

Mycorrhizal Inoculation of California Native Plants in Containers

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At Tree of Life Nursery, we grow California native plants for ecological restoration, revegetation, and authentic early California landscaping. Our plants need to stand up to the rigors of the harsh, dry planting sites typical of southern California. More important than the rate of growth in the nursery are the sturdiness, vigor, health, and self-sustaining capabilities of the plants when they leave the nursery. For this reason, we began looking seriously at mycorrhizae approximately 12 years ago.

From our experience, the first step the nursery should take if interested in mycorrhizae is to seek the services of an expert in the field. We learned early that our expertise in propagation is completely different from the expertise required to produce healthy inoculum and maintain a program for making plants mycorrhizal. The expert at Tree of Life Nursery is Dr. Ted St. John, who has been on staff for about 10 years.

After experimenting with methods of inoculum production, we determined that a commercial product would only become popular if it were easy to handle in the field. Since endomycorrhizal fungi are host-obligate, we needed a growing medium for the host plant that would hold spores and hyphae, stay viable for a long time, and handle like a granular soil amendment. We found that calcined clay (similar to cat litter) met all our criteria. The commercial vesicular arbuscular (VA) inoculum produced by Tree of Life Nursery is labeled "VAM80" and is registered by the California Department of Food and Agriculture for use as a soil conditioner. Essentially, the inoculum is the screened, clay-based root ball of the production host plant.

We produce the fungus *Glomus intraradices*. This species occurs widely as a native in the soils of western North America and has proven itself adaptable to a wide range of climates and soils. We have in the past produced mixtures of fungal species native to the particular restoration site, but we find that almost all of our customers prefer the convenience and lower cost of our "generic" inoculum.

As we move into the fall planting season, the nursery continues to produce thousands of mycorrhizal container plants every week. Our routine production methods were not derived easily, but have required special accommodations in container mix, fertilization, and other details of the production schedule. Some of the most important details have been presented by Castellán and Molina (1990), St. John (1990, 1996), and St. John and Evans (1990).

Our inoculum has become a separate product and is in direct use in field restoration projects. The easily handled material appears to be changing the way habitat restoration is done in California. Many tons of the product were applied last year by both specialized machinery (a "land imprinter") and conventional agricultural and landscaping equipment.

To successfully establish a mycorrhizal program, the nursery must commit to a considerable modification of the standard routine, and must realize that the benefits are not to be realized by the nursery, but by the customer.

LITERATURE CITED

- Castellano, M.A.** and **R. Molina.** 1990. Mycorrhizae, pp. 103-167 In: T.D. Landis, R.W. Tinus, S.E. McDonald, and J.P. Barnett (eds.). The container tree nursery manual. Vol. 5. The biological component: Nursery pests and mycorrhizae. U.S.D.A. Forest Service Agriculture Handbook 674.
- St. John, T.V.** 1990. Mycorrhizal inoculation of container stock for restoration of self-sufficient vegetation, pp. 103-112. In: J.J. Berger (ed.). Environmental restoration, science and strategies for restoring the Earth. Island Press, Covelo, CA.
- St. John, T.V.** 1996. Mycorrhizal inoculation: Advice for growers and restorationists. Hortus West 7(2):10.
- St. John, T.V.** and **J.M. Evans.** 1990. Mycorrhizal inoculation of container plants. Comb. Proc. Intl. Plant Prop. Soc. 40:222-232.

“Collection and Use of Native Plants in the Landscape”**Question-Answer Period**

KATHY ECHOLS: Are you marketing the products you are currently using?

MIKE EVANS: Yes. It is labelled in California as a soil conditioner with the name VAM80.

LAINÉ MCLAUGHLIN: Do we have reason to think that this same fungus will work up here in the northwest or will we have to start from scratch?

MIKE EVANS: That's a good question; will it work here. Bob Linderman at Oregon State is one of the premiere researchers in the world and we've been in contact with him. We're working on some strains of *Glomus* that will tolerate acid soils, but *G. interadices* has not been very promising under acid conditions. It grows best in the pH 6.5 range and even slightly alkaline soils.

HANK BROKAW: I would like to know if you find different concentrations of the mycorrhizae with different depths in your 15-gal containers? If so, to what do you attribute that?

MIKE EVANS: Yes, we do find different concentrations. We discard the entire top (3 inches of medium) simply because there are not many roots there and that's where there would be any contamination from surrounding fields (weed seed, etc.). I think it relates directly to the quantity of roots in that part of the container and that's why we use SpinOut™ in an attempt to get a uniform distribution of roots throughout the whole container volume. The spores and hyphae, of course, attach themselves to the roots and prefer the cooler temperatures in the center of the container.

LIBBY DAVISON: Do you know anything about the temperature sensitivities of various VAM fungi?

MIKE EVANS: It's a good question. Inoculum laying out under the full sun for as little as a half-day will be damaged. However, within the container, as long as roots are surviving the fungus will be in good condition. We paint the containers white to minimize the build-up of heat in the soil medium.