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The Sun Gro'er

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The Sun Gro'er is a newsletter distributed two times yearly for the purpose of communicating horticultural and Sun Gro product information.

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Mycorrhizae: What's all the hubbub?

OVERVIEW

Customers have inquired about using mycorrhizae in Sun Gro mixes. Most people are not familiar with mycorrhizae and there is confusion and misleading information out in the industry about these beneficial organisms. This document is intended to answer these questions and provide a factual explanation about mycorrhizae, what these organisms are, how they benefit plants and how we can "use" them in our production.

First, let's examine what mycorrhizae actually is. The term mycorrhizae refers to a group of fungi which form a symbiotic relationship with a plant's roots. The term symbiotic means an association between two living organisms that benefit both organisms. These fungi grow either inside of a plant's roots or attach to the surface of a root. The fungi benefits from the plant's photosynthetically produced carbon compounds (i.e. "food" and "nutrients"). In turn, and regardless if the mycorrhizae are growing

inside the root or outside the root, the fungi send their hyphae out into the surrounding soil to absorb nutrients and water. So, mycorrhizae then enhance a plant's ability to take up nutrients and water. By virtue of this fact, research has shown that the association of mycorrhizae with plant roots will help plants deal with drought and some diseases. Approximately 95% of the world's plants have some form of mycorrhizal dependence. As far as greenhouse / nursery culture is concerned, in some cases, significant root and top growth is observed when plants are inoculated with mycorrhizae. These benefits are not always evident especially on short term crops, unless the crop is stressed. But as mentioned above, benefits of mycorrhizae may show after plants are installed into the landscape / garden when the environment is not as "hospitable" to plant growth and establishment.

TYPES OF MYCORRHIZAE

There are two major groups of mycorrhizae – Ectomy-

corrhizae and Endomycorrhizae. Both groups are specific in what plant types they form associations with. The first is **ectomycorrhizae** which forms relationships with birch, oak, spruce, pine and fir. Ectomycorrhizae forms an extensive hyphae network which is frequently visible to the eye and is characteristic of these organisms. Ectomycorrhizae is not important to most greenhouse growers (i.e. our customers) since the above plant types are not typical greenhouse crops. Some of the mycorrhizal species found in ectomycorrhizal product blends include *Rhizopogon villosulus*, *R. luteolus*, *R. amylopogon*, *R. fulvigleba*, *Pisolithus tinctorius*, *Schleorderma cepa*, *S. citri-*

Benefits from mycorrhizae are not always evident on short term crops (in the greenhouse), unless the crop is stressed.



Mycorrhizae....

num. If you examine many growing medium products, you will find large quantities of these "ecto" species which are inexpensive and easy to grow, even if the product is not likely to be used for the susceptible plant species. But it looks impressive on the label!

We have seen advertisements promoting the fact that products include these organisms even though the intended application would not benefit from them.

The second group of mycorrhizae is **endomycorrhizae** which are also known as vesicular-arbuscular mycorrhizae or **VAM**. Roughly, 80% of all the plants in the world form associations with endomycorrhizae. This is the group of mycorrhizae that is most important to greenhouse growers; and so, it is most important to Sun Gro.

The primary genus in the "endo" group is Glomus and the principle, or most important species in this group is



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Glomus intraradices. Most plants form associations with Glomus intraradices and so, most endomycorrhizal inoculants contain G. intraradices. Other Glomus species, such as G. mosseae, G. aggregatum, G. etunicatum, G. clarum, G. deserticola, G. claroidium, and Gigaspora albida form associations with plants to a significantly lesser scope compared to G. intraradices. You will find these other endomycorrhizae species in blended "endo" products along with G. intraradices with the intent that those blends will have a positive effect on a **wider range of plant types**. Secondly, it is thought that the addition of these other species to the G. intraradices helps or **"enhances" the establishment** of the G. intraradices organism.

There is a smaller, third group of mycorrhizae, called ericoid mycorrhizae. This group of fungi colonizes ericaceous plants such as rhododendrons, azaleas and heathers. These plant types **only form associations with these ericoid mycorrhizae** and do not form associations with Ectomycorrhizae or Endomycorrhizae.

