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THE STUDY OF THE MINERAL CONTENT IN THE PLANT CENTAUREA CYANUS L. WITH THE ISP-OES METHOD

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Annotation
In this article, Centaurea cyanus L. the amount of macro- and microelements in the morphological parts of the plant, namely in the leaf, flower and stem, was studied using inductively coupled plasma optical emission spectrometry.

Keywords: Centaurea cyanus, morphological parts of the plant, macronutrients, trace elements, toxic elements, optical emission spectroscopy with inductively coupled plasma.

Introduction

Centauréa cyánus is mainly one or two—year-old plants, a species of the Cornflower genus of the Asteraceae or compound-flowered family. 566 species belonging to 121 genera have been found in Uzbekistan. Species of the large golden millet grow on lands along the banks of rivers and streams in Tashkent, Syrdarya, Jizzakh, Samarkand, Ferghana, Bukhara regions.

The height of the cornflower is from 30 to 80 centimeters. The stem is thin, pubescent and branched. Flower baskets are 2-3 centimeters in diameter.

Cornflower flowers are used in the form of an infusion or decoction as a mild diuretic, laxative, choleretic, anti-inflammatory, disinfectant, diaphoretic, antipyretic.

Cornflower flowers contain anthocyanin glycosides (cyanidin and pelargonidin diclucosides), flavone glycosides (apigenin, luteolin derivatives), flavonols (quercetin glucoside, 3-methyl kaempferol, rutin, cycornin), vitamin C, carotene, tannins, essential oil, mucus, polyacetylene compounds, macro- and microelements.

Accumulates copper, selenium and zinc [1]. The biological activity of cornflower flowers is associated with a complex of biologically active substances of a phenolic nature [2]. In the aboveground part of the blue cornflower, which is many times larger than funnel-shaped flowers, a wide range of biologically active substances has been found, which indicates the possibility of recommending it also as a new medicinal plant raw material [3].

If the aboveground parts of the Centaurea cyanus L plant: flower, stem, leaf are used in folk medicine to prevent various diseases, one of the important issues is to determine whether the macro- and microelements contained in them meet the criteria and ensure their safety for human health [4].

The aim of the study is to determine the mineral composition of the morphological parts of Centaurea cyanus L. by the ISP-OES method and consists in comparing them with each other.

Materials and Methods

The morphological parts (stems, flowers and leaves) of the plant Centaurea cyanus L. (cornflower blue), growing in the Uchkuprik district of the Fergana region, were selected as the object of the study.

Reagents: nitric acid, hydrogen peroxide, a multi-element solution.

Equipment: analytical weight (FA220 4N), drying cabinet (VWR DRY-line, Germany); mineralization device (MILESTONE Ethos Easy, Italy); determination of the qualitative composition and quantitative content of macro- and microelements in the aboveground part of cornflower blue was carried out by optical emission spectroscopy with inductively coupled plasma Avio 200 ISP - OES (Perkin Elmer, USA).

To prepare the diluting solution, 250 ml of purified water, 50 ml of concentrated nitric acid and 10 ml of hydrogen peroxide solution with a volume fraction of 30% were mixed in a 500 ml flask. Purified water was added to bring the volume of the solution to 500 ml. The flask was closed and stirred[5].

For preparation, the standard solution was placed in a 100 ml volumetric flask with a capacity of 1.0 ml of a multi-element solution (10 micrograms/ml). The volume of the solution was adjusted to 100 ml with a diluting solution and mixed well [6].

For analysis: The leaves, stems and flowers of Centaurea cyanus L. were initially dried in a drying cabinet. Dried samples of cornflower blue were crushed to particles less than 1 mm in size. Three identical sample samples weighing 200 ±5 mg were carefully weighed in an analytical balance and placed in a 50 ml quartz vessel resistant to high pressure. The samples were mineralized to remove volatile

substances. A MILESTONE Ethos Easy mineralization device, Italy, was used to mineralize stems, flowers and leaves. To do this, 6 ml of concentrated nitric acid and 2 ml of hydrogen peroxide solution with a volume fraction of 30% were added to the sample using a graduated pipette. The lid of the container was closed. The mixture was mineralized at 1800C for 20 minutes. After mineralization, the sample was cooled at room temperature, 20 ml of demonized water was added to the mineralized solution, the outer walls of the container were rinsed and tightly closed with a lid. They were filtered through filter paper, placed in a measuring flask with a capacity of 50 ml and diluted to the required volume with distilled water [7, 8].

The samples were analyzed using an optical emission spectrometer with inductively coupled plasma Avio 200 ISP - OES (Perkin Elmer, USA).

