mycorrhiza

noun

my·cor·rhi·za | \ ˌmī-kə-ˈrī-zə \

plural **mycorrhizae**\ -ˌzē \ *also* **mycorrhizas**

Definition of *mycorrhiza:*

the symbiotic association of the mycelium of a fungus with the roots of a seed plant
(*Merriam-Webster)

Let's talk about a fungus among us. Not the mushrooms on our pizza, but the countless colonies of unique beneficial fungi that reside beneath our feet. At Organic Approach, we think of a living soil as being nothing more than the sum of its individual components. One of these critical components is Mycorrhizae.

Mycorrhizae are fungi that can form symbiotic root relationships with more than 90% of the vascular plants on our planet. How is the relationship symbiotic? First, the mycorrhizal spores colonize (reside *on* or *within*) the root structure of the plant. The root structure of a vascular plant is a multicellular organ originally stemming from a radicle. The cells of the root system work in concert to carry out common plant life-cycle functions, such as absorbing nutrients and water and storing carbohydrates (the plant's food). The two main subtypes of mycorrhizae colonize roots in different ways. *Endo*mycorrhizae colonize the inside of the root by forming a structure called an arbuscule inside the cell wall. *Ecto*mycorrhizae form their relationships on the outside surface of the root. This colonizing action is described in the Greek root words- *Endon* (within), and *Ektos* (meaning outside).

Once mycorrhizal spores have come into contact with a plant's roots, they germinate (much like a seed does). They then grow mycelium (vegetative fungal bodies) that are made up of many long filamentous "hyphae". These hyphae look like thousands of white hairs extending from the roots out into the surrounding soil structure. Now, these hyphae have one main job, and that is to scatter through the soil column in search of water and nutrients in order to "link" the host plant to these valuable soil resources. This phenomenon is representative of an invaluable symbiotic relationship in nature, and it is why we decided to brand our mycorrhizal inoculant products under the name "HyphaLink". In fact, these hyphae can reach throughout tiny corridors within the soil to access pockets of trapped groundwater and nutrients that wouldn't otherwise be available to the larger roots of the plant. These mycorrhizal hyphae also secrete enzymes that allow them to break down and assimilate (absorb) macro and micronutrients in the soil. In this way, the Mycorrhizae dramatically increase the availability of water and nutrients for the plant. In turn, the plant supplies the mycorrhizae with energy-rich carbohydrate sugars from its "root cellar".

In following, now that we understand the general give and take of this symbiotic relationship, let's look at the big picture. What does it all mean? Well, as one example, when a plant obtains a greater ability to draw water from deeper and tighter areas (that it would not

have otherwise had access to without the penetrating mycorrhizal hyphae), it instantly becomes more resilient. A more resilient plant is going to suffer less harm from environmental stressors such as wind and drought. High winds and drought conditions more often than not result in a drop in relative humidity, which in turn drastically increases transpiration rates, i.e. water loss through the stomata. With more water reserves in the soil now available to the plant, these heat and drought stressors aren't often as damaging as they may have been without the presence of mycorrhizae. Under severe drought conditions, plants with plentiful mycorrhizal root relationships will be able to remain functional for longer periods of time without suffering in between rain events due to these increased water reserves, just like a camel in the desert. Think of mycorrhizae as "**drought insurance**".

When it comes to fertility, mycorrhizae are undeniably influential in improving the uptake and efficient exchange of nutrients; for a grower, this means several things. First, less fertilizer will be necessary due to the increased availability of soil fertility components. Second, more of the fertilizer nutrients will be retained in the soil without leaching or running off due to the increase in soil structure and complexity added by the presence of a significant and varied biological community. These factors reduce the total overhead cost of the grower, and in turn also reduce nutrient pollution of our water resources via decreased groundwater leaching and runoff. So, we protect our land and water assets and reduce our costs at the same time? Yes. Everybody wins, and we haven't even discussed the potential for improved yields that come as an added bonus to exponentially increasing your crops root mass and efficiency…

