

Insect Pests in Home Vegetable Gardens:

Basic Training for Master Gardeners



**Celeste Welty
Ohio State University
2009**

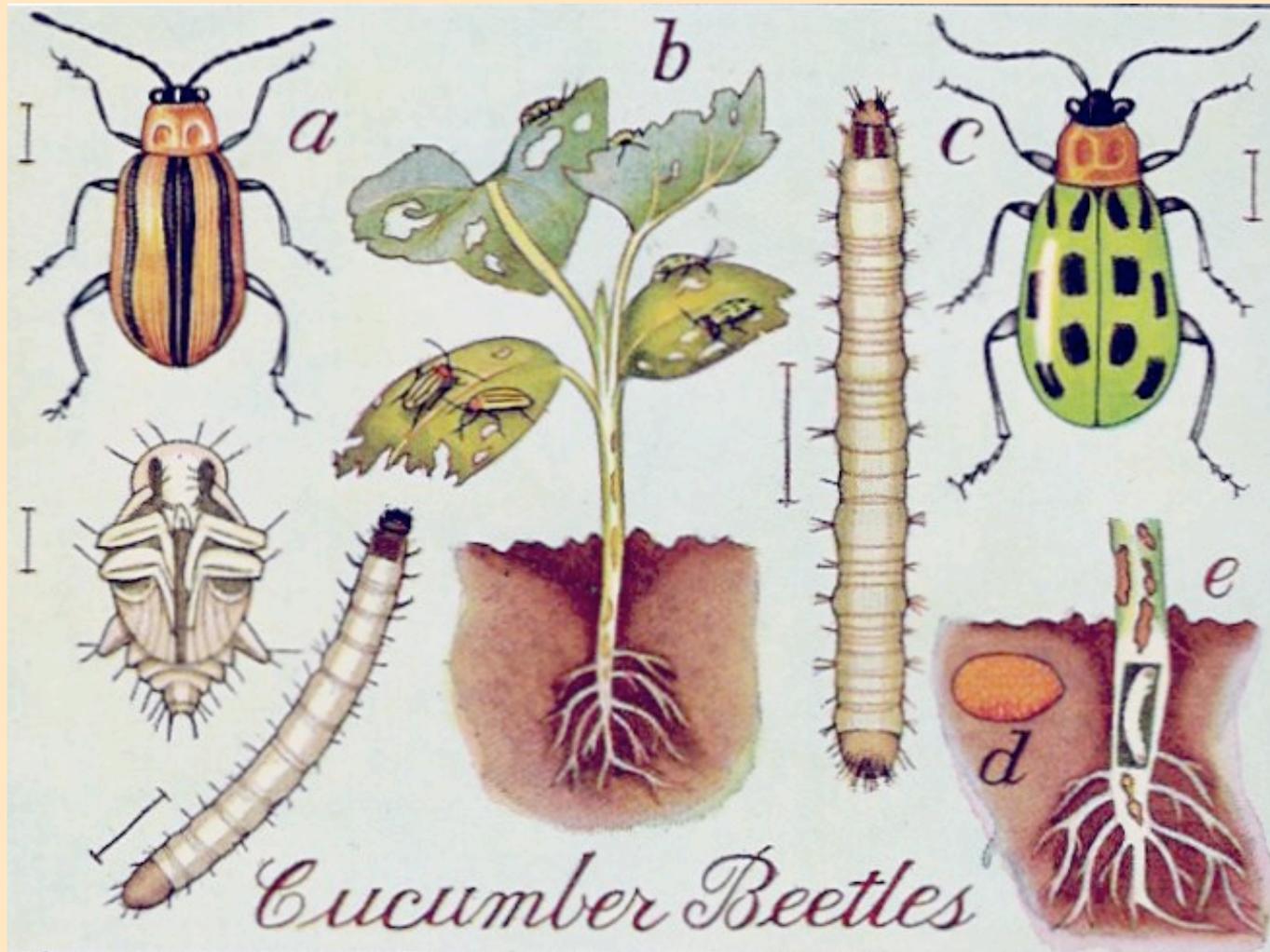
Overview of common pests

- **Cucurbit family: 4 pests**
- **Cole crop family: 2 pests**
- **Tomato family: 3 pests**
- **Beans: 2 pests**
- **Spinach: 1 pest**
- **Asparagus: 2 pests**
- **Corn: 2 pests**
- **Multi-crop: aphids, mites, slugs**

Cucumber beetles

Striped cucumber beetle

Spotted cucumber beetle





Cucumber beetles

Important damage by adults:

- Chew seedlings
- Transmit bacterial wilt
- Chew on fruit surface

Less critical damage:

- Larvae chew on roots
- Adults chew on flowers



Bacterial wilt of cucurbits

- **Vectored by cucumber beetles**
 - Transmitted in feces
 - Enters via wound in plant (such as feeding wound)



- **Hosts:**
 - Well-known killer of cukes & melons
 - Recently adapted to kill squash & pumpkins (but slower)

Cucumber beetle management

- **Mechanical control**
 - Screen or row cover (seedlings)
- **Cultural control**
 - Early trap crop (Turks Turban or Blue Hubbard squash)
- **Chemical control**
 - Spray with pyrethrins, rotenone, carbaryl, or permethrin
- **Biological control**
 - Conserve parasitoids (by no spray)
- **Behavioral control**
 - Kairomone trap (under development)

