

Biologicals and Botanicals: Responding to the Pesticide Ban with Natural Alternatives



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Ontario's Cosmetic Pesticides Ban :

Ontario Regulation 63/09 April 22, 2009



- Pesticides cannot be used for cosmetic purposes on lawns, vegetable and ornamental gardens, patios, driveways, cemeteries, and in parks and school yards. There are **no** exceptions...
- >250 pesticide products banned for sale and over 80 pesticide ingredients banned for cosmetic uses.





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No insecticides, no herbicides...

- Lawn care suddenly became difficult!
- Insect control – how...???
- No longer spray/broadcast and walk away
- Requires a whole new approach and mindset
- Creating a healthy system rather than curing a problem – east meets west
- Know the pest, the control options and how to use them



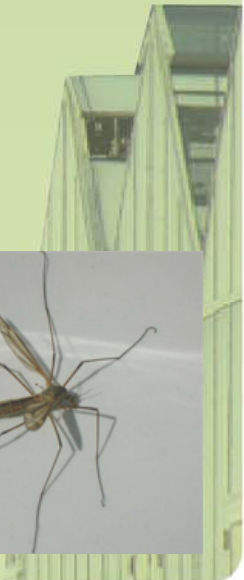
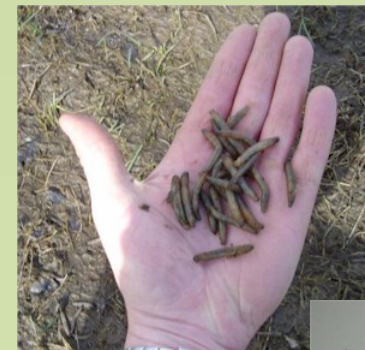
Changes in lawn care practices

- ‘Preventative’ vs ‘curative’ actions to ensure success
- No silver bullets
 - need to consider several approaches
 - healthy soil, healthy lawn as a first line of defense
- Managing customer expectations

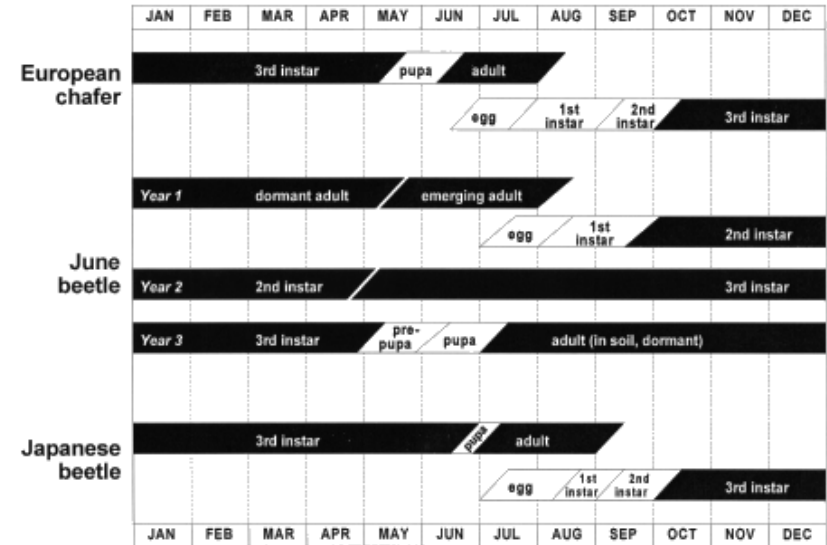


Understand the enemy(ies)

