

Abstract

Microbial communities inhabiting upper soil horizons represent an important component of forest ecosystems. However, despite the evidence that yeasts represent an integral part of topsoil fungal communities, their role in forest ecosystems received so far little attention. The aims of my PhD thesis were to describe yeast communities in soil and litter of a temperate forest using high-throughput sequencing of environmental DNA, identify dominant yeast species and to explore how the composition of yeast communities reflects the biotic and abiotic factors of the environment. I also aimed to isolate yeasts from forest topsoil, describe novel yeast taxa abundant according to the environmental DNA survey and screen representative isolates for the traits relevant to their involvement in organic matter transformation.

I have demonstrated that in forest topsoil, yeasts represent a substantial proportion of fungal communities with higher relative abundance in soil than in litter. In litter, yeast communities differ significantly among beech, oak and spruce-dominated stands. Drivers of community assembly are probably more complex in soils and comprise the effects of soil chemistry and vegetation. Even though there are similarities in the response of the communities of yeasts and filamentous fungi to environmental conditions, many differences are also evident. Despite taxonomic heterogeneity, yeasts represent a fungal group with a specific nutritional strategy dissimilar to other soil fungi. While the efficient decomposition of hemicellulose, cellulose or chitin appears to be restricted to only a few taxa, results of the carbon sources utilization assays indicate that most yeasts can efficiently act as mutualists that utilize products of decomposition, provided by other microbes. Importantly, large fraction of enzymes produced by yeasts is associated with their cell surfaces. This adaptation should ensure that the decomposition takes place at the cell surface of the unicellular microorganisms and the resulting compounds are readily available to the producers of the enzymes. Based on the results of this thesis, forest soil yeasts seem to have unique ecology which may reflect their unicellular growth form. Three novel yeast species were described, all belonging to the subphylum Pucciniomycotina, class Microbotryomycetes: *Leucosporidium krtinense* f.a. sp. nov., *Yurkovia mendeliana* sp. nov., and *Libkindia masarykiana* sp. nov. Based on the analysis of environmental DNA, these new species are common and abundant in the studied environment which indicates their high environmental relevance in the temperate mixed forest.