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FRUIT-COAT AND SEED FATS OF *RHOPALOSTYLIS*, *ELAEOCARPUS* AND *NESTEGIS SPECIES*

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Key Word Index—*Rhopalostylis*; Palmae; *Elaeocarpus*; Elaeocarpaceae; *Nestegis*; Oleaceae; fruit-coat; fatty acids.

Abstract—The fruit-coat fats of *Rhopalostylis sapida*, *R. baueri* (Palmae), *Elaeocarpus dentatus* (Elaeocarpaceae) and *Nestegis cunninghamii* (Oleaceae) and the seed fats of *E. dentatus* and *N. cunninghamii* contain as their major fatty acids palmitic 11–35%, oleic 13–68%, and linoleic 16–31%. The seed fat of *E. dentatus* contains 10% hexadecenoic acid and the fruit-coat fat of *N. cunninghamii* 13% linolenic acid.

INTRODUCTION

Fruit-coat fats, with a few notable exceptions, have not been as extensively investigated as seed fats, probably because fruit-coats often contain very little fat and seeds are considered a better source. The fruit-coats of the oil palm (*Elaeis guineensis* Jacq., Palmae) and the olive (*Olea europaea* L., Oleaceae) however are rich in fat and are widely used to produce commercial oils [1]. In general the fatty acids of fruit-coat fats consist mainly of palmitic and oleic acids [2]. Linoleic acid is often present, but usually not in the high proportions found in seed fats. *Valerianella olitoria* with linoleic acid comprising 74% of the fatty acids is exceptional [2]. Occasionally linolenic acid is present as in *Celastrus paniculatus* [2], and hexadecenoic acid as in *Mangifera indica* [3]. Fruit-coat fats of *Myrica* species are unusual in containing saturated acids only [2, 4].

In the present work the fruit-coat fats of *Rhopalostylis sapida* Wendl. and Drude and *R. baueri* Wendl. & Drude (Palmae), and the fruit-coat and seed fats of *Elaeocarpus dentatus* (J. R. and G. Forst.) Vahl (Elaeocarpaceae) and *Nestegis cunninghamii* (Hook f.) L. Johnson (Oleaceae) have been studied. The seed fats of *R. sapida* and *R. baueri* have already been reported [5]. *R. sapida*, *E. dentatus* and *N. cunninghamii* are endemic in New Zealand, and *R. baueri* is endemic in Norfolk Island.

RESULTS AND DISCUSSION

In Table 1 the amounts of fat, iodine values, saponification equivalents and percentages of unsaponifiable matter are shown. The percentages of fat are low. Those of the palms *R. sapida* and *R. baueri* are much less than those found in the oil palm [1], and those of the fruit-coat and seed of *N. cunninghamii*, which belongs to the same family as the olive, are not comparable with the amounts reported for olive fruit-coat [1] and kernel [6] respectively. In all samples except the fruit-coat fats of *N. cunninghamii* and *E. dentatus* the iodine values are a little higher than would be calculated from the fatty acid composition, but as they were determined on the fatty oils which contained unsaponifiable matter a higher value is not unexpected. With unsaponifiable matter Wijs reagent may give substitution of halogen as well as addition [7]. The two lower iodine values are explained by the presence of conjugated fatty acids. *N. cunninghamii* fruit-coat contained 3·4% conjugated diene and 2·9% conjugated triene. *E. dentatus* fruit-coat also gave UV absorption at 233 and 268 nm, but slight contamination by chlorophyll prevented accurate determination of conjugation. The unusually high

Table 1. Characteristics of fats

	Fat (% dry wt)	I_2 value Wijs (1 hr)	Saponification equivalent	Unsaponifiable matter (% wt of fat)
Fruit-coat fats				
Rhopalostylis sapida	8·2	93	286	7·1
R. baueri	10·9	89	289	4·4
Elaeocarpus dentatus	0·8	81	279	18·7
Nestegis cunninghamii	2·4	89	485	72·0
Seed fats				
Elaeocarpus dentatus	5·2	95	285	3·6
Nestegis cunninghamii	5·0	96	279	12·3

saponification equivalent of *N. cunninghamii* fruit-coat fat is due to the large amount of unsaponifiable matter. This material was not further investigated.

