

UPDATE FROM THE BOLWARRAH, VICTORIA, DEMONSTRATION SITE

Rising prices, unreliable supply and the importance of using inputs as efficiently as possible, are top of every grower's mind. Reducing use of fertilisers and pesticides is not just good for sustainability, but also for farm profitability, reports Stephanie Tabone

THE BOLWARRAH SITE

Bolwarrah is 30 km east of Ballarat. The soil is generally rather low in nutrients, especially phosphorus. As the site had previously been used for grazing and forestry, it was virgin ground for potato production.

These factors made it an ideal candidate for addition of mycorrhizal fungi. Naturally occurring populations were likely to be low, and nutrients were potentially limiting. Mycorrhizal fungi develop symbiotic relationships with their host plant. The plant provides food for the fungi (photosynthates), in exchange for the fungi supplying nutrients from the soil to the plant.

Many species of mycorrhizal fungi are well adapted to colonise potato plants. The product EndoPrime by Sumitomo Chemical contains four such species.

Processing potato grower Neville

Quinlan, with the support of agronomist and PotatoLink regional representative Stuart Grigg (Stuart Grigg Ag Hort Consulting), decided to trial EndoPrime in the 2021/2022 potato growing season. The product was applied to most of the paddock at planting in late October 2021, with a central area left untreated (Figure 1).

Mycorrhizae act as an extension of the plant's root system, effectively increasing the surface area of the roots. This is particularly useful for uptake of nutrients which are immobile in the soil, such as phosphate.

Application of a mycorrhizal product is most likely to provide benefits during the first 6-8 weeks of crop growth. This helps the mycorrhizae to establish and colonise the roots more quickly. As the crop progresses, naturally occurring mycorrhizae are likely to colonise untreated cropping areas, so

long as environmental conditions are suitable.

Sap tests conducted on 16 January and 1 February provided a snapshot of the plants' nutrient status. Interestingly, phosphate levels were 15-20% higher in the EndoPrime treated area compared to the control (Figure 2).

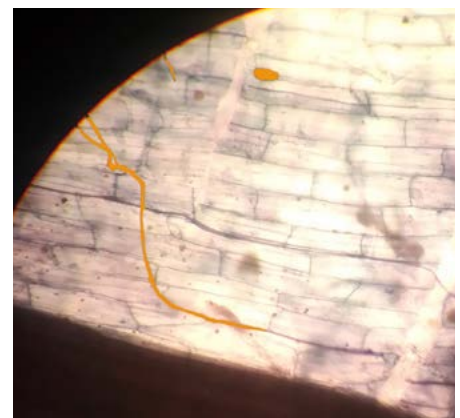
This result suggested that the potato plant roots had been successfully colonised by the fungi. To test this, root samples were collected from the treated and untreated areas of the crop three weeks before harvest and processed for microscopic examination. This revealed that mycorrhizae had indeed colonised the roots, with both fungal hyphae and vesicles (bladder-like structures formed by the fungus) clearly visible within the cells (Figures 3, 4).

Crops are considered colonised when the percentage of roots with



Figure 1. Areas of the field treated with EndoPrime or left as untreated control.

Figure 3. Potato roots observed under a microscope showing colonisation of the cells by mycorrhizal hyphae and vesicles. These structures have been coloured orange in this image.



mycorrhizal fungi exceed 10%. Both treated and untreated plants exceeded this level. However, the rate of colonisation was higher in the area treated with EndoPrime (Figure 4).

While biologicals can provide great results, some farming practices may need to change to create an environment in which they can thrive.

Products containing mycorrhizal fungi are usually applied at planting. If a fungicide is also required, then it is important to check compatibility with your supplier. For example, Sumitomo advises that EndoPrime can be used at the same time as several common fungicides. However, not all products and biologicals will be compatible. In some cases, results may be improved by applying fungicides at a different time, or in an area separated from the root zone, so as not to compromise efficacy of the biological.

It is also important to consider that full application rates of fertiliser will provide the plant with all the nutrition that it needs. If the plant does not need additional nutrients, it is less likely to form a strong association with the fungus.

While products such as EndoPrime may still provide a yield increase under a normal fertilisation program, results are likely to be most dramatic if nutrients are limited.

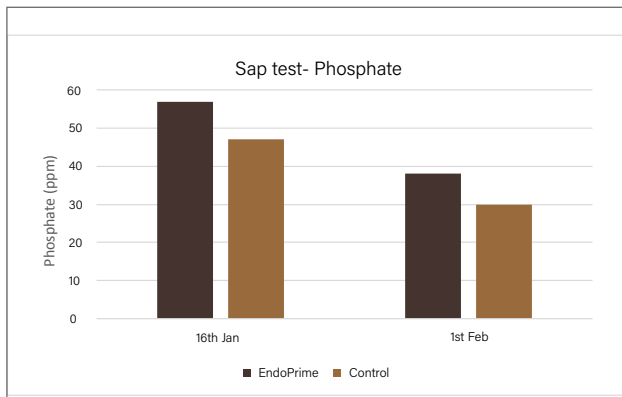


Figure 2. Potato crop sap tests from 16 Jan 2022 and 1 Feb 2022, indicating phosphate levels in the EndoPrime treated area compared to the untreated control.

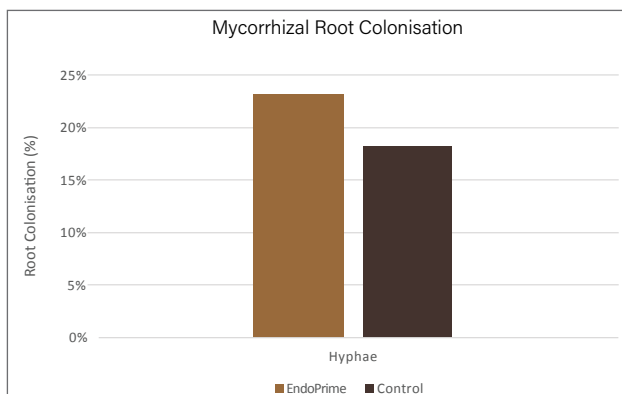


Figure 4. Percentage of mycorrhizal root colonisation of hyphae in EndoPrime treated and untreated control plants three weeks before harvest.

GETTING BEST RESULTS FROM PRODUCTS CONTAINING MYCORRHIZAL FUNGI

When to apply?

- When growing a crop that responds strongly to mycorrhizae – such as potatoes
- After using a soil fumigant
- When soil nutrition is not ideal or limited
- If the field has been empty of vegetation for 6 months or more
- If crops have been grown which do not host mycorrhizal fungi, reducing natural populations in the soil
- When soil constraints are present such as sodicity or salinity
- After any significant cultivation
- When growing legumes, as mycorrhizal fungi and rhizobium are highly complementary

How to use?

- Ensure the spray, dip or drench solution is well agitated
- Apply at planting, or as early in the crop cycle as possible
- Ensure good contact between the inoculant and potato seed
- If applying through the irrigation system after planting, ensure enough water is applied to wash the material into the root zone
- Do not over fertilise the crop
- Apply enough to ensure colonisation; you can't 'overdose' with mycorrhizal fungi