When reviewing a product label, it will usually list the various mycorrhizal organisms and their respective amounts. If it is a product

that serves to inoculate growing media or soil with mycorrhizae, the mycorrhizal amounts will be expressed in spores per gram of product. If it is a growing medium, the amounts will be expressed as propagules per cubic centimeter (cc). When considering various growing medium products having mycorrhizal inoculants, blends of endomycorrhizae will show much smaller numbers than ectomycorrhizae blends. For example, you may see 0.2 propagules per cubic centimeter for a growing media containing an endomycorrhizae species. This observation is primarily driven by product cost. The key is to look carefully at the label and the amount of mycorrhizae that will be useful for the crops you are growing, paying attention to the units of measure used.

USING MYCORRHIZAE – THE INOCULANTS AND THE RATES OF MYCORRHIZAE FOR GROWING MEDIA

Mycorrhizal spores are usually added to some type of carrier – this may be a powder or a granular product. Most manufacturers of endomycorrhizae recommend a rate of 1 to 2 pounds per cubic yard for general potting mixes, 2 pounds or more per cubic

yard for plug / propagation mixes. Much depends on the concentration of the spores in the carrier and the desired number of propagules in the growing mix. The BioTerra Plus endomycorrhizae products and MycoApply endomycorrhizae products were tested by the Technical Service team in Sun Gro / Sacramento and found to provide for adequate root colonization in "growing-on" media at a rate of 1 pound per cubic yard. Our plug transplants needed 2 to 3 pounds per yard for adequate root colonization.

WHAT INFLUENCES MYCORRHIZAL GROWTH?

It is not difficult to create a beneficial environment for endomycorrhizal (VAM) colonies. Naturally, you need to have a plant that forms a symbiotic relationship with VAM. After that, the primary factor is the amount of **inorganic** phosphorus in the soil solution. Since the relationship between plant and fungi evolved to help the plants access low levels of phosphorus in the soil, mycorrhizae do not grow and colonize roots when the phosphorus level is high. Phosphorus levels above 10 ppm-P in the soil solution will impact the growth and establishment of mycorrhizae. This does not kill the mycorrhizae, it just creates an environment in

which the mycorrhizae do not germinate and grow and are rendered ineffective.

As far as is known, typical lime rates and medium pH levels of SunGro growing media products do not have a significant positive or negative effect on the growth and colonization of mycorrhizae

There is some concern over the use of other biological products with the use of mycorrhizae. Root-shield and Actino-Iron have been shown in independent research to be fully compatible with mycorrhizae in soilless mixes, so these can be included if desired. There are other helper bacteria or fungi that are often added to a mycorrhizal blend which stimulate and support the growth of the mycorrhizal colonies. At this point, work at Sun Gro has not evaluated these types of product although we know they exist.

When using mycorrhizae in your growing medium, chemical fungicides should be avoided especially at the start of production and until time has elapsed to allow root colonization to

occur. Mycorrhizal Applications has information on their website (www.mycorrhizae.com) to suggest that most fungicides used as a root drench in greenhouse culture are O.K at low rates, except for Etridiazol (Truban/ Koban /Banrot) in which there is no information for VAM species. Etridiazol inhibits Ectomycorrhizal growth however. Go to their website for further information on this aspect.

SUN GRO MIXES

Sun Gro mixes typically contain inorganic based fertilizers. Research conducted in Sacramento has shown very low levels of mycorrhizal colonies when we use our standard inorganic nutrient charge , which releases nutrients in a short time frame. However, we have found excellent colonization when mycorrhizae is added to Sunshine Natural & Organic formulations. Organic fertilizers "release" their nutrients slowly over time so the levels of phosphorus remain within a tolerable range for good mycorrhizal growth and colonization.

Since we wish to supply our customers with the best performance, we are offering Sunshine Natural & Organic Mixes with mycorrhizae. Any customer wishing to incorporate mycorrhizae must either have no nutrient charge added or an or-

ganic or controlled release nutrient charge.

WHAT ABOUT CUSTOM BLENDED GROWING MEDIA PRODUCTS?

