AHDB
HORTICULTURE

Grower Summary

CP 124

Managing ornamental plants sustainably (MOPS):

Ornamentals: Novel pesticides and biopesticides for control of vine weevil (Otiorhynchus sulcatus) larvae on Fuchsia erecta

Annual 2015

Disclaimer

The results and conclusions in this report may be based on an investigation conducted over one year. Therefore, care must be taken with the interpretation of the results.

Use of pesticides

Only officially approved pesticides may be used in the UK. Approvals are normally granted only in relation to individual products and for specified uses. It is an offence to use non-approved products or to use approved products in a manner that does not comply with the statutory conditions of use, except where the crop or situation is the subject of an off-label extension of use.

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

Read the label before use: use pesticides safely.

Further information

If you would like a copy of this report, please email the AHDB Horticulture office (hort.info.@ahdb.org.uk), quoting your AHDB Horticulture number, alternatively contact AHDB Horticulture at the address below.

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Project Title:	Managing ornamental plants sustainably (MOPS)
Work package title:	Ornamentals: Novel pesticides and biopesticides for control of vine weevil (*Otiorhynchus sulcatus*) larvae on *Fuchsia erecta*
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GROWER SUMMARY

Headline

Currently available biological and conventional chemical control measures for controlling vine weevil larvae on ornamentals were shown to be effective. New biopesticides currently in development have also been found to be effective.

Background and expected deliverables

Vine weevil (*Otiorhynchus sulcatus*) is one of the most serious and persistent pest problems in UK hardy nursery stock and it can also damage some ornamental pot plants. Favoured ornamental crop hosts include *Bergenia*, *Cyclamen*, *Euonymus*, *Primula* and *Taxus*. Damage is caused both by the adults, which feed on foliage (resulting in characteristic leaf notching), and the larvae, which feed on plant roots, stem bases and tubers. The adult leaf notching does not severely affect the health of the plant but can make ornamental plants unmarketable or significantly reduce crop value. Damage caused by larvae is serious on both ornamental and soft fruit crops and may result in reduced yields, plant growth and, if damage is severe, may kill the plant.

Conventional chemical insecticides available to growers of container-grown ornamentals include the use of the neonicotinoid insecticides imidacloprid (e.g. Imidasect 5GR) or thiacloprid (Exemptor) in the growing media and the use of foliar sprays for the control of adults. The current restrictions on the use of neonicotinoid insecticides limit the use of imidacloprid to glasshouse crops and non-flowering ornamentals.

Current biological control options against larvae include various species of entomopathogenic nematodes (epns) applied as drenches to the substrate or through drip irrigation systems and the entomopathogenic fungus *Metarhizium anisopliae* (Met52 granular), supplied ready-mixed in substrate or as a product for mixing with the substrate or substrate by the grower. Although epns can give very effective control of vine weevil larvae many growers are unsure of which epn product to use and how best to apply it in their own crop and situation. Similarly, Met52 granular has given variable control of vine weevil in both HNS and soft fruit crops and growers need reliable, impartial information on efficacy and best-practice use in different production systems and environmental conditions.

This trial aimed to evaluate the efficacy of selected pesticides, biopesticides and biological control agents for control of vine weevil larvae on *Fuchsia erecta* in a polytunnel and to evaluate crop safety.

Summary of the work and main conclusions

Materials and methods

The trial was carried out at ADAS, Boxworth between April (timed to coincide with when *F. erecta* cuttings are being taken commercially) and November 2014 (when vine weevil eggs have hatched and larvae are developing) in a 20m long polytunnel.

There were 10 treatments. Each treatment was replicated six times and each treatment consisted of ten plants in a plot (60 plants per treatment).

Treatments were either substrate-incorporated or applied as drenches (Table 1). Substrate-incorporated products were included throughout the plant propagation process (i.e. plugs and final pots) while drenches were applied either preventatively (drench applied 24 hours prior to egg infestation) or curatively (drench applied in September when larvae developing).

