

Control of the European pepper moth using biological control

*Biological Control in Ornamental Plant Production Symposium
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Outline

European pepper moth - *Duponchelia fovealis*

- Pest status
- History - in Europe, in North America
- The Canadian situation
 - Detection
 - Eradication?
 - Control
- Implications for US growers?



Pest status of EPM

Small, nondescript moth, $\sim\frac{1}{2}$ " long

Caterpillar, about 1" long when fully grown

6-7 weeks, egg to adult

Wide host range including many ornamentals

Lays eggs at the base of the plant, feeds on plant material, organic matter, can tunnel into stems, webbing in the plant canopy

When not controlled can cause severe damage



Photo: Cornell U.

History of EPM in Europe

- Native to Mediterranean - southern Europe, northern Africa.
- Established in greenhouses in northern Europe since the mid-1980s
- First recorded in Finland in 1984
- Subsequently in Germany, Denmark, France, Italy, The Netherlands
- Now considered an established pest in many greenhouse operations

History in the USA

- Actionable status in USA
- Numerous interceptions (2001-2005) especially in peppers from Europe,
- Found in a begonia crop in California in 2004 - eradicated
- Numerous anecdotal reports from California, 2005-2008
- Mid-2010, widespread finds in California, Florida. Subsequently other states



History of EPM in Canada - Part I

- 2005 - found in 3 greenhouses in Ontario - all cut flowers - anthurium, gerbera, roses
- Pest regulated as a quarantine pest by CFIA
- Greenhouses quarantined - shipping of product allowed to continue under strict protocols
- Emergency use pesticide registrations
- Eradication programs put in place
- Almost 12 months before all 3 greenhouses were considered free of EPM

History of EPM in Ontario - Part II

The Standard - 2008
17 Queen Street, St. Catharines 905.684.7251

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Niagara greenhouse quarantined after moth attack; Larvae of Duponchelia moth feed on leaves, flowers, buds and stems

By By TIFFANY MAYER
Posted 3 years ago

A greenhouse operation in Niagara that produces ornamental plants is under quarantine after an infestation of a moth with an appetite for destruction was discovered in the facility.

The Duponchelia moth showed up in the greenhouse in December, forcing the Canadian Food Inspection Agency to issue an order prohibiting the movement of product into and out of the greenhouse. But Dawn Miller-Cormier, program network specialist for horticulture with the CFIA, said privacy rules prevented her from disclosing the name of the greenhouse operation or where in the region it is located.

The facility ships its products throughout Canada and to the U.S. All outlets that may have received any plants from the facility have been notified, but they have found no trace of the bug, Miller-Cormier said.

Irwin Smith, executive director with Flowers Canada Ontario, also cited proprietary issues keeping him from revealing the affected greenhouse.

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History of EPM in Ontario - Part II

2008 - Found in a number of other greenhouses - potted plants, herbs

- Eradication measures put in place initially
- Other growers scared, widespread use of pesticides - biocontrol programs killed
- As more and more greenhouses found infested, taken off regulated list
- Taking our chances with exports

History of EPM in Ontario - Part III

2008 - present

- EPM now considered established in Ontario
- Growers treating it as another greenhouse pest requiring regular management

Options for control of EPM

Pesticides

- Adult control - pesticides, pheromones?
- Larval control - pesticides including IGRs

Cultural

- Growing medium amendments

Physical control

- Screening

Biological

- Bt
- Hypoaspis
- Atheta
- Nematodes
- Trichogramma
- Orius
- Podisus?

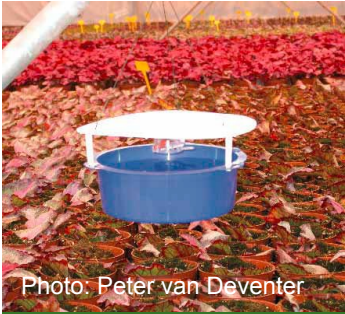


Photo: Peter van Deventer

Options for control of EPM

Pesticides

- Adult control - pesticides, pheromones
 - Synthetic pyrethroids, OPs - aerosols/ fogs, night application
 - Pheromone traps? Water traps vs Delta traps. Mass trapping vs monitoring
- Larval control
 - E.g. Orthene, Conserve, Adept, Confirm, pyrethroids