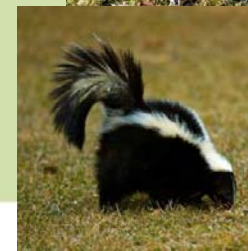
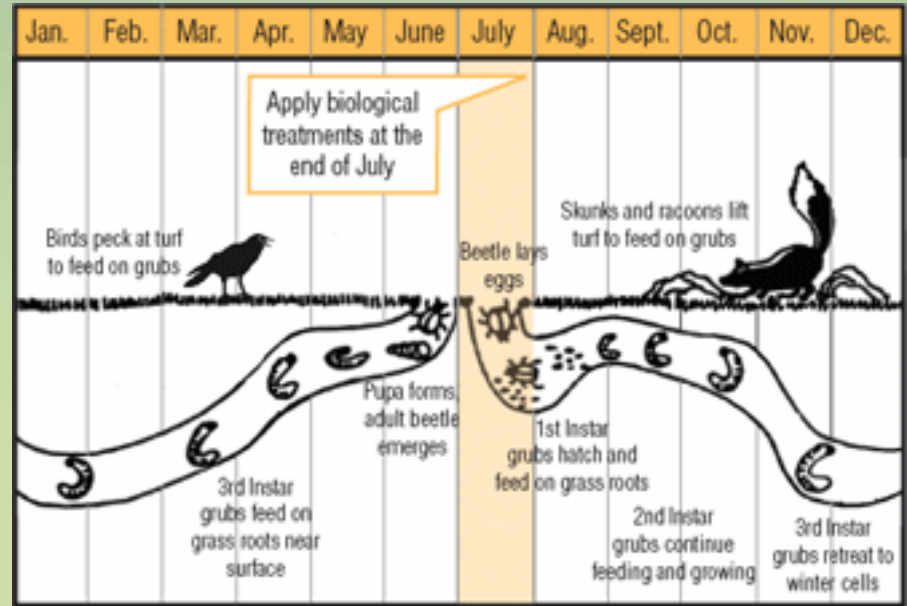
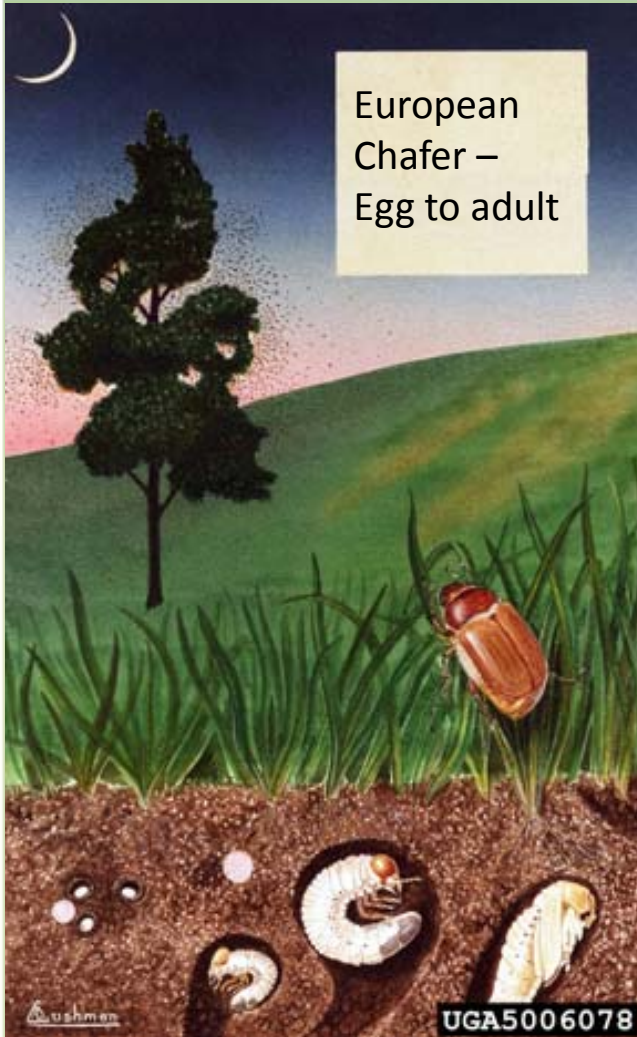
- White grubs
 - European chafer
 - Japanese beetle
 - June bugs
- Chinch bug
- Sod webworm
- Leatherjackets



White grubs



European chafer – *Rhizotrogus majalis*



Detecting white grubs

- Adult swarms
- Flocks of starlings feeding on the lawn
- Feeding on fibrous roots causes turf to wilt and turn brown, turf lifts with ease
- Fold back turf to look for grubs



Chinch bugs

- Piercing-sucking mouthparts
- Nymphs and adults feed on many lawn grasses
- Often aggregate when feeding
- Feed on the crown and stems of turf grasses
- Damage rapidly evident in hot, dry weather – irregular yellow/brown patches
- Most damage in open, sunny areas, well-drained soils



