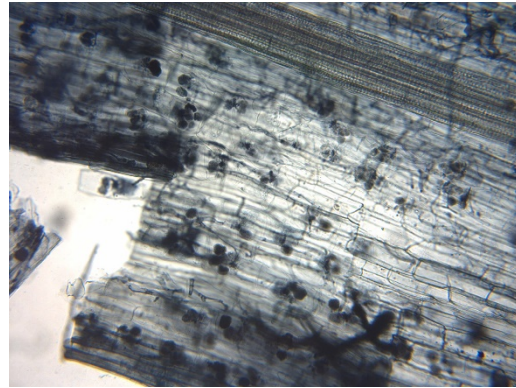


6.2 Other Decomposers Reading: Mycorrhizal Fungi



Mycorrhizal fungi on pine seedling roots; the white threads are the fungi. Photo Credit: USDA Forest Service, Public Domain (wikicommons)



Hyphae of mycorrhizal fungi branching inside flax root cells. Photo Credit: Public Domain (wikicommons)

Where and How Mycorrhizal Fungi Live?

Mycorrhizal fungi are a specific type of fungi that get their food from the roots of living plants. In this relationship, thread-like tubular structures of the fungi (called hyphae) wrap around or enter into the root cells of a plant. Since fungi cannot make their own food (through photosynthesis), they get sugars from the plant. In turn, some mycorrhizal fungi help plants obtain water and minerals from the soil that move through their networks of hyphae (called mycelium).

Over 80% of all plant species form relationships with mycorrhizal fungi, and many plants could not survive without them. These fungi can increase water and mineral uptake by plants up to 1000 times and double plant growth! Mycorrhizal fungi can also protect plants against soil contaminants, such as heavy metals and diseases. However, not all plants (such as those of the Mustard family (Brassicaceae) form this association with mycorrhizal fungi. Some plants contain chemicals that are toxic to mycorrhizal fungi. For example, garlic mustard is an effective invasive species in parts of the United States because it can kill its neighbors' fungal partners.

The same mycorrhizal fungus can form relationships with multiple plants at the same time. The fungus can serve as underground pipeline between connected plants to transfer nutrients and sugar. The fungus also can act an early warning system, carrying chemicals between plants to inform each other to build up their defenses against insect attacks, pathogens, or drought.

How Do Mycorrhizal Fungi Live and Grow?

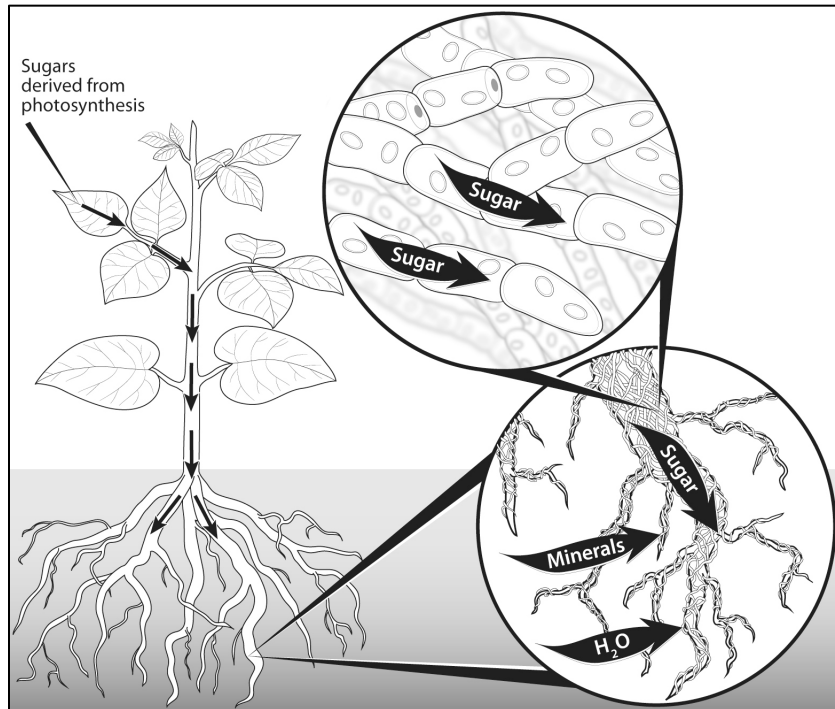
Like other fungi and animals, mycorrhizal fungi cannot make their own food but absorb or take it in from their environment. Mycorrhizal fungi get their sugar from their host plants in exchange for other nutrients, and then all the cells in the fungi use that sugar to live and grow. We can explain how mycorrhizal fungi do this in four steps.