Biocontrol of cucumber beetle by parasitoid



Pupa of *Celatoria setosa* (Tachinid fly) emerging from dead beetle's abdomen

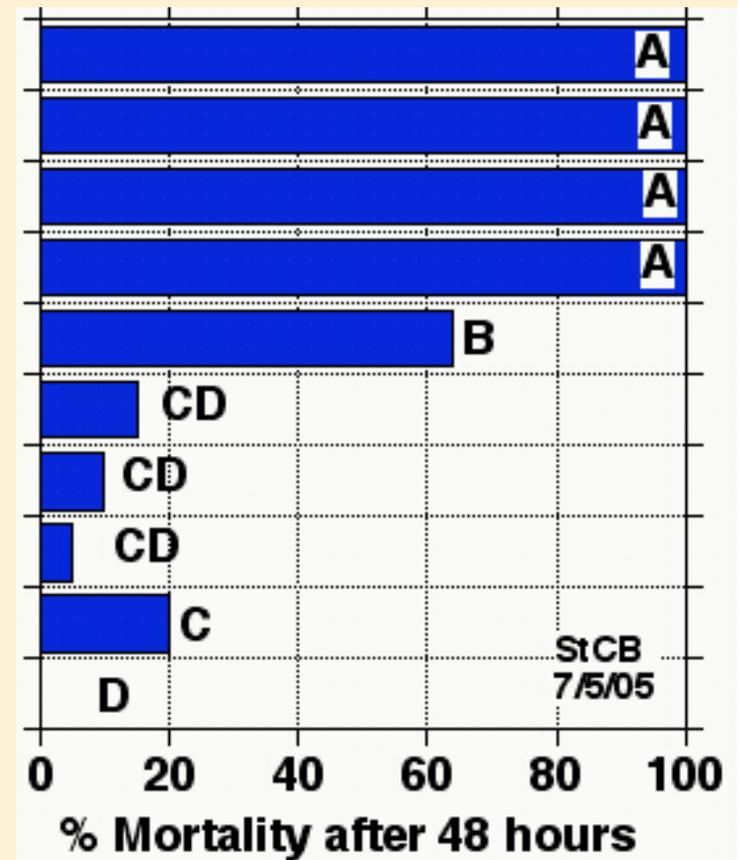
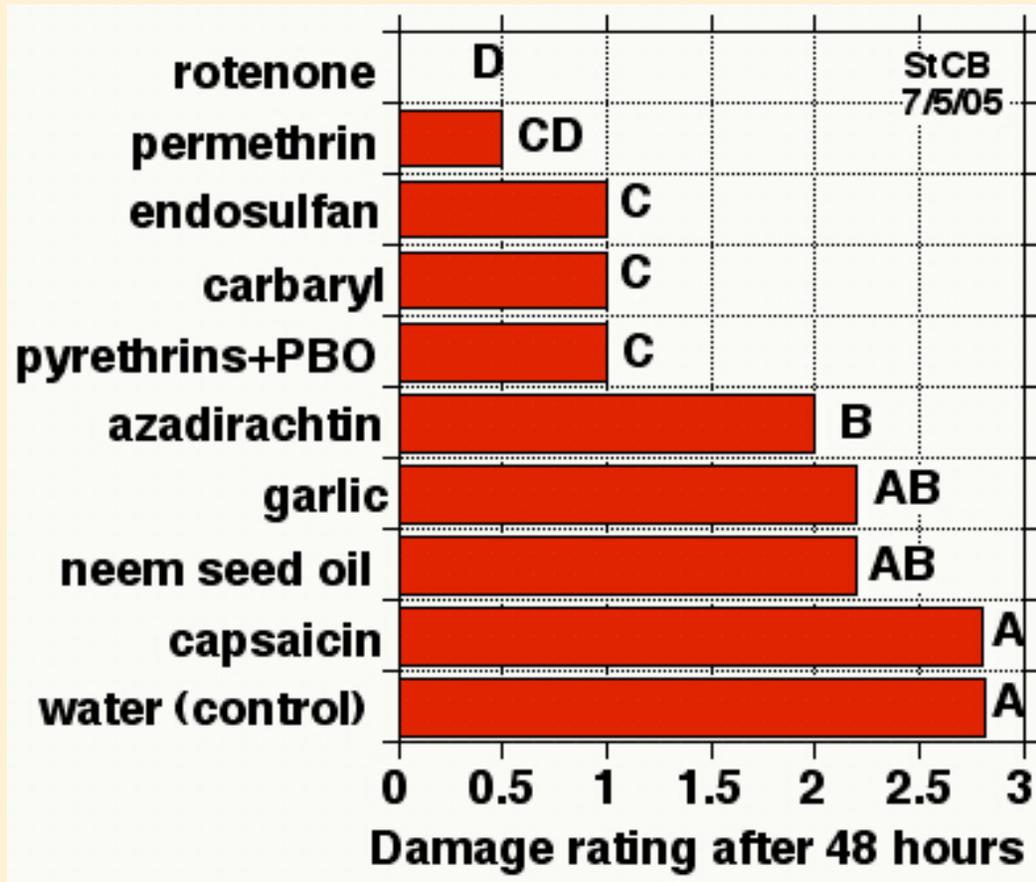


Adult of *Celatoria setosa*

Striped cucumber beetle



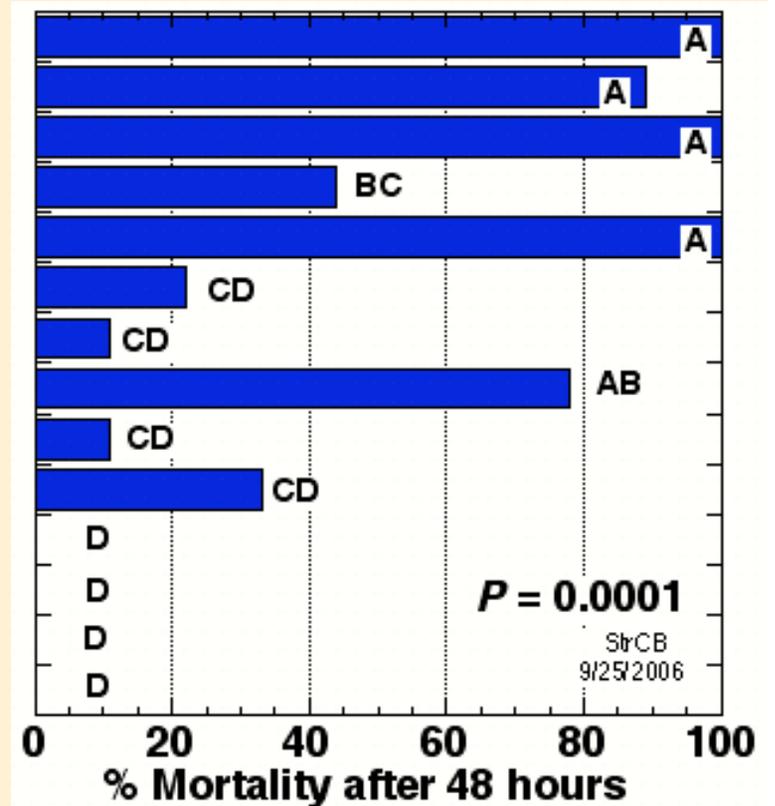
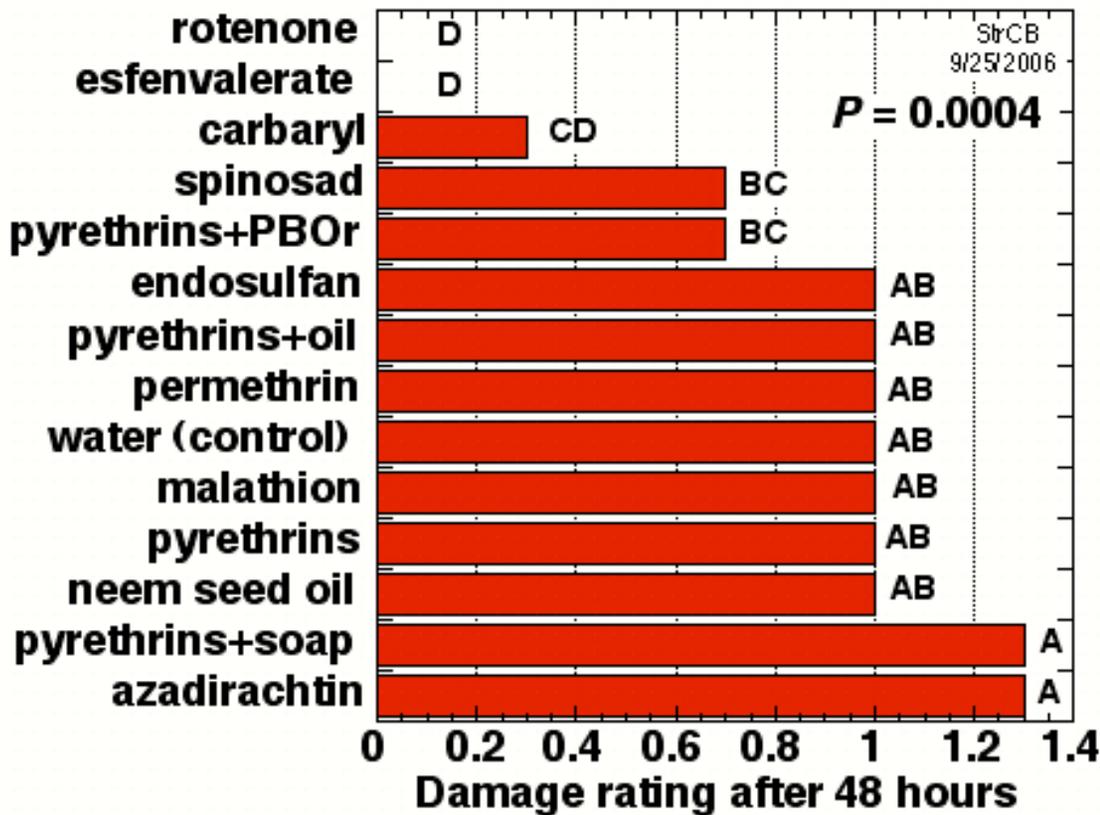
tested on pumpkin leaves, 7/5/05;
4 replicates/treatment, 5 beetles/replicate