Several customers request the addition of mycorrhizae to their custom blends. The same guidelines apply to these requests as to our standard Sun Gro mixes. If you wish to add mycorrhizae to your mix, please use a compatible fertilizer. This can be in the form of a **low / no P** inorganic fertilizer, a **low P** controlled release fertilizer (CRF), or an organic fertilizer. If using mycorrhizae, a fertility program resulting in low levels of inorganic P should be employed. This means that any water soluble or controlled release fertilizer formulations should be low in P and delivered at a concentration or rate that result in 10 ppm P or less. Sun Gro's goal is to provide horticulturally sound growing media that also support excellent mycorrhizal growth, should mycorrhizae be incorporated.

COMPETITIVE GROWING MEDIA PRODUCTS

Other media products in the market offer single species of endomycorrhizae or offer a blend of endo and ecto mycorrhizae. Sunshine mixes amended with mycorrhizae use a blend of endo species designed to enhance colonization under



Some plant types do not form associations with mycorrhizae and so, do not respond to addition of these microorganisms. Pictured is a crop of Dianthus. See below.

a wide range of growing conditions. We do not add ectomycorrhizae to boost the number of species or the amount of propagules per gram since they provide no benefit to most crops. If you are growing plants that form associations with ectomycorrhizae, we will be happy to add them to your custom blend.

LIST OF PLANTS

For a complete list of plants that form associations with endomycorrhizae, see www.mycorrhizae.com.

There are a few groups of plants that do not form any mycorrhizal associations – these include the following:

- Brassica family – Broccoli, Brussel Sprouts, Cabbage, Cauliflower, Collards, Kale
- Beets
- Carnations/Dianthus
- Mustard
- Orchids
- Protea
- Rush
- Sedge
- Spinach

We at Sun Gro purchase my-



"... We are offering Sunshine Natural & Organic mixes with mycorrhizae."

corrhizae directly from suppliers that grow the spores for colonization. This insures that we add the freshest product and receive the best technical support. Endomycorrhizae has a shelf life of 2 years from manufacture if stored in a cool, dry environment.

At this point, there are no published shelf life guidelines for growing media with endomycorrhizae incorporated based on scientific research. However, mixes containing mycorrhizae should also be stored in a cool dry place and

should be used soon after delivery.

FINAL THOUGHTS...

As with contemplating using any product additive it is typically recommended to conduct reasonably structured growth trials to determine if the additive is providing the value you expect.

When setting up a trial always include growing media containing the desired additive at the appropriate addition rate and compare this to growing me-

dia without the additive (control).

Decide in advance what you are going to observe / measure during the trial and how long the trial is going to take. Record detailed notes frequently. Using a digital camera is a fantastic tool for these purposes.

- MM & RV

Editors Note: *The use of product names not produced or marketed by Sun Gro does not indicate endorsement or imply rejection of those not mentioned.*

Update on Sun Gro Growing Media...

Sun Gro Horticulture is the largest provider of professional greenhouse mixes in North America. Sun Gro offers a wide range of mixes covering all the needs of the greenhouse industry, from seed/cutting propagation to general production. All of our standard mixes contain a liming agent to adjust medium pH, a lean nutrient "starter" charge and a proprietary wetting agent, which helps avoid major wet-out issues.

We often get requests for what is new or "different". And as you know, with time, needs change. Sun Gro has a few new formulations that have gained in popularity quickly and we also have, more economical alternatives for your consideration.

We also offer mixes geared to certified organic production. Many of these mixes are OMRI listed. Our Natural and Organic (N&O) mixes include dolomitic limestone, an approved organic nutrient charge and a Yucca-based wetting agent, which has been OMRI listed. In fact, we have been working very hard in developing N&O mixes to meet industry demand in the important area.

In this article, we will review some of the more common coir-based media,

our Natural and Organic mix, as well as our economical Sunshine® #15 mix and Metro-Mix® 830 product.



Sun-Coir Based Growing Media—

Sun Gro offers a number of mixes that include Sun Coir (i.e. coconut coir pith, coir, coir dust) as a major component. What makes the coir we use "Sun Coir"? We don't use any coir product on the open market. We have a number of quality control parameters that must be met before a coir supplier is accepted. These parameters are checked for every shipment of coir that we receive. Growing media products containing Sun-Coir offer properties similar to peat-based media, but with some additional water holding capacity. Our most popular products with Sun-Coir include Metro-Mix 360 with Sun Coir, Metro-Mix 366P with Sun Coir, Metro-Mix 380 with Sun Coir, and Metro-Mix 560 with Sun Coir.

