STUDIES IN RING TRANSFORMATION

Part I.—Clemmenson Reduction of 1:4-Dimethyl 1-Ethyl Cyclohexane-3:5 Dione

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Self condensation products of methyl ethyl ketone in the presence of calcium carbide have been studied. An equilibrium mixture of two isomeric dimers 5-methyl hept-4-en-3-one and 5-methyl hept-5-en-3-one is obtained which can be quantitatively estimated through separation in a gas chromatogram. A third product, a trimeric ketone, presumably 5,7-diethyl octa-4:6-diene 3-one, is also obtained through this condensation. The dimeric ketone gave dimethyl ethyl cyclohexane dione which on Clemmenson reduction gave four hydrocarbons, 1-methyl-1-ethyl-4-methylenecyclohexane, 1:4-dimethyl-1-ethyl cyclohex-2-ene, 1:3-diethyl-1-methyl cyclopent-3-ene and 1-methylvinyl-3-methyl-3-ethyl cyclopent-4-ene, together with three ketones, 2:4-diethyl-4-methyl cyclopentan-1-one, 2:5-dimethyl-5-ethyl cyclohexanone-1-one and 4-methyl-4-ethyl-2-(ethyl-2'-enol) cyclopentan-1-one.
CONSTITUENTS OF CEDRUS DEODARA (DEÄR WOOD)

Part II.—Isolation of Dewardiol and Dewarenol

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An unsaturated diol, b.p. 134 °C, 2 mm., n D 24.5 1.5123, a D 25° +41° and a polyhydric aromatic unsaturated alcohol, m.p. 218°, a D 24.5 5° +6.5° being designated as Dewardiol and Dewarenol, respectively, have been isolated from Deär Wood (Cedrus deodara).

In the first communication on the chemical constituents of Cedrus deodara (Deär wood), the isolation of an unsaturated hydrocarbon Dewarene and an unsaturated monohydric alcohol Dewarol had been reported. The isolation of two other compounds, designated as Dewardiol and Dewarenol, is being reported in the present paper.

The alcoholic extractive of deär wood flakes was steam distilled and the non-volatile residue was extracted with ether. After washing with alkali and acid, the solvent was removed and the residue fractionally distilled. The fractions with close refractive indices were combined and the products reconstituted a few times. The lower boiling fractions gave some Dewarol. The higher boiling fractions on careful distillation gave a uniform fraction b.p. 134 °C, 2 mm. n D 24.5 1.5132 and a D 25° +41° (10% solution in chloroform), Dewardiol, isolated for C_{15}H_{24}O_{2} and showed the presence of two double bonds on microhydrogenation. Both the oxygen functions can be accounted for as alcoholic groups. The analysis showed the presence of two C-CH_{3} groups.

On oxidation with chromium trioxide in glacial acetic acid, dewardiol gave a liquid ketone which had one of the alcoholic groups unattacked. It absorbed in the infra-red spectrum at 1710 cm\(^{-1}\) showing the presence of an unconjugated six membered or open chain ketone. It had I.R. maxima at 3450, 1690w, 1620w cm\(^{-1}\) which showed the presence of OH group and also unsaturation. This ketone could be acetylated to give a mono-acetyl ketone, which absorbed in the infra-red spectrum at 1735, 1710, 1690w and 1620w cm\(^{-1}\) thus showing the presence of an acetate group, open chain or six membered ketone, and unsaturation in the molecule.

The acidic fraction of ether soluble steam non-volatile fraction on chromatography over acidic alumina with ether as eluent yielded a crystalline product, which on crystallisation from methanol-water gave Dewarenol, m.p. 216-8°C. The ether insoluble brown resinous mass from the steam non-volatile fraction also on column chromatography over acidic alumina according to Brockman standard gave Dewarenol, m.p. 218°C, identical with the sample obtained from the ether soluble fraction, described above.

The analysis for Dewarenol fits in equally well with the three following formulae C_{21}H_{34}O_{6}; C_{22}H_{38}O_{6} and C_{25}H_{44}O_{6}. The last of the three formulae is favoured on the basis of the analysis of its oxygen functions. It shows the presence of three O-Me groups and four active hydrogen, which accounts for seven oxygen atoms. The ultraviolet spectra of this compound indicates a highly unsaturated structure for Dewarenol, \(\lambda_{\max} 288\text{;} 283; 230\text{;} 207\text{ }\mu\lambda\) (ε 9,000; 10,000; 20,000; 99,500).

Experimental

Analyses were done by Drs. Pascher and Pascher, Microanalytical Laboratories, Bonn, West Germany. The infra-red and ultra-violet spectra were taken by Mr. A. Razzaz, Drugs and Pharmaceutical Division and Photomicrograph was taken by Mr. Ashtraf Ali, Physics Division, Central Laboratories, P.C.S.I.R.

Isolation of Dewardiol.—The alcoholic extractive (486.0 g.) from deär wood flakes (5.0 kg.) was subjected to steam distillation. The steam non-volatile fraction (205.0 g.) was extracted with ether, leaving behind a brown powdery resin (47.0 g.). The ether solution was then separated into basic (2.0 g.), acidic (65.0 g.) and neutral (191.0 g.) fractions. The neutral fraction was then rectified by distillation in vacuo and the fractions with close refractive
USE OF MALEIC ANHYDRIDE FOR EXTENDING THE OIL-LENGTH OF COTTONSEED OIL-BASED OLEO-RESINOUS VARNISHES

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Incorporation of maleic anhydride by ‘in-situ’ technique is useful in increasing the oil/resin ratio of cottonseed oil-based coating compositions from 1.25 to 3.0. Varnishes prepared with an oil/resin ratio of 2.0 and maleic anhydride 7.5% by weight of the oil have superior film forming properties. The use of maleic anhydride-modified resin esters with ordinary or maleinized cottonseed oil is not successful for extending the oil length of these varnishes.

