Role of Mycorrhizal Fungi in Ecosystems

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INTRODUCTION

Most land plants form associations with mycorrhizal fungi. Mycorrhizas are mutualistic associations between fungi and plant roots. They are described as symbiotic because the fungus receives photosynthetically derived carbon compounds and the plant has increased access to mineral nutrients and sometimes water. The two most common associations are the arbuscular endomycorrhizas (AM) formed by Zygomycete fungi, and the ectomycorrhizas (ECM) formed by Basidiomycetes, Ascomycetes, and a few Zygomycetes. Other mycorrhizal associations include the orchid, ericoid, arbutoid, monotropoid and ectendo- mycorrhizas (Brundrett et al., 1996).

Mycorrhizal associations predominate in most natural terrestrial ecosystems (Brundrett, 1991). Whereas the AM fungi are widespread geographically and have a very extensive host range, the ECM fungi are more restricted, forming associations predominantly with genera of important woody plants. Nevertheless, ECM fungi are dominant components of the ground-dwelling macro-fungi in ecosystems where members of the following plant families abound: Betulaceae, Dipterocarpaceae, Fagaceae, Myrtaceae, Pinaceae, Ulmaceae, Salicaceae. ECM fungi are common in tropical forests of Asia but are uncommon in many forests in Africa and South America. In Asia, the number of host species tends to increase with altitude and at higher latitudes.

BENEFITS TO PLANTS

Supply of inorganic mineral nutrients

Many thousands of experiments have shown that mycorrhizal fungi can overcome nutrient limitation to plant growth by enhancing nutrient acquisition, especially phosphorus (Marschner and Dell, 1994; Clark and Zeto, 2000). Most studies have investigated P, but mycorrhizas have been implicated in the uptake of most essential nutrients. A notable exception is the element boron which is often the main micronutrient limiting growth in SE Asia (Dell and Malajczuk, 1994).

The main mechanisms for an increase in inorganic nutrient uptake in mycorrhizal plants are:

- The large surface area for nutrient acquisition provided by the fungal hyphae external to the root compared to uninfected roots. A high proportion of ECMs are located in soil pores (Babel, 1987) from where hyphae radiate out into soil particles. The aerobic environment of such pores facilitates nutrient transfer from the fungal sheath to the root (Harley et al., 1953). As the fungal mycelium grows through soil, it scavenges for mineral nutrients and is able to