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Short Communication

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Determination of the Elemental Composition of Lichens by Atomic Emission Spectrometry

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Abstract

This work represents the results of a determination of the elemental composition of lichen thallus as a promising, ecologically pure, and renewable raw material for biotechnological processing. The content of toxic elements and heavy metals in the samples analyzed does not exceed their maximum allowable concentrations and therefore does not preclude the possibility of use of these lichens as a renewable raw material for biotechnology. Indeed, the samples contained 20 macro- and microelements and 9 trace elements that would be valuable in a food source. These include the elements Fe, Mg, and Ca, required for prevention of deficiency diseases. **(Int J Biomed. 2015;6(1):85-86.).**

Keywords: *lichen; elemental analysis; biotechnology; emission spectromenry.*

Introduction

In recent years the lichen blastema has been widely used as a valuable raw material for obtaining a series of biopreparations used in medicine, and in the veterinary and food industries [1-2].

The objective of this work was to study the elemental composition of two types of lichen thallus: *Cladoniarangiferina (reindeer lichen)* and *Cetrariacuculata* as a prospective raw material for use in biotechnology.

Materials and Methods

The lichens were collected in the summer from an area of their typical habitat, 30 km to the north of Yakutsk and 1.5km away from any highway. The collected lichenoid raw material was dried in accordance with GOST-13727-68.

Solutions of the samples were prepared [3] and analyzed by inductively coupled plasma mass-spectrometry on an iCAP6300 Duo (Thermo Scientific, USA) optical emission spectrometer with inductively coupled plasma, set to an axial view of the plasma flame.

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Results and Discussion

The results obtained from this elemental analysis of the two types of lichen are presented in Table (1). The content of most micro- and macroelements in the studied samples didnot differ much between the two species. In Cetrariacuculata, there are trace amounts of lead and cadmium, but at this level they would not cause any toxic effect in the human body. Their content is considerably lower than the amounts stated in the Sanitary Regulations and Standards (SanPiN).3.2.560-02. Maximum Allowable Concentrations.

Conclusion

The content of toxic elements and heavy metals in the samples analyzed does not exceed their maximum allowable concentrations and therefore does not preclude the possibility of use of these lichens as a renewable raw material for biotechnology. Indeed, the samples contained 20 macro- and microelements and 9 trace elements that would be valuable in a food source. These include the elements Fe, Mg, and Ca, required for prevention of deficiency diseases.

Competing interests

The authors declare that they have no competing interests.

Table 1.

The micro- and macro element content of thalli of Cladoniarangiferina and Cetrariacuculata

Elements	Mineral content as percentage of dry weight		Elements	Mineral content as percentage of dry weight	
	Cladoniarangiferina	Cetrariacuculata		Cladoniarangiferina	Cetrariacuculata
Al	0.07090	0.17630	Pb	0.00040	0.00140
Ba	0.00350	0.01420	Rb	0.00330	0.01000
Be	0.00020	0.00020	Sc	0.00004	0.00009
Ca	3.54440	17.7840	Si	0.29140	0.68530
Cd	0	0.00004	Sr	0.00830	0.03990
Ce	0.00102	0.00043	Ti	0.00360	0.00770
Co	0.00050	0.00080	V	0.00008	0.00027
Cr	0.00110	0.00250	Y	0.00006	0.00003
Cu	0.03900	0.03680	Yb	0.00001	0
Fe	0.07000	0.19750	Zn	0.06740	0.11600
K	3.94900	12.8360	Mn	0.02680	0.03970
La	0.00007	0.00043	Na	2.68240	22.7980
Li	0.00020	0.00130	Nd	0.00280	0.00020
Mg	2.15820	13.7170	Ni	0.00570	0.01000

References

1. Anshkova VV, Stepanova AV, Uvarov DM, Smagulova ASh, Naumova KN, Vasilyev PP, et al. Actoprotective activity of complex biologics based on Lichen thalli and Rhodiola Rosea. Ekologiia Cheloveka. 2015: 5:46–51. [in Russian].

2. Anshakova VV. The mechanochemical technology for producing of biocomplexes based on lichen material. Int J Biomed. 2012; 3:232-236. [in Russian].

3. Vershinina SE, Vershinin KE, Kravchenko OYu, Chebykin EP, Vodneva EN. Elemental composition of lichen p. Cetraria ACH from the different regions of Russia. Chemistry of Plant Raw Materials. 2009;1:141–146. [in Russian].