Results and their discussions: The Avio 200 ISP - OES made it possible to measure 30 different elements in solution with high accuracy during the study. The result is shown in Table 1.

Table.1 **The number of macronutrients in the morphological parts of Centaurea cyanus (mcg/g)**

Elements	Leaves	Stems	Flowers	Elements	Leaves	Stems	Flowers
Li	0,24	0,066	0,17	Ni	4,756	1,71	3,485
B	13,52	7,12	17,47	Cu	26,74	14,7	16,85
Na	820,5	845,7	603,8	Zn	89,647	93,8	74,375
Mg	2358,6	1594,6	2260,1	As	0,058	0,06	0,045
Al	330,5	76,8	243,5	Se	0,15	0,2	0,078
P	3452,7	3201,4	2910,4	Sr	13,7	14,5	8,25
S	928,4	784,1	657,8	Mo	1,27	0,3	0,584
K	9874,2	19288,4	28844,1	Ag	0,02	0,02	0,011
Ti	14,8	4,3	13,4	Cd	0,235	0,38	0,112
Ca	6075,4	2734,3	6347,0	Sn	0,94	0,75	0,687
V	0,347	0,3	0,395	Sb	0,05	0,04	0,02
Cr	1,348	1,48	1,574	Te	0.0006	0.0006	0.0005
Mn	36,54	18,24	24,75	Ba	5,684	9,8	2,79
Fe	305,2	79,5	261,3	Hg	0,001	0,001	0,001
Co	0,28	0,12	0,21	Pb	0,002	0,001	0,001

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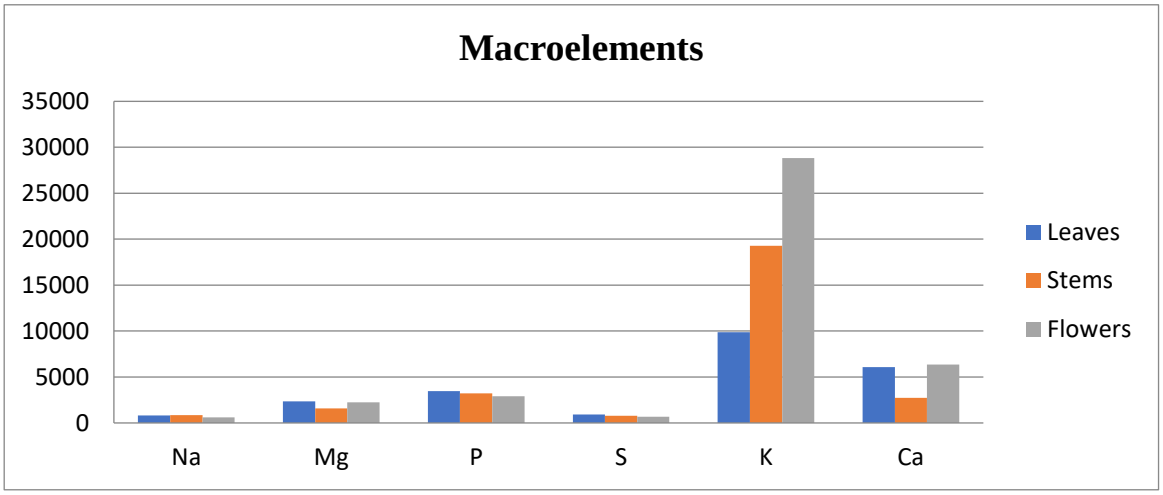

Figure 1. Diagram of macronutrients in morphological parts of Centaurea cyanus l.

The analysis of the elemental composition of the studied samples showed the presence of 30 elements, which can be conditionally divided into 3 large groups: macronutrients, trace elements and toxic elements. The number of macronutrients in the morphological parts of Centaurea cyanus increased in the following order: in the leaf Na<S<Mg<P<Ca<K; in the stem S<Na<Mg<Ca<P<K; in the flower Na<S<Mg<P<Ca<K. A comparative analysis of the content of macronutrients in the studied samples found that the largest amount is characteristic of the elements potassium and calcium. The largest amount of potassium (28,844.1 mcg/g) and the smallest amount of sodium (603.8 mcg/g) were found in the flower Centaurea cyanus. The number of other macronutrients in the morphological parts is close to each other (Fig. 1).

