

Comparison of the impact of fourteen tree species on herbaceous layer development, soil physicochemical properties and arbuscular mycorrhizal fungi abundance, species richness and composition in the experimental forest

Arbuscular mycorrhiza (AM) is the most common type of symbiotic coexistence and affects about 80% of plants on Earth. Despite the fact that arbuscular mycorrhizal fungi (AMF) are significant components of forests ecosystems, they still remain underappreciated part of these ecosystems. The overpowering percentage of studies related to the forests in temperate climate zone focuses only on ectomycorrhizas, formed mainly by overstorey plant species. Nonetheless, also the presence of AM among herbaceous plant species has been noticed.

AMF communities are affected by several factors (biotic and abiotic) which have variable and cooperative effects. In European forests, the studies on AMF communities and their associations with herbaceous plant species are rare. Moreover soil physicochemical properties as well as microbial processes and communities are also affected by overstorey species, however, the role of overstorey species in the abovementioned interactions is still slightly deepened. Thus, the aim of this project is to characterize and compare the impact of 14 tree species on herbaceous layer development, soil physicochemical properties and AMF abundance, species richness and composition in the Siemianice Experimental Forest.

The Siemianice Experimental Forest is the optimal model for proposed studies. In nature, at the same time many factors impact on soil processes, plant species and AMF communities with uncontrollable extent. In the experimental model environmental conditions, factors that affect the entire area are similar. The experimental area harbors as many as 14 different tree species as monocultures on the same soil type, which allows differentiation of the impact of particular overstorey species in the proposed studies. So far studies in the Siemianice Experimental Forest omitted the thread of interaction between herbaceous layer development, soil physicochemical conditions and AMF communities/AM development.

In the proposed project, we will determine herbaceous layer development, soil physicochemical properties, and AMF community structure and AM formation by herbaceous plant species on 52 monospecific plots with 14 overstorey species, using modern methods such as e.g. next generation sequencing of AMF DNA and the assessment of AMF markers (lipids, glomalin). So far such comprehensive comparisons have never been performed. As a result, we will obtain a comprehensive characteristic of the impact of overstorey specificity on AMF abundance, species richness and composition and AM formation by vascular herbaceous plant species in relation to soils physicochemical properties and herbaceous layer development.