

Abstract:

My PhD thesis is focused on study of plant-soil interactions. **Chapter 1** is focused on general introduction to the interactions between plants and soil biota in terms of relationships between soil organisms and aboveground biomass as well as root biomass. **Chapter 2** is focused on food interaction of *Folsomia candida* and soil microscopic fungi (*Penicillium chrysogenum*, *Penicillium expansum*, *Absidia glauca*, and *Cladosporium herbarum*). Fungi were grown separately on Petri dishes or on different litter type (oak, alder and willow) separately as well. Laboratory experiments showed that food preference was more influenced by different litter types than fungal species. In **chapter 3** was studied long-term production of hybrid sorrel and its effect on the composition of the soil meso and macrofauna, basal soil respiration, microbial biomass and composition of cultivable fraction of soil microscopic fungi in comparison with oilseed rape and cultural meadow. There was found that long-term production of hybrid sorrel affects the composition of soil fauna, while the microbial activity of the soil was more affected by agriculture practices, especially tillage. In **chapter 4** was studied the effect of native (*Salix viminalis* and *Phalaris arudinacea*) and introduced (*Reynoutria sachalinensis*, *Silphium perfoliatum* and *Helianthus tuberosus*) energy crops on community composition of soil meso and macrofauna, the composition of microbial communities, soil biological activity and composition community of cultivable fraction of soil fungi in comparison with cultural meadows. Introduced energy crops more reduced the abundance of soil fauna. Although the significant differences in the structure of microbial communities and their biological activity were found in soils overgrown by individual plant species, they are not considerable as significant between native and introduced plant species. **Chapter 5** showed plant chemistry and the allelopathic effect of hybrid sorrel, knotweed and miscanthus on seed germination, fungal growth and population density and development of soil mesofauna. Miscanthus and knotweed litter had a higher C:N ratio than the control meadow and hybrid sorrel litter. Miscanthus and hybrid sorrel litter had a higher content of phenols than knotweed and cultural meadow litter. Leachates from hybrid sorrel, miscanthus and knotweed litter significantly decreased seed germination of wheat and mustard in both substrates. Soil fungal pathogens grew less vigorously on agar enriched by leachates from both energy crops than on agar enriched by knotweed and control leachates. Litter from hybrid sorrel, miscanthus and knotweed significantly altered (both ways) the population growth of the soil mesofauna.