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FLAVONOID PATTERNS IN *CONVOLVULUS* L., (*CONVOLVULACEAE*) SPECIES FROM MOROCCO

YUSUF MENEMEN, CHRISTINE A. WILLIAMS* AND STEPHEN L. JURY*

University of Kirikkale, Department of Biology, Faculty of Science and Literature, Kirikkale, Turkey.

Abstract

This study was undertaken to document the distribution of chemical components and determine whether phytochemical characters support the delimitation of the taxa in the genus *Convolvulus* L., from Morocco. Twenty taxa from the genus were investigated for their flavonoid aglycone constituents. The flavonols quercetin, kaempferol and isorhamnetin, the flavone luteolin and the hydroxycoumarin cichoriin were identified. It was seen that the aglycone pattern is useful for the delimitation of some species in the genus and correlate with morphological features. The flavonoid glycosides identified from *Convolvulus mazicum* were isorhamnetin 3-glucoside, quercetin 3-glucoside and 3-galactoside and luteolin 5-glucoside.

Introduction

There have been several chemical studies both in the family *Convolvulaceae* and the genus *Convolvulus*. Alkaloids have been reported from *Convolvulus* (Mothes & Romeike, 1958), while acylated anthocyanins have been identified in many genera e.g., *Ipomoea* (Pomilio & Sproviero, 1972), *Convolvulus* (Tronchet, 1966) and *Calystegia* (Ueno *et al.*, 1969). The flavonoids rutin (quercetin 3-rutinoside), isoquercetin and kaempferol 3-rhamnoglucoside and the coumarins scopoletin and umbelliferone have been recorded in the family (Tronchet, 1966). In a previous survey of *Convolvulus* species Rizk (1982) and El-Nasr (1983) reported the presence of flavonoids, but did not identify the constituents. Some species of *Convolvulaceae* produce resin where glycosides from which D-glucose, D-rhamnose, D-fucose and D-quinovose have been isolated (Anthonsen *et al.*, 1976). The present report describes the leaf flavonoid patterns in a group of *Convolvulus* L., (Convolvulaceae) species from Morocco.

Materials and Methods

Dried leaves of each sample of plants given in Table 1 were crushed and extracted with 80% hot MeOH. The dried extracts were dissolved in 80% MeOH and run by 2DPC in BAW (*n*-butanol: acetic acid: water, 4:1:5) and 15% HOAC. The glycoside spots were examined in UV light and their position and colour reactions recorded before and after fuming with ammonia. R*f* values were recorded. In several cases, it was unclear whether spots in similar positions on different papers were in fact the same compounds. These were cut out, eluted and co-chromatographed two-dimensionally as above.

The remaining methanolic extracts were hydrolysed with 2 M HCl for 40 min., at 100°C. The flavonoid aglycones were extracted into EtOAc and the dried extracts re-dissolved in 100% MeOH, were run by TLC in BAW, CAW (chloroform:acetic acid:water, 30:15:2), Forestal (acetic acid:water:conc. HCl, 30:15:2) and 50% HOAc against the standard markers. The plates were examined in UV light before and after spraying with Diphenylboric acid ethanolamine ester (Naturstoffreagenz A, NA) in MeOH. The depth of the yellow obtained with NA indicated the B-ring hydroxylation pattern.

Plant Science Laboratories, The University of Reading, P.O. Box 221, White Knights, Reading, Berkshire, RG6 2AS, UK.

Table 1.Voucher specimens.

Taxa	Country	Herbaria	Collector and Number, or Date
C. althaeoides L.	Morocco	E	P. & J. Davis D.48232
		E	Davis 54328
C. elegantissimum Mill.	Morocco	E	Davis & King D.68339
		E	Davis 51224
C. arvensis L.	Morocco	E	Spence S. 74
C. cantabrica L.	Morocco	RNG	Davis 52575
C. dryadum Maire	Morocco	RNG	Jury 11467
		E	Davis 54878
C. gharbensis Batt & Pitard	Morocco	E	Jahandiez 19
C. humilis Jacq.	Morocco	E	Jahandiez 244
		E	Blanche et al. 9503
C. lineatus L.	Morocco	E	Alexander & Kupicha 381
C. mazicum Emb. & Maire	Morocco	RNG	Crane 37
C. pentapetaloides L.	Morocco	RNG	Davis 49978
C. pitardii Batt.	Morocco	E	Davis 557
		SEW	Devesa et al. 12. iv 1983
		SEW	Dapena et al. 3700/94
C. sabatius Viv. subsp. *sabatius*	Morocco	E	Jahandiez 308
C. sabatius subsp. *mauritanicus* (Boiss.) Murbeck	Morocco	E	Davis 54809
C. supinus Cossen & Kralik	Morocco	RNG	Romo et al. 6659
C. trabutianus Schweinf. & Muschler	Morocco	E	Davis 53565
C. tricolor L. subsp. *tricolor*	Morocco	E	Davis 51223
C. siculus L. subsp. *siculus*	Morocco	E	P. J. Davis D.48426
		E	Davis 53739
C. siculus subsp. *elongatus* Batt.		E	Davis D.48443
C. glaouorum Br-Bl. & Maire	Morocco	SEW	Aparicio et al. 22. 4. 1984
		E	Stocken 64/18
		SEW	Acchal et al. 4/88
C. valentinus Cav.	Morocco	E	Jahandiez 48
		E	51405