Now, just because mycorrhizae have the ability to form root relationships with more than 90% of the world's plants, it doesn't always mean that they will. Although Mycorrhizae are a naturally occurring phenomenon in healthy soil environments, their presence can be limited under a variety of challenging conditions. Challenges to mycorrhizal colonies and soil biology as a whole can be either natural or man-made. Variables such as arid climates, shifts in weather patterns, compaction from land development, salt-laden coastal environments, and polluted soils all contribute stress factors to local mycorrhizal colonies. Farmers, golf courses, greenhouses, lawn care companies, arborists, etc. are all faced with similar challenges from time to time.

So, if a significant mycorrhizal link in our soil chain is missing, we clearly must figure out how to replace it! This is where mycorrhizal inoculants come into play. The majority of mycorrhizal inoculants on the market are broad spectrum, meaning they contain propagules (spores) of multiple strains of both the *endo* and *ecto*mycorrhizal varieties. The critical issue here is the distinction between *endo* and *ecto*, and which plant species they are each capable of forming relationships with (symbiotically colonizing). *Endo*mycorrhizae can create relationships with far more plant species than *Ecto*mycorrhizae can, so it stands to reason that a broad-spectrum product that contains both *endo* and *ecto* strains will make our lives considerably easier, so we don't have to switch tank mixes when working with widely varied plant species. Alternatively, when working with only *endo* compatible plant species, a grower can save money and in turn be able to afford more volume of the inoculant or other fertility/biostimulant products. It is for this reason that Organic Approach offers both broad spectrum *endo/ecto* cocktails, as well as pure *endo*mycorrhizal inoculants. All of our mycorrhizal inoculants are linked at the

bottom of this article, as well as a helpful chart of mycorrhizal fungi and some common plant species that they interact with. This list is not intended to be all inclusive, but it is helpful, nonetheless.

We at Organic Approach believe that by replacing the missing “HyphaLinks” in the soil environment, healthy plants, crops, turf and trees all become a self-fulfilling prophecy. Since modern plants are a result of millions of years of adaptation and specialization, it shouldn't be that much of a stretch to assume that they will grow to their full potential if provided with the minerals, nutrients and beneficial biomass that they so crave from the environment. The problem is that the overall health of our soils is lacking. Rather than depleting our soils further, let us consider the new information that has come to light in recent decades regarding soil health and microbiology. Replace the missing elements, restore the broken cycle, and watch the fruits of your labor bloom.

Featured Mycorrhiza Products

HyphaLink EEI

A complex soluble inoculant derived from a diverse blend of endo & ecto mycorrhizae, Trichoderma, beneficial bacteria, soluble humate, seaweed, yucca, amino acids and a complete B-Complex vitamin package with other valuable vitamins and biological compounds. Designed to be effective for a wide variety of plant species and soils. While mycorrhizae attach to plant roots and create a web-like network that massively increases the surface area of plant roots for all critical root functions, mycorrhizae also form a protective living fungal barrier around plant roots, shielding the plant’s roots from invaders and drought. While some folks also use the EEI as a soil drench over porous bare soils, it is primarily designed to be soil injected into the soil, in the plant’s rhizosphere.

HyphaLink PurEndo

A blend of six strains of endomycorrhizae. It is designed to be effective on most vegetables, herbs, garden variety plants and turfgrasses. Endomycorrhizae are compatible with more than 80% of the world’s vascular plants. HyphaLink PurEndo is most beneficial when used during planting and transplanting.

HyphaLink EETP

A complex dry granular inoculant also derived from a diverse blend of endo and ecto mycorrhizae, Trichoderma, beneficial bacteria, soluble humate, soluble seaweed, soluble yucca, amino acids, a complete B-Complex vitamin package and other valuable vitamins & biological foods. HyphaLink EETP is specifically different from the all-soluble HyphaLink EEI in that the EETP is primarily designed to be used as a highly effective convenient granular beneficial mycorrhizal “backfill” mix when planting trees and shrubs. The EETP backfill formula also offers the same exponential expansion of root surface area and root protection attributes as the injectable EEI.

