

# MYCORRHIZAL FUNGI AND FIELD CROPS

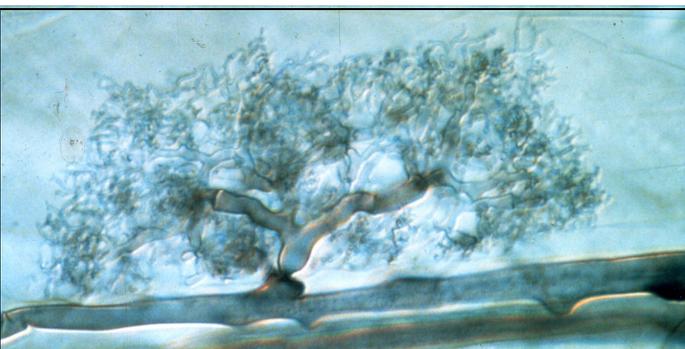
## What are mycorrhizal fungi?

Mycorrhizal fungi are very common soil microorganisms that colonize the roots of the majority of plants, including crop species. Together, the plant and fungus form a symbiotic association called a mycorrhiza, which means “fungus root”.



**A carrot mycorrhiza**

Mycorrhizal fungi produce structures called hyphae that allow them to forage for some nutrients more effectively than roots alone. The fungi transfer some of these nutrients to the root and receive carbohydrates from the root. The site where this exchange takes place is called an arbuscule. In some cases this nutritional relationship is essential for the plant. The relationship is always essential for the fungi because plants are their only source of energy.



**An arbuscule (photo by Mark Brundrett)**

## How do they impact crops?

Numerous studies have shown that arbuscular mycorrhizal fungi can provide direct benefits to host crops (crops that form arbuscular mycorrhizas) that lead to increased crop productivity. These benefits include:

- Increased nutrient uptake (especially phosphorus and zinc)
- Increased pathogen resistance



**Mycorrhizal and nonmycorrhizal oats**

Arbuscular mycorrhizal fungi can also have a positive impact on crops by improving the soil quality. They improve soil quality by binding particles together, resulting in:

- Improved soil structure
- Increased water infiltration and retention
- Reduced risk of soil erosion

# Managing for mycorrhizal fungi

Mycorrhizal fungi can be found in abundance in most farm soils, but certain practices can reduce their ability to form associations with host crops. Fortunately, steps can be taken to help promote arbuscular mycorrhizal fungi so they can form associations with crops that depend on them.

## Reducing tillage

Spores produced by mycorrhizal fungi are generally resistant to physical soil disturbances. However, tillage can damage their hyphae, which also serve as an important source of inoculum. Following tillage there are reduced levels of mycorrhizal colonization. Therefore, reducing or eliminating tillage will help promote the formation of arbuscular mycorrhizas.

**Arbuscular mycorrhizal fungi produce spores, one type of inoculum in the soil.**



**Hyphae of arbuscular mycorrhizal fungi**

## Reducing fertilization

High rates of phosphate fertilizer can reduce the ability of the fungi to form associations. Reducing fertilizer inputs may promote mycorrhiza formation.

## Cover cropping

Fallow periods are detrimental because mycorrhizal fungi depend on host plants for their nutrition. Cover crops help maintain their populations.



**Sweetcorn grown after a winter wheat cover (see tassling) and after fallow (no tassling).**

## Proper crop rotations

Crops incapable of forming mycorrhizas (canola, buckwheat, forage radish, camelina, mustards) inhibit mycorrhizal fungi. Following such crops, growers should avoid planting species that are highly dependent on mycorrhizal fungi (e.g. corn).



**Corn following soybean (mycorrhizal, left) and following canola (nonmycorrhizal, right)**