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# DETERMINATION OF VITAMINS B COMPLEX IN *SERRATULA CENTAUROIDES* L.

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## ABSTRACT

Vitamins B complex has been found in various parts of *Serratula centauroides* (L.), which grow on the territory of Republic of Buryatia. The influence of mechanoactivated disintegration on the yield of vitamins B complex was investigated in the aerial part of the plant.

**KEYWORDS:** *Serratula centauroides* L.; vitamins B complex; mechanoactivated disintegration

## 1. INTRODUCTION

*Serratula centauroides* L., *Asteraceae (Asteraceae)* genus, is widespread in Europe, the Caucasus, the Far East, Western and Eastern Siberia, Mongolia.[1,2,3,4] *S. centauroides* L. belongs to the perspective adaptogenic agents, that is primarily due to the significant content of ecdysteroids (ecdysterone and vikotesteron E).[2,3,5,6,7,8] *Serratula coronata* L. is used as an adaptogenic remedy, on the base of which a medical product *"Serpistenum"* with adaptogenic activity has been developed.[8] Preliminary chemical researches of extracts from aerial and underground parts of *S. centauroides* showed the presence of a complex of biologically active substances - ecdysteroids, flavonoids , polysaccharides, tannins, saponins of triterpenoid type, aminoacids; carotenoids are found only in extracts from the aerial parts of the plants. [7] Vorobjeva A.N. *et al*. (2006) studied the dynamics of ecdysterone content, depending on the part and the stage of the plant development from 0.045 to 1.7 % in *S. centauroides* L. [6] We identified fatty acids, phytosterols and hydroxyacids in the aerial and underground parts of *S. centauroides.* [9] Currently the methods of increasing the yield of biologically active

substances from plant material are being searching, in this regard the mechanoactivation of plant materials, which increases the yield, is of concern.[10]

**The aim** of this research is the discovery of vitamins B complex in various parts of *S. centauroides* and the studying of the effect of mechanoactivated disintegration on the yield of vitamins B complex in aerial part.

## 1. MATERIALS AND METHODS

The objects of the study were the aerial part, collected in a flowering stage, and underground parts of *S. centauroides*, harvested in the period of withering of aerial parts in Ivolginsky district, Republic of Buryatia (2015). The aerial part was divided into two samples; first sample and underground parts of *S. centauroides* were disintegrated in a standard way (particle size - 1 mm) using a rotary mill RM25, particle size 1-3 mm (rotation 3000 rev / min); the second sample of the aerial part of *S. centauroides* was disintegrated using mechanic activation (particle size from 10 to 100 microns) in a centrifugal grass mill TM3 (the development of the Institute of chemistry of solids and mechanochemistry SB RAS, Novosibirsk). Sample of the aerial part of *S. centauroides*, disintegrated in a standard way, is a volume, light plant material with a specific smell, consisting of particles from green to dark greencolour with pale yellow granuls. Mechanoactivated disintegrated sample is dense light-green powder with specific odor: various shaped pieces of the roots, from yellowish-white to dark brown colour, with pale yellow granules and specific odor.

Quantification of vitamins B complex was determined by capillary zone electrophoresis using a capillary electrophoresis system "CAPEL - 105 / 105M" according to the method developed by the group " Lumex " companies , M 04-72-2011. The method of measuring content of free forms of water-soluble vitamins in premixes, vitamin concentrations, mixtures and additives, including liquid.[11] This method is based on the extraction of free forms of water-soluble vitamins from samples, their separation, identification and determination of mass concentrations of vitamins using capillary electrophoresis method.

We used capillary $L_{eff}$ / $L_{gen}$ = 65/75, inner diameter - 50 mm ; voltage - 25 kV; polarity - positive; sample input - 600mbar*s; temperature - 30 ºC; borate buffer with pH 8,9; sample volume - 50 microliters. Detection of vitamins was carried out by their own absorbance at wavelengths of 200 nm and 267 nm using software switching of wavelengths.[11,12] Determination method: about 0.1 g of ground raw material (accurately weighed quantity) was

put in a dark glass vial, 10 ml of solution were added for vitamins extraction, which consisted of purified water and alcohol mixture (5 h: 20 h). For the preparationof alcohol mixture in a volumetric flask of 100 ml, 1.0 g of boric acid, 0.72 g of dihydrateoxalic acid, 1.0 ml of pyridine were placed and thorough lymixed, then made up to volume with 96% ethyl alcohol. The sample vial was heated in a boiling water bath for 5 minutes, after cooling, the extract was centrifuged in a tube Epindorf type for 5 minutes at a rotation speed of 5000 r / min, and the supernatant was transferred into a hermetically closing vial. In a tube Epindorf type 0.5 ml of the resulting solution was collected and 0.5 ml of water was added, thoroughly mixed and then water-soluble vitamins were determined using capillary electrophoresis CAPEL - 105 / 105M.

## 2. RESULTS AND DISCUSSION

In the aerial part of *S. centauroides* thiamine, riboflavin, pantothenic acid, nicotinic acid, pyridoxine and folic acid were found, and in underground parts - thiamine, riboflavin and pyridoxine (Table 1.). The study has found that the aerial part contains a significant amount of nicotinic acid, pantothenic acid, riboflavin, and underground part -riboflavin. Mechanoactivated disintegration of aerial part of *S. centauroides* increases the yield of all detected vitamins. The content of pantothenic acid is increased almost 8 times, pyridoxine - 4 times, thiamine and nicotinic acid - 2 times, and extraction of riboflavin and folic acid - about 1.5 times. Thus, the aerial part of *S. centruroides* contains thiamine, riboflavin, nicotinic acid, pantothenic acid, pyridoxine, folicacid, and underground part - thiamine, riboflavin and folic acid. Mechanoactivated disintegration of the aerial part of *S. centauroides* significantly contributes to the extraction of vitamins B complex.

