Survival of BIOFUNGICIDE and MYCORRHIZAE in PRO-MIX Growing Media

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* Only available in the US.

BIOFUNGICIDE™ and MYCORRHIZAE™ are active ingredients that are available premixed in different PRO-MIX® formulations. They work together to enhance plant performance, quality and yield. The advantages of having these active ingredients premixed in the growing medium is that they are present from the start of planting, the convenience of not having to add them at all during the crop cycle, and the fact that they benefit the crop throughout the growing season. PRO-MIX® products amended with active ingredients are easy to use and most storage conditions are compatible with the biologicals. Because these are live organisms added to growing media, we often receive questions about integrity, storage and survival of these organisms.

Optimized Plants: Using Living Organisms as Active Ingredients

Both groups of organisms occur naturally in soils and are not genetically modified. They have been selected through a screening process for their growth enhancing properties or disease suppression. Their modes of action are slightly different. Mycorrhizae are symbioses between a

mycorrhizal fungus and roots. The fungus colonizes the roots, extending the root surface area, and acquires water and nutrients where the plant roots are not present, and transfers them to plants. It accelerates rooting, improves fertilizer uptake and increases resistance of plant to stresses.

Whereas the BIOFUNGICIDE™ is a rapid colonizing bacterium that grows around the plant root system to reduce the occurrence of plant root diseases and enhance plant growth. It suppresses certain insects, including fungus gnats and thrips that pupate into the growing media, by suppressing their food sources and plant susceptibility. It also protects by reducing incidence of plant root diseases (*Fusarium, Pythium and Rhizoctonia*) and risk of pathogens that develop resistance to chemical fungicides. Finally, it enhances the use of fertilizer and water, increases resistance to stresses and improves plant strength and productivity, resulting in an optimized plant growth rate and uniformity.

MYCORRHIZAE™: Surviving in Difficult Temperatures

Mycorrhizae are defined as symbioses between plant roots and a fungus, which mutually benefit each other. The symbiosis, known as the "Arbuscular Mycorrhiza" type, is most common among vegetable and annual plants grown in greenhouses. In non-farmed environments, mycorrhizal fungi colonize almost 80% of the plant species present. These types of mycorrhizae do not occur naturally in peat moss and growing media; therefore, they are introduced into growing media.

Our MYCORRHIZAE™ not only colonize plants in PRO-MIX®, but continue to colonize plant roots even after transplanting in soil. They will survive almost all temperature extremes and climatic changes from freezing to intense heat because they have very resistant cells, called "spores", which are filled with lipids. These spores can be compared to seeds of plants because they allow for long survival in the soil. When MYCORRHIZAE™ are added into growing media, the storage temperature changes are similar to those in soils. When storage temperatures become cold in winter, the mycorrhizal fungi gradually prepare their cell walls for freezing temperatures, so they can survive. Even high soil temperatures do not kill our MYCORRHIZAE™. Carpio et al 2003 at Texas A & M University, conducted tests on various stresses in Texas nurseries during summer heat, and mycorrhizae remained functional in plant roots even at very high summer temperatures.

MYCORRHIZAE™ added to PRO-MIX® growing media are viable up to 2 years in storage, which includes exposure to freezing temperatures. However, when mycorrhizae are sold only as inoculants, they are more fragile and there is a narrow storage temperature range because

mineral carriers used in inoculants do not insulate as well as peat moss, bark and coir in growing media.

COMPARISON of PRO-MIX® BIOFUNGICIDE™ and MYCORRHIZAE™

Description	PRO-MIX B	PRO-MIX M
Beneficial Organism	Growing media containing the bacterium *Bacillus pumilus* PTB180	Growing media containing the Endomycorrhizal fungus – *Glomus intraradices* PTB297
Growth Enhancement	Plants planted directly in growing media have less incidence of roots diseases, particularly *Fusarium, Pythium and Rhizoctonia.* There is also a positive plant growth response.	Plants planted directly in growing media have improved growth even when exposed to nutrient or drought stress, particularly noticeable towards crop maturity.
Colonization Time	24-48 hours to colonize plant roots	2-4 weeks to colonize plant roots
Storage Temperatures	Not impacted by freezing, thawing or temperatures below 120°F	Not impacted by freezing, thawing or temperatures below 110°F
Impact of rapid temperature fluctuations	No impact	Freezing and thawing of growing media is gradual to allow mycorrhizae to acclimate to temperature changes.
Shelf-life *	2 years from date of manufacturing	2 years from date of manufacturing
** Note: Although active ingredients have a help life of 2 years from date of manufacturing, it is best to use growing media with 9-12 months of manufacturing for peat-based media and 6 months for peat-bark growing media.*		

BIOFUNGICIDE™: Effective and Resistant *Bacillus* strain

Premier Tech currently offers a BIOFUNGICIDE™, consisting of *Bacillus pumilus* bacteria, in the PRO-MIX® BIOFUNGICIDE™* + MYCORRHIZAE™ product line. The bacteria have the same tolerance to storage temperatures. This biofungicide has been selected to help suppress root disease caused by *Fusarium, Pythium and Rhizoctonia*. Many tests confirm the strain can survive in prolonged storage temperatures up to 120°F and well below freezing. Abundant research data show these bacteria can survive long periods of time at various temperatures.

Most other biofungicides available on the market utilize different types of microorganisms. Most can work for root disease suppression and biostimulation, but they need to be re-applied, they require control storage conditions before use and they are more susceptible to viability loss from

heat and frost because they do not have the hearty, spore-like structures like the *Bacillus* bacteria. The manufacturers of these products also recommend a short storage period when incorporated into growing media.

Premier Tech recommends using PRO-MIX® peat-based growing medium within 9-12 months or peat-bark based growing medium within 6 months after manufacturing. This is mainly due to the natural biodegradation of the wetting agent added to the growing medium, which facilitates the absorption of water in growing media.

* PRO-MIX BIOFUNGICIDE™ + MYCORRHIZAE™ growing media products are only available in the US. Validate the availability of eligible products with your PRO-MIX sales representative.

References:

- Carpio, L., F. T. Davies, M.A. Arnold, 2003. *"Effect of commercial arbuscular mycorrhizal fungi on growth, survivability and subsequent landscape performance of selected container grown nursery crops."* J. Environ. Hort 21(4):190-195

For more information, contact your Premier Tech Grower Services Representative: https://www.pthorticulture.com/en/grower-services/