Introduction

Earlier work reported from these laboratories has shown that cottonseed oil can be used for the preparation of oleo-resinous varnishes by judicious control of catalysts and the degree of polymerisation. The maximum proportion of oil that can be used in these formulations is 1.95 parts of oil to 1.00 parts of resin and there is thus a need to develop methods for preparing varnishes of longer oil-length. Maleic anhydride is known to improve the drying properties of semi-drying oils, for example soyabean oil, (iodine value 134) when cooked with 5-10% maleic anhydride, gives hard and dry, though not tack-free, film in 48-72 hours. On the other hand, maleic anhydride reacts with resin to form adducts which have improved film-forming properties. Incorporation of maleic anhydride in the cottonseed oil-based varnishes is therefore most likely to give the desired results by yielding improved coating compositions. The use of maleic anhydride for extending the oil-length of these varnishes has been investigated and the results of the study are reported in this paper. The following types of varnishes have been chosen for the present study: (A) those in which maleic anhydride is allowed to react simultaneously with oil and resin (in-situ method) and the acidity is then reduced with metallic oxides or glycerol or a mixture of both, (B) those in which maleic anhydride-modified resin ester is processed with the oil, and finally (C) those in which maleic anhydride-modified resin ester is processed with maleinised oil.

Experimental

Preparation of Maleic Anhydride-modified Rosin Ester.—This resin was prepared according to Method(1) described in the work on maleic resins reported from these laboratories.

Preparation of Varnishes.—Type A: Method (1): A mixture consisting of resin, maleic anhydride and a portion of cottonseed oil (generally 25% by weight of resin) was processed in an open beaker with agitation, at a temperature of 200-210°C, for about 30 minutes. The temperature was then raised to 240-250°C, and the oxides incorporated in the following order: calcium hydroxide, zinc oxide, litharge and manganese dioxide. After the addition of oxides, balance quantity of oil was added and the temperature raised to 300-310°C. Cooking was continued at this temperature and samples drawn from time to time for evaluation of physical properties. Method (2): A mixture consisting of resin, maleic anhydride and cottonseed oil was processed at 200-210°C, as in method (1). The mass was heated to 270-280°C, and maintained at that temperature while the catalyst was introduced and glycerol added in instalments. After the esterification had been substantially completed, the balance quantity of oil was added, litharge and manganese dioxide incorporated, and the temperature raised to 300-310°C. The rest of the procedure was the same as described in method(1).

Type B:—A mixture consisting of Maleic-modified resin ester and cottonseed oil was heated to 240-250°C, litharge and manganese dioxide incorporated and the temperature raised to 300-310°C. Heating was continued at this temperature and samples drawn at regular intervals for examination.

Type C:—A mixture consisting of cottonseed oil and maleic anhydride was processed at 200-210°C, for about 30 minutes. Maleic anhydride-modified resin ester was incorporated and the resulting mix was processed as in Type B.

The varnishes were evaluated for acid value, viscosity, drying properties, scratch hardness and water resistance. The methods used were the same as described in the earlier publication.

Results

Data in respect of the formulations studied are given in Table I, physical properties of these.
THE EFFECT OF MAGNESIUM SULPHATE ADDITION ON THE PROPERTIES OF ARTIFICIAL POZZOLANIC CEMENTS

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Pozzolanic cements are characterised by a low rate of development of strength, low rate of heat evolution but improved resistance to sea and sulphate waters. This paper describes the effect of magnesium sulphate addition on the properties of artificial pozzolanic cement and mortars. The addition of one per cent magnesium sulphate by the weight of the artificial pozzolanic cements increases the rate of compressive strength, chemical resistance specially to the attack of magnesium sulphate solutions and heat of evolution. The water permeability of the mortars made with Portland or Pozzolanic (with or without adding magnesium sulphate) cements remains unchanged.

Introduction

The powdery volcanic lava found near Pozzuoli, Italy and in several other places in Europe has been employed as a construction material since ancient times. It is mainly silica and alumina and possesses hydraulic properties. A pozzolana is defined as material which, though not cementitious in itself, combines with lime at ordinary temperatures to form stable insoluble cementing compounds related to those in set Portland cement. Artificial pozzolanic cement, the use of which is becoming popular in United States, is made by intergrinding Portland cement with a portion of such pozzolana as diatomaceous earth, pumice, burnt clay or shale. This cement is characterised by a low rate of development of strength, a low rate of heat of hydration and high resistance to the chemical attack. Pozzolanas combine with the lime liberated during setting of Portland cement and a lime-pozzolana compound of cementitious value is formed. The calcium hydroxide does not add to the strength of set cement and is readily subject to the chemical attack. The lime also reacts with certain siliceous constituents of the aggregate and causes premature failure of concrete. The partial replacement of Portland cement with pozzolana therefore controls the alkali-aggregate reaction and increases the resistance of concrete to the attack of alkalines salts. Pozzolanic cements increase the workability and reduce segregation and bleeding in concrete mixes.

