

Sustainable Turf: *Biological tools for turf pest management*

Michael Brownbridge & Pam Charbonneau Landscape Ontario IPM Symposium January 7, 2013





Research Partners

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Ontario's Cosmetic Pesticides Ban: Ontario Regulation 63/09 April 22, 2009

- Pesticides cannot be used for cosmetic purposes in urban environments; there are **no** exceptions...
- >250 pesticide products banned for sale
- >80 pesticide ingredients banned for cosmetic uses
- Necessary to develop new control options and information to support their successful implementation

Lawn care: where are we today?

- Landscape has changed
- Moved from pest and weed 'control' to 'management'
- 'Preventative' vs 'curative' actions
- Lawn management strategy
 - Healthy soil, healthy lawn first line of defense
 - New management tools
 - Integrated use of a variety of approaches
 - Greater emphasis on a sustainable turfgrass 'system'



Target pests

- White grubs
 - European chafer
 - Japanese beetle
 - June bugs
- Chinch bug











GOAL

Deliver new pest management tools and resilient use practices to maintain the functionality and appearance of lawn turf

Objectives

- ✓ Validate performance of biopesticides against white grubs
- ✓ Evaluate new biopesticides for chinch bugs
- ✓ Assess the environmental performance of novel turf grasses



'Best practices' for new management tools

Biopesticides based on:

- Fungi (Metarhizium brunneum Met52™)
- Nematodes
- Plant-derived products













Key challenges:

- Efficient targeting
- Timing when and where
- Challenging environment
 - Chinch: hot (>30°C), dry
 - Chafer: cool soil (<15°C)





Biopesticides tested against chafer grubs: 2012

Test Product	
<i>H. bacteriophora</i> (Hb)	nematode
S. glaseri (Sg)	nematode
Metarhizium brunneum (Met52 spray)	fungus
Met52 spray + Hb	fungus + nematode
Met52 spray + Sg	fungus + nematode





Biopesticide efficacy vs white grubs

Spring (May)No significant effect of treatment on grubpopulations





Biopesticide efficacy vs white grubs

August40-50% reduction with nematodesHb 1714-1 consistent from wk 4 to 8Timing of application critical





Biopesticide efficacy vs white grubs

August applications Disease development in 'healthy' larvae collected from field plots







Biopesticide efficacy against white grubs (British Columbia)

Late Summer Approx 50% reduction with nematodes

(end of July) Combined applications→ better control vs. young larvae

Neem seed cake improved performance of nematodes and BC isolate of *M. anisopliae* (fungus) 001









New biopesticides for chinch bug

- Steinernema carpocapsae, Met52 spray, essential oil
- Consistent control 2010/11
- No significant effects of a suite of products tested in 2012
- Activity compromised by weather (hot, dry)?
- Effects on chinch bug behaviour?
- Poor contact at time of spray?





Biological control of chafer grubs with nematodes

- Optimal time to treat: August in Ontario
- Species:
 - *Heterorhabditis bacteriophora* ; sold under a variety of trade names
 - Steinernema glaseri
- Refrigerate after purchase until use; limited shelf life
- Ensure sufficient nematodes are applied to a moist lawn
- Overcast conditions ideal
- Irrigate after application







Challenge

- Biopesticides will provide 50-60% control (at best)
- Timing of application is critical to efficacy
- Environmental factors can compromise efficacy
- Need additional tools
- Integrated management practices



New tools

Novel grasses

- Rhizomatous tall fescue (RTF)
- Regenerating perennial ryegrass (RPR)
- Creeping perennial rye/fescue
- Kentucky bluegrass

Benefits

- Faster establishment
- Denser establishment, less space for weeds
- Reduced inputs
 - Water, fertilizer
- Insect tolerance?







Results

Environmental performance of grasses assessed in Ontario (assessment ongoing)

RPR > RTF > HLM*

- Establishment faster, denser by RPR
- Greater survival and recovery after drought
- Less weed ingress (less 'bare' ground)
- Effects on insects?
- For the full story: Pam Charbonneau @ 10.30

Home Lawn Mix





RPR

* Home Lawn Mix RTF



Effects of grasses on chafer grub behaviour

Preference for HLM over RPR/RTF in feeding choice tests





Growth response of chafer grubs on different grass types

Insect development slower in RPR/RTF Greater window of opportunity for biopesticides? Complementary activity?



R. majalis larval growth (weight gain)





Novel seed coatings for enhanced delivery of microbes

Electrostatic wax coatings

- Efficient delivery of rhizocompetent microbes, e.g. *Metarhizium* spp. (insect control), *Trichoderma* spp. (disease suppression)
- Established in root zone as grass grows
- Superior root development, water/nutrient uptake





Summary and Future Directions

- Nematodes will provide 40-50% control of chafer
- More to do on chinch
- Timing of application is critical to efficacy
- Essential to take an integrated management approach, including
 - Healthy lawn
 - New grasses for insect management, reduced inputs
 - Seed coatings to deliver beneficial microbes
 - Endophytes greater resilience (pest/disease, environmental)





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