Abstract

In nature, there are many examples of the accumulation of various types of compounds by living organisms. Heavy metals are particularly harmful compounds. Their presence in living organisms causes many negative effects. However, man can use the accumulation potential of the organisms and the substances derived from these organisms to remove pollutants from the environment in the bioremediation process.

The ability of fungi to bind heavy metals has been known for many years, the research but in most publications was focused on whole fruiting bodies. It is difficult to find publications where the authors extended their research to determine what components of fruiting bodies and to what extent were responsible for metal sorption. Likewise, little is known about the possible use of insects or substances derived from these animals for sorption of heavy metals. In order to fill this gap, although only to a small extent, research was conducted on the use of natural biopolymers to bind heavy metals.

The main goal of this dissertation was to investigate the sorption capacity of natural biopolymers, i.e. (1→3)-α-D-glucans derived from fungi and chitin derived from an insect (*Hermetii illucens*), as heavy metal sorbents in the context of their potential use in the bioremediation process.

By implementing the assumed goal:

- in screening tests, the sorption capacity of α-glucans obtained from various species of fungi was determined. On this basis, α-glucan from *Lentinus edodes* (shiitake) was selected for further research. The selection criterion was the high sorption capacity of metals and the enormous availability of waste substances after the production of this very popular fungus in the world,
- the physicochemical properties of (1→3)-α-D-glucan obtained from *Lentinus edodes* were determined,
- chitin was isolated from the *Hermetia illucens* fly before selecting the best methods of isolation,
- the properties of chitin were characterized,
- using the obtained biopolymers, the sorption of heavy metals was carried out, and the process itself and the properties of the biopolymers after the sorption process were characterized.

The study confirmed the high capability of heavy metal biosorption in both tested biopolymers. The research was carried out on waste materials (after the cultivation of mushrooms and *H. illucens*), which opens the possibility of a new way of managing a very large (on a world scale) amount of biomass, which until now has mainly been composted, or worse, stored in landfills.

Keywords: (1→3)-α-D-glucan, chitin, *Hermetia illucens*, sorption, bioremediation, heavy metal