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Research Article

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The Element Composition Study of Cattail Fruits

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ABSTRACT

The element composition of cattail fruits was studied by the atom-emission spectroscopy method. The presence and content of 19 elements was determined. Potassium, silicon, calcium and sodium dominated among the mineral elements.

Keywords: Cattail; Mineral elements; Atom-emission spectroscopy

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INTRODUCTION

Minerals are known to participate in a variety of biochemical processes in human body; they may act as coenzymes, electrolytes, bone and teeth building material. Most elements are connected in organism with organic compounds, such as hemoglobin, phosphoproteins, etc. [1]. Availability of a number of mineral substances in strictly determined quantities is a sine qua non condition for preservation of human health as they are capable of regulating fluid composition in body, conveyance capacity of cellular membranes, water balance, osmotic pressure, acid balance [2]. Humans obtain a large number of bioactive substances, including macro- and microelements, with foods, and in case of their lack plant extract-based food additives may be applied.

The genus cattail (*Typha*) consisting of about 40 primary and hybridized species is a single representative of the *Typhaceae* family. They are perennial herbaceous plants with a long, horizontal creeping rootstock. From a thick rootstock two types of roots protrude – thin ones and widely ramified that lie in water and are capable of absorbing nutritive substances from it, as well as thicker roots ensuring plant fixation in soil [3]. Cattail trunks are cylindrical, leaves are linear, sometimes belt- and strap-like, leathery. Blossoms are small, unisexual and monoecious, forming cylindrical inflorescences, where narrow loose top part consists of staminate flowers and wide dense part consists of carpellary flowers. Staminate inflorescence dries down after pollen precipitation, becomes spiked, flowers fall off. Carpellary inflorescence in the period of fruit maturity may be 2-3 cm in diameter and up to 40 cm long [3,4]. Though cattail is not an officinal plant, it is used in folk medicine as an anti-inflammatory, antioxidant, antibacterial, astringent, wound healing drug [3,5,6]. The purpose of work is a study of cattail fruits element composition.

EXPERIMENTAL SECTION

The objects of our study were fruits of narrow-leaved cattail (*Typha angustifolia* L.) collected in 2015 in Kharkov Region (Ukraine). The element composition of seeds was studied using atomic emission spectrography with photographic registration [7]. Before analysis the crude samples pretreated with diluted sulfuric acid were carbonized in a muffle furnace (temperature max. 500^oC). 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^oC, ignition pulse frequency 100 discharges per second, analytical gap 2 mm; spectrograph slit width 0,015 mm; exposure 60 s. 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 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}). 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, %. 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

The results of study of cattail fruits element composition are specified in the table 1 below.

Table 1: Results of the element composition study of cattail fruits

No	Element	Element content in cattail fruits, μg/100 g
1	Fe	120,00
2	Si	320,00
3	P	32,00
4	Al	100,00
5	Mn	30,00
6	Mg	120,00
7	Pb	<0,03
8	Ni	0,08
9	Mo	<0,03
10	Ca	280,00
11	Cu	0,20
12	Zn	4,00
13	Na	240,00
14	K	600,00
15	Sr	2,00

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

The crude material studied showed the presence of 19 elements, 3 of them as traces. The content of heavy metals in cattail fruits did not exceed the maximum permissible limits. As we see from the table, this species of herbal material contained in the largest amounts such mineral elements as potassium, silicon, sodium and calcium, whereas iron, magnesium and aluminum were present in somewhat lesser amounts. The content of other elements was negligible. The experimental data obtained will be used in development of standardization parameters for cattail fruits.

CONCLUSION

The quantitative content of 19 macro- and microelements in narrow-leaved cattail fruits was determined by atomic emission spectroscopy. Among other elements potassium, silicon, sodium and calcium were mostly accumulated in this species of herbal material.

REFERENCES

[1] A Klink; M Wisłocka; M Musiał; J Krawczyk, *Pol. J. Environ. Stud.*, **2013**, 22 (1), 183-190.
[2] C Vidya, DB Rao. *A textbook of nutrition*. New Dehli: DPH, **2010**, 525.
[3] OA Kapitonova, GP Platunova, VI Kapitonov. *Cattails of Vyatka-Kama region: Monograph*. Publishing Udmurt University, **2012**, 192.
[4] SMM. Hamdi; M Assadi; M Ebadi, *Asian J. Plant Sci*., **2009**, 8 (7), 455-464.
[5] AS Andleeb; K Zaheer-ud-Din; P Anjum, *PJPS*, **2014**, 27 (2), 279-284.
[6] RL Londonkar; UM Kattegouga; K Shivsharanappa; JV Hanchinalmath, *J. Pharm Res.*, **2013**, 6, 280-283.
[7] VV Hutsol; IO Zhuravel, *Coliection of scientific works of staff member of P. L. Shupyk NMAPE*, **2015**, 24 (5), 97-100.