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## FAQ'S ON MYCORRHIZA

- 1. What are mycorrhizae?** Mycorrhizae are mutualistic relationships between soil fungus and plant roots. Scientist tells us that the relationship has been around for 400 million years although discovered in 1845 by a scientist in Germany.
- 2. Where can the introduction of mycorrhizal fungi with roots have the greatest effect?** In disturbed soils, the kinds found in landscape projects, restoration, new grove/orchards, and mine reclamation sites.
- 3. Are mycorrhizae in the plants that I buy at the nursery?** Probably not. Even if there was a mycorrhizal fungi present in nursery stock the species that would thrive in a nursery setting would probably offer little benefit in a real world landscape, restoration, or forestry planting.
- 4. What about field grown plant materials - would they have beneficial mycorrhizal fungi associated with the roots?** Again, practices generally are geared to high production to turn inventories. Under highly managed operations any mycorrhizal fungi present would be poorly adapted to “real world” conditions found at out planting sites.
- 5. Are multi-species mycorrhizal inoculants really necessary?** Multiple species are very important because they increase the odds significantly that one of the selected species will prosper with the roots and multiply quickly.
- 6. Since mycorrhizal fungi may be present in the soil anyway why should I inoculate my transplants?** Although mycorrhizal fungi may be present the types (species) may not be the most effective for the plant species that is being planted. The introduction of diverse species at the time of planting greatly enhances the probability of successful colonization of the roots to take advantage of all of the benefits of mycorrhizal roots.
- 7. When buying an inoculant for mycorrhiza is the number of spores important?** Yes, the number of spores can be important, but more important is the degree of infectivity present in an inoculant. How effective an inoculant is depends on how rapid it can cause colonization of the root system. Spores tend to be the least infective of fungal parts in the genus *Glomus* (which comprise the majority of commercially available inoculants). Hyphal fragments are most infective, followed by mycorrhizal root fragments. All three infective components are referred to as propagules by INVAM (<http://invam.caf.wvu.edu/otherinfo/articles/propagules.htm>). Make sure that the species used in the inoculant are diverse and have been proven to be effective over wide ranges of plant species, pH, and soil types. ([DIEHARD™ species are proven - see a +40 page reference list.](#)) Consumers can be fooled by companies that claim high spore count but use weak,



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or ineffective spores, in the count that are easy to reproduce to achieve spore count specifications. Some spores too offer little potential for good colonization but the propagules of these species are the real potential partner to begin the colonization process. So, unfortunately, the answer to the question is both yes and no. The key here is to work with a company that has established itself in the market from top to bottom with high standards of products, customer service, and an honest effort to be a legitimate business partner with your company. Too often you can get sucked in with four-color advertising and fancy literature, but beyond the window dressing is a company out to take your money and give you junk - packaged in a pretty box!! It's a fact that one company claims its product consists only of spores and that makes it the best product on the market, when in fact the company's products are weak at best and when compared to other products are not superior and usually inferior. Know whom you're dealing with. Ask for references.

Lastly, some strains such as *Glomus deserticola*, *Glomus microaggregatum*, *Glomus mosseae*, and sometime *Glomus intraradices* produce clusters of spores very (like a popcorn ball". Most of time, *Glomus deserticola* and *Glomus microaggregatum* produce clusters with as many as 500 spores minimum stuck together. *Glomus mosseae* produce external sporocarps (5-10 spores inside) or external clusters of "young spores" and *Glomus dussii* produce external sporocarps (containing hundred of very small spores) and also external spores entrapped within the external mycelium. *Glomus intraradices* produce large quantity of INTERNAL spores inside the root (hundred spores /cm of root can be counted sometime). All these "natural occurring" sporulation configurations are considered for the counting spores.

Endomycorrhizae are not Ecto and this difference must be considered.

The most important aspect is the standardization of the product and the efficiency and quality.