The substitution of pozzolana reduces the strength obtained at the earlier stage though the ultimate strength is more than that of Portland cements. Pozzolana concretes develop lower strength if cured in air and require a long period of wet curing if the best results are to be obtained. The slow rate of setting hinders the progress of construction. The rate of development of strength has been increased1 by finer grinding, by increasing gypsum additions to 3.3-3.5 per cent and by using a clinker having a high content of calcium tri-silicate. The additions of CaCl2 and CaOCl2 have also been tried to hasten the hardening process so that the compressive strength at 28 days is obtained equal to that of pure Portland cement. The present paper deals with the use of magnesium sulphate for accelerating the early rate of compressive strength and for improving chemical resistance to sulphate attack of artificial pozzolanic cements.

Setting Times of Portland and Artificial Pozzolanic Cements

The temperature of 850°C, to which a moderately burnt brick is fired in this country, has been reported to be the best average temperature to make pozzolana from ordinary brickmaking clays. Burnt bricks obtained from Hyderabad, West Pakistan were therefore crushed to cement fineness and used as artificial pozzolana throughout in this investigation. In the sub-continent of India and Pakistan, the powdered burnt brick is known as surkhī and this has been employed since ages in mortars and renderings based on pozzolana-lime mixes. The artificial pozzolanic cements were prepared by replacing Portland cements and clinkers from 5 to 30 per cent (by weight) with surkhī and setting times determined with the help of Vicat needle apparatus. The initial and final setting times of Portland and pozzolanic cements recorded in Table 1 show that the substitution of 15-20 per cent surkhī in Portland clinkers gives the desired period of 45 minutes specified for initial settings and eliminates gypsum addition during the manufacture of Portland cements. Daudkhel Portland cement was prepared in the laboratory by adding 2 per cent Khewra gypsum to the clinker obtained from Daudkhel Cement Factory. The gypsum retarded the clinker approximately to the same extent as the partial replacement of clinker with 30 per cent surkhī. The replacement of Portland cement with surkhī increases slightly both
THE EFFECT OF THE ROOT EXTRACT OF WATER HYACINTH (EICHHORNIA SPECIOSA KUNTH), ON THE GROWTH OF MICROORGANISMS AND MASH KALAI (PHASEOLUS MUNGO VAR. ROXBURGHII), AND ON ALCOHOLIC FERMENTATION

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Root of water hyacinth have been extracted with different solvents such as ethanol and distilled water under different conditions and their influence on the growth of Microorganisms, Mash Kalai and Alcoholic Fermentation has been studied. In all cases, the root extract enhances the growth of microorganisms and Mash Kalai and accelerates the alcoholic fermentation. Analyses of the extract showed that the organic substances have no effect and the inorganic constituents are responsible for the activity of enhancement of growth.

Introduction

Earlier workers 1-4 have reported that the water extract of the root of water hyacinth enhances the growth of the shoots and roots of certain plants. Sarcare and Kundu2,3 identified aspartic acid, glutamic acid, arginine, cystine, tyrosine, glycine, amino-isobutyric acid, lysine, valine and theonine in this extract but found that the mixture of these amino acids, gibberelllic acid, and indole-3-acetic acid in water hyacinth, were not responsible for the enhancement of growth. They therefore attributed this activity to some unknown constituent. The effect of the Root Extract of Water Hyacinth (Eichhornia speciosa Kunth) on the growth of microorganisms and mash kalai (Phaseolus mungo var. Roxburghii) and on Alcoholic Fermentation has been studied at these laboratories and the results are presented in this paper.

Experimental

Extractions.—The fresh fleshy roots, collected from local sources, were cut into thin slices and extracted with different solvents, filtered and distilled under reduced pressure at 40°C. according to the following procedures:

1. Extraction with Distilled Water: (a) At lower temperature: 20 g. of roots were extracted with 100 ml. of water for 40 hours. The filtrate (Soln. No. 1) was evaporated and 1% solution of the solid substance was prepared with sterile distilled water (Soln. No. 2). (b) At room temperature: The method was same as in (a). The filtrate was designated as solution No. 3 and the 1% solution of solid substance as solution No. 4. (c) At higher temperature: 20 g. of roots were treated with 100 ml. of water and autoclaved under 30 lbs. pressure/sq. inch for two hours. The filtrate was designated as solution No. 5 and the 1% solution of the solid substance as solution No. 6. (d) After oven drying: 20 g. of oven dried (100°C.) root of water hyacinth was extracted with 100 ml. of water for 40 hours at room temperature. The filtrate was designated as solution No. 7 and the 1% solution of the solid substance as solution No. 8.

2. Extraction with Methyl Alcohol: (a) At lower temperature: 20 g. of roots were extracted with 100 ml. of methanol at 4°C. for 40 hours. The solvent was removed and 1% solution of the solid substance left was prepared and this designated as solution No. 9. (b) At room temperature: The experiment 2(a) was repeated at room temperature (3o-32°C.) and the 1% solution of the solid substance thus obtained, was designated as solution No. 10. (c) After oven drying: 20 g. of the oven dried roots were extracted with 100 ml. of methanol for 40 hours at room temperature, 1% solution of the solid was prepared and designated as (Soln. No. 11).

3. Extraction with Ethyl Alcohol: (a) At low temperature: Method was the same as in case of methyl alcohol (a) and the 1% solution of the solid was designated as (Solution No. 12). (b) At room temperature: The above experiment was repeated at room temperature and the 1% solution of the solid substance was designated as solution No. 13.

