Grower Summary

CP 124

Managing ornamental plants sustainably (MOPS):

Powdery mildew (Podosphaera clandestina) on hawthorn (Crataegus monogyna)

Annual 2014

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Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

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Project Title:	Managing ornamental plants sustainably (MOPS)
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Contractor:	ADAS
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GROWER SUMMARY

Headline

- Three novel fungicides and four biofungicide/alternative products showed efficacy against powdery mildew on hawthorn seedlings.
- The fungicide 77 gave better control and fungicides 10 and 39 showed equivalent control of powdery mildew to the standard treatment Signum up to three weeks after the final application.
- Biofungicide/alternative treatments 47, 105, 11 and Serenade ASO (*Bacillus subtilis* strain QST 713) + Silwet L-77 gave suppression of powdery mildew at low disease pressure.

Background and expected deliverables

Powdery mildew diseases commonly affect a wide range of woody and herbaceous perennial ornamentals, pot and bedding plants and cut flower species, causing yellow, crinkled and distorted leaves, premature senescence and reduced vigour. Young, soft shoots are particularly affected. Even with slight infections, the white fungal growth on leaves, stems and flowers, and associated leaf yellowing and distortion, make plants unsightly and often unsaleable. Some crop species/cultivars such as hawthorn are affected virtually every year while a wide range of other species are affected sporadically depending on climatic and other variables.

Powdery mildew diseases are usually managed by regular treatment with fungicides and sprays at 7 to 14 day intervals may be necessary to prevent economic crop damage. Cultural practices provide partial control, but fungicides are almost invariably necessary for the production of high-quality, saleable plants.

A range of fungicides have label recommendations for control of powdery mildew in ornamental crops. Some being more effective as protectants while others have curative (usually for a few days only) or eradicant activity. However resistance development is a concern when the same fungicide or products from the same fungicide group are used repeatedly. Effective conventional fungicides from at least two and preferably more mode-of-action groups are needed in order to be able to devise anti-resistance programmes and maintain effective disease control.

Several biofungicides have been shown to have activity against powdery mildew species and some warrant testing against powdery mildew pathogens on ornamentals. Availability of biofungicides effective against powdery mildews on ornamentals could help to reduce

development of resistance to conventional fungicides. Some mode of action groups, whilst known to have good activity against powdery mildew, have not been tested on ornamental crops and this needs to be evaluated as part of the project. The specific objectives therefore are:

1. To identify novel biological and conventional products with activity against powdery mildew of hawthorn and define their performance in relation to current standard treatments.
2. To assess whether products cause any phytotoxicity on hawthorn.

Summary of the work and main conclusions

The trial was carried out on field-grown rows of first-year hawthorn seedlings at a nursery (J & A Growers Ltd) that became naturally infected with powdery mildew. Hawthorn mildew was chosen as the target pathogen as this species has a wider host range (across the Rosaceae) than many other powdery mildew species.

Four conventional chemical fungicides (three novel 77, 10 and 39 and a grower standard Signum (boscalid and pyraclostrobin) and four biological/alternative products (47, 105, 11 and Serenade ASO + Silwet L-77) were applied over a period of eight weeks to a randomised block design with six fold replication (Table 1). The conventional chemical pesticides were sprayed four times at fortnightly intervals and the biological/alternative products were applied eight times at one week intervals, all at 400 L water/ha. Each plot consisted of a sprayed 5-row x 4 m bed length of seedlings, with the central 2 m of row lengths assessed. Untreated plots were sprayed with water at the same water volume (400 L/ha).

Table 1. Treatment list

MOPS code number	Active ingredient(s)	Use/Action
1. Untreated	Tap water	-
2. Signum	boscalid + pyraclostrobin 26.7:6.7 w/w	Preventative and systemic. Powdery mildew on protected and outdoor ornamentals (EAMU 2141 of 2012)
3. 77	Not disclosed	Preventative, systemic, and Curative
4. 10	Not disclosed	Preventative
5. 39	Not disclosed	Preventative and Systemic

6. 47	Not disclosed	Stimulates plant defence mechanisms
7. 105	Not disclosed	Stimulates plant defence mechanisms
8. 11	Not disclosed	Preventative
9. Serenade ASO + Silwet L-77	*Bacillus subtilis* strain QST 713+ 80% w/w trisiloxane organosilicone copolymers	Preventative

Applications started on 30th May 2014 at the two true leaf stage prior to visible infection being observed. Assessments of % powdery mildew severity and phytotoxicity were made weekly, and continued one, two, three and four weeks after the final spray to determine contact and persistence attributes and any effects on plant vigour.