**8. If I am planting like type plants in an established setting. Is the use of a mycorrhizae inoculant still necessary?** Use of an inoculant here is still appropriate as research shows that the species of mycorrhizal fungi most effective with young plants may be different than the species most effective with mature plants of the same plant species.

**9. I'm a grower. Can I use mycorrhiza in my production to produce a more natural plant?** Yes, you can but you have to commit yourself to change. Several companies, both nursery and peat suppliers now market their products as "Contains Mycorrhizae". Their statements DO NOT claim that colonization has happened and that the roots of the plants are mycorrhizal. I've quizzed these companies and found that they have not measured the degree to colonization that has taken place in the plants produced. Therefore what's the point? Could they be making claims only to better sell their products without caring about the end results? Unfortunately I believe they are selling the "sizzle" instead of the steak.



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So what must you change and understand so that you can get mycorrhizal roots? Understand a mycorrhizal inoculant can be introduced to the roots of a plant and never colonize because the fungi's benefit to the root is being supplied by the management techniques of the grower. The fungi must play a roll if it is to earn foods from the roots. If the roots can get by "freeloading" everything from the grower it will not give the fungi the time of day let along foods. The big benefit that the fungus offers is phosphorus uptake. To give the fungi a chance to perform this vital roll back off of phosphorus applications and use an organic nitrogen source. This will give the fungi a roll and perhaps justify colonization to the plant.

To assure inoculation the University of California recommends that the nutrient levels should be below at least one of the following with the phosphorous level being the most critical:

Nitrogen* 50 ppm	(approx 95 lbs/ac = 105 kg/ha)
Phosphorous (Olsen) 34 ppm	(approx 64 lbs/ac = 71 kg/ha)
Manganese 27 ppm	(approx 50 lbs/ac = 55 kg/ha)
Zinc 12 ppm	(approx 23 lbs/ac = 25 kg/ha)
Organic Matter	Low

\*Nitrate forms of nitrogen are preferable to ammonium forms especially in peat mixes.

Response to mycorrhizal inoculation along with fertilization has often been positive even at normally recommended application rates (nutrient levels higher than those suggested above). However, mycorrhiza can be most beneficial at low fertility levels - increasing growth rate, plant quality, and survivability and at the same time reducing fertilizer material and labor costs.

As a general guideline for citrus, the University of California suggests applying 1/3 or less the recommended rates of ammonium nitrate and super phosphate.

Here's some further reading:

- <http://ashs.confex.com/ashs/2011/webprogram/Paper7115.html>
- <http://aggie-horticulture.tamu.edu/faculty/davies/research/morgan.html>

Procedure to see if roots are mycorrhizal:

<http://invam.caf.wvu.edu/methods/mycorrhizae/mycorrindex.htm>



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**10. What differences are there between commercial suppliers available?** There are presently a dozen, or more, suppliers of mycorrhizal products. The differences are typical of what one would expect. There are two or three with good products, four or five with "so-so" products and three or four with real "dogs". Our advice to you is to ASK THE SUPPLIER FOR REFERENCES. If they can't give you references that you can RELATE to, or that you've at least heard of, then that speaks volumes about the company. If they give you some homeowner in Portland, OR that used the product with tomatoes and got really good results - who really cares if you're an arborist in New York! Hey come on, you're in business. Ask questions and decide on your own...

**11. I'm a landscaper in an area where porous soils are the norm. I was told the mycorrhizal fungi in a transplant product here would leach into the soil and be of no value. Is this accurate?**

This would depend on the particle size of the propagules of mycorrhiza used and if the inoculum includes a water management gel. A landscape installation inoculant particle size should be 2-4 millimeter in size. If the correct product is used it will not percolate into the soil. Also, with tiny propagules (ecto) the use of a water management gel will absorb into the gel the ecto and hold it there for the roots to find. Liquid inoculants on the other hand will quickly drain into the soil away from the roots and should be avoided as a transplant aid. The key here is to deal with a company that has experience of longevity and the wisdom of a world class technical team on your side.