Grower Summary

HNS 179

Management of bacterial canker in Prunus spp.

Annual 2012

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Further information

If you would like a copy of the full report, please email the HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

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Headline

- Levels of the potential bacterial canker pathogens *Pseudomonas syringae* pv. *morsprunorum* (*Psm*) and *P. s.* pv. *syringae* (*Pss*) were reduced by sprays with Cuprokylt (copper oxychloride) and a Cuprokylt + Dithane NT (mancozeb) mix.
- Results with the biological control agent Serenade ASO (*Bacillus subtilis*) have not been consistent from year to year.
- The overall levels of bacteria were greater in 2011 than in 2010 and levels of both *Psm* and *Pss,* but especially *Psm,* continued to be greater on plum than on cherry.
- The pattern of variation in bacterial numbers with sampling period differed between years, and calls into question previous thinking on changes in populations through the growing season.
- A practical approach to disinfection of pruning tools during field operations using isopropanol-impreganated disinfectant wipes such as "Azowipes" has been identified.

Background and objectives

Bacterial canker of *Prunus* spp. has been an on-going problem for HNS growers for many years and also causes losses to stone fruit growers. It was identified as a major concern during a survey of bacterial diseases of HNS in 1996-97 (HNS 71)

Bacterial canker may be caused by two distinct pathovars of *Pseudomonas syringae*: pv. *morsprunorum* (*Psm*) and pv. *syringae* (*Pss*). *Psm* is host specific to *Prunus* spp., whereas pv. *syringae* has a much wider host range, with the potential for cross infection between a number of different species and genera. Although the stem canker phase is the most economically important, these pathogens may also cause leaf spots/shot-holes, shoot die-back and flower blights. It is important to note that stem cankers result from infections which have been initiated in the previous year, and may not always be obvious in the first year after infection. Thus cankers may not be observed until 18 months after the initial infection has taken place.

For many years (based on work done at East Malling in 1960's and 70's), *Psm* was considered to be the primary cause of the disease in the UK. During a MAFF-funded survey or 'Farm Woodland' cherries, led by the author, in 2001-02, it became clear that both pathogens were causing canker in England, it was also clear that trees were already contaminated with the pathogen on the nursery.

It is generally considered that the most effective way to control bacterial diseases is by an avoidance strategy, i.e. avoiding introduction/carry over of (pathogen) inoculum. Such a strategy can usually be implemented effectively for seed-raised annual crops, but presents considerable challenges for vegetatively propagated perennials.

Growers are aware that good hygiene practices are important, and that secateurs/pruning knives, etc. should be disinfected, but the most practical and effective method(s) to achieve this are not clear.

The overall aim of the project is to identify management options which will be of benefit in the control of bacterial canker of *Prunus* spp. To achieve this the project will: aim to identify the main sources of primary inoculum on propagation nurseries; examine the potential of targeted treatments to reduce/eliminate inoculum; examine the relative merit of different practical approaches for cleaning/disinfection of pruning knives/secateurs; and critically review relevant scientific and advisory literature and draw together with the new experimental work to produce a fact-sheet with clear practical recommendations. This report summarises the results for the second year, and combined analysis of all data from both years of the project.

Summary

Spray trials and epidemiology

Spray trials were located at two commercial tree production nurseries in the UK (England), one in the South and one in the Midlands. Following discussions with grower co-ordinators two rootstocks (Saint Julien A and Colt) and three scions (plum cv. Victoria; cherries cv. Stella and Kiku-shidare Sakura) were selected for the experimental work/treatments. The stock hedges used to produce cuttings for rootstocks and the mother plants used to produce bud-wood for grafting were located at one nursery. The rootstocks were planted, budded, and grown-on at both nurseries.

Six (five plus untreated control) different treatments were examined for their effects, on leaf/bud populations of bacterial canker pathogens. Following review of the first year results with grower representatives, two modifications to the year 1 (2010) treatments were agreed (see Table 1). The 2010 Treatment C (C1; Bactime Cu L4F, glucohumate + copper) was replaced by Cuprokylt (copper oxychloride) alternating with Serenade (*Bacillus subtilis*) (C2) as pathogen levels were worse than in the untreated samples. The first year Aliette treatment (D1) was replaced by Cuprokylt plus Dithane mix plus wetter (D2) as Aliette will not be available in the future. The treatments are summarised in Table 1.

Applications were made according to the following timings: 2 x spring at bud burst, 2 x prior to budding, 2 x autumn sprays. Approx. 12 individual stock hedge plants were allocated to each treatment, 2-3 mother plants and 100 rootstocks or maidens.

Table 1. Treatment codes, products and rates used in spray trial.

