Abstract

All plants live in symbiosis with fungal endophytes – they can form mutualistic, commensal or parasitic symbioses. Symbiosis of root endophytes, called for their darkly pigmented and septated hyphae *dark septate endophytes* (DSE), and plants has been often overlooked although its role for plant communities can be very important. Despite their ubiquitous presence in roots of terrestrial and also aquatic plants the influence of DSE on their host plants is still unresolved. Results of previous studies are inconsistent - some reported that DSE have positive effects on their host plant growth and some negative. The main reason for this inconsistency might be their complicated taxonomy and difficult identification of different cryptic species which are morphologically indistinguishable. We were able to complete a unique collection of the most common DSE species, mainly members of the *Phialocephala fortinii – Acephala applanata* species complex. The collection includes the most common DSE species isolated from roots of forest plant communities.

The goal of my thesis was to describe behaviour of DSE in roots of typical forest plants and elucidate their physiological influence on host plants. *In vitro* resynthesis experiments were used to observe root colonization patterns. Nutrient flow between the plant and the fungus was traced by radioactive and non-radioactive isotopes.

All tested isolates colonized roots of all three host plants (*Betula pendula*, *Picea abies* and *Vaccinium myrtillus*) in *in vitro* conditions. No mycorrhizal structures were formed by any of isolates of the *Phialocephala fortinii* s. l. cryptic species and their influence on growth of their hosts was very similar. A close relative of the cryptic species, *Acephala macrosclerotiorum*, was able to form ectomycorrhizal structures in roots of *P. abies*. Although the endophyte *A. macrosclerotiorum* acted as a weak parasite in *P. abies*, it had positive influence on biomass of *V. myrtillus* and *B. pendula* and ^{33}P flow was detected from the fungus to the host plant.

Although *P. fortinii* s. l. cryptic species have been often isolated from mycorrhizal roots our result show that they do not form mycorrhizal structures in roots of *P. abies* and *V. myrtillus.* They thus do not behave as mycorrhizal fungi but they live together with mycorrhizal fungi as their co-associates – the importance of this

coexistence is still unresolved. According to the findings of my work the reason for high variability of life strategies of DSE observed so far is not the difference in behaviour of the cryptic species. All species used in our experiments had negative influence on host plant biomass. Not all of the DSE species were acting as weak parasites – endophyte *A. macrosclerotiorum* formed mycorrhizal structures and had positive influence on host plant growth. What are the mechanisms of the positive influence of DSE remains unclear but our results suggest that endophytes can have direct influence on nutrient transport to the host plant.