Abstract

Despite the fact that arbuscular mycorrhizal fungi (AMF) are the most abundant symbionts in terrestrial ecosystems, only about 240 species have been described, based on the morphological features of their spores. Modern molecular techniques have identified many more taxonomic groups, indicating that the overall AMF diversity has been significantly underestimated. However, such information does not permit the differentiation between functional and biological variation within AMF on the impacts on plant growth and community composition. The great functional diversity evident in AMF from genetically different isolates, even those within species, may play an important role in determining plant diversity, productivity, and ecosystem variability. Exchange of phosphorus and photosynthate between plants and AMF, colonization rates, growth of extraradical mycelium (ERM), and differential gene expression of the host plant induced by AMF are important factors in functional diversity. However, the extent to which these and other determining functions are distributed within and between different taxa is still unclear. The mutual interaction between hosts and AMF is critical in determining the benefits to the former. Maintenance of a sustainable mixed plant population therefore depends on the preservation of a diverse AMF population, based on the concept that larger AMF communities have greater probability of containing more diversity in phenotypic traits. Employing this strategy may help to ensure availability of the essential number of species required for ecosystems functioning. Evidence of the coexistence of distinct evolutionary lineages resulting from phylogenetic trait conservatism can enhance ecosystem functioning because of functional complementarity. Thus any change in populations or loss of diversity within agroecosystems may result in changes to productivity or loss of resilience to adverse conditions because of alteration in the ability of AMF to sustain multiple functions in above- and belowground ecosystems. Management practices such as crop rotation, tillage, and phosphorus fertilization influence AMF diversity and, consequently, AMF functioning. Agronomic systems that minimize negative effects on AMF diversity will enable the proper functioning of ecosystems and will provide the desired agricultural benefits, however, appropriate practices still need to be further developed. The combination of crop sequence selection and tillage practices that maintain the ERM intact appears to be a

possible approach to selecting a consortium of AMF that can be induced to colonize and improve the productivity of more than one crop.

Keywords: Ecological roles; host benefits; biological diversity in AMF; functional diversity in AMF; interactions through host and AMF diversity; agronomic practices