline in the like manner. It is considered that the positively charged chloronium ion (Cl^+) and the protonated form of the bases are the main species involved in the initial and the subsequent chlorination. Such reactions should form convenient preparative routes to the mono- and dichlorination of quinoline.

STUDIES IN THE SANTONIN SERIES

Part I.—The Bromination Products of Desmethyldesmotroposantonins

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Bromination of $6\beta(\text{H}), 11\beta(\text{H})$ -desmethyldesmotroposantonin (II) gave the corresponding 2-bromo-derivative (III), which on acetylation yielded the acetate (X). The acetate (X) was also obtained by the bromination of the acetate (XI). The 2-bromoderivative of $6\alpha(\text{H}), 11\beta(\text{H})$, desmethyldesmotroposantonin (VII) was also obtained by usual bromination. The constitution of the 2-bromoderivative (VII) was proved by its acetylation to give (IX), obtained also by the acid catalysed acetylation of (III). A third isomeric desmethyldesmotroposantonin (VI) which differs from (V) at 11-position was also brominated to give (VIII), which could also be obtained on treatment of (VII) with potassium carbonate in xylene. The fourth isomer, $6\beta(\text{H}), 11\alpha(\text{H})$, desmethyldesmotroposantonin (XIV) was prepared by the treatment of (II) with potassium carbonate in xylene which on bromination furnished (XV). Its acetate (XVI) was prepared and the constitution established. The position of bromine in the bromodesmethyldesmotroposantonins has been established.

SYNTHESIS OF HETERO-BICYCLIC COMPOUNDS: II. FORMATION OF PYRIDINO-DIOXINS

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(Received September 23, 1965)

The formation of pyridino-dioxins (II) occurs from amino-pyrano-dioxins (I, R = *o,m,p*-methoxyphenyl, *p*-nitrophenyl, *o*-chlorophenyl, benzyl, and 2-methyl-5-nitrophenyl) with phenoxide. Pyrano-dioxins derived from aliphatic amines except isobutylamine, did produce phenolic but intractable materials. 7-chloro-pyridino-dioxin (VII) with sodium alkoxides gave dialkoxy acids (VIII, IX). The structural evidence of the products was gathered from U.V. spectroscopic data.

ALKYLATION REACTIONS OF MANNICH BASES IN AQUEOUS MEDIUM

Part IV.—Some Reactions of β -morpholinoethyl-2-phenanthryl ketone hydrochloride

AHMAD KAMAL, IZHAR HUSAIN QURESHI, (MISS.) SOORAIYA AZIZ AND (MISS.) PARVEEN KHAN

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(Received August 31, 1966)

Syntheses of skatyl-(phenanthroyl-2) methane, α -methylskatyl-(phenanthroyl-2)-methane, 1, 5-di phenanthroyl-2) 3-nitopentane, α , α 1 di (phenanthroyl-2-ethyl)-furan, (phenanthryl-2)-vinyl ketone and Skatyl-(phenanthroyl-3)-methane are described.

ALKALOIDS OF BERBERIS LYCIUM ROYLE-I

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(Received August 3, 1965)

Three new alkaloids named as Berbenine, $C_{19}H_{21}NO_3$, m.p. 152-53°, Berbericine $C_{20}H_{17}NO_4$, m.p. 162-63° and Berbericinine iodide, $C_{21}H_{22}NO_4I$, m.p. 205-6° (dec.) have been isolated from *B. lycium*.

THE FATTY ACIDS OF INDIGENOUS RESOURCES FOR POSSIBLE INDUSTRIAL APPLICATIONS

Part I.—Investigation of the Species of Urticaceae and Rosaceae Families

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(Received February 11, 1966)

Some of the locally available varieties of *Morus alba* and *Morus nigra* (N.O. Urticaceae) and *Rosa macrophylla*, *R. moschata* and *R. webbiana* (N.O. Rosaceae) have been studied with respect to the chemical composition of their seeds and seed oils. Linoleic acid is the predominant component of the *M. alba* and *Rosa* species. Whereas palmitic acid constitutes the major component of the *M. nigra* seed oil, it is present, alongwith oleic, linoleic and linolenic acids in minor amounts in the *Rosa* varieties.