Table 1 Treatments used in trial including active ingredients, application timing, rate and drench volume per pot

Product name or MOPS code number	Active ingredient	Application timing
1. Water (negative control)	-	Curative drench in September
2. Exemptor [standard] (positive control)	thiacloprid (conventional)	Substrate incorporation
3. Calypso	thiacloprid (conventional)	Curative drench in September
4. Nemasys L	*Steinernema kraussei* (biological)	Curative drench in September

5. Larvanem	*Heterorhabditis bacteriophora* (biological)	Curative drench in September
6. SuperNemos	*Steinernema feltiae, Steinernema carpocapsae* & *Heterorhabditis* spp. (biological)	Curative drench in September
7. 205	(biopesticide)	Preventative treatment - Drench applied 24 hours prior to infestation with eggs.
8. Met52 granular	*Metarhizium anisopliae* var. *anisopliae* strain F52 (biopesticide)	Substrate incorporation
9. 179	(biopesticide)	Preventative treatment - Drench applied 24 hours prior to infestation with eggs
10. 130	(biopesticide)	Preventative treatment - Drench applied 24 hours prior to infestation with eggs

Cuttings of *Fuchsia erecta* were taken on 1 May at Darby Nursery Stock, Thetford. Cuttings were planted in plugs (77 plug holes per tray) in a propagation mix containing 55% coir, 15% fine grade bark, 30 % Perlite, 1.5kg/cu. m of Osmocote mini (5-6 m) and 200g/cu. m MicroMax Premium TE. For treatment 8 and 2, Met52 granular and Exemptor respectively were incorporated into the propagation mix used for the plugs.

Plugs were transported to ADAS Boxworth on 3 July and potted up into 2 L pots on 4 July using a herbaceous mix (70% peat, 30% bark). Cuttings planted in plugs treated with either Met52 granular or Exemptor were potted up into the same treated substrate.

Following potting up plants were arranged in a randomised design (Figure 1). The trial was surrounded by a border of duct tape coated with Eco Tack® glue to stop any resident naturally-occurring vine weevils on site from infesting the trial.

Figure 1 **Trial on *Fuchsia erecta* which took place in a polytunnel at ADAS, Boxworth.**

All treatments were applied once. Treatments 2 and 8 are substrate-incorporated and were applied preventatively in the plugs for the *F. erecta* cuttings and at potting on.

On 31 July the preventative drench treatments were applied 24 hours prior to egg infestation. On 16 September curative drench treatments were applied (see Table 1 for application timings). Drenches were applied using a small watering can (without the rosette) trying to cover as much of the growing media surface as possible. Drench applications were made to already moist soil to ensure the drench was absorbed.

On 1 August all plant were artificially infested with 15 brown (embryonated) vine weevil eggs per plant. Plants were infested with eggs by removing a small area of the topmost substrate layer next to each plant close to the roots. The eggs were then washed off with water from a piece of filter paper onto the substrate and re-covered lightly with moderately moist substrate. Egg viability was 85% (20 extra eggs were monitored in the laboratory for hatching).

The trial was assessed between 3 and 11 November. In each of the plots five out of 10 plants were assessed (30 pots per treatment). The number of live vine weevil larvae per plant were recorded along with vine weevil weight, plant vigour and signs of phytotoxicity.

<u>Results</u>

All the products tested, except for Code 179, were effective and significantly reduced the number of live vine weevil larvae compared to the water control (Figure 1). The best performing products were Exemptor, Calypso, Code 205 and the three nematode products (Nemasys L, Larvanem, and SuperNemos).

Exemptor, Calypso and Code 205 reduced the mean number of vine weevil larvae per pot to 0, 0.033 and 0 respectively compared to the control which had a mean of 5.1 vine weevil larvae per pot. The three entomopathogenic nematodes, Nemasys L, Larvanem and SuperNemos, reduced the mean number of vine weevil larvae to 0.67, 0.87 and 1.13 respectively per pot and were equally effective as each other.

Met52 granular and Code 130 reduced the number of vine weevil larvae to 2.23 and 1.7 larvae respectively per plant.

