

Abstract

There is a great functional diversity within and between different species of arbuscular mycorrhizal fungi (AMF) in terms of the benefits they may confer to host plants, such as the acquisition of nutrients or protection from biotic and abiotic stresses. It is critical to understand how the various practices available for use within production systems, particularly those compatible with the sustainable intensification of agriculture, impact AMF, and their diversity. In commercial crop production farmers need to prepare the land for seeding, protect the developing and maturing plants from pests and diseases, provide a suitable supply of nutrients and water, and ensure a timely harvest. Tillage systems vary greatly in the extent of their disturbance of soil in terms of the depth and fragmentation, affecting AMF abundance and diversity. In contrast to inversion tillage, the AMF colonization rate of crops under no-till starts earlier and develops faster due to the presence in the soil of an intact extraradical mycelium, which enhances the role of AMF in the uptake of nutrients and the protection against stresses. Rational use of applied nutrients, supplied either through the application of organic amendments or inorganic fertilizers, which is essential to maintain soil productivity, is compatible with maintaining an abundant and diverse AMF population, especially in association with no-till systems. Crop rotation has been the traditional approach to ensure that neither pests nor diseases of a particular crop build up to epidemic proportions in the soil or field environment. There is a relationship between the diversity of plant material above ground and the AMF present below the soil surface. Reducing soil disturbance by tillage, adding organic amendments, keeping harvest residues and use of cover crops all help to increase soil organic matter, which in turn plays an important role in reducing application of mineral fertilizer and the need for herbicides. By employing cropping practices that achieve these goals, it might be possible to improve AMF diversity to levels identical to that in natural ecosystems. There is an urgent need to use the new generation of molecular tools for the evaluation of effects of cropping systems on biodiversity of AMF associated with field crops, especially for AMF from different functional groups.

Keywords: Cropping system; soil; AMF abundance and diversity; tillage; crop diversification; fertilizers; pesticides