Grower Summary

CP 124

Managing ornamental plants sustainably (MOPS)

Final 2017 - Efficacy of plant protection products against sucking insects

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Read the label before use: use pesticides safely.

Further information

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Project title:	Managing ornamental plants sustainably (MOPS)
Project number:	CP 124
Work package title:	Efficacy of plant protection products against sucking insects – melon and cotton aphid / protected hardy nursery stock
Work package leader:	Dr Tom Pope, Harper Adams University
Report:	Final report, February 2017
Previous report:	Annual report, December 2015
Key staff:	Dr Tom Pope, Harper Adams University Grace Smith, Harper Adams University Prof Simon Edwards (Statistical advice), Harper Adams University
Location of work:	Harper Adams University
Date work commenced:	1st December 2013
Date work completed (or expected completion date):	31st January 2017

GROWERS SUMMARY

Efficacy of plant protection products against sucking insects – melon and cotton aphid / protected hardy nursery stock

Headline

- The conventional insecticides Mainman (flonicamid), product 59 and product 210 gave control (greater than 90% reduction) of melon and cotton aphid on *Hebe* plants.
- Biopesticide products 62 and 179 also gave control (greater than 80% reduction) of melon and cotton aphid on *Hebe* plants.

Background and expected deliverables

The melon and cotton aphid (*Aphis gossypii*) is one of the most serious pests of ornamentals due to the wide range of plants it attacks and because it has developed resistance to several groups of pesticides. *Aphis gossypii* is very polyphagous and common on protected ornamental and hardy nursery stock (HNS) hosts including begonia, chrysanthemum, *Coronilla*, cyclamen and *Hebe*. This aphid species tends to form large colonies on stems, young leaves and growing points. Plants attacked by this pest may yellow, wilt and, if damage is severe, die.

The purpose of Objective 2 was to test the efficacy of plant protection products against sucking insects. Specifically, Objective 2.3 was to test the efficacy of products against the melon and cotton aphid on a selected susceptible protected HNS species. Work completed in 2016 tested the efficacy of a range of plant protection products, each used according to the recommendations of each product manufacturer.

Summary of the work and main conclusions

Seven plant protection products (Table 1) were tested against melon and cotton aphid (*Aphis gossypii*) on *Hebe* (cv. Pink Pixie) plants grown under polytunnel conditions between July and August 2016 at Harper Adams University. Environmental conditions within the polytunnel were measured through the use of dataloggers and nearby meteorological recording station. The polytunnel was ventilated by rolling up the sides of the polytunnel to allow airflow through mesh walls.

Table 1. Products tested

MOPS code number	Authorisation status	Biopesticide or conventional pesticide
Water control	-	-
Mainman (flonicamid)	EAMU 20130045	conventional
130	unauthorised	biopesticide
62	unauthorised	biopesticide
210	unauthorised	conventional
59	unauthorised	conventional
179	unauthorised	biopesticide
Botanigard (*Beauveria bassiana*) + Majestik (maltodextrin)	On-label 20162754 On-label 20152230	biopesticide & biopesticide

Plants were provided by Bransford Webbs as plugs on 24 March 2016 and these plants were potted into John Innes No. 2 Compost in 9 cm diameter pots on 12 April 2016. Plants were grown on in a ventilated polytunnel until 8 July when the plants were transferred to the polytunnel. Nine plants were arranged in three rows of three in each of 48 plots. Each plot was 0.5 m x 0.75 m in size and screened on three sides with horticultural fleece in order to physically separate each plot. Plants were watered from beneath using capillary matting.

The population of aphids used in this experiment was established from field-collected aphids (aphids supplied by Dove Associates in 2015) from a commercial ornamentals nursery. Aphids were maintained in the insectary at Harper Adams University on *Hebe* plants under controlled environmental conditions (20°C and 60% relative humidity) for two months prior to use. All nine plants in each plot were artificially infested with fragments (leaves and stems) of aphid-infested *Hebe* plants taken from the aphid culture on 7 July.

