Pesticides for Organic Gardeners

Making an informed decision

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The Issue

- Toxicity
  - To People (especially children)
  - To Pets (especially dogs)
  - To Wildlife – on land and in water
  - To the Environment – water, air, soil…
  - To Beneficial Organisms– insects, worms, etc.

The ideal pesticide would….

- Kill only the "pest" –
- Have a short duration in the environment
- Not be "mobile" – in water or through soil

What is a pesticide?

- Pesticides kill or control pests
  - Insects – use insecticide
  - Fungi – use fungicide
  - Bacteria – use a disinfectant
  - Weeds – use a herbicide
  - Others
    - Rodents – rodenticide
    - Slugs & snails - molluscicide

Pesticides Are Only Part of Pest Management

- ***Integrated Pest Management (IPM)***
  - Proper Plant Identification
  - Proper Pest Identification
  - Prevention
  - Observation

- Tolerance
  - How much damage can your plants tolerate?
  - How much can you tolerate?
  - What are the consequences of doing nothing?

Taking Action

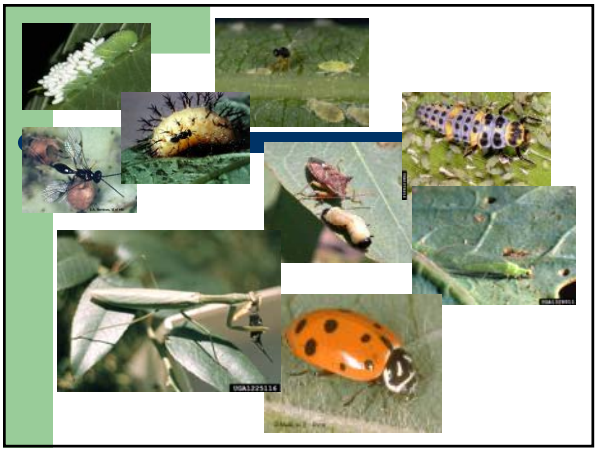
- Cultural Controls
- Physical Controls
- Biological Controls
  - Predators, parasites and pathogens
- Chemical Controls
  - Synthetic pesticides
  - Biopesticides
    - *Microbial (pathogens)*
    - *Botanical*
    - *Biochemical*

Biological control

- ***Composed of living organisms =*** **"Beneficials"**
  - Types:
    - Predators
    - Parasites
    - Pathogens
  - Methods:
    - Introduce
    - Augment
    - Conserve

Biological control

- **Predators**
  - Birds, amphibians, reptiles, mammals
  - Invertebrates
    - spiders & mites
    - Insects
- **Parasites**
  - Parasitic flies and wasps
    - Attack eggs, larvae, nymphs & pupae
    - On outside of pest or inside pest



Chemical Controls: Biopesticides

- **Pathogens = microbials**
  - "B. t." – *Bacillus thuringiensis* (bacteria)
    - *Var. kurstaki (Btk) – infects caterpillars*
    - *Var. san diego & var. tnebrionis – infects CO potato beetle & elm leaf beetle*
    - *Var. israelensis (Bti) – infects mosquitoes, black flies, fungus gnats*

Chemical Controls: Biopesticides

- Milky spore disease - *Bacillus popillae or lentimorbus* (bact.)
  - Japanese beetle – not hardy in WI so pops. do not build
- Gypsy moth
  - Gypchek – Nucleopolyhedrosi - NPV (virus)
  - *Entomophaga maimaiga* (fungus)
- Nematodes – for iris borers, etc. as soil drench

Chemical Controls: Biopesticides

- **Botanical pesticides**

Advantages:

- **degrade rapidly; reduces potential exposure**
- **fast acting – "knock-down"**
- **low mammalian toxicity**
- **low plant toxicity**
- **selective effects on pests**

Chemical Controls: Biopesticides

Cautions:

- **Can be quite toxic at the time of appliation.**
- **Always wear personal protective equipment when applying.**

Chemical Controls: Biopesticides

- **Pyrethrum**
  - Derived from chrysanthemums
  - Pyrethrins are six compounds which occur naturally in pyrethrum
  - Pyrethroids are not botanical but synthetic comonds based on the pyrethrins
    - Categorized under pesticides

Chemical Controls: Biopesticides

- **Rotenone**
  - Derived from the roots of *Lonchocarpus spp.* and *Derris spp.*

Chemical Controls: Biopesticides

- **Sabadilla**
  - From seeds of a tropical lily
- **Ryania**
  - From seeds of a woody shrub
- **Neem**
  - From seeds, leaves, fruits, and bark of the Neem tree
  - Azadirachtin is the active ingredient – extract of neem seeds
  - Very broad spectrum – insects, fungi and mites!
  - Many formulations available

Chemical Controls: Biopesticides

- **Nicotine**
  - **EXTREMELY TOXIC!**
    - **Home preparations strong enough to kill insects also strong enough to be toxic to humans.**

Chemical Controls: Biopesticides

- **Biochemicals**
  - Naturally occuring substances with pesticidal properties
    - Insecticidal soaps
    - Horticultural oils
    - Inorganics
      - Sulfur
      - Lime sulfur
      - Copper-containing pesticides
      - Iron phosphate

Chemical Controls: Biopesticides

- **Insecticidal soaps**
  - Kill soft-bodied insects
  - Low plant toxicity
  - Consistent formulation
    - Not household soaps
      - Soaps can be used as “spreaders”

Chemical Controls: Biopesticides

- **Horticultural oils**
  - Dormant oil
    - Used on dormant plants not succulent tissue
  - Summer oil
    - Diluted dormant oil
  - Ultrafine oil
    - Highly refined to remove harsh residues
    - Safe for succulent, growing tissue
  - Plant essential oils
    - Cedar, lavender, eucalyptus, citronella, canola, etc.
      - (15 plus EPA reg.)
    - Repellents
    - High concentrations can cause skin irritation
    - Pennyroyal and citrus are toxic if ingested

Chemical Controls: Biopesticides

- **Inorganics**
  - **Sulfur**
    - Oldest known pesticide (3,000 yrs. ago)
    - Wettable powder, dust or liquid
    - Insecticidal and fungicidal properties
      - Diseases – powdery mildew, rust, blights, fruit rots
      - Insects – spider mites, psyllids and thrips
    - Causes plant injury in hot, dry weather
    - Cannot be mixed with others

Chemical Controls: Biopesticides

- **Lime sulfur**
  - **Dormant spray**
    - **Diseases – blight, anthracnose and powdery mildew**
    - **Insects – scales, eriophyid mites and spider mites**
    - **Burns plants at high temps.**
    - **Irritates skin and eyes**
- **Copper-containing pesticides**
  - Bordeaux mixture (not approved for organic production)
    - Copper sulfate and lime
      - Diseases – downy mildew of grapes; bacterial leaf spots, blights, anthracnose and cankers
      - Insects - repellent
- **Iron phosphate**
  - Slug and snail control

Chemical Controls: Biopesticides

- **Miscellaneous**
  - Garlic
  - Pepper
    - Black, red, capsacin
  - Baking soda (potassium and sodium bicarbonate)
  - Corn gluten meal – pre-emergent herbicide
  - Vinegar (acetic acid)

Making an informed decision

- ***Summary***
  - Evaluate problem and positively identify pest
  - Consider the options
    - Including the consequences of not treating
  - Consider chemical control
    - If damage can't be tolerated
    - And other methods are not sufficient to manage
  - Select the least toxic option
  - Observe all safety precautions when handling
  - Store safely
  - Dispose of properly