The use of Beneficial *Trichoderma* in Grapevine Propagation

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INTRODUCTION

For some time, the beneficial effect of *Trichoderma* on plants has been known. Laboratory and field experiments have shown it to have antifungal properties as well as growth-promoting effects in field cropping situations (McPherson & Hunt, 1995). More recently, its use has been promoted in growing media (Brooke, 1998) and seed treatments (Bjorkmann et al., 1998).

Previous attempts to use *Trichoderma*-based products by Sunraysia Nurseries in vine propagation failed to provide any improvement in vine quality. However, as researchers have discovered more about how to better handle and utilise the organism, more reliable preparations have become available. On learning of these improved formulas at the 1998 I.P.P.S. conference in Perth, it was decided to revisit the trial. Two products were tested. The first was a nutritive pellet impregnated with *Trichoderma* spores called Trichopel®. The second, a wettable powder formulation called Trichoflow™. Both these products contain strains of *Trichoderma harzianum* and *T. viride*. At the time, experience with the product had been in vermiculite filled callusing boxes, not in organic striking media such as our own. For this reason we trialed both vermiculite and peat-based striking media.

METHOD

Grafts were packed in layers of the appropriate media in sealed styrofoam boxes. They were arranged in layers of 20 grafts, with 8 layers to a box (i.e., 160 grafts to a box).

The Trichopel was sprinkled over the tops and bottoms of the cuttings as they were layered in the box. The amount of Trichopel used was 5 g per layer in vermiculite media (recommended rate), and 2.5 g in peat-based media. This reduction was due to the organic nature of the peat media, and its ability to better support microorganisms.

The Trichoflow was used as a soaking solution. Usually, while scions await grafting, they are soaked in water to prevent desiccation. This water was simply substituted with a Trichoflow solution. Two strengths were trialed: a full strength (2 g litre^{-1}), a half strength [1] (1 g litre^{-1}), as well as a water control.

RESULTS

Effectiveness of Trichoderma Inoculant on Various Striking Media.

Peat-Based Striking Medium (Peat, Redgum Sawdust, and Isolite, 1 : 2 : 3 by Volume). This medium was the optimum media for *Trichoderma* growth, but the callusing of the cuttings was poor. The *Trichoderma* grew as a thick carpet of white mycelium. Not only was it feeding off the nutritive pellet, but also off the organic matter in the medium, and eventually off the cutting as well. The rapid growth of *Trichoderma* appeared to have used up all the oxygen in our sealed callusing boxes.

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Table 1. Effect of callusing media on callus growth and disease development with and without a *Trichoderma* inoculant.

Media used	Treatment	Callus growth	Trichoderma development	Disease level present on covered part of canes
Peat : sawdust : isolite	Control	Moderate	None	High
Peat : sawdust : isolite	Trichopel	Poor	Excessive	None
Sawdust : isolite	Control	Poor	None	Moderate
Sawdust : isolite	Trichopel	Poor	Excessive	None
Vermiculite	Control	Moderate	None	Moderate
Vermiculite	Trichopel	Excellent	Ideal	None
Vermiculite : isolite	Trichopel	Excellent	Ideal	None

This resulted in extremely slow callus growth. The average time to reach pot-up condition was 28 days. Some vines were still not ready after 36 days. The rate of *Trichoderma* was reduced to 1g per layer, but still the *Trichoderma* swamped the cuttings. The controls of regular medium averaged 21 days to pot-up. There was better callus growth in these boxes, but still some rotting of shoots due to a range of different fungi, including *Botrytis*. These fungi were not present in the *Trichoderma*-treated boxes.

Sawdust-Based Medium (Sawdust and Isolite, 2 : 3 v/v). In order to slow the development of the *Trichoderma*, we trialed a mix with less readily degradable organic matter, i.e., we removed the peat component. In the *Trichoderma*-treated boxes, there was still an abundance of mycelium, and there was no callus at all after 25 days. The vines had to be transferred to vermiculite to get them to move. In the control, there was no white mycelium, but the callus growth was still poor and *Botrytis* was present on many of the cuttings.

Vermiculite (Grade 4 – Coarse). From the beginning of the season to the end, vines packed in coarse vermiculite were of more consistent development and quality. Those packed without *Trichoderma* averaged 21 days to pot-up, the same as for vines in peat media with no *Trichoderma*. Again, there was a range of fungi growing on these canes. Those that were packed with 5 g per layer of Trichopel had a fine white mycelium over the wood, and no sign of *Botrytis,* though there was some benign yellow growth on the vermiculite, and some black fungal growth on the exposed parts of the scion. These cuttings were ready for pot up sooner, on average in 18 days. The callus growth was faster, especially at the graft union. The shorter time in callusing boxes meant that less buds had the opportunity to burst while in a sealed environment and, therefore, didn't rot off. This led to more even growth of the grafts in the greenhouse after potting on.

Vermiculite and Isolite Medium (Vermiculite : Isolite, 1 : 1 v/v). On observing the improvement to graftling development in vermiculite in the first half of the season, we attempted to make a medium which was free of organic matter, but with less of the expensive vermiculite. We mixed vermiculite with isolite 50 : 50, and packed vines with 5 g per layer of Trichopel. These were ready in 18 days. The callus growth was as good as vines packed in straight vermiculite, and there was no sign of *Botrytis* on the canes. There was some fungal growth other than the *Trichoderma* on untreated scions. All these boxes were packed with *Trichoderma*, as we had seen the improvement it made to callusing time, and we were approaching the end of the season.

Effectiveness Of Soaking in a Trichoderma Solution.

Table 2. Effect of soaking buds in a *Trichoderma* solution.

Scion soak	*Trichoderma* growth	Disease presence
Full strength	Good	None
Half strength	Good	None
Water	None	Moderate

All treatments in this trial were packed in vermiculite, with 5 g of Trichopel per layer.

Full-Strength Trichoflow (2 g litre^{-1}). These vines had a covering of white mycelium over the scions, even though the scions were exposed. There was no other fungal growth on the canes. Remember, the vines without the scion soak weren't covered all the way to the top, and had some black fungal growth.

Half-Strength Trichoflow (1 g litre^{-1}). These vines were almost identical in development to those soaked in full-strength solution.

Water Control. These vines had a covering of *Trichoderma* over the covered parts of the canes, but not over the exposed scions. The scions had growths of black fungi on them, particularly on the buds.

DISCUSSION

The use of *Trichoderma* in vermiculite callusing medium and vermiculite : isolite callusing medium improved the amount of callus produced at the graft union. It also improved the callus and number of roots at the bases, and shortened the callusing time. In organic media, *Trichoderma* growth was at detrimentally high levels, even with the inoculum doses substantially reduced. In all cases where *Trichoderma* was included in the callusing media, disease growth on the covered portions of the canes was nil or substantially lower than in control boxes. The uncovered scions were protected from disease by soaking in a *Trichoderma* solution at half label rates.

CONCLUSION

From the results of these experiments, the advantages of using *Trichoderma* in callusing grapevine grafts are:

- Less time in callusing boxes resulting in faster production time.
- Stronger graft union and root system
- No use of toxic fungicides.

LITERATURE CITED

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