

Abstract

Natural habitats of psammophilous species of aculeate hymenoptera, which are inland drift sand, are disappearing. This causes these species to become threatened or even extinct. However, ash contains heavy metals that are accumulated in tissues by plants, vertebrates, and invertebrates. These elements cause various organisms different complications, ranging from mild complications to serious complications often ending with the death of an individual. The aim of this work is to determine whether and, if so, what selected elements (Ag, Al, As, Ba, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Se, Sr, V and Zn) 55 species of aculeate hymenoptera accumulate from two coal fly ash deposits and two sand dunes in their tissues, depending on the type of substrate and the food strategy. Using t-test, the concentrations of all selected elements were found to be higher in fly ash than in sand and using the PCA method it was found, that although sands are similar in terms of element concentration to each other, the ash deposits differ from each other. The concentration of selected elements in the hymenoptera relative to the substrate type was tested using the GLM and GEE method with phylogenetic correction. The results show that the hymenoptera from coal fly ash deposits, related to the type of substrate, accumulate more than half of the selected elements in their tissues in higher concentrations than hymenoptera from sands. Finally, the relation of the concentration of selected elements in the hymenoptera tissue to the substrate type and the feeding strategy was tested using the GEE method with phylogenetic correction, showing that food strategy has little effect on the accumulation of selected elements. The knowledge gained by this work is crucial for further research on the influence of selected elements on hymenoptera from coal fly ash deposits and will support future arguments for conservation of coal fly ash deposits as important biotope for protecting hymenoptera and other coal fly ash inhabitants from extinction.

Key words: heavy metals, Aculeata, drift sand, coal fly ash deposit, sand, fly ash, ecotoxicology, accumulation