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Seasonal variations of biologically active compounds in Eleuthero (*Eleutherococcus senticosus* /Rupr. et Maxim./ Maxim.)

INTRODUCTION

Eleuthero (*Eleutherococcus senticosus* /Rupr. et Maxim./ Maxim.) is a thorny shrub belonging to Araliaceae family, native to Far Eastern Asia [1]. It grows in China, Russia, Japan and Korea, at the edges of deciduous forests where it forms thick brushwood [2]. Underground organs (rhizomes with roots), leaves and shoots of these plant has been used in traditional Chinese medicine for over 2000 years [1,2]. Nowadays, Eleuthero underground organs are used in western medicine as a pharmacopoeial drug with adaptogenic activity [3, 4]. Its stimulant and tonic effects are considered to be even stronger than true ginseng's [2, 4]. Extracts from these plant stimulate immune system, improve mental activity and physical capacity. They also reveal radioprotective and anti-ulcer effects and are used during chemotherapy as an agent stimulating body regeneration [2-6]. Biologically active compounds of this plant responsible for pharmacological activity, named eleutherosides, belong to different chemical groups such as lignans, phenylpropanoids, coumarins and sterols. The most pharmacologically active seems to be eleutheroside B (syringin) and eleutheroside E (syringaresinol-4,4-O-β-D-diglucoside) [4, 6, 7].

The aim of undertaken investigation was to determine seasonal variation of biologically active compounds content and composition in the underground organs and in the stem bark of Eleuthero cultivation in Poland, during four years of plant vegetation.

MATERIAL AND METHODS

The objects of investigation were plants of Eleuthero population originated from Vladivostok region (Picture 1, 2). Stem-root cuttings were used as a plant material to establish field experiment carried out at the experimental fields of Department of Vegetable and Medicinal Plants, WULS-SGGW. The stem-root cuttings were planted in spring 2004 and 2005 at 75 × 75 cm distance. For chemical evaluation two-, three-, and four-year-old plant material (rhizomes with roots and stem bark) was collected successively three times during vegetation period i.e. at the early spring (April-IV), plant blooming (June-VI) and late autumn (November-XI) (Picture 3-5). The biologically active compound were determined by HPLC using the Shimadzu chromatograph with DAD detector. Luna 5µm C18 (2) 250 × 4.6 mm column was applied.

The results were analyzed statistically with Stargraphics Plus, version 4.1. The differences between the means were compared with the Tukey's HSD test.

Picture 1. 4-year-old plants at the stage of blooming

Picture 3. Eleuthero underground organs

Picture 2. 4-year-old plant at the beginning of vegetation (April-IV)

Picture 4. Crashed and cut raw material – underground organs

Picture 5. Stems and stem bark

RESULTS

During three years of plant vegetation the mass of Eleuthero underground organs doubled from 132.38 in the second year to 312.61g in fourth year, whereas the mass of stem bark increased only slightly (Figure 1). Irrespective of plant age, the content of eleutherosides B, E and E1, the most important compounds of Eleuthero, decreased from early spring to full blooming and then increased at the end of vegetation both in underground organs and in the stem bark. When comparing the underground organs harvested in late autumn, the content of above mentioned eleutherosides in two-years-old plants was almost two times lower in comparison with four-year-old plants. Irrespectively of the time of harvest and plant age the content of eleutheroside B was distinctly higher in the stem bark than in the underground organs whereas the content of eleutheroside E was higher in the underground organs (Table 1). In the investigated raw materials five phenolic acids, namely rosmarinic, protocatechuic, chlorogenic, caffeic and ferulic were identified as well (Table 1).

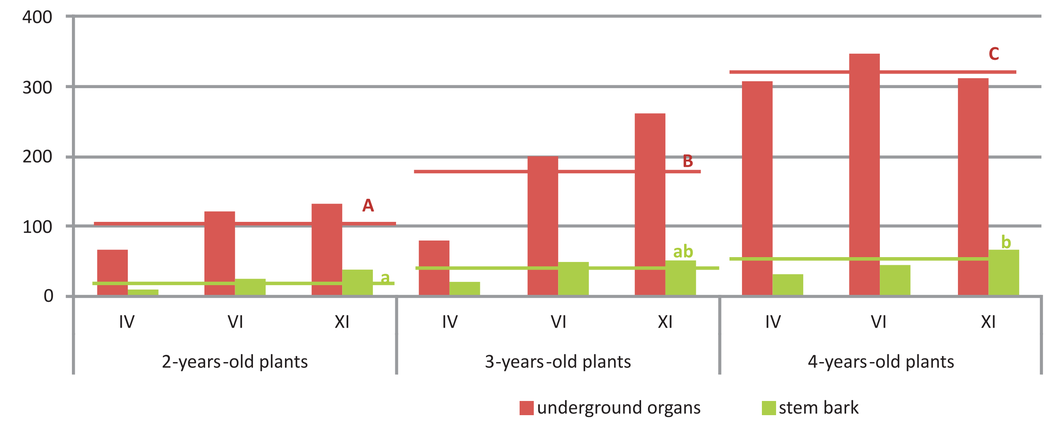

Figure 1. Air dry mass increase of underground organs and stem bark during 3 years of plant vegetation (g × plant $^{-1}$)

Means followed by the same letters are not significantly different according to the Tukey's test for α=0.05

Table 1. Accumulation of biologically active compounds in Eleuthero underground organs and stem bark (mg × 100^{-1} d.m.)

CONCLUSIONS

1. **The raw materials collected from Eleuthero cultivated in Poland might be a rich source of biologically active compounds.**
2. **The content of eleutherosides in underground organs and stem bark depends on the time of harvest and is the highest at the period of plant dormancy.**
3. **Eleutheroside B accumulation is distinctly higher in the stem bark whereas eleutheroside E in the underground organs.**
4. **Both undrground organs and stem bark are also rich in phenolic acid, specially in chlorogenic and rosmarinic acids.**

LITERATURE

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