PREMIER TECH

PRO-MIX®

Building Better Plants With Biologicals

Nathan Wallace-Springer

How two microorganisms can benefit your plants while saving you money.

The fight to protect plants from root disease, insects or other stress factors is a constant ongoing battle that growers in the horticulture industry face. Chances are you, the reader, have already heard that some microorganisms—such as beneficial fungi or bacteria—can help aid in this battle. However, with a lot of misinformation currently out there, what exactly are these microorganisms? Why should you consider using a growing medium that contains them? And, more importantly, are they cost-effective for a growing operation?

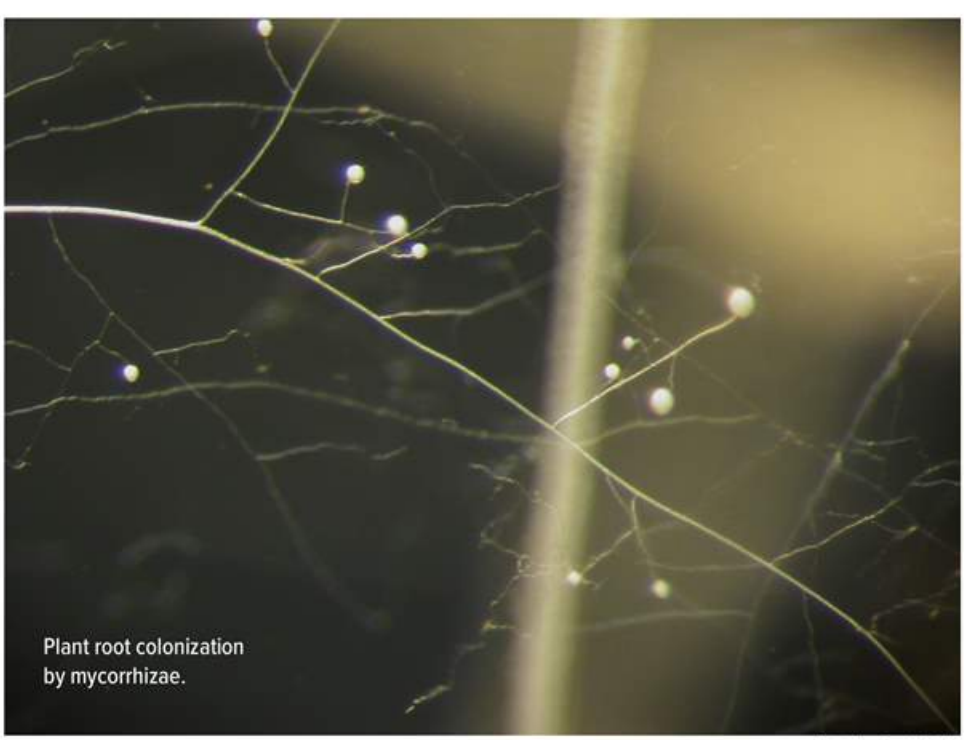
Active ingredients are natural, non-GMO, living biological microorganisms that we've cultivated for their ability to enhance plant growth, suppress pathogens that can cause root disease and/or reduce insect populations that can damage plants. Two strongly efficient biologicals currently offered to the horticulture industry are *Rhizophagus irregularis* (formerly known as *Glomus intraradices*), which is an endomycorrhizal fungi, and *Bacillus pumilus*, which is a beneficial bacterium.

Rhizophagus irregularis is an endomycorrhizal fungi that develops a positive symbiotic relationship with approximately 85% of all plants. The way this fungus works is, once its spores germinate, they'll send out filaments into the media called hyphae to search for plant roots. Then, if these hyphae receive a chemical signal back from a nearby root system, they'll grow in that direction to make contact, at which point they'll penetrate the plant root's cell, produce an arbuscule and establish a connection within the plant root.