Bioassay.—The strain of Aspergillus niger No. 21* was used as the test organism for bioassay on the medium No. 1 in test tubes of uniform size, having the dimensions 16 x 1.7 cms. 5 ml. of the medium No. 1 was used in each test tube and one ml. of each test solution was used in each experiment. In control experiment 1 ml. of distilled (sterile) water was used in place of test solution. These tubes were then inoculated with equal quantities of the spores of the test organism and

* These organisms were isolated in these laboratories from local sources.
BACTERIOLOGICAL EXAMINATION OF DRINKING WATER OF KARACHI AND ISOLATION OF ENTERIC PATHOGENS

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A bacteriological examination of drinking water from various localities of Karachi was carried out and the total count as well as the most probable number of coli-aerogenes was determined for the samples collected. A seasonal variation was observed in the T.C. and M.P.N. Each of the samples was further examined for the presence of any traceable pathogen.

Introduction

Higher incidences of typhoid, gastroenteritis and diarrhoea have become common problems of public health in Karachi. The origin seems to lie in the defective water and sewage pipelines, most of which happen to be old and rusted. At some places they have been laid very closely together, sometimes even crossing each other. Bursting of pipelines is a common occurrence, particularly in some of the older localities of Karachi, causing pollution of the drinking water. This condition is further worsened where there is a combined sanitary system and the sewage is let down in storm-water drains.

Among the measures necessary for relieving the situation, it was considered of importance to develop a low cost filtering device from indigenous raw material and the work carried out in this direction is being reported elsewhere. The present paper deals with the bacteriological examination of drinking water from various localities of the city in order to find out whether the pathogens were originally present in the drinking water or they were introduced during its journey from the treatment plant to the water taps. Hussain and Sethna1 while working on the incidences of enteric fever had reported earlier the presence of a few pathogens in the drinking water being supplied to the Civil Lines area of Karachi.

A total of 125 samples was collected from various parts of the city at different distances from the filter plant and subjected to presumptive-coli tests. Each of these samples was further examined for the presence of any traceable pathogen. The results obtained are shown in Table 1.

Material and Methods

In order to obtain samples from every locality of Karachi, the city was divided into sectors and a few neighbouring areas were also included in the survey. Samples were collected from public taps and also from storage tanks, underground reservoirs of private buildings and a few handpumps fitted at different places.

Methods adopted for testing were in accordance with those laid down in the 'Standard Methods for the Examination of Water and Sewage.'2 Glass stoppered flasks of 500 ml capacity were used to collect samples. For presumptive-coli tests three sets each consisting of 5 tubes with 10 ml, 1 ml and 0.1 ml of the sample respectively, were used and “Most Probable Numbers” were ascertained from McCrady’s table. Serial dilutions were made and inoculated in agar plates in duplicate. A temperature of 37°C was maintained for the incubation and colonies were counted after 48 hours. In addition to agar, other differential and selective media were also inoculated for the isolation of organisms. Lactose broth tubes were incubated at 37°C and checked after 18, 24 and 48 hours. The M.P.N. was determined from the 48 hours reading.

In the case of E. coli only those organisms are being reported, which grew in brilliant green bile 5% broth, producing acid and gas at 44°C. It has however to be noted that according to Raghavachari and Iyer,3 organisms other than E. coli may also account for acid and gas at this temperature under the climatic conditions of the sub-continent. Peptone water-tubes were therefore incubated at 44°C and checked for indol production after 48 hours.4 This was further confirmed by the production of acid and clot in litmus milk, nonutilisation of citrate and uric acid, reduction of nitrates to nitrites, negativity of V.P. test and positivity of M.R. test. Only members of the enteric group were identified up to species and the identification was based on biochemical tests according to Burgey’s Manual of Determinative Bacteriology.5 In the identification of organisms, the results were further checked up by following the procedures laid down in Kauffmann’s Enterobacteriacea.6

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SPASMOLYTIC PRINCIPLE OF LAVENDULA STOECHAS LINN. AND ITS PHARMACOLOGY

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The pharmacology of Lavendula stoechas Linn. (ustukhuddus) has been studied. A smooth muscle relaxant factor present in it has been isolated and identified as 7-methoxy coumarin. A synthetic sample of 7-methoxy coumarin was prepared and found to be chemically and pharmacologically identical with the isolated compound.

Lavendula stoechas Linn. (ustukhuddus), a pleasant smelling drug, is a native of Arabia and Mediteranean coasts to Asia Minor and regarded in the native systems of medicine as cephalic, resolvent, deobstruent and carminative and is prescribed for colic and chest affections. It is also considered to be a good stimulant, aromatic, dispheotropic, expectorant, antispasmodic, antiphlogistic and emanaogue. An essential oil derived from it has been variously used to relieve biliollness and to remove nervous headaches. Fomentation with flowers is claimed to relieve rheumatic and neuralgic pains.

Despite the fact that L. stoechas has the reputation of possessing important therapeutic properties and has been held in high esteem in the Greeco-Arab system of medicine, no scientific investigation except for the recent work of Hahn and collaborators appears to have been carried out on this plant. These workers isolated a hydrocarbon, d-camphor and three sterols from the petroleum ether extractive of the plant. In the present paper a detailed pharmacology of the plant material and the isolation of its smooth muscle relaxant factor has been presented.

Experimental

Ustukhuddus was obtained from the local market and identified as L. stoechas Linn. Dried stems of the material Linn. (300 g.) were extracted with alcohol and the solvent removed in vacuo. The residue (70 g.) was extracted repeatedly with water and the combined aqueous extracts were freed of the solvent, after filtration. Aqueous solution of the extractive thus obtained (20 g.) and marked as “A” was used for pharmacological tests.

