



Psa progression within orchards

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A report prepared for

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PLANT & FOOD RESEARCH *Pseudomonas syringae* pv. *actinidiae* (Psa) RESEARCH NOTE

PROJECT DETAILS

Project Title	6.1 Progression within orchards
Project Protocol No./ Objective No.	VI 1175 Obj. 6.1
Project Leader	Ian Horner & Mike Manning
Research Requested / Contracted by	ZESPRI Group Limited
Date (Month, Year)	April 2012

KEY QUESTION AND AIM

This project aims to map carefully and follow progress of Psa disease development within selected kiwifruit orchards, and to provide answers to questions about the pattern and timing of spread within the canopy, and progression from leaf to secondary symptoms. Data collected could also be used to develop the relationship between weather events/environmental conditions and disease incidence and severity, and help to guide chemical control strategies.

METHODOLOGY

2011/12 season progress:

- Emphasis in 2011/12 is on orchards with the V-strain of Psa.
- Three 'Hayward' and three 'Hort16A' orchards were selected from last season's study (all now Psa-V).
- Focus was on detailed collection of data early in the season.
- In each selected orchard, assessments were made weekly during spring, commencing soon after budbreak. Weekly visits continued until mid-November, with intervals extended to 2, then 3, then 4 weeks thereafter.
- Three 'ZESY002' (= Gold3 or Y3) blocks were added to the list of study orchards in January 2012. All three orchards had been diagnosed in the current season as having Psa-V.
- Assessments of percentage leaf infection and shoot die-back within 25 selected bays in each orchard, with detailed scoring of symptoms on every leaf on selected canes and shoots at each visit.
- The same bays, canes and shoots, and leaves were assessed at every visit.

KEY RESULTS (all results must be auditable in terms of access to raw data if required) A summary of leaf spot and cane/shoot die-back symptom development up to early April 2012 is presented in Figures 1, 2 and 3.