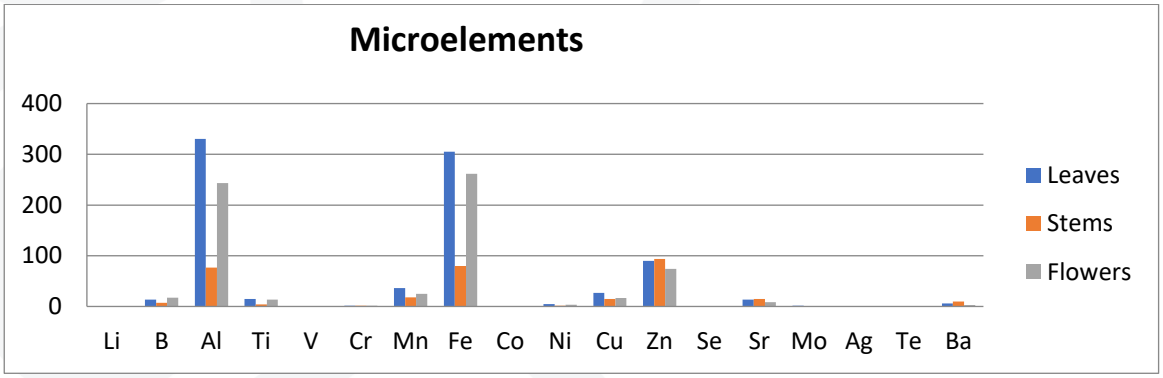

Figure 2. Diagram of micronutrients in morphological parts of Centaurea cyanus l.

The amount of 18 trace elements in the morphological parts of Centaurea cyanus was determined. According to the results, their number increased in the following order: in the sheet Te<Ag<Se<Li<Co<V<Mo<Cr<Ni<Ba<B<Sr< Ti<Cu<Mn<Zn<Fe<Al; in the stem Te<Ag<Li<Co<Se<V=Mo<Cr<Ni<Ti<B<Ba <Sr<Cu<Mn<Al<Fe<Zn; in the flower Te<Ag<Se<Li<Co<V<Mo<Cr<Ba<Ni <Sr<Ti<Cu<B<Mn<Zn<Al<Fe.

A comparative analysis of the amount of trace elements in the studied samples revealed that aluminum and iron have a high concentration in leaves and flowers. In addition, the content of the elements copper, zinc and manganese has a high concentration in the samples. Manganese and magnesium have a positive effect on the functioning of the nervous system (Fig. 2).

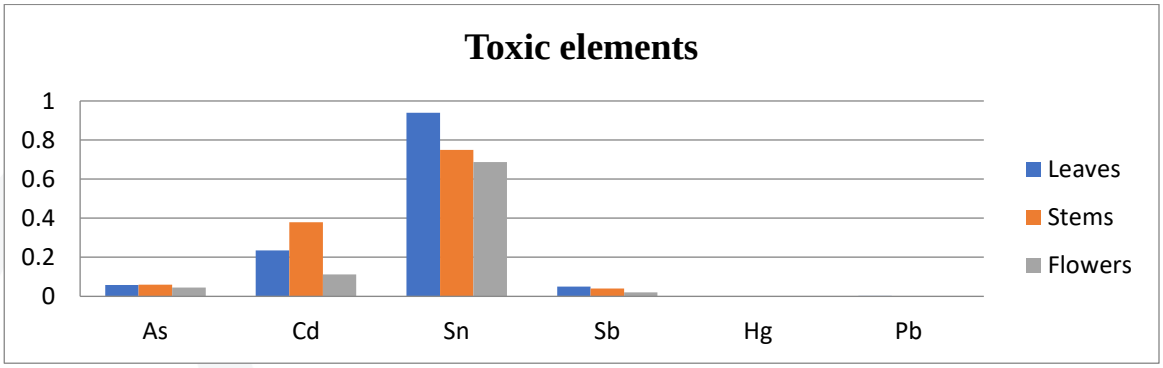

Figure 3. Diagram of toxic elements in morphological parts of Centaurea cyanus l.

One of the most important indicators of the quality of medicinal plant raw materials is the indicator "content of heavy metals and arsenic". The morphological parts (leaves, stem and flowers) of Centaurea cyanus L. contain toxic elements (Pb, Cd, Sn, Sb, Hg, As) in small quantities. The arsenic and tin content in the leaf was higher than in the stem and flower. The content of toxic elements in the studied samples of Centaurea cianus did not exceed the MPC [9] (Fig.3).

Conclusion

Thus, the analysis of the results of the study showed that the leaves, stems and flowers of Centaurea cyanus L complement each other in terms of the content of macro- and microelements. The content of elements necessary for life, such as Ca, Na, K, Mg, Zn, Cu, Fe, is high in the composition of Centaurea cyanus L. The use of extracts from cornflower blue will make up for the deficiency of body minerals. This indicates its widespread use in pharmaceuticals and folk medicine.

Therefore, the use of inductively coupled plasma optical emission spectrometric method is one of the convenient and effective methods for determining minerals in plants.

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