BIOCHEMICAL AND NUTRITIONAL STUDIES ON EAST PAKISTAN FISH

Part XII—Investigation on the Solubility of True Protein of Fish and Prawn in Fresh and decomposed Conditions and after Freezing Storage for One Year

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(Received December 18, 1965)

Ten varieties of fish and one variety of *crustacea* (prawn) were investigated with regard to the changes in the quantity of the total soluble nitrogen and soluble protein nitrogen due to decomposition and due to storage at -15°C . for a period of one year. The results show that actual protein nitrogen extracted by the solvents (KCl of ionic strength 0.05M) was much lower than that simply deduced from the soluble nitrogen fraction and this is because of the presence of non-protein nitrogen.

In the case of both fish and prawn there is not much effect in the extraction of soluble total nitrogen and soluble protein nitrogen due to decomposition. Due to frozen storage, there is decrease of soluble fraction to 70 percent whereas in case of prawn the soluble fraction remains unchanged. Higher decrease of soluble fraction in the case of marine teleosts to 25 per cent in contrast to 70 percent in the case of fresh water teleosts as noted here, and solubility of the same fraction in the case of prawn when those are stored in freezing condition for a considerable period, has been discussed in the light of difference in the osmosis of the cell membrane and the participation of the bone in causing the change of the salt concentration of the extracellular fluid.

STUDIES ON THE CHANGES IN THE FREE AMINO ACIDS AND THE EFFECT OF PRESOAKING ON THE GERMINATION OF JEQUIRITY SEEDS (*ARBUS PRE-CATORIUS*)

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(Received December 6, 1965)

Changes in the non-protein nitrogen during three weeks of germination of jequirity seeds have been studied. After the first week, asparagine, proline and threonine were detected besides those amino acids which were already present in the cotyledons. γ -Amino butyric acid was added to this list in the second week. Abrine did not appear to be metabolised by the plant and was detected throughout the seedling. Asparagine was present in greater amounts during the first week, but gradually decreased with the passage of time; at the same time the amount of aspartic acid increased. The effect of presoaking on the germination of Jequirity seeds has also been studied.

BIOCHEMICAL AND NUTRITIONAL INVESTIGATIONS ON RICE AND RICE PRODUCTS OF EAST PAKISTAN

Part VI.—Differential Culinary Properties of Raw and Parboiled Rice Evaluated by Water Absorption Ratio and Starch Loss in the Gruel

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(Received April 26, 1965)

The culinary properties of thirteen varieties of raw and parboiled rice were investigated by determination of the Water Absorption Ratio, the volume of the gruel discarded and loss of starch in it. The results show less water absorption by the parboiled rice and less loss of starch in their gruel. The water Absorption Ratio seems to maintain direct relationship with the breadth of the grain rather with their length. Patna variety rice, in spite of having maximum length, behaved like medium-size grain with respect to water absorption because of its breadth size equivalent to that of the medium-size grain. The significance of the results of less water absorption and less loss of starch in the gruel of the parboiled rice as compared to those of the raw ones has been discussed in the light of the hardening of the surface and the partial inactivation of amylase due to parboiling treatment.

FURTHER STUDIES ON THE FUNGICIDAL PROPERTIES OF MAKROLIN

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Makrolin, a chlorinated hydrocarbon, was further tested for its fungicidal properties and compared with colloidal copper and zerlate. *Alternaria tenuis*, *Helminthosporium anomalum* and *Fusarium dimerum* were used as test fungi. Poisoned food and slide-spore germination techniques were employed and the results of the two methods compared. In poisoned food technique, Makrolin was found to be as effective as zerlate in controlling the growth of *F. dimerum* and *H. anomalum*. 50 ppm. of both compounds gave 100% inhibition of the two fungi. Makrolin was less effective on *A. tenuis*. The third compound, colloidal copper, was not employed in this technique due to its unstable suspendability in the liquid media.

