

ABSTRACT

The aim of the thesis was to analyze soil microbial communities of three ecologically different locations, about 25 years old, forestry reclaimed dumps in the Republic of Poland, namely dumps of brown coal mine Bełchatów and sand mines Piaseczno and Szczakowa. I evaluated the degree of dependence of structure and composition of these communities on various substrate grain sizes and the influence of the dominant tree species. These were stands of birch (*Betula pendula*), pine (*Pinus silvestris*), oak (*Quercus robur*) and alder (*Alnus glutinosa*). Analysis of soil microbial communities was made by evaluating specific phospholipid fatty acids (PLFA) of microorganisms. It is the most appropriate way to implement the relatively rapid analysis of large numbers of samples, since PLFA are easily extractable and act as biomarkers indicating the presence of a number of different microorganisms (fungi, G- and G + bacteria, Actinobacteria, etc.) and thus allowing a qualitative and quantitative assessment of whole microbial communities. PLFA analysis enables to detect a total concentration of PLFA only in living soil microbial biomass. I analyzed 66 soil samples, 33 from an Oe layer and 33 from an A layer, every in three replications, i.e. three replications were collected at each location below each tree monoculture, except for Piaseczno sand mine dump where alder is not presented. Lipids were extracted, fractionated, transesterified and finally analyzed using gas chromatography with mass spectrometric detection (GC/MS). The obtained data were analyzed using statistical programs Canoco and Statistica. Contrary to the original hypothesis that composition and structure of microbial communities depend on the substrate grain size and the dominant tree species, the results indicated that the composition of microbial communities expressed by PLFA values depended especially on vertical stratification of the soil horizons. A significant effect of individual tree stands or grain size of substrate has not been demonstrated. This is in contradiction to successional habitats.

Keywords:

PLFA, soil microbial communities, microorganisms, bacteria, fungi, decomposition, C/N ratio, land reclamation, land reclamation trees, dump, soil horizons, GC/MS