

WARMING UP TO NEW IDEAS

Cherry Tree Trunk Protection – Update March 2020

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Background

Research carried out in 2018 and 2019 identified cycles of freezing and thawing of the cambial tissue of cherry trees, particularly in August. Young trees (less than 4 years old) were especially at risk and were less tolerant of temperature extremes, which may be due to thinner bark and less ability to buffer temperature variations. Damage to the cambial tissue may be accumulative, leading to the formation of cankers and increasing the risk of infection by *Pseudomonas syringae* strains, the cause of bacterial canker in summer fruits. Severe *P. syringae* infections may kill the tree and losses of up to 50% of new plantings have been observed during assessments carried out recently in Central Otago. Therefore, new methods of young tree protection, especially in Central Otago, are urgently required. A trunk-protection field trial carried out in 2018 indicated that protecting the lower portion of trunks of central-leader cherry trees with different materials from April to October 2018 significantly reduced the incidence of cankers. Here we present an update on a recent field trial set up on 11 April 2019 looking at trunk protection and we suggest further actions to be taken this year to try to reduce damage in spring 2020.

Cherry trunk protection trial 2019:

- A central-leader trial, with trees of 'Lapins' in their first field growing season, was set up at the Plant & Food Research research block of cherries in Clyde on 11 April 2019, with the aim of comparing different methods of trunk protection for their ability to reduce canker lesions on young cherry trees (Figure 1). Treatments were selected for their ability to reflect/absorb solar radiation and/or to provide thermal insulation. Seven trunk protection treatments plus an untreated control were tested (Figure 2). The treatments were: an untreated control (UC), double green plastic spray guard (DSG, two consecutive guards along the trunk length from the ground attached to each other with metal staplers), white plastic spiral (WPS), white interior acrylic paint (WP), rabbit deterrent paint (RP) and three different tree-trunk wrapping materials: tree-wrap 1 (TW1, cardboard/brown crepe bandage); tree-wrap 2 (TW2, white plastic wrap), tree-wrap 3 (TW3, white wrap frost-cloth-like material). All wrapping materials were removed on 9 October 2019.
- The air temperature at Clyde and the tree cambial temperature, using thermocouple sensors, were monitored on the east and west sides of trunks of the control and for treatments DSG, WP and TW3 from April to October 2019.
- Plant mortality and presence/absence of cankers were assessed on 9 October and 11 December 2019 and 10 March 2020. Here we present key findings from the first two assessments.

Key findings

- Cankers were first detected on trees on 9 October 2019.
- At the first assessment (October 2019), the control treatment had 32.1% incidence of cankers, while the WP and TW3 treatments had no cankers at all. This reduction is biologically substantial. For the other treatments, the canker incidence ranged from 7.1% for DSG to 21.4% for the TW4.
- By December 2019, the incidence of cankers increased to 68% in the untreated control. **By contrast, the canker incidence in the DSG and TW3 treatments was 14%, representing a reduction of 79%, compared to the untreated control. All the other treatments reduced the incidence of cankers by up to 69% on cherry trunks** (except for RP with 57% incidence of cankers). A final assessment carried out on 10 March 2020 is still to be analysed.
- Cycles of freezing and thawing of the cambial tissue of cherry trees were detected during the monitoring period. An example of a 24-hour period on 18 August 2019 showing the variation in air and cambium temperature on the east and west sides of trunks for the control and TW3 treatments is shown in Figure 3. After a frost the night before, at 2 pm the cambium temperature on the west side of the control reached 22°C, 13°C warmer than the air temperature (at 9°C) while the cambium on the west sides of TW3 remained the same than the air temperature. Treatment TW3 reduced the difference between air and cambium temperature, preventing temperature extremes (keeping it below 15°C during the day) and the rapid warming of the cambium tissue during the day, particularly on the east side of trunks after sunrise and on the west side in the afternoon. Treatments WP and DSG had similar effects in reducing the variation between the air and the cambial temperature, although at different magnitudes. Several cycles of freezing and thawing occurred during the study period, particularly at the end of winter and sometimes on consecutive days.
- Warming of the internal plant tissues on sunny days in winter may lead to activation of dormant cells, deacclimation and loss of cold hardiness. The active cells may become damaged or killed during freezing events. This damage results in cracking of the bark and canker-like lesions. The damaged tissue may also be colonised by the bacterial canker pathogen. The results observed here may help to explain the efficacy of some of the trunk protection treatments by preventing the trunk tissue from overheating during sunny days in winter, losing cold hardiness and becoming damaged by subsequent freezing events.