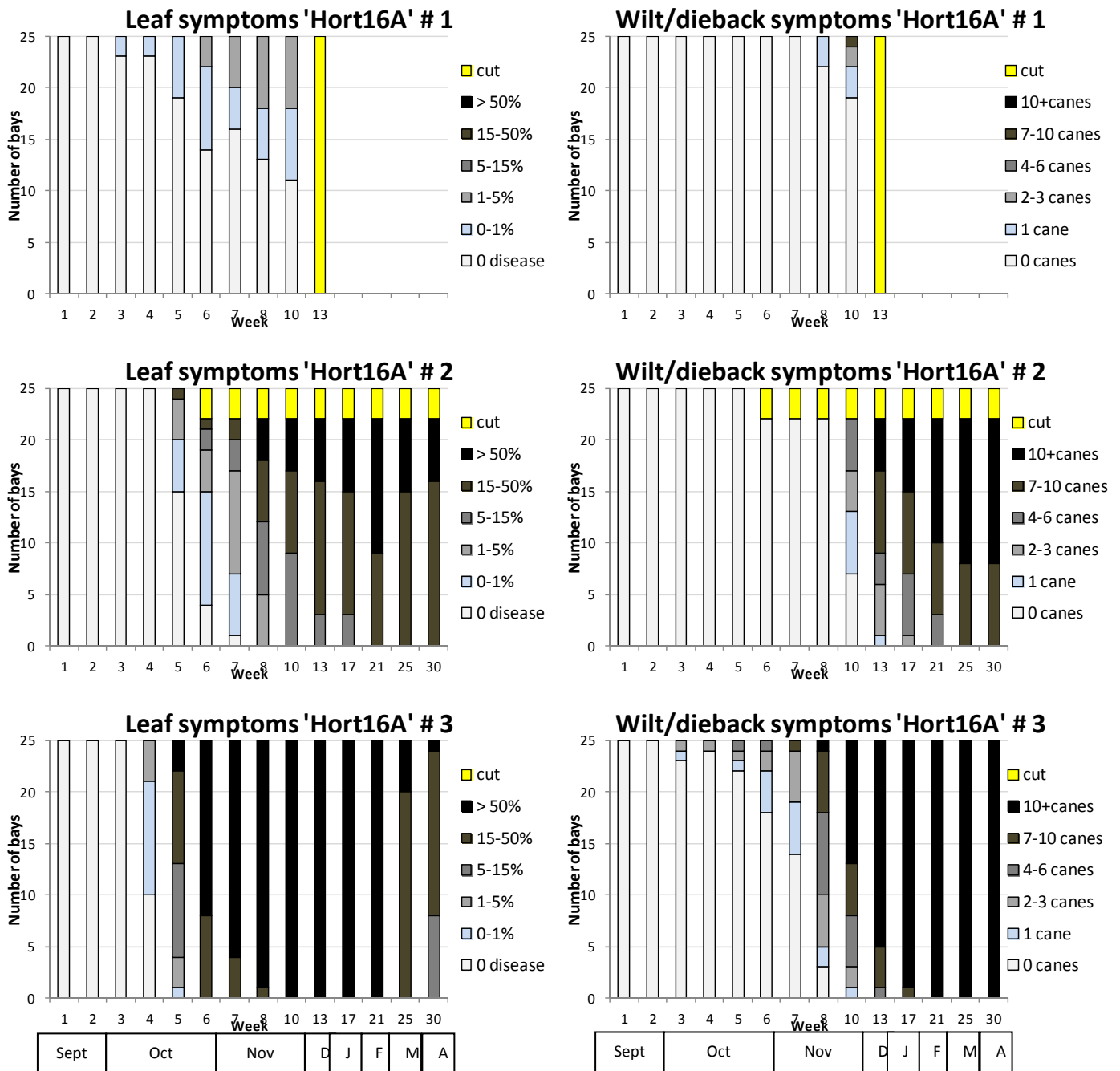


Figure 1. *Pseudomonas syringae* pv. *actinidiae* (Psa) disease severity recorded in bays during spring and early summer 2011/12, on three 'Hort16A' kiwifruit orchards with Psa-V. The same twenty-five bays per orchard were assessed weekly. For Leaf symptoms, the percentage of leaves showing Psa-like symptoms in each bay was estimated and assigned to a disease severity class (0, <1%, 1-5%, 5-15%, 15-50% and >50% of leaves). Wilt/die-back symptoms were recorded as the number of canes in each bay with wilt, die-back or bacterial ooze symptoms. There was an average of 33, 19 and 17 canes per bay in orchards 1, 2 and 3 respectively. 'Cut' = vines were cut back or removed. Week 1 assessments were on 22 & 23 September 2011, and week 30 on 10 & 11 April 2012.

