indicates the presence of a sensible absorption in the region of shorter wavelengths in the spectrum. The deeper the colour, the further has the absorption advanced from the violet into the blue and then towards the green. A change from yellow to orange indicates that the absorption has entered well into the green sector of the spectrum. The further the absorption advances into the green, the deeper becomes the orange hue. It then passes over into orange-red and finally into a scarlet colour.

The absorption by yellow flowers in the violet and blue sectors of the spectrum is usually so strong as to result in a complete cut-off of those regions. When the petals are very thin, however, it is possible with longer exposures photographically to record a feeble transmission in the blue and the violet sectors. It is interesting to remark that the transmission then appears as a succession of bands clearly resolved from each other.

The four spectrograms reproduced as Fig. 5 were recorded with the petals of a flower which is grown extensively in South India and finds a large market. It is known as "Kanakambaram" which may be translated into English as the "Cloth-of-Gold". The flower is of a beautiful orange-yellow tint. The individual petals are so thin that there is a sensible transmission over the entire spectrum which however exhibits a succession of bands, as can be seen in the third and fourth of the spectrograms reproduced as Fig. 5. When two petals are held together, however, the shorter wavelengths are cut off and only three bands are recorded, as can be seen in the first two spectrograms in Fig. 5. It would be interesting to ascertain the chemical constitution of the colouring matter which gives these remarkable effects.

A METHOD OF DEGRADATION OF HARD RESIN FROM LAC

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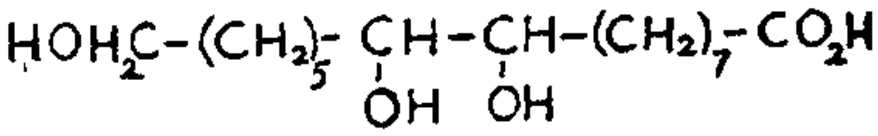
THE resin secreted by the insect *Laccifer lacca* Kerr has been the subject of extensive investigation over a number of decades. After the separation of the colouring matters and the waxes that accompany the resin it is generally divided into two parts on the basis of solubility : (1) ether-soluble soft resin and (2) ether-insoluble hard resin. The hard resin possesses the desirable resinous properties and consequently has been more widely investigated. It is apparent however that a rigorous separation of the soft and hard resin is often not made. This is the result of the following factors. The resin is a mixture of a number of polymeric acids with some free hydroxyl groups and its nature depends on storage and preliminary treatment. The remarkable property of the resin to form rubbery aggregates in contact with non-polar solvents, particularly ether, into which further penetration of the solvent becomes difficult, leaves the chemical separation often incomplete.

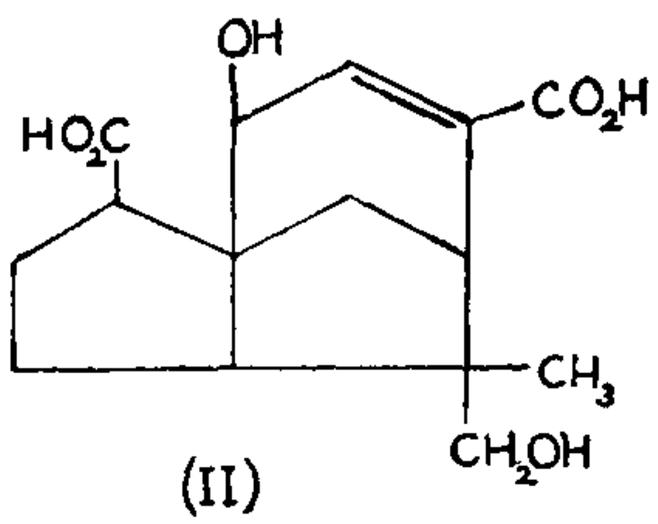
A fairly satisfactory and effective method of separation has now been attempted with a view to get a standard product. A concentrated alcoholic solution of the resin, free from wax and colouring matters obtained from palas (*Butea frondosa*) seedlac, was poured into ether with continuous vigorous stirring. The precipitated hard resin was treated similarly two or three times until all the ether-soluble material was removed. The hard resin, obtained as an amorphous powder, gave consistent results and was employed in all the reactions. The viscous residue obtained by evaporating the ether solution consists of soft resin along with some hard resin that has been carried over because of the presence of some alcohol in the mother liquors.

