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ALKANE DISTRIBUTION IN EPICUTICULAR WAX OF EPACRIDACEAE*

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Key Word Index—Epacridaceae; epicuticular wax; alkanes; chemotaxonomy.

Abstract—Alkane distribution pattern was determined in the epicuticular wax of leaves of 39 species and in the flower wax of three species of Epacridaceae. Uniform patterns were observed within some genera (*Monotoca*, *Styphelia*), whereas in others no common pattern was apparent. There was no difference between the alkane patterns of the two subfamilies Epacrideae and Styphelieae. The pattern was not affected by the presence of new growth, and there was no correlation with the season, habitat, climate, nature of soil, or the presence or absence of flowers.

INTRODUCTION

The Epacridaceae, one of four families in the order Ericales, comprises *ca* 35 genera and over 400 species. Its chemistry has received only scant attention. Apart from a few general phytochemical surveys [1–4], the only systematic study has been of their anthocyanins [5]. The identity of some triterpenes [6] and the occurrence of methyl salicylate in one species [7] have also been reported.

This article reports the distribution of alkanes in the epicuticular wax of the leaves of 39 species from 14 genera of Epacridaceae (14 species from six genera of the subfamily Epacrideae and 25 species from eight genera of the subfamily Styphelieae), as well as in the flower wax of three species. Plants are grouped according to their alkane patterns, and parallels are drawn where possible between these patterns and morphological classification, environmental conditions or other factors. Plants investigated include *Wittsteinia vacciniacea* F. Muell., the only member of its genus, which is placed in Epacridaceae by some taxonomists (e.g. ref. [8]), in Ericaceae by others (e.g. ref. [9]).

RESULTS AND DISCUSSION

Details of plant material and the results on leaf waxes are given in Table 1. All plant material was collected in New South Wales unless indicated otherwise.

Plants of the Epacridaceae range in size from dwarf shrubs to trees over 10 m tall; the species covered in this work range in height from *ca* 5 cm (*Acrotriche serrulata*) to 5 m (*Monotoca elliptica*). Most are shrubs 0.5–1.5 m in height. Each batch of plant material originated from several to many individuals. Voucher specimens are representative of the plant material and were collected at the same location, though not necessarily at the same time.

Leafy cuttings were dipped in petrol either at ambient temperature or at boiling point, to isolate the wax. Because of the relatively small size and uneven density of leaves on branches, the weight of leaves could not be estimated; consequently, the wax yields were not calculated. Flowers if present were removed before dipping only where indicated in Table 1. In a few cases the surface wax of flowers was extracted and analysed separately. These results are given in Table 2.

The effects of temperature of wax extraction on the alkane pattern have been discussed elsewhere [12]. Though the content of particular alkanes may vary by several percent, the results in Table 1 include only one case (*Trochocarpa laurina*) where the differences between the waxes extracted with cold and hot petrol are sufficient to alter the ranking order of alkanes. In all other cases where similar plant material was extracted at two different temperatures, the alkane patterns are essentially the same. Therefore, both kinds of waxes are treated as equivalent and the results are discussed together.

The relatively high non-alkane content of the hydrocarbon fraction of the wax of *Richea continentis* from Victoria and the absence of the main non-alkane constituent (tentatively identified as a diterpene) from *R. continentis* from New South Wales will be the subject of another communication.

The general pattern of alkane distribution in Epacridaceae is as expected [13], being made up of normal alkanes in the range of 17–34 carbons, with the odd-carbon chains dominating, and with no evidence of the presence of alkenes or branched alkanes having emerged. Generally the odd-carbon alkanes increased gradually towards the major homologue and then fell off, giving a single peak if represented graphically. In only seven cases were there multiple peaks. The ranges varied from the very narrow range of five alkanes to extended ranges of 13 alkanes plus traces. None of the waxes contained any pentatriacontane or higher alkanes.

There are no distinctive differences between the alkane patterns of the two subfamilies. When the waxes are arranged by the ranking order of major alkanes, both subfamilies are represented in the first two waxes where hentriacontane exceeds 80% while all other alkanes are present at less than 10% (*Sprengelia sprengelioides* No. 22 and *Leucopogon microphyllus* No. 43), as well as in the last two waxes where the major alkane is heptacosane (*Rupicola gnidioides* No. 21 and *Leucopogon hookeri* No. 39). While all seven species with more than one peak in

*Part of this work was presented at the XIII International Botanical Congress in Sydney, Australia, 21–28 August 1981.

