Successful biological control in Ontario greenhouses

Biological Control in Ornamental Plant Production Symposium
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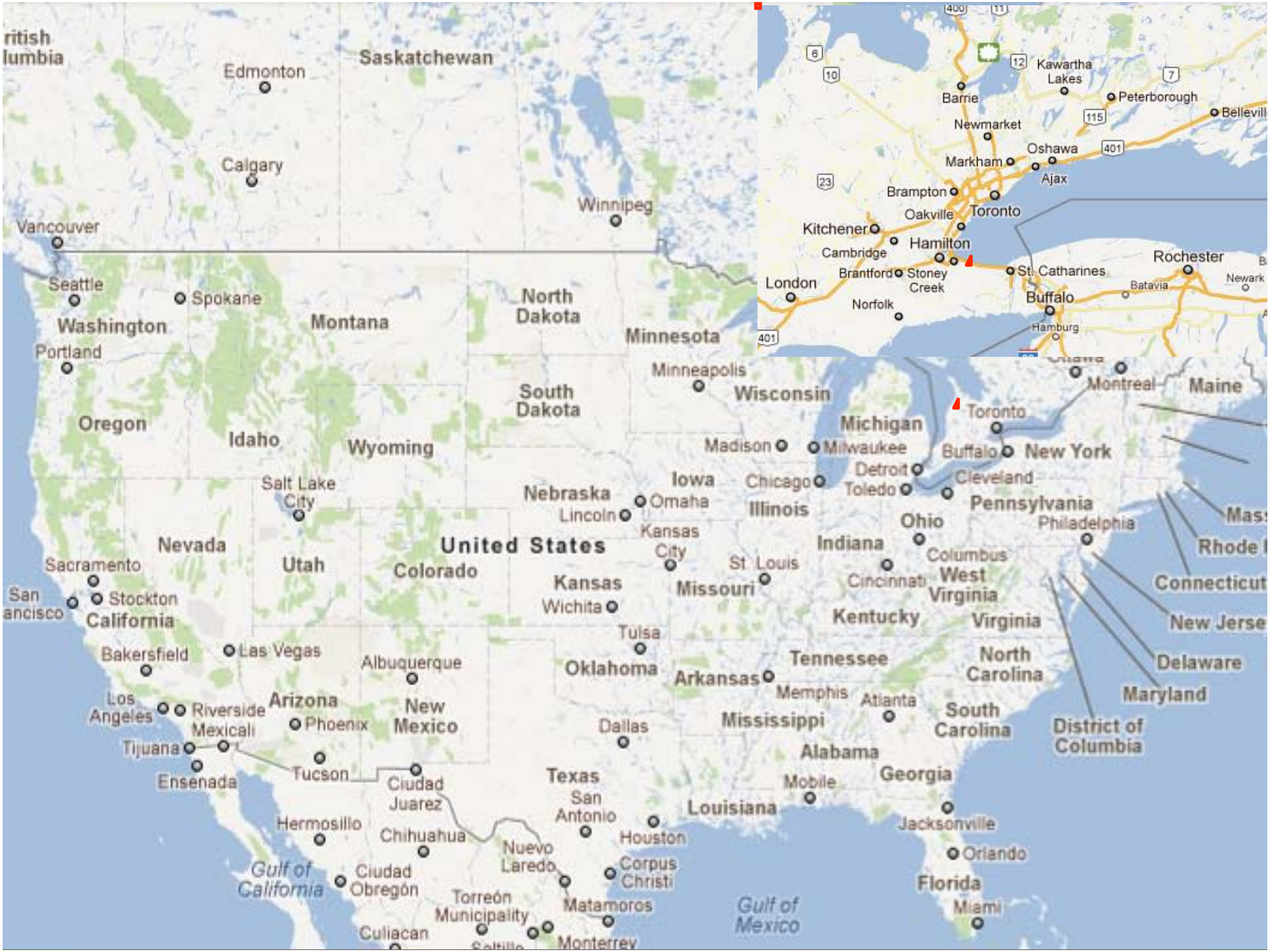
Outline

- 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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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


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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

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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

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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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Spring – baskets, 4", rooting station

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* early and another when hung
  - 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

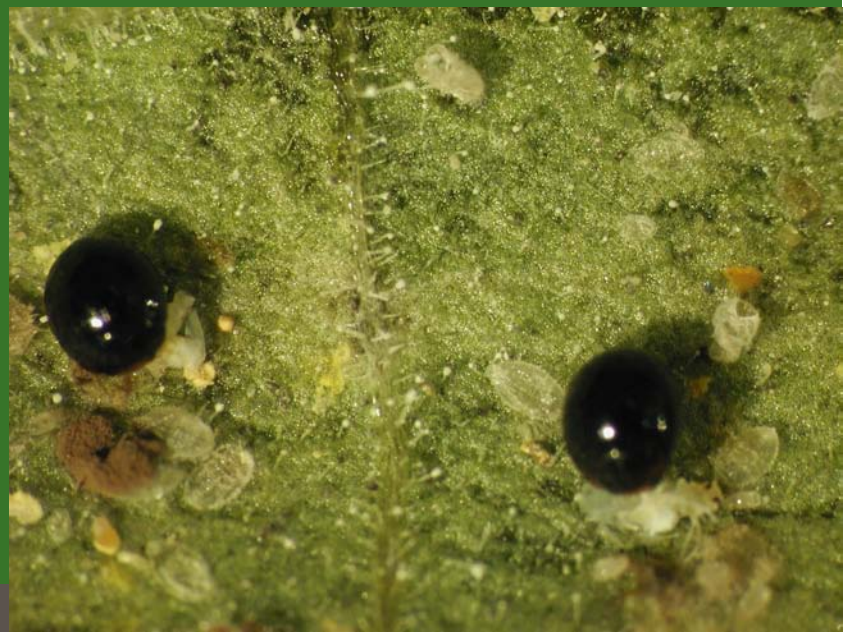
- Encarsa @ 0.15/ft^2/week for 12 weeks
- Eretmocerus @ 0.3/ft^2/week for 12 weeks

- 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