

## ABSTRACT

This PhD thesis follows my master's thesis, which I focused on the problem of uranium determination and content in macrofungal fruit-bodies (the results have been published, Appendix 1). Macrofungi apparently do not accumulate uranium in fruit-bodies but as other studies suggested major roles of fungi in environmental geochemistry of uranium, I hypothesized possible accumulation of uranium and other elements in ectomycorrhizae. I therefore decided to continue the research and focus on investigation of trace elements in ectomycorrhizae. As I had opportunity to use a variety of analytical methods, I also participated in other studies in the field geomycology and the results are included in this thesis.

In response to alarmist reports in Czech media, I focused on activity and distribution of radiocaesium in fruit-bodies of *Boletus badius*. As demonstrated in Appendix 2, the fruit-bodies of this species do not represent a health risk for mushroom consumers.

Distribution of mycelium of saprotrophic *Agaricus bernardii* in a soil profile in Prague was investigated by use of molecular methods (PCR with specific primers). The results have shown that the mycelium reaches the depth of 30 cm. Lead isotopic composition of fruit-bodies suggests lead can be accumulated from soil depth of 13-17 cm (Appendix 3).

However, the main aim of my thesis was investigation of trace elements in ectomycorrhizae with instrumental neutron activation analysis as the principal analytical method. Ectomycorrhizal roots, fine roots and organic soil samples were collected mainly in the smelter-polluted area in the region of Příbram (Central Bohemia, Czech Republic). Almost all samples of ectomycorrhizae were identified at species level by molecular methods (DNA sequencing). The results of this research are presented in Appendix 4 and Appendix 5. Similarly as observed in the fruit-bodies, trace element accumulation in ectomycorrhizae depends on particular element and fungal species; very high concentration variability was observed. Furthermore, fungal biomass was quantified in ectomycorrhizae of *Boletus badius* and *Amanita muscaria* by use of qRT-PCR.

The aims of thesis were fulfilled and the knowledge of the field of geomycology deepened. The greatest outputs of this study were: 1) determination of 14 elements in ectomycorrhizae from polluted sites; 2) identification of distribution of mycelium of saprotrophic *Agaricus bernardii* in a soil profile; and 3) determination of fungal biomass concentration in ectomycorrhizae of two macromycete species.