

Trunk sprays and lower phosphite injection rates for kauri dieback control – brief update March 2018

Horner I
Plant and Food Research Hawke's Bay

March 2018

1 INTRODUCTION

Trials evaluating phosphite trunk injection for control of kauri dieback provided promising results, with cessation of lesion expansion in treated trees, and evidence for excellent control of *Phytophthora agathidicida* within trees (Horner et al. 2017, PFR report no. 15425; Horner et al. 2015 NZ Plant Protection 68:7–12). However, there have also been some detrimental effects, with foliar phytotoxicity in some treated trees. In addition, there were some trunk symptoms such as cracking, which appeared to be associated with injection points. Application concentrations in the early trials were probably too high (20% and 7.5% phosphite), and this may have contributed to the observed phytotoxicity, particularly on trees with advanced symptoms.

The current trials have been established to investigate the efficacy of lower concentrations and doses of phosphite, to determine if phytotoxicity symptoms can be reduced, while still providing adequate disease control. In addition, trunk sprays have also been included to determine if topical application and absorption through the bark could provide disease control while avoiding invasive injection. Such treatments have been tried with other species (such as apple, avocado and oak) and while not always as effective as trunk injection, they still had a positive effect on *Phytophthora* control.

This brief update summarises results from assessments made in March 2018, 2 years after initial treatment, and supersedes a similar report presented in August 2017 (PFR report No.15451).

2 METHODS

The trials are on three sites: Huia Dam (Waitakere Ranges) — adjacent to the existing long-term trial, and two farm blocks at Arapohue, near Dargaville. Trees in the trial are mostly at the advanced ricker and early mature stage, ranging in size from 20- to 70-cm trunk diameter. All trial trees showed symptoms of kauri dieback at the start of the trial, including basal trunk lesions. Treatments were:

1. Untreated control
2. 7.5% phosphite trunk injection, 20 mL every 20 cm
3. 4% phosphite trunk injection, 20 mL every 20 cm
4. 4% phosphite trunk injection, 20 mL every 40 cm
5. 10% trunk spray with bark penetrant (Pentrabark™)
6. 10% trunk spray without bark penetrant.

All treatments were applied in March 2016. Trunk sprays were applied to the lower 2 m of the trunk, using a hand mister. Volumes were carefully measured, so that equivalent total volumes of phosphite were applied in injection and spray treatments (based on trunk girth). Trunk spray treatments were re-applied in March 2018, but all other trees were left untreated at this time.

The rationale of the treatment selection was to include the lowest concentration from previous trials (7.5%) as the high injection rate for this trial, to include injections with a lower phosphite concentration (4%), plus the 4% concentration at a lower dose (i.e. one 20-mL injection every 40 cm around the trunk, rather than every 20 cm). The trunk sprays were included to test this application method, with or without the bark penetrant recommended by the phosphite suppliers.

There are a total of 72 trees, 24 on each site. The trial is evenly balanced, with four replicates of each treatment on each site. At each site, trees were placed into groupings based on disease parameters such as lesion activity and canopy symptoms, then within each grouping trees were randomly assigned to the various treatments. This ensured a relatively even distribution of disease symptoms across treatments.

Before treatment, baseline assessments were made on various tree growth and health parameters. These included tree girth, canopy health score, canopy colour, plus trunk lesion size and activity. Selected lesion margins were marked for subsequent measurement of expansion, and canopy photographs were taken for later comparison.

Approximately every 6 months, tree health and lesion expansion plus activity are measured. Assessments to date have been in August 2016, February/March 2017, August 2017 and February/March 2018.

