Cyclopropenoid Fatty Acids of Six Seed Oils from Malvaceae

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The seeds of *Alyogine hakeifolia, Alyogine huegelii, Gossypium australe, Hibiscus coatesii, Lawrencia viridigrisea* and *Radyera farragei* (Malvaceae) contained 13.5–18.6% oil. Linoleic acid predominated (60.0–68.2%) in the component fatty acids of all the oils, followed by palmitic (9.9–18.1%) and oleic acids (7.8–15.8%). Cyclopropene fatty acids, malvalic and sterculic, were present in small concentrations (1.0–4.4%, 0.1–1.5% respectively). Dihydrosterculic acid was present in small quantities (trace–2.1%).

KEY WORDS: Cyclopropenoid fatty acids, Malvaceae, six seed oils.

Cyclopropene fatty acids (CFA) have been reported as components in the seed oils from many species of the Sterculiaceae, Malvaceae, Tilliaceae and Bombacaceae families (1), which are responsible for some physiological disorders and may have some cocarcinogenic properties (2,3). In a study of the composition of seed oils from the Malvaceae family, the oil content and their fatty acid compositions of six species, *Alyogine hakeifolia, Alyogine huegelii, Gossypium australe, Hibiscus coatesii, Lawrencia viridigrisea* and *Radyera farragei,* are communicated here for the first time.

EXPERIMENTAL METHODS

Seed samples were purchased from Nindethana Seed Service, R.M.B. 939, Woogenilup, Western Australia-6324, Australia. The contents of oil in the seeds were determined according to official American Oil Chemists' (AOCS) method (4). The oils were qualitatively examined for the presence of hydroxy, epoxy and CFA by the sulfuric acid turbidity (5), picric acid (6) and Halphen (4) tests, as well as by ultraviolet (UV), infrared (IR) and proton nuclear magnetic resonance (NMR) spectroscopy. Other experimental procedures were described in detail in earlier communications (7,8). Fatty acid methyl esters from each of the six oils responded positively to the Halphen test and hence were treated with anhydrous methanol saturated with silver nitrate for 20 hr at ambient temperature to convert cyclopropene fatty acids into stable ether and keto derivatives for analysis by gas-liquid chromatography (9). Gas-liquid chromatography (GLC) analysis was carried out with a Hewlett-Packard 5840A (Palo Alto, CA) unit fitted with a flame ionization detector and a data processor. Helium was used as carrier gas. The column, injection port, and detector were maintained at 200°, 210° and 220°C, respectively. A polar (BP-20) capillary column (25.0 m × 0.25 mm, SGE Scientific, Melbourne, Australia) was used for the analysis. The peaks were identified by comparison with standard fatty acid methyl esters.

RESULTS AND DISCUSSION

The oil and fatty acid compositions are presented in Table 1. The oil contents were not high, compared with those of conventional oilseeds. The oils from all samples responded positively to the Halphen test, indicating the presence of cyclopropene fatty acids. This was further confirmed by an IR band at 1008 cm^{-1} and an NMR signal at δ 0.8 (7). The predominant fatty acid was linoleic (60.0–68.2%) in all the oils, followed by palmitic acid (9.8–18.1%) and oleic acids (7.8–15.8%). Total cyclopropene fatty acid constituents varied from 1.1 to 4.8%. All the seed oils contained more malvalic acid than sterculic acid. Dihydrosterculic acid was found at higher concentrations in *Alyogine* species (1.8–2.1%) than in other species (trace to 0.5%). The fatty acid profiles of the seed oils of the Malvaceae family studied in the present investigation are generally consistent with the fatty acid pattern found in this family (1,7,8,10,11).

TABLE 1

Fatty Acid Composition (area %) of Seed Oils of Malvaceae Family

	A. hakeifolia	*A. huegelii*	*G. australe*	*H. coatesii*	*L. viridigrisea*	*R. farragei*
Oil (%[a])	13.5	18.6	15.4	14.8	15.7	18.0
14:0	0.1	0.0	0.7	0.2	0.3	0.1
16:0	11.4	12.9	18.1	17.1	9.9	10.5
16:1	0.1	0.3	0.7	0.7	trace[b]	0.2
17:1	0.5	0.3	0.0	0.2	0.3	0.0
18:0	3.0	2.4	2.8	3.5	6.7	2.8
18:1	12.6	15.5	14.2	9.9	7.8	15.8
18:2	62.1	60.0	61.6	62.1	67.8	68.2
18:3	2.4	1.6	0.2	0.5	0.9	1.0
20:0	0.3	0.6	0.3	0.4	0.8	0.3
Malvalic[c]	4.4	2.5	1.2	2.3	3.3	1.0
Sterculic[c]	0.4	0.7	0.1	1.5	1.1	0.1
Dihydrosterculic	2.1	1.8	trace[b]	0.3	0.2	0.5
Unidentified	0.5	1.3	0.0	1.3	0.8	0.0

[a]Dry basis. [b]Trace = < 0.05. [c]Ether plus keto derivatives.

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[Received September 11, 1990; accepted March 29, 1991]