Striped Cucumber Beetle



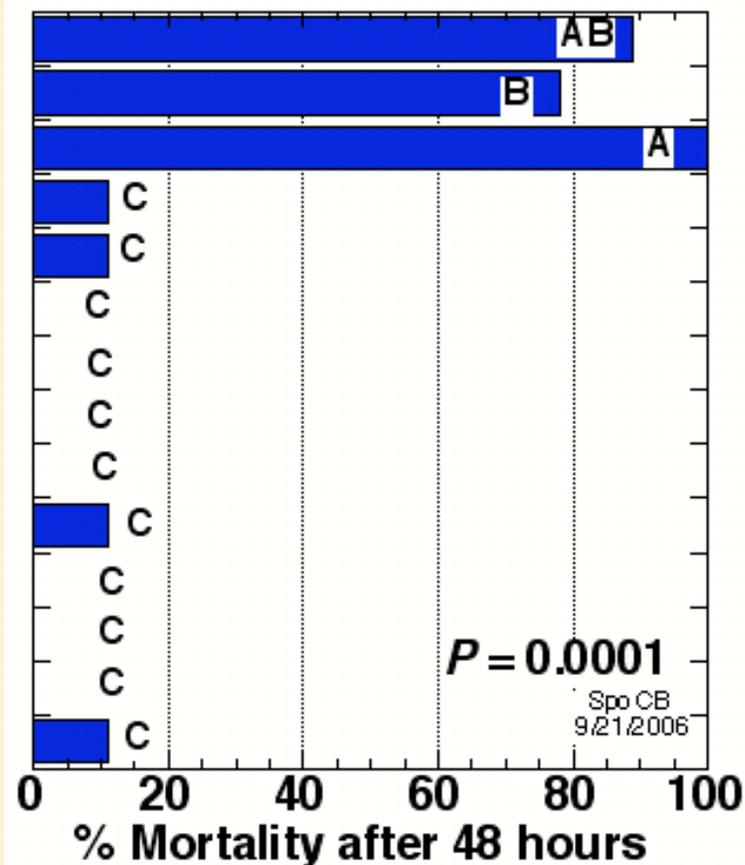
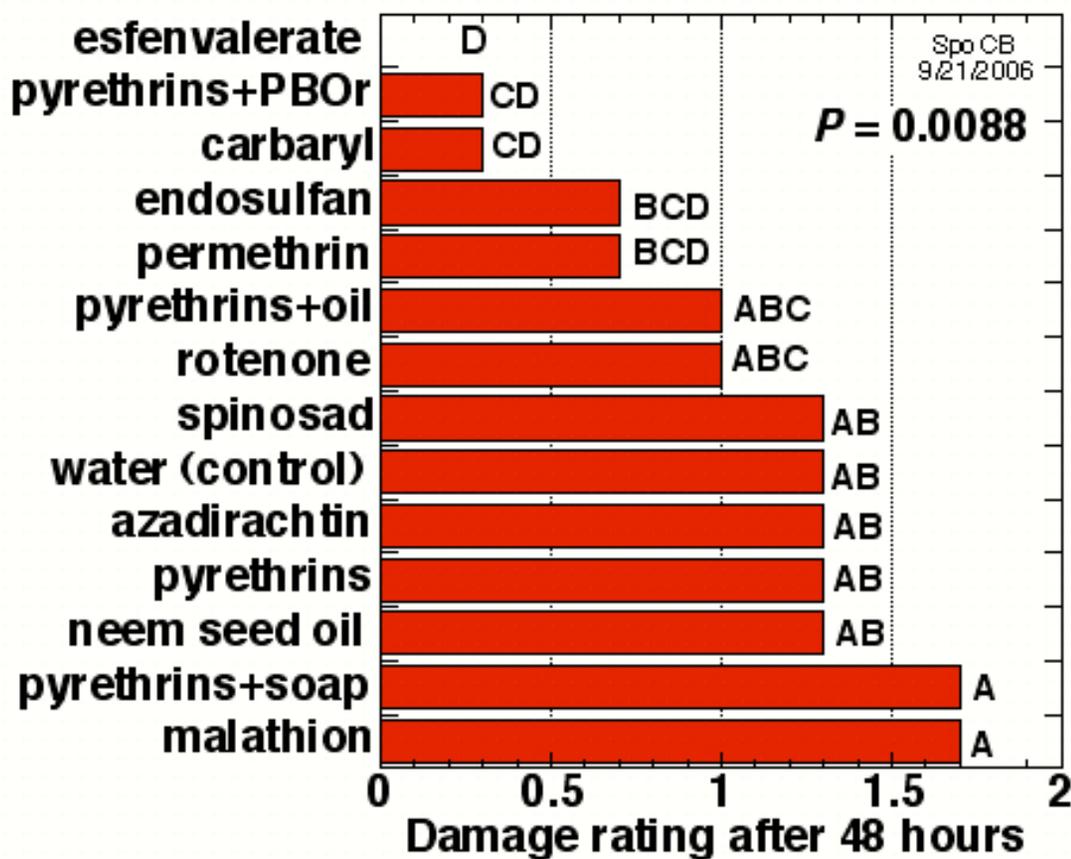
tested on pumpkin leaves, 9/25/2006
 3 replicates/treatment, 3 beetles/replicate



