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FLAVONOIDS OF PLANTS OF THE GENERA *Silene* AND *Otites*  
ADANS, FAMILY CARYOPHYLLACEAE

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UDC 615.32

We have studied the flavonoids of the epigeal parts of plants of the genera *Silene* L. and *Otites* collected in the flowering period. The flavonoid compounds were extracted from the plant material by 50% ethanol with heating on the water bath. The extracts were chromatographed on paper in various solvent systems [15% acetic acid; butan-1-ol-acetic acid-water (4:1:2); 0.1 N hydrochloric acid] before hydrolysis, after hydrolysis with 10% hydrochloric acid for 4 h, and after complete acid cleavage by Kiliani's method [1]. The chromatograms were examined in UV light before and after treatment with a solution of zirconyl nitrate, and also after treatment of the zirconyl complexes with ammonia vapor, which permitted a further differentiation of the colors obtained.

The individual compounds were isolated by chromatography on polyamide sorbent and "hydrocellulose," and also by preparative chromatography on "Filtrak" No. 3 paper. The flavonoid compounds were studied chemically and physically and by chromatographic methods. Interpretation of the UV spectra of the compounds permitted isomeric 6- and 8-C-monoglycosides of apigenin and luteolin to be distinguished on the basis the nature of the absorption of the zirconyl complexes. The following flavonoid compounds were identified: apigenin, luteolin, orientin, isoorientin, vitexin, saponaretin, isosaponarin, adonivernitol, homo-adonivernitol, vicinen and its rotational isomers, isoneovitexin, neovitexin, avroside, iso-avroside, neoavroside, and isoneoavroside. A chemotaxonomic study of a number of species of the genera *Silene* and *Otites* has been performed. As "markers" we used compounds obtained previously from representatives of the family Caryophyllaceae [2]. It was established that each of the plants contained several flavonoids belonging to the flavone group and having apigenin and luteolin as aglycones. The presence of vicinen and its rotational isomers [3], and also their mono-O- and di-O-glycosides, is characteristic for a number of plants. These compounds were found in the following species: *Silene commutata*, *S. macrostyla*, *S. foliosa*, *S. graminifolia*, *S. jenseensis*, *S. nutans*, *S. italica*, *S. wolgensis*, *S. cyri*, *S. boissieri*, *S. chlorantha*, *Otites dolichocarpa*, *O. artemisetorium*, *O. chersonensis*, *O. borysthenica*. In addition, the same plants contained vitexin, isovitexin, orientin and homoorientin, and also their 8- $\alpha$ , 6- $\alpha$ , and 6- $\beta$  isomers.

A second group consisted of species in which no vicinen was detected, although the other compounds mentioned above were present. Characteristic for these is the presence of isosaponarin, adonivernitol, and homo-adonivernitol. This group includes *S. compacta*, *S. armeria*, *S. bupleuroides*, *S. polaris*, *S. chlorifolia*, *S. cubanensis*, *S. cretacea*. Some plants (*S. multijida*, *S. brahuica*, *S. repens*, *S. supina*, *S. turgida*) contained only apigenin derivatives - saponaretin, and vitexin and their isomers, and also their mono-O- and di-O-glycoside. The flavonoid composition is characteristic for each plant and can serve as a species characteristic.

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FLAVONOIDS OF SOME SPECIES OF THE GENUS *Melandrium*

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The following plants of the family Caryophyllaceae have been investigated for the presence of flavonoid compounds: *Melandrium ovalifolium*, *M. viscosum*, *M. noctiflorum*, *M. firmum* and *M. silvestre*. We studied the epigeal part of the plants, collected in the flowering phase. The flavonoid compounds were extracted with 50% ethanol with heating on the water bath for an hour. The extract was chromatographed on paper in several solvent systems [1] 15% acetic acid; 2) butan-1-ol-acetic acid-water (4:1:5); 3) 60% acetic acid] before hydrolysis, after hydrolysis with 10% hydrochloric acid for 4 h, and after acid cleavage by Kiliani's method [1]. The chromatograms were treated with zirconium nitrate solution followed by treatment of the zirconyl complexes with ammonia vapor, which permitted a differentiation of the colors formed.

It was established that each of the plants mentioned contains several flavonoid compounds.

Before treatment with the zirconium nitrate solution, all the flavonoid spots fluoresced dark brown in UV light. After the treatment of the chromatogram with a chromogenic reagent, all the spots had a dull yellow color. After treatment of the chromatograms with ammonia vapor, the spots acquired colors ranging from light green to yellow-orange with very different transitional tinges due to the structures of the compounds.

Hydrolysis of the extracts with 10% hydrochloric acid did not lead to the production of the aglycones, as was confirmed by chromatography of the hydrolyzates in systems 2 and 3 with authentic samples of several aglycones and by Bryant's cyanidin reaction [2]. Chromatography of the products of acid cleavage in systems 1 and 2 with samples of C-monoglycosides isolated previously from the family Caryophyllaceae [3] showed that all the species investigated contained vitexin, isovitexin, orientin, homoorientin, and also their 8 $\alpha$ , 6 $\alpha$ , and 6 $\beta$  isomers. An exception was *M. viscosum*, in which no luteolin derivatives were found. The conclusion concerning the aglycone composition of the glycosides of the plants studied was confirmed by the results of Kiliani acid hydrolysis which gave as aglycones apigenin and luteolin, or only apigenin (in *M. viscosum*). In addition to the compounds mentioned, the species of plants studied included more polar compounds (system 1). Some of them were isolated by preparative methods and subjected to acid and enzymatic hydrolyses and also to chromatographic identification. This showed the presence in the plants of isosaponarin (*M. ovalifolium*), cachimoside (*M. firmum*), and luteolin di- and triglycosides (*M. ovalifolium*, *M. silvaticum*, *M. noctiflorum*). Each plant differed from the others by its set of glycosides, which may serve as a chemotaxonomic characteristic for the species. The study of plants of the genus *Melandrium* is continuing.

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