There seems to be a need to explore the possibility of using new methods of study of lac resin. The hard resin has so far been investigated by alkaline degradation. Two fission products, aleuritic acid[1] (I) and shellolic acid[2,3] (II) have been isolated and completely characterised. Recently Cookson and his co-workers[4] reported the isolation of epishellolic acid in small yield. The isolation of an aldehydo acid named jalaric acid[5] was reported from the jalari (*Shorea talura*) seedlac. However the yields of aleuritic acid and shellolic acid have always been a subject of uncertainty. Yields of aleuritic acid that have been reported vary from 20% to 40%,[6] that of shellolic acid 0-8%.[7] Most of the remaining portion of the fission products has not been fully characterised.

The variations in the yields of aleuritic acid may partly be due to the indefinite quality of the resin employed and may partly be due to the lack of standardisation of the methods.



(I)



(II)

We have now conducted experiments on the hard resin leading to a clearer understanding of the quantities of the fatty acid part and terpenoids. Lac resin is believed to contain a variety of C—O—C links such as esters, lactones and lactides. In an attempt to break down all such links without allowing recombination, the resin was fissioned with constant boiling hydriodic acid and red phosphorus in acetic acid solution at 115° during 2 hours. The fissioned product could be separated into a fraction readily soluble in a solution of sodium hydrogen carbonate and an insoluble oily fraction. The soluble part gave an amorphous powder on acidification which answered the Liebermann-Burchard test. It appears to be a complex mixture of the terpenoids iodinated at the reactive centres. On treatment with zinc and hydrochloric acid, acetic acid mixture (1 : 1), it gave an iodine-free product (approx. 15% of the hard resin) answering the Liebermann-Burchard test. The sodium hydrogen carbonate insoluble oil on similar treatment gave a wax acid (approx. 30% of the hard resin). The rest of the fission product could not be isolated in any form.

The above wax acid was chromatographed on neutral alumina. Elution with petroleum (40-60°) followed by chloroform-ethanol and ethanol gave very minor amounts of waxes which were not investigated. Further elution with alcohol-acetic acid (9 : 1) mixture completely removed the acid, partly in combination with aluminium as a salt. The total solid (95% of the weight chromatographed) was treated with dilute acid and it crystallised from light petroleum (40–60°) as plates, m.p. 61–62° C. I.R., $>C=O$, 1718 cm.$^{-1}$; $>C=C$, absent; U.V., low general absorption. (C, 75·3; H, 12·4%. Calc. for $C_{16}H_{32}O_2$: C, 75·0; H, 12·5%.)

Reverse phase chromatography with the system liquid paraffin/glacial acetic acid on Whatman paper No. 1, similar to the method described by Ballance and Crombie,[8] gave a single spot. It was identified as palmitic acid by a parallel run of authentic palmitic acid.

The method described above cleaves the resin smoothly into the components. However, the fatty acid portion of the resin could not exceed 40% in the present sample on the basis that all the C_{16} chain is present in the form of aleuritic acid. Further conclusion may be drawn that the hard resin does not contain any appreciable amounts of other chain lengths and no dicarboxylic acids or diols.