Cardio-Vascular System

Blood Pressure.—Male dogs weighing between 12 to 18 kg. were anaesthetised by intravenous administration of pentothal (15 mg./kg.) and phenobarbitone (25 mg./kg.) followed by pheno- barbitone (75 mg./kg.) intraperitoneally. Blood pressure was recorded from the carotid artery through a mercury manometer. The drug was administered through a cannula in the femoral vein. Solution “A” in doses up to 10 mg./kg. did not have any effect and doses of 20 mg./kg. showed only a transient fall in blood pressure. A moderate fall in blood pressure was noted with a dose of 40 mg./kg. and 80 mg./kg. produced a fairly drastic fall, the blood pressure regaining its initial level in 4 to 8 minutes. Prior intravenous injections of acetyl choline (0.005 mg./kg.) adrenalin (0.005 mg./kg.), atropine (2 mg./kg.) and bilateral carotid occlusion for one minute did not alter the degree, intensity or type of hypotensive response. The action on blood pressure in rats was similar to that observed in dogs.

Perfused Rabbit Heart.—Rabbit hearts were perfused according to Langendorff’s technique, with MacEwens solution at 36°C. and the amplitude of contraction was recorded on a smoked drum. The aqueous solution of ‘A’ was added to the perfusion fluid through a polythene cannula opening near the coronary artery to reduce the dilution to a minimum. Doses up to 0.2 mg. did not appear to have any effect on the amplitude or rate of cardiac contraction. With a dose of 1 mg., ventricular contraction was arrested momentarily, but the heart started beating again after a few seconds though with a greatly diminished amplitude of contraction, the initial level being regained after 10-30 minutes.

Central Nervous System

Anti-epileptic activity of the aqueous solution “A” was screened by electrically induced convulsions in male rabbits. It was given intraperitoneally to three rabbits and their electroshock threshold was determined hourly for four hours. No significant change in their electroshock threshold was noted up to a dose of 1.0 g./kg. during the period mentioned above.
HARD-WAX IN THE ARCHITECTURE OF THE CROWN-SHAPED CELL

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There are two generations per year of the lac insect, the major one has a tendency to produce males in a large number, some of them seem to change their sex and become abnormal females. These are distinct from the normal apple-like cells and appear crown-shaped cell. The architecture of the crown-shaped cell immediately after the insect has become adult, has been studied.

The main horizontal crevice on the equatorial region of the cell shows wax fibres arising upwards and downwards. There are six such areas all round the cell. Corresponding to each area on the outside wall is a path on the skin comprising the wax pores which secrete wax as hard fibres, and is studied under polarized light.

The adult female lac insect is a delicate creature. It has a soft skin and protects itself by secreting a coat of hard resin, the ordinary lac or shellac. Lac therefore forms a cell all round the insect body. The shape of the cell is like an apple with a smooth surface. This is rather a summarised picture of a full grown normal lac cell. The cell is constructed of a resinous wall which in turn is supported by the frame-work of a hard wax as fibres embedded within the cell wall, like a skeleton. This has been reported before. Besides the normal smooth-surfaced lac-cell there is another, decorated or ornamental, also dome-shaped and comparable to a crown. The architecture of the crown-shaped cell has not been studied so far. Firstly a word on the origin of such an abnormal cell. There are two generations per year of the lac insect. Mother insects growing during the humid part of the year, from July to November, give rise to a generation in which males form the majority when they are winged. A few females and wingless males are also to be found. It means that in such cases very few females are to be found to propagate the species further. The Sind lac insect has a tendency to produce males in large numbers and which is responsible for the ups and downs of lac crops from year to year. In the post-monsoon generation, some larvae seem to change their sex and become abnormal females. These are distinct from the normal apple-like cells and appear crown-shaped. In fact the insect producing such a cell is so different as to have been described as a new species, L. rangoensis by Chamberlin who naturally never studied the biology of the insect he was describing. It is proposed to study the architecture of the crown-shaped cell immediately after the insect has become adult. The problem is part of the study that is being carried out on the biology of the Sind lac insect which alone is responsible for the production of lac collection from Acacia arabica.

The typical appearance of the abnormal cell is presented in Fig. 1. The cell is three-fourths grown and seen sideways. It was collected from Karachi, growing on Albizzia lebbeck as an avenue tree near Clifton bridge. The main rough striated area seems to comprise a terraced arrangement. The main horizontal crevice on the equatorial region of the cell shows wax-fibres arising upwards and downwards. These fibres are thinly coated with lac-resin and give rise to the sculptured or ornamental appearance. There are six such areas all round the cell. Corresponding to each area on the outside wall is a patch on the skin itself comprising the wax-pores which secrete wax as hard fibres. The arrangement of these pores, or the patch as a whole, differs between the normal and abnormal lac insects. Patches of wax-pores belonging to the normal and abnormal lac insect of the species L. cummzsis, have been illustrated before as pen and ink drawings. A more objective appearance is revealed by a microphotograph, Fig. 2, belonging to L. sindica. The specimen comes from an insect attacked by a chalcid. The chitin got oxidized and was stained by itself thus requiring no staining for being properly photographed. Briefly Fig. 2, as a patch of wax exuding pores, shows the seat of origin of the wax fibres. The major or lower horizontal crevice, in Fig. 1, shows the external seat of exudation appearing as fibres outside the cell wall.