In the slide spore-germination technique, Makrolin was found to be as effective as colloidal copper in checking the spore-germination of *F. dimerum* and *H. anomalum* but less effective as compared to zerlate.

Similarly zerlate and colloidal copper were more effective in controlling the spore-germination of *A. tenuis* than Makrolin.

On the basis of above results Makrolin can easily be recommended for further exploitation.

A CONTRIBUTION TOWARDS AN ECO—TAXONOMIC STUDY OF EUPHORBIACEAE OF KARACHI DISTRICT

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(Received June 15, 1965)

An eco-taxonomic study of the Euphorbiaceae of Karachi district has been carried out in which 26 species and 11 genera have been recorded. Out of these only 14 species distributed over 5 genera are indigenous while the rest are cultivated or naturalized. The genus euphorbia occupies a dominant position comprising over 40% of the total population of Euphorbiaceae and is represented by 8 indigenous species namely: *E. hirta* L., *E. indica* Lamk., *E. caducifolia* Hains., *E. clarkeana* Hook., *E. thymifolia* Burm., *E. prostrata* Ait., *E. granulata* Forsk and *E. dracunculoides* Lamk. and 4 cultivated species namely: *E. tirucalli* L., *E. bojeri* Hook. f., *E. pulcherrima* Willd and *E. geniculata* Orteg. The next dominant genus is phyllanthus which includes 3 indigenous species: *P. niruri* L. sub sp. *fraternus* (Webster) Jafri, *P. scabrifolius* Hook., *P. caroliniensis* and 1 cultivated one *P. distichus* Muell. The rest of genera, *andrachne*, *fluggea*, *chorzophora*, *codiaenum*, *ricinus*, *jatropha*, *manihot* and *putranjiva*, with the exception of *caclypha* which has two species (*A. hispida* Burm. and *A. wilkesiana* Muell.), are represented by a single species each (*Andrachne aspera* Spreng, *Fluggea leucopyrus* Willd., *Chorzophora oblongifolia* (Del) Juss., *Codiaenum variegatum* Blume, *Ricinus communis* L., *Jatropha pandurifolia* Andr., *Manihot utilissima* Pohl. and *Putranjiva roxburghi* Wall). The genera *Andrachne*, *Fluggea* and *Chorzophora* besides *Euphorbia* and *Phyllanthus* and their respective species are wild while the remaining ones are cultivated. To facilitate the identification a key to the tribe, genera and species has been worked out. A new record of *Phyllanthus carolinensis* Walt has been made for the first time from the Old World whose identifying characters have been described. An analysis of genera and species with a note on their distribution and ecological conditions has been brought out and attempted.

INTERACTIONS OF SOIL MICRO-FLORA WITH *FUSARIUM SOLANI* (MART.) SACC., THE CAUSE OF DRY ROT OF POTATO TUBERS*

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(Received July 23, 1965)

Fusarium solani was found to be associated with the dry rot of potato tubers. The fungus is a soil inhabitant. Apart from other factors, the effect of soil micro-flora on *F. solani* was studied to find a possible explanation for its persistence and accumulation in the soil.

Micro-organisms belonging to 13 genera of fungi, 2 of bacteria and to the genus *Streptomyces* were isolated from the soil of Karachi University Botanical Garden and identified.

