265. *The Resinols of the Latex of* Holarrhaena Antidysenterica.

By J. C. Chowdhury and D. H. Peacock.

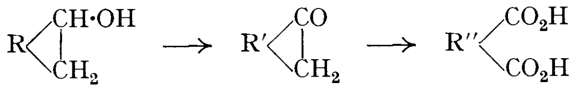
The bark and seeds of *Holarrhaena antidysenterica* (Burmese name lettôk) contain a number of alkaloids, the most abundant being conessine (Ulrici, *Arch. Pharm.*, 1918, **256**, 57). At the suggestion of, and by the kindness of, the Forestry Department of the Government of Burma, we have examined the bark and latex of local origin. For the bark, we have confirmed (this vol., p. 734) the results of other workers, and in addition have isolated an alkaloid not mentioned by them. The latex was found to contain no alkaloids at all. Two crystalline compounds of the resinol type were obtained, but the bulk of the latex remained as a clear, colourless, viscous mass.

The alcohol-soluble portion of the latex, when treated with warm acetone, left a residue which we call provisionally *lettoresinol-A*. After several crystallisations, this substance, $C_{28}H_{50}O_5$, was obtained with m. p. 227—228°. It is neutral, dextrorotatory, and very inert. It was not changed by the action of boiling, alcoholic caustic potash or by acetic anhydride. It did not form a semicarbazone and appeared to contain no methoxyl groups.

The second substance, *lettoresinol-B*, $C_{32}H_{56}O_2$, separated from the warm acetone solution, and after repeated crystallisation was obtained as colourless leaflets, m. p. 136—137°. It was neutral, dextrorotatory, and unaffected by boiling alcoholic potash. With acetic anhydride it gave a dextrorotatory *diacetyl* compound, $C_{32}H_{54}(O{\cdot}CO{\cdot}CH_3)_2$, m. p. 170°. Oxidation with chromic acid (1—2 mols.) gave a mixture of unchanged substance and oxidation product, which crystallised with a constant melting point but, on acetylation and fractional crystallisation from acetone, gave the diacetyl derivative of the original substance and the *monoacetyl* derivative of a *hydroxy-ketone*, $C_{32}H_{53}O(OAc)$, from which the *hydroxy-ketone*, $C_{32}H_{53}(OH)O$, m. p. 216°, was obtained.

Oxidation of lettoresinol-B with chromic acid (3 mols.) gave a mixture of a *dicarbonyl* compound, $C_{32}H_{52}O_2$, and a tricarboxylic *acid*, $C_{32}H_{52}O_6$ or $C_{31}H_{50}O_6$. The former, m. p. 265°, was dextrorotatory, and gave a *disemicarbazone*, m. p. 287°, but it was not oxidised by potassium permanganate in aqueous solution. The tricarboxylic acid, obtained as above or by further oxidation of the dicarbonyl compound by excess of chromic acid in acetic acid, had m. p. 174—175° and was dextrorotatory.

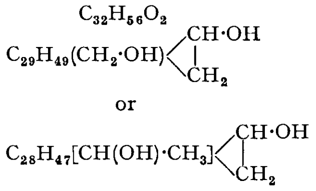
The formation of two of the carboxyl groups in the tricarboxylic acid is probably due to the rupture by oxidation of a ring containing the $CH(OH)\cdot CH_2$ group :



$$R\left\langle\begin{matrix}CH\cdot OH\\ |\\ CH_2\end{matrix}\right. \longrightarrow R'\left\langle\begin{matrix}CO\\ |\\ CH_2\end{matrix}\right. \longrightarrow R''\left\langle\begin{matrix}CO_2H\\ \\ CO_2H\end{matrix}\right.$$

Only one acid was isolated from the products of oxidation, which may be significant. The formation of a single carboxyl group by the oxidation of the other carbonyl group suggests that it was either an aldehyde group or part of a short side chain. Although the analytical figures probably agree better with the aldehyde formula, yet the stability of the dicarbonyl compound towards potassium permanganate makes the side-chain formula at least equally likely. We therefore suggest the following partial structures :

Lettoresinol-B.



