AHDB HORTICULTURE

Grower Summary

CP 089

Maintaining the expertise for developing and communicating practical Integrated Pest Management (IPM) solutions for Horticulture

Annual 2014

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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GROWER SUMMARY

Headline

- All the entomopathogenic nematode products and Met52 in a coir substrate significantly reduced the numbers of live vine weevil larvae in substrate-grown strawberry when compared with untreated controls.
- Aphid hyperparasitism shows annual and seasonal variation. Percentage aphid hyperparasitism was between 0 and 95% on a HNS nursery during 2013. Compared to 2012 percentage hyperparasitism was similar in May but higher in August following a warm summer.
- Monitoring of parasitised potato aphid (*Macrosiphum euphorbiae*) mummies on an outdoor organic lettuce crop showed that naturally occurring parasitoids such as *Praon volucre* and *Aphidius ervi* were responsible for most of the parasitism rather than *A. colemani* which was released by the grower. Predators and entomopathogenic fungi were also observed. The control of aphids was likely to be due to the natural enemy community rather than one individual species.

Background

Efficacy of entomopathogenic nematodes against vine weevil

Vine weevil (*Otiorhynchus sulcatus*) remains one of the most serious problems in both soft fruit and nursery stock industries. In order to reduce damage caused by this pest, controls can be targeted against both the larvae in the soil and the adult weevils within the crop. Biological control of vine weevil is preferable to the use of insecticides in Integrated Pest Management (IPM) programmes. Current options for biological control of vine weevil larvae are entomopathogenic nematodes (various species and products) and the entomopathogenic fungus *Metarhizium anisopliae* (Met52).

The aim of this project was to assess the efficacies of four commercially available nematode products Nemasys L® (*Steinernema kraussei*), Nemasys H®, Nematop® and Larvanem® (all *Heterorhabditis bacteriophora)* and the entomopathogenic fungus, Met52® (*Metarhizium anisopliae),* for the control of vine weevil larvae. Efficacy of Met52 combined with each of the nematode products was also determined.

Aphid hyperparasitoids on protected ornamentals

Aphid parasitoids are widely used for biological control of aphids within IPM programmes on many protected crops. Until recently, biological control of aphids on protected crops relied mainly on three aphid parasitoid species:

- *Aphidius colemani* for control of e.g. the peach-potato aphid, *Myzus persicae* and the melon-cotton aphid, *Aphis gossypii*.
- *Aphidius ervi* and *Aphelinus abdominalis* for control of e.g. the potato aphid, *Macrosiphum euphorbiae* and the glasshouse-potato aphid, *Aulacorthum solani*.

Use of aphid parasitoids on some crops has increased recently, due to the availability of a new mix of six parasitoid species. The new mix contains the above three parasitoid species plus an additional three species (*Aphidius matricariae*, *Ephedrus cerasicola* and *Praon volucre*) which has extended the range of aphid species that can be parasitised, and have thus led to further uptake of aphid parasitoids on a range of crops. In 2005, in a MAFF (now Defra)-funded project on developing IPM in outdoor HNS, ADAS confirmed that hyperparasitoids (secondary parasitoids which parasitise the primary aphid parasitoids) were a potential problem in naturally- parasitised aphids in outdoor HNS (Buxton *et al.* 2005). More recent investigations by Rob Jacobson in HDC-funded project PC 295, 295a and 295b have shown that breakdown in aphid control by parasitoids in mid-summer on some sweet pepper nurseries were predominantly due to the presence of hyperparasitoids (Jacobson 2010, 2011).

During 2011 in this Fellowship project, the presence of hyperparasitism was monitored and confirmed in sweet pepper, protected strawberry and hardy nursery stock crops. A range of aphid species were parasitised by both *Aphidius* spp. and *Praon* spp. The hyperparasitoid species identified were similar to those recorded in PC 295 and 295a and b, including *Asaphes suspensus*, *Asaphes vulgaris*, *Dendrocerus carpenteri*, *Dendrocerus laticeps* and *Pachyneuron* sp. On protected strawberry, hardy nursery stock (HNS) and sweet pepper hyperparasitism reached 5, 32 and 25% respectively in 2011. During 2012 on a HNS site hyperparasitism reached 50% on 18 May and 70% on 1 August. The aim during 2013 was to continue monitoring hyperparasitism at the same HNS site.

Biological control of aphids on lettuce

Control of aphids on lettuce with pesticides is becoming increasingly difficult due to the limited number of pesticides available, pressures to reduce pesticide use and the increasing aphid resistance issues relating to both insecticides and to resistant cultivars which have been observed on lettuce for the peach-potato aphid, *Myzus persicae* and to currant-lettuce aphid, *Nasonovia ribisnigri* respectively. A major grower has reported achieving successful control of aphids in organic outdoor lettuce through the release of parasitoids. The use of biological control in field-grown lettuce, particularly for organic growers, could be an important component of an Integrated Pest Management (IPM) programme.

During 2012 in this Fellowship project, the effect of releasing parasitoids in an outdoor organic lettuce crop was monitored but only low levels of parasitism were observed. Low parasitism was likely to have been due to the presence of the entomopathogenic fungi which killed most of the aphids that had infested the plants after planting. The aim during 2013 was to continue monitoring parasitism following the release of parasitoid and evaluate the grower's current release strategy.

Summary

Efficacy of entomopathogenic nematodes against vine weevil

The aim of this project was to assess the efficacies of four commercially available nematode products Nemasys L® (*Steinernema kraussei*), Nemasys H® (*Heterorhabditis bacteriophora),* Nematop® (*Heterorhabditis bacteriophora)* and Larvanem® (*Heterorhabditis bacteriophora)* and the entomopathogenic fungus, Met52® (*Metarhizium anisopliae),* for the control of VW larvae. Efficacy of the Met52 combined with the Nemasys L, Nematop Larvanem and Nemasys H was also determined.

