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The Element Composition Study of Thick Extract from Tribulus terrestris L. Herb.

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ABSTRACT

The element composition of thick extract from caltrop herb was studied by the atom-emission spectroscopic method. The content of 19 elements was determined. Potassium, sodium and calcium dominated among the mineral elements. The content of heavy metals did not exceed the permissible limits.
Keywords: caltrop, mineral elements, atom-emission spectroscopy

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INTRODUCTION

Tribulus terrestris L. (prostrate caltrop, family Zygophyllaceae) is an annual herbal plant growing as a weed in many countries [1].

Prostrate caltrop herb contains phenolic compounds, including flavonoids, saponins of steroid nature, polysaccharides [2, 3, 4, 5]. Saponins are represented by tygogenin, neotygogenin, gitogenin, neogitogenin, gecogenin, neogecogenin, diosgenin, chlorogenin, ruscogeninn and sarsasapogenin [4].

Drugs made of this herb have diuretic, tonic, immunomodulatory, antidiabetic, hypolipidemic, antineoplastic, anti-inflammatory, anesthetic, anti-oxidant, anti-microbial, hepatoprotective and cardiotonic action.

Mineral elements participate in many biochemical processes in human body and show pharmacological activity [6]. For instance, zinc acts as an immunostimulant. Deficit of such mineral elements as zinc, copper and magnesium may lead to infertility [6, 7]. Lack of nickel may change distribution of other elements in body, including calcium, iron, zinc, whereas silicon deficit may be one of the causes of atherosclerosis and hypertension [8].

Besides, one of the criteria in drug quality control is heavy metals content control.

We have obtained a thick extract from prostrate caltrop herb. Extraction agent was 50% ethanol. For further standardization as well as for a deeper phytochemical research we studied element composition of the obtained extract.

The purpose of work was a study of prostrate caltrop herb thick extract element composition.

EXPERIMENTAL

We used atomic emission spectrography with photographic registration to study element composition of prostrate caltrop herb thick extract [9].

Before analysis the crude samples pretreated with diluted sulfuric acid were carbonized in a muffle furnace (temperature max. 500°C). Samples were evaporated from graphite electrode craters in AC arc discharge at 16 A current and 60 sec exposure. Spectra were obtained and registered at DFS-8 spectrograph with diffraction grating of 600 grooves/mm and three-lens slit illumination system. Specter photography terms: AC arc current 16 A, ignition phase 60°C, ignition pulse frequency 100 discharges per second, analytical gap 2 mm; spectrograph slit width 0,015 mm; exposure 60 sec. Specters were photographed at 230-330 nm range.

Photo plates were developed, dried, then the following lines (in nm) were photomeasured in spectra of samples and graduated specimens as well as their background.

For each element we calculated from photometry results the differences in blackening of lines and background ($S=S_{l+b}-S_b$) for spectra of samples (S_e) and of calibration specimens (S_{cs}).

Then we built the calibration plot in such coordinates: mean value of lines and background blackening difference (S_{cs}) – calibration specimens element content logarithm (lg C), where C is expressed in per cent relative to base.

From this plot we found an element content in ash (a, %). The element content in plant material (x, %) we found by formula: $x = \frac{a \cdot m}{M}$, where *m* – ash mass, g; *M* – crude material mass, g; *a* – element content in ash, %.

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In analysis we considered the bottom limits of impurities content which were for Cu – $1 \cdot 10^{-4}$; for Co, Cr, Mo, Mn, V – $2 \cdot 10^{-4}$; for Ag, Ga, Ge, Ni, Pb, Sn, Ti – $5 \cdot 10^{-4}$; for Sr, Zn – $1 \cdot 10^{-2}$ %.

RESULTS AND DISCUSSION

As a result of the performed experiment we have determined a quantitative content of 19 mineral elements.
The results of experiment are specified in the table below.

Table 1: Results of element composition study of prostrate caltrop herb thick extract

No.	Element	Element content in prostrate caltrop grass thick extract, µg/100 g
1	Fe	115,00
2	Si	385,00
3	P	510,00
4	Al	46,00
5	Mn	380,00
6	Mg	895,00
7	Pb	<0,03
8	Ni	<0,03
9	Mo	<0,03
10	Ca	3070,00
11	Cu	2,60
12	Zn	7,70
13	Na	3070,00
14	K	8960,00
15	Sr	38,40

Note: In sample Co< 0,03 µg/100 g; Cd< 0,01 µg/100 g; As< 0,01 µg/100 g; Hg<0,01 µg/100 g.

As we see from the table, prostrate caltrop herb thick extract contained in the largest amounts such mineral elements as potassium, sodium and calcium, whereas magnesium, phosphorus, silicon and manganese were present in somewhat lesser amounts. The content of lead, nickel, molybdenum, cobalt, cadmium, arsenic, mercury in prostrate caltrop grass thick extract was just traces within acceptable limits.

Heavy metals were contained in prostrate caltrop grass thick extract within the maximum permissible limits.

The obtained data will be used in standardization of the extract under study.

CONCLUSION

The quantitative content of 19 mineral elements in prostrate caltrop herb thick extract was determined by atomic absorption spectroscopy. Among the elements potassium, sodium and calcium were dominants. Heavy metals content was within the permissible limits. The results of the performed experiment may be used in standardizing of prostrate caltrop herb thick extract.

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