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ANTHOCYANINS IN THE GENUS *ERICA*

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Key Word Index—*Erica*; Ericaceae; anthocyanins; chemotaxonomy.

Abstract—3-Glucosides, 3-galactosides and 3-arabinosides of cyanidin, delphinidin, malvidin, peonidin and pelargonidin have been identified as major floral pigments in *Erica* (Ericaceae). Unidentified 3-biosides are present as minor pigments in some species. A comparison is made with floral anthocyanins occurring in the related family Epacridaceae.

An examination of anthocyanins in the flowers of 39 species of *Erica* has shown that 3-monosides (glucoside, galactoside and arabinoside) are the dominant pigments with 3-biosides occurring less frequently and in lower concentration (Table 1). All five common anthocyanidins are present, sometimes in complex admixture. Cyanidin 3-glucoside was identified in all species examined. It co-occurred with the 3-galactoside in several species, par-

Table 1. Occurrence of floral anthocyanins in genus *Erica*

Species	Dp G	Dp A	Cy G	Cy A	Mv G	Mv A	Pn G	Pn A	Pg G	Pg A	B	Aglycone relationship
E. sparsa Klotsch	+	+	+	+	+	+						Cy > Mv > Dp
E. polyantha Kotzsch	+	+	+	+	+	+						Cy = Mv ⩾ Dp
E. obliqua Ait.	+	+	+	+	+	+						Cy ⩾ Mv > Dp
E. hendriksii H. A. Baker	+	+	+	+	+	+						Mv > Cy = Dp
E. aristata Andr.	+	+	+	+	+	+	+					Cy > Dp > Mv = Pn
E. corifolia L.	+	+	+	+								Cy ⩾ Dp
E. mauritanica L.	+	+	+	+								Cy ⩾ Dp
E. porteri Compton	+	+	+	+								Cy > Dp
E. axilliflora Bartl.	+	+	+	+								Cy > Dp
E. x wilmorii Knowles & Westc.	+	+	+	+	+						+	Cy > Dp > Mv
E. glomiflora Salisb.	+		+	+	+	+	+				+	Cy ⩾ Dp, Mv, Pn
E. hispidula L.	+		+	+	+	+					+	Cy ⩾ Dp > Mv
E. dichrus Spreng.	+		+	+	+						+	Cy > Dp > Mv
E. cubica L.	+		+	+	+	+	+	+				Cy = Mv > Dp > Pn
E. baccans L.	+		+	+	+	+	+					Mv > Cy ⩾ Dp, Pn
E. copiosa Wendl.	+		+	+	+	+						Cy ⩾ Mv > Dp
E. phylicaefolia Salisb.	+		+	+	+	+						Cy > Mv > Dp
E. imbricata L.	+		+	+	+	?						Cy ⩾ Mv > Dp
E. bayera Andr.	+		+	+								Cy ⩾ Dp
E. articularis L.	+		+	+								Cy ⩾ Dp
E. macowanii Cufino	+		+	+								Dp > Cy
E. glauca Andr.	+		+									Dp > Cy
**E. melanthera* L.			+	+	+	+	+				+	Cy > Mv, Pn
E. multumbellifera Berg.			+	+	+	+	+					Cy > Mv ⩾ Pn
E. quadrangularis Salisb.			+	+	+	+					+	Cy > Mv
E. vestita Thunb.			+	+	+	+						Cy ⩾ Mv
E. discolor Andr.			+	+	+						+	Cy > Mv
**E. carnea* L.			+	+	+						+	Cy > Mv
**E. mediterrania* L.			+	+	+							Cy > Mv
E. cinerea L.			+	+	+							Cy > Mv
E. walkeria Andr.			+	+	+		+		+			Cy > Pg > Mv > Pn
E. curviflora Salisb.			+	+								Cy
E. versicolor Andr.			+	+								Cy
E. plukenetii Berg.			+	+								Cy
E. coccinea L.			+	+			+					Cy > Pn
E. mammosa L.			+	+			+					Cy > Pn
E. blenna Salisb.			+	+					+			Pg > Cy
E. ardens Andr.			+	+					+			Pg > Cy
E. regia Bartl.			+	+					+	+		Pg > Cy

Key: Dp = Delphinidin, Cy = Cyanidin, Mv = malvidin, Pn = peonidin, Pg = pelargonidin, G = glucose (and galactose), A = arabinose, B = 3-bioside. * gluc/gal both present.

ticularly in derived horticultural varieties of *E. carnea* and *E. melanthera*.

