Psa-V Product Testing – Field Trial Report

Trial 7

Copper phytotoxicity - Hort16A

February 2012

26 April 2012

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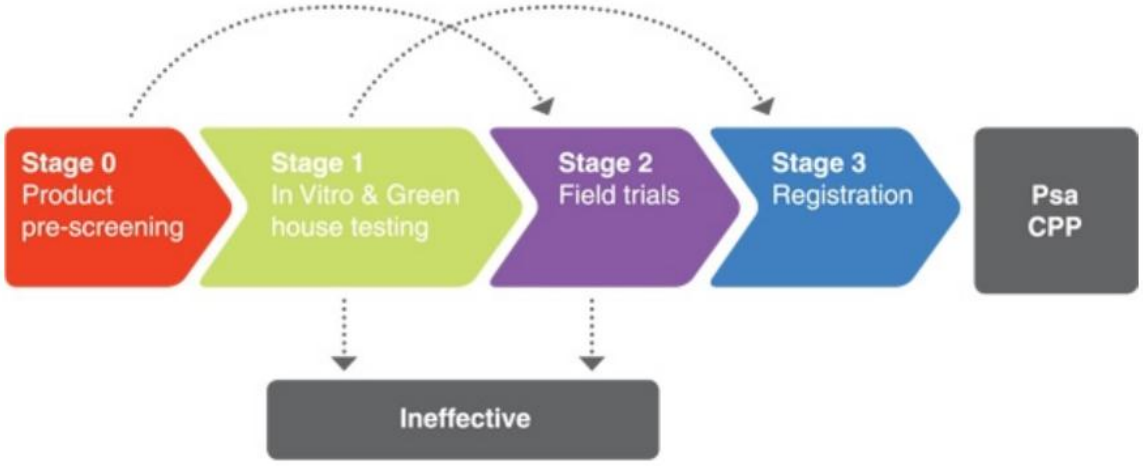
Introduction

ZESPRI, with support from KVH, is coordinating the screening of the effectiveness of a wide range of products to control the virulent type of bacterial disease caused by Pseudomonas syringae pv. Actinidiae (Psa-V). The screening programme has been developed to identify, rigorously test and then obtain permission to use suitable products as part of the crop protection programme (CPP) to help manage Psa-V. To understand the steps in the product testing programme the process is outlined in the diagram below.

The final stage in the testing programme is field testing which is the subject of this report. The efficacy of products for the control of Psa-V is being evaluated using potted plants in an infected orchard in Te Puke. The plants have been propagated Psa-V free and are treated with products prior to being shifted to the trial site where they are actively inoculated with Psa-V. Symptoms are subsequently monitored in the field. Products are applied using protocols agreed with the suppliers.

ZESPRI has contracted HortEvaluation Ltd, led by Lynda Hawes, to undertake the field trials. The results are reported directly to ZESPRI so that publications of this nature can be produced.

This report documents the findings from a copper phytotoxicity trial conducted on Hort16A potted plants in Rotorua in February 2012 which compared different copper products and different copper rates. The key objective was to identify any relationship between the level of copper applied and phytotoxicity.



Methodology

Trial location

This trial was conducted at Dunroamin Nurseries in Rotorua as this is where plants for KVH/ZESPRI potted plant field trials were being kept.

Plants

This trial utilised 2 year old Hort16A on 1 year old Bruno rootstocks, sourced from Pyes Pa (Tauranga) in September 2011. The plants were approximately 2m in height with a significant number of leaves. Examples of the plants used are shown in Figure 1.

One to two months before the trial, the plants became infected with Psa-V and so this trial represented an opportunity to use the plants before destroying them.

Figure 1. Example of the Hort16A plants used in KVH/ZESPRI copper phytotoxicity trial.

Treatments and inoculation

Five copper products (Kocide Opti, Nordox 75 WG, Champ DP, Liquicop and Phyton 27) were each tested at three different rates i.e. the amount of copper was standardised to 5, 10, 20 and 30 g Cu / 100L. Table 1 lists these treatments in detail. The highest rate of 30 g Cu / 100L was close to the highest summer rate for Kocide Opti, Nordox 75 WG and Champ DP (Table 2). The highest summer rate for Liquicop and Phyton 27 is around 20 g Cu / 100L.

Each treatment was applied to 10 plants (single plant replicates) on February 23 inside a large shed using a gas-assisted knapsack sprayer. The total amount of water used to treat the 10 plants per treatment was 1L. This represented a water rate of approximately 1000L per canopy hectare.

Once plants were dry they were shifted back outside with their pots directly watered via drippers. No overhead irrigation was used.

Table 1. List of treatments applied in the KVH/ZESPRI phytotoxicity trial.