The interactions of 59 isolates of fungi, 8 of actinomycetes and 10 of bacteria, respectively, with *F. solani* were studied on agar culture. These were grouped into 5 different types of reaction. With the exception of the unidentified *Penicillium* sp. none of the fungi, actinomycetes and bacteria inhibited the growth of *F. solani*. *Trichoderma viride*, *Cunninghamella echinulata*, *Monilia* sp. and *Rhizopus* sp. intermingled with the hyphae of *F. solani* but had no effect on it. *T. viride* which is known to coil around the hyphae of a number of organisms had no effect on *F. solani*. *F. solani*, however, grew over the isolates of *Alternaria* sp., *Curvularia* sp. and *Helminthosporium* sp.

Although the effect of pure antibiotics on *F. solani* was not studied, yet the attributes like the production of an antibacterial and antifungal substance "Javanicin" and "Oxyjavanicin" respectively by *F. solani* and its tolerance of several toxins known to be produced by micro-organisms used in this study, suggest that *F. solani* can compete saprophytically with the normal soil micro-flora, persists and accumulates in the soil which ultimately becomes "disease sick".

**NUCLEAR BEHAVIOUR AND DEVELOPMENT OF ASCOCARP IN *SPORORMIA*
FIMETARIA DE NOT**

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(Received October 26, 1965)

The hyphae of *S. fimetaria* were found to be uninucleate. The development of the ascocarp took place through the formation of the pseudoparenchymatous structure, either derived by the repeated divisions of a single cell or by the fusion of several vegetative hyphae. The vertical orientation of the pseudoparaphyses was independent of the ascogenous hyphae and the asci. Pseudoparaphyses were formed earlier than the ascogenous hyphae. These sterile elements were either attached at both ends or some attached above and free below and some attached below and free above. The ascogenous hyphae originated from the basal cells of the locule. Diplodization process is however, at present incompletely understood. Development of the asci took place by the formation of croziers in the normal way.

PRELIMINARY REPORT ON THE LOBSTERS OF WEST PAKISTAN COAST

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(Received October 18, 1965)

Since lobsters are economically important as an article of food, a study of the West Pakistan lobsters is undertaken. The present paper deals with the systematics of the lobsters, based on the collections made by the Zoology Department, University of Karachi and the Marine Fisheries Department Karachi. Three species: *Panulirus polyphagus*, *P. homarus* (family, palinuridae) and *Thelus orientalis* (family scyllaridae) are represented in our collection. Six species of lobsters are recorded from Bombay. *P. versicolor* which is found in Bombay waters and is also reported from Aden is missing in our collection. It seems necessary that a systematic survey of the coast should be made.

HISTOLOGICAL ANALYSIS OF THE BUDS OF POTATO TUBERS TREATED WITH GAMMA RADIATIONS TO INHIBIT SPROUTING

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(Received December 18, 1965)

The present investigation showed that gamma radiations brought about degenerative changes in the buds and leaves buttresses of potato tubers, the effective doses being 6,8 and 10 Krads. This degenerative effect was dependent upon the storage time. No such effect was observed immediately after irradiation and after 30 days of storage. After 90 days of post-irradiation storage, tunica was found to be intact while corpus destroyed and at 150 days of storage all the tissues had degenerated and were homogeneous. The procambium did not retain its distinctivity. This degeneration of buds might be one of the possible causes of sprout inhibition in potatoes by the gamma radiation treatment.

SHORT COMMUNICATION

THE FATTY ACID COMPOSITION OF PAKISTANI ELASMOBRANCH FISH LIVER OILS

Part I.—The Fatty Acids of (*Mustelus monazo*) Shark Liver Oil

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VITAMIN B₁₂ IN THE VARIOUS ANIMAL LIVERS

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NOTE ON THE FORMATION OF MAGNESIUM CARBOHYDRATE COMPLEXES

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ULTRASONIC DEGRADATION OF VINYL BENZOATE

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**PHARMACOGNOSTIC STUDIES ON THE STEM AND ROOT OF EUPHORBIA
HELIOSCOPIA LINN.**

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(Received June 26, 1965)

EUPELMUS TACHARDIAE AND ITS INDUCED PARASITICISM OF THE LAC INSECT

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