Options for control of EPM

Cultural

- Growing medium amendments
 - Dutch research using different growing media with or without mulch
 - Mulch reduced EPM populations by 32%
 - Highly organic media resulted in increased predatory mite populations

Physical control

- Screening



Options for control of EPM

Biological

- Bt - *Bacillus thuringiensis*, e.g. Dipel
- *Hypoaspis* - predatory mites
- *Atheta (Dalotia)* - rove beetles
- Nematodes - applied to the soil
- *Trichogramma* - parasitic wasp
- *Orius* - predatory bug
- *Podisus* - predatory bug

Biocontrol options for control of EPM

Bt - *Bacillus thuringiensis*, e.g. Dipel

- The most widely used product for control of EPM caterpillars - stomach poison
- Apply every 1-2 weeks
- Heavy, low pressure spray directed to the lower part of the plant and soil
- More effective against younger caterpillars
- A number of studies have shown it to be more effective than Conserve or some of the IGRs - Dutch research



Biocontrol options for control of EPM

Hypoaspis (Gaeolaelaps) - predatory mites

- Dutch work showed great potential for the use of these predatory mites
- Control >90% at high introduction rates

Atheta (Dalotia)

- 50-87% consumption of EPM eggs
- Also prey on first larval stage



Biocontrol options for control of EPM

Nematodes

- *Steinernema feltiae* and *Heterorhabditis* sp. show promise as a potential biocontrol agent
- Dutch research, 2003
- Equivalent to spinosad
- Not as good as Bt, Hypoaspis



Biocontrol options for control of EPM

Trichogramma

- Parasitizes moth/butterfly eggs
- No research specifically on EPM, but there is likely to be some activity. Number of German references to effectiveness against EPM

Orius

- No research data, but known to feed on moth eggs

Podisus

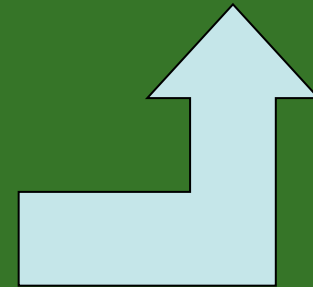
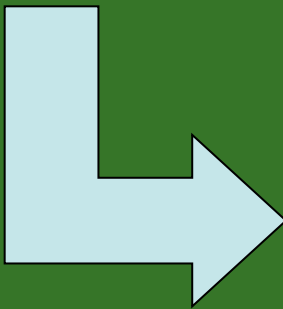
- Predatory bug specializing in caterpillars



Photo: Russ Ottens, U. Georgia



Not a recommended control option



Management of EPM in Ontario

Critical aspect is widespread use of biocontrol for other pests

- Limits potential for control of adult moths with pesticides such as pyrethroids
- Control activities for EPM focus on caterpillars

Management of EPM in Ontario

For a number of years, growers have been using soil dwelling predators such as *Hypoaspis* and *Atheta*, as a routine part of their pest management programs

In recent years, nematodes (*S. feltiae*) have been added as a routine thrips control (but many of the crops affected by EPM are not greatly affected by thrips, e.g.) begonia, kalanchoe, poinsettia

Widespread use of these BCAs has not provided full control of EPM. Bt still used

Management of EPM in Ontario

EPM is now commonly found in Ontario greenhouses

Can be found outside in summer, but is unlikely to overwinter except in very sheltered areas

Growers use soil-applied biocontrols, not necessarily for EPM but they are collateral targets and probably slow build up of pest populations

When EPM numbers increase and become noticeable, growers apply several Dipel sprays

Use pheromone traps and crop observations to make spray decisions

Implications for control of EPM in US?

Very different situations

- In Canada, does not overwinter outside. In southern US, greater potential for movement into greenhouses
- Exclusion screens more useful in the US?
- Different pesticide options
 - Pyrethroids are not used in Ontario because of biocontrol. No control of adults
 - Same would apply to greenhouses anywhere using bio/c
 - Where bio/c is not used, adult control with pesticides, combined with larval control with Bt should be very effective