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Trace elements in *Pleurozium schreberi*, *Racomitrium lanuginosum* and *Sanionia uncinata* from arctic tundra (Iceland) and alpine tundra (Karkonosze)

ABSTRACT

The research was conducted in the northern part of Iceland, classified as an Arctic floristic region, and in the high-mountain parts of the Karkonosze Mountains, often described as the Arctic-Alpine tundra. These areas vary greatly in their exposure to pollution. Iceland is considered to be a relatively pollution-free island. The Karkonosze, on the other hand, are under the influence of pollution coming from the "Black Triangle" area.

The aim of the study was to compare the content of trace elements in the same moss species from similar habitats in the northern part of Iceland and in the subalpine and alpine zones of the Karkonosze. The research was carried out on three species of ectohydric mosses: *Pleurozium schreberi*, *Racomitrium lanuginosum* and *Sanionia uncinata*. The concentrations of Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb and Zn were determined in the studied plants and in the rocks and soils from their sampling sites. The following hypotheses were tested: 1) *P. schreberi*, *R. lanuginosum* and *S. uncinata* collected from the northern parts of Iceland contain significantly less trace elements than the same species of moss collected in the high mountain parts of the Karkonosze, 2) *S. uncinata* accumulates trace elements best due to the plicate surface of the leaves.

The conducted research showed significant differences in the concentrations of trace elements in the analyzed species between Iceland and the Karkonosze. *Pleurozium schreberi*, *R. lanuginosum* and *S. uncinata* from Iceland contained higher amounts of Co, Cr, Cu, Fe and Ni. The highest concentrations of these metals as well as Mn and Zn were found in mosses from places subject to the influence of transport, the fishing industry and sea aerosol, as well as in places near an active volcano, which are subject to strong erosion. Mosses from the Karkonosze contained more Cd, Hg and Pb. The highest concentrations of these elements were observed in mosses from sampling sites on the northern slope of Czarny Grzbiet and near the radio and television broadcasting station. *Sanionia uncinata* was the best bioaccumulator of Cd, Cu and Zn, both in Iceland and the Karkonosze, and *R. lanuginosum* was a good bioaccumulator of Fe

and Pb. *Pleurozium. schreberi* was the weakest bioaccumulator of Cr, Cu, Fe and Pb and had the lowest metal accumulation index (MAI). All tested species accumulated increased metal content when they grew under the influence of environmental pollution, so they can be used for bioindication in arctic and alpine tundra regions characterized by severe climate habitats with a restricted number of species.

Keywords: bioindication, ectohydric mosses, metals, tundra, environmental pollution