

Phosphite large tree treatment trials: brief report

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March 2018

1 INTRODUCTION

Forest trials established in 2012, testing phosphite for kauri dieback control, provided promising results with demonstration of a curative effect. But these trials were all carried out with trees in the 'ricker' size class, mostly 15– to 35–cm diameter, with no testing on larger trees. Before any future deployment to treat moderate-sized trees or large iconic trees, and to allow informed decisions to be made, information on safe and effective treatment regimes for large trees is required. Doses based on trunk girth have previously been used to calculate required phosphite volumes. But with giants such as kauri, scaling up from rickers to trees with girths of 5–15 m may be difficult. Earlier trials also indicated some problems with phytotoxicity, particularly with higher phosphite rates, so it is very important that effects on larger trees are assessed before widespread release of the treatment. A balance must be struck between rates sufficient to suppress the disease, yet still safe for the tree.

In 2016, new trials were established on large kauri trees to help to determine appropriate treatment regimes, with emphasis on phosphite rates and doses lower than those used in previous trials. This report summarises results of assessments made on all trial trees in March 2018, and supersedes a similar report in August 2017 (Horner 2017 PFR Report No. 15440).

2 METHODS

2.1 Trial sites and tree selection

Three sites were selected for the trials: Puketotara Road, near Kerikeri in Northland; Trounson Park in Northland, and the Cascades in the Waitakere Ranges, Auckland. The Puketotara block is on a private land, and Trounson Park and the Cascades are under Department of Conservation and Auckland Council jurisdiction, respectively.

Trees in the trial are in the mature stage. At Puketotara, trees range in size from 0.4– to 1.1–m trunk diameter. At Trounson, trial trees range from 1.0– to 2.1–m trunk diameter, and trees at the Cascades range from 0.6– to 2.4–m diameter. All trial trees showed symptoms of kauri dieback at the start of the trial, including basal trunk lesions.

2.2 Treatments

1. Untreated control.
2. 4% phosphite trunk injection, 20 mL every 40 cm around the trunk circumference.
3. 4% phosphite trunk injection, 20 mL every 80 cm around the trunk circumference.

Treatments were applied at the Puketotara site in March 2016 and at the Trounson and Cascade sites in November 2016.

The determination of phosphite concentration and doses for the large trees was difficult. With trunk girth being the main determinant of dose and no international experience with treating trees of such size, a very conservative approach was taken. This decision was in part influenced by previous experiences with phytotoxicity. The selected phosphite concentration of 4% with injector frequency of one every 40 cm corresponds to the lowest rate and dose used in the concurrent 'Trunk spray and low rate trial' (Horner 2018 PFR report No. 16145). We have also included another treatment with an even lower dose of one injector every 80 cm girth. Although this dose may be too low to provide adequate long-term control, we have the opportunity to observe effects over the first year or two, then make another application if deemed appropriate.

2.3 Trial design

There are a total of 42 trial trees, (9 at Puketotara, 15 at Trounson and 18 at the Cascades). This is double the number that was proposed in the initial trial outline, but should lead to more robust data. At each site, trees were divided evenly among the three treatments. To ensure a relatively even distribution of disease symptoms across treatments, at each site trees were placed into groupings based on disease parameters such as lesion activity and canopy symptoms, before random assignment of the various treatments within each grouping.

2.4 Initial assessments

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.

2.5 Periodic assessments

Tree health and lesion expansion plus activity has been measured approximately every 6 months. Assessments to date have been in August 2016 for the Puketotara site and February/March 2017, August 2017 and March 2018 for all three sites.

3 RESULTS & DISCUSSION

To date, no phytotoxicity symptoms have been observed in any of the trees. There are no major changes in canopy density to date, and no sign of yellowing of leaves in any of the treated trees.