Spotted Cucumber Beetle

tested on pumpkin leaves, 9/21/2006

3 replicates/treatment, 3 beetles/replicate



Squash vine borer



- **Larva bores into stem at base**
- **Infest squash, gourd, pumpkins**
- **Plants often die**
- **Moths lay eggs in late June & early July**

Squash Borer



cocoon in soil overwinter

wilting leaves are symptom of infestation

larva is a caterpillar

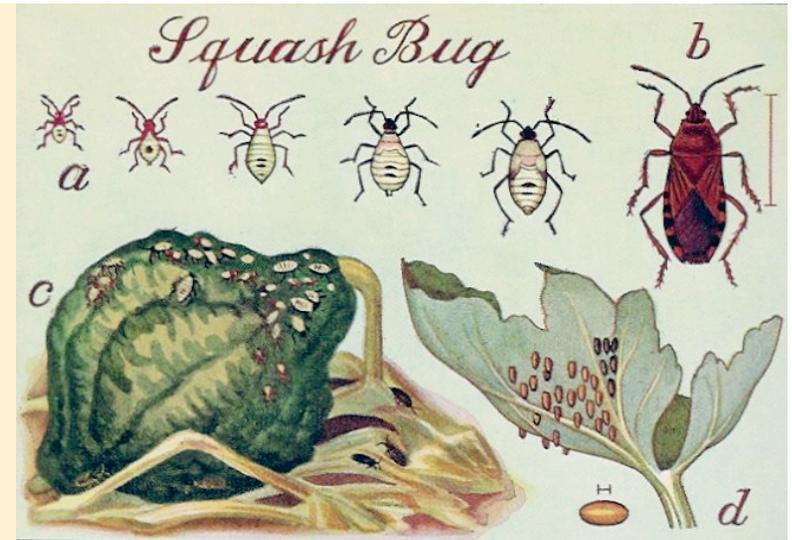
adult is a day-flying moth

Squash vine borer

- **Cultural control:**
 - Till soil to destroy pupae
 - Plant 2nd crop in late June (sacrifice the 1st crop to borer)
 - Exclusion by screen or row covers
- **Chemical control:**
 - During egg hatch period, early July
 - Direct at base of stems
 - Minimum 2 sprays 1 week apart
 - Maximum 4 sprays 1 week apart, late June to late July
 - permethrin or esfenvalerate or endosulfan



Squash bug

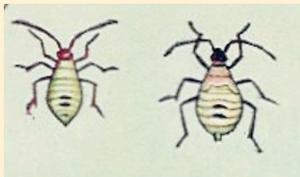


- **Damage:**
 - Suck sap from stems, leaves, fruit
 - Can kill plants
 - Nymphs can feed in large groups
- **Natural enemies:**
 - 1 fly species attacks adult
 - 2 wasp species attack eggs
- **Control:**
 - Hand pick adults
 - Board traps
 - Destroy vines after harvest

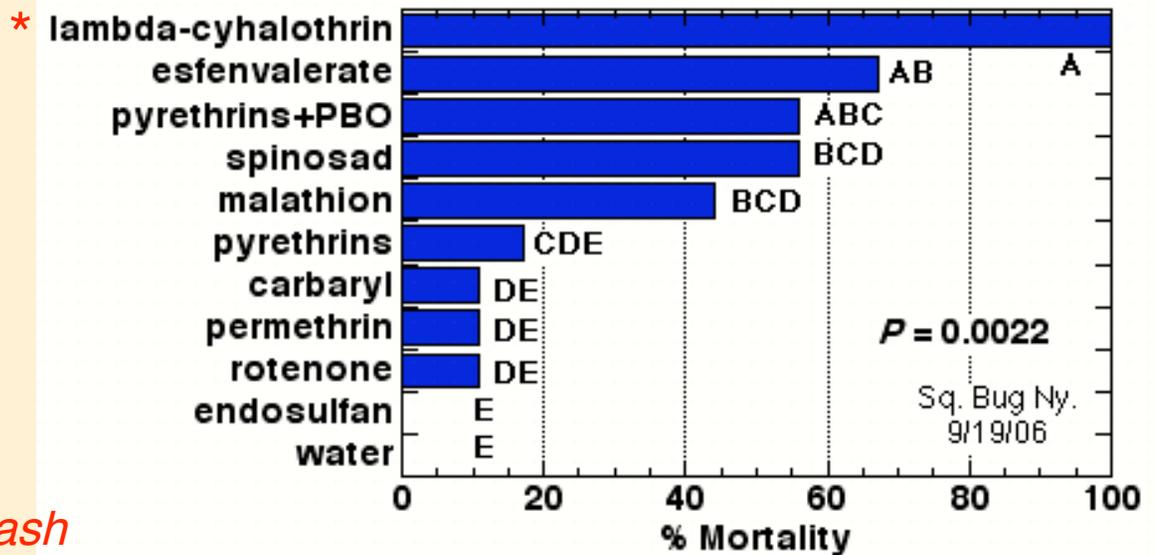
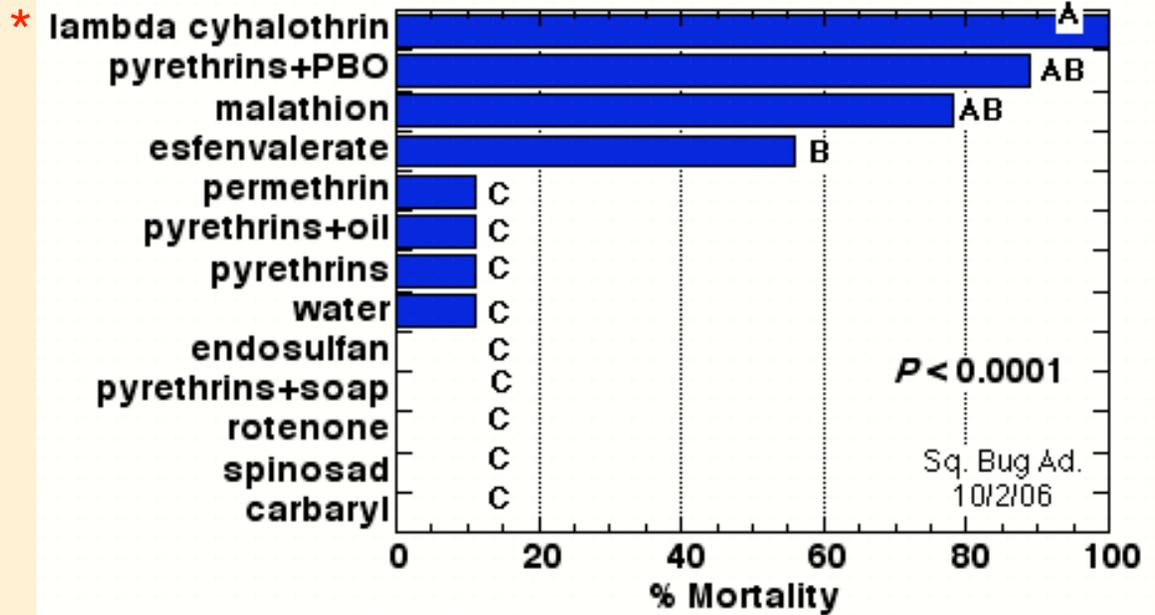
Squash bug



