



**UN FOOD  
CONFERENCE**  
University of Belgrade  
**210<sup>th</sup> Anniversary**  
OCTOBER 5-6 2018

**PROGRAM  
I  
ZBORNIK RADOVA**

*Programme  
&  
Book of Abstracts*

Beograd, 5 i 6 oktobar 2018  
Belgrade, Octobre 5-6, 2018

CIP-Kategorizacija u publikaciji  
Narodna biblioteka Srbije, Beograd

Univerzitet u Beogradu  
UNIFOOD CONFERENCE (2018; Beograd)  
Program; i zbornik radova= Programme; & Book of Abstracts/  
Beograd, 5 i 6 oktobar 2018 = Belgrade, Octobre 5-6 2018  
[organizator] Univerzitet u Beogradu; [organized by] University of Belgrade  
[urednici, editors Marina Soković, Živoslav Tešić] Beograd, Univerzitet u Beogradu

Radovi na srp i engl. jeziku – Tekst ćir i lat- Tiraž

ISBN 978-86-7522-060-2

UNIFOOD Konferencija, Beograd, 5-6 oktobar 2018  
PROGRAM I ZBORNIK RADOVA

UNIFOOD Conference, Belgrade Octobre 5-6 2018  
Programme and Book of Abstracts

**Izdaje / Published by**

**Univerzitet u Beogradu / University of Belgrade**

Studentski trg 1, 11000 Beograd

Tel/fax ; [www.bg.ac.rs](http://www.bg.ac.rs), email

**Za izdavača / For Publisher**

**Vladimir Bumbaširević, rektor**

**Urednici / Editors**

**Marina Soković**

**Živoslav Tešić**

**Dizajn korica i kompjuterska obrada teksta / Cover Design Layout**

**Tomislav Tosti**

**Tiraž / Circulation**

ISBN 978-86-7522-060-2



BKH15 / FQSP15

## Bioakumulacija arsena i pojedinih teških metala u tkivima puževa poreklom iz Srbije

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Kratak izvod: Cilj ovog istraživanja je bio da se utvrdi koncentracija arsena i pojedinih teških metala (olovo, živa, bakar, kadmijum, cink, gvožđe i mangan) u tkivu puževa (stopalo i utroba) sa farme puževa u Srbiji. Uzorci puževa analizirani su korišćenjem atomskog apsorpcionog spektrofotometra (GBC 932 plus atomski apsorpcioni spektrometar, GBC Scientific Equipment, USA). Tačnost metode potvrđivana je referentnim materijalom. Rezultati su predstavljeni kao srednja vrednost  $\pm$  SD (standardna devijacija). U ovom istraživanju bilo je uključeno ukupno 730 pojedinačnih uzoraka puževa. Uzorci puževa sakupljeni su u plastične kese i transportovani u laboratoriju Fakulteta veterinarske medicine, Univerziteta u Beogradu. Puževi su oprani destilovanom vodom, a stopala i utroba su odmah secirani. Ova tkiva su ispitivana jer se najčešće prijavljuju kao izvor akumulacije teških metala. Nivoi arsena, olova i žive u ispitivanim uzorcima puževa bili su ispod granice detektovanja. Koncentracija bakra u tkivu puža iznosila je  $29,08 \pm 3,03$  mg kg<sup>-1</sup> u uzorcima stopala, a  $22,47 \pm 1,96$  mg kg<sup>-1</sup> u utrobi. Koncentracija kadmijuma u uzorcima stopala iznosila je  $0,12 \pm 0,02$  mg kg<sup>-1</sup> i  $2,81 \pm 0,38$  mg kg<sup>-1</sup> u utrobi. Koncentracija cinka u tkivima stopala iznosila je  $11,69 \pm 0,83$  mg kg<sup>-1</sup>, a  $21,19 \pm 2,26$  mg kg<sup>-1</sup> u utrobi. Koncentracija gvožđa u utrobi iznosila je  $46,90 \pm 6,78$  mg kg<sup>-1</sup>, a u uzorcima stopala iznosila je  $10,07 \pm 0,94$  mg kg<sup>-1</sup>. Koncentracija mangana u utrobi iznosila je  $64,24 \pm 7,04$  mg kg<sup>-1</sup>, a u uzorcima stopala iznosila je  $2,27 \pm 0,19$  mg kg<sup>-1</sup>. Utvrđene su varijacije u različitim uzorcima tkiva puževa u bioakumulaciji teških metala. Koncentracija teških metala bila je veća u uzorcima utroba puževa u odnosu na uzorke tkiva stopala. Uzorci puževa mogu se koristiti kao dobar bioindikator za praćenje koncentracije teških metala.

Ključne reči: teški metali, stopalo, utroba, monitoring, zagađenje životne sredine.

Zahvalnica: Rad je deo projekta TR 31034, koje finansira Ministarstvo prosvete, nauke i tehnološkog razvoja Republike Srbije.

## Bioaccumulation of arsenic and heavy metals in snail tissues from the Serbia

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Abstract: The aim of this study was to determine arsenic and heavy metal concentration (lead, mercury, copper, cadmium, zinc, iron and manganese) in snail tissues (foot and digestive gland) from snail farm in Serbia. Snail samples were analysed by using atomic absorption spectrophotometer (GBC 932 plus atomic absorption spectrometer, GBC Scientific Equipment, USA). The accuracy of method is validated by certified reference material. The results were presented as mean  $\pm$  SD (Standard Deviation). Total of 730 individual snails were included in this study. Snail samples were put in plastic bags and transported to the laboratory of Faculty of Veterinary Medicine, University of Belgrade. The snails were washed with distilled water, and the foot and digestive glands were fast dissected out. These tissues were examined because there are most often reported as the main source for heavy metal accumulation. The levels of arsenic, lead and mercury in examined snail samples were below detectable limit. The copper concentration in snail tissues was  $29.08 \pm 3.03$  mg kg<sup>-1</sup> in foot samples, and  $22.47 \pm 1.96$  mg kg<sup>-1</sup> in digestive gland. The cadmium concentration in foot samples was  $0.12 \pm 0.02$  mg kg<sup>-1</sup>, and  $2.81 \pm 0.38$  mg kg<sup>-1</sup> in digestive gland. The zinc concentration in foot tissues was  $11.69 \pm 0.83$  mg kg<sup>-1</sup>, and  $21.19 \pm 2.26$  mg kg<sup>-1</sup> in digestive gland. The iron concentration in digestive gland was  $46.90 \pm 6.78$  mg kg<sup>-1</sup>, and in foot samples was  $10.07 \pm 0.94$  mg kg<sup>-1</sup>. The manganese concentration in digestive gland was  $64.24 \pm 7.04$  mg kg<sup>-1</sup>, and in foot samples was  $2.27 \pm 0.19$  mg kg<sup>-1</sup>. There are variations from the tissues to another in heavy metals bioaccumulation. Concentration of heavy metals was higher in digestive gland tissues compared with foot tissues. The snail samples can be used as a good bioindicator for heavy metals concentration monitoring.