Treatment	Product	Active	g Cu / 100L
1	Liquicop	Copper ammonium acetate	5
2			10
3			20
4			30
5	Kocide Opti	Copper hydroxide	5
6			10
7			20
8			30
9	Champ DP	Copper hydroxide	5
10			10
11			20
12			30
13	Nordox 75 WG	Copper oxide	5
14			10
15			20
16			30
17	Phyton 27	Copper sulphate pentahydrate	5
18			10
19			20
20			30
21	Water		0

Table 2. Recommended summer rates for above copper products.

	Amount of active copper	Percentage active copper	Recommended rate (per 100L)	Copper rate (g /100L)
Kocide Opti	300 g/kg	30%	70 - 90 g	21 - 27
Nordox 75 WG	750 g/kg	75%	25 - 37.5 g	19 - 28
Champ DP	375 g/kg	37.5%	50 - 75 g	19 - 28
Liquicop	92.8 g/L	9.28%	200 mL	19
Phyton 27	66 g/L	6.6%	150 – 300mL	10 - 20

Assessments

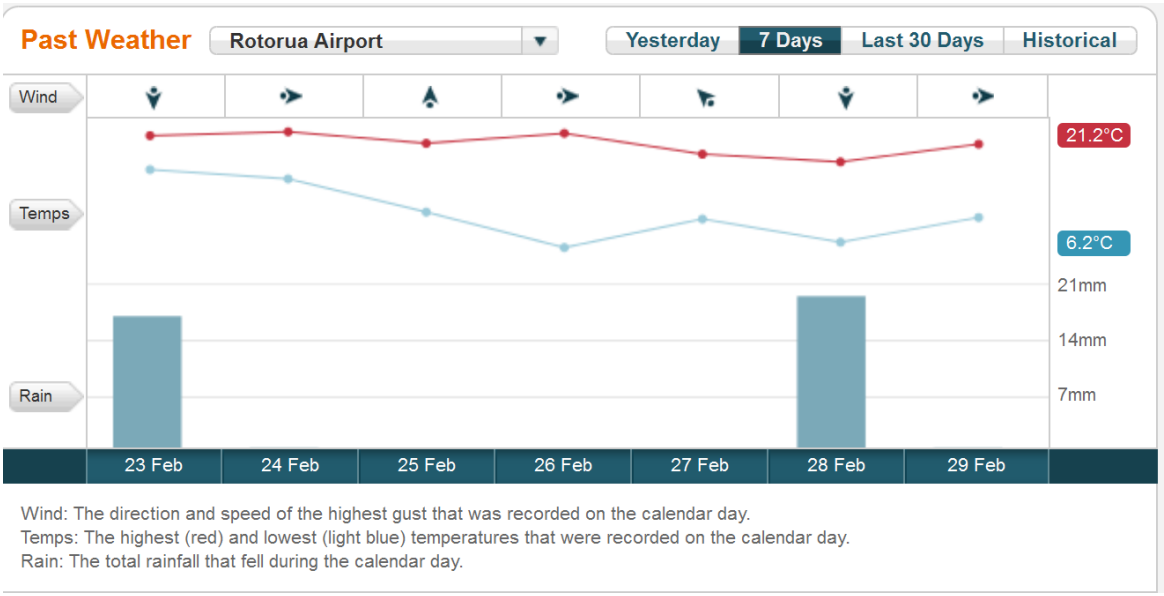
Approximately 1 and 2 weeks after treatment, on February 29 and March 8 respectively, leaf phytotoxicity was visually assessed and scored using a scale from 1 (none) to 10 (severe). A simplified version of this scale and the associated symptoms is presented in Appendix 1.

Weather

Weather conditions, particularly rainfall, during field trials need consideration when interpreting results hence a summary is presented here. Figure 2 shows that on the day of treatment, some rain fell. Rain also fell 5 days later on February 28. Light amounts of rain fell between March 1 and 3 with none falling subsequent to that (data not available).

Because of the rain on treatment day, plants were treated indoors and allowed to fully dry before being moved back outside later in the afternoon.

Figure 2. Weather in Rotorua during the first week of the KVH/ZESPRI copper phytotoxicity trial.



Wind: The direction and speed of the highest gust that was recorded on the calendar day.
Temps: The highest (red) and lowest (light blue) temperatures that were recorded on the calendar day.
Rain: The total rainfall that fell during the calendar day.

Results and interpretation

The main findings were:

- Low levels of phytotoxicity were observed throughout the trial (Figure 3). With the exception of Phyton 27 at the highest rate, the levels of phytotoxicity were well below what is regarded as light i.e. light browning of veins on the under surface of leaves.
- Ignoring Phyton 27, there was no relationship between the level of copper applied and the level of phytotoxicity (Figure 4).
- There was a slight increase in the level of phytotoxicity between the first and second assessments.