adult

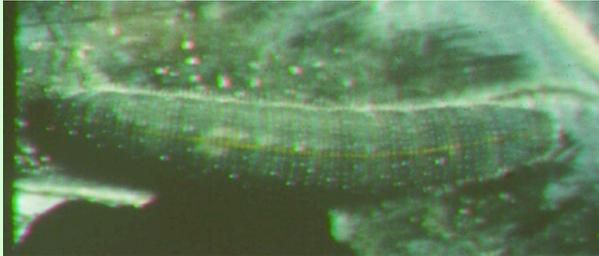


nymph



* *Not registered for use on squash*

Caterpillars (3 species) on cole crops



Imported cabbageworm



Cabbage looper



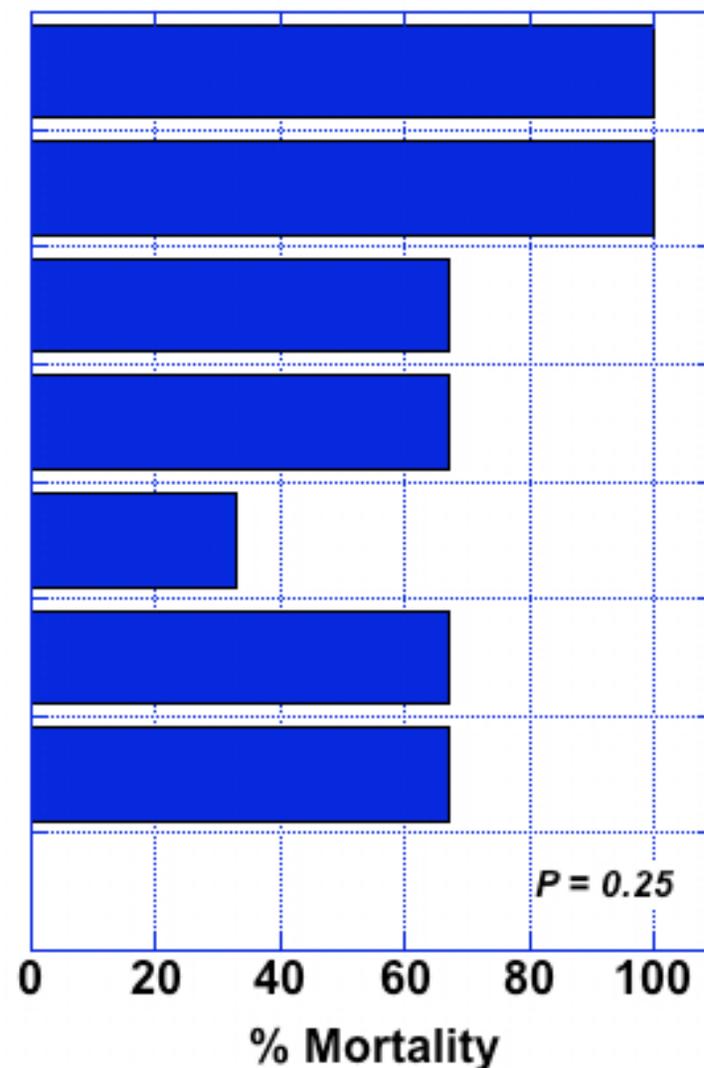
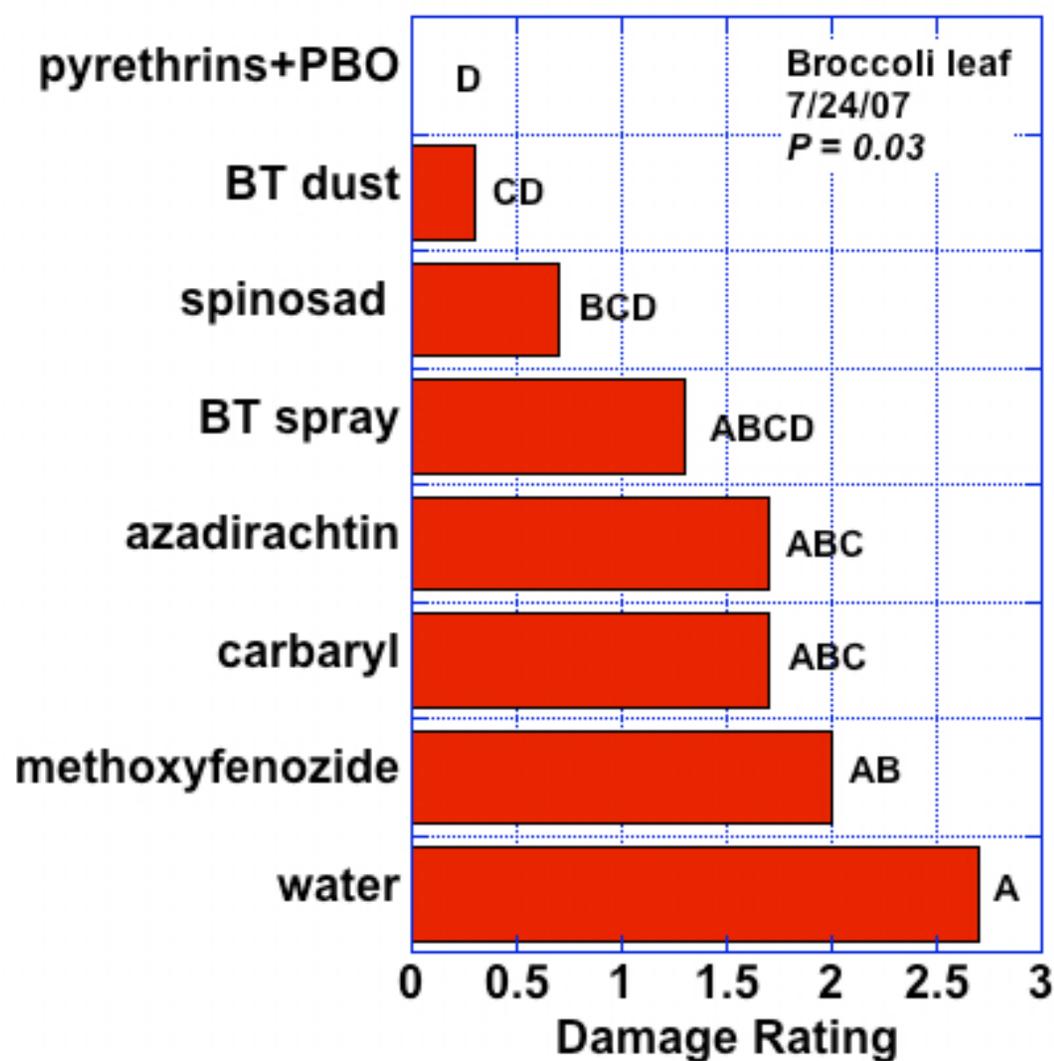
Diamondback moth