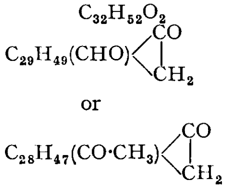
$C_{32}H_{56}O_2$

$$C_{29}H_{49}(CH_2\cdot OH)\left\langle\begin{matrix}CH\cdot OH\\ |\\ CH_2\end{matrix}\right.$$

or

$$C_{28}H_{47}[CH(OH)\cdot CH_3]\left\langle\begin{matrix}CH\cdot OH\\ |\\ CH_2\end{matrix}\right.$$

Dicarbonyl compound.



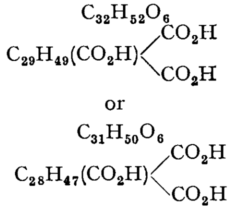
$C_{32}H_{52}O_2$

$$C_{29}H_{49}(CHO)\left\langle\begin{matrix}CO\\ |\\ CH_2\end{matrix}\right.$$

or

$$C_{28}H_{47}(CO\cdot CH_3)\left\langle\begin{matrix}CO\\ |\\ CH_2\end{matrix}\right.$$

Tricarboxylic acid.



$C_{32}H_{52}O_6$

$$C_{29}H_{49}(CO_2H)\left\langle\begin{matrix}CO_2H\\ \\ CO_2H\end{matrix}\right.$$

or

$C_{31}H_{50}O_6$

$$C_{28}H_{47}(CO_2H)\left\langle\begin{matrix}CO_2H\\ \\ CO_2H\end{matrix}\right.$$

EXPERIMENTAL.

Lettoresinol-A.—The latex of *Holarrhaena antidysenterica* (940 g.) was made into a paste with slaked lime and sand, air-dried, and extracted in a Soxhlet apparatus with rectified spirit for 16 hrs. The alcohol was distilled off from the extract, and the sticky residue treated with dilute hydrochloric acid : no basic substances were obtained. The dry product (153 g., 16%) was a sticky solid melting indefinitely between 65° and 100°. On treatment with warm acetone, it left an insoluble portion, *lettoresinol-A* (7 g.), m. p. 170—175°; this was crystallised from benzene and from absolute alcohol until the m. p. was constant, 205—206°. Crystallisation from ethyl acetate then raised it to 227—228° (3·5 g.). Lettoresinol-A crystallises in large, colourless needles, readily soluble in ether, light petroleum, chloroform, and benzene, sparingly soluble in cold but readily in hot ethyl acetate, sparingly soluble in acetone, ethanol and methanol even hot (Found : C, 71·9, 72·0; H, 10·7, 10·7; *M*, 459, 457, 456. $C_{28}H_{50}O_5$ requires C, 72·1; H, 10·7%; *M*, 466); $[\alpha]_D^{33°}$ 68·6° in chloroform (*p*, 1·7488). It did not appear to contain methoxyl groups.

Lettoresinol-B, $C_{32}H_{54}(OH)_2$.—The acetone solution (above), when cooled, deposited crystals which were separated and washed with cold acetone. The crude product, crystallised several times from acetone and finally from ethanol, separated as colourless plates, m. p. 136—137° (11 g.).

Lettoresinol-B is readily soluble in benzene, ether, light petroleum, and chloroform, less readily in cold acetone or ethyl acetate, sparingly soluble in cold, rectified spirit (Found : C, 81·4, 81·2, 81·0, 81·3; H, 12·1, 12·1, 12·1, 12·1; *M*, 462, 456. $C_{32}H_{56}O_2$ requires C, 81·3; H, 11·8%; *M*, 472), $[\alpha]_D^{28°}$ in chloroform (p = 1·904) 61·1°. Its *diacetate*, $C_{32}H_{54}(OAc)_2$, crystallised from rectified spirit and then from acetone, separated in colourless plates, m. p. 170° (Found : C, 77·0, 77·1; H, 11·1, 11·1; *M*, 543, 540; acetyl number, 2·026, 1·965. $C_{36}H_{60}O_4$ requires C, 77·7; H, 10·8%; *M*, 556; acetyl number, 2), $[\alpha]_D^{30°}$ in chloroform (p = 2·192) 71·2°.