This symbiosis is a two-way street. The plant provides the fungi with necessary carbohydrates and sugars to survive, and in return the fungi will begin to act as a "secondary root system" to the plant, pulling in additional water and nutrients—such as phosphorus, zinc, manganese and copper—that the plant may have a harder time finding in the growing media. As a result, your plants will grow faster and more uniform due to increased access to water and nutrients, be more resilient to environmental stresses—such as nutrient deficiencies, heat or transplant shock—and yield more flowers and fruit.

Similarly, *Bacillus pumilus* is a natural, gram-positive bacterium that also forms a symbiotic relationship with all plant species. This microorganism works in several unique ways. First, once its spores germinate, they rapidly colonize plant roots they come into contact with and form a physical barrier of protection around them. This process occurs quickly, taking place in as little as 48 hours, and results in the exclusion of many harmful plant pathogens from coming into contact with plant roots.

Additionally, once established, this bacterium excretes lipopeptides, such as surfactin, and biostimulant molecules, such as auxins, that act as an antibiotic to suppress root rot diseases like Fusarium, Pythium and Rhizoctonia, as well as stimulate root growth and root hair proliferation. Accordingly, your plants will grow more uniform due to an enhanced uptake of water and nutrients from healthier root systems, require fewer fungicide drenches and your total crop shrinkage will be reduced during the growing season.



Plant root colonization by mycorrhizae.

Photos by Premier Tech.

Cost effectiveness of active ingredients

When purchasing growing media with active ingredients, it's important for a grower to consider all aspects of a growing operation that these microorganisms

can help improve. For example, if the primary goal is to increase the profitability of your growing operation, then you must either boost your production output (such as by increasing the number of plants grown per square meter), increasing the number of crop cycles grown per year or increasing the yield from each plant. Or you must reduce your cost of production by decreasing plant loss or input of resources. Microorganisms such as mycorrhizae and *Bacillus* have the ability to do both.

Suppose a grower is growing 10,000 10-in. hanging baskets that wholesale for $10/basket. Would active ingredients be a favorable investment for this growing operation?

In this scenario, if the grower were to sell all their hanging baskets, this would equate to a total revenue of $100,000. However, not all plants that are grown are typically sold due to some shrinkage. Along the way, some plants will be discarded due to plant diseases, uneven growth, watering issues, lack of sales, etc., often referred to as crop shrinkage. Annually, shrinkage typically falls somewhere between 4% to 7% for most growers and 5% to 15% for retail garden centers. Now, if we apply crop shrinkage to this scenario using a rate somewhere in the middle, say around 5%, we would expect a loss of roughly 500 hanging baskets during the growing season for an estimated loss of $5,000.

Calibrachoa grown in PRO-MIX BX vs. in PRO-MIX BX BIOFUNGICIDE + MYCORRHIZAE.
Source: PRO-MIX Efficacy Report.

Difference shown on tomato roots colonized by *Bacillus pumilus*.

Conversely, suppose a grower switched to a product with mycorrhizae and *Bacillus* that could recapture 2.5% of crop loss due to shrinkage. What would the loss and yield look like then? Well, depending on the growing medium needed, this would cost the grower an additional upfront investment of $0.04 to $0.12 per pot (or $400 to $1,200 total for the crop). However, this grower would save an additional 250 plants that would have otherwise been lost to crop shrinkage, netting them an increased profit of $1,300 to $2,100 in total revenue.

Moreover, this 2.5% reduction in plant shrinkage didn't factor in additional overhead cost savings that can also be expected from switching to a product incorporating active ingredients. This includes a reduction in the number of fungicide drenches a grower typically applies, a reduction in labor costs needed to apply those drenches and/or a reduction in their crop cycle in the greenhouse. Therefore, a grower's true savings will likely be much higher!

In conclusion, a growing medium incorporating active ingredients may initially be more expensive upfront, however, using these microorganisms will almost always result in saving you valuable time, money and energy on the back end of your growing operations. Not only do they come with the convenience of not having to be added during the crop cycle, but they produce higher-quality crops and they'll also continue to benefit your crops throughout the growing season, as well as your customers who purchase them next. It's for these reasons that these active ingredients more than justify their cost.

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