FLAVONOIDS FROM *Senecio viscosus*

E. M. Suleimenov,[1*] R. A. Jose,[2] S. B. Rakhmadieva,[1] W. De Borggraeve,[2] and W. Dehaen[2]

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Raw material of *Senecio viscosus* L. (Compositae) first yielded the pyrrolizidine alkaloid senecionine in 0.06–0.075% yield [1] and then the alkaloids squalidine and S-F were isolated by chromatography and their structures were elucidated [2].

We established the component composition of the aerial part of *S. viscosus* collected in the National Park near Bayanaul Pavlodar Oblast′ of the Republic of Kazakhstan at the beginning of August 2007.

The $CHCl_3$ extract of the finely ground aerial part of *S. viscosus* was separated by column chromatography over silica gel with elution by heptane:EtOAc (7:3) to isolate β-sitosterol (**1**), which was identified by mass spectral and PMR data. Further elution isolated **2** as yellow crystals, mp 164–168°C. Its molecular formula $C_{18}H_{16}O_7$ was proved by high-resolution mass spectrometry by production of an ion $[M]^+$ with *m*/*z* 344.08929. The UV spectrum showed strong absorption maxima at 253 and 355 nm that were indicative of conjugated chromophores.

According to PMR and ^{13}C NMR data (Table 1), **2** was identified as 5,4′-dihydroxy-3,3′,7-trimethoxyflavone (or 3,3′,7-trimethyl ether of quercetin, pachypodol), which was isolated earlier from *S. viscosissimus* [3], *Artemisia heptapotamica* Poljak [4], *A. annua* L. [5], *Plectranthus cylindraceus* [6], *Varthemia iphionoides* Boiss. [7], and others.

TABLE 1. ^1H and ^{13}C Spectral Data for **2** and **3** (DMSO-d_6, δ, ppm, J/Hz)

C atom	**2**		**3**	
	δ_H	δ_C	δ_H	δ_C
2	–	156.20	–	164.33
3	–	138.40	6.94 s	103.84
4	–	178.49	–	182.36
5	–	161.36	–	161.50
6	6.34 (d, J = 1.83)	98.21	6.37 (d, J = 2.3)	98.46
7	–	165.56	–	165.49
8	6.73 (d, J = 1.83)	92.83	6.80 (d, J = 2.3)	93.18
9	–	156.71	–	157.60
10	–	105.62	–	105.02
1′	–	121.15	–	121.72
2′	7.65 d	112.51	7.58 (d, J = 2.2)	110.73
3′	–	147.94	–	148.40
4′	–	150.37	–	151.23
5′	6.96 (d, J = 8.22)	116.10	6.94 (d, J = 8.4)	116.23
6′	7.62 (dd, J = 8.22; 2.1)	122.77	7.59 (dd, J = 8.4; 2.2)	120.95
5-OH	12.66 s	–	12.97 s	–
4′-OH	9.97 s	–	9.98 s	–
3-OMe	3.81 s	60.14	–	–
3′-OMe	3.87 s	56.52	3.87 s	56.53
7-OMe	3.85 s	56.22	3.90 s	56.53

1) L. N. Humilev Eurasian National University, 010008, Astana, Munaitpasov, 5, Republic of Kazakhstan, fax: +7 (7172) 35 98 72, e-mail: syerlan75@yandex.ru; 2) Department of Chemistry, Katholieke Universiteit Leuven, Celestijnenlaan 200F, 3001 Leuven, Belgium, fax: +32 16 32 79 90, e-mail: wim.dehaen@chem.kuleuven.be. Translated from Khimiya Prirodnykh Soedinenii, No. 5, pp. 612–613, September–October, 2009. Original article submitted March 29, 2009.

Further elution by heptane:EtOAc (1:100) isolated **3** as yellow crystals, mp 233–235°C. Its molecular formula $C_{17}H_{14}O_6$ was confirmed by production of a peak $[M]^+$ with *m*/*z* 314.08007. The UV spectrum showed strong absorption maxima at 249 (sh), 250, 254, and 350 nm, which indicated the presence of conjugated chromophores.

According to PMR and ^{13}C NMR data (Table 1), **3** was identified as 5,4′-dihydroxy-7,3′-dimethoxyflavone (velutin), which was isolated earlier from *Artemisia gmelinii* Weber. ex Stechm. [8], *Lethedon tannaensis* [9], *Zygogynum pausiflorum* [10], and others.

Resonances in ^{13}C NMR spectra were refined and functional hydroxyls and methoxyls of **2** and **3** were located using 2D DEPT, HSQC, COSY, and HMBC spectra.

Compounds **2** and **3** were isolated from *S. viscosus* for the first time.

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