Comparison of the *Erica* pigments with those previously identified in a related family, the Epacridaceae [1] is shown in Table 2. Several significant comparisons are readily apparent. Glucose was detected in floral anthocyanins of only 2/54 Epacridaceae species (*Trochocarpa gunnii* and *T. cunninghamii*) [1]. Methylated anthocyanins (peonidin and malvidin) are relatively abundant in *Erica* species (25/39), but are infrequent in the Epacridaceae (1/54). Delphinidin anthocyanins also occur more commonly in the genus *Erica*, their presence in the Epacridaceae being confined mainly to fruits [1].

Table 2. Comparison of floral anthocyanins of *Erica* with those of the Epacridaceae

Species examined (no.)		*Erica* 39	Epacridaceae 54
Dp	glc	23	6 (gal)
	ara	11	4
Cy	glc	41	52 (gal) 2 (glc)
	ara	39	50
Mv	glc	23	1 (gal)
	ara	16	1
Pn	glc	9	0
	ara	1	0
Pg	glc	4	1 (gal)
	ara	1	2
Biosides present		8(21%)	19 (28%)
Methylated anthocyanins present		25	1

3-Biosides are present in species from both families, but are found in higher concentration in the Epacridaceae, particularly in fruits of species from the subfamily Stypheliae [1]. The quantity of 3-biosides in extracts of *Erica* species was usually too low to permit absolute identification by isolation and degradative procedures. However, from PC data, the principal bioside appears to be rutinose (cf. robinobiose in Epacridaceae [1]. Anthocyanins with 5-glycosylation were not observed in either group. However, in other genera of the Ericaceae, e.g. *Rhododendron* [2,3], 3, 5-diglycosides occur frequently.

EXPERIMENTAL

Fresh plant material was collected from Kew and Shinfield Gardens, UK, and from Kirstenbosch Gardens and in the field, S. Africa. Voucher specimens are lodged in the herbarium, Botany Department, University of Tasmania. Laboratory procedures for extraction, isolation and identification of anthocyanins were as previously described [1]. Relative aglycone concn was extimated visually. For all major pigments, the anthocyanidin and sugar present was determined unambiguously, following acid hydrolysis.

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FLAVONOIDS OF *ELAEOCARPUS LANCEOFOLIUS*

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Key Word Index—*Elaeocarpus lanceofolius*; Elaeocarpaceae; 4′-methylmyricetin; myricetin; myricetin-3-*O*-rhamnoside.

Abstract—4′-Methylmyricetin has been isolated from the leaves of *Elaeocarpus lanceofolius* together with myricetin and its 3-*O*-rhamnoside. This is the second report of the natural occurrence of a 4′-methyl ether of myricetin and the first in the family, Elaeocarpaceae.

INTRODUCTION

In continuation of the work done on the phenolic constituents of *Elaeocarpus* species [1] in our laboratory, we now report on the flavonoid constituents of *Elaeocarpus lanceofolius* Roxb., a large tree growing in the eastern Himalayas and hills of Assam up to 8000 ft [2].

RESULTS AND DISCUSSION

Preliminary fractionation of the ethanolic extract of the plant material and subsequent chromatography of individual fractions gave three crystalline flavonoids two of which were readily identified as myricetin (**1**) and myricetin-3-*O*-rhamnoside (**2**) by spectroscopic and chroma-