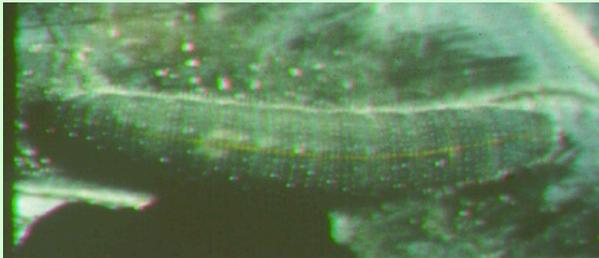
Row covers



Imported Cabbageworm



Caterpillars on cole crops & their parasitoids



Imported cabbageworm



Cotesia larva
spinning cocoons



Cotesia
adult wasp



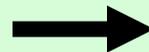
Cabbage looper



Copidosoma
floridanum wasps
emerging from
one cocoon



Diamondback moth



Diadegma insulare
oviposits on larvae

Integration of Chemical Control & Biological Control

- **Use microbial insecticide, **BT**, as a selective insecticide**
 - Kills caterpillars
 - Does not kill parasitoids
 - ‘DiPel’, ‘Thuricide’ etc.
- **Allows natural enemies to help kill pests**
- **Spinosad also easy on parasitoids**

Cabbage maggot

- Turnip, radish, other cole crops
- Symptoms:
 - Seedlings wilted, stunted
 - Holes or tunnels in roots
- Life cycle:
 - Adult fly lays egg at stem base
 - Larvae feed for 3 weeks
 - 3-4 generations per year
- Control:
 - Choose planting date to avoid egg peak
 - Cardboard collars on stem



Colorado potato beetle

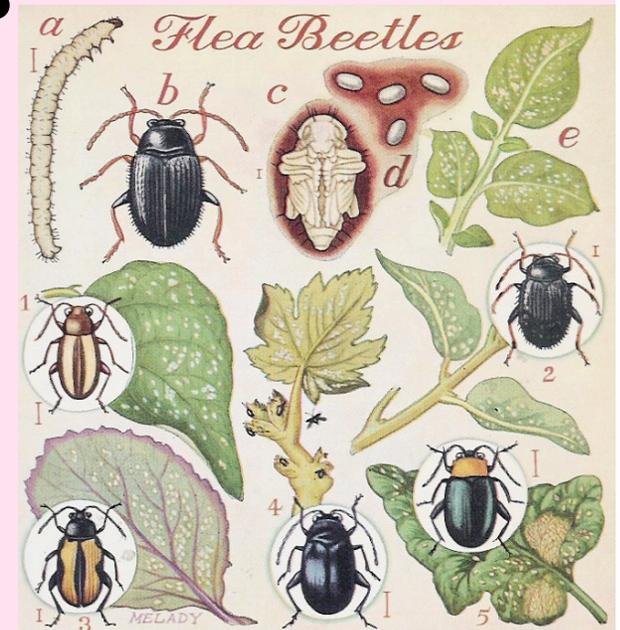


- **Damage:** Adults & larvae eat leaves of potato, eggplant, tomato
- 2 generations/year
- Pupal stage in soil
- **Control:**
 - Hand pick
 - Plant potato early or late but not both
 - Spray larvae with spinosad

Eggplant flea beetle



- Chew many small holes in leaves
- Damage critical to seedlings
- Management:
 - Hand-pick (or aspirate) daily
 - Insecticides or repellents
- Similar species on:
 - Cabbage (2 species)
 - Potato

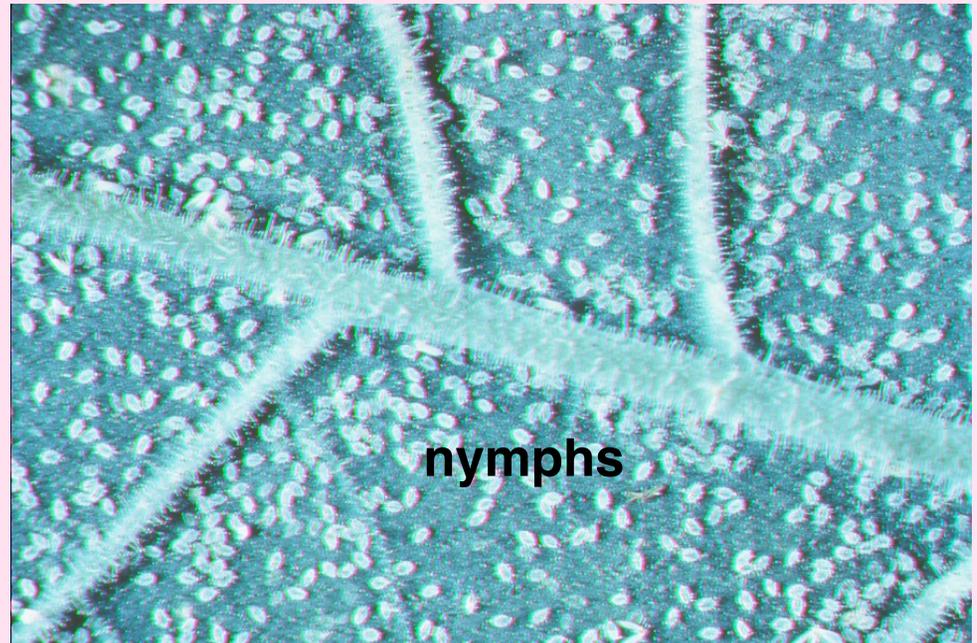


Removal by aspirator: Eggplant flea beetle



Whiteflies

- Suck sap
- Infest tomato
- Life stages:
 - Adult
 - Egg
 - Crawler (1st instar)
 - Sessile nymphs
 - Pupa
- Damage done by nymphs from leaf undersides
- Control by soap sprays