Table 1. Alkane distribution in epicuticular wax of Epacridaceae leaves*

No.	Species	Voucher speçimen No.†	Date	Location	Habitat‡	Stage of development	Extraction method§	Hydrocarbons in wax (%)	Alkanes in hydrocarbon fraction (%)	Carbon chain length of alkanes															
										19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
	Subfamily EPACRIDEAE																								
1	*Dracophyllum secundum* R. Br.	UNSW 10320	30.12.73	Nerriga	OF	New growth	Hot	30.87	99.7	—	—	—	—	—	—	tr	—	2	tr	22	2	55	2	16	—
2	*D. secundum* R. Br.	UNSW 12766	29.12.80	Nerriga	OF	New growth	Cold	72.95	99.3	—		—	—	—	—	tr	tr	2	tr	20	1	58	2	16	tr
3	*D secundum* R. Br.	UNSW 12766	29.12.80	Nerriga	OF	New growth	Hot	45.34	98.5	—	—	—		tr	—	tr	—	2	1	21	2	57	2	15	tr
4	*Epacris calvertiana* F. Muell.	UNSW 10331	23.02.73	Nerriga	LW	Few unseasonal flowers	Cold	61.98	99.7	—		—	—	—	—	1	tr	12	4	78	2	2	—	—	—
5	*E. impressa* Labill.	UNSW 10332	04.12.72	Clyde Mountain	TOF	Flower buds, flowers, fruits	Cold	15.69	100		—	—	—	tr	—	tr	—	7	1	87	1	4	—	—	—
6	*E. impressa* Labill.	UNSW 10332	01.12.74	Clyde Mountain	TOF	Flowers	Cold	3.64	98.7	‖		tr	tr	1	1	4	1	13	2	68	1	7	tr	tr	—
7	*E. longiflora* Cav.	UNSW 12767	29.05.81	Bayview	TS	Flowers	Cold	53.62	98.9	—		—	—	—	—	tr	tr	1	1	35	3	54	2	3	tr
8	*E. microphylla* R. Br.	UNSW 10319	31.03.72	Central Mangrove	TS	Fruits	Cold	42.08	99.9	—		—	—	—	—	tr	tr	1	1	33	6	54	2	3	—
9	*E. microphylla* R. Br.	UNSW 10311	17.02.80	Beacon Hill	TS	Fruits	Cold	37.27	99.3	—		tr	tr	tr	tr	tr	tr	tr	1	34	5	51	2	4	tr
10	*E. obtusifolia* Sm.	UNSW 10325	24.11.74	Bell	LOS	Flower buds, flowers	Cold	2.48	95.0	tr	tr	2	1	5	2	10	4	22	5	29	1	15	1	3	—
11	*E. obtusifolia* Sm.	UNSW 12768 CBG 8112715	13.09.81	Corang	OH	Flower buds, old fruits	Cold	3.19	97.7	tr‖	tr	1	1	4	3	8	5	17	5	32	2	18	1	3	—
12	*Epacris paludosa* R. Br.	UNSW 10327 MEL 501193-4 USNH 2876838	21.02.74	Baw Baw Alpine Reserve (Vic.)	CH	Past flowering	Hot	1.59	98.8	1**	1	2	3	8	7	18	5	23	4	23	1	2	tr	tr	—
13	*Epacris pulchella* Cav.	UNSW 10316	22.08.72	Mooney Mooney	LW	Green and ripe fruits	Cold	13.43	97.3	—	—	tr	tr	1	tr	1	1	6	4	57	4	25	tr	1	—
14	*E. pulchella* Cav.	UNSW 10309	28.03.80	Calga	LW	Flower buds, flowers, fruits	Cold	13.59	98.9	—	—	—	—	tr	—	tr	tr	2	1	77	2	16	tr	tr	—
15	*E. pulchella* Cav.	UNSW 10302	27.04.80	Mt. Ousley Road	OH	Flower buds, flowers, fruits	Cold	5.69	97.2	—	tr	tr	1	1	1	2	1	9	3	71	2	8	—	tr	—
16	*Epacris purpurascens* var. *onosmiflora* Maiden et Betche	UNSW 10328 USNH 2876859	11.02.75	Lithgow	OF	Fruits	Cold	26.04	100	—	—	—	—	—	tr	1	tr	3	2	53	10	29	1	tr	—
17	*Epacris reclinata* A. Cunn. ex Benth.	UNSW 10329 USNH 2876858	11.02.75	Lithgow	LW	No flowers or fruits	Cold	41.24	98.8	—	—	—	—	tr	—	1	tr	3	3	56	4	31	1	1	—
18	*Richea continentis* B. L. Burtt	MEL 501192 USNH 2876835	21.02.74	Baw Baw Alpine Reserve (Vic.)	CH	Some new growth	Hot	8.80	54.0	—	—	—	tr	1	tr	2	1	9	3	24	4	46	3	6	tr
19	*R. continentis* B. L. Burtt	UNSW 12774	07.01.82	Baw Baw Alpine Reserve (Vic.)	TS (CH)	Past flowering	Hot	11.02	44.4	—	—	tr	—	1	tr	2	1	7	3	25	4	47	3	6	—
20	*R. continentis* B. L. Burtt	UNSW 12775	23.01.82	Kosciusko National Park	CH	New growth	Hot	5.66	99.2	—	—	—	—	tr	tr	tr	tr	2	3	11	6	57	7	12	—

