



Nursery & Garden Industry
Queensland

Mycorrhizal and trichodermal associations in nursery plant production

The beneficial interactions between fungi and plants roots are called mycorrhizal associations. In the soil in the ground or in growing media in containers, mycorrhizal fungi link the plant's roots to the soil/ growing media and facilitate the movement of nutrients into the plant's roots.

The fungi benefit from this association by receiving carbohydrates for energy which are produced by the plant during photosynthesis. Mycorrhizal associations also help reduce plants being attacked by some pathogens by competing with these pathogens or by assisting in the synthesis of plant phytochemicals to fight or deter the pathogens. This improved plant performance, through mycorrhizal association, also helps the plant to tolerate external stresses such as drought, salinity, heavy metal contamination and chemical toxicity.

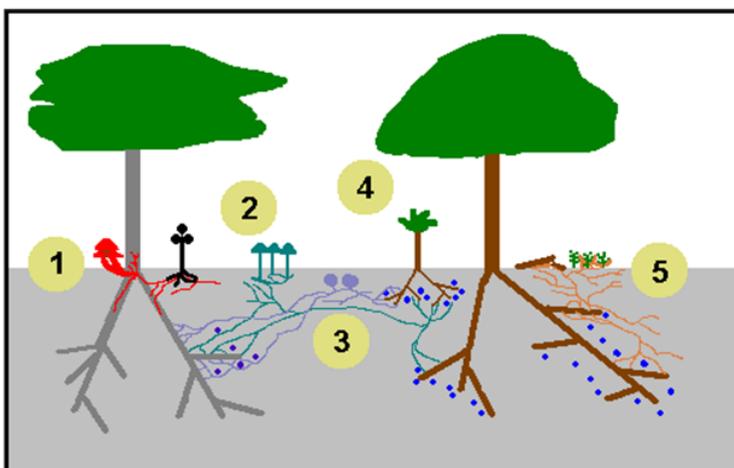
There are four different types of mycorrhizal associations between plants and fungi and they occur with almost all terrestrial plant species. The diagram below illustrates how four different types

of mycorrhizal associations may occur between plants and fungi.

Although the benefits of mycorrhizal associations in container plant production have been known about since the seventies, with the main benefits being less fertiliser and fungicide use, improved vigour and improved performance when planted out into the field, few nurseries have rigorously trialled these beneficial fungi in commercial plant production.

Trichoderma fungi are beneficial saprophytic fungi which are known to include species that help control several nursery pathogens (eg *Pythium*, *Rhizoctonia*, *Fusarium*, *Phytophthora*, *Sclerotinia* and *Verticillium*). Because *Trichoderma* fungi are saprophytic and require carbon for energy, which declines in aging growing media, it was thought that the combination of mycorrhizal fungi would provide this carbon source for the pathogen fighting *Trichoderma* in aging growing media.

In 2000/2001 scientific trials, funded by Horticulture Australia Limited and Nursery & Garden Industry Australia, were conducted on 15



1. The **red hyphae** of the black parasitic fungus have penetrated a tree and some red mushrooms have formed at the base of the trunk.
2. **Mushrooms** from a mycorrhizal fungus have **mycelium** linking several plants.
3. **Fruiting bodies** of a mycorrhizal, truffle-like fungus have **mycelium** connecting two plants.
4. The young plant is growing in the shade of a mature plant, but it is connected to two mature plants by two **mycorrhizal mycelia**. The mycorrhizal helper bacteria are the **dark blue dots**.
5. The **mycelium** of another mycorrhizal fungus has formed fruiting bodies on fallen twigs and mosses.

plant species at 8 nurseries in southeast Queensland to determine whether there was improved growth in plants that received treatments at potting up with mycorrhizal and *Trichoderma* fungi. At each nursery there were differences in the plant species potted up, fertiliser rates, phosphorus source, level of gypsum and growing media used. Following the nursery trial, a 100-day field trial was conducted to determine whether there were any additional benefits in the field of these plants that had been treated in the nursery with beneficial fungi.

The 3-6 month nursery trial showed that mycorrhizal treatment improved plant growth at nurseries, but it depressed growth at 2 sites, and the rate of fertiliser and plant species influenced this result. *Trichoderma* treatments also promoted growth at 4 sites, but depressed growth at 2 sites and this result was also influenced by fertiliser rate and plant species. Importantly, there was a synergy observed when both mycorrhizal and *Trichoderma* fungi were used on a plant species.

The 100 day field trial also showed improved plant growth with mycorrhizal and *Trichoderma* treatments in plants from 3 nurseries, and the most rapid growth occurred in plants that had good mycorrhizal root colonisation. A 21% field growth response was recorded for *Westringia* which received the mycorrhizal treatment in the nursery at potting up. *Trichoderma* treatments had some small positive effects in the field trial, but also had quite depressive effects on plants from one nursery. The evidence from these commercial trials on mycorrhizal and *Trichoderma* treatments supports further investigation in commercial plant production in the use of these beneficial fungi treatments to improve plant performance.

References:

NGIA website – NY99046 - *Interactive Effects of Mycorrhiza and Trichoderma on Plant Performance in the Nursery and Field Phase*

Australian National Botanic Gardens; University of Western Australia; Horticulture Australia Limited.

Thea Pobjoy
Farm Management Systems Officer
Nursery & Garden Industry Queensland

Published March 2014