Summary

Under the conditions of this trial low levels of phytotoxicity were observed. These levels would not be expected to impact significantly on production. With the exception of Phyton 27 the level of phytotoxicity did not change with copper rate. The mechanism of phytotoxicity is not clear. One hypothesis is that water is required to release the copper ions from products which are responsible for phytotoxicity. While some rain fell on the day that the treatments were applied the plants were inside for most of the day and not subjected to all the rain. The Phyton 27 result indicates product formulation can affect the level of phytotoxicity particularly at higher rates.

Figure 3. Average level of phytotoxicity in KVH/ZESPRI copper phytotoxicity trial conducted on Hort16A potted plants in Rotorua in February 2012.

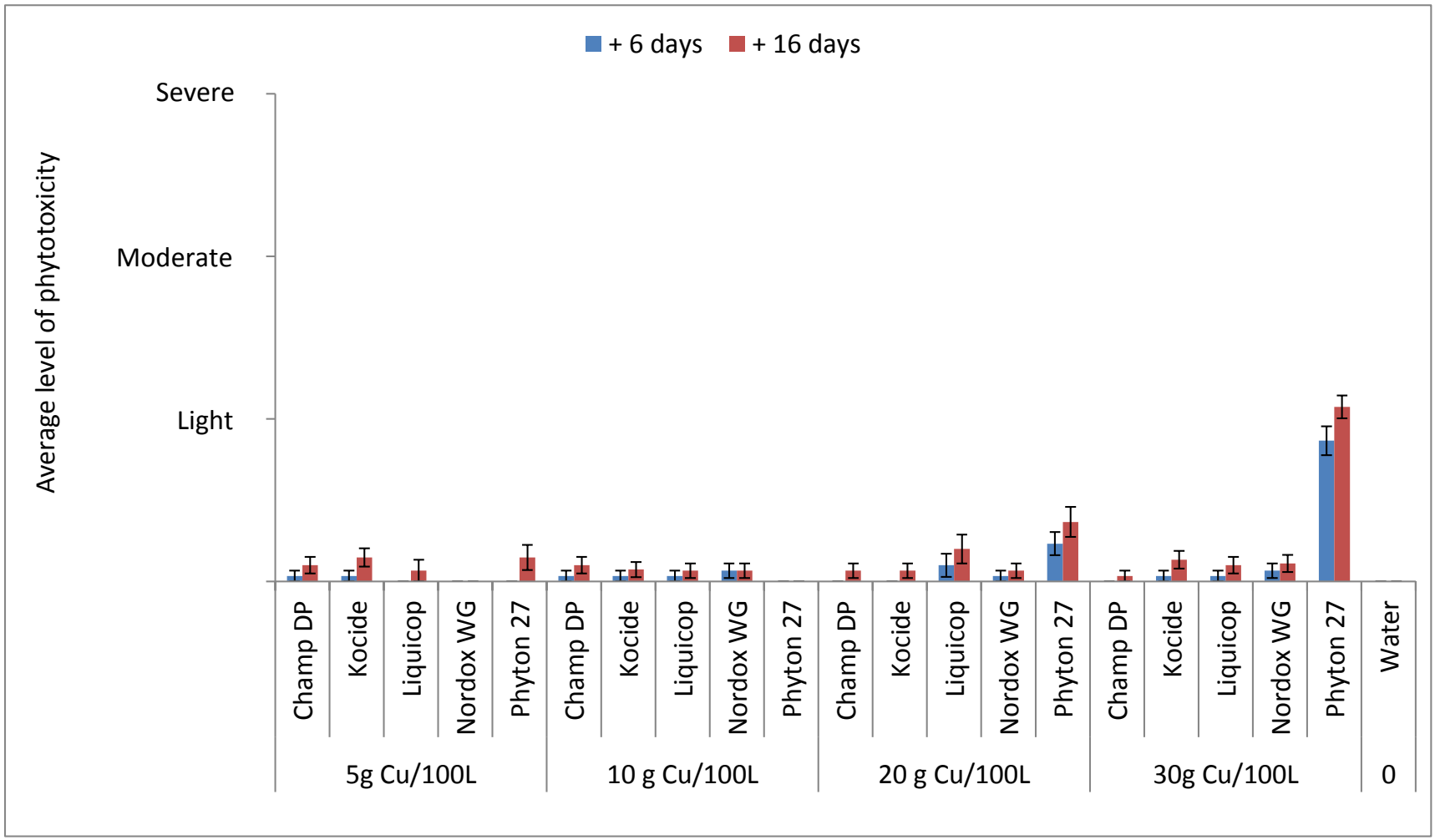