Detecting chinch bugs

- Damage
- Direct observation
 - Adults lay eggs May/June
 - Nymphs in early June, adults mid-July thru' Aug
 - Gently part the base of the grass
 - Adults only 4mm long; nymphs bright red



Monitoring

- Flootation method
 - Fill bucket with water
 - Place 10 cm diam plug into bucket
 - Wait several minutes for chinch bugs to float to the surface; gently agitate to dislodge insects
 - Repeat over lawn adjacent to areas of visible damage, or sample whole area
 - ≥ 10 bugs/sample, damage likely
 - Treat area to control bugs in late June-July



Research on natural controls

- Microbial biological control agents
 - living organisms, e.g., nematodes, fungi
 - need to be stored, handled and applied correctly
- Botanicals
 - plant-derived materials, e.g., essential oils, neem, corn gluten
 - need to be stored, handled and applied correctly
- Combined treatments to improve efficacy



Microbial biocontrol agents

- European chafer, Japanese beetle susceptible to:
 - Nematodes
 - Fungi (*Metarhizium anisopliae*)
- Chinch bugs:
 - Naturally infected with *B. bassiana* and *M. anisopliae*
 - Natural aggregation behavior may promote spread of disease
 - Nematodes
- Nematodes
 - New species adapted to cooler soils?
 - Best use practices, combinations
- New fungal products, application protocols



Biological control of white grubs with nematodes

- Optimal time to treat: July/Aug
- Purchase the correct species, as-needed
 - *Heterorhabditis bacteriophora* (Hb nematode)
 - Sold under a variety of trade names (Grub Patrol, Nemasys G)
- Refrigerate after purchase until use; limited shelf life
- Ensure sufficient nematodes are applied



Key to successful use of nematodes: Refrigerate, irrigate, agitate...apply

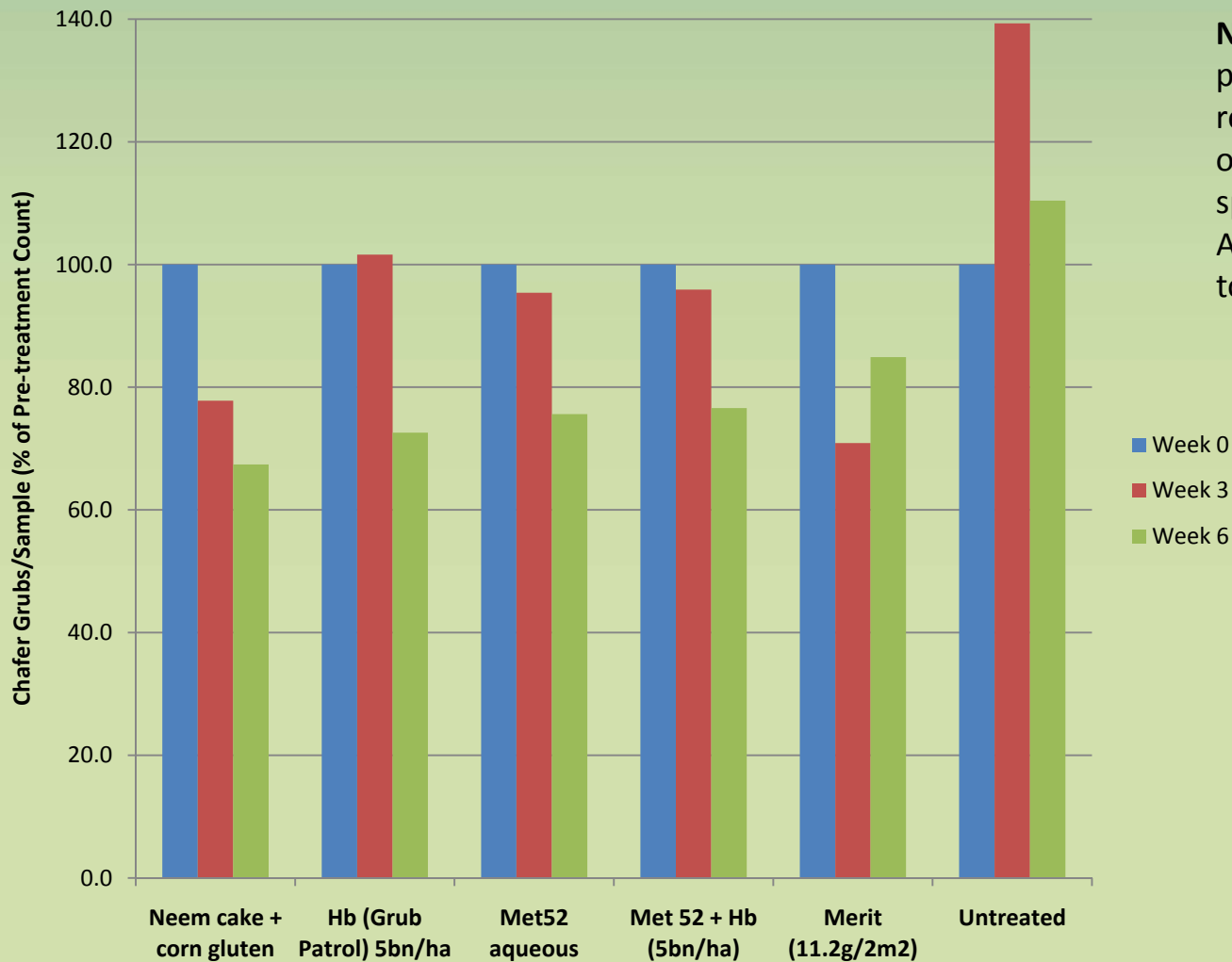
- Ideally, apply when conditions are overcast, early morning or evening
 - Nematodes are temperature and uv sensitive
- If the lawn is dry, irrigate (approx 0.5 - 1 inch)
- Prepare and use on the same day:
 - Add entire contents of a pack to cool, fresh water to re-hydrate
 - Remove any filters in sprayer
 - Add to spray tank to obtain correct concentration and rate/unit area
 - Apply, agitating constantly
 - Irrigate again to 'wash' nematodes into the soil
- Correct use protocols are key to ensure nematodes are healthy and sufficient numbers reach the target pest to cause mortality