Key message and considerations:

- **Trunk protection reduced canker lesions on the cherry trunks of standard 2-year-old ‘Lapins’ trees by up to 79%. The best two methods were double green plastic spray guard (DSG) and tree wrap 3 (TW3, white wrap frost-cloth-like material). Protecting the trunk using any other method (except rabbit deterrent paint) was better than no protection at all.**
- However, some considerations are necessary regarding the use of tree wrapping methods. If cankers develop and become colonised by *Pseudomonas* spp., the wrapping of trunks with any material (T1, T2, T3 and WPS in this case) may have a negative effect by creating ideal conditions for pathogen development, so caution is advised.
- Similarly, wraps need to be removed at the end of winter. If left on, they could have detrimental effects on tree growth or increase canker development.
- Easy-to-apply, fast and cost-effective treatments such as **white paint** and the **double green spray guard** had good efficacy and are recommended.
- This work is ongoing and we will be looking at the further improvement of materials and application methods to make the most effective treatments as cost-effective and practical as possible. The methods are **aimed at insulating the cambial tissues and preventing the occurrence of cankers, they DO NOT have a curative effect.**

Based on the trial results to date and the above considerations, it is suggested that cherry growers could carry out the following in 2020:

- Paint trunks of **NEW cherry trees** with white acrylic interior or exterior paint. **Make sure to use white latex or acrylic paint that has no toxic organic solvents that may damage the tree.** White paint will not have detrimental effects on trees that may already have developed bacterial canker (although it will not cure them, it will not make things worse). We did not test mixing white paint with any other antibacterial product and applying to bacterial cankers so we have no information of efficacy of this practice at this stage.
- Paint the trunk from ground level to top on both sides of the trunk on central leader or cordons on high-density systems (e.g. UFOs, Figure 4). Although in this trial we painted up to 1.3 m of central leader trees, sometimes damage was observed above the paint (Figure 5) and therefore extending the surface painted may help prevent cankers along the leader or cordon.
- Use double spray guard to cover the trunk from ground to first lateral branches or cordons. This can be in addition with the white paint.
- Applying the treatments before the end of April and beginning of May is preferred as we do not have data on placing the treatments later in the season.

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Figure 1. Overview of the trunk protection field trial set up at the Plant & Food Research research block of cherries in Clyde on 11 April 2019 with treatments applied to central leader 'Lapins' on their first field growing season.



Figure 2. Close-up of treatments applied to cherry tree trunks. From left to right: untreated control (UC), double green plastic spray guard (DSG), white interior acrylic paint (WP), tree wrap 1 (TW1); tree wrap 3 (TW3) and white plastic spiral (WPS).

