

MULTIVARIATE DATA OF TRACE ELEMENTS IN MUSHROOM *SARCODON IMBRICATUS*

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Introduction

Fruiting bodies (mushrooms) of high number of edible fungi are collected from the wild in many regions of the world until now, while largely not by “the western citizens”, which have a lack or deficit of forests and knowledge of mushrooms. Many species of edible wild-growing mushrooms are without a good coverage on their metallic elements status both from the nutritional and toxicological point of views (Falandysz and Borovička, 2013). This study aimed to provide a baseline on occurrence of several metallic elements in edible wild growing mushroom *Sarcodon imbricatus* (L.) P. Karst. Presented and evaluated are data on occurrence and inter-relationships of eighteen trace metallic elements in fruiting bodies of *S. imbricatus* collected from the background areas in the northern regions of Poland.

Methods

Mushrooms were collected at four sites (Augustowska Primeval Forest, Wdzydze Landscape Park, Ontoga and Gołubie Kaszubskie) across the northern region of Poland, where *S. imbricatus* is relatively abundant species so far but not in each year. The caps and stipes cleaned up from an external debris were sliced, dried, ground and kept in a brand new polyethylene bags in dry condition until chemical analysis.

An elemental analysis of Ag, As, Ba, Co, Cd, Cs, Cu, Cr, Li, Mn, Ni, Pb, Rb, Sr, V, Tl, U and Zn was carried out using the ELAN DRC II ICP-MS Inductively Coupled Plasma Mass Spectrometer (PerkinElmer, SCIEX, Canada) equipped with a Meinhard concentric nebulizer, cyclonic spray chamber, Pt cones and quadruple mass analyzer and was used for this study. For calibration curves construction, a mixed standard solution with concentration of 10 mg L⁻¹ was used (Multielement Calibration Standard 3, Atomic Spectroscopy Standard, PerkinElmer Pure). Moreover the isotopes of ⁴⁵Sc, ⁷⁴Ge, ¹⁰³Rh and ¹⁵⁹Tb prepared from individual solutions with concentration of 1000 mg L⁻¹ were applied as an internal standards in order to effectively correct temporal variations in signal intensity (ICP Standard CertiPUR, Merck, Germany).

Principal component analysis (PCA) was used to achieve a reduction of the dimension, covering the maximum amount of variability present in the data and to observe a primary evaluation of the between-class similarity. PCA was used to explain information hidden in the investigated dataset (Chudzińska and Barałkiewicz, 2010).

Results

The PCA model constructed for variables allowed a reduction of 18 variables to four principal components (PC1-PC4), which were distinguished according to the eigenvalue-one-criterion (their eigenvalues were above 1) as important factors. These four PCs explained over 90% of the total variability, which was enough to describe the whole structure. The first PC explained over 40% of the total variance; high loadings (> 0.7) in PC1 were obtained for Ag, As, Cd, Cu, Cs, Li, Ni, Rb, Tl and Zn. Next, the PC2 was strongly associated with negatively correlated Ba, Sr, U and V and provided information enclosed in the next 25% of structure variability. PC3, accounting for nearby 19% of total variance, was influenced by correlated variables describing Co and Pb. Hence, PC4 did not reveal a high factor loading, so it was not important in explaining the variability. The most of elements were negatively correlated with PC1 and only Li and Tl had a positive correlation with this PC. Whilst PC2 considered here exhibited a strong, hard and negative interrelation with Ba, Sr, U and V. Next, inspection of Fig. 1b revealed that samples of *S. imbricatus* were divided into separate groups which were connected with the morphological part of fruiting body. The samples on the right-hand side, with a positive value of PC1 were stipes of fruiting bodies; which were characterized by higher concentration levels of Li and Tl. The samples on the left-hand side of the plot, with a negative value of PC1, featured by higher concentration levels of Ag, As, Cd, Cu, Cs, Ni, Rb and Zn in stipes of fruiting bodies. The position of outlying sample at the bottom part of the plot relates to a whole fruiting bodies of *S. imbricatus*, which are featured because of a different (higher) concentration levels of Ba, Sr, U and V.

Conclusion

In *S. imbricatus* certain metallic elements and arsenic are not equally distributed between cap and stipe. No clear differences could be noted in concentration levels of Ag, As, Ba, Co, Cd, Cs, Cu, Cr, Li, Mn, Ni, Pb, Rb, Sr, V, Tl, U and Zn in caps and stipes of fruiting bodies or in a whole fruiting bodies of *S. imbricatus* from the spatially distantly distributed localizations in northern regions of Poland. This finding imply on soil bedrock as a major source to topsoil of the chemical elements examined and lack of a local or regional sources of emission/pollution, which could significantly impact topsoil geochemistry and *S. imbricatus*.

References

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