

BRIEF COMMUNICATIONS

SOME OBSERVATIONS ON THE ANTHOCYANINS IN THE FLOWERS OF *ANTHYLLIS VULNERARIA* L. (LEGUMINOSAE – FABACEAE)

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Anthyllis vulneraria shows an appreciable variation in the colour of the corolla which ranges from pale yellow to a deep purplish red. Also the calyx often has purple teeth.

Most of the subspecies of *A. vulneraria* (16 out of 24) occur in the Mediterranean area, more particularly in the N. and W. parts. About the moiety of these subspecies has purple or reddish flowers; the other half predominantly yellow or yellowish ones. In central Europe 4 subspecies with yellow corollas occur; red-flowered variants are rare. In N. Europe also 4 subspecies are found of which one has a red-flowered variety: *A. vulneraria ssp. vulneraria var. coccinea* (CULLEN 1968). The red floral colour is predominantly found in the Mediterranean area. According to BECKER (1912) the red-flowered populations are mostly encountered in drier and warmer climates; the yellow-flowered ones being more dominant in the colder and moister regions.

Observations by COUBERC (1971) suggest that the pigmentation of the corolla is strongly influenced by environmental conditions and certainly does not always provide a reliable taxonomic characteristic. The anthocyanin pigments of *Anthyllis* had not been studied previously. The flavonols have been investigated by GONNET & JAY (1972).

In this study flowers of 12 populations of *A. vulneraria* were studied and flowers of one population of *A. montana*. The results are shown in the table. The most frequently occurring pigment was identified as cyanidin-3-galactoside. Usually it is the only anthocyanin present, but not infrequently smaller amounts or traces of peonidin- and/or delphinidinglycosides are found in addition; as to their R_f values probably also 3-galactosides.

Aberrant cases are the ssp. *iberica* (in which delphinidin is the principal corolla pigment), the ssp. *vulnerarioides* (in which about equal amounts of cyanidin and delphinidin were found), and the ssp. *pyrenaica* (in which apart from cyanidin relatively large admixtures of peonidin and delphinidin were recorded). In all three subspecies cyanidin is the principal pigment in the calyx. It is striking that these three taxa have a range of distribution mainly including the Iberian peninsula. This fact gains in significance if we consider that in the W.-Mediterranean area the greatest specific diversity of the genus *Anthyllis* (and also of the species *A. vulneraria*) is found. Conceivably the genus originated

Table 1. Anthocyanins recorded from flowers of 7 subspecies and 3 varieties of *Anthyllis vulneraria* and from flowers of *Anthyllis montana ssp. montana*.

Subspec.	Locality	Part of flower	Colour	Anthocyanidins % of total			
				cya	peo	del	mal
praepropera	Diakoftin, Greece	corolla calyx	purplish-red purple at apex	90 100		10	
praepropera	Orebic, Yugoslavia	corolla calyx	purplish-red purple at apex	100 100			
iberica	Matoshinjos, Portugal	corolla calyx	purplish-red purple at apex	30 90		70 10	
maura	Cabo Espichel, Portugal	corolla calyx	purplish-red purple at apex	100 90	<10	<10	10
maura	Sagres, Portugal	corolla calyx	purplish-red purple at apex	100 100	<10 <10	<10	
pyrenaica	Luchon, France	corolla calyx	pink purple at apex	50 70	20	30 30	
vulnerarioides	Orange Carpentras, France	corolla calyx	reddish-purple purple at apex	50 100	<10	50	
vulneraria var. coccinea	Öland, Sweden	corolla calyx	purplish-red purple at apex	100 100	<10 <10	<10	
vulneraria var. langei	Fowey, England	corolla calyx	yellow-purple carina purple at apex	100 100	<10		
vulneraria var. langei	Terschelling, Netherlands	corolla calyx	yellow purple at apex	100 100			
vulneraria var. vulneraria	Wrakelberg, Netherlands	corolla calyx	yellow purple at apex	100 100			
alpestris	Schneeberg 2070 m, Austria	corolla calyx	yellow purple at apex	90 100	10		
A. montana ssp. montana	Hort. Bot. Riga, U.S.S.R.	corolla calyx	purple purple at apex	30 80	10 20	20	40

cya = cyanidin, peo = peonidin, del = delphinidin, mal = malvidin

in this region. The relatively greater diversity in floral anthocyanidin pigmentation in the Iberian peninsula may be associated with the possible centre of variation and the place of origin of the genus. In the flowers of *A. montana ssp. montana* the anthocyanidin malvidin occurs, which pigment was not found in any taxon of the *A. vulneraria* aggregate included in the present investigation.

The flowers of the specimens of *A. montana* clearly differ in colour from those of the (red-flowered) phenotypes of *A. vulneraria*.

EXPERIMENTAL

Petals and calyces of 50 or more flowers from dried or frozen material were extracted in methanol + 0.1% HCl. The main anthocyanin pigment from the ssp. *vulneraria* var. *coccinea* and of ssp. *maura* (loc. Sagres) was purified by paper chromatography and identified by the usual methods (HARBORNE 1958, 1967). The minor anthocyanin pigments and the anthocyanins from the other subspecies were identified in the crude extracts by paper and thin-layer chromatography against the references: cyanidin 3-galactoside, cyanidin 3-glucoside, delphinidin 3-glucoside, cyanidin, peonidin, delphinidin, petunidin and malvidin from *Petunia hybrida* (WIERING & DE VLAMING 1973).

The relative amounts of anthocyanidins within an extract of a subspecies were valued on a light box.

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