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PHYTOECDYSTEROIDS FROM *Serratula centauroides*

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In continuation of the study of phytoecdysteroids from species of the *Serratula* L. genus, we investigated the distribution of 20-hydroxyecdysone (**1**), integristerone A (**2**), 2-deoxy-20-hydroxyecdysone (**3**), and α-ecdysone (**4**) in the aerial and subterrean organs of *S. centauroides* L. collected during budding in 2003 near Chita (Titov volcano) in Chita district.

S. centauroides is a perennial herbaceous plant from the Asteraceae family with a straight branched stem up to 70 cm in height and with pinnatisect leaves and a few anthodia (each up to 2 cm in diameter). It grows on open steppes or rocky slopes, less commonly in fields. It is cultivated in middle and eastern Siberia and in northern Mongolia. In the Far East, it is found only in western Amur district (Ignashino village).

Leaves of *S. centauroides* were found previously to contain **1** and viticosterone E [1]. Data on the content of other ecdysteroids in this species have not been reported. Extraction of the plant material, preparation of samples, and determination of the content of phytoecdysteroids were carried out as previously described [2]. Phytoecdysteroids were identified by GC—MS using chemical ionization at atmospheric pressure and HPLC—UV [2].

We established for the first time the presence of **2** and **3** in the vegetative and generative organs of *S. centauroides*. Compound **4** was not detected in its aerial and subterrean organs.

Table 1 lists the contents of **1**-**3** in various organs of *S. centauroides*.

The distribution of **1** and **3** in *S. centauroides* is uneven, typical of most *Serratula* species [3, 4]. The content of **1** in aerial organs varies from 4.51 to 16.92 μg/mg. This is about 10-40 times greater than in the subterrean organs. The content of **1** is maximum in leaves; slightly less in stems and inflorescences.

We compared the results for the content of **1** in *S. centauroides* with previous ones [5] for the most promising *S. coronata* L. The content of **1** in leaves of *S. centauroides* (1.69%) does not differ noticeably from that of *S. coronata* (1.70%). The content in the upper stem parts and inflorescences of *S. centauroides* is approximately 1.5-2 times greater than in those of *S. coronata*. The results indicate that *S. centauroides* can be considered a promising source of **1**.

Compound **2** is more evenly distributed among the organs of *S. centauroides*. The aerial part contains from 0.1 to 0.25 μg/mg. This is 1.5-3 times greater than in the rhizomes (0.08 μg/mg). Its content is maximum in leaves and slightly less in stems and inflorescences.

Compound **3** varies in the aerial organs from 1.05 to 3.16 μg/mg. This is about 20-60 times greater than its content in rhizomes. Its content is maximum in the upper stem part.

We used 20-hydroxyecdysone that was prepared as described earlier [6], 2-deoxy-20-hydroxyecdysone and α-ecdysone from Sigma (USA), and integristerone A (Institute of Petrochemistry and Catalysis, Academy of Sciences of the Republic of Bashkortostan and Ufa Scientific Center, Russian Academy of Sciences, Ufa) as standards.

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TABLE 1. Content of 20-Hydroxyecdysone (**1**), Integristerone A (**2**), and 2-Deoxy-20-hydroxyecdysone (**3**) in Various Parts of *Serratula centauroides*

Plant organ	Content, μg/mg		
	1	**2**	**3**
Root	0.45±0.02	0.08±0.01	0.05±0.01
Leaf:			
radical	10.74±0.54	0.20±0.01	2.07±0.10
lower stem	16.92±0.98	0.25±0.01	2.87±0.14
middle stem	16.82±0.84	0.16±0.01	2.42±0.12
upper stem	13.39±0.67	0.17±0.01	1.99±0.10
young radical	8.79±0.44	0.18±0.01	1.05±0.05
Stem			
lower part	4.51±0.22	0.13±0.01	1.05±0.05
middle part	6.89±0.34	0.10±0.01	1.33±0.07
upper part	14.16±0.71	0.17±0.01	3.16±0.16
secondary	10.86±0.54	0.13±0.01	2.02±0.10
Inflorescence	6.49±0.32	0.12±0.01	1.06±0.05

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