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SHORT COMMUNICATION

THE LEAF LIPIDS OF SOME MEMBERS OF THE CARYOPHYLLACEAE

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Abstract-Leaf **lipids of 10 members of the Caryophyllaceae contain significant proportions of γ-linolenic and octadecatetraenoic acids. Octadecatetraenoic acid is concentrated mainly in the monogalactosyl diglyceride fraction and y-linolenic acid in the more polar fraction of *Stellaria media*.**

INTRODUCTION

ALTHOUGH it has been established that there is a close similarity in the lipid composition of all deciduous leaf tissues, Jamieson and Reid' found that the leaf lipids of five members of the Boraginaceae family contained relatively large proportions of y-linolenic (18 :3ω6) and octadecatetraenoic (18 :4ω3) acids. Since then these unusual acids have been found in three other species of Boraginaceae.[2] During a survey of the fatty acid composition of various green plants it was found that these two unusual acids were also present in the leaf lipids of members of the Caryophyllaceae.

RESULTS AND DISCUSSION

The fatty acid composition of the total lipids from leaves of 10 species of Caryophyllaceae is shown in Table 1. There is a close similarity in fatty acid composition among the ten species, the major components being palmitic, linoleic and linolenic acids. The sum of these acids accounts for 76–96% of the total acids. All the species contained γ-linolenic and octadecatetraenoic acids but, in general, the amounts of these acids were less than those found in the Boraginaceae (Table 2). The caryophyllaceous species all contained small amounts of 16 :2ω6 and 16 :3ω3; neither of these C_{16} polyolefinic acids were detected in any of the Boraginaceae studied.

The fatty acid composition of three classes of ***Stellaria media*** leaf lipids are shown in Table 3. The ω3 acids are concentrated in the galactosyl diglycerides and the ω6 acids are concentrated in the more polar lipids. The degree of unsaturation of the fatty acids falls in the series monogalactosyl diglycerides, digalactosyl diglycerides, more polar lipids, the average number of double bonds per mole fatty acid in each lipid class being 3·1, 2·7, 1·7 respectively.

The distribution of the fatty acids among the lipid classes of ***S. media*** is similar to that found for ***Myosotis scorpiodes*** (Boraginaceae). In both of these plants the ω3 acids are concentrated in the galactosyl diglycerides and the C_{18}ω3 acid of higher unsaturation, viz 18 :4ω3, is concentrated in the monogalactosyl diglycerides.

[1] G. R. JAMIESON and E. H. REID, *Phytochem.* **8, 1489 (1969)**
[2] G. R. JAMIESON, Ph.D. Thesis, Univ. of London (1970).

TABLE 1. FATTY ACID COMPOSITION OF THE TOTAL LIPIDS OF LEAVES OF CARYOPHYLLACEAE

Species		14:0	15:0	16:0	16:1*	16:2 ω6	16:3 ω3	18:0	18:1†	18:2 ω9	18:3 ω6	18:3 ω6	18:4 ω3	20:0 ω3	22:0 20:1		24:0	
Stellaria graminea	Lesser Stitchwort	0·7	0·4	13.1	4.4	0·3	0·5	0·6	2.1	19.4	0·6	54.4	3·4	0·1	tr	tr		
Stellaria holstea	Greater Stitchwort	0·5	0·3	13.7	2·0	0·3	0·2	1.7	1.6	16-2	0·1	62.6	0·8	tr	tr	tr		
Stellaria alsine	Bog Stitchwort	0·7	0·4	13.7	2.6	0·3	0·1	0·7	2·7	25·0	0·7	49.9	3·1	tr	0·1	tr		
Stellaria media	Chickweed	0·8	0·2	12.5	1·7	0·1	0·1	0·7	1·6	15.5	2·3	47·8	16.6	tr	0·1	tr		
Silene dioica	Red Campion	0·8	0·5	11.6	2.7	0·3	0·3	1.2	2.3	16.3	0·8	62.0	0·8	0·2	0·2	tr		
Silene alba	White Campion	0·5	0·1	11.6	1·2	0·1	0·2	0·6	1·1	16.7	0·3	67.4	tr	0·1	0·1		tr	
Silene vulgari	Bladder Campion	1.1	tr	17.3	1·2	0·1	0·1	0·7	2.2	19.9	0·2	54.8	1·5	0·4	0.4		0·1	
Lychnis coronaria	Rose Campion	0·9	0·3	16.8	2.2	0·5	0·4	1·0	2.2	11·4	0·4	63.3	0·5	0·1	tr	tr		
Lychnis flos-cuculi	Ragged Robin	1.1	0·4	14·8	2·1	0·2	0·2	1·0	2.8	14.4		1·2	57·0	4·8	tr	tr	tr	
Gerastium glomeratum	Mouse-Eared Chickweed	1·1	0·2	17.4	3·7	tr	tr	1·1	2·6	21·6	1·8	38.8	11.6	tr	0·1	tr		

* Both ω7, ω9 and ω13t isomers present.
† Other isomers may be present.
tr. trace.

TABLE 2. COMPARISON OF THE AMOUNTS OF 18:3ω6 AND 18:4ω3 IN CARYOPHYLLACEAE AND BORAGINACEAE

	Percentage by weight*	
Acid	Caryophyllaceae	Boraginaceae
18:3ω6	0·1–2·3 mean 0·8	2·0–14·0 mean 7·3
18:4ω3	tr-16.6 mean 4·3	7·9–20·2 mean 14·0

* Of oven dry leaf.

TABLE 3. FATTY ACID COMPOSITION OF DIFFERENT LIPID CLASSES OF *Stellaria media*

Acid	MGDG	DGDG	P
16:0	3·9	9·0	24.2
16: 1ω7 + 9	0·1	0·1	0·1
16: 1ω13t	—	—	1.8
16:2ω6	0·1	tr	0·2
16:3ω3	0·6	0·4	0·3
18:0	0·2	0·6	0·8
18:1ω9	0·4	0·8	3·2
18:2ω6	2·7	2·0	41.9
18:3ω6	0·7	0·4	3·8
18:3ω3	62.3	76.4	20·3
18:4ω3	29·0	10.3	3.4
Total ω3 acids	91.9	87·1	45·9
Total ω6 acids	3.5	2.4	24·0

MGDG : monogalactosyl diglycerides ; DGDG : digalactosyl diglycerides; P: more polar lipids; tr: trace.

EXPERIMENTAL

Leaves were collected from various areas in the surrounding district of Paisley, and the leaf lipids were extracted and concentrated by the methods described previously.' Lipids were separated into classes using preparative TLC with the solvent systems described by Jamieson ;[2] fractions from the preparative TLC separations were monitored by analytical TLC on silica gel with acetone as the eluting solvent.

GLC analyses of the total lipid methyl esters and the methyl esters from each of the lipid classes were carried out on a PE800 chromatograph employing both EGSS-X open tubular and SCOT columns. The methyl esters were tentatively identified from the chromatograms by methods previously described.[3]

[3] G. R. JAMIESON, in *Topics in Lipids Chemistry* (edited by F. D. GUNSTONE), Vol. 1, Logos Press, London (1970).