It is proposed now to start with the earliest adult stage of a normal and crown-shaped cell. The normal cell under polarized light is seen, in Fig. 3, which clearly reveals the wax fibres embedded with the cell wall. The same specimen, Fig. 3, is photographed under ordinary microscopic illumination as shown in Fig. 4. Polarised light selectively brings out wax which, so to say, is alone illuminated by it. In Fig. 3 wax appear in three pairs of flat ribbons on each side, thus a dozen of
BLOOD GLUCOSE, HAEMOGLOBIN AND CHOLESTEROL IN THE PAKISTANI MALE ADULTS

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Blood glucose, haemoglobin and cholesterol contents of normal Pakistani male adults ranging in age between 21-50 years have been determined. The values of blood glucose and haemoglobin were noted to be somewhat lower than those reported in the literature. Plasma cholesterol concentration of subjects belonging to high income group (Group A) was substantially higher than that of low income group (Group B) and this difference is statistically significant in all the age levels of the two groups. It has also been observed that in Group “A” there is a direct correlation between age and cholesterol, but this effect is not seen in group “B”. An attempt has been made to explain these findings on the basis of different dietary habits and physical activity of the two groups.

Introduction

In the course of studies on an antidiabetic factor isolated from Karela (Momordica charantia), which involved its use in alloxan diabetic animals as well as human diabetic patients, random cases were noted, where the blood sugar values of normal human subjects were considerably lower than those reported in the literature. Some interesting findings regarding the blood cholesterol content of Pakistanis were observed during the investigation of alkaloids and alkaloidal complexes isolated from indigenous plants employed in the treatment of cardiovascular ailments. These observations and also the fact that no data is available on any of the blood values of Pakistanis, led the authors to investigate the blood sugar, cholesterol and haemoglobin levels in the normal Pakistani male adults. In view of the different climatic conditions, racial traits and dietary habits of our people when compared with the people of other countries, whose blood values are known these investigations become all the more significant, as all these factors have been reported to influence the values of some of the constituents, particularly that of cholesterol.

It may, however, be stated that the values reported in the present paper are based on preliminary studies which will have to be extended and rechecked on a comprehensive scale in order to formulate dependable standard values for the population of the country. The subjects studied in this work came from various walks of life, but cannot be assumed to be representative of the population, because, although hailing from different parts of the country, they were all of them living in Karachi, under conditions which were not exactly identical to those prevailing in their home towns.

Experimental

Healthy male adults between the ages of 21-50 years were taken for all the assays reported below. No distinction was made between the East and the West Pakistanis but for the estimation of cholesterol values the volunteers were placed in two groups—“A” and “B”, depending upon their income and status in life.

Blood Collection.—1 to 1.5 ml blood was obtained by venipuncture and was collected in glass stoppered tubes containing 5 mg. sodium citrate. The citrated tubes were prepared by pipetting 0.1 ml. of a 5% sodium citrate solution in a tube, rotating to produce maximal spreading and then drying at 100°C. For the determination of blood glucose, the volunteers were asked to fast for 15 to 18 hours.

Glucose Determination.—The blood filtrates were prepared by mixing 0.2 ml. citrated blood to 3 ml. of water. 0.4 ml. of 0.3N barium hydroxide was then added and after the mixture had turned brown, 0.4 ml. of 5% zinc sulphate was added. After a few minutes the mixture was filtered. One ml. of this filtrate was used for the determination of glucose by the Nelson’s Photometric adaptation of the Somogyi method. The blue colour produced was read on the Fisher Clinical Electrophotometer using Filter No. 525. Results are given in Tables 1 and 2.

Plasma Cholesterol.—For cholesterol determination, all the volunteers were placed in the following two groups, depending upon their status in life:

GROUP “A”: Comprising people from the middle and higher middle class families.

GROUP “B”: Comprising skilled and unskilled labourers mostly engaged in works where physical activity is required. This group also included prisoners.

Duplicate analyses were done on plasma from 261 subjects. For each analysis 0.2 ml. plasma was treated with a mixture of alcohol-ether (3:1), thereby extracting cholesterol and precipitating proteins. The extract was evaporated to dryness and cholesterol in it was determined by adapting
STUDIES ON SOME OF THE PHYSICAL CHARACTERISTICS OF WOOL FIBRES IN DIFFERENT PARTS OF THE FLEECE OF HASHTNAGRI SHEEP

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(Received June 12, 1963, revised October 22, 1963)

Variations of the percentages of true, heterotypical, and medullated fibres in eleven different parts of the fleece of Hashtnagri sheep were studied and tensile strength, extension at the breaking point, diameter, and length of the fibres were determined. It was found that "shoulder wool" contained the maximum number of true fibres while heterotypical and medullated fibres were in excess in the "belly wool". The tensile strength of the true fibres was greatest in the "seared wool" while that of heterotypical and medullated was maximum in "fleece wool" and "brisket wool", respectively. "Brich wool", "belly wool", and "back wool" had maximum fibre length. In certain cases extension at the breaking point exceeds 30%, elongation. The tensile strength and the respective diameters of the fibres of the different parts were not related.

Introduction

West Pakistan has 6,000,000 sheep with 13 major types of breeds. They are heterogeneous with wide variations in physical characteristics including body size and wool production. Wool produced in the different parts of the body of the sheep has true heterotypical, and medullated fibres in varying amounts and having different physical characteristics which may be due to differences in the physiological conditions of the different parts of the body. This difference in medullation and in other physical characteristics such as fibre-length percentage elongation at break and tensile strength indicate the characteristics of the wool furnished by different parts.

A scheme has been undertaken to survey different areas of West Pakistan and to collect wool samples from each of eleven parts of the fleece of different types of breeds of sheep, to assess the percentages of different types of fibre distributed in the fleece and to determine the variation in their respective tensile strength, percentage elongation, diameter, and fibre length.

