Cyclopropene Fatty Acids of Six Seed Oils from Malvaceae

K. Sundar Rao[a], Gwyn P. Jones[a], Donald E. Rivett[b] and Daryl J. Tucker[a]
[a]School of Sciences, Deakin University, Geelong, Victoria 3217, Australia, and [b]CSIRO Division of Protein Chemistry, 343 Royal Parade, Parkville, Victoria 3052, Australia.

Seeds of *Hibiscus leptocladus, H. sturtii, Sida echinocarpa, Abutilon amplum, Gossypium robinsonii* and *Lagunaria patersonii* contained 11.2—26.8% oil and 11.6—18.2% protein. Spectral, chromatographic and chemical analyses of the seed oils revealed the presence of malvalic (0.5—3.2%), sterculic (0.1—1.7%) and dihydrosterculic (trace—0.7%) acids.

Seed oils of many species of the Malvaceae, Bombacaceae and Sterculiaceae families are reported (1) to contain cyclopropene fatty acids (CFA). In many cases CFA are accompanied in small amounts by their saturated analogues. In a study of the composition of seed oils from the Malvaceae family, the fatty acid compositions of five species, *Hibiscus leptocladus, Hibiscus sturtii, Sida echinocarpa, Abutilon amplum* and *Gossypium robinsonii,* are presented here for the first time. New data on *Lagunaria patersonii* are also presented.

EXPERIMENTAL METHODS

L. patersonii seeds were collected locally and identified by the National Herbarium, Melbourne. The remaining five species seeds were purchased from Nindethana Seed Service, Woogenilup, Western Australia.

The contents of oil and protein in the seeds were determined according to official AOCS methods (2). The oils were qualitatively examined for the presence of hydroxy, epoxy and CFA by the sulfuric acid turbidity (3), picric acid (4) and Halphen (2) tests, as well as by ultraviolet (UV), infrared (IR) and proton nuclear magnetic resonance (NMR) spectroscopy. The methyl esters obtained by treatment of the oils with methanolic sodium methoxide at room temperature were treated with methanolic silver nitrate to convert CFA esters into stable ether and keto derivatives (5) for GLC analysis. Other experimental procedures were described in detail in earlier communications (6,7). GLC analysis was carried out using a Varian 3700 unit fitted with a flame ionization detector (FID) and a data processor. Helium was used as carrier gas. The column, injection port and detector were maintained at 200°C, 240°C and 280°C, respectively. A capillary column (12.0 m × 0.25 mm) of BP-20 (SGE Scientific; Melbourne) was used for the analysis.

RESULTS AND DISCUSSION

The oil and protein contents of the seeds are given in Table 1. The oil and protein contents were not high, except for *G. robinsonii* and *L. patersonii* in which the oil contents were sufficiently high for economic recovery of oil by solvent extraction. The oils from all samples responded positively to the Halphen test, indicating the presence of CFA. The IR and NMR spectras strongly supported the presence of CFA. Particularly significant was the band at 1008 cm^{-1} in the IR and a signal at 9.2T in the NMR. No other unusual fatty acids were indicated.

The fatty acid compositions are also presented in Table 1. Linoleic acid was predominant (56.0—67.3%) except in *L. patersonii* in which oleic acid (38.9%) was the major component. Significant amounts of palmitic acid were found in all the seed oils. The total concentration of the CFA varied from 0.6% to 4.9%. All the seed oils contained more malvalic acid than sterculic acid. From trace quantities up to 0.7% of dihydrosterculic was found in all six species.

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

TABLE 1

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

	H. leptocladus	*H. sturtii*	*S. echnocarpa*	*A. amplum*	*G. robinsonii*	*L. patersonii*
Oil (%[a])	15.3	15.8	11.2	15.6	21.1	26.8
Protein (%[a])	15.8	18.2	12.6	14.6	14.2	11.6
14:0	0.2	0.3	0.0	0.3	0.4	0.1
16:0	13.3	21.8	18.3	19.1	23.4	12.5
16:1	2.1	1.5	0.0	1.5	0.6	8.2
18:0	1.9	2.0	2.5	3.0	2.9	1.6
18:1	11.8	13.2	8.1	14.0	15.1	38.9
18:2	67.3	59.0	67.3	57.6	56.0	32.0
18:3	0.3	0.0	0.4	0.5	0.3	0.3
20:0	0.2	0.2	0.2	0.3	0.2	0.2
20:1	0.0	0.0	0.0	0.2	0.0	0.2
Malvalic[b]	1.4	1.2	2.5	2.1	0.5	3.2
Sterculic[b]	0.4	0.3	0.2	1.0	0.1	1.7
Dihydrosterculic	0.6	Trace	0.1	0.2	0.1	0.7
Epoxy	0.0	0.0	0.0	Trace	Trace	Trace
Unidentified	0.5	0.5	0.4	0.2	0.4	0.4

[a]Dry basis.
[b]Ether plus keto derivatives.

in this family (1,6,7,8). However, the new data on *Lagunaria patersonii* are somewhat different from the only known published study (9), perhaps due to geographical variation.

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