All plant protection products, except Botanigard WP + Majestik, were applied using an Oxford Precision Sprayer fitted with an HC/1.74/3 nozzle. The Botanigard WP + Majestik treatment was applied using an Oxford Precision Sprayer fitted with an F80/1.2/3 nozzle. All products were applied in 600 litres of water per hectare using 3 bar pressure. A water control was applied using the same water volume and pressure using an HC/1.74/3 nozzle. No adjuvants were used for any products tested. The number of applications and time between each application was determined by on-label or EAMU approval. Where a product was not yet approved the number of applications and time between each application was determined by

the manufacturer based on the approval they are seeking for the product (Table 2). Each plant protection product and the water control was applied as indicated in Table 3. Aphid numbers were recorded one day before the first spray application was applied on 28 July and then at regular intervals throughout the remainder of the experiment (5 counts in total, see Table 3) with the final assessment of aphid numbers completed on Day 22 (21 days after the first count). In addition, assessments of phytotoxicity were completed on each day that aphid counts were completed.

Mean aphid numbers recorded one day before the first spray application were between 25 and 32 per plot for each treatment and the water control. Aphid numbers declined in all plots initially but in the water control mean aphid numbers then began to increase and had reached 33 per plot by the end of the experimental period.

Table 2. Numbers of applications and time between applications

MOPS Code	Minimum time (days) between applications	Number of applications to apply during experiment
Water control	-	2
Mainman (flonicamid)	21	1
130	7	2 (applied morning or late afternoon)
62	5	3
210	7	2
59	7	2
179	3	5
Botanigard WP (*Beauveria bassiana*) + Majestik (maltodextrin)	5	3 (applied late afternoon after wetting matting)

Table 3. Applications and aphid counts by day number

Day number	Activity	Product(s)
1.	Aphid counts	All products
2.	Spray application	All products
5.	Aphid counts & Spray application	All products & 179 (applied after counts)
7.	Spray application	62 & Botanigard WP + Majestik
8.	Aphid counts & Spray application	All products & 179 (applied after counts)
9.	Spray application	Water control, 130, 62, 210 and 59
11.	Spray application	179
12.	Spray application	62 & Botanigard WP + Majestik
14.	Spray application	179
15.	Aphid counts	All products
22.	Aphid counts	All products

A single application of the conventional insecticide flonicamid (Mainman) gave very good control of melon and cotton aphid (97% reduction) with numbers being reduced by more than 80% within six days of the spray application. Products 59 and 210 (both conventional insecticides), gave similar levels of control to Mainman, although both were sprayed twice with seven days between applications. Overall product 59 was most effective at controlling melon and cotton aphids both in terms of speed of kill (94% reduction six days after the first spray application) and absolute efficacy (no aphids found in plots treated with this product 14 days after the first spray application). Product 210 was very similar to Mainman in its efficacy against melon and cotton aphid.

Biopesticide products 62 and 179 effectively reduced numbers of melon and cotton aphids on Hebe plants during the experimental period (by 80 and 90%, respectively). Aphid numbers in plots sprayed with product 179 were not statistically different to aphid numbers in plots sprayed with Mainman when assessments were completed six and 14 days after the first spray application.

Botanigard WP + Majestik significantly reduced numbers of aphids in plots compared with the water control by the end of the experiment. Product 130 was the only product tested not to reduce numbers of melon and cotton aphid.

Product 62 and Botanigard WP + Majestik were each applied three times and product 179 was applied five times during the experiment. Repeated applications of these products improved the consistency of control seen between plots and this was similar to the

conventional insecticides tested at the final assessment. All of the biopesticides tested work through direct contact with the pest and so good spray coverage is essential. Initial work using water sensitive paper indicated that while spray coverage of upper leaf surfaces was generally good, coverage of lower leaf surfaces was relatively poor. This was observed when a hollow cone or a flat fan nozzle was used. This suggests that the efficacy of these biopesticide products could be further improved through achieving better spray coverage.