The amounts of the component fatty acids as percentages of the total fatty acids are shown in Table 2. The fruit-coat fats of *R. sapida* and *R. baueri* are alike in fatty acid composition and contain more oleic acid than their respective seed fats [5]. In their fruit-coat fatty acids these two species of *Rhopalostylis* resemble more closely *Elaeis guineensis* [2] than species of *Oenocarpus* [2] and *Jessenia* [2, 8], which have smaller amounts of palmitic and linoleic acids and 65–82% oleic acid, but are considered nearer to *Rhopalostylis* botanically [9]. Among the fatty acids of *R. baueri*, but not of *R. sapida*, was 0·8% of an unknown acid. Its methyl ester had an ECL of 18·7 on Apiezon L and 20·8 on DEGA. It was not affected by hydrogenation or silylation, but disappeared on bromination, an indication of a cyclopropane fatty acid [10] which was confirmed by MS. The small amount of material precluded further investigation.

For *E. dentatus* the proportions of major fatty acids, palmitic, oleic and linoleic, are rather similar in both fruit-coat and seed fats. The chief differences between the two fats lie in the presence of 1% γ-linolenic acid in the fruit-coat and 10% hexade-

Table 2. Fatty acid composition, area % of total acids

Fatty acids	Fruit-coat acids *Rhopalostylis sapida*	*Rhopalostylis baueri*	*Elaeocarpus dentatus*	*Nestegis cunninghamii*	Seed acids *Elaeocarpus dentatus*	*Nestegis cunninghamii*
10:0*					0·1	
12:0	0·1	0·1	0·2	0·3	0·1	
14:1				0·6		
14:0	0·2	0·1	1·4	1·2	0·1	0·6
16:1	1·4	1·6	0·8	1·8	10·0	0·6
16:0	24·9	25·9	23·8	35·1	23·3	11·1
17:1	tr	0·1	tr	tr		
17:0	0·1	0·1	tr	tr		
18:3	1·5	1·2	4·5	13·3	0·3	
18:3 γ			1·1			
18:2	21·3	15·6	26·1	30·2	31·2	16·2
18:1	49·1	52·4	36·8	12·7	31·5	67·9
18:0	1·1	1·2	3·7	3·6	3·4	1·8
20:1	0·1	0·1	0·3			0·6
20:0	0·1	tr	0·2	1·2		1·2
22:0	0·1	0·2	0·2			
24:0		0·6	0·9			
Unknown		0·8				

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

cenoic acid in the seed. The only other member of the Elaeocarpaceae of which the seed fat has been studied, *Tricuspidaria lanceolata* [11], contains 15% hexadecenoic acid and has a fatty acid pattern similar to that of *E. dentatus*.

The fruit-coat fatty acids of *N. cunninghamii*, in containing 13% linolenic acid and 13% oleic acid, differ in their proportions from the seed fatty acids which contain 0 and 68% respectively of these acids. Thus it is unlike the olive in which the fruit-coat and seed fatty acids are present in similar proportions [2], but resembles members of the genus *Olea* in its seed fatty acids, the proportions of which are similar to those of *O. dioica* [12] and almost identical with those found by Jart [6] and by Amelotti *et al.* [13] for olive kernels.

EXPERIMENTAL

The ripe fruits of *R. sapida* were collected from Paraparaumu, those of *R. baueri* from Norfolk Island, those of *E. dentatus* from the Otari Open Air Native Plant Museum, Wellington and those of *N. cunninghamii* from Lake Pounui, Wairarapa. The fatty oils, unsaponifiable matter and Me esters were obtained as described for the Agavaceae [14], and the Me esters were analysed by GLC as described for the Juncaceae [15]. Saponification equivalents were determined on 0·1 g fat by refluxing with 10 ml 0·1 N ethanolic KOH for 1 hr. The hot soln was titrated with standardized 0·1 N H_2SO_4 with phenolphthalein as indicator. Two blanks were treated similarly at the same time. Conjugated acids were determined by UV spectroscopy [16]. *Hydrogenation* was carried out in MeOH with PtO_2 catalyst at 50° for 6 hr, silylation in dry C_5H_5N with HMDS and TMCS and bromination in petrol at −15–0°.

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