

# Pre-planting treatments for apples on old apple ground



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**A** Future Orchards demonstration site was set up in 2017, testing the effectiveness of different pre-planting treatments when planting onto old apple ground at Trevor and Carmel Fontanini's Orchard in Manjimup.

Old apple ground can harbour apple replant disease (ARD) which reduces new tree growth and production by around 20% per annum for the whole trees life. The demonstration site tested biofumigant plants as two different mixes of Mustard, Rocket and Ethiopian Cabbage, a product containing beneficial bacteria, the chemical fumigant chloropicrin against the standard practice treatment of metham sodium.

This demonstration site came about through the interest of the grower Joe Fontanini and the Future Orchards Community Orchard Group in biofumigation and to see if it would have any positive effects for apple tree growth after seeing their neighbouring vegetable grower's trial the practice. There was also interest in applying beneficial bacteria to the trees to support the growth and development of the trees by improving the soil health.

But Steve Spark experienced AgFirst consultant impressed upon us how well chloropicrin could work for apples and couldn't understand why WA apple growers were not using the product in all new plantings. As in New Zealand,

applying chloropicrin before planting has been standard practice for many years. While in Manjimup it was considered too expensive to get an accredited contractor to apply the product.

It was expected that all these treatments would improve tree survival rates when planting new varieties of apples into old apple ground. But it was thought that the beneficial bacteria and biofumigation options would be better for soil health.

## Biofumigants

Biofumigation is the practice of using plants from the Brassicaceae family that produce toxic chemicals to suppress soil borne pathogens and break the life cycle of pests and diseases.

**The Brassica crop is mulched at early flowering stage and Glucosinolate gas is released and macerated within hours of mulching.**

The demonstration site tested two different biofumigation seed mixes:

- David Grays Green Fume which consisted of 90% Mustard and 10% Rocket planted at 20kg/ha on 22nd May 2017.
- PGG Wrightson Seeds BQ Mulch which consisted of 75% Ethiopian Cabbage and 25% Mustard planted at 10kg/ha on 22nd May 2017.

Both mustard mixes were cut, mulched and ploughed in after reaching flowering stage then left for three weeks so that the biofumigation activity could occur and the plant material could break down.



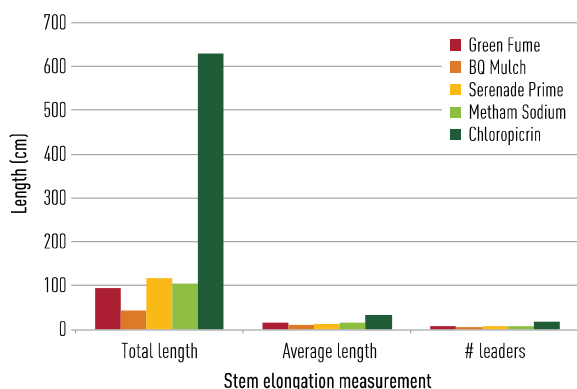
▶ **TOP:** On the day of mulching and ploughing to incorporate the biofumigant plants (17th September 2017).

▶ **ABOVE:** The Green Fume treatment block, Joe Fontanini shows how well the biofumes had grown.

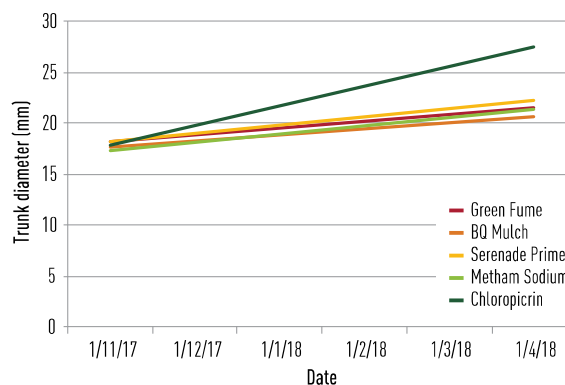
## Beneficial bacteria

Serenade® Prime from Bayer was applied via a soil drench to each tree at a rate of 35mL per tree at the time of planting. Serenade® Prime contains viable spores of the highly active QST 713 strain of *Bacillus subtilis*. These beneficial bacteria live on the plant root surfaces and in the soil around the plant roots. The beneficial relationship between the plant roots and the bacteria can enhance plant growth and productivity. If applied at planting and during root flushes it can play a role in improved nutrient exchange, crop vigour and uniformity.

- ▶ CHLOROPICRIN being applied by licensed contractor (25th August 2017).
- ▶ INSET: Growth of Chloropicrin trees March 2018.



**FIGURE 1** Stem elongation of each treatment showing the total length of leaders, average length of leaders and the average number of leaders per tree



**FIGURE 2** Average trunk diameter growth between November and April for the different pre-planting treatments

### Chloropicrin

Rural Telone C-60 has a high chloropicrin content and is better for use in heavier, wetter, colder soils where rapid volatilising will allow for quicker release of the product from the soil to prevent the need for extended plant-back periods. It targets soil-borne disease as well as helping to control Parasitic Nematodes, and suppression of weed.

An accredited contractor (A-Gas® Rural) applied the Rural Telone C-60 at a rate of 300L/ha. This needed to be applied at least three weeks prior to planting to avoid any phytotoxic effects. The trees were planted six weeks after treatment.

A block of Fiero® Fuji was planted on 12th October 2017 onto ground that in the previous years had grown Fuji apples at 5m row spacing and 3m tree spacing on MM105 rootstock. The new planting was planted at 3.5m row spacing and 0.8m tree spacing on MM106 rootstock under sprinkler irrigation. Planting was delayed until the Brassicas reached flowering to ensure that there was plenty of gas to be released into the soil profile.

All fumigant practices required at least three weeks and rainfall before planting could commence. The block received

at least 100mm of rainfall from mid-September to mid-October, before planting.

In each treatment five trees are being monitored for their growth rate using trunk diameter and stem elongation until the end of the Future Orchards project (2021) (see Figure 1).

The initial growth rates after the first leaf have shown the Chloropicrin treated trees to be amazing with the stem elongation six times longer and more than double the amount of leaders on each tree.

The Chloropicrin treated trees had trunk diameters that were greater by more than 5mm compared with the trees treated with the other products, and only small differences between the other treatments (see Figure 2). Grower Joe Fontanini was 'surprised by the growth results of the chloropicrin treatment. There is very noticeable shoot growth compared to the other four treatment areas. Other treatment areas are very similar at this point, it will be interesting to see next seasons growth.'

The survival rate of trees in the Chloropicrin treatment has not been as good, with eight trees having died at the

time of the first monitoring. 'Trees on MM106 rootstock planted into old ground are prone to root disease and M26 would have been a better option' said Joe at the time of investigating the tree deaths.

While the Chloropicrin treatment has given the trees a good start by reducing the effect of possible ARD, the Biofumigation and beneficial bacteria have the potential to improve soil health by improving organic matter, soil biology, nutrient cycling and holding capacity, water infiltration and holding capacity and overall microbial activity. Time will tell if the benefits of improved soil health will enable to the trees to become good producers of quality Fiero® Fuji apples. 🍏🍏

#### MORE INFORMATION ▶

Thank you to our suppliers of the products used in this demonstration; David Grays, PGG Wrightson Seeds, Bayer and A-Gas Rural. Thank you to Pomewest for funding the soil and nematode tests. APAL's Future Orchards Project and Steve Spark, AgFirst NZ. Growers Trevor, Carmel, Joe and Lucy Fontanini are thanked for implementing the trial in their orchard.