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SEED FATS OF FURTHER SPECIES OF *ASTELIA*

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Abstract—The seed fats of ten species and one variety of *Astelia* not previously examined contain 63–82% linoleic, 6–26% oleic and 5–11% palmitic acids, but no trace of γ-linolenic acid. *A. nadeaudii* of section *Desmoneuron* contains 58% linoleic, 8% oleic, 6% palmitic and 25% γ-linolenic acids, and in fatty acid content resembles other species of the same section as well as those of section *Isoneuron*. A rearrangement of *Astelia* species within the genus would agree better with the fatty acid content of their seeds.

INTRODUCTION

The genus *Astelia* is mainly a southern genus ranging from Réunion and Mauritius through Australia, New Guinea, New Caledonia, New Zealand, Rapa, Tahiti and the Marquesas Islands to South America and the Falkland Islands, the only known region of its occurrence north of the equator being the Hawaiian Islands [1–3]. The closely related genus *Collospermum*, separated from *Astelia* by Skottsberg [1], is found in New Zealand, Fiji and Samoa. Skottsberg [1] in a monograph on the two genera divided *Astelia* into three subgenera and six sections (Fig. 1), and considered *Collospermum* to be nearest to subgenus *Tricella*. In a previous paper [4] the seed fats of the New Zealand species of *Collospermum* and 11 New Zealand species of *Astelia* were described together with those of *A. alpina*, Australia and *A. neocaledonica*, New Caledonia. It was found that the two species of *Collospermum*, *A. banksii* and *A. neocaledonica* of section *Isoneuron* and *A. solandri* and *A. trinervia* of section *Desmoneuron* contained γ-linolenic (6,9,12-octadecatrienoic) acid in amounts of 12–30%, whereas the other species investigated in section *Astelia* and subgenus *Tricella* contained none. It was apparent that Skottsberg's botanical grouping of the species of *Astelia* [1] was not altogether in accordance with the presence or absence of this acid. Therefore it became of particular interest to find out if γ-linolenic acid occurred in the uninvestigated sections *Palaeastelia*, *Periastelia* and *Micrastelia* as well as in the remaining species of sections already examined.

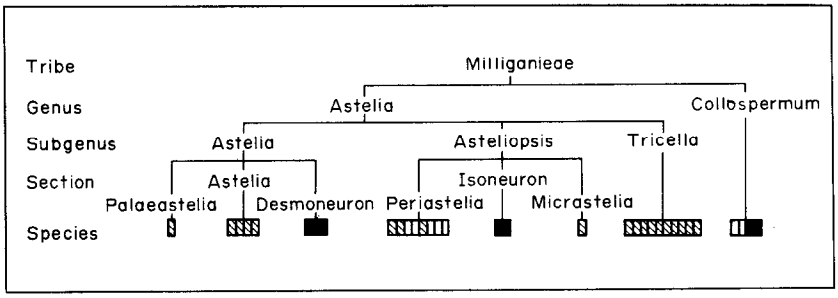

Fig. 1. Species of asteliads, as classified by Skottsberg, showing presence of γ-linolenic acid in seed fats. γ-Linolenic acid present, ■; absent, ▨; not tested, □.

Seeds have now been obtained of all other members of subgenera *Astelia* and *Tricella*, of section *Micrastelia* and of three members of *Periastelia*, as well as the other variety of *A. nivicola* and a further sample each of *A. nervosa* and *A. neocaledonica* from localities different from those reported before [4]. The fatty oils of these seeds and their component fatty acids are described in this paper.

RESULTS AND DISCUSSION

As previously [4], the species of *Astelia* have been divided into two groups based on the presence or absence of γ-linolenic acid. In Table 1 the amounts of fat, iodine values and percentages of unsaponifiable matter are shown. These values are similar in range to those found before [4], the iodine values of Group 2 being markedly higher than those of Group 1.

The amounts of the component fatty acids as percentages of the total fatty acids are shown in Table 2; eicosadienoic, docosenoic and docosanoic acids which occurred only as traces have not been included. The two samples of *A. forbesii* are alike in fatty acid composition as are those of *A. pumila*, but those of *A. nivicola* var. *nivicola* differ somewhat, *A. nivicola* var. *nivicola* 2 being more like *A. nivicola* var. *moriceae* [4]. *A. nervosa* which

