Tricuspidaria lanceolata Seed Oil: A Rich Source of Palmitoleic Acid

FOUR OUT OF THE FIVE families of the order Malvales have been shown to contain cyclopropene fatty acids in their seed oils (1). During our study on the analysis of cyclopropene fatty acids (2) we examined a member of the fifth family, the Elaecarpaceae, which has not been previously studied. Oil (10% based on the weight of the undried seeds) from crushed *Tricuspidaria lanceolata* seeds (purchased from Thomson and Morgan Ltd., Ipswich, England) was extracted with petroleum ether (30–60 bp). Cyclopropene fatty acids could not be detected in the oil either by the Halphen test (3) or by gas-liquid chromatography (GLC) (2).

Fatty acid methyl esters were prepared by transmethylation (1% sodium methoxide in absolute methanol) at room temperature and analyzed by GLC (Table I). The content of the hexadecenoic acid was unusually high for a seed fat. The 16:1 was isolated by successive preparative GLC on a silicone column and silver-ion thin-layer chromatography (TLC). Oxidation of the methyl esters with potassium permanganate in acetic acid–acetone medium yielded only azelaic semi-ester and pelargonic acid by GLC, indicating that the double bond is at the 9,10-position. The absence of *trans* bond was inferred from the behavior during silver-ion TLC.

The unusually high content of the palmitoleic acid prompted the study of the distribution of this acid in the triglycerides. Purified triglycerides were prepared by TLC on Adsorbosil-1 (Applied Science Labs, State College, Pa.) and hydrolyzed by pancreatic lipase (4). The fatty acid composition of the original triglycerides and monoglycerides produced by lipase hydrolysis is given in Table I. Within the limits of experimental error, palmitoleic and oleic acids appear to be equally distributed between the 1,3- and 2-positions, and palmitic and stearic acids are exclusively at the 1,3-positions. The distribution of palmitoleic acid is in agreement with the findings of Gunstone et al. (5) in the distribution of the *cis* 9-hexadecenoic acid in *Macadamia ternifolia* seed oil or the *cis* 11-hexadecenoic acid in *Gevuina avellana* seed oil.

GLC analysis of the triglycerides (6) shows the presence of triglycerides with carbon numbers 48, 50, 51, 52, 54, and 56 (Table II). These data are not in agreement with either the random distribution or the 1,3-random, 2-random distribution patterns.

TABLE I

Fatty Acid Positional Distribution in *Tricuspidaria lanceolata* Seed Oil

Fatty acids	Original triglycerides	2-Monoglycerides from lipase hydrolysis	In 2-position[a]
	mole %		
16:0	13.4	0.6	1.5
16:1	15.1	14.8	30.4
17:1	0.6	1.9	100+
18:0	3.4	Tr	Tr
18:1	39.2	37.1	31.6
18:2	27.2	43.3	53.1
20:1	1.1	2.3	69.1

Analyses were carried out on a Research Specialties Model 600 gas chromatograph. Column, 6 ft by ¼-in., packed with 10% EGSX on Chromosorb W. Operated isothermally at 165C, helium flow rate, 40 ml/min. Identification of the fatty acids was made by comparison of the relative retention times with authentic samples, the behavior on silver-ion thin-layer chromatography, and from the plot of logarithm of retention time versus carbon number.

Tr = less than 0.1%.

[a] Per cent in 2-monoglyceride × 100 ÷ 3 × per cent in triglycerides.

TABLE II

Triglyceride Composition of *Tricuspidaria lanceolata* Seed Oil

Carbon No.	More per cent
48	5.4
50	27.1
52	43.9
53	Tr
54	23.4
56	0.2

GLC analyses were made on an F&M Model 400 gas chromatograph under conditions described by Litchfield et al. (6).

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