Role of Arbuscular Mycorrhizal Fungi in Root Development with a New Dimension in the Root Web Network

Palak Nagpal, Rachna Kapila, and Shantanu Mandal

Abstract A number of interactions take place in the soil. These interactions are important for the physiology, growth and development of the plant. It is one of the important interactions is the symbiotic relationship between the arbuscular mycorrhizal fungi and the roots of the plant. It tends to affect the growth patterns of plant indirectly by forming colonization in roots through hyphae. Many benefits like more nutrient uptake, more water absorption and an increase in biomass are provided to plants through the roots. The hyphal colonization also helps the plant to survive in harsh environmental conditions and from biotic and abiotic stress. Many studies and researches have proved that the inoculation of arbuscular mycorrhiza to the roots of the plant acts as a benefit for them. Findings also say that arbuscular mycorrhiza resists weeds by decreasing the amount of nutrition for them. In the presented chapter, the studies, researches and Findings, about the relationship between roots and Arbuscular mycorrhizal fungi and their importance have been covered.

Keywords Arbuscular mycorrhizal fungi · Root colonization · Nutrient uptake · Biotic and abiotic stress

1 Introduction

Arbuscular mycorrhizal (AM) fungi, is one of the most well-known group of obligate symbiotic fungi that colonizes approximately 70–80% of the land plant species and belongs to a monophyletic group, the Glomeromycota (Parniske 2008; Harrison 2005). Arbuscular mycorrhizae are present in the soil in forms like spores. During germination, the hyphal germ tube grows in search of the host root. As the symbiotic relationship is formed, the fungus forms appressorium in the root surface through which it enters the root. However, the growth depends upon the species and type of plant (Cavagnaro et al. 2001; Harrison 2005).

P. Nagpal · R. Kapila · S. Mandal (✉)
Department of Biology, Institute of Home Economics, University of Delhi, New Delhi, India
e-mail: shantanu.mandal@ihe.du.ac.in

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These spores can even germinate in water without the signal of plants (Bécard and Piché 1989; Harrison 2005). It uses triglyceride and glycogen reserves for the growth and hyphal germ tube extension. The symbiotic development of Arbuscular Mycorrhiza results in the formation of Arbascules. These are tree-shaped subcellular structures along with plant cells. It acts as the main door for nutrition exchange between the plant and symbiotic fungal partners (Parniske 2008; Harrison 2005). The association connects the plant and fungi with hyphae that can be 100 m long or hyphae per cubic centimetre of soil. These hyphae proceed with the intake of water and nutrients, phosphate predominantly. In return for providing nutrients, it gets carbohydrates from plants (Parniske 2008; Harrison 2005).

Mycorrhizal colonisation can also increase root longevity through a number of