3 RESULTS & DISCUSSION

To date, no canopy phytotoxicity symptoms, such as the leaf yellowing and canopy thinning noted in earlier trials, have been observed in this trial. In assessments made after 12, 18 and 24 months after treatment, minor 'stretch marks' were noted in the trunks of almost half the injected trees, apparently in line with injection points. These were noted with both 7.5% and 4% phosphite concentrations. At the Huia site, after 18 months small bleeds in line with injection points were observed in half the trees in both the 7.5% and 4% injection treatments. One minor bleed was noted in one of the Arapohue trees injected with 7.5% phosphite. All these bleeds appeared dry and healed in the 2-year assessment. All trees will be carefully monitored to see if any substantial cracks develop, such as occurred in some trees in earlier trials.

In some of the 'trunk spray' trees there was prolific peeling of bark in the sprayed zone, first noted in the 6-month assessment. This was not just around lesion margins. In some cases the peeling was of bark that would not normally be expected to peel, although there appeared to be healthy bark below. By 18-24 months post-treatment almost all this bark had shed and trunks appeared normal and healthy.

Lesion activity and expansion was substantially lower in all phosphite injection treatments than in untreated controls (Figures 1 and 2). Even the lowest concentration of 4% at the reduced dose of one injector every 40 cm (instead of the standard 20 cm) appeared to provide control. Negative lesion growth reflected lesion peeling in some trees. As yet there is no clear discrimination between the various injection treatments.

The trunk spray treatment **without** Pentrabark provided some control, although it was inconsistent, with lesions on some trees remaining active and spreading. It was not as effective as injection treatments. The trunk spray treatment **with** Pentrabark has reduced average lesion

expansion compared with that in the untreated controls (Figure 2), indicating some efficacy. However, many lesions have remained active, with average activity scores similar to those of untreated controls. Trunks sprays were re-applied to trees in March 2018, two years after the initial application, and trees will be closely monitored to see if this second spray application can heal the lesions.

Six-monthly assessments of tree growth, canopy health, lesion activity and spread, and phytotoxicity symptoms will continue for a period of at least 3 years, with a brief report to follow each assessment.

Lesion activity 2 years post-treatment

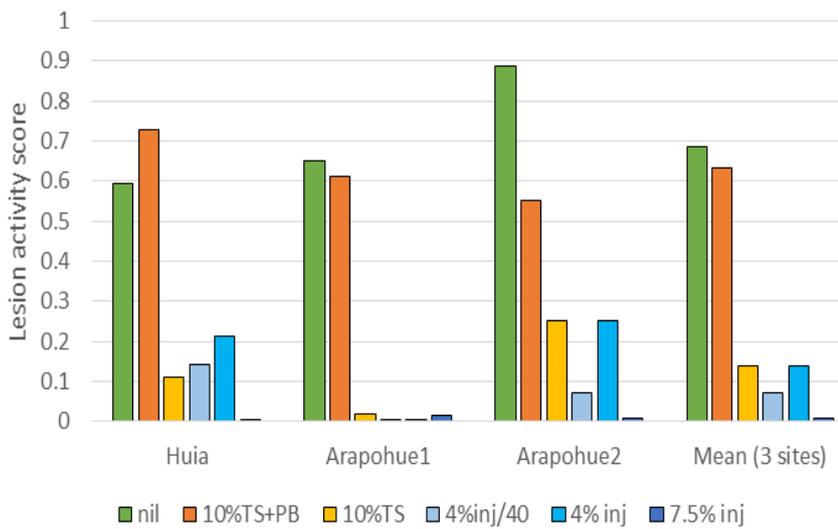


Figure 1. Mean basal trunk lesion activity score, on *Phytophthora agathidicida*-infected kauri trees in three forest sites, assessed 2 years after application of various phosphite treatments in February/March 2016. Lesion data are averaged across all monitored lesions. Lesion activity was assessed as 0 = not active, 0.2 = probably not active, 0.5 = probably active, 1 = active, 2 = very active. TS = trunk spray, PB = Pentrabark™, inj = trunk injection. Percentage figures are phosphite concentrations. 4%inj/40 = 4% phosphite, 20 mL injected every 40 cm around the trunk. Both other injection treatments were 20 mL every 20 cm.