Bean beetles

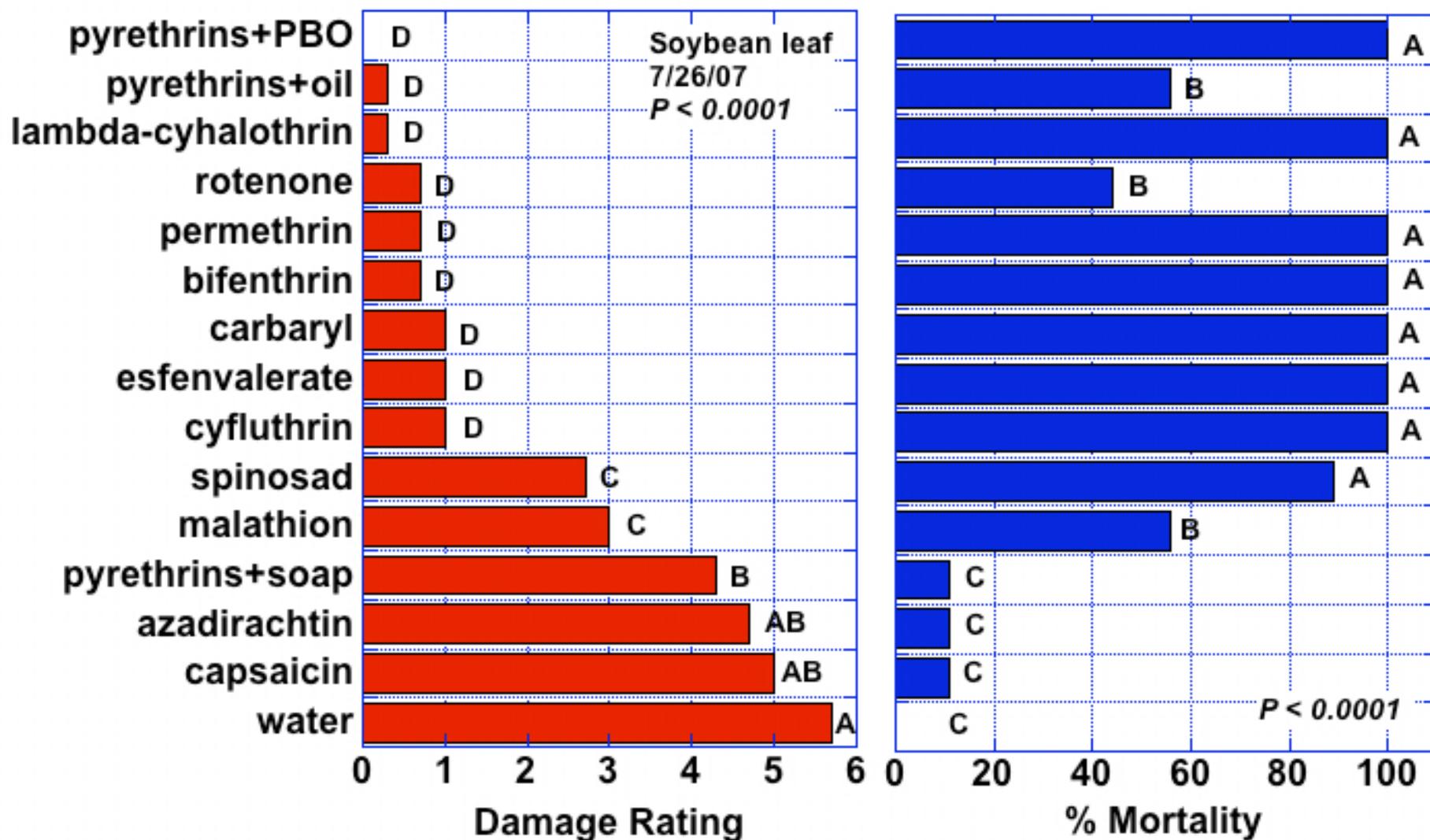
- **Bean leaf beetle:**
 - Adults chew holes through leaves, pods
- **Mexican bean beetle:**
 - A true lady beetle
 - Larvae skeletonize leaves
- **Cultural control:**
 - Exclusion (row covers)
 - Plow after harvest
- **Chemical control:**
 - Sevin or pyrethrins



Bean leaf beetle



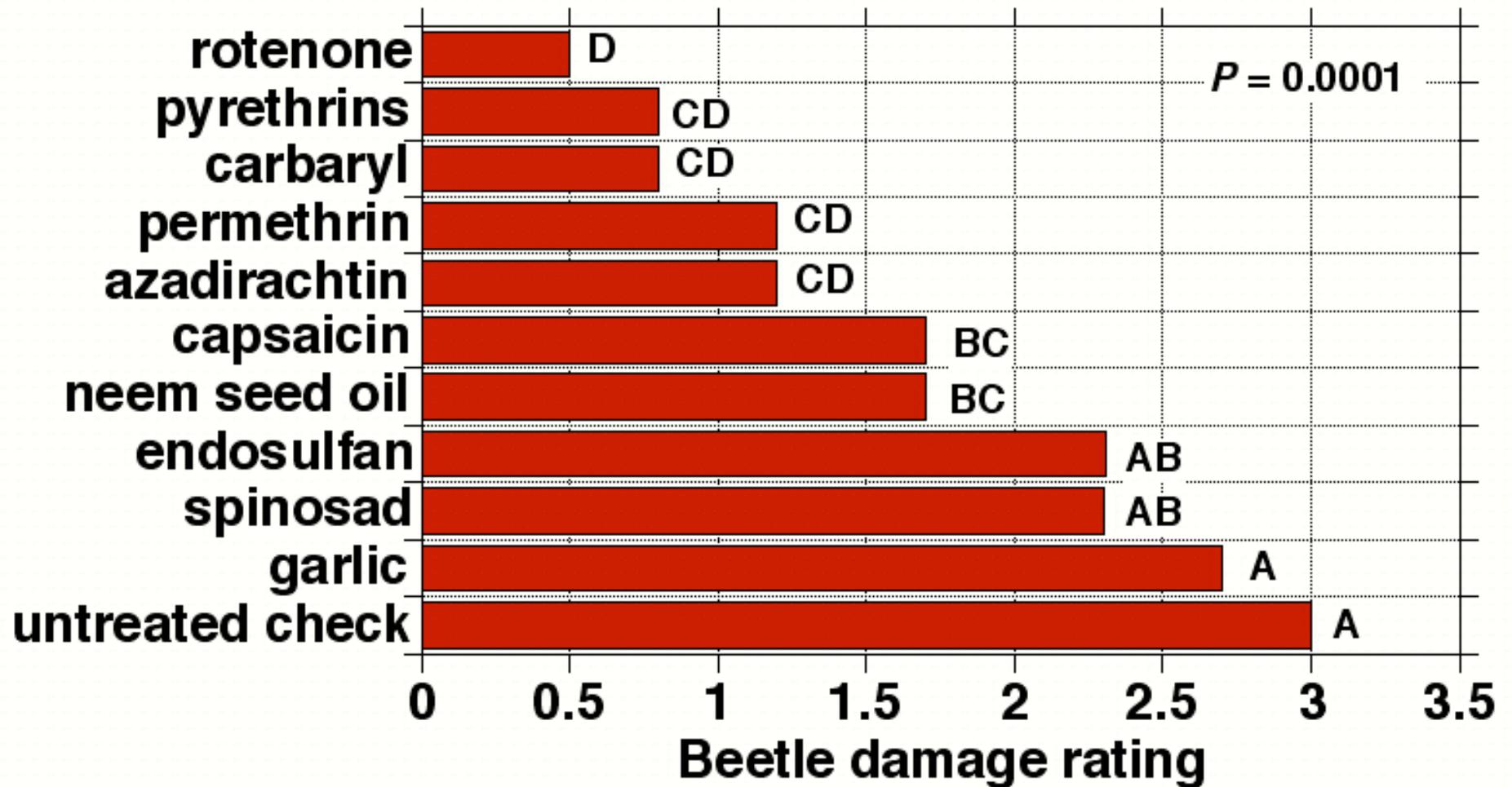
Bean Leaf Beetle



Field trial on snap beans

(bean leaf beetle + spotted cucumber beetle)