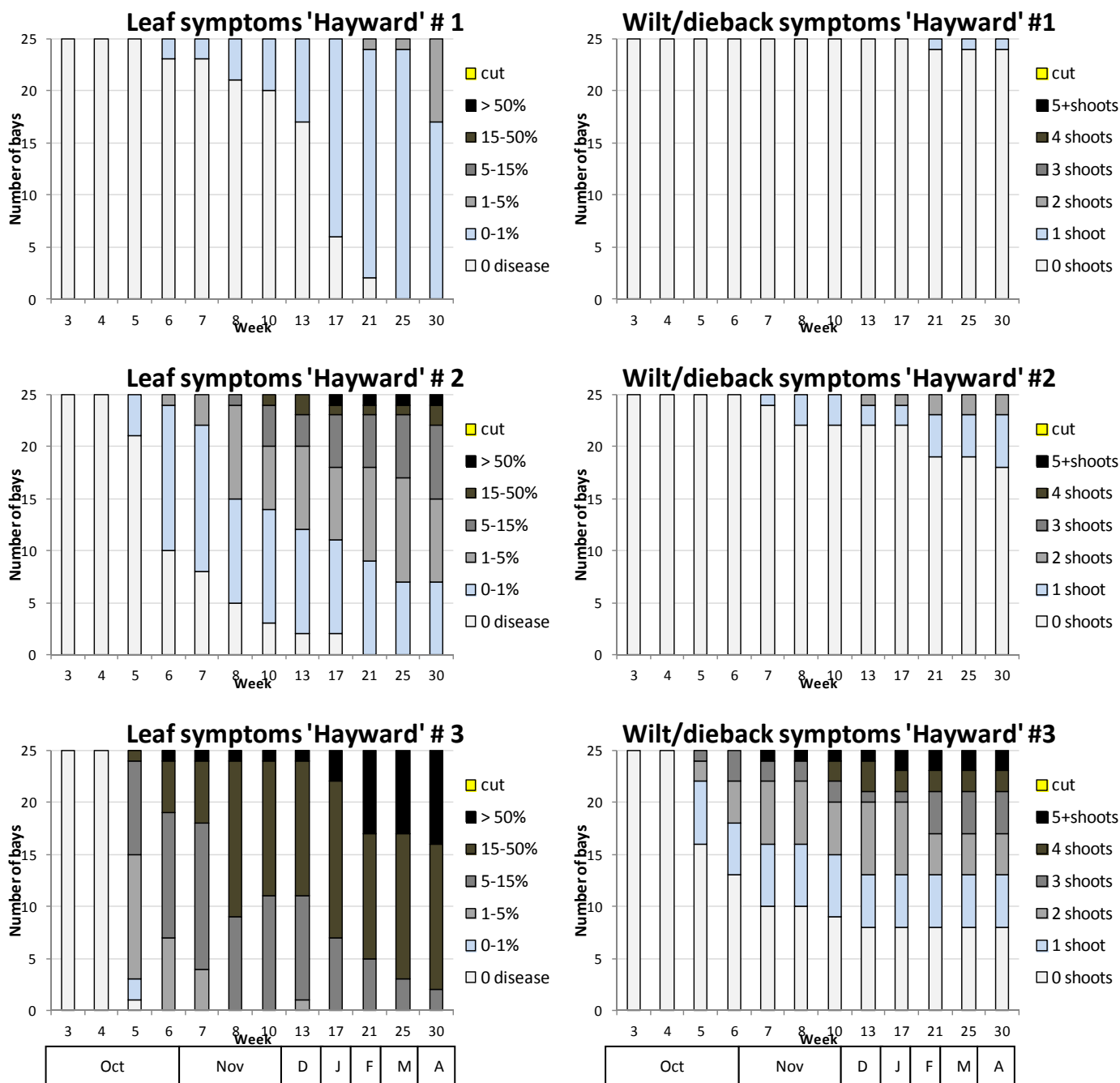


Figure 2. *Pseudomonas syringae* pv. *actinidiae* (Psa) disease severity recorded in bays during spring and early summer 2011/12, on three 'Hayward' kiwifruit orchards with Psa-V. The same twenty-five bays per orchard were assessed weekly. For Leaf symptoms, the percentage of leaves showing Psa-like symptoms in each bay was estimated and assigned to a disease severity class (0, <1%, 1-5%, 5-15%, 15-50% and >50% of leaves). Wilt/die-back symptoms were recorded as the number of shoots in each bay with wilt, die-back or bacterial ooze symptoms. 'Cut' = vines were cut back or removed. Week 3 assessments were on 6 & 7 October, and week 30 on 10 & 11 April 2012.