For this purpose, a general survey of Charsadda, Peshawar, and Nowshera, the home-tracts of Hashmagri breed, has been made. The wool samples were collected from eleven different parts of the 60 Hashmagri sheep found in various villages of these Tehsils and were tested accordingly.

Sampling.—1 or 2 sheep in each flock was selected and staples from each of the eleven parts were taken and kept separately. Similarly, 60 sheep in different flocks at various villages were selected and wool staples were taken accordingly.

Experimental

Medullation.—The samples were collected in the autumn season of 1962 and the staples of wool were shorn as close to the skin as possible. In order to determine the medullation, these samples were dusted and 0.06 gm. of each sample was sorted for true heterotypical and medullated fibres by the benzene method. The percentage of each type of fibre was thus determined.

Length Measurement.—For measuring length, the fibre was stretched out along a metre-rod and the distance between the two ends was noted. The length of 20-25 fibres from each type of fibre were determined.

Dynamometric Measurement.—Tensile strength and breaking strength along with extension at break, were found by means of a single fibre testing machine, that recorded breaking force and elongation simultaneously. The machine was hydraulically operated and the water flow was maintained in such a way that the time to break the fibre was 20 seconds; the length of the fibre between the two clamps was set accordingly. To promote accuracy with each type of fibre, different additional weights were used. 20-25 fibres from each type of all the wool samples were tested.

Diametric Measurement.—To determine the diameter, the strength of tested fibres were aligned on clean glass slides after being cut sectionally and secured by the cover-slip using glycerine. These slides were then inserted into a projectional microscope (Lanameter) and the diameter of the fibres was determined at a magnification of \( \times 500 \). An attempt was made to find the diameter at the centre and at least 100 readings were taken.
POLLEN MORPHOLOGY OF SOME PAKISTANI MEDICINAL PLANTS

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Pollen morphology of sixty-five Pakistani medicinal plants which are used in different systems of medicine, have been studied. The pollen grains of one plant i.e. *Albizia lebbeck* occur in polyads, while in all other plants studied these occur singly. The pollen grains are of various shapes i.e. varying from spheroidal to prolate with polar or lateral germinat exine. The pollen grains of various plants also vary in thickness of their exine. The exine may be, with or without ornamentations. The different measurements of the pollen grains recorded are: equatorial diameter, apocolpium diameter, width of colpi at the equator and with the description of the end of colpi and thickness of exine with comparison of sexine and nexine.

Introduction

Considerable emphasis has been laid on the pollen morphology during recent years. Palynology, or the study of spores and pollen grains has found application in plant taxonomy, plant geography, climatology and geology. Pollen analysis has also been tried as a means of tracing the history of the cultivated cereals.1 Pollen grains and spores are used in different indigenous systems of medicines for various diseases.

The flowers of *Adhatoda vasica* are regarded as antiseptic.2 Similarly the flowers of *Dianthus caryophyllus* are considered as cardiotonic, diaphoretic, astringent, nervine and antiseptic in Spain and North America. Chopra et al.2 have mentioned that *Elaeagnus umbellata* flowers are stimulant, cardiac and astringent, while the flowers of *Osimum basilicum* are carminative, diuretic, stimulant and demulcent.

In some cases the flower drug samples are found adulterated with various other flowers which are similar in appearance, as *Viola* flowers are commonly mixed with *Impatiens* flowers. Similarly the flowers of *Coccinia glauca, Onosma macrocephala, Anchusa italica, Anchusa hybrida* and *Trichodesma moll* have been supplied under the same name. The flowers of *Onosma echoides* and *Macroasma benthami* are commonly sold under the same name in Punjab. Against these adulterations there is no effective method of checking the purity of the drugs. Pollen grain analysis however, helps in qualitative analyses of drug powders and in the correct identification of drugs.

The plants selected in the present study are mostly those in which the flowers or pollen grains are regarded as drugs while in others the flowering shoots along with the leaves are the drugs in the indigenous systems of medicines.

Materials and Methods

The plants, on whose stamens the pollen grain studies have been carried out, were mainly collected from the Experimental Farm of North Regional Laboratories, P.C.S.I.R., Peshawar and its adjoining areas. Stamens of some other plants were also taken from the voucher specimens present in the herbarium.

Pollen grain preparations from the fresh as well as herbarium specimens were made as described by Erdtmann,4,4 The preparations were stained with safranin and mounted in glycerine. The diagrams were drawn with the help of camera lucida and the measurements were taken with an eyepiece micrometer. The measurements of about twenty pollen grains of each plant were taken and analysed statistically. The measurements mentioned in each case represent their averaged values. The uses of flowers and plants given in the text are after Chopra et al.2 The descriptive terms used are after Erdtmann4 and Nair.5

Description of Pollen Grains

1. **PLANTS IN WHICH FLOWERS ARE REGARDED AS DRUGS**

*Achillea millefolium*. Linn. (Compositae-flowers-essential oil, azulene) Plate I, Fig. 1. Pollen 3 zonocolporate spheroidal, 16a excluding spines, apocolpium diameter 5a, exine 3a thick, sexine is thicker than nexine, spinate; spines are pointed.

*Adhatoda vasica*, Nees: (Acanthaceae-flowers antiseptic) Plate I, Fig. 2. Pollen 2 zoniporate, prolate 64 × 36a, pore elliptical 6 × 4.2a, exine 3a thick, sexine thicker than nexine, faintly granulate.

