Biorational and Organic Insecticides

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Disclaimer

- Some parts of this presentation have been borrowed from Dr. Rick Weinzierl from the University of Illinois
- Thanks, Rick

Biorational Insecticides

- An active ingredient or formulation that effectively controls pests and is derived from biological or natural origins

Organic Insecticides

- Insecticides possessing carbon atoms
- Insecticides from a plant or animal source
- Insecticides that are on the OMRI (Organic Materials Review Institute) list

Biorational vs. Organic

- Some biorational products may not be on the OMRI list
- Some materials on the OMRI are not biorationals
- Lots of overlap

Why Use a Biorational Insecticide?

- Better control than conventional insecticides
  - Not usually better; sometimes equal
- Broader spectrum of activity
  - Usually a narrower spectrum of activity
- Cheaper
  - Usually more expensive
- Less toxic to workers or consumers
  - Usually true
- Safer for the environment
  - Usually true
- Safer for beneficial insects
  - Usually true
- Required for certified organic production
  - Almost always

Types of Organic Insecticides

- Botanicals
- Soaps and oils
- Microbial insecticides
- Growth regulators
- Pheromones
- Non-organic natural products

Old Botanicals

- Nicotine
- Pyrethrins
- Rotenone
- Sabadilla
- Ryania

Pyrethrins

- Only one of the old botanicals that is widely available with labels covering many crops
- Nerve poison – affects Na+/K- ion transmission in axons
- Low toxicity to humans
- Rapid knockdown; low residual

Potential Uses for Pyrethrins

- Flea beetles
- Young squash bug nymphs
- Striped cucumber beetles - ?
- Potato leafhopper

Newer Botanicals

- Citrus oil derivatives
- Neem - azadirachtin
- Garlic oils
- Hot pepper oils

Neem

- Most promising of newer botanicals
- Oil from seeds or leaves of neem tree
- Multiple modes of action but primarily acts as a repellent
- Very low toxicity: used medicinally and as an ingredient in toothpaste

Potential Uses for Neem

- Flea beetles
- Japanese beetles
- Aphids

Insecticidal Soaps

- Salts of fatty acids
- Disrupt insect membranes
- Must contact insect to be effective
- No residual activity
- Effective against aphids, whiteflies, mites, etc.

Oils

- Suffocate arthropods
- Must contact insects to be effective
- No residual activity
- Effective against eggs, aphids, mites, etc.

Microbial Insecticides

- Bacteria
- Viruses
- Fungi
- Nematodes
- Protozoa

Bacillus thuringiensis

- First used commercially in US in 1958
- DiPel was first produced in 1972

How Bt works

- Bts contain protein endotoxin crystals and living spores
- When insect eats proteins, feeding stops within minutes
- The toxin damages the gut tisues, allowing the spores to enter the body cavity
- Larvae die within 1-3 days

Potential Uses

- *Bacillus thuringiensis kurstaki* – many caterpillars
- *Bacillus thuringiensis aizawai* – many caterpillars
- *Bacillus thuringiensis tenebrionis* – primarily Colorado potato beetle
- *Bacillus thuringiensis israelensis* – larvae of black flies, fungus gnats, and mosquitoes
- *Bacillus popilliae and B. lentimorbus* – Japanese beetle larvae

Keys to Bt Success

- Larvae must be actively feeding
- Early detection of infestations, not to clean up problem
- Good coverage
- Use spreader-sticker or surfactant
- Not during extremely hot or cold conditions

Genetically Modified Organisms

- Most GMOs that provide protection from insects contain genes from a Bt
- Plant produces proteins instead of bacteria
- Used in corn, sweet corn, rice, cotton, and potatoes (no longer)
- Not OMRI approved

Other Microbials

- Viruses – available for corn earworm and some other pests
- Fungi – *Beauveria, Entomophthora* and *Metarrhizium*; more effective from natural sources than commercial products
- Nematodes – *Steinernema & Heterorhabditis*; limited usefulness
- Protozoa – *Nosema* used for grasshopper control

Fermentation Products

- Spinosads
- Avermectins

Spinosads

- SpinTor or Entrust
- Radiant
- Derived from soil actinomycete
- Effective against a range of insects
- Most caterpillars, Colorado potato beetles, apple maggots, thrips
- Entrust is OMRI approved

Avermectins

- Agri-Mek
- Derived from *Streptomyces avermitilis*
- Block nerve transmission
- Effective against mites, leafminers, Colorado potato beetle
- Not OMRI approved

Pheromones

- Sex pheromones can be used for mating disruption
- Not a biorational product; synthetic
- OMRI approved
- Effectively used in cotton and fruit

Non-organic Natural Products

- Cryolite or Kryocide
- Surround - Kaolin

Cryolite or Kryocide

- Sodium aluminoflouride
- Mined mineral
- Colorado potato beetle
- Not OMRI approved

Surround

- Kaolin-based clay
- Acts as a feeding barrier
- Purported to reduce damage from many insects and diseases
- My experience – plum curculio and potato leafhoppers
- Protects against sunburn
- Leaves white residue on produce
- OMRI approved

Some Precautions

- Don’t expect to use biorational insecticides as a substitute for conventional insecticides
- Preventive and alternative control measures should be used when appropriate
- More scouting will be required to detect infestations sooner
- Greater management skills are required

Questions?