



7th ICOBTE



**7th International Conference on the Biogeochemistry
of Trace Elements
Uppsala, Sweden, June 15-19, 2003**

CONFERENCE PROCEEDINGS

Editors: George R. Gobran and Nicholas Lepp

Editorial Committee: D. C. Adriano, L. Bergström, R. Finlay, G. R. Gobran,
A. Iskandar, N. Lepp, E. Lombi, S. McGrath, T. Punshon, M. Selim, O.
Selinus and W. Wenzel

Cover photos: Mats Gerentz, SLU

Printed by: SLU Service/Repro, 2003

ISBN 91-576-6582-6

Microelements in the Soils and Ashes of the Plants *Viola alsharica* and *Thymus alsharensis* of the Alshar Site-Macedonia

B. Boev, S. Lepitkova

Faculty of Mining and Geology, Goce Delcev 89, 2000 Stip, MACEDONIA
(E-mail: bboev@rgf.ukim.edu.mk)

INTRODUCTION

The paper presents detailed geochemical investigations carried out in part of the Alshar polymetallic deposit to investigate the presence of individual microelements in the soils and plants such as *Viola alsharica* and *Thymus alsharensis*. The investigated area covers the northern portion of the deposit. Elements analyzed included Sb, Se, W, Zn, Ba, Tl, As, Co, Cu, Mn, Ni, Pb, Cd and Be. Investigations demonstrated high geochemical correlation between the distribution of individual elements in the soils and plants. It can be inferred that the plants in the area under investigation contain increased concentrations of thallium, zinc, lead, manganese and copper.

For the results of previous studies of the Alshar deposit, the reader is referred to Ivanov (1965), Percival and Boev (1990), Percival *et al.* (1992), Boev and Serafimovski (1996), and for investigation of minerals to Caye *et al.* (1967), Balic-Zunic *et al.* (1986) El Goresy and Pavicevic (1988), and Frantz (1994).

MATERIAL AND METHODS

The aim of the investigation was to determine the correlation between individual micro elements present in the soils and those in the ash of *Viola alsharica* and *Thymus alsharensis*. In this regard a number of samples were collected from the rocks in the site. Samples were collected in oblong grids in which the distances between profiles were 100 meters, whereas the distance between the samples collected 50 meters. Samples were analyzed by instrumental neutron activation to determine the contents of individual micro elements such as Sb, Se, W, Zn, Ba, Tl, As, Co, Cu, Mn, Ni and Pb.

Besides samples taken from the soils, samples of plants such as *Viola alsharica* and *Thymus alsharensis* were also collected for analysis. The samples were dried at 105 °C, at 700 °C for 2h and then the individual microelements (Sb, Se, W, Zn, Ba, Tl, As, Co, Cu, Mn, Ni and Pb) were determined by ICP-AES.

RESULTS AND DISCUSSION

The two plants served as local indicators, since they are characterized by their abundance in the site and the specific size of certain organs in the plant compared to the same kinds found in other areas.

It can be inferred from the data that in terms of the average abundance, there was a multiple increase in the As, Zn and Tl in the soil relative to their average concentration in the rocks. It should also be mentioned that the abundance of certain microelements is also influenced by the Fe and Zn contents present in the soil since their hydroxides and oxides consume some microelements such as As, Cu, Ni, Se, Mo, Pb, Co, Zn and Tl.

The Zn content in the rocks ranged from 11 to 465 ppm and compared to the Zn content in the ashes of *Viola alsharica* (Table 2) it can be inferred that the abundance of microelements is uniform in almost all samples studied and several times higher in the plants than in the rocks.

Increased contents of Tl in *Viola* of several hundred times can be noticed compared to its contents in the rocks and soil where the plant grew.

Arsenic, which is a common microelement in the rocks in the area, was less abundant in the plants than Tl and Zn, but more abundant in the ashes of *Viola* than *Thymus*. Data obtained indicate that Tl and As were more abundant in *Viola* due to their geochemical connection (Fig. 1).

In contrast, Zn as a significant biogenic element was very common in the two plants in amounts that were several times higher than those in the rocks - the amount in *Thymus* being higher than that in

Viola. Other microelements were not found in significant amounts and their presence will not be the subject matter of this paper. Bearing in mind that the elements under consideration are heavy metals, known for their toxic properties, the increased amounts of certain microelements, first of all those of As and Tl, which are not known as biogenic microelements, point out that these plants are potential toxic materials for the living world in the area. Efforts should be made to analyze a large number of plants along with the analysis of the presence of certain microelements in individual plant organs.

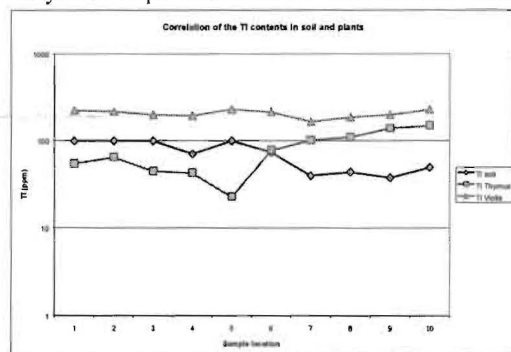


Fig. 1. Logarithmic correlation diagram of Tl contents in soil and plants from the Alsar.

CONCLUSIONS

The results presented in the paper lead to the conclusion that there is pronounced correlation between the distribution of individual microelements in the soils of the Alshar deposit and those found in *Viola alsharica* and *Thymus alsharensis*. The correlation is particularly pronounced in elements such as Tl, which is very common in the plants mentioned. This concentration distinguishes them as separate kinds known as *Viola alsharica* and *Thymus alsharensis*. Zinc also occurs in large contents in the plants discussed and is an indicator of the possible presence of significant individual concentrations of some microelements in the soils.

REFERENCES

- Balic-Zunic, T., Seavnicar, S., Engel, P. (1986) The crystal structure of rebulite Zt.f.Krist., 160, ½, 199.
- Boev, B., Serafimovski, T., (1996) General genetic model of the Alshar deposit, Plate Tectonics Aspects of the Alpine Metallogeny in the Carpatho-Balkan Region, Proceedings of the Annual Meeting of IGCP ject 356, Vol. I, pp 75-85, Sofija, 1996
- Caye, R., Picot, P., Pierrot, R., Permingeat, F., (1967) Nouvelles Sur la Vrbaite, sa Teneur en Marcure, Bull.Soc.Franc.Min.Crist, 90, 185
- El Goresy, A., Pavicevic, M., (1988) A new thallium mineral in the Alshar deposit in Yugoslavia, Naturwiss., 75, 37-39, Springer-Verlag
- Frantz, E., (1994) Mineralogische, Geochemische und Isotopen-geochemische Untersuchungen der As-Tl sulfide in der Lagerstätten Allshar, Doct.disert., Johannes Gutenberg Universität, Mainz, 160, p.
- Ivanov, T., (1965) Zonal Distribution of Elements and Minerals in the Deposit Alshar., Symp. Problems of Postmagmatic Ore Deposition, II 186-191, Prague.
- Percival, T., Boev, B., (1990) As-Tl-Sb-Hg-Au-Ba Mineralization Alshar District Yugoslavia: A Unique type of Yugoslavian Ore Deposit, Int.Sym. On Solar Neutrino Detection with 205 Tl, Dubrovnik.