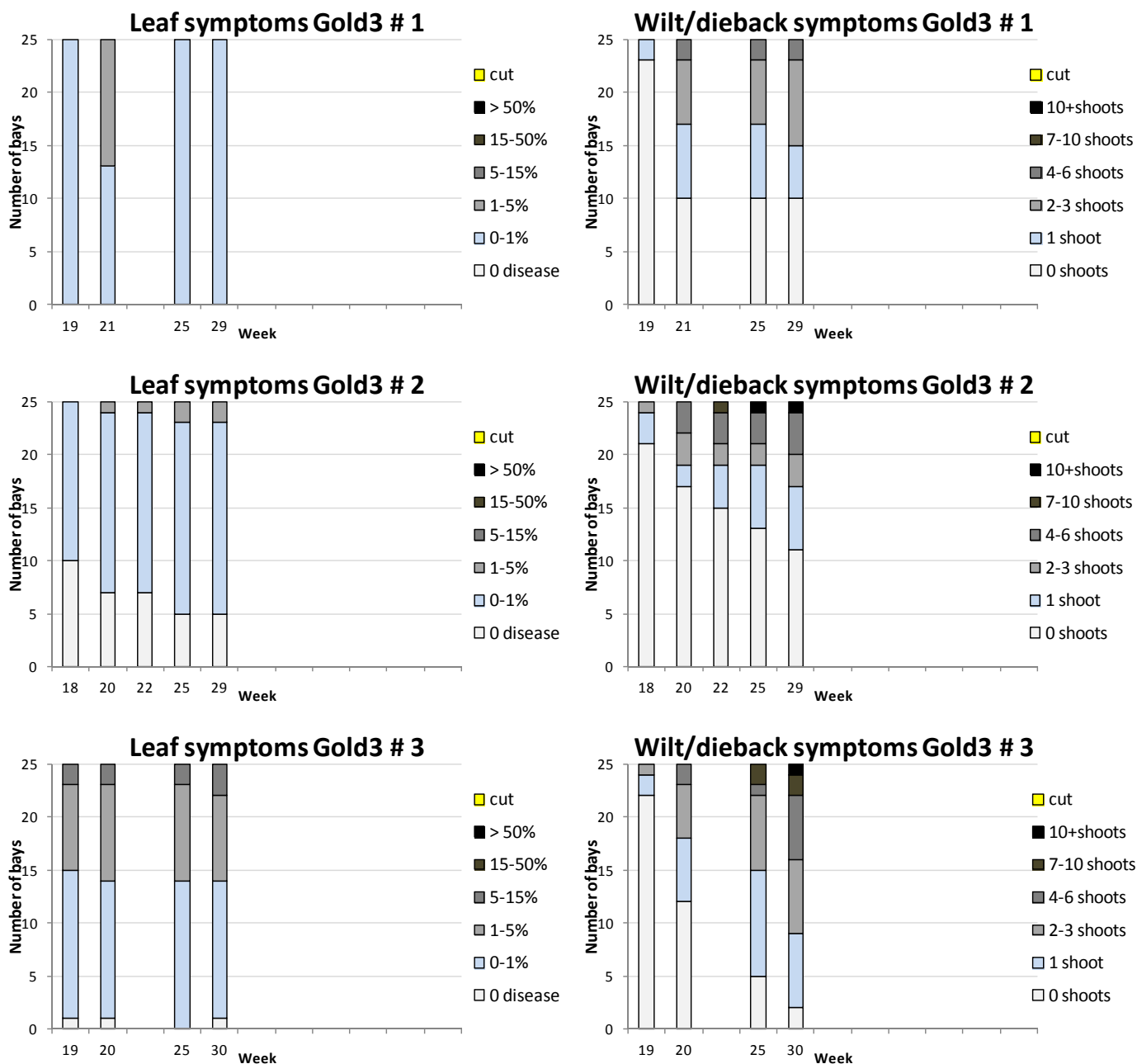


Figure 3. *Pseudomonas syringae* pv. *actinidiae* (Psa) disease severity recorded in bays during spring and early summer 2011/12, on three 'ZESY002' (= Gold3 or Y3) kiwifruit orchards with Psa-V. The same twenty-five bays per orchard were assessed weekly. For Leaf symptoms, the percentage of leaves showing Psa-like symptoms in each bay was estimated and assigned to a disease severity class (0, <1%, 1-5%, 5-15%, 15-50% and >50% of leaves). Wilt/dieback symptoms were recorded as the number of shoots in each bay with wilt, die-back or bacterial ooze symptoms. 'Cut' = vines were cut back or removed. Week 18 assessments were on 16 January 2012, and week 30 on 10 & 11 April 2012.