*Alhagi maurorum*. Baker: (Leguminosae-flowers used for piles) Plate III, Fig. 4. Pollen 3 zoncolporate, prolate, spherical in polar view.
PHARMACOGNOSTIC STUDY OF THE STEM AND LEAF OF PAEDERIA FOETIDA LINN.

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A taxonomic description, and the macroscopy and microscopy of the stem and leaf of Paederia foetida Linn., used in the indigenous systems of medicine, are described. The diagnostic microscopic feature of the leaf are: presence of clustered acicular crystals in the long sausage-shaped cells in the mesophyll, spirally thickened tracheids in the mesophyll and uniseriate hairs on the upper epidermis. Usually there are two to three layers of hypodermis in the petiole. The stomata which are mostly found in the lower side of the leaves are accompanied by two subsidiary cells which are placed parallel to the pore. The stem is characterised by the presence of uniseriate epidermal hairs. Two to three layers of stone cells or sclereids which constitute the pericyclic fibres are present below the endodermis. Xylem bundles are simply collateral type and the vessels usually consist of single perforations. Pith cells contain acicular crystals. Fat bodies, morulae and resins are present in the leaves and in stipular sheaths.

Introduction

Paederia foetida Linn.: (Bengali: Gandhabhadulia; Hindi: Gandhali; Somraj; Urdu: Gandhana) belongs to the family Rubiaceae. The word “Paederia” has been derived from the Latin word “Pardus” meaning bad smell and the word “Foetida” also conveys the same meaning i.e. an offensive or stinking smell. According to Hooker, the plant is distributed from the Central and Eastern Himalaya ascending to 5000 ft. southward to Malacca. This plant is also commonly available in West Bengal, East Pakistan and in Assam.

The plant Paederia foetida is a slender twining shrub, foetid when bruised, branches terete, flexuous, leaves 2-6” by 1-2½”, opposite, ovate, acute, base cordate, nerves 4-5 pairs fine, petioles ½-1” long. Stipules in trapezoidal with shaggy hairs; ovate-lanceolate, bifid deciduous. (Plate 1, Fig. 1). Panicle 2-6” long, puberulous. Flowers violet, shortly pedicelled in slender trichotomous often scorpioid cymes, calyx small, tube campanulate. Corolla ½-¾” tomentose. Fruits ½-¾” polished, crowned by conical disk and minute calyx-teeth.

The stem and the leaf of the plant are used medicinally in the indigenous systems of medicine both in Ayurvedic and Unani systems. Soup prepared from the leaves is considered a good remedy for diarrhoea and dysentery and in fact is given as a household remedy during convalescence from acute illness. The extract of the stem and leaf is bitter, indigestible, aphrodisiac, tonic; cures “Vata” and “Kapha” inflamations, piles, fever, and is good for diseases of the eye and night blindness, laxative. It is also used for rheumatic affections, in which it is administered both internally and externally. As no work has been carried out on the pharmacognosy of the drug, the present work was undertaken.
BOTANICAL PHARMACOGNOSTIC STUDY OF RHASYA STRICTA DECAISNE

Part II.—Root

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The macroscopic and microscopic characters of the root of *Rhasya stricta* Decaisne are described. The root is characterized by the presence of large amount of starch in the cortical cells and the presence of large amount of unclarked phloem bands in the secondary xylem. Presence of large amount of latexers and the absence of crystals in the root tissues are the distinguishing characters.

Introduction

The botanical description of the plant and its distribution have already been dealt with in a previous paper. The different uses to which this plant is put and the total alkaloids reported were also mentioned in the same paper.

Material and Methods

The material used in the present study was collected from the adjoining areas of Peshawar, i.e., Jamrud, Khyber Agency. Pieces of the root were fixed in F.A.A. for microtome sectioning just like the stem. After washing out the fixative pieces were softened by Lendrum’s technique as given by E. Gurr. Dehydration and paraffin embedding was done by normal butyl alcohol and ethyl alcohol. Staining of the sections was done with safranin and fast green. Jeffrey’s method was employed for the maceration of the material as described by Johansen. Fresh hand sections were cut for the various microchemical tests as given by E. Gurr and Johansen. A few roots were then dried and powdered. The uniform powdered material was obtained by sifting it through a No. 80 sieve and studied after clearing in chloral hydrate. Cell measurements were taken with an eye piece micrometer.

Description of the Root

Macroscopic Characters.—*Rhasya stricta* Decaisne has tap root with secondary rootlets. The older portion of the root is marked with scars of the secondary rootlets. Surface of the root is rough and covered with yellowish brown striated bark with lenticels. Its diameter varies from 2 cm. to 4 cm. in a 2 to 3-year old root. A transversely cut section of the root reveals an outer yellowish brown bark and inner pale yellow wood. Wood occupies about 1/3 of the entire diameter of the root in the young root, and to 2/3 in a two to three-year old root. (Fig. 1) The taste is bitter, while the odour is slight.

Microscopic Characters.—The outermost covering of the root is yellowish brown periderm which is composed of 8 to 10 layers of cells. The periderm is formed by one layered phellogen, the cells of which are meristematic and rectangular in shape. Phellogen gives rise to phellem on the outside and phelloderm towards the inner side of this phellogen (Figs. 2 and 3). Cork cells measure about 31-51-92μ in length and 20-30-33μ in breadth. Due to formation of lenticels the outer layers of the bark are ruptured. Below the phelloderm is the cortex which is clearly delimited from the cork cells. Cortex in the young root occupies about two-thirds of the entire root, while in the mature
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