The experiment was done in a poly tunnel at ADAS Boxworth. On 20 June, ten bare-rooted everbearer strawberry plants were planted per standard one metre-long grow-bag (either coir or 80% peat and 20% wood fibre). Vine weevil eggs were added on 23 August (15 eggs per plant) and curative applications of the nematode products were made on 16 September. In early November, plants were destructively sampled and the numbers of live larvae in each grow-bag were recorded.

The results were as followed:

● All the nematode products and Met52 in a coir substrate significantly reduced the numbers of live vine weevil larvae in substrate-grown strawberry when compared with untreated controls.

● Met52 in coir was as effective as Larvanem, Nematop and Nemasys H but less effective than Nemasys L. Met52 in a peat substrate was ineffective.

● Nemasys L (*Steinernema kraussei)* and Larvanem (*Heterorhabditis bacteriophora)* were the best performing products and were not significantly different in their reduction of mean numbers of live vine weevil larvae. Nematop and Nemasys H (both *Heterorhabditis bacteriophora)* were not significantly different than Larvanem but did not reduce the mean number of vine weevil larvae as effectively as Nemasys L.

● Combining nematodes with Met52 did not significantly improve the control of vine weevil larvae compared to when using nematodes alone.

Aphid hyperparasitoids on protected ornamentals

Aphid hyperparasitoids were collected from a hardy nursery stock (HNS) site in Norfolk where the grower used regular releases of a new aphid parasitoid mix which included the six parasitoid species *Aphidius colemani*, *Aphidius ervi* and *Aphelinus abdominalis*, *Aphidius matricariae*, *Praon volucre* and *Ephedrus cerasicola*.

The site was sampled on 23 May, 16 July and 13 August and hyperparasitism ranged between 0-44, 0-90 and 13-95% at each date respectively with the highest parasitism on *Solanum* sp., Cosmos Chocamocha and Cistus x purpureus. The main aphid species was the potato aphid, *Macrosiphum euphorbiae.* The hyperparasitoid species identified were *Dendrocerus* sp. *Asaphes* sp. and *Alloxysta brevis*.

During 2012, hyperparasitism on 18 May was between 0-50% which was similar to the 0-44% observed this year on 23 May 2013. However, by 13 August 2013, following a prolonged July heat wave, hyperparasitism increased and was higher (13-95%) compared with 1 August 2012 (17-70%).

Biological control of aphids on lettuce

Following reports that a major lettuce grower had been achieving successful control of aphids in organic outdoor lettuce through the release of parasitoids (*Aphidius colemani*), it was decided to evaluate the population dynamics of aphids in response to the release of parasitoids in an organic lettuce crop. Between 4 June 2013 and 17 July 2013 two fields were monitored and the presence of aphids, mummies and natural enemies were recorded (Objective 1). In both monitored fields natural parasitism was occurring i.e. parasitoid species which had not been released by the grower. It was concluded that the release of *A. colemani* into the field is unlikely to have made a significant contribution to the control of the aphid populations. As *Macrosiphum euphorbiae* was the most common aphid recorded and it is not readily parasitised by *A. colemani*, it is likely that the control of aphids was due to the natural enemy community rather than one individual species. Syrphid (hoverfly) larvae were observed in high numbers in Objective 1.

A second experiment was also carried out to evaluate the grower's parasitoid release strategy (Objective 2). The release strategy used by the grower involved walking through the field distributing mummies onto the crop at repeated locations. Determining whether the grower could release parasitoids from one location and achieve the same control as the currently used strategy would allow a less labour intensive method to be used.

Following the release of *A. colemani* into designated release areas, aphid numbers were observed to decrease two weeks later in both the release and non-release areas. The confirmation of *A. colemani* mummies 35 m into the non-release areas as early as three weeks into the experiment suggests that the parasitoids were able to move out of the release areas fairly quickly (assuming that they were not naturally occurring *A. colemani*). Overall few *A. colemani* were recorded in the crop and as in Objective 1, more natural parasitism (*Praon volucre* and *Aphidius ervi)* and predation (spiders) was observed. Spiders were observed in high numbers in Objective 2. This suggests that a range of parasitoids and predators contributed to the aphid control and it was not possible to confirm whether releasing parasitoids at fewer locations was as effective as the current grower release strategy.

Financial Benefits

- No clear financial benefits could be determined from this experiment
- Biocontrol of aphids usually requires regular releases of parasitoids. High proportions of aphid hyperparasitoids reduce the effectiveness of these parasitoids, resulting in increased losses caused by aphids. Growers will benefit from being aware of this risk on a range of horticultural crops so that they can adapt their IPM programmes if needed.
- Growers are not always confident of using entomopathogenic nematodes for control of vine weevil in strawberry, and are unsure of which product to buy. Growers will benefit from the results in this project which compared the efficacy of different products for the control of vine weevil larvae allowing them to make an informed choice.

Action Points

- Growers using aphid parasitoids in any crop should be aware that aphid hyperparasitism may occur. Look out for ragged emergence holes in aphid ‘mummies’ as an indicator that hyperparasitoids are present.
- Seek advice from your biocontrol supplier or IPM consultant if there are high levels of aphid hyperparasitism. It is likely that you will need to switch from using aphid parasitoids to aphid predators, and/or IPM-compatible pesticides.
- Growers should take care when using Met52 and nematodes which can be sensitive to temperature and moisture. Apply the products when conditions are suitable for optimum efficacy.
- Natural beneficial insects can help to control aphid populations. Use the parasitoid mix rather than a single species on crops that can be infested with a range of aphid species.