Chemistry of Natural Compounds, Vol. 48, No. 3, July, 2012 [Russian original No. 3, May–June, 2012]

ANALYSIS OF STEROL COMPOUNDS FROM *Sambucus ebulus*

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UDC 547.918

Sambucus ebulus L. (Caprifoliaceae) is a species native to Europe, southwestern Asia, and northwestern Africa. Plants from *Sambucus* genus are known in folk medicine for their health benefits, especially *Sambucus nigra* L., which has been used in different studies.[1–3].

Sambucus ebulus L. is mentioned in Romanian folk medicine in the treatment of rheumatic pain or cold. Leaves are applied externally to treat wounds, inflammations, and burns. Roots are used in diets for their laxative and diuretic properties. Roots are also a potent appetite supressant. The anti-inflammatory effect of *Sambucus ebulus* L. has been reported [4, 5] and the wound healing potential has been studied [6], but in the specialty papers there are very little data on the chemical composition of this plant.

Phytosterols are present in plant cells as important components of membranes [7]. Campesterol and stigmasterol are the most abundant phytosterols in nature, and a large number of oxidation products can be produced from them [8]. Stigmasterol was evaluated for its thyroid inhibitory, antiperoxidative, and hypoglycemic effects [9]. Recent researches indicated the use of this sterol for the prevention of various types of cancers.

Both campesterol and stigmasterol inhibit intestinal cholesterol absorption, and, for this reason, the National Cholesterol Education Program Adult Treatment Panel III guidelines recommend sterol-containing vegetal food as one of the lifestyle changes to lower cardiovascular risk [10].

Brassicasterol is a sterol found in certain plants and other foods such as seafood and is found in high concentrations in brassica, also known as rapeseed oil.

All three sterols are components of dietary supplements (CardioChol, CholestSafe) that support cardiovascular function and maintenance of cholesterol levels within normal ranges.

Determination of each compound was based on a combination of retention time and spectral matching.

Because in the ionization conditions all sterols lose a molecule of water, ions detected by the spectrometer are always of the form $[M - H_2O + H]^+$. Quantitative determination of the three phytosterols was done using the external standard method.

Chromatographic characteristics for the five samples studied are shown in Table 1.

From the analysis of results, it is shown that the dominant sterols from *Sambucus ebulus* L. are campesterol and brassicasterol. Those are found in considerable quantities, especially campesterol, found in greater amounts than brassicasterol, which is less common in the vegetal world. The flowers are richest in campesterol, where it is present at a concentration of 136 mg%, followed by strains containing 109.411 mg%.

Stigmasterol, which was found only in the leaves of this plant in high concentration (132.748 mg %), inhibit several pro-inflammatory and matrix degradation mediators typically involved in osteoarthritis [11], and this may be related to the anti-inflammatory properties of *Sambucus ebulus* L. leaves.

The HPLC profile of the methanol extracts of *Sambucus ebulus* L. detected at 230 nm revealed three sterols known to have beneficial anti-inflammatory, antibacterial, and anticholesterol properties. For the first time, the analysis of sterol compounds of the *Sambucus ebulus* autochtonous species has been achieved using HPLC-MS. Campesterol, brassicasterol, and stigmasterol were for the first time identified and quantified in *Sambucus ebulus* L., which have not yet been reported in the specialty literature. The concentrations of sterols in the analyzed plant are relatively large, and it can be considered a rich source of phytosterols.

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 0009-3130/12/4803-0520

TABLE 1. Results of HPLC Analysis of the *Sambucus ebulus* Samples

Phytosterol	Retention time, min	Peak area, mAu × min	Peak height, mAu	Concentration, mg %
		Flos		
Brassicasterol	3.59	174.09	886.88	29.222
Campesterol	4.18	965.29	2691.67	136.310
		Folium		
Brassicasterol	3.63	73.98	394.13	12.418
Stigmasterol	4.46	163.05	952.64	132.748
		Cauli		
Campesterol	4.21	755.37	2787.99	109.411
		Radicis		
Campesterol	4.20	674.08	2771.32	95.118
		Fructus		
Brassicasterol	3.31	221.80	478.27	37.230
Campesterol	4.19	568.67	2699.82	80.244

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