**Table 1 The results of the quantitative analysis of Vitamins B complex**

| Vitamins | Content*, ppm | | |
|---|---|---|---|
| | Aerial part | | Underground part (standard disintergration) |
| | Standard disintergration | Mechanoactivated disintergration | |
| Thiamine ($B_1$) | 19,7 | 53,5 | 8,2 |
| Riboflavin ($B_2$) | 189,5 | 263,8 | 123,9 |
| Pantothenic acid ($B_3$) | 179,6 | 1383,1 | - |
| Nicotinic acid ($B_5$) | 273,0 | 575,6 | - |
| Pyridoxine ($B_6$) | 56,2 | 210,9 | - |
| Folic acid($B_c$) | 34,8 | 44,7 | 12,8 |

Note: * - average of 3 samples

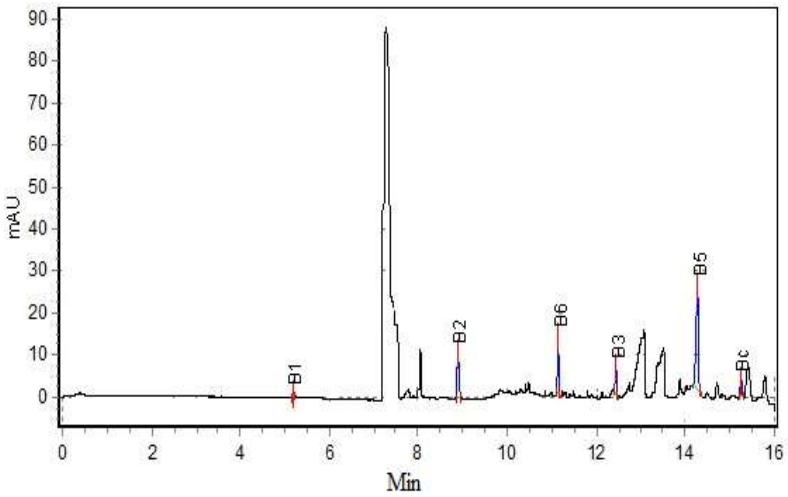


**Fig 1. Electrophoregram of the extract from the aerial part of *Serratula centauroides L.*, using standard method**

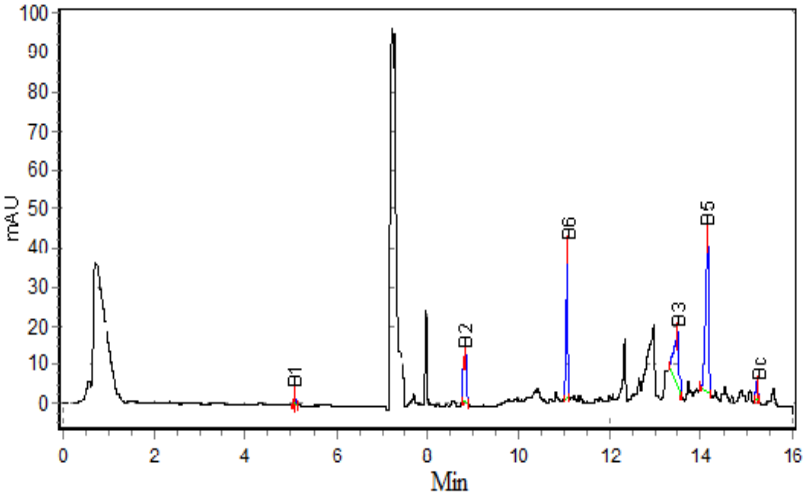


**Fig 2. Electrophoregram of the extract from the aerial part of *Serratula centauroides L.*, using mechanoactivated method**

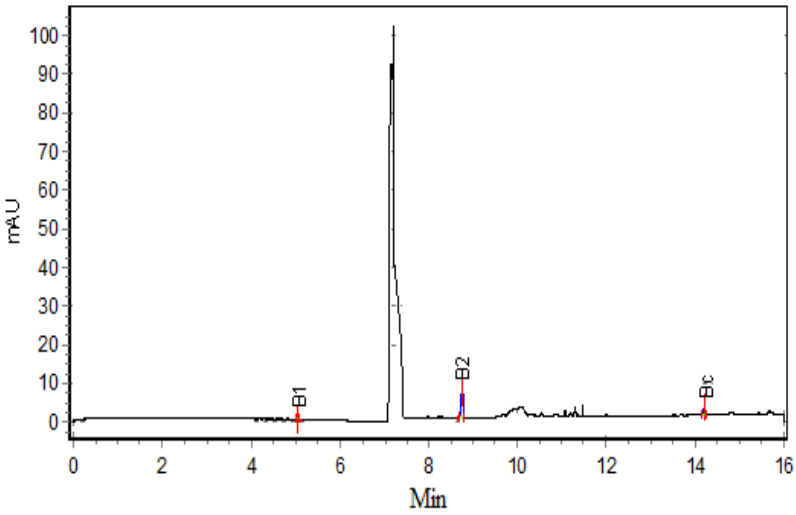


**Fig 3. Electrophoregram of the extract from the underground part of *Serratula centauroides L.*, using standard method**

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