Oxidation. (i) Lettoresinol-B (1 g.) was dissolved in glacial acetic acid and oxidised with chromic acid (0·22 g.) as for the dicarbonyl derivative (below). The oxidation product contained only a trace of an acid substance. The main product after several crystallisations from rectified spirit and from acetone melted at 194°; it was acetylated with acetic anhydride and sodium acetate (4 hrs. at 150°), and the product on fractional crystallisation from acetone gave the preceding diacetate, m. p. 170°, and the *acetyl* compound $C_{32}H_{53}O\cdot OAc$, m. p. 208°, colourless plates (Found : *M*, 509, 498; acetyl number, 1·075, 1·017. $C_{34}H_{56}O_3$ requires *M*, 512; acetyl number, 1). This substance was hydrolysed by alcoholic caustic potash and gave the *hydroxy-ketone*, flat plates from rectified spirit, m. p. 216° (Found: C, 81·6; H, 11·5. $C_{32}H_{54}O_2$ requires C, 81·7; H, 11·5%).

(ii) Lettoresinol-B (2 g.) was dissolved in glacial acetic acid (100 c.c.), and chromic acid (1·2 g.) in acetic acid (20 c.c.) added during 2 hrs. to the stirred solution at 70°. After a further 2 hrs., the mixture was poured into water (800 c.c.), and the white, flocculent precipitate collected, well washed, dissolved in ether, and extracted (*a*) with sodium bicarbonate solution, (*b*) with caustic soda. The ethereal solution was washed with water, dried over calcium chloride, and the ether removed. The residue was crystallised from ethyl alcohol and then from acetone, forming colourless plates, m. p. 265° (1·3 g.) (Found: C, 81·9, 82·0; H, 11·1, 11·2; *M*, 469, 462. $C_{32}H_{52}O_2$ requires C, 82·1; H, 11·1%; *M*, 468), $[\alpha]_D^{30°}$ in chloroform (p = 0·652) 90·6°. This *dicarbonyl* compound gave a *disemicarbazone*, $C_{32}H_{52}(N{\cdot}NH{\cdot}CO{\cdot}NH_2)_2$, which crystallised from methyl alcohol, m. p. 287° (Found: N, 14·1. $C_{34}H_{58}O_2N_6$ requires N, 14·4%).

The caustic soda solution (*b*, above) yielded nothing on acidification, but the sodium bicarbonate extract (*a*) gave an acid, m. p. 174—175°. The same acid was also prepared by dissolving the dicarbonyl compound (0·5 g.) in glacial acetic acid (25 c.c.) and oxidising it at 70° with chromic acid (0·65 g., 6 mols.) in acetic acid (15 c.c.). The reaction mixture was poured into water and the precipitated product worked up in the usual way, affording a solid *acid*, which crystallised from methyl alcohol, m. p. 174—175° (Found: C, 72·1, 72·0; H, 9·8, 9·8; equiv., 180·7; *M*, 537, 528, 521. $C_{32}H_{52}O_6$ requires C, 72·2; H, 9·8%; equiv., 177·3; *M*, 532. $C_{31}H_{50}O_6$ requires C, 71·8; H, 9·7%; equiv., 172·6; *M*, 518), $[\alpha]_D^{31°}$ in chloroform (p = 1·2032) 25·3°.

We thank the Indian Forestry Department, Burma, for the supply of material, and the University of Rangoon for a grant and for a research scholarship for one of us (J. C. C.).

UNIVERSITY COLLEGE, RANGOON. [*Received, June 5th,* 1935.]