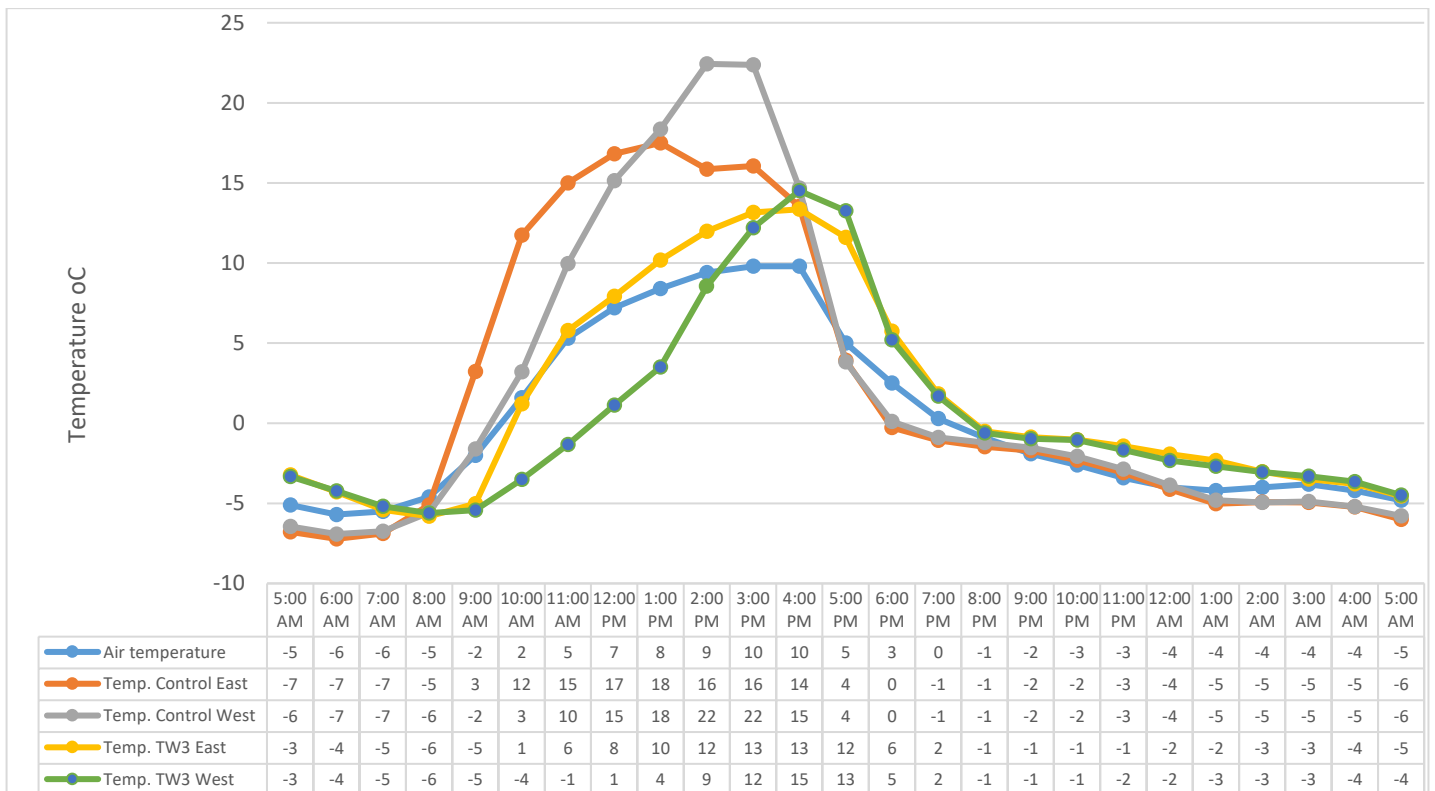


Figure 3. Air and cambium temperature (°C) for east and west sides of the control and TW3 treatments. A cycle of freezing and thawing of the cambial tissue occurred in a 24 h period on 18 August 2019. Note the rapid increase in cambium temperature for the control between 8 and 11 am on the east side of the trunk, from -5°C to 15°C, an increase of 20°C in a 3 hour period, and the heating of the trunk, reaching 22°C at 2 pm on the west side. Treatment TW3 reduced the variation between air and cambium temperature, the rapid warming of the trunk on the east side in the morning and overheating of the plant tissues in the afternoon.



Figure 4. White acrylic painted applied to trunk and both cordons on 1-year-old cherry UFO tree. Note that only one spray guard is protecting the trunk but a second one could easily be placed on top of the first one to increase the protected area, similar to our DSG treatment in central leader 'Lapins'.



Figure 5. A canker has developed in the trunk just above the area treated with white acrylic paint.