Successful biological control in Ontario greenhouses

Biological Control in Ornamental Plant Production Symposium
San Marcos, CA, January 18, 2012

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Outline

- The Ontario greenhouse ornamental industry
- History of pest management
- Current state of biocontrol
- The road from 1980s to the present
- Case studies - Thrips, whitefly
- A story of what can be achieved when it has to be
The Greenhouse Ornamental Industry

2010 farm gate sales:
- Canada - $1.13 billion
- Ontario - approx. $563 million
  - ~ 30% exported

Provincial:
- Ontario ~ 50%
- B.C. ~ 22%
- Quebec ~ 10%
IPM in greenhouse ornamentals

-Then-

Late 1980’s

- Calendar spraying - weekly in winter, 2X weekly in summer, broad spectrum biocides
- Monitoring?
- IPM?
- Biological control? - ??
IPM in greenhouse ornamentals

-Now-

• IPM - now standard practice

• Monitoring - Almost all greenhouses in Ontario use routine monitoring (yellow sticky cards, visual inspections, record-keeping)

• Exporting requirement

• Alternative control strategies - screening, mass trapping, environmental

• Biocontrol → 80-90% of growers
  - Much of this increase since 2007
From then to now - how did we get here?

A number of factors working in favor:

• Ontario industry highly concentrated
From then to now - how did we get here?

A number of factors working in favor:
- Ontario industry highly concentrated and often of common origin - Dutch
- Leads to a similar concentration of allied industries - builders, systems, suppliers - incl. biocontrol companies
- Research facility/extension service in the region
- Pesticide registration system
From then to now - how did we get here?

Pesticide registration system in Canada

- Difficult to get new products registered
- When we do get new registrations, they are often a number of years after other countries
- Limited number of registered products
  - E.g. for thrips (spinosad, 3-4 OPs, 1 SP)
  - For leafminer (Avid, Citation, Permethrin)
- When resistance develops, there are few options
From then to now - how did we get here?

Pesticide resistance - thrips

- **Pre-2007, thrips the roadblock to biocontrol**
- Spinosad registered in Canada in 2006, 10 years after it was registered in US
- Poor control found within 6-12 months
- Widespread breakdown in efficacy in 2 years
- Other registered products ineffective (exception dichlorvos)
- Growers left with no option
- **Post-2007, thrips becomes the key driver of increased biocontrol use**
IPM/Biocontrol Programs

Almost all growers now using bio/c. A few observations:

- There is no recipe
- Every situation/crop/greenhouse/production system is different
- Not just a matter of introducing biocontrol agents
- What other strategies may be useful?
- What information do we have that can be used?
- Case studies
Case Study – thrips control

2008–present
Crop – various potted, spring crops
Large greenhouse
• Finishing grower
• Propagator
• Rooting station
Problem
• Zero control with registered insecticides
• Large thrips populations
• Flower damage
• Lost sales
Case study - thrips control

Crops include:

Geraniums - ivy, zonal, Regals
  • Grown for cuttings, finish
Begonias - for cuttings and finish
Poinsettia - rooting station and finish
Chrysanthemum - seasonal (fall) - finish
Gerbera - finish
Kalanchoe - finish
Spring - baskets, 4”, rooting station
Case study - thrips control

Identify most susceptible crops, prioritize
Production schedule of each
• Cuttings - grown or imported
• Rooting schedule - time under mist
• Transplanting, final spacing - timing
• Other information, e.g.
  - Environment
  - Origin of cuttings
  - Seeded or vegetative propagation
Case study - thrips control

Key crops include:

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Case study - thrips control

Tools to work with

• Predators in the soil
  - *Hypoaspis* (*Gaeolaelaps*), *Atheta*

• Predators on the foliage
  - *N. cucumeris* (slow-release mini-sachets), *Orius*

• Microbials
  - Nematodes (soil), BotaniGard (foliage)

• Trap plants, banker plants?