All Metro-Mix's containing Sun-Coir products are ideal for container production. Metro-Mix 360 and 380

with Sun-Coir can also be used for production of bedding plants in flats. Metro-Mix 560 with Sun-Coir are better suited to use in larger containers due to the amount of bark. All of these products include a liming agent, starter charge and Sun Gro's proprietary wetting agent.

Sun Gro offer's Sunshine brand mixes containing Sun-Coir too. Our Sunshine LC1 with Sun Coir (formerly Metro-Mix 390) and Sunshine SC1 offer a media without bark and is more suited to bedding plant production.

Sunshine® Natural and Organic Growing Media— Sun Gro offers a line of Natural and Organic (N&O) products that are OMRI listed. One such product is based on our popular #1 mix. This mix is called Sunshine #1 Natural and Organic. It is a blend of 75% -85% Canadian sphagnum peat and 15% - 25% coarse perlite. As mentioned before, it also includes dolomitic lime, a yucca based OMRI listed wetting agent and an OMRI listed organic starter charge. This mix is available out of all our Canadian growing medium manufacturing plants. It is available in both com-

pressed (3.8, 55, and 110 cubic feet) and loose-fill (2.8 and 80 cubic feet) formats.

Sun Gro has conducted extensive trials to determine the best possible starter charge type and rate to be used in our Natural and Organic growing medium. It is important to note that the purpose of the nutrient charge is not to support growth for the entire cropping period. Growers who use this mix will need to begin supplementing with an organic fertilizer of their choice within 1 - 2 weeks of planting. This mix is used for the same types of containers as is our Mix #1 -- anything from cell packs to large pots and hanging baskets.

Three More Sun Gro Mixes—

Newer Sun Gro mixes include Sunshine #15, Metro-Mix 830 and Metro-Mix 852.

Sunshine #15 mix is available in both compressed and loose-fill formats. This mix is a more economical version of our Sunshine Mix #1. It contains 80% - 90% peat and 10% - 20% perlite. This mix has a higher water holding capacity than our #1 mix, due to the higher peat content. The best use for this mix is for bedding plant production, including cell packs, pots and hanging baskets.

Metro-Mix 830 contains a blend of peat (50% - 60%), bark (20% - 30%), perlite (10% - 20%) and vermiculite (3% - 7%). This mix is ideal for a wide range of uses, including

bedding plants (packs to hanging baskets) and perennial plants.

Metro-Mix 852 contains a blend of peat (25-35%), bark (50%-60%), perlite (5%-10%) and vermiculite (3% - 7%). This mix is more suited for potted floral crops and containerized perennial and nursery crops.

Sun Gro Support— Sun Gro provides sales and technical support for all of its products. Growers interested in finding out more about our products can visit our website (www.sungro.com). Or you may consult with your Sun Gro distributor sales representative or Sun Gro sales managers for further information.

- DJJ & RW

What's up with Technigro?

Technigro is live and well. In fact, we have expanded the line and enhanced distribution.

The Technigro line continues to feature standard formulas as:

- 20-18-18 Plus
- 20-9-20 Plus
- 15-17-17 Plus
- 17-5-24 Plus
- 24-7-15 Plus
- 15-0-15 Plus
- 13-2-13 Plus

Sun Gro continues to carry several specialty fertilizer formulas as well.

We currently market a 15-5-15 and a 17-5-17 formulation both of which contains calcium and magnesium with chelated micronutrients. Both are recommended in applications where the water quality requires the need to provide additional calcium and magnesium — Typically, where water sources have low alkalinity and are considered "pure".

The 15-5-15 is potentially basic— Which is considered to promote the

growing medium pH to increase. The 17-5-17 formula is "neutral" in reaction - Which is considered to have no to very little effect on the medium pH over time. This of course is dictated by the alkalinity of your irrigation water. So, it is important to have a water analysis conducted when re-evaluating your fertilization programs.

The Technigro formulations have a long and successful track record. If you are interested in Technigro water soluble fertilizers, do not hesitate to contact one of our district sales managers for details.

- RV



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Eastern Region:	1-888-896-1222	Fax: 1-888-896-1444
Southeastern Region	1-800-683-7700	Fax: 1-800-231-5307

