

Helpline Hot Topic for March 2021

Mycorrhizal Fungi

by Cynthia Zimmerman

“Synergy – the bonus that is achieved when things work together harmoniously.” – Mark Twain

There is so much that goes on in our gardens, lawns, shrub and flower beds even without our help; some of it helpful, some of it not so much. Most of our attention is focused on what is above ground, that which we can see, smell, hear, and feel. In general gardeners understand that good soil is necessary and try achieving this through adding composted materials and fertilizers, some being organic, some not. It's easy to forget that unseen, even without our help, magic can be taking place in the soil; lots of magic if the soil is particularly healthy. One of those magical processes comes from mycorrhizae (literally translated “fungus-root”).

Mycorrhizae (pronounced my-coh-rise-eh) are very tiny, often times microscopic, threads called *hyphae*. These are interconnected in a web or net called *mycelium*. A thimbleful of healthy soil can contain hundreds of miles of these fungal filaments. The mycelium of a mycorrhiza (singular) can extend out connecting multiple plants and even create an underground system of connection with other mycorrhizae called a common mycorrhizal network.

There are two main ways that mycorrhizae establish symbiotic relationships with plants and are classified by where the fungi colonize on the plants: *ectomycorrhizae* and *endomycorrhizae*.

Ectomycorrhizal fungi form exchange mechanisms outside of the root cells by surrounding the outside of the roots. These fungi form relationships mainly with woody plants such as birch, beech, willow, pine, oak, spruce, and fir and are instrumental in keeping healthy forests. Only about 5-10% of terrestrial plant species have ectomycorrhizae.

Endomycorrhizae are found in over 80-85% of the plant species including vegetables, grasses, flowers, shrubs and fruit trees. As the name implies the fungi form exchange mechanisms on the inside of the root cells, intracellularly and the hyphae extend outside the root.

Through mycorrhizal fungi the surface absorbing area of plant roots is greatly increased improving the ability of plants to acquire more nutrients and water. This happens not only because of the increase in the surface absorbing area of the roots but also because the mycorrhizae release powerful enzymes into the soil that solubilize hard to capture nutrients such as phosphorus, nitrogen, iron and other tightly bound soil nutrients. Much of the fertility is wasted, run-off in ground water, or lost from the soil in non-mycorrhizal conditions.

Since this is a symbiotic relationship, what do the mycorrhizae get in return? Plants feed the mycorrhizae by taking the excess sugar produced by photosynthesis in their leaves and send it to the roots. The mycorrhizae absorb the sugar and are able to sustain themselves since they lack the ability to photosynthesize it themselves.

Additional to providing water and nutrients to plants, mycorrhizae help in other ways too. Plants with mycorrhizal associations are more resistant to certain soil-borne diseases through creating a physical

barrier between pathogens and plant roots. They can also serve as a sugar delivery system when plants send sugar back and forth to different plants connected to a common mycorrhizal network. This same common network can also serve as a means for plants to “talk” to one another via chemicals signaling an attack on an individual plant in the network. They can use these signals to start producing natural insect repellants and also use them to start producing attractants to bring in natural predators of the attacking pests. Mycorrhizal fungi are also able to interact with and change the environment for the host plant by improving the soil structure and quality.

How does this wonderful process come to be a part of our own gardens? It can happen in several ways. When you buy plants from nurseries, they often already have the beginnings of this going on in the soil around the plants roots. Most growers and greenhouses use growing soil mixes that are made from composted organic materials. To that compost certain microbes are added in scientifically established amounts for the type of plant to be grown in it. Mycorrhizae are among those added microbes. When those plants are added to your garden, you are adding the mycorrhizae as well. Additionally a number of the bagged retail growing soils that we add to our gardens have mycorrhizae in them. Sometimes you will even find it listed on the ingredients. If you make your own compost you may not have this benefit so you can buy mycorrhizae that you can either add to your compost after it is ready to use, or you can add it to the garden or planting holes as you plant. One caution, don’t add it to your compost while it is still processing because the high temperatures (140°F or higher) in the pile can kill the mycorrhizae. As the old jingle goes “just a little dab will do you” for great results.

You might be interested in the following websites.

<https://mycorrhizae.com/wp-content/uploads/2017/04/Types-of-Mycorrhizal-Plants-v2.1.pdf>

An extensive list of plants that do and don’t benefit from mycorrhizae.

<https://myrrhizae.com/wp-content/uploads/2017/04/Mycorrhizal-Status-of-Families-and-Genera-v1.6.pdf>

An extensive chart showing Mycorrhizal Status of Families and Genera

<https://mycorrhizae.com/how-it-works/>

Great short video and illustrations of how mycorrhizae work

Sources for information:

<https://biologydictionary.net/mycorrhizae/>

<https://mycorrhizae.com/faqs/>

<https://mycorrhizae.com/how-it-works/>

<https://ucanr.edu/> (various articles – search “mycorrhizae”)

<https://untamedscience.com/biology/ecology/mycorrhizae/>

“Coming together is a beginning; keeping together is progress; working together is success.”

– Henry Ford