

## HYDROCARBONS, ESTERS AND FREE ALCOHOLS IN THE BARK OF *Saraca indica* L.

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Chromatographic and spectroscopic methods were employed for analysis of the bark. The wax obtained from benzene extract contains n-alkanes (C<sub>20</sub>—C<sub>35</sub>), esters (C<sub>34</sub>—C<sub>60</sub>) and free primary alcohols (C<sub>22</sub>—C<sub>30</sub>). Distribution pattern of n-alkanes is discussed.

*Saraca indica* L. (*Leguminosae*) is an important Indian medicinal plant. Its bark is much used by Hindu practitioners in uterine affection especially in menorrhagia and is also reported to cure biliousness, dyspepsia, dysentery, colic, piles, ulcers and pimples<sup>1-3</sup>. The bark is found to contain tannin (6%), catechol, essential oil, haematoxylin, a oxosterol, a crystalline glycosidal constituent, a saponin and an organic calcium compound<sup>4</sup>. In the view of the medicinal properties of the bark chemical analysis of the wax obtained from the bark has been undertaken.

### EXPERIMENTAL

*Methods:* The dried powdered bark (2 kg) was extracted with benzene for 36 h at boiling temperature. A total of 6.5 g extract was obtained (0.32%). Column and thin layer chromatography was done on silica gel. Gas chromatography was performed on PYE series 104 Chromatograph Model 124 with flame ionization detectors, two columns packed with 3% SE-30 on Gas Chrom Z at 230°C or at programmed temperature 150—250°C (2°C min<sup>-1</sup>) or with 1% PPE on Chromosorb G at 250—310°C. For identification of homologues the graphical method was employed<sup>5</sup>. The comparison of the retention values with those of standards was used for identification of some gas chromatographic peaks. For a quantitative evaluation areas under the peaks have been calculated. Infra red spectra were recorded in a Perkin Elmer spectrometer in KBr discs.

### RESULTS

The waxy extract was subjected to column chromatography over silica gel (40-fold excess) which yielded two major products:

*Product A.* Elution with light petroleum (60–80°C) and crystallisation from acetone–ethanol yielded a waxy solid (550 mg), m.p. 61–62°C which exhibits two spots on TLC. The mixture was rechromatographed (silica gel) and two different separated groups were analyzed by GLC. The first one, obtained on elution with hexane, exhibited homologous series of n-alkanes (C<sub>20</sub>–C<sub>35</sub>) with a maximum occurrence of C<sub>27</sub>, C<sub>28</sub>, C<sub>29</sub>, C<sub>30</sub> and C<sub>31</sub> (Table I). This pattern of n-alkanes is rather unusual<sup>6,7</sup>, but similar patterns were found in barks of beech<sup>8</sup>, cork<sup>9,10</sup> and jack pine<sup>11</sup>. The unimodal type of n-alkanes distribution without the predominance of odd members is reported for “internal” lipid alkanes<sup>12,13</sup>. Taking into consideration the fact that the lipids of barks rank also among “internal” lipids one can believe this pattern of n-alkanes may be common in the barks.

TABLE I

Composition of n-Alkanes, Ester Components and Free Alcohols from GLC Analysis

Number of C atoms	n-Alkanes	Acids <sup>a</sup> from esters	Alcohols from esters	Free alcohols
14, 15	—	traces	—	—
16	—	10.6	—	—
17	—	traces	—	—
18	—	2.2	—	—
18 : 1	—	5.0	—	—
19	—	traces	—	—
20	traces	0.6	0.1	—
21	traces	traces	traces	—
22	traces	1.6	0.1	traces
23	traces	traces	traces	traces
24	2.5	8.8	5.2	3.9
25	6.8	0.7	0.1	1.0
26	9.3	20.3	19.6	28.9
27	14.2	0.8	1.0	4.3
28	14.8	7.4	14.9	60.7
29	15.5	traces	traces	1.2
30	11.3	traces	traces	traces
31	10.6	—	—	—
32	7.2	—	—	—
33	5.3	—	—	—
34	1.3	—	—	—
35	0.3	—	—	—

<sup>a</sup> As methyl esters.

The second group obtained on elution with chloroform exhibited characteristic IR bands at 1176 and 1727  $\text{cm}^{-1}$ . It has been found by GLC analysis to be a mixture of esters  $\text{C}_{34}$ — $\text{C}_{60}$ . After transesterification with methanol and hydrochloric acid the mixture was gaschromatographed. The methyl ester series (saturated  $\text{C}_{14}$ — $\text{C}_{30}$  +  $\text{C}_{18:1}$ ) was composed mainly of  $\text{C}_{26}$ ,  $\text{C}_{16}$ ,  $\text{C}_{24}$ ,  $\text{C}_{28}$  and  $\text{C}_{18:1}$  (Table I). Esters of even acids were predominated as usual. The alcohol series ( $\text{C}_{20}$ — $\text{C}_{30}$ ) contained mainly hexacosanol and octacosanol (Table I). Even members were prevalent as usual<sup>6,7</sup>. The actual composition of fatty acids and alcohols in natural esters was not determined but, according to results obtained earlier<sup>14,15</sup>, we suppose that single chromatographic peaks do not represent individual substances but mixtures of esters.

*Product B.* Elution with light petroleum-benzene (6 : 4) gave a fraction of alcohols which exhibited bands at 1050, 3400  $\text{cm}^{-1}$  (OH) and 720, 730  $\text{cm}^{-1}$   $(\text{CH}_2)_n$  in IR spectrum. This fraction on GLC analysis represented a series of primary aliphatic alcohols ( $\text{C}_{22}$ — $\text{C}_{30}$ ) with maximum occurrence of  $\text{C}_{28}$  (60.7%) and  $\text{C}_{26}$  (28.9%) (Table I). Even alcohols prevailed as usual<sup>16-18</sup>. From this mixture n-octacosanol, m.p. 83–84°C (lit.<sup>19</sup> m.p. 83.4°C) (275 mg) could be crystallised from methanol (TLC homogenous). It was characterized by preparation of its acetate<sup>20</sup>, m.p. 75–76°C.

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