

# LEAST TOXIC PEST & DISEASE MANAGEMENT



# What is a pest?

- Primary pest – the main pest of a crop; occurs every year & can cause economic damage



# What is a pesticide?

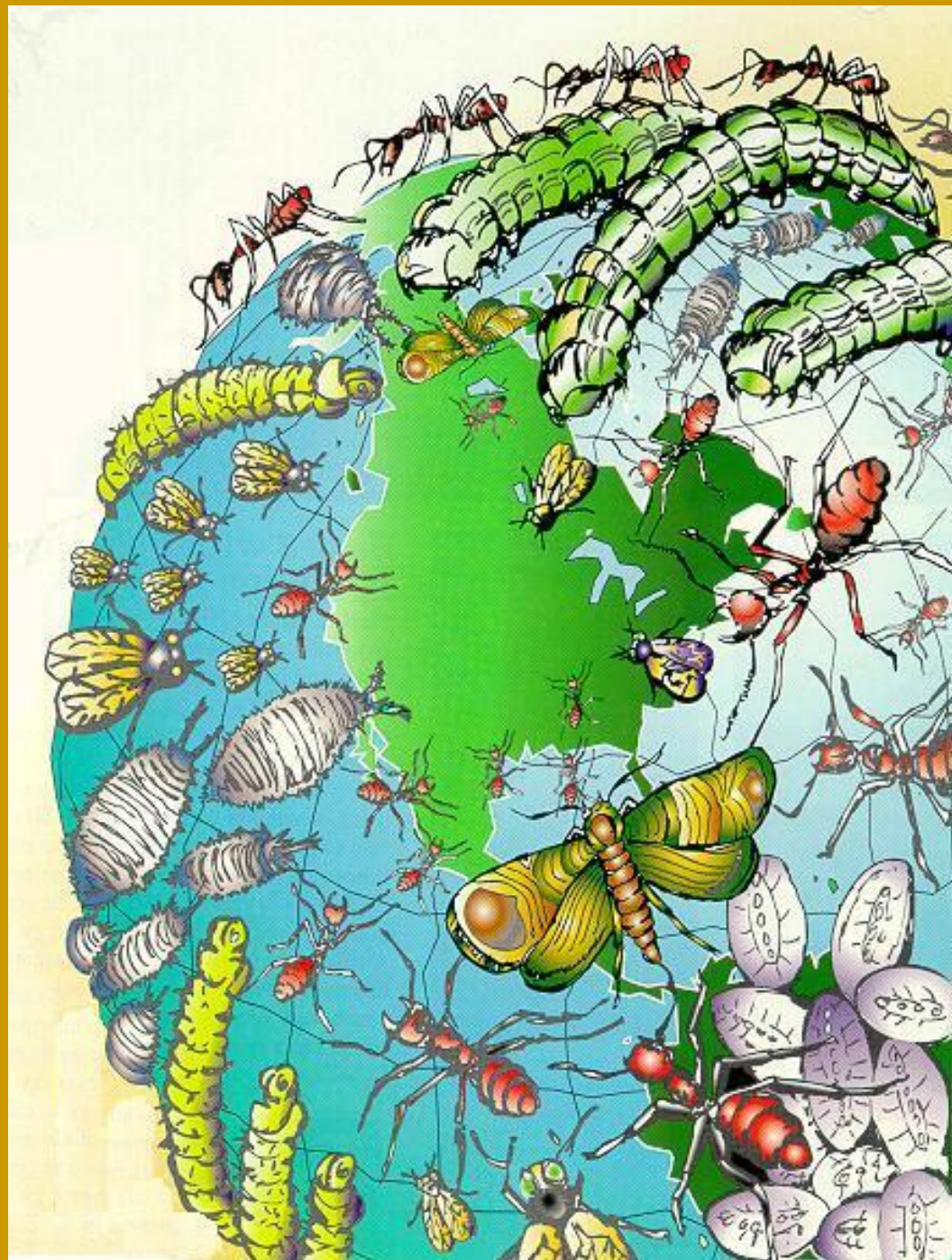


- FIFRA defines a "pesticide" as "(1) any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest, (2) any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant, and (3) any nitrogen stabilizer



# Types of Pesticides

(the world without pesticides according to the industry)



# Chemicals

- Organophosphates, carbamates, chlorinated hydrocarbons
- Newer categories of synthetics, some mimic natural compounds
- 1996 - EPA exempted certain minimum risk pesticides from FIFRA requirements for pesticides posing little or no risk



# Minerals – naturally occurring or derived

- Sulfur, lime sulfur
- Mineral (petroleum) oils
- Kaolin clay
- Mineral salts:  $K_2CO_3$ , copper sulfate, calcium hydroxide, Bordeaux mixes,
- Soaps & detergents
- Diatomaceous earth
- Boric acid
- Iron phosphate (Sluggo snail bait)
- Potassium phosphite (Fosphite)
- NOT: Lead arsenate, mercury, toxics (as in the past)





# Botanicals – plant derived

- First 100 years: rotenone, ryania, pyrethrum, sabadilla
- New generation: neem, plant oils (cedar, clove, garlic, mint, cinnamon, rosemary, sesame, orange)



