

ABSTRACT

Arbuscular mycorrhizal (AM) symbiosis, a widespread plant-fungal relationship, is based on reciprocal resource exchange. The functioning of this fragile relationship balances on the scale from mutualism to parasitism, depending on the specific context. The thesis aims to interlink the functioning of AM symbiosis both with the composition of AM fungal communities and with different abiotic conditions. The thesis is divided into a methodological and a factual part and consists of three publications and one manuscript.

All experiments were conducted in greenhouse conditions with medic (*Medicago sp.*) as host plant. Host plants were inoculated with single AM fungal species in Paper I and II, and with a synthetic AM fungal community of five species in Paper III and IV. The host plant identity, the amount of phosphorus (P) in substrate and the type of substrate played an important role for the achievement of mutualistic AM symbiosis, as demonstrated in Paper I. Paper II showed that mitochondrial and nuclear qPCR markers can be used alternatively for the quantification of particular AM fungal species. However, intraradical fungal biomass was better related to copy numbers of nuclear DNA than of mitochondrial DNA.

The functioning of AM symbiosis was modulated by the availability of P, light and water, though different abiotic conditions had a very limited influence on the quantitative composition of AM fungal communities, as shown in Paper III. The mycorrhizal benefits were linked to contrasting P demands of the plants across all the abiotic contexts. Paper IV showed that mycorrhizal benefits were mainly related to intraradical fungal biomass and partially also to the abundance of a particular AM fungal species. The composition of communities establishing from differently composed inoculum pools initially differed in their composition, but tended to converge in time.

In conclusion, the functioning of AM symbiosis was found to be influenced by different abiotic conditions and by the quantitative composition of AM fungal communities via the traits of particular AM fungi related to spread and symbiotic functioning. The composition of the AM fungal synthetic communities was affected by the root colonization traits, temporarily also by the amount of propagules in the inoculation pools and a only little by abiotic conditions.