Step 1: Cells in the fungi absorb sugars from their host plants through their thread-like hyphae.

Mycorrhizal fungi get their sugar, in the form of glucose or sucrose, from their host plants through their hyphae wrapped around or penetrating into the plant's root cells. Sugar that is made in the plant's leaves (through the process of photosynthesis) moves down to the plant's roots, and then from the plant's roots into the hyphae of the mycorrhizal fungi.

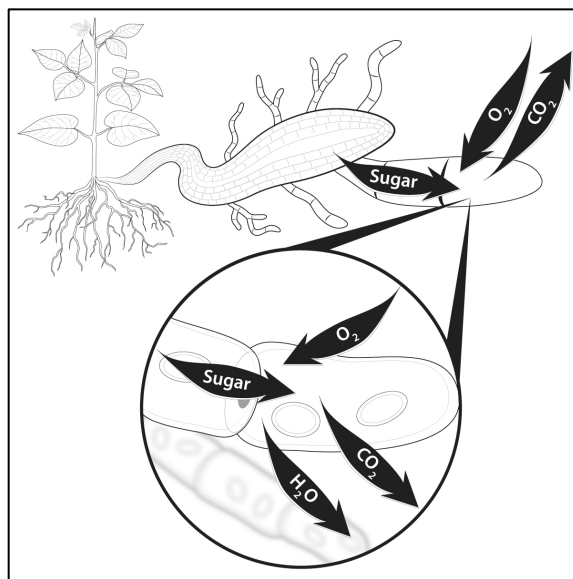
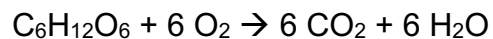
Step 2: Sugar moves to all the cells in the fungus.

Tiny holes between cells in the fungus allow for the rapid flow of sugar from cell to cell along hyphae and throughout the whole fungus by the mycelium. The hyphae also absorb water, minerals, and some types of small organic molecules from the soil.



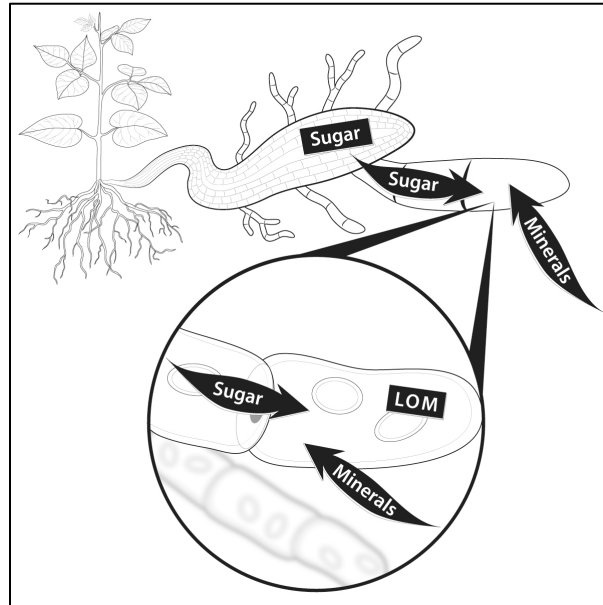
Step 3: All the cells get energy by combining sugar with oxygen in the process of cellular respiration.

All the fungal cells need energy to carry out their life functions, and they get that energy by combining the sugar with oxygen. You are familiar with the chemical equation for cellular respiration:



Step 4: Cells grow by making large organic molecules from sugar in the process of biosynthesis.

Mycorrhizal fungi grow when their hyphal cells grow and divide. They grow by using the sugar that comes from their relationship with plants.



Digging Deeper: Where You Can Learn More about Mycorrhizal Fungi?

- To find out more about the relationship between fungi and plants:
 - <http://www.the-compost-gardener.com/mycorrhizal-fungi.html>
 - <https://treesforlife.org.uk/forest/ecology/mycorrhizas/>
- To find out more about garlic mustard's toxic effects on mycorrhizal fungi:
 - <http://www.amjbot.org/content/early/2015/03/02/ajb.1500025>
- To find out more about how plants communicate through mycorrhizal fungi:
 - <http://www.bbc.com/earth/story/20141111-plants-have-a-hidden-internet>
 - <http://www.newyorker.com/tech/elements/the-secrets-of-the-wood-wide-web>