Table 1. Characteristics of seed fats

Group Subgenus Section Species	Fat (% on dry wt)	Iodine value (Wijs, 1 hr)	Unsaponifiable matter (% wt of fat)
Group 1			
Tricella			
A. chathamica (Skottsb.) L. B. Moore, Chatham Islands, New Zealand	8·2		4·0
A. nervosa Hook. f., Kauaeranga, New Zealand	35·8	136	1·3
A. australiana (J. H. Willis) L. B. Moore, Pioneer Creek, Victoria, Australia	35·2	136	1·6
A. nivicola Cheesem. var. *nivicola*			
(1) Cobb Valley, New Zealand	36·7		2·6
(2) Key Summit, New Zealand	24·4		1·2
A. psychrocharis F. Muell., Mt Kosciusko, New South Wales, Australia	37·8	130	1·1
Asteliopsis			
Micrastelia			
A. pumila (Forst.) Gaud.			
(1) El Mirador, Cordillera Pelada, Chile	20·6	146	2·7
(2) Moat Bay, Tierra del Fuego, Argentina	12·8	150	3·7
Periastelia			
A. menziesiana J. Smith, Kilauea, Hawaii, Hawaii	16·9	133	2·0
A. forbesii Skottsb.			
(1) Puu Kukukui Summit, West Maui, Hawaii	27·0	141	1·3
(2) Lake Waianapanapa, East Maui, Hawaii	24·3	137	2·0
A. argyrocoma Skottsb., Alakai Plateau, Kauai, Hawaii	47·0	139	1·9
Astelia			
Astelia			
A. papuana Skottsb., Mt Wilhelm, New Guinea	28·7	138	2·3
A. subulata (Hook. f.) Cheesem., Paparoa Range, New Zealand	21·3	143	2·6
Palaeastelia			
A. hemichrysa (Lam.) Kunth, Réunion	22·2	143	2·1
Group 2			
Astelia			
Desmoneuron			
A. nadeaudii Drake, Mt Aorai, Tahiti	21·5	173	1·4
Asteliopsis			
Isoneuron			
A. neocaledonica Schlechter, Mt Boulinda, New Caledonia	16·4	179	2·2

Table 2. Percentage composition of fatty acids

Group Subgenus Section Species		16:1*	16:0	18:3	γ18:3	18:2	18:1	18:0	20:1	20:0
Group 1										
Tricella										
A. chathamica		0·4	8·1	0·6	—	77·2	10·4	2·5	0·2	0·6
A. nervosa		0·2	7·8	0·3	—	67·2	21·9	1·6	0·4	0·6
A. australiana		0·1	9·5	0·5	—	68·5	18·8	2·2	0·2	0·2
A. nivicola var. *nivicola*	1	0·7	8·4	0·7	—	63·6	23·0	2·8	0·3	0·5
	2	0·2	5·8	0·8	—	75·8	14·5	1·9	0·3	0·7
A. psychrocharis		0·2	8·1	0·2	—	62·6	26·4	1·8	0·4	0·3
Asteliopsis										
Micrastelia										
A. pumila	1	0·1	9·9	1·1	—	77·2	9·2	2·1	0·2	0·2
	2	tr	9·9	1·4	—	81·5	5·9	0·8	0·3	0·2
Periastelia										
A. menziesiana		0·1	10·5	0·6	—	69·4	17·8	0·6	0·4	0·6
A. forbesii	1	0·2	9·1	0·7	—	74·5	11·8	2·6	0·4	0·7
	2	0·2	10·0	0·5	—	73·2	14·2	1·4	0·1	0·4
A. argyrocoma		tr	6·5	0·2	—	82·3	9·1	1·5	0·2	0·2
Astelia										
Astelia										
A. papuana		0·1	7·1	tr	—	72·0	18·4	2·0	0·2	0·2
A. subulata		0·2	5·3	tr	—	73·8	17·6	2·1	0·5	0·5
Palaeastelia										
A. hemichrysa		tr	5·5	0·1	—	75·0	16·7	2·0	0·5	0·2
Group 2										
Astelia										
Desmoneuron										
A. nadeaudii		0·3	5·9	0·5	24·8	58·4	7·9	2·0	0·2	—
Asteliopsis										
Isoneuron										
A. neocaledonica		0·1	5·2	0·9	26·6	58·2	6·1	1·5	0·5	0·9

* Number of carbon atoms followed by number of double bonds.
tr = Trace.

comes from further north than those previously reported has a fatty acid pattern more like the northern specimens (1–8) than the southern ones (9–11) [4].

None of the samples from the sections unrepresented before, *Palaeastelia*, *Periastelia* and *Micrastelia*, nor additional samples from section *Astelia* and subgenus *Tricella* contained any trace of γ-linolenic acid, Fig. 1. *A. nadeaudii* and *A. neocaledonica*, in accordance with their higher iodine values, were the only species of this study in which it was present. Like most of the previous Group 2 samples of *Astelia*, these two contained 24·8% and 26·6% γ-linolenic acid respectively, about 58% linolenic acid and less than 8% oleic acid.

Now that *Desmoneuron* and *Isoneuron* appear to be the only sections containing γ-linolenic acid, it is possible that some rearrangement of the sections may be botanically feasible. As far as is known at present, without the final species from *Collospermum* and section *Periastelia*, it seems that Skottsberg [1] was correct in his section grouping of similar species, but at subgeneric level it would appear that some change in his grouping may be necessary. If *A. nadeaudii*, *A. solandri* and *A. trinervia* of *Desmoneuron* and *A. banksii* and *A. neocaledonica* of *Isoneuron* are not thought close enough botanically to be in the same section, at least they might be placed in the same subgenus, and *Collospermum* considered nearer to these species than to subgenus *Tricella*.

EXPERIMENTAL

The seed samples were obtained from plants growing in the wild in the localities shown in Table 1. The names and authors are those given by Moore [5] for the New Zealand and Australian species, and by Skottsberg [1, 2] for the remaining ones. The fatty oils, unsaponifiable matter and methyl esters of the fatty acids were obtained as described for the Agavaceae [6].

and the methyl esters were analysed by GLC as described for the Juncaceae [7].

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