21	*Rupicola gnidioides* Summerhayes	UNSW 12776 CBG 8116298	15.08.81	Mt. Nibelung	Rock wall	New growth, old fruits	Hot	0.78	99.4	tr	tr	1	2	8	5	19	9	27	9	20	tr	—	—	—	—
22	*Sprengelia sprengelioides* (R. Br.) Druce	NSW HS 5483 USNH 2876847	06.07.74	Diamond Head	LOS	Flower buds	Hot	31.73	100	—	—	—	—	—	—	—	—	—	—	7	2	89	1	1	—
23	*Woollsia pungens* (Cav.) F. Muell.	UNSW 10305	29.09.73	West Lindfield	CS	Past flowering	Hot	11.87	99.0	—	—	—	—	tr	—	1	—	3	1	41	1	45	1	6	—
24	*Woollsia pungens* (Cav.) F. Muell.	UNSW 10305	13.04.80	West Lindfield	CS	Flower buds	Cold	18.32	99.4	—	—	—	—	—	—	—	—	1	tr	36	1	52	2	6	—
	Subfamily STYPHELIEAE																								
25	*Acrotriche divaricata* R. Br.	UNSW 12764 NSW HS 5477	05.07.74	Styx River State Forest	TCF	Flower buds, flowers	Cold	2.77	99.2	tr	tr	4	tr	13	1	26	1	12	1	33	1	8	tr	tr	—
26	*A. divaricata* R. Br.	UNSW 10323	11.10.74	Forresters Beach	LS	Green fruits	Cold	21.23	99.6	—	—	—	—	—	—	tr	—	1	1	43	3	49	1	2	tr
27	*Acrotriche serrulata* (Labill.) R. Br.	UNSW 10307	04.04.80	Blackmans Flat	LW	Flower buds, fruits	Cold	1.66	92.9	—	tr	tr	1	1	1	1	1	5	2	45	3	37	1	tr	—
28	*Astroloma pinifolium* (R. Br.) Benth.	UNSW 10318	31.03.72	Forresters Beach	CS	Flower buds, flowers¶	Cold	2.27	100	—	—	—	—	tr	—	tr	1	11	tr	17	3	56	2	9	tr
29	*Brachyloma daphnoides* (Sm.) Benth.	UNSW 12765	08.11.71	Tahmoor	LW	Past flowering	Cold	3.50	96.6	—	—	—	—	2	1	3	1	11	1	15	1	60	1	3	1
30	*B. daphnoides* (Sm.) Benth.	NSW HS 5484	20.07.72	Seal Rocks	OF	Swollen leaf buds	Cold	1.92	94.5	—	—	2	1	7	2	6	5	25	2	13	1	34	tr	1	—
31	*Leucopogon amplexicaulis* (Rudge) R. Br.	UNSW 10312	30.09.73	Beacon Hill	CF	Flowering	Hot	1.13	98.7	—	tr	tr	tr	1	1	3	5	22	15	38	3	9	tr	1	—
32	*L. amplexicaulis* (Rudge) R. Br.	UNSW 10310	22.03.80	Berowra	OS	No flowers or fruits	Cold	2.66	96.6	—	tr	1	2	2	2	4	5	22	9	37	3	12	tr	tr	—
