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NON-NITROGENOUS CONSTITUENTS OF SESBANIA SESBAN MERR.

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Abstract.--A comparative study of alkanes, alkanols, and sterols present in the pods, flowers and leaves of Sesbania sesban Merr. has been made. The C_{27}, C_{29}, and C_{31} n-alkanes and C_{26} and C_{28} n-alcohols predominate in these parts. Cholesterol has been found to occur in pods and leaves but not flowers.

In continuation of our program of chemical investigation of medicinal plants growing in the Chandigarh (India) area, the constituents of Sesbania sesban Merr. (syn. S. aegyptiaca Poir.)(Fam: Leguminosae, Sub-family: Papilionoideae) were explored. The plant is a soft-wooded tree of rapid growth and occurs as three varieties in which the only known difference is the color of the flowers. For the present study the variety with yellow flowers was chosen.

The plant has been reported (Kirtikar and Basu, 1933, p. 732; Watt and Breyer-Brandijk, 1962, p. 646) to be used for a variety of ailments, and more recently, abortifacient activity on rats of extracts from flowers has been noted (Pakrashi et al., 1975). Jain (1964) has found six flavonols in S. sesban (violet flowers) and identified two of them as cyanidin and delphadin. Farooq et al. (1954, 1959) indicated the presence of fatty acids and oleanolic acid in the plant; and we have recently presented a preliminary study on alkaloidal constituents of the plant (Kapoor et al., 1977). In this paper we wish to report the results of a comparative study on the non-nitrogenous, hexane-soluble constituents of pods, flowers and leaves of S. sesban as a beginning in the taxonomical studies of this genus which may prove useful in the proper recognition of different varieties. Studies on n-alkane chemotaxonomy have had some limited value for these purposes (Douglas and Eglinton, 1966; Piatak and Eichmeier, 1972; Sorensen et al., 1978).

EXPERIMENTAL

Plant Material.--The pods, flowers and leaves of Sesbania sesban Merr. (yellow flowers) were collected from several plants at random in the Chandigarh (India) area in the months of September, December, and January.

The plant material was authenticated by Dr. T.S. Sareen, Department of Botany, Panjab University. The plant materials were reduced to moderately coarse powder and extracted in a Soxhlet apparatus with pet. ether (b.p. 60-80°).

Pods.--The material (14 g) from pods (2.4 kg) was saponified with 0.5 N ethanolic KOH to yield the unsaponifiable matter (7.1 g). It was chromatographed on alumina (350 g, S.M., India). The first fractions eluted with petroleum ether:benzene (2:1, 6 x 150 ml) gave a waxy substance (0.90 g) which was crystallized from acetone to m.p. 65-67°; ν_{max} 730 and 719 cm^{-1} $[-(CH_2)_x]$. It was analyzed by GLC and the components authenticated as previously described (Sorensen et al., 1978). The results are given in Table I.

The subsequent fractions eluted with the same solvent (16 x 150 ml) gave a whitish residue (0.3 g) which could be crystallized from acetone, m.p. 79-80°. ν_{max} 3350 cm^{-1} (O-H), 732 and 722 cm^{-1} $[-(CH_2)_x-]$; NMR, δ 0.87 (br, t, J = 5 Hz, $-CH_2-CH_3$), 1.26 [s, $-(CH_2)_x-$] and 3.65 (t, J = 6 Hz, $-CH_2-CH_2-OH$). GLC analysis of the material at 240° revealed it to be a mixture of n-alcohols (Table I) which were identified by comparison to known materials (Piatak and Reimann, 1970). The components are given in Table I.

Further elution of the column with benzene (11 x 150 ml) gave a yellowish residue (1.3 g) which crystallized from methanol, m.p. 129-130°. It gave a positive Liebermann-Burchard test for sterols. GLC analysis at 240° showed it to be composed of different sterols (see Table I) which were characterized with known sterols (Applied Science Labs) by comparison of retention times and by the increase in signals when authentic material was added.

Flowers.--The powdered flowers (200 g) were processed in the same way to get unsaponifiable matter (2.4 g). Resolution over alumina yielded alkanes, alcohols and sterols. These were analyzed by GLC as above (Table I).

Leaves.--The powdered leaves (700 g) were also processed as above to yield unsaponifiable matter (7.5 g). Chromatography on alumina gave alkanes, alcohols and sterols, and GLC analyses of the materials are shown in Table I.

RESULTS AND DISCUSSION

Table I presents the initial comparative study of the alkanes, alcohols, and sterols of the pods, flowers and leaves of S. sesban Merr. (yellow flowers). As more results are accumulated with the other varieties and with other species, the data reported will, hopefully, be useful for proper recognition of the different types.

Several points can be made about the present results. The predominating n-alkanes in the pods are C_{31} (55.7%) and C_{29} (27.3%), while mainly the C_{29} (54.1%) and C_{27} (21.4%) n-alkanes occur in the flowers. It is interesting to note these alkanes are similar in amount but differ by two carbons (one acetate unit). Data from the leaves, on the other hand, is closer to that of the flowers except the C_{31} isomer is present in a higher amount.

TABLE L. ALKANES, ALCOHOL AND STEROL COMPOSITION OF PODS, FLOWERS AND LEAVES OF SESBANIA SESBAN MERR.*

n-ALKANES

	C_{24}	C_{25}	C_{26}	C_{27}	C_{28}	C_{29}	C_{30}	C_{31}	C_{32}	C_{33}
PODS	--	--	tr	2.2	1.3	27.3	3.6	55.7	1.5	8.3
FLOWERS	tr	5.6	1.3	21.4	5.7	54.1	2.9	9.3	--	--
LEAVES	tr	3.0	1.6	14.3	5.9	45.0	1.3	24.5	2.8	tr

n-ALCOHOLS

	C_{24}	C_{25}	C_{26}	C_{27}	C_{28}	C_{29}	C_{30}
PODS	--	2.9	60.0	4.2	28.9	3.1	--
FLOWERS	--	1.0	57.9	3.5	37.0	2.1	--
LEAVES Fr. I	1.7	1.6	31.6	11.7	50.9	2.5	--
Fr. II	--	--	--	3.0	37.5	tr	59.6

STEROLS

	CHOLESTEROL	CAMPESTEROL	β-SITOSTEROL	UNIDENTIFIED
PODS	1.2	74.7	24.4	--
FLOWERS	--	56.5	42.5	--
LEAVES	3.5	62.2	24.7	9.6

*Amounts expressed as % of total sample; tr = trace.

The n-alcohol results indicate a carbon content higher than C_{30} does not occur in any noticeable amount. If common biosynthetic origins of both alkanes and alcohols from fatty acids are considered, the significant amount of the C_{31} n-alkane does not parallel what is found with the alcohols and rather divergent pathways must operate. The comparison of the n-alcohol amounts indicates similarity between the pods and flowers; the leaves, however, contain higher amounts of the longer chain homologs.

The sterol results indicate the campesterol content of the pods is more than that of the flowers. Also, cholesterol is not apparent in the flowers while appearing in the more mature parts-pods and leaves.

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