Research: Natural products tested against chafer grubs

Product	Designation
Neem seed cake	Botanical
Neem seed cake + corn gluten	Botanical
Hb (Grub Patrol) 7.5 billion/ha	Biological (nematode)
Hb (Grub Patrol) 5.0 billion/ha	Biological (nematode)
Hb (experimental) 7.5 billion/ha	Biological (nematode)
Hb (experimental) 5.0 billion/ha	Biological (nematode)
Met52 granular	Biological (fungus - <i>Metarhizium</i>)
Met52 'spray'	Biological (fungus)
Met52 spray + Hb (Grub Patrol 5bn/ha)	Combination biological/botanical
Merit granules (11.2 g/2m ²)	Chemical standard
Untreated	N/A

Field trials 2010...to date

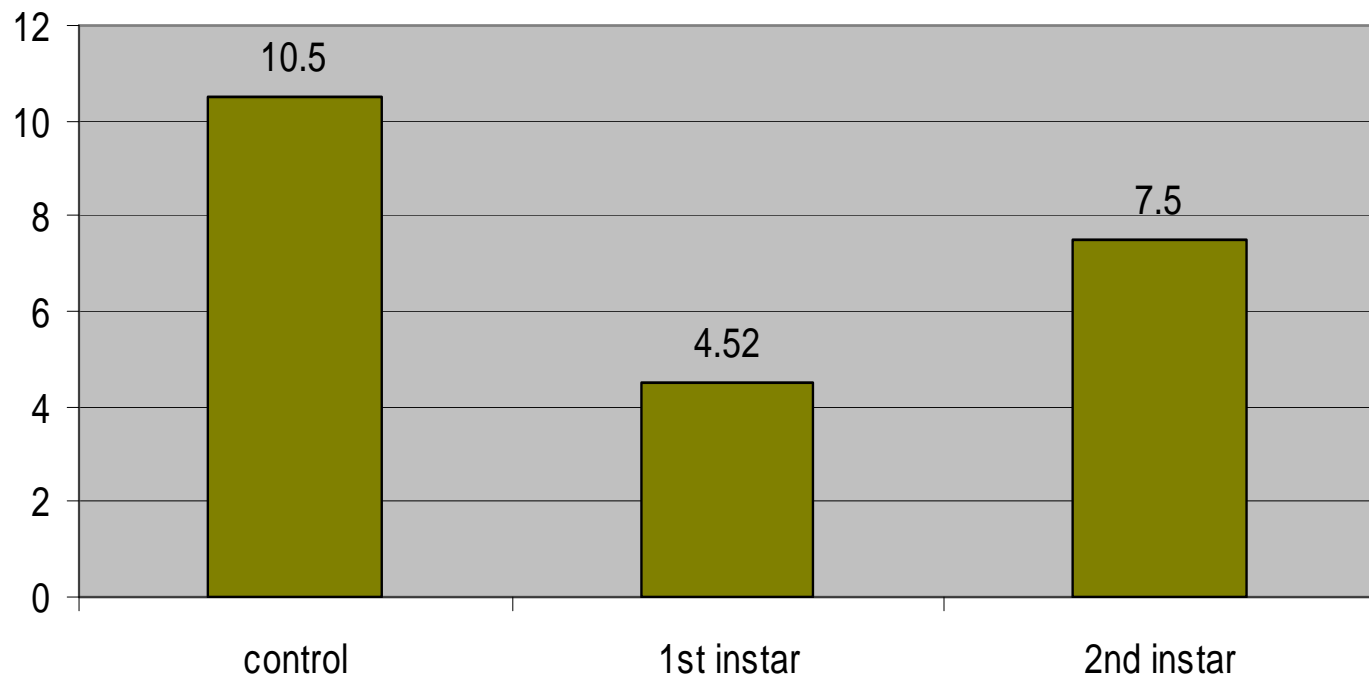


Note. These results are preliminary and do not represent a recommendation or endorsement of any specific product tested. Additional trials are needed to confirm these findings.



Effects of timing on European chafer control in lawn turf

**Mean # Chafer larvae in lawn samples (0.45 sq M)
after treatment with *H. bacteriophora***



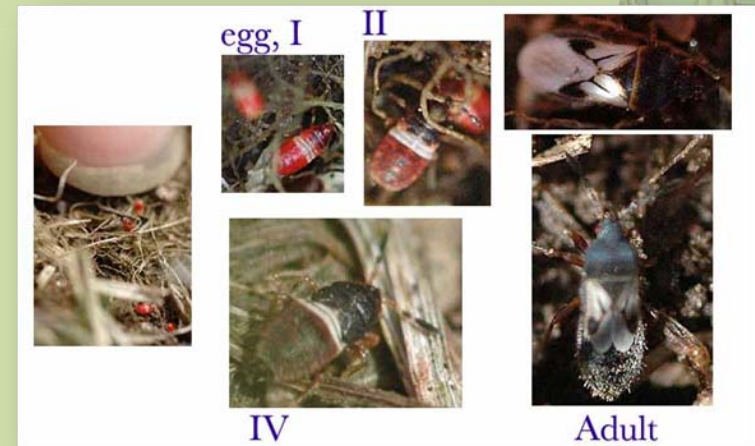
Data courtesy Deb Henderson, Kwantlen Polytechnic University, BC

Fun in the field 2010



Control of chinch bugs

- Cultural practices, e.g.,
 - Aeration to reduce compaction
 - Removal of thick layers of thatch
 - Use of slow-release fertilizers, etc.
- Grasses with endophytic fungi (fescues, rye grass) will reduce chinch feeding but are less cold-tolerant
- Natural predators (rove beetles, ants, spiders), parasites
- Microbials, e.g., nematodes (*Steinernema carpocapsae* - Sc), fungi (*B.bassiana*, *M. anisopliae*)