33	*Leucopogon ericoides* (Sm.) R. Br.	NSW HS 5485	20.07.72	Seal Rocks	OF	Flower buds	Cold	29.49	99.2	—	—	—	—	tr	—	1	tr	2	1	23	3	61	3	7	—
34	*Leucopogon esquamatus* R. Br.	UNSW 10314	15.07.73	Mount White	TS	Flower buds	Hot	1.40	99.7	—	—	tr	tr	1	tr	1	2	13	2	47	3	30	1	tr	—
35	*L. esquamatus* R. Br.	UNSW 10301 USNH 2876855	14.09.74	Mt. Ousley Road	TS	Flower buds, flowers	Cold	5.28	98.2	—	—	—	—	1	tr	2	tr	17	2	42	2	29	1	2	—
36	*L. esquamatus* R. Br.	UNSW 12769	20.12.80	Somersby	TOS	No flowers or fruits	Cold	5.80	97.8	—	—	tr	—	tr	1	1	2	11	3	49	3	28	1	tr	—
37	*L. esquamatus* R. Br.	UNSW 12769	20.12.80	Somersby	TOS	No flowers or fruits	Hot	2.97	98.2	tr	tr	1	1	1	1	3	5	18	3	42	3	22	1	tr	—
38	*Leucopogon fraseri* A. Cunn.	UNSW 12770 CBG 8112711	13.09.81	Corang Arch	OH	Flowers	Cold	5.78	99.0	—	—	tr	tr	2	1	1	tr	4	2	26	2	56	2	3	—
39	*Leucopogon hookeri* Sond.	MEL 1007563-4-5	22.02.73	Countegany	LS	Flower buds, green and ripe fruits	Cold	11.04	99.3	—	—	—	—	tr	tr	tr	1	59	2	30	tr	6	tr	tr	—
40	*Leucopogon juniperinus* R. Br.	UNSW 12771	01.09.81	West Pennant Hills	CF	Old flowers, green fruits	Hot	5.47	96.8	tr	tr	1	tr	1	1	3	1	4	1	20	5	56	3	3	—
41	*Leucopogon lanceolatus* (Sm.) R. Br. var. *lanceolatus*	UNSW 10315	01.12.74	Clyde Mountain	TOF	New leaves, green fruits	Cold	5.53	99.2	—	—	—	tr	1	tr	2	1	5	1	29	3	53	2	3	tr
42	*Leucopogon microphyllus* R. Br.	UNSW 10303 USNH 2876854	14.09.74	Mt. Ousley Road	TOS	Flowers	Cold	8.38	99.0	—	—	tr	—	1	tr	2	tr	4	1	29	2	54	2	4	tr
43	*L. microphyllus* R. Br.	UNSW 10308	28.03.80	Calga	LW	Flowers	Cold	47.14	100	—	—	—	—	—	—	—	tr	tr	tr	8	2	80	3	7	—
44	*Leucopogon muticus* R. Br.	UNSW 12772	09.07.72	Rylstone	LW	Flower buds	Cold	41.58	97.8	—	—	—	—	—	—	—	1	2	—	29	3	59	2	6	—
45	*Leucopogon setiger* R. Br.	UNSW 12773	07.11.71	Tahmoor	OS	Green fruits	Cold	4.16	98.3	—	—	tr	tr	11	2	15	1	6	1	52	1	11	—	—	—