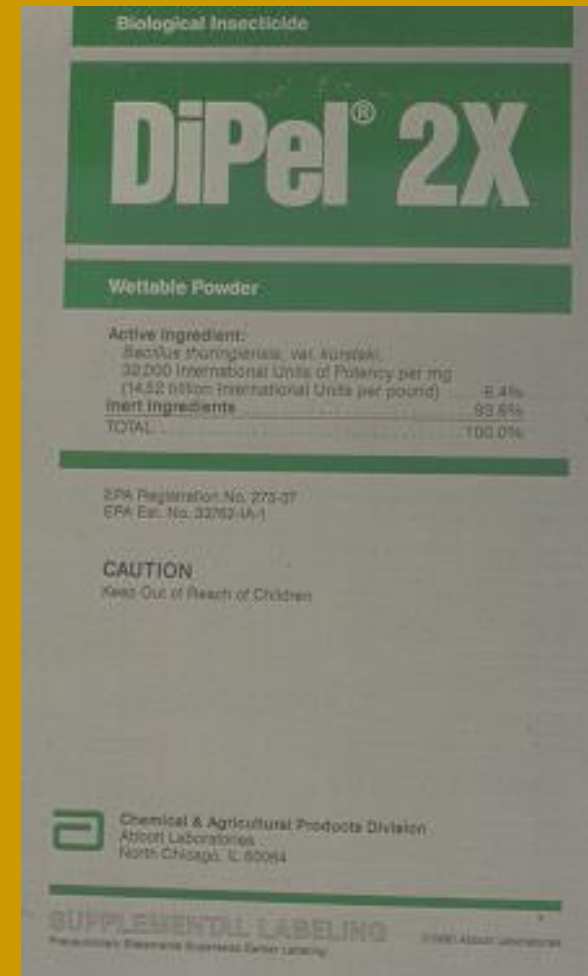
# Active Ingredients That May Be in Minimum Risk Pesticide Products

Castor Oil (U.S.P. or equivalent)	Cedar Oil
Cinnamon* and Cinnamon Oil *	Citric Acid*
Citronella and Citronella Oil	Cloves* and Clove Oil*
Corn Gluten Meal*	Corn Oil*
Cottonseed Oil*	Dried Blood
Eugenol	Garlic* and Garlic Oil*
Geraniol	Geranium Oil
Lamyl Sulfate	Lemon grass Oil*
Linseed Oil	Malic Acid*
Mint* and Mint Oil*	Peppermint* and Peppermint Oil*
2-Phenethyl Propionate	Potassium Sorbate
Putrescent Whole Egg Solids (See 180.1071)	Rosemary * and Rosemary Oil*
Sesame* and Sesame Oil*	Sodium Chloride (common salt)*
Sodium Lauryl Sulfate	Soybean Oil
Thyme* and Thyme Oil*	White Pepper*
Zinc Metal Strips	



# Biological – natural or modified

- 1st *Bacillus thuringiensis* (Bt): several varieties
- Bacteria: milky spore, *Bacillus subtilis* (Serenade), *Bacillus pumilis* (Sonata) *Bacillus cereas*, *Beauveria bassiana*, spinosad, *Pseudomonas*,
- Fungi: Ditera (*Myrothecium*), AQ 10, *Trichoderma*
- Viruses: (forest pest, codling moth, caterpillars)
- Protozoa: grasshopper bait
- Other: vitamin D, beneficial nematodes, spinosad

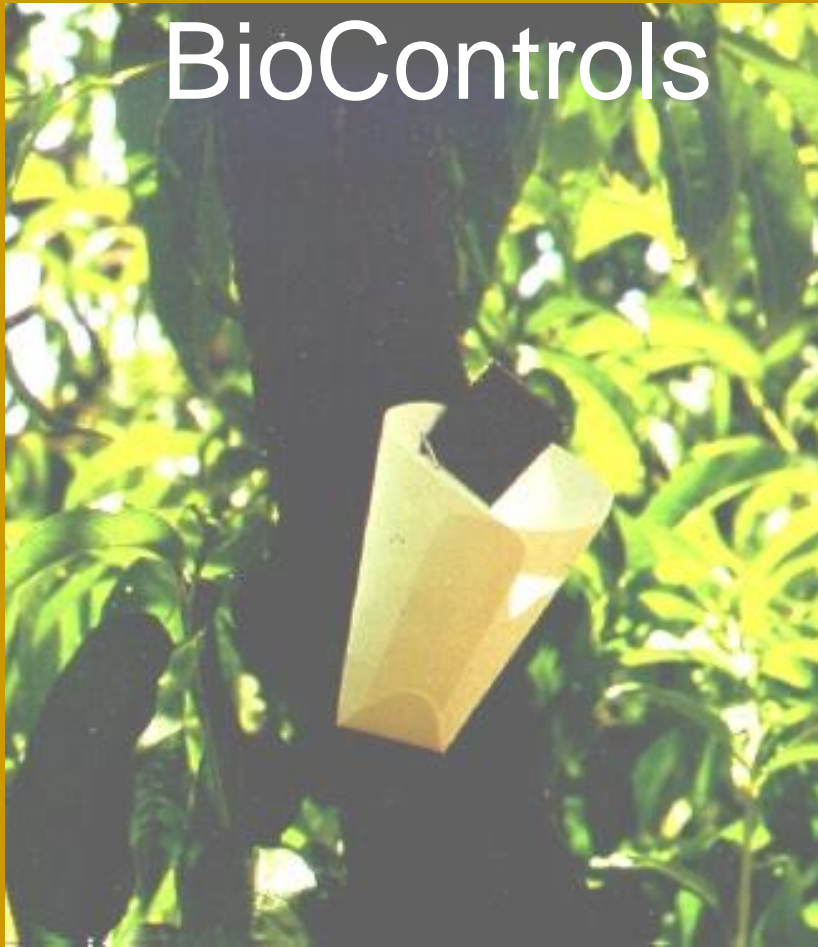


# Biological Controls

- Beneficial insects do not need to be registered as pesticides (yet)



# BioControls



- Predators – consume their prey: ladybird beetles, green lacewings, predatory mites
- Parasitoids – lay eggs or consume within host: beneficial nematodes, Trichogramma wasps,