

Chlorine and bromine accumulation in mushrooms at selected forest site

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Fungi play important roles in the biogeochemical cycling of many chemical elements, including halogens, in forest environments. Several studies have pointed to the ability of mushrooms to accumulate Cl and Br in the fruit-bodies and produce chlorinated and brominated organic compounds (e.g., amino acids) or substances known primarily as anthropogenic pollutants (e.g., methyl halides). However, available data on Cl and Br content in mushroom fruit-bodies is limited: a high variability of concentrations of both elements has been reported, with up to 1000-fold differences in the case of Cl. Previous studies have indicated possible mushroom species-specific Cl and Br accumulation ability.

We therefore focused on total Cl and Br contents in mushroom fruit-bodies growing in a temperate coniferous forest plantation above gneissic bedrock at selected area of circa 0.2 km². Concentrations of Cl and Br in 126 mushroom samples and 11 soil samples collected throughout the investigated area were non-destructively determined by instrumental neutron activation analysis (INAA). Chlorine and Br concentrations in mushrooms ranged from 30 to 36,000 mg kg⁻¹ and 0.15 to 45 mg kg⁻¹ (dry weight), respectively. Both Cl and Br contents were also determined in organic and A soil horizons. In deeper mineral horizons, the concentrations of Cl and Br were below the INAA detection limits (<50 mg kg⁻¹ for Cl and <1.1 mg kg⁻¹ for Br, approximately). The average Cl and Br concentrations in the organic (Oe) soil horizon were 280 ± 130 and 10.0 ± 1.5 mg kg⁻¹, respectively.

In the case of Cl, a significant accumulation capability was observed for some mushroom genera (e.g., *Amanita*, *Hydnum*) where up to 100× higher concentrations than those in soil were detected. However, median Cl concentration in most mushrooms was lower (x~1,450 mg kg⁻¹). Only few mushrooms were found to discriminate Cl (non-accumulating species, e.g., *Armillaria*, *Lycoperdon* and *Paxillus*), with Cl concentrations below 200 mg kg⁻¹. An affinity for Br was noted in Cl-accumulating mushrooms, *Amanita* spp. in particular (20.5 ± 10.0 mg Br kg⁻¹). However, the Br content of most mushroom species was generally lower than that measured in soil (1.8 ± 1.6 mg kg⁻¹ on the average).