Mycorrhizae:

Insurance for your plantings

These tiny little fungi can make a mighty big difference in promoting landscape plant survival and health

BY KRISTI WOODS, M.S., AND MIKE AMARANTHUS, PH.D.

We purchase insurance for our cars, our houses, and ourselves. What about for the trees and shrubs you install? Naturally you want your landscape installations to have the best opportunity to succeed. You choose healthy stock plants, insure proper planting depth and choose the ideal location.

However, after you leave the job site, care of the plant is often then left to the property owner, and here is when most plants fail. Plants succumb for a variety of reasons including over- or under-watering, shock of transplant stress and lack of proper nutrition. Wouldn't it be great if you could leave behind something that would help insure against common plant neglect? This is where mycorrhizae play an essential role.

We are fungi

Mycorrhizae are specialized fungi that form mutually beneficial associations with plant roots. They help increase establishment and growth, greatly extend the roots' surface area and provide resistance against stress. The presence of mycorrhizae results in healthier plants.

Typically, both the plants and mycorrhizal fungi benefit from their association with each other. This functional give-and-take relationship provides a carbohydrate source for the mycorrhizal fungi, which is what they need to grow and explore the soil resource. The plant, in turn, benefits from improved nutrient and water uptake, carbon acquisition, phytohormone production, salt tolerance and resistance to pathogens.

Mycorrhizae actually alter the relationship between the plant's roots and the soil, increasing the roots' ability to absorb phosphorus and nitrogen, critical nutrients for plant growth and stress physiology.

Mycorrhizae form an association with more than 400,000 different plant species, ranging from primitive plants to more advanced species. The nature of the association depends upon the species of plant and fungus involved as well as the environmental conditions. Forming with approximately 95% of all land plants, mycorrhizae are found in a variety of ecosystems and plant communities. About the only terrestrial setting in which they do not occur are where plants are absent.

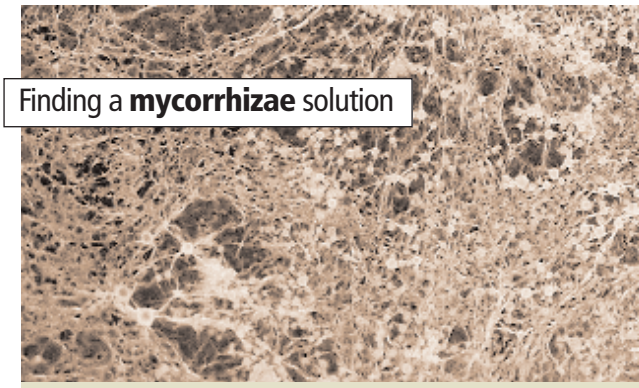
Mr. Outside; Mr. Inside

While mycorrhizae are classified into seven major groups characterized by key morphological features of the root-fungus association, the two most common groups are ectomycorrhizae (colonize outside) and endomycorrhizae (colonize inside). Ectomycorrhizae colonize outside root cells and can produce a mushroom, puffball or truffle "fruiting body" above or below ground. Ectomycor-

continued on page 46

A flourishing landscape two months after using mycorrhizal inoculants at planting.

Finding a **mycorrhizae** solution



Plants fail for a variety of reasons including over- or under-watering, shock of transplant stress and lack of proper nutrition.

Fungal absorbing mycorrhizal threads like those above form mutually beneficial associations with plant roots. They help increase establishment and growth, greatly extend the roots' surface area and provide resistance against stress. The presence of mycorrhizae results in healthier plants.

Choose a product based on the tree or shrub being planted and their mycorrhizal status. Most companies offer an all-in-one product containing both ectomycorrhiza and endomycorrhiza to make the decision easy. For a complete list of trees, shrubs and annual plants and their mycorrhizal status please visit Mycorrhizal Applications at **www.mycorrhizae.com**.

continued from page 44

rhizae form associations with trees such as pines, birch, oak, walnut, willow and beech. Ectomycorrhizae create a sheath of hyphae (fungal cells), increasing the root surface and volume around the plant root and make it harder for fungal or bacterial diseases to penetrate.

Arbuscular mycorrhizae, or endomycorrhizae, colonize inside root cells. An endomycorrhizal association is traditionally characterized by two structures: vesicles and arbuscules. Vesicles are used for the storage of carbon. Arbuscules are where the nutrient exchange between the fungus and plant actually takes place. Endomycorrhizae form beneficial partnerships with 70% of all plant families, including flowering plants, annuals, grasses and select trees such as maple, magnolia and dogwoods. Endomycorrhizae are critical to plants commonly used in landscaping; therefore, the world would be significantly less colorful without them.

Endo and ectomycorrhizal fungi similarly produce an abundance of tiny threads or "hyphae" that spread from the roots themselves into the surrounding soil. These tiny threads are critical for getting plants established by extending the effective absorptive area of the roots system away from the plant and into soil at the planting site.

There are a number of commercially available endo and ecto mycorrhizal inoculants. These inoculants come in various forms, including dry soluble powders, granular pills, tablets and pre-inoculated soil media. Plants can be inoculated via numerous methods such as soil drenching, liquid injections, granular incorporation and vertical mulching.

Put 'em to work

Applying a mycorrhizal product to established or newly transplanted plants can result in a range of benefits to the plant's health, such as increased water uptake, increased resistance to insect pests and diseases, increased nutrient accumulation, and increased transplant survival.

▶ **Insurance against under-watering.** After the mycorrhizae colonize the roots of a plant, the fungus then grows throughout the surrounding soil and forms an extensive cobweb-like network that explores a larger soil volume than normal roots. These special fungi can increase the ability of the roots to access water in the small areas between soil particles because they are smaller about 1/10 the diameter compared to roots. The ability of mycorrhizae to enter small areas can increase absorption several hundred to several thousand times compared to roots alone.

▶ **Insurance against poor nutrition.** Mycorrhizae increase uptake of phosphorus and other tightly bound nutrients to the roots by secreting enzymes in the root zone that unlocks these important minerals. With the enhanced nutrient uptake, mycorrhizae encourage flowers to grow more quickly and efficiently, extending the growing season or providing fruiting trees with earlier yields. An increased growth rate of the root and shoot means plants grow larger, with healthier root zones.

▶ **Insurance against transplant stress.** Plants colonized by mycorrhizae produce larger, more extensive root systems. This highly developed root system greatly reduces drought stress on the plant since it absorbs moisture more effectively. Inoculated plants also produce new root structures called "feeder roots." The increased surface area provided by the mycorrhizae and their associated threads in inoculated plants increases the ability of plants to become established.

Insuring against some of the main homeowner and business owner miscues by using mycorrhizal products is another method landscapers can use to further their business dollar. If a customer is satisfied with your one year guarantee not only will the landscaper be less likely to have to replace plant stock saving money the customer will spread the word encouraging business to grow. LM

— Mike Amaranthus is president at Mycorrhizal Applications Inc. He can be reached at **info@mycorrhizae.com**.
Kristi Woods is a research associate with Novozymes Biologicals, Inc. She can be reached at **KYW@novozymes.com**