BENEFICIAL FUNGUS IMPROVES PLANT PRODUCTION

For decades, scientists have studied soils to better understand nutritional content and microscopic flora and fauna. Countless hours are spent each year working to improve agriculture production. In their quest, scientists have found that soils contain a variety of microorganisms, some of which benefit plants while others may cause disease. Although many years of research have lead to the development of chemical controls for pathogenic organisms, in natural ecosystems, beneficial soil organisms regulate disease and assist in plant development.

FUNGUS - FRIENDS OR FOE?

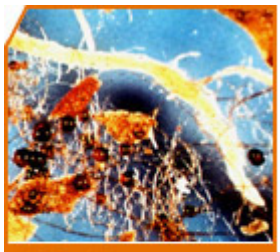

FIG. 1
THIS IS A MAGNIFIED IMAGE OF ROOT COLONIZED WITH ENDOMYCORRHIZAL FUNGI.

Over the past several years, a strong interest has developed in the identification and culture of beneficial soil organisms. It is documented that many bacteria and fungi can help plants in combating diseases, locating nutrients and acquiring water when in short supply. Within the beneficial organisms exists a complex group of fungi called mycorrhizae (fig.1). These fungi grow in association with most plants and have been investigated as growth and quality enhancers for agriculture and horticulture crops. Some of the benefits reported include larger plant size, enhanced foliar quality, more profuse flowering and fruiting, resistance to certain diseases and improved resistance to certain stresses during cropping (transplanting, drought, salinity), particularly when introduced to plants grown in poor soils.

WHAT ARE MYCORRHIZAE?

Mycorrhiza (singular), a term that means “fungus root”, describes the mutually beneficial, symbiotic relationship between fungi and plant roots. Symbiosis begins when fungal spores germinate and emerging threadlike structures, called ‘hypha' (plural hyphae), enter the surface of plant roots. The plant root system and fungal hyphae combine to form a greatly enhanced absorptive surface area. The result is improved nutrient acquisition and uptake, particularly elemental phosphorus (P), zinc (Zn), manganese (Mn) and copper (Cu) and water. In return, the plant provides carbohydrates to the fungi. This root-fungus association mutually benefits the host plant and fungi. There are more than 150 defined species of mycorrhizal fungi found around the world in all types of soils and climates. Two general classes categorize mycorrhizal fungi as Ectotrophic and Endotrophic.

WHAT'S THE DIFFERENCE?

Classification is based on the inter-relation of threadlike fungal hyphae and the plant root cell. Ectomycorrhiza form a compact mantel on the surface of plant roots, but do not enter plant root cells. Mycelia strands extend inward between cortical root cells and outward from the mantle to soil surface. Often hyphal fruiting bodies (stinkhorns and other mushrooms) can be seen in forested areas around the base of trees after sufficient amounts of rain. Ectomycorrhiza commonly occur on pine (Pinaceae) and other conifers, birch (Betulaceae), beech and oak (Fagaceae) families and some woody plants.

Endomycorrhizae form an association in which fungal hyphae penetrate the epidermal and cortical cells of plant roots. Endomycorrhizae are present on root surfaces only as individual threads that may penetrate directly into root hairs, epidermal cells and the fleshy cortex cells of roots. Although it is not fully understood, it is possible that recognition signals allow the mycorrhizal fungus to penetrate the plant root tissue. Individual threads extend from the root surface and outward into surrounding soil forming a vast network. This allows an improved absorption of nutrients and water by the root, particular unavailable or limited amounts. Although invisible to the naked eye, endomycorrhizae can occur on most seed bearing

plants (except those susceptible to ectomycorrhizae), rain-forest tree species, most agriculture crops and a variety of ornamental plants.

THE 'INSIDE' SCOOP ON ENDOMYCORRHIZAE

FIG. 2
DETAIL OF ARBUSCULES (LITTLE TREES)

Many endomycorrhizae form structures between and within the cortex cells of plant roots. Hyphal branches penetrate the host cell and give rise to small structures called "arbuscules" (Latin for tree). These structures resemble tiny trees and serve as exchange sites within cortical cells of plant roots. Arbuscules form within 2 to 3 days after the cell is colonized and will last from 1 to 3 weeks.

Sac-like structures, called "vesicles" (little sac), are generally found as terminal ends of hyphae filaments. Vesicles contain many lipid droplets and serve primarily as storage organs for the fungus. Vesicles can also germinate into propagules to colonize other portions of plant roots. Normally, vesicles form after the collapse of arbuscules and become more numerous late in the growing season as plants mature. Both arbuscules and vesicles are connected by long threads of fungal hyphae inside and outside the plant root system.

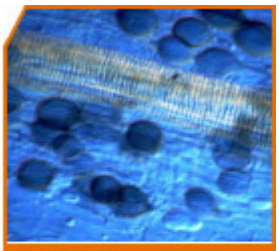

FIG. 3
MAGNIFICATION OF VESICLES FOUND IN PLANT ROOT

VAM TO THE RESCUE!

Endobmycorrhizae containing both arbuscules and vesicles are called VAM fungi. VAM fungi benefit plants most when used in conjunction with phosphorus-fixing soils (sandy soils) and poor quality soils. Intensely farmed land, new housing developments where the topsoil has been stripped away, landfills and mine sites can benefit greatly from VAM fungi. For average soils, benefits are most evident when plants are subjected to stressful growing environments (i.e.: arid conditions, unseasonable temperatures, low nutrient soils, excessive fertilizer, transplanting, and establishment of new plantings). The combination of chemical fertilizer applications and the lack of organic matter replenishment have left much of our soils almost void of beneficial organisms. Many agriculture crops, ornamental plants and container plantings can benefit from these microscopic wonders. To learn more about PRO-MIX Professional Growing Media and PRO-MIX Consumer Potting and Planting Mixes enhanced with MYCRORISE® PRO contact Premier Horticulture @ 1-800-525-2553.

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