• Physical controls
  - Screening, sticky tape
Case study - thrips control

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Case study - thrips control

Ivy geranium

- Cutting program, finishing program (baskets, 4"")
- Begin with stock plants - critical.
- A small # stock plants can produce a much greater area of finished plant material.
- Therefore - very efficient to put most effort/money into eliminating thrips from stock.
Case study - thrips control

Ivy geranium - stock
• Hypoaspis, Atheta into pots when first planted
• Nematode applications (weekly) to soil
• Weekly applications of N. cucumeris to foliage
• Weekly monitoring
• Ensures that cuttings are free of thrips, whether for sale or own use
• No thrips issues since 2009. Also no oedema
Case study - thrips control

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Case study - thrips control

Potted chrysanthemum (cv Pelee)

- Imported cuttings, direct-stuck weekly from early Jun-end Jul for Aug-Nov sales
- Cuttings inspected closely, thrips often found on mum cuttings, pesticide residues?
- Treatment of cuttings
  - Dipping cuttings - nematodes, BotaniGard
  - Rooting bench (long days), Hypoaspis, Atheta, nematodes, BotaniGard
  - *N. cucumeris* broadcast
Case study - thrips control

Potted chrysanthemum (cv Pelee)

• Treatment after final spacing (short days)
• Continue with nematodes weekly
• Continue with *N. cucumeris*
  - Broadcast?
  - Slow release?
• Monitor
• Very successful. Three years without pesticides for thrips. Refining program each year
Case study - thrips control

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Case study - thrips control

Gerbera

- Potted gerbera can have serious thrips infestations
- Plants arrive as rooted liners
- Thrips may arrive with plants
- Treat intensively early
  - Nematodes
  - BotaniGard
  - *Hyopaspis*, *Atheta*
  - *N. cucumeris*
Case study  - thrips control

Gerbera
  • In final spacing
    - A. cucumeris, slow release
    - Nematodes
  • Two years without pesticides
Case study - thrips control

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Case study - thrips control

Spring

- **Cuttings for rooting and resale**
  - Just nematodes, BotaniGard
  - Not enough time for more extensive program

- **Baskets**
  - Planted early, longer crop, hung up
  - Nematodes, BotaniGard, slow-release *N. cucumeris*
  - Monitor closely
Other strategies used for thrips control

Banker plants for Orius

- Ornamental peppers for pollen production
- Orius introduced early in the year (March)
- Build up in numbers prior to spring and summer
- Still experimental
- Research, commercial growers
Other strategies used for thrips control

Trap plants

- Flowering yellow mums
- Highly susceptible varieties, e.g. Vyron, Chesapeake
- Used in with:
  - Other mum varieties
  - Vegetative crops
  - Foliage crops
  - Herbs
Other strategies used for thrips control

Mass trapping with sticky tape
- Widely used prior to growers using biocontrol
- Used in biocontrol programs based on predatory mites
- Can compromise control where flying BCAs are used
Case study
- whitefly control in poinsettias

Current situation in Ontario
• The majority of poinsettia growers are using biocontrol
• Gradual increase since 2006
Case study
- whitefly control in poinsettias

Reasons for biocontrol
• Insecticide resistance/Q biotype/few registered products
  - Marathon/Tristar - X
  - OPs - X
  - SPs - X
  - Sanmite - X (against Q)
  - Distance - X (against Q)
  - Judo
Case study
- Whitefly control in poinsettias

Strategies being used
- *Encarsia formosa* + *Eretmocerus mundus*
- or
- *Eretmocerus eremicus*

Introduction rates
- Encarsa @ 0.15/ft²/week for 12 weeks
- Eretmocerus @ 0.3/ft²/week for 12 weeks

- Cost ~ $0.08/pot
Case study
- whitefly control in poinsettias

Some growers also using:
• A. swirskii – predatory mite
• Delphastus – predatory ladybeetle
Case study
- whitefly control in poinsettias

Success?
• Since 2006, 70-80% of growers using biocontrol do not have to spray - at all
• A few require clean up sprays towards the end of the crop
• A very few run into problems earlier on - some use Judo very early in the crop (2X) and continue with biocontrol
Case study
- whitefly control in poinsettias

Success depends on
- **Clean cuttings!** – whitefly and pesticide residues
- **Good monitoring especially early in the crop**
  - Know your crop, know your pest populations
  - Check every variety, every shipment
  - Plant inspections are more important than card counts
Thinking biocontrol?

• Take whole production system into account - all crops
• New products (slow-release sachets?)
• New strategies (cutting treatments, banker plants, trap plants?)
• Cultivate employee interest
• Understand economics of biocontrol
• How does it compare with the cost of dumping damaged plants?
• Not all programs work as well as the ones I have described
Take home messages

Be prepared to change

- In greenhouse ornamentals, every situation is different
- We may start with a program that has worked elsewhere, but there will inevitably be changes
- Step back and look at the overall system
- How can we make use of what we know and what we observe?
- Be creative, innovative
- Necessity makes anything possible