It is now 17 months since treatments were applied at Trounson and the Cascades, and 2 years since the Puketotara treatment, so it is still fairly early to draw conclusions about treatment efficacy. On average, lesion activity at all sites is greater in the untreated controls than in either of the injected treatments (Figure 1), with a drying up and healing of many lesions in the injected trees. However, there was still some lesion activity in many of the injected trees, indicating that lesion healing is not complete. This was the case in both injection treatments. The amount of activity was greater than that seen at the same stage in earlier trials on rickers, where most lesions were dried up and healed 12– to 18–months post-injection (Horner 2017 PFR Report No. 15425). Phosphite concentrations and doses were greater in those earlier trials, and it seems likely that the rates selected in the current large tree trial are too low for effective control.

In the 'Trunk spray and low rate trial' a rate of 4% phosphite injected every 40 cm around the trunk has to date been effective at stopping lesion activity in rickers (Horner 2018 PFR report No. 16145). The same dose (based on trunk circumference) in the current large tree trial has not been fully effective, and it is possible that these large trees need a higher dose. Given that there have been no obvious phytotoxicity symptoms noted to date, higher dose rates or higher frequency of application should be considered.

In light of the lesion activity in some treated trees, following the March assessment a 4% phosphite solution was re-applied to the trees in lowest phosphite treatment ('Treatment 3', injector spacing 80 cm) at the Puketotara site. This was 2 years after the initial treatment application. A similar re-treatment will be done on 'Treatment 3' trees at the Cascade and Trounson sites in November 2018, also two years after their initial treatment.

4 PLANS

Six-monthly assessments of tree health, lesion activity and spread, and phytotoxicity symptoms will continue for a period of at least 4 years, with a brief report following each assessment.

Re-application of injection treatments as noted above will be done in the lowest dose trees at the Cascade and Trounson sites in November 2018. Retreatment of other trees will be carried out in future following further lesion activity assessments and discussion with the P&I team and other interested parties.

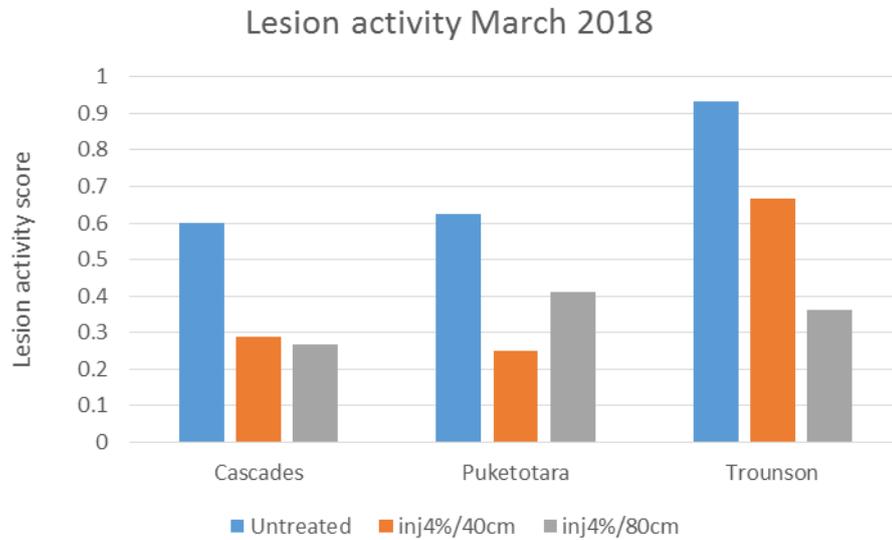


Figure 1. Mean lesion activity in *Phytophthora agathidicida*-infected kauri trees on three sites, assessed in March 2018. Phosphite injections were applied in March 2016 (Puketotara site) or November 2016 (Cascades and Trounson sites). A 4% phosphite solution was applied as one 20-mL injection every 40 cm or one injection every 80 cm around the trunk circumference. Lesion activity scoring: 0=not active, 0.2=probably not active, 0.5=probably active, 1=active, 2=very active.

Confidential report for:
Ministry for Primary Industries
Client ref: 18061

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PUBLICATION DATA

Horner I. March 2018. Phosphite large tree treatment trials: brief report. A Plant & Food Research report prepared for: Ministry for Primary Industries. Milestone No. 66659. Contract No. 33447. Job code: P/345160/05. SPTS No. 16195.

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March 2018

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