

Summary

The aim of the study was to follow the changes in bioavailability of pollutants in soil after two kind sewage sludge application as a factor supporting phytoremediation. In addition, the effect of reclamation was assessed by estimation of the changes in physical, chemical and biochemical properties of urban soils after the addition of municipal sewage sludge with different treatment processes.

Two field experiments were prepared on the two lawns along the streets of Białystok on Hetmańska and Popiełuski Streets. The first experiment was established in 2010. In this case the mechanical dewatered sewage sludge from the Municipal Wastewater Treatment Plant in Sokółka was applied to the soil. This sewage sludge had a smear texture. Second experiment was established in 2014. The granular sewage sludge thermally dried from Wastewater Treatment plant in Białystok was used. The studied areas were fertilized respectively with dewatered and thermally dried sludge with 14.5 and 29 t DM/ha. Control plots without sewage sludge application were also founded. On the prepared plots mixtures of lawn grasses were sown. Both experiments were conducted for two years

The influence of sewage sludge application to soil was assessed by determining the main physical, chemical and biochemical properties such as soil pH, electrical conductivity, content of organic substrates, total nitrogen, available phosphorus, heavy metals and their fractions. The enzymes activity in soil samples for example dehydrogenases, catalase, phosphatases, proteases and urease was also determined. Moreover, the total yield of grass mixtures and heavy metal content in the aboveground part of the grasses in both experiments were determined. The effect of phytoremediation was assessed by calculating the bioconcentration factor and heavy metals removal from the soil by the collected yield of grass mixture.

The results show an increase in the content of organic matter, available phosphorus and activity of dehydrogenases and phosphatases after the sewage sludge application. Furthermore, the total yield from the plots with sewage sludge was higher than in the case of the control fields. It was found that after the application of the mechanically dehydrated sewage sludge, the best reclamation effect was observed in the first year of study. In the second year the effect was no longer observed. On the other hand, the application of the thermally dried sludge to the soil resulted in less intense changes in the soil properties in the first year. These changes in the second year of my research were also observed.

The obtained results showed that the used lawn grass mixtures accumulated low amounts of heavy metals because of their low biomass production. Moreover, metals in the soil occurred mainly in the residual form which is not available for plants. Therefore, phytoextraction may not bring the desired results. The use of sewage sludge to alkaline urban soil can be the basis for conducting phytostabilization. In this process, heavy metals can be immobilized in the soil with the use of selected lawn grasses.

Application of sewage sludge improves quality of urban soil and allows to a relatively safe disposal of this biosolids.