Table 1. (*Contd.*)

No.	Species	Voucher specimen No.†	Date	Location	Habitat‡	Stage of development	Extraction method§	Hydrocarbon in wax (%)	Alkanes in hydrocarbon fraction (%)	Carbon chain length of alkanes															
										19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
46	*Leucopogon virgatus* (Labill.) R. Br.	NSW HS 5482 USNH 2876845	06.07.74	North Haven	CH	Flowers	Hot	4.19	95.6	—	tr	1	1	1	1	3	3	12	2	7	2	55	3	10	—
47	*Monotoca elliptica* (Sm.) R. Br.	UNSW 10313	31.03.72	Point Wamberal	CS	Flowers	Cold	2.30	99.6	—	—	—	—	tr	tr	2	tr	2	1	17	2	69	1	5	—
48	*Monotoca scoparia* (Sm.) R. Br.	UNSW 10321	21.11.71	Forresters Beach	CH	New leaves, green fruits	Cold	3.91	96.4	—	—	—	—	tr	tr	6	tr	1	1	18	1	68	tr	5	—
49	*Styphelia adscendens* R. Br.	UNSW 12777 CBG 8112714	13.09.81	Mongarlowe Road	LW	Flowers,¶ green fruits	Cold	0.91	73.7	—	tr	2	1	3	2	2	6	27	4	30	3	19	tr	tr	—
50	*Styphelia laeta* R. Br. var. *laeta*	UNSW 12785	20.09.74	Beacon Hill	TS	Flowers¶	Cold	7.30	96.8		—	tr	tr	1	1	2	2	21	3	56	1	14	—	—	—
51	*Styphelia laeta* var. *latifolia* (R. Br.) Benth.	UNSW 10333 USNH 2876863	22.08.72	Mooney Mooney	LW	Few flowers,¶ green fruits	Cold	2.57	93.1	—	tr	2	1	3	2	3	6	33	4	41	1	6	—	—	—
52	*Styphelia triflora* Andr.	UNSW 10304	04.04.80	Ilford	OF	Flower buds	Cold	14.36	99.2	—	—	—	—	tr	tr	1	1	12	1	70	1	13	—	—	—
53	*Styphelia tubiflora* Sm.	USNH 2876864	22.08.72	Mooney Mooney	LW	Few flowers	Cold	46.59	100	—	—	—	—	—	—	—	—	4	2	62	5	26	tr	tr	—
54	*S. tubiflora* Sm.	UNSW 12786	16.09.72	Beacon Hill	TS	New growth	Cold	23.12	100	—	—	—	—	tr	—	tr	—	4	2	66	5	22	tr	tr	—
55	*Styphelia viridis* Andr.	USNH 2876836	19.08.72	Forresters Beach	CS	Flower buds, flowers, green fruits	Cold	4.39	94.5		tr	tr	1	2	2	3	4	24	3	52	1	9	—	—	—
56	*Trochocarpa laurina* R. Br.	UNSW 12778	13.02.82	Barrington Tops	OF	Few flowers	Cold	12.04	99.6			tr	tr	tr	tr	1	tr	3	tr	22	2	57	2	11	—
57	*T. laurina* R. Br.	UNSW 12778	13.02.82	Barrington Tops	OF	Few flowers	Hot††	2.95	99.5	tr	tr	tr	tr	1	1	2	3	9	1	21	2	50	2	8	—
58	*Wittsteinia vacciniacea* F. Muell.‡‡	UNSW 12779	07.01.82	Baw Baw Alpine Reserve (Vic.)	LW	Flowers¶	Cold	17.80	98.7	—	—	—	—		—	tr	tr	2	1	18	5	69	2	2	—
59	*W. vacciniacea* F. Muell‡‡	UNSW 12779	07.01.82	Baw Baw Alpine Reserve (Vic.)	LW	Flowers	Hot††	12.84	99.2	—	—	—	—	—	—	tr	tr	2	1	17	5	70	2	2	—

*Percentages (by weight) are rounded off to the nearest 1%. Trace (tr) = 0.1–0.5%.

†Prefixes indicate herbaria [10]. The prefix NSW HS refers to the collection sent by Dr. Hugo Salasoo to the National Herbarium of New South Wales, Royal Botanic Gardens, Sydney. The U.S. National Herbarium, listed in ref. [10] as US, uses the prefix USNH.

‡Structural formations as defined by Specht [11]: CF, closed-forest; CH, closed-heath; CS, closed-scrub; LOS, low open-shrubland; LS, low shrubland; LW, low woodland; OF, open-forest; OH, open-heath; OS, open-scrub; TCF, tall closed-forest; TOF, tall open-forest; TOS, tall open-shrubland; TS, tall shrubland.

§Cold = at ambient temperature; hot = at bp of petrol.

||Traces of C_{18} alkane present.

¶Flowers were removed before extraction of wax.

**Traces of C_{17} and C_{18} alkanes present.

††Calculated; for details see ref. [12].

‡‡Placed in Ericaceae by some taxonomists; see ref. [8].

Table 2. Alkane distribution in epicuticular wax of Epacridaceae flowers*

Species	Wax yield†	Hydrocarbons in wax (%)	Alkanes in hydrocarbon fraction (%)	Carbon chain length of alkanes														
				19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Epacris longiflora	0.51	18.0	98.5	—	—	—	—	—	—	tr	—	1	1	94	1	3	—	—
Styphelia adscendens	0.28	10.1	99.9	—	—	—	—	tr	—	tr	tr	3	1	54	2	39	tr	—
Wittsteinia vacciniacea	1.76	3.2	96.8	tr	—	tr	tr	3	1	11	1	11	1	25	2	42	1	1

*Percentages (by weight) are rounded off to the nearest 1%. Trace (tr) = 0.1–0.5%.
†Expressed as percentage of weight of fresh flowers.

graphic representation of odd-carbon alkanes are from Styphelieae, the majority of Styphelieae have a single peak, like all Epacrideae.