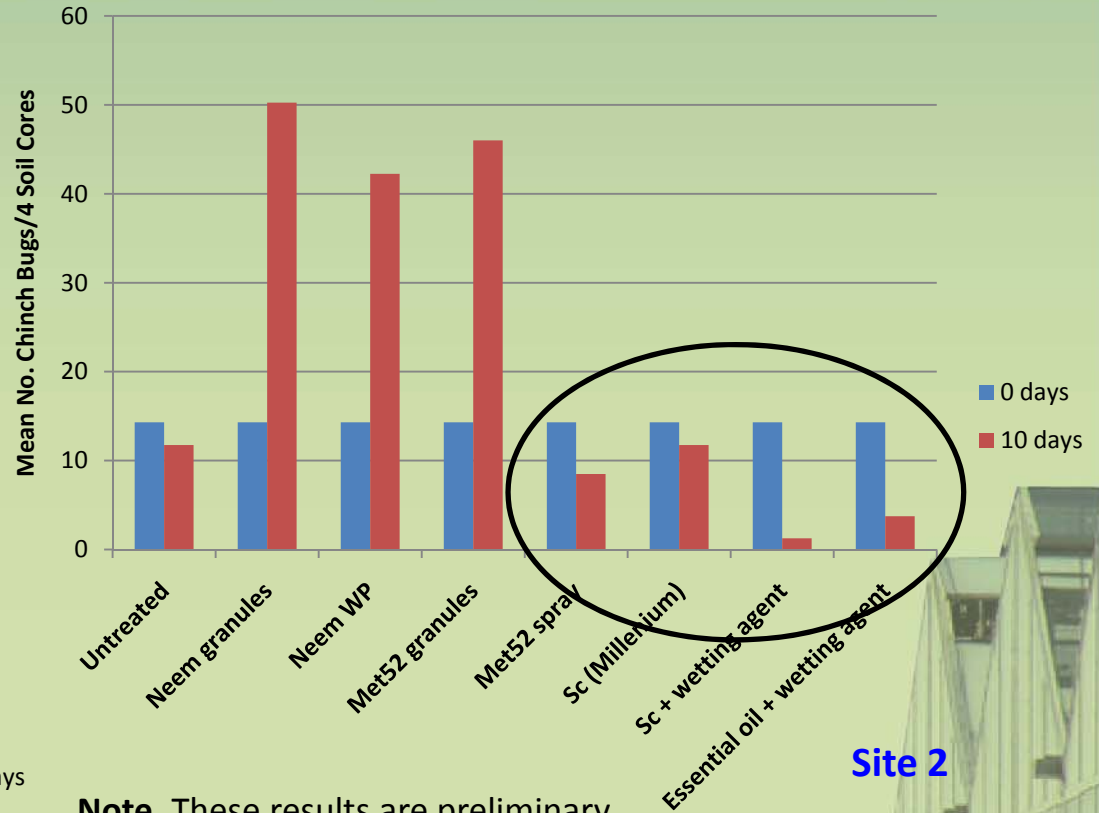


Natural products tested against chinch bugs

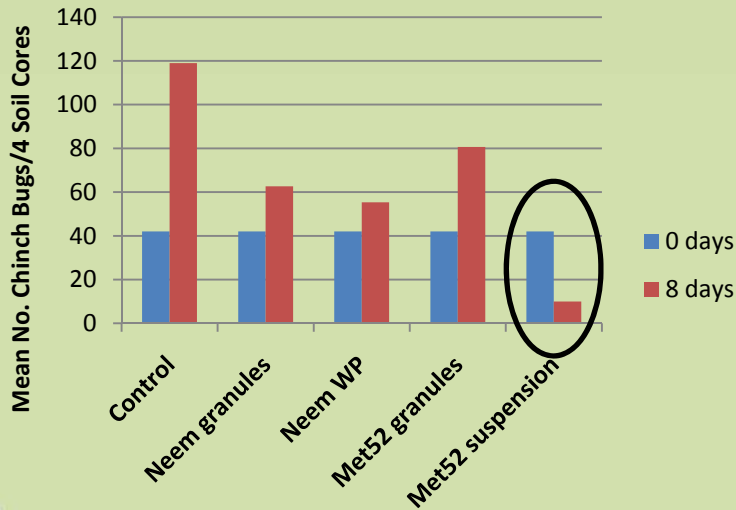
Product	Designation
Neem granules	Botanical
Neem WP (spray)	Botanical
Met52 granules	Biological (fungus)
Met52 spray	Biological (fungus)
Sc (Millenium) 250 million/1,000m ²	Biological (nematode)
Sc (Millenium) + natural wetting agent	Biological + botanical
Essential oil	Botanical
Untreated	N/A