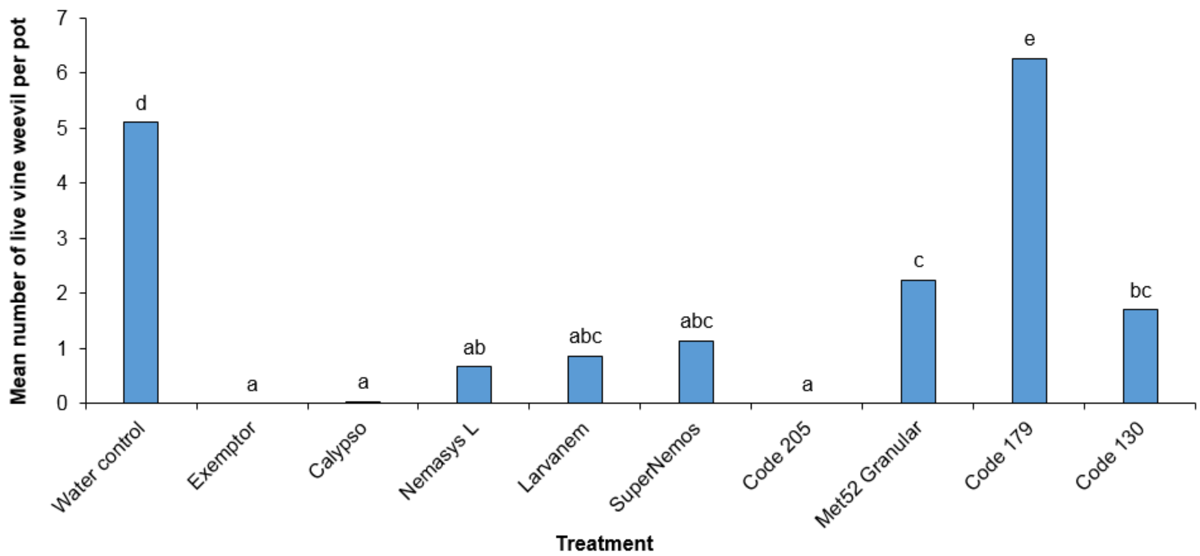

Figure 1 Mean number of live vine weevil larvae per pot (treatments with the same letters are not significantly different).

No effects of treatment were observed on plant vigour or larval weight. There was an effect of treatment observed on root weight and root vigour with a trend for the plants treated with the best performing products to have a higher root vigour and root weight compared to the control. Root weight was significantly higher than the control (mean root weight of 9.9g) when treated with Exemptor (13.0g), Calypso (15.6g) and Larvanem (13.1g). Mean root vigour scores were significantly higher than the control (mean score of 2.9) when plants were treated with Exemptor (3.4), Calypso (3.7), Nemasys L (3.5), SuperNemos (3.4) and Code 205 (3.6). Code 179 had significantly lower root weight and root vigour score compared to the control plants.

Conclusions

The trial confirmed that there are effective control measures currently available to growers for controlling vine weevil larvae. While the trial has shown that growers have the option of using conventional pesticides either preventatively (Exemptor) or curatively (Calypso), it has also confirmed that, when applied correctly, entomopathogenic nematodes can achieve a similar level of control while being safer to the operator, the environment and other beneficial insects. The temperatures during this trial did not appear to negatively affect the activity of the nematodes (full details given in science section and Appendix B).

Met52 granular was also observed to reduce the number of vine weevil larvae and is currently the only approved biopesticide which can be used preventatively in ornamental plant production. Met52 granular requires temperatures between 15°C - 30°C to infect its host and the temperature data collected during this trial suggests that substrate temperatures were suitable for Met52 granular activity for 504 hours (21 days) during August. Air temperatures indicated that average daily temperatures were suitable until the end of September. It is likely that higher temperatures would have increased the level of control recorded for Met52 Granular.

The trial also identified two additional biopesticides currently in development which were effective in controlling vine weevil larvae, particularly Code 205 which gave 100% control. Different timings of application should be investigated for Code 130 and 179 as this could improve their efficacy. Root weight and root vigour scores were generally higher than the control for the most effective treatments due to the reduction of vine weevil larvae feeding on the roots.

There was no evidence that any of the products tested in the study had a repellent or feeding deterrent effect as there were no observed differences in the average weight of the larvae recovered between treatments. If this was the case it would be expected that larvae from the treatments would weigh less than those from the controls.

While the products used in this trial were effective using our drenching methods on *F. erecta*, growers may see differences in efficacy using different crops (particularly those with dense roots or fleshy crowns) and application methods

Action Points

- If wishing to use a preventative treatment in the substrate of the plugs and substrate used for potting up, use Exemptor or the biopesticide Met52 granular. Exemptor was more effective than Met52 granular in this trial, giving 100% control of live vine weevil larvae.

- Use either entomopathogenic nematodes or Calypso curatively (EAMU (2014/2153) for the use of Calypso as a drench on protected ornamentals).
- When using biopesticides read the label carefully as the application method and timing of application requires more consideration compared to conventional pesticides.
- Biopesticides and biological control agents do not always provide 100% control and need to be used within an Integrated Pest Management programme.