Monotoca is the only genus (leaving aside the genera from which only one species was analysed) with a completely uniform pattern: $C_{31} > C_{29} >$ others below 10%. Indeed, the results for the two species analysed are remarkably similar. The genus *Styphelia* (six species analysed) is uniform in nonacosane being the major alkane and the C_{32-33} alkanes being absent or present as traces only. However, the patterns of these two genera are not exclusively characteristic: each pattern can be found in other genera.

In *Epacris*, two species (*E. longiflora* and *E. microphylla*) stand out from the rest by having hentriacontane as the major alkane, while in the other seven species nonacosane exceeds hentriacontane. Even so, the genus is far from uniform, for the nonacosane content in those species where it forms the major alkane, varies from 87% in *E. impressa* down to 23% in *E. paludosa*.

No common characteristics appeared among the alkane patterns in the largest genus of the family, *Leucopogon* (*ca* 130 spp.; 11 spp. analysed), nor in *Acrotriche*. The two batches of *A. divaricata*, with different alkane patterns, came from different habitats and were of different appearance. The material from Styx River State Forest (No. 25) had some resemblance to *A. aggregata* R. Br., though it was identified as *A. divaricata* on the basis of its five-celled ovary. The two must be regarded as different varieties if not different species.

Hentriacontane was the major alkane in all but one of the genera represented in this work by single species: *Dracophyllum*, *Richea*, *Sprengelia*, *Woollsia*, *Astroloma*, *Brachyloma*, *Trochocarpa* and *Wittsteinia*. The exception was *Rupicola gnidioides*, which contained no hentriacontane at all and in which the major alkane was heptacosane.

Alkane patterns were not affected by the presence of new growth: the two batches of *Styphelia tubiflora*, collected in different locations at different stages of development, showed similar alkane patterns. Swollen leaf buds, however, could have been the reason for increased proportions of shorter chain alkanes in *Brachyloma daphnoides* No. 30, compared with No. 29, and for pentacosane and nonacosane content in No. 30 being lower than those of neighboring odd-carbon alkanes; such effects have been observed in a *Rhododendron* cultivar [14].

There was no correlation between the alkane pattern and the season, habitat, climate, nature of soil, or the presence of flowers in plant material. This latter aspect could be expected to influence the wax alkanes, for it has been found for roses (Rosaceae) [15] and for the genus *Cistus* (Cistaceae) [16] that the alkanes of the petal waxes contain more shorter chain homologues than those of the leaf waxes. On the other hand, a comparison of alkane patterns in the leaf and perianth waxes of 51 *Aloe* species (Liliaceae) [17] showed that the alkane chain length range (excluding values below 0.5%) in perianth wax extended to lower values than in leaf wax only in five species, and similarly the chain length of the major alkane was lower in perianth wax than in leaf wax in only five species (though not in the same ones). Also the alkane range in perianth wax was narrower than in leaf wax in 43 species. Data on flower wax alkanes of a limited number of Epacridaceae (Table 2) show that while *Wittsteinia vacciniacea* agreed with roses and *Cistus*, the other two (*Epacris longiflora* and *Styphelia adscendens*) followed the pattern of *Aloe*. The dominance of nonacosane (94%) in *E. longiflora* flower wax could be interpreted as a tendency toward shorter chain lengths when compared with nonacosane and hentriacontane content of its leaf wax (35% and 54%, respectively), but in *Styphelia adscendens* the alkane chain lengths were actually higher in flower than in leaf wax. If the patterns of these two flower waxes were taken as typical (*Wittsteinia* could not be regarded as a typical member of Epacridaceae), then the presence of flower wax in leaf waxes would not increase the relative proportion of lower alkanes. The alkane patterns of the batches which contained more than just a few flowers (Nos. 5, 6, 10, 14, 15, 42, 43, 46 and 55) do not exhibit any common characteristics different from the rest.

Because of the wide variety of patterns in Epacridaceae, the alkane distribution pattern is of no help in the placement of *Wittsteinia*, whose pattern is fairly similar to that of the genus *Monotoca*, but at the same time not much different from *Gaultheria* (Ericaceae) [18, 19].

EXPERIMENTAL

All plant material was collected by the author. Epicuticular wax of leaves was isolated by dipping fresh leafy cuttings in petrol (bp 60–80°) for 1–5 min either at ambient temp. or at bp. Flower wax was obtained by soaking flowers (corolla and calyx) in two successive portions of petrol at room temp. for 7 and 2 days, respectively, and combining the two solns. The extracts were worked up, the waxes fractionated and the hydrocarbon fractions analysed as described elsewhere [14].

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