Note: as no pesticides can be used in urban lawns, no insecticide 'standard' was included in the trials

Chinch bug field trials 2010



Site 1



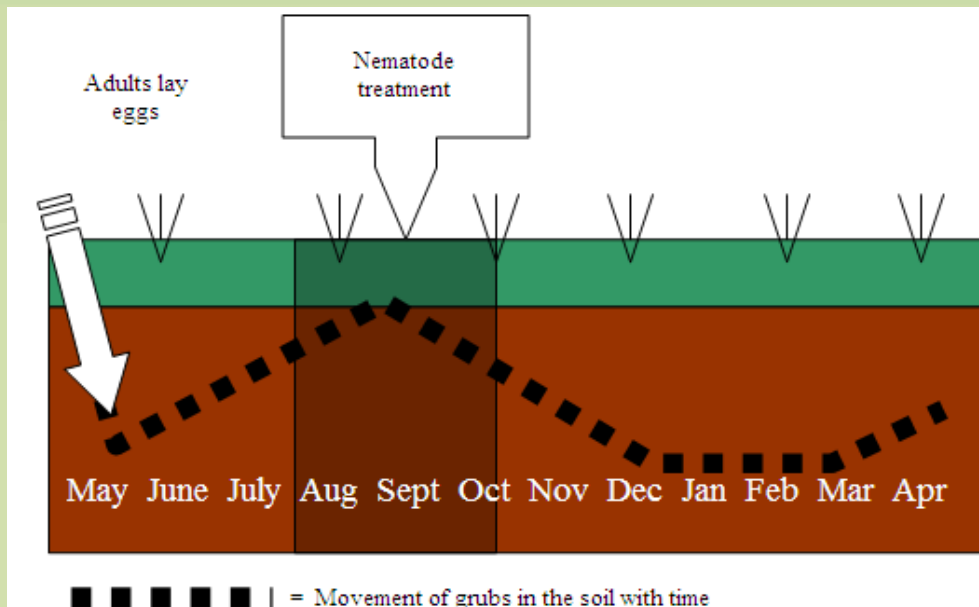
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Site 2



Sod webworm, leatherjackets

- Susceptible to nematodes used vs white grubs (Hb) and chinch bugs (Sc)
- May need to apply later in the season for leatherjackets (Sept-Oct)
- Healthy lawn = first line of defense



And weeds...???

Mycoherbicides

- Sarritor (*Sclerotinia minor*)
 - Selective control of broad leaf weeds
- Phoma (*Phoma macrostoma*)
 - Active vs a wider range of broadleaf weeds incl. thistles
 - Original research done in AAFC Saskatchewan
 - Commercial development by Scott's

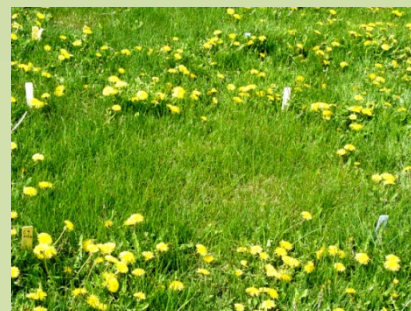
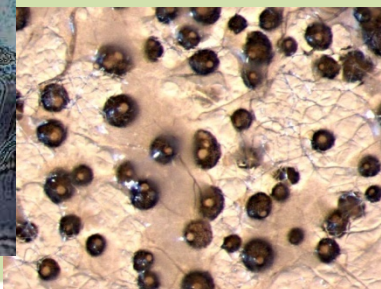
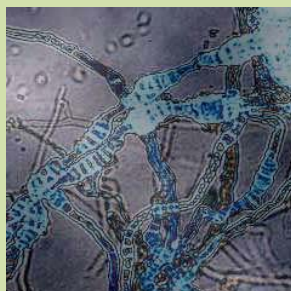


Corn gluten

- Natural pre-emergent herbicide

Fiesta

- Chelated iron



Summary

- The cosmetic pesticide ban has changed the way we must think about lawn pests
- New approaches require a different mindset
- Understand the pest's biology and the 'needs' of the control agents
- Change of mindset by the clients – difficult!
- Encouraging results for a range of new products



Acknowledgements



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QUESTIONS?