Code	Product	Active ingredient	Rate	Approval status
A	Cuprokylt plus adjuvant (Activator 90)	copper oxychloride	3 g/L Cuprokylt + 0.25 mL/L Activator	Label approval
B	Serenade ASO	*Bacillus subtilis*	10 mL/L	EAMU for ornamental plant production
C1	Bactime Cu L4F (Year 1)	copper + glucohumate	4 g/L	n/a - foliar fertiliser
C2	Alternating Cuprokylt and Serenade ASO (Year 2)	copper oxychloride or *Bacillus subtilis*	3 g/L Cuprokylt or 10 mL/L Serenade ASO	Cuprokylt – Label approval Serenade ASO - EAMU for ornamental plant production
D1	Aliette 80WG (Year 1)	fosetyl-aluminium	1 g/L	Label approval
D2	As E plus Activator 90 (Year 2)		0.25 mL/L Activator	
E	Dithane NT + Cuprokylt	Mancozeb + copper oxychloride	2 g/L Dithane + 3 g/L Cuprokylt	Dithane NT – LTAEU Cuprokylt – Label approval
U	control, no treatment	n/a	n/a	n/a

Leaf/bud samples were collected from each treatment from each nursery during the growing season and taken to the lab for processing. Sampling visits were timed to occur shortly after sprays had been applied. Samples were extracted, diluted and plated onto semi-selective agar media to determine the presence/absence and numbers of *Psm* and *Pss.*

Both of the target pathogens (i.e. either *Psm* or *Pss)* were isolated from samples at both nurseries throughout the year. The overall effects of treatments in 2011 are shown in Fig. 1 (percentage of leaves contaminated) and Fig. 2 (numbers of bacteria). The main statistically significant differences can be summarised as follows:

- Levels of *Psm* and *Pss* were reduced by sprays with Cuprokylt and Cuprokylt + Dithane NT.
- Results with Serenade ASO have not been consistent from year to year.
- There are indications that the new treatments introduced in 2011 (alternating Cuprokylt/Serenade ASO and Dithane NT + Cuprokylt + wetter) may reduce levels but with only a single year of results are not so significant.

- Levels of both *Psm* and *Pss*, but especially *Psm* continued to be greater on plum than on cherry.
- The overall levels of bacteria were greater in 2011 than in 2010.
- The pattern of variation with sampling period differed between years, and calls into question previous thinking on changes in populations through the growing season.

Disinfection of pruning tools

The cutting edges of secateur blades or 'Stanley' knife blades were contaminated with a standard amount of a known strain of *Psm.* An attempt was then made to disinfect the blades by one of several methods (Table 2). Following 'disinfection' each blade was then used to make ten cuts in a plate of agar medium. Disinfection efficiency was then assessed on the basis of the number of cuts in the agar with bacterial growth. Results are summarised in Table 2.

Table 2. Summary of disinfection tests. Each replicate consisted of ten sequential cuts following disinfection of the contaminated blade. The percentage is the number of cuts giving bacterial growth: the lower the % the better the treatment.

Code	Detail	Replicates	% cuts (5×10^7)[a]	% cuts (1×10^6)[b]
U	Untreated control	20	99.9	99.3
SW	Spray with 70% iso-propanol, leave 30 s then wipe dry with paper towel.	20	16.9	0.8
SW2	Spray with 70% iso-propanol, wipe residue, repeat spray leave 30 s then wipe dry.	3	1.1	0.0
W	Wipe with Azo-wipes (70% iso-propanol).	8	8.6	0.4
J5_0	Brief dip in Jet 5 (0.8%) then wipe dry	19	48.2	3.4
J5_15	15 s dip in Jet 5 (0.8%) then wipe dry	6	0.0	0.0
J5_30	30 s dip in Jet 5 (0.8%) then wipe dry	7	0.3	0.0
Cl_0	Brief dip in 1% chlorine then wipe dry	7	24.4	1.2
Cl_30	30 s dip in 1% chlorine	1	0.0	0.0
GW	Rub edge of blade with alcohol hand gel between finger and thumb, wipe dry	11	51.1	3.8

[a] Predicted % cuts with growth, adjusted to a standard inoculum concentration of 5×10^7 CFU/mL

[b] Predicted % cuts with growth, adjusted to a standard inoculum concentration of 1×10^6 CFU/mL

During the first rounds of testing done in 2010, we failed to identify a practical option for disinfection in the field. Given the wider potential importance of disinfection of pruning tools, although further work was not originally scheduled in this project, further experiments were done in 2011 with lower inoculum concentrations and shorter drying times.

At lower inoculum doses and with shorter drying times, the efficacy of all treatment improved, and all gave significant reductions in potential pathogen transfer compared to the untreated control. Conversely, the level of disinfection achieved was reduced as inoculum increased and when drying was fan-assisted. Although long (30 s) dips in disinfectants (chlorine or Jet 5) were the most effective, these are not practical to implement in the field. Hence, whilst not the most effective when bacterial inoculum levels are high or when it is dried on, regular use of disinfectant wipes (impregnated with 70% iso-propanol as the active ingredient) are probably the most practical option for use in the field. The Azo Hard Surface Wipes used in the tests and similar products are readily obtained from a number of suppliers, especially medical and clear-room suppliers. In addition because such an approach is easily implemented and so more likely to be applied, it seems likely that the benefits of more frequent use may outweigh the lower efficiency compared to other methods.

Financial benefits

Current industry estimates indicate potential losses from bacterial canker during nursery production and soon after final planting in the range £125,000 to £200,000 per annum.

Action points for growers

- Disinfect pruning tools and knives as often as possible in the field using iso-propanol impregnated wipes such as Azowipes.
- Growers should be aware that canker symptoms may not become apparent until 18 months after infection has occurred, thus actions taken in one growing season may potentially have an impact on appearance of disease two seasons later.