Beetle Damage on Beans, 9/15/05



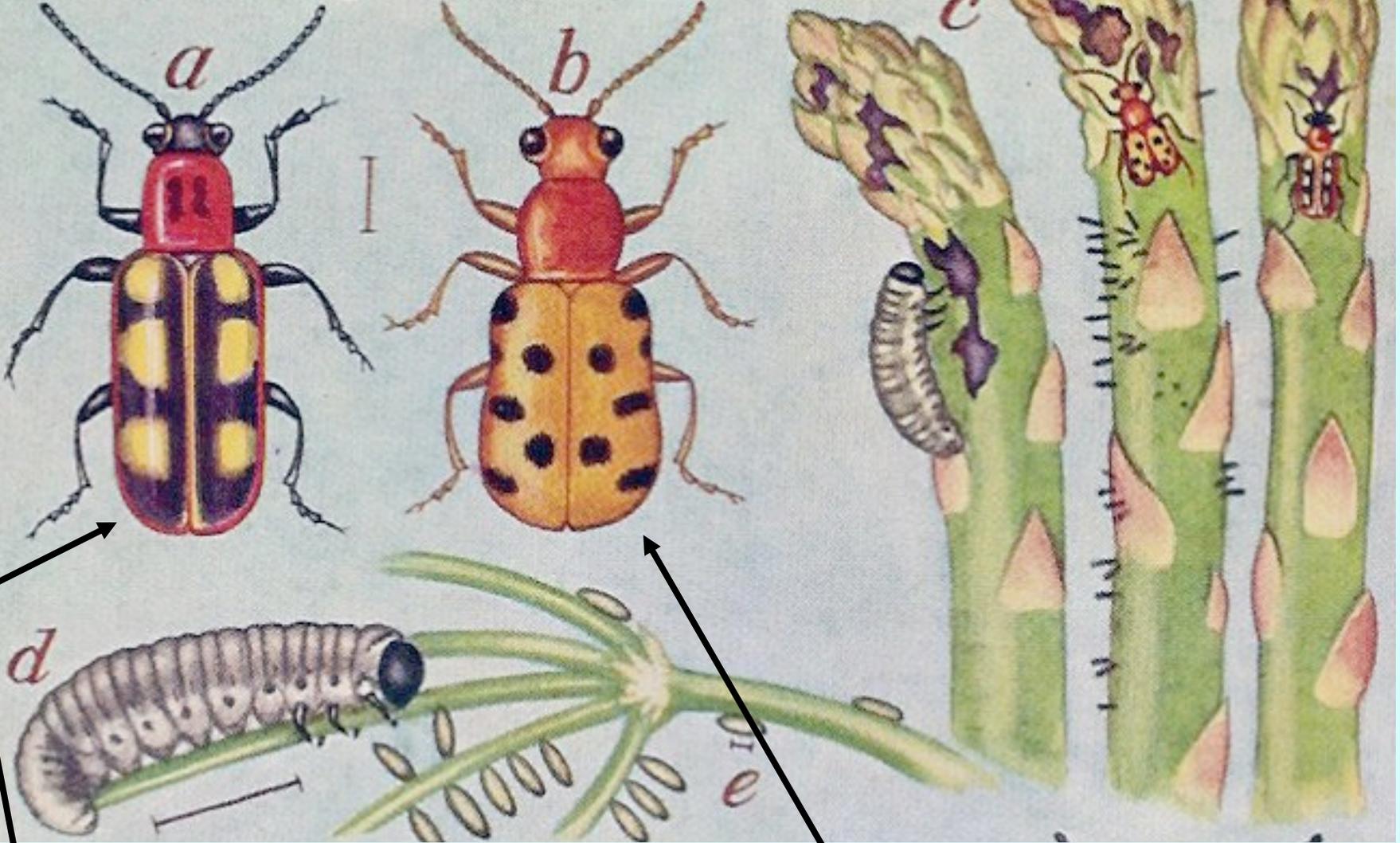
Spinach leafminer



- **Adult fly lays eggs**
 - On leaf underside
 - in early spring
- **Maggots feed inside leaf, 1-2 weeks**
 - Narrow mine when young
 - Large blister-like mines when older
- **Pupate in soil**
- **Several generations per year**
- **Hand pick** infested leaves, early



Asparagus Beetles

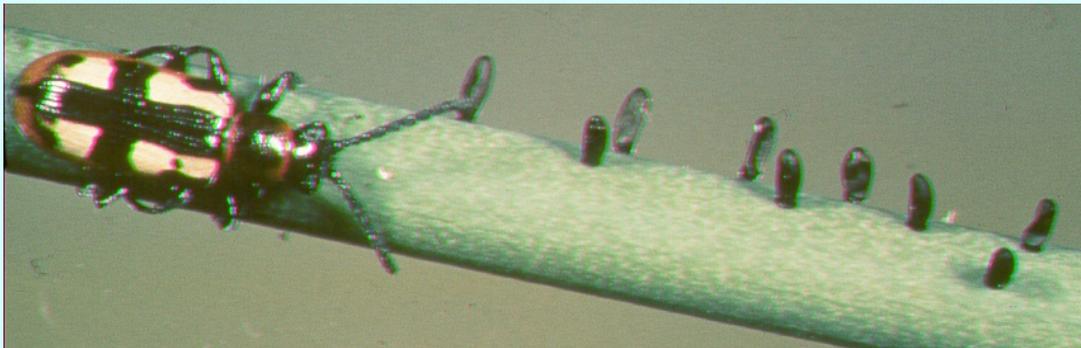


Common asparagus beetle

Spotted asparagus beetle

Asparagus beetles

- **Common asparagus beetle**
 - Adults feed on spears
 - Adults lay eggs on spears
 - Larvae feed on leaves
- **Spotted asparagus beetle**
 - Adults feed on spears
 - Larvae feed in berries



Asparagus beetles

- **Management**
 - **Hand picking**
 - **Insecticides or repellents**