Identification of flavone and flavonol glycosides from *Convolvulus mazicum*

The flavonoid glycosides were separated from a direct methanolic leaf extract by multiple (20 -30 paper replicates) 2DPC on Whatman No. 3 paper. The flavonoid spots from each paper were cut out, combined and eluted with 80% MeOH and run on the TLC cellulose in BAW, CAW, 15% HOAc and H_2O to test which solvent gave the best separation. The flavonoids were further purified by PC on 3MM paper in suitable solvent. The pure compounds were identified by UV spectral analysis and acid hydrolysis to aglycone and sugar using standard procedures (Harborne, 1998).

Results and Discussion

The results of leaf flavonoid aglycone survey of 20 *Convolvulus* taxa are presented in Table 2. Quercetin was detected in all the taxa but kaempferol was found in two subspecies *C. sabatius* and in *C. siculus* subsp. *elongatus*. Isorhamnetin occurred in five taxa: *C. mazicum, C. trabutianus, C. tricolor* subsp. *tricolor, C. glaouorum* and *C. valentinus*. The hydroxycoumarin, cichoriin, was detected in five taxa: *C. elegantissimum, C. lineatus, C. pentapetaloides, C. trabutianus* and *C. siculus* subsp. *elongatus*.

Table 2. The distribution of flavonoid glycosides and cichoriin in 20 taxa of the genus *Convolvulus*.

Taxa	Kaempferol 3-mono-glycosides	Isorhamnetin 3-mono-glycosides	Quercetin 3-mono or di- glycosides	Luteolin 5-mono-glucoside	Cichoriin
C. althaeoides			+		
C. elegantissimum			+		+
C. arvensis	+		+		
C. cantabrica			+		
C. dryadum			+		
C. gharbensis			+		
C. humilus			+		
C. lineatus			+		+
C. mazicum		+	+	+	
C. pentapetaloides			+		+
C. pitardii			+		
C. sabatius subsp. *sabatius*	+		+		
C. sabatius subsp. *mauritanicus*	+		+		
C. supinus			+		
C. trabutianus		+	+		+
C. tricolor subsp. *tricolor*		+	+		
C. siculus subsp. *siculus*			+		
C. siculus subsp.*elongatus*	+		+		+
C. glaouorum		+	+		
C. valentinus		+	+		

The flavonoid aglycone data support the delimitation of some closely related taxa. For example, the classification of the two species *C. althaeoides* and *C. elagantissimum* has been problematic. These are separated by leaf morphology, in *C. elegantissimum* the uppermost leaf lobes reach to the midrib, whilst in *C. althaeoides* they do not. The results of the present survey support the separation of these two species in that *C. elegantissimum* has been shown to contain cichoriin in its leaf whilst *C. althaeoides* does not. Similarly, *C. cantabrica, C. valentinus* and *C. supinus,* have been separated from each other using morphological characters where there have been identification problems between *C. cantabrica* and *C. valentinus* and *C. valentinus* and *C. supinus*. However, the flavonoid aglycone data showed clear differences between these taxa. Thus, *C. supinus* contains only quercetin, *C. valentinus* quercetin and isorhamnetin and *C. cantabrica* quercetin and kaempferol glycosides. The other morphologically similar species are *C. lineatus* and *C. mazicum,* but the flavonoid data clearly distinguishes *C. mazicum* from *C. lineatus* and all the other *Convolvulus* species surveyed by the presence of the flavone, luteolin.

Among the subspecies surveyed, *C. sabatius* subsp. *sabatius* and *C. sabatius* subsp. *mauritanicus* showed no differences in their flavonoid aglycone patterns. However, *C. siculus* subsp. *siculus* and *C. siculus* subsp. *elongatus* are distinguished by the absence of kaempferol and cichoriin in the latter.

The flavonoid aglycone and the presence or absence of cichoriin do not always support the present morphological classification as in *C. dryadum* and *C. gharbensis,* which contain the same flavonoid aglycone, quercetin, although morphologically these two species are very different. *C. gharbensis* has 5 to 7 flowers in a terminal cluster whereas *C. dryadum,* a solitary flower which arises in the axil of a leaf.

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