Lesion growth 2 years post-treatment

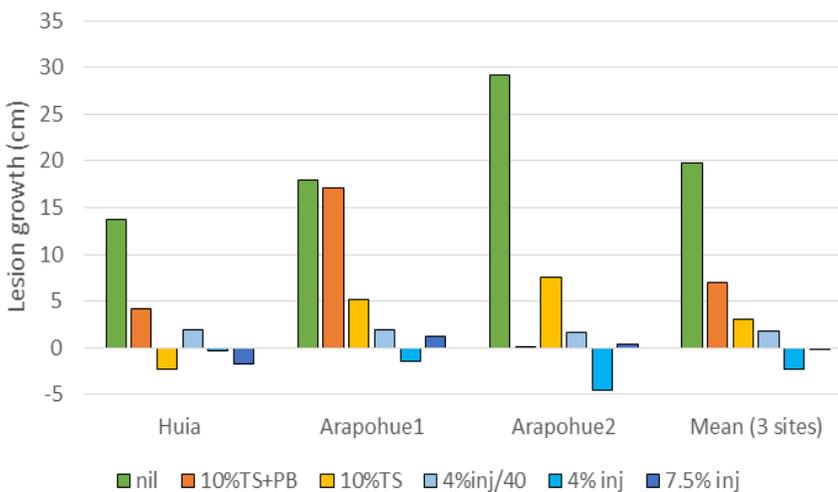


Figure 2. Mean basal trunk lesion expansion, on *Phytophthora agathidicida*-infected kauri trees in three forest sites, assessed 2 years after application of various phosphite treatments in February/March 2016. Lesion data are the average of all marked lesions. TS = trunk spray, PB = Pentrabark™, inj = trunk injection. Percentage figures are phosphite concentrations. 4%inj/40 = 4% phosphite, 20 mL injected every 40 cm around the trunk. Both other injection treatments were 20 mL every 20 cm.

Confidential report for:
Ministry for Primary Industries

DISCLAIMER

Unless agreed otherwise, The New Zealand Institute for Plant & Food Research Limited does not give any prediction, warranty or assurance in relation to the accuracy of or fitness for any particular use or application of, any information or scientific or other result contained in this report. Neither Plant & Food Research nor any of its employees shall be liable for any cost (including legal costs), claim, liability, loss, damage, injury or the like, which may be suffered or incurred as a direct or indirect result of the reliance by any person on any information contained in this report.

CONFIDENTIALITY

This report contains valuable information in relation to the Pathogen Biology and Ecology programme that is confidential to the business of Plant & Food Research and Ministry for Primary Industries. This report is provided solely for the purpose of advising on the progress of the Pathogen Biology and Ecology programme, and the information it contains should be treated as "Confidential Information" in accordance with the Plant & Food Research Agreement with Ministry for Primary Industries.

PUBLICATION DATA

Horner I. March 2018. Trunk sprays and lower phosphite injection rates for kauri dieback control – brief update March 2018. A Plant & Food Research report prepared for: Ministry for Primary Industries. Milestone No. 66674. Contract No. 33523. Job code: P/345160/04. SPTS No. 16145.

Report approved by:

Ian Horner
Team Leader, Pathogen Ecology and Biology
March 2018

Suvi Viljanen
Science Group Leader, Plant Pathology
March 2018

For further information please contact:

Ian Horner
Plant & Food Research Hawke's Bay
Private Bag 1401
Havelock North 4157
NEW ZEALAND
Tel: +64 6 975 8880
DDI: +64 6 9758925
Fax: +64 6 975 8881
Email: Ian.Horner@plantandfood.co.nz

This report has been prepared by The New Zealand Institute for Plant & Food Research Limited (Plant & Food Research).
Head Office: 120 Mt Albert Road, Sandringham, Auckland 1025, New Zealand, Tel: +64 9 925 7000, Fax: +64 9 925 7001.
www.plantandfood.co.nz