Powdery mildew was first observed in the crop on 26th June 2014, and levels of infection increased rapidly in July, peaking on 8 August at 82% cover in the untreated control (28 days after the final application day in treated plots) (Figure 1). At the assessments carried out prior to the completion of treatment applications (17th July), and in the week after completion, all treatments showed significantly lower powdery mildew severity than the untreated control, with treatment 77 showing better control than Signum and the other two novel fungicides (10 and 39) showing comparable levels of powdery mildew control to Signum. The four biological/alternative products showed good efficacy at low disease levels. Treatments 47 and Serenade ASO + Silwet L-77 still had significantly less powdery mildew than the untreated by the 8 August (21 days after their final application) and overall performed better than 105 and 11 (Figure 1). One week after the final biological/alternative treatment application (three weeks after final conventional chemical fungicide treatment), two novel fungicides showed equivalent control, and treatment 77 showed significantly better control than the standard Signum indicating lasting preventative action (Figure 2). By mid-August the whole-plot assessment showed all treatments had similar levels of powdery mildew severity compared with the untreated control. However an assessment carried out on new growth on the 22nd August demonstrated that the four fungicide treatments (in particular 77 and 39) appeared to show systemic preventative and or curative activity that had significantly reduced levels of powdery mildew on new growth.

No phytotoxicity was observed with any of the treatments. Crop vigour was suppressed by the level of powdery mildew, therefore plots treated with the most effective fungicides showed greatest vigour (Figure 3).

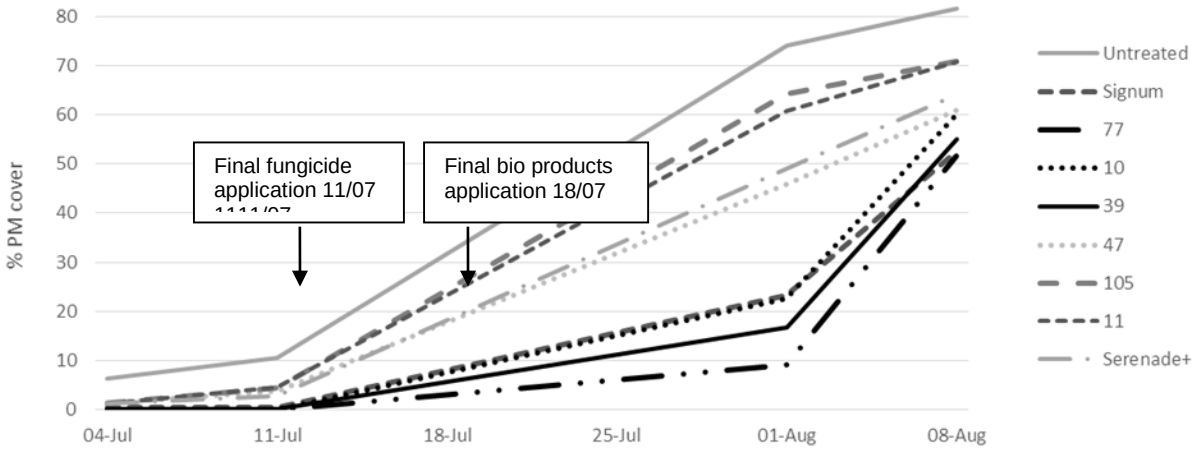

Figure 1. Powdery mildew progression (% cover) during July and August 2014. Serenade + = Serenade ASO + Silwett wetter