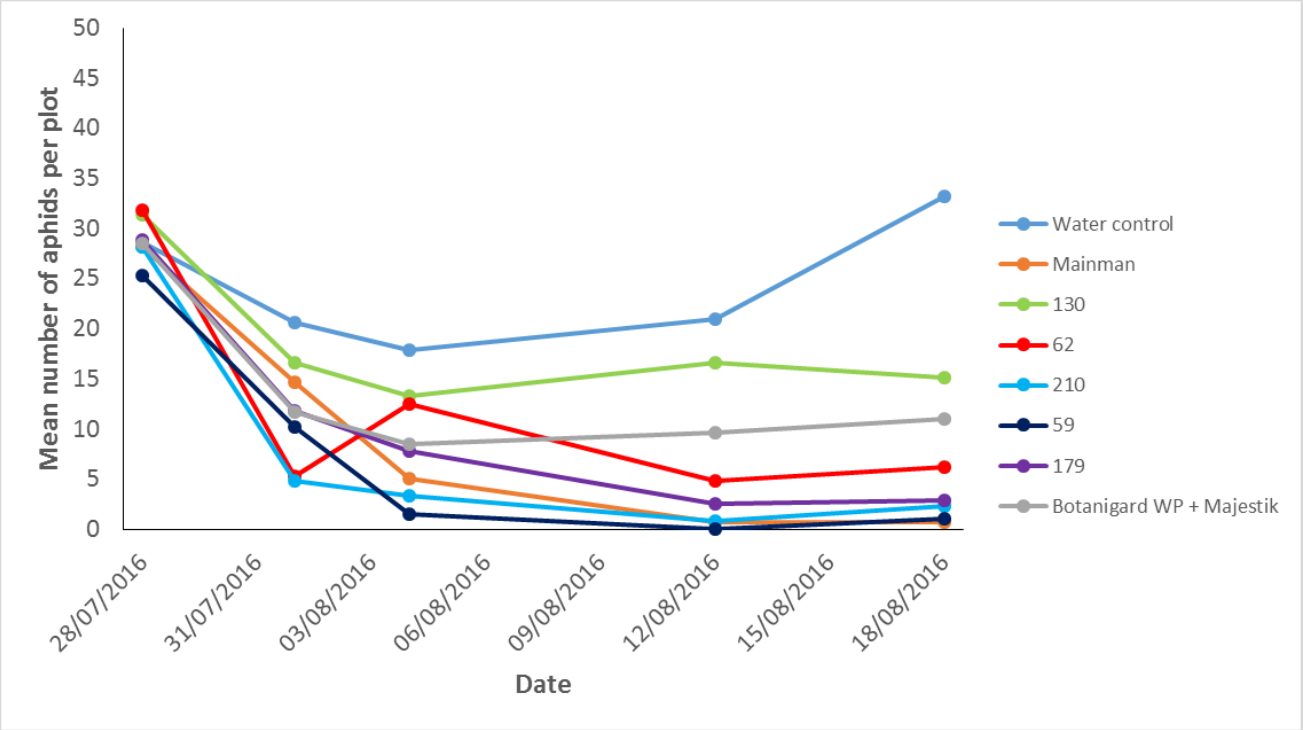

Figure 1. Mean numbers of aphids per plot on each assessment date (9 plants sampled in each plot).

There was no evidence of any phytotoxicity caused by the plant protection products tested. Plants remained largely free of other aphid pests, e.g. peach-potato aphids (*Myzus persicae*) during the experimental period. Similarly there was no need to apply biological or chemical controls against other pests, e.g. two-spotted spider mite (*Tetranychus urticae*). Natural enemies included aphid parasitoids (*Aphidius* spp.), seen as mummified aphids, hoverfly adults, eggs and larvae (mainly *Episyrphus balteatus*). These natural enemies were present in low numbers (aphid mummies were the most numerous but a mean <1 aphid mummy per plant recorded on any one assessment). Despite the low numbers of natural enemies recorded, each of the natural enemies mentioned here was seen in plots to which each of the products was applied.

Action Points

- Consider flonicamid (Mainman) as a very effective option for control of melon and cotton aphid, reducing aphid numbers quickly after a single spray application.
- When products 59 and 210, both conventional insecticides, gain approval in the future, consider their use against melon and cotton aphid as they showed similar, or slightly improved in the case of product 59, levels of efficacy to Mainman. Product 59 works both on contact and through ingestion and displays translaminar movement (moves to the opposite leaf surface) when applied to foliage and is xylem-mobile.
- Products 62 and 179 (both biopesticides) were effective at reducing numbers of melon and cotton aphid. With repeated applications product 179 gave similar levels of control to Mainman. When these products gain approval in the future, consider their use against this aphid pest as part of an IPM programme.
- Results presented here are broadly similar to those reported in year one of this project in which the same products were tested against peach-potato aphid (*Myzus persicae*) on pansy.
- Consider products for compatibility with biological control agents used in an IPM programme