The monitored block on 'Hort16A' Orchard #1 was removed/cut in late November 2011. Until that time, this orchard showed the slowest disease progression of the three monitored "Hort16A' orchards, probably the result of an aggressive protective spray management programme.

On both remaining 'Hort16A' orchards, leaf symptoms continue to develop on new leaves as the shoots grow. By early March 2012, the worst infected orchard (#3) and to a lesser extent Orchard #2 had lost most of the leaves that were infected earlier in the season. Because of this, and as new leaves have emerged with shoot extension, the average severity of leaf symptoms recorded has declined. However, new leaf spots are still appearing on the recently emerged leaves. The expression of secondary symptoms increased rapidly in November and into mid-December, but there was only a slight increase in symptoms in the three subsequent months. Orchard #3 now has die-back symptoms on most canes.

In 'Hayward' Orchard 1, disease symptoms have been very slow to develop, probably the result of a comprehensive spray programme. Incidence of leaf spotting has increased throughout the summer to a point where all monitored bays have some leaf spotting, but the disease appears to be under control; a majority of the 25 monitored bays have less than 1% incidence of leaf spotting and no bay has more than 5% spotting. Only one shoot has been observed with secondary symptoms.

On the remaining two 'Hayward' orchards, there has been a steady increase in the incidence of leaf spotting throughout the season, but the vines continue to grow well. There has been a levelling off in overall percentage of leaves infected, as some older leaves fall and as new leaves emerge on growing shoots. Spot symptoms continue to develop on newly emerged plus some older leaves. There is a low incidence of shoot die-back in each orchard, but this has not increased significantly since early November, and in no case has the disease spread from the occasional wilted shoot into the cane (Figure 4).

There is no evidence on any of the monitored 'Hayward' orchards that the vines will not carry the crop through to harvest. However, in the two remaining 'Hort16A' orchards, the crop has been severely affected, if not completely lost.

In the three monitored 'ZESY002' (Gold3) orchards, there has not been an obvious trend of increasing incidence in leaf spotting over the six or seven weeks of monitoring. To put this in perspective however, this pattern is similar to that observed in 'Hayward' and 'Hort16A blocks' over the same mid/late-summer period. Unfortunately, we don't have early season data for the Gold3 orchards. However, there has been continuing appearance of spot symptoms on new Gold3 leaves as the canopy has expanded. Of concern is an increasing incidence of wilt and cane die-back symptoms in all three Gold3 orchards over the monitoring period. Although the disease does not seem as aggressive as in 'Hort16A' vines, the development of secondary symptoms in Gold3 is noticeably more rapid and severe than in any of the observed 'Hayward' orchards. Whereas secondary symptoms in 'Hayward' were generally confined to single shoots and didn't expand into canes, with Gold3, on occasion, multiple shoot collapse on the same cane was observed. Expansion of lesions back down shoots has been rapid, and in some cases lesions have spread down shoots and into the main canes (Figure 4).



Figure 4. Left. 'Hayward' vine showing secondary symptoms of Psa-V infection. The symptom has not spread from the diseased shoot into the supporting cane in any of the monitored vines.

Top right. 'ZESY002' (= Gold3) vine showing secondary Psa symptoms on the shoot (right), with cracking and lesion development in the horizontal cane.

Bottom right. 'ZESY002' (= Gold3) vine showing secondary Psa symptoms on a shoot, with spread of the lesion into the supporting cane. Note the darkened area on the cane around the base of the diseased shoot.

FUTURE RESEARCH STEPS

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- One more assessment is planned for May, with full analysis of results in June 2012.
 - Extension of the monitoring of the 'ZESY002' (= Gold3) and 'Hayward' blocks into next season should be discussed once the current season's data are fully analysed.
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This report has been prepared by The New Zealand Institute for Plant & Food Research Limited (Plant & Food Research), which has its Head Office at 120 Mt Albert Rd, Mt Albert, Auckland.

This report has been approved by:

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Date: 13 April 2012

Science Group Leader: Bob Fullerton

Date: 13 April 2012