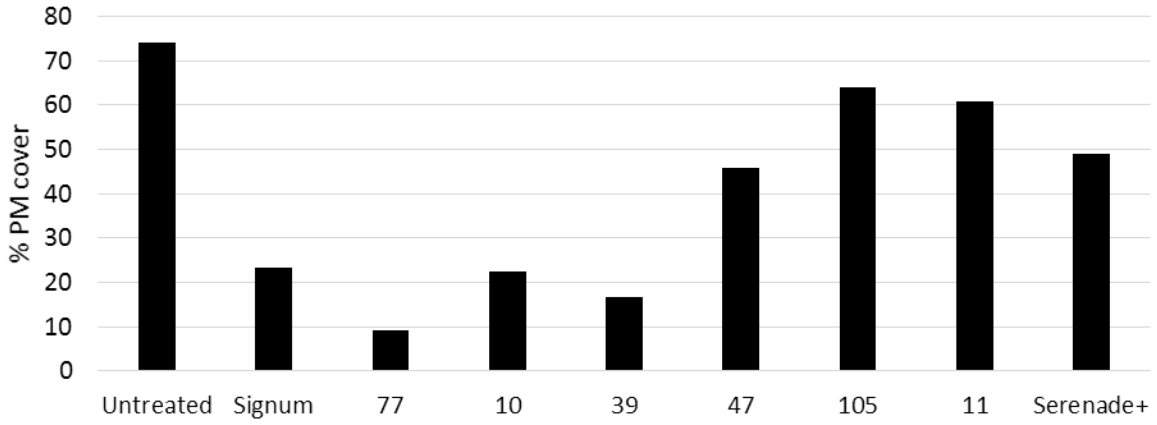

Figure 2. % Powdery mildew cover at 01.08.14 assessment two weeks after final treatment application. Letters show significant difference at the 95% confidence level. Serenade + = Serenade ASO + Silwett wetter.

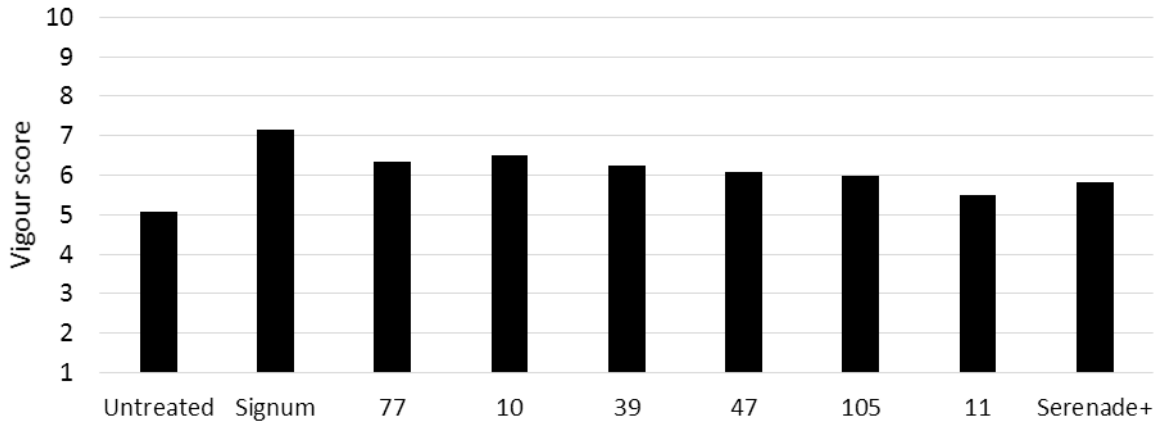

Figure 3. Vigour scores taken on 15.8.14 four weeks after final treatment applications.

1 – 10 scale: 1 = very poor vigour, 10 = excellent vigour. Letters show significant difference at the 95% confidence level. Serenade + = Serenade ASO + Silwett wetter

Novel fungicides 10, 39 and particularly 77 have shown good efficacy during and up to three weeks after treatment, reducing levels of mildew infection by over 50% compared with no treatment. All four biological/alternative products showed suppression of low level mildew infection demonstrating their potential place in programs, and in helping to avoid the development of resistance. Of these treatments 47 (a plant defence mechanism stimulant) and Serenade ASO + Silwet L-77 appeared slightly more effective than 11 and 105.

Action Point

- The most successful of the treatments identified within this project will be taken forward and combined into treatment programs to be tested on hawthorn in 2015