In order to fully understand the significance of this method of degrading the resin it may be mentioned that aleuritic acid itself under similar conditions has been studied and it is known to give quantitative yields of palmitic acid. For purposes of strict comparison with the behaviour of the resin, the reaction has now been carried out with the methyl ester of aleuritic acid and this also behaves in the same way. We could therefore conclude that all the aleuritic acid part of the resin could have come out as palmitic acid. However the same behaviour will be exhibited by more or less hydroxylated derivatives of aleuritic acid. With the exception of one claim of the isolation of a compound named Kerrolic acid,[9] reported to be a tetrahydroxy palmitic acid but not substantiated by any degradative evidence, no such compounds have so far been isolated and characterised. The aleuritic acid content of the resin could thus be reasonably estimated from the yield of palmitic acid obtained by this method and this should be about 35 to 40% in the present sample.

Alkaline hydrolysis of the same sample of hard resin was then investigated under a wide variety of conditions. The yield of aleuritic acid was invariably about 20%. It is not as yet clear why the yield is so low. However it may be mentioned that the terpenoid acids were not obtained crystalline. Considerable amount of uncrystallisable resin was left behind. Further study is necessary in order to get more detailed knowledge of the complexities.

Our grateful thanks are due to Dr. F. B. Padley of Unilever Research Laboratory, England and Dr. K. E. Murray of C.S.I.R.O., Australia, for authentic samples of palmitic acid and the Director, Indian Lac Research Institute, for a sample of palas seedlac.

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SOME STRUCTURAL FEATURES AND NEUROTOXIC ACTION OF A COMPOUND FROM *LATHYRUS SATIVUS* SEEDS

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'NEUROLATHYRISM' a syndrome characterized by such profound neurological disturbances as weakness, irritability, spasticity and rigidity of leg muscles, paralysis and at times death, has been described in humans subsisting for prolonged periods on the seed-meal of certain legumes belonging to the genus of *Lathyrus*.[1,2] The existence of this crippling disease in an endemic form among the poor people in certain regions of Central India accustomed to consume *Lathyrus sativus* seeds (Kesari dal) as the major dietary constituent has been reported.[3] However, the exact chemical and biochemical characteristics of the neurolathrogen(s) present in the pulse have not been elucidated so far. The lack of a convenient experimental organism capable of responding to the neurotoxic principles present in the seed has been the chief obstacle which impeded any progress. In a recent communication from this laboratory,[4] we have detailed a procedure for the bulk isolation, from the aqueous ethanol-soluble fraction of the seed-meal of *L. sativus*, of a new ninhydrin-positive principle, present in the free form and toxic to several micro-organisms in minute amounts. Further, some of the physico-chemical properties of this compound and its degradation products have also been reported. This communication deals with our further findings on its structural aspects and profound neurotoxic action in experimental chicks.

Earlier observations[4] that the toxic principle yielded, on acid and alkaline hydrolysis, another ninhydrin-positive compound, distinctly different from the parent compound in its behaviour on paper chromatograms, ion-exchange column chromatograms (Dowex-50) and in electrophoretic mobility, has now been followed up by the bulk isolation of the degradation product by ethanol precipitation from acid hydrolysates of the parent compound and crystallization from methanol. On the basis of its elementary analysis, melting point, paper chromatographic and electrophoretic characteristics, and the properties of its dipicrate and diflavianate derivatives, it has been identified as α, β-diamino propionic acid, a C_3-diamino monocarboxylic acid. It had a molar rotation $[M]_D^{22}$ of $+ 28{\cdot}6$ ($c = 2$, 6 N HCl) establishing thereby that it is of L-configuration. When tested with ninhydrin according to Rosen[5] the colour yield was 33% of that given by leucine on a molar basis, in agreement with the reported value in literature.[6] A comparison of the solid-phase infra-red spectra (KBr disc) of its monohydrochloride with that of an authentic sample of L-α, β-diamino propionic acid monohydrochloride lends support to its identity with the proposed structure.

Absence of a positive reaction with Tollens reagent ruled out the possibility of an aldehyde type of group in the original toxic compound and its infra-red spectra did not show any characteristic peaks corresponding to either a —CN-function or a lactone ring. The elementary analysis indicated a difference of a C_3-fragment between the parent compound and the diamino propionic acid-moiety and this C_3-fragment has since been isolated in a pure form from