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## **Title**

Biennial plant *Cirsium vulgare* savi Ten. comparison of chemical composition and antioxidant activity during two years grow

## **Abstract, word count limits (min: 200, max: 300) (please note that submission authors are defined separately in next step)**

*Cirsium vulgare* is a biennial plant from a family of Asteraceae. Scientists studied other species of the *Cirsium* found that these plants accumulate large amounts of phenolic compounds and amino acids. Essential amino acids are important for all life forms, it is also known, that phenolic compounds often have particularly good antioxidant properties, so it was important to investigate this as well. The main goal of our research was to investigate how chemical composition of the plant and antioxidant activity differs in different phenological stages of the plant through the year.

The HPLC method was used for the determination of phenolic compounds in the ethanolic extracts of the first and second year raw material. Quantitative determination of amino acids was performed using the GC-MS method using derivatization with MTBSTFA. The antioxidant effect was determined using CUPRAC method.

After carrying out a two-year quantitative determination of the active compounds from ethanolic extracts of *Cirsium vulgare* leaves, flowers and roots, it was found that the highest yields were detected of chlorogenic acid and apigenin-7-O-glucoside. The highest yields of chlorogenic acid were found in extracts made from the leaves. In the raw material of the first year, higher yields were determined of chlorogenic acids during the mass flowering, in the second year - phenological stage - the end of plant rest. The yield of apigenin-7-O-glucoside was found to be the highest in extracts of the leaves than other parts of the plant. Quantitative composition of amino acids in the flowers of the plant had the highest diversity and the highest yields of amino acids, compared to the extracts made from other parts. During the antioxidant test, it was found that the raw material, which was collected at the dormant period, had an exceptionally higher antioxidant activity.

## **Keywords (use semicolon to separate multiple keywords)**

*Cirsium vulgare*; biennial plant; phenolic compounds; antioxidant activity