

A Native Symbiotic Fungus Increases Shoot Biomass and Grain Yield of Canola (*Brassica napus*)

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More than 90% of land plant species (including most agricultural crops) form beneficial associations with soil-borne mycorrhizal fungi. Mycorrhizal hyphae allow plants to indirectly explore a large soil volume and forage for nutrients (most importantly P, but also micronutrients) that are usually poorly available in soils due to their immobility. Recent studies using state-of-the-art DNA sequencing technologies have unearthed much more complexity in root-fungal relationships than those discovered using the traditional morphology-based approaches. Unconventional root-fungal beneficial relationships have been reported that do not fall within the mycorrhizal categories defined based on properties of the interface structures, including a novel symbiosis formed between the native fungus *Austroboletus occidentalis* (isolated from jarrah forest, Jarrahdale, WA) and jarrah (*Eucalyptus marginata*) plants. This novel symbiosis (referred to as feremycorrhiza, FM) has quite different characteristics and functional pathways compared to the conventional mycorrhizal symbioses, but still has strong positive impacts on improving plant growth and nutrition. Root colonisation does not occur in FM symbiosis, and the symbiotic benefits are primarily attributed to rhizosphere modification and nutrient solubilisation/mobilisation. The host plant range of the FM symbiosis is currently unknown and needs to be investigated, focusing on economically important crops. A glasshouse experiment was conducted to explore the potential effects of the FM fungus *A. occidentalis* on canola (*Brassica napus*), which is one of the major grain crops in Australia. Inoculation of paddock soil (collected from Northam, WA) with the hyphal inoculum (prepared using the vermiculite-based substrate) led to significant shoot biomass and grain yield increases in canola under glasshouse conditions compared to the uninoculated control (received autoclaved inoculum). Root colonisation was not observed in inoculated canola plants, which is a typical feature of the FM symbiosis as previously observed with jarrah plants. The results demonstrated that the non-mycorrhizal crop canola (unable to draw benefits from arbuscular mycorrhizal fungi) can get significant growth and yield benefits from the native symbiotic fungus, reinforcing the necessity to explore the potential of this fungus for different agricultural crops under glasshouse and field conditions.