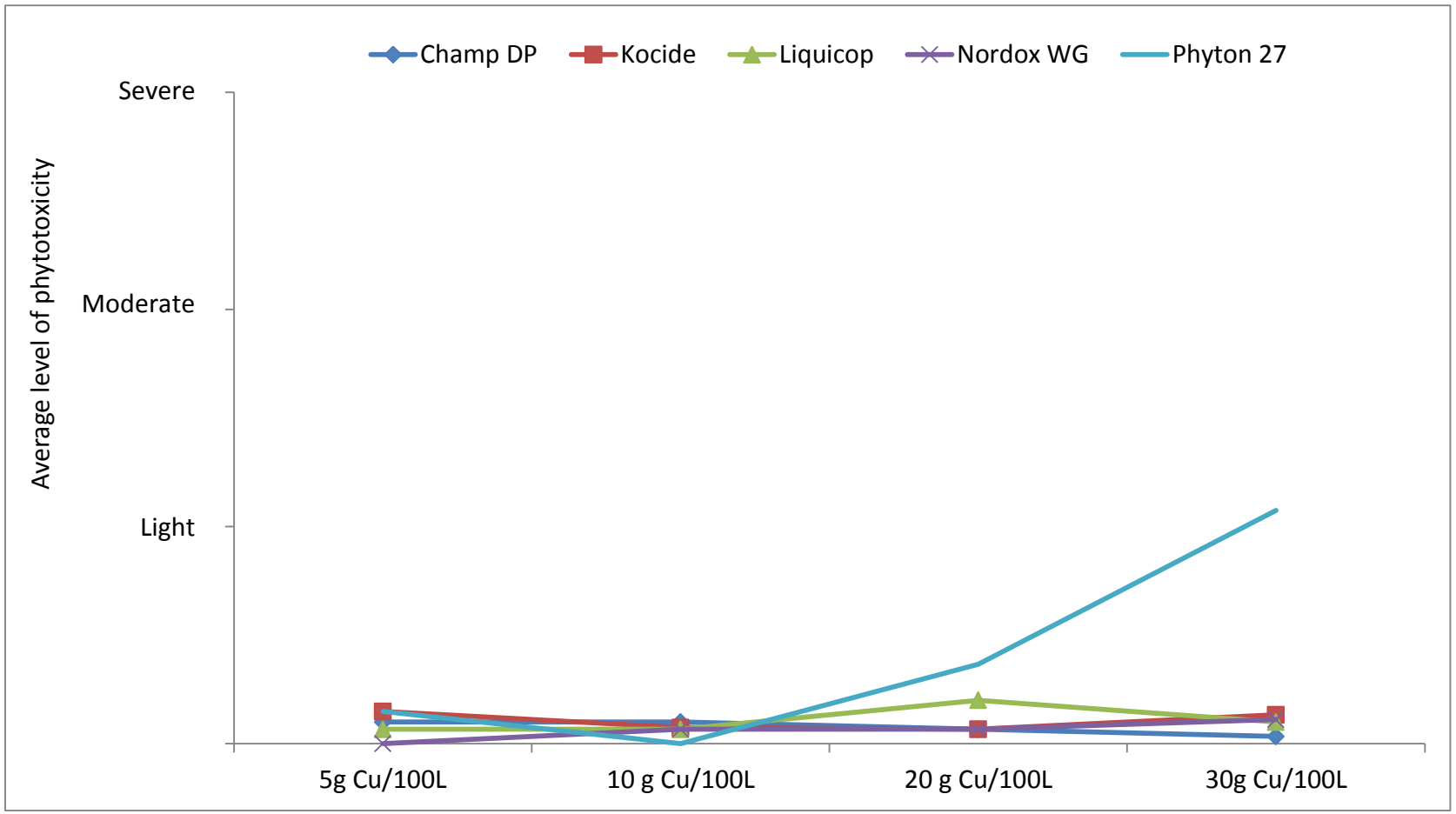


Figure 4. Average level of phytotoxicity in KVH/ZESPRI copper phytotoxicity trial conducted on Hort16A potted plants in Rotorua in February 2012. 16 days after treatment.



Appendix 1. KVH phytotoxicity scoring system (Source: KVH Website)

0 = No symptoms

1 = Light symptoms (vein staining, bronzing)

2 = Moderate symptoms (vein staining, 'cross hatching', mild yellowing)

3 = Severe symptoms (vein staining, 'cross hatching', heavy yellowing and leaf breakdown)

Level	Upperside of leaf	Underside of leaf	Description/details
0			No effects
1			The early symptom of light vein staining can be seen on the underside of the leaf. Vein staining may darken over time.
2			Cross hatched vein staining/darkening. Early signs of yellowing may appear on the topside of the leaf.
3			Severe yellowing and leaf beginning to breakdown. Leaf may deform as a result.