Mycorrhizal Fungi by Plant Species

Endo Mycorrhizal fungi are the most dominant species in nature – they attach to:
All nut trees except Pecans, Chestnuts, Macadamias, and Hazelnuts.
All fruit trees, grapevines, grasses and many vegetables.
All berries except blueberries, cranberries and lingonberries.
All shrubs except Laurels, Rhododendrons, and Azaleas.

Endo Mycorrhizal Plant Species List:

Acacia	Carrot	Fescue	Locust	Passion Fruit	Sedge (limited)
Agapanthus	Casuarina	Fig	London	Paulownia	Serviceberry
Ailanthus	Cassava	Ficus	Lychee	Paw Paw	Sequoia
Alder	Catalpa	Forsythia	Plane tree	Pea	Silver bell
Alfalfa	Ceanothus	Fountain Grass	Magnolia	Peach	Sourwood
Almond	Cedar	Fuchsia	Mahogany	Peanut	Soybean
Apple	Celery	Gardenia	Mahonia	Pear	Squash
Apricot	Cherry	Garlic	Mango	Pepper	Strawberry
Arborvitae	Chokeberry	Geranium	Maples (all)	Pistachio	Sudan Grass
Artichoke	Chrysanthemum	Gingko	Marigold	Persimmon	Sugar Cane
Aspen	Citrus (all)	Grapes (all)	Melons (all)	Pittosporum	Sumac
Ash	Clover	Grass	Mesquite	Plum	Sunflower
Asparagus	Coconut	Gum	Millet	Podocarpus	Sweet Gum
Avocado	Coffee	Hackberry	Mimosa	Poinsettia	Sweet potato
Bamboo	Coral Tree	Hawthorn	Morning	Potato	Sycamore
Basil	Corn	Hibiscus	Glory	Poplar	Tea
Bayberry	Cotton	Holly	Mulberry	Rain tree	Tobacco
Bean	Cottonwood	Hop hornbeam	Monkey	Raphiolepis	Tomato
Begonia	Crabapple	Hombeam	Pod	Raspberry	Tree-of-heaven
Black Locust	Cryptomeria	Horsechestnut	Nasturtium	Redbud	Tupelo
Blackberry	Cucumber	Impatiens	Okra	Redwood	Walnut
Box Elder	Currant	Jojoba	Olive	Rice	Wheat
Buckeye	Cypress	Juniper	Onion	Rose	Willow
Bulbs	Dogwood	Kiwi	Pacific Yew	Rush (limited)	Yam
Burning Bush	Eggplant	Leek	Palms (all)	Russian Olive	Yellow poplar
Cacao	Elm	Lettuce	Palmetto	Ryegrass	Yucca
Cactus	Eucalyptus	Ligustrum	Pampas Grass	Sassafras	
Camellia	Euonymus	Lily	Papaya	Sagebrush	

Ecto Mycorrhizal Plant Species List:

Alder	Chestnut	Hemlock	Pecan
Aspen	Chinquapin	Hazelnut	Pine
Basswood	Cottonwood	Hickory	Poplar
Beech	Eucalyptus	Larch	Spruce
Birch	Fir	Oak	Willow

Endomycorrhizal and Ectomycorrhizal Plant Species List (plants that work with both):

Alder	Cottonwood	Poplar
Aspen	Eucalyptus	Willow

Ericoid Mycorrizal Species List:

Azalea	Camelia	Heather
Blueberry	Cranberry	Rhododendron

Species That Mycorrhizae Do Not Colonize:

Alternanthera	Cleome	Kennedia	Sesuvium
Broccoli	Daviesia	Kingia	Striga
Brussels	Drosera	Nuytsia	Trianthema
Buchnera	Epipremnum	Ptilotus	Xyris
Cabbage	Glinus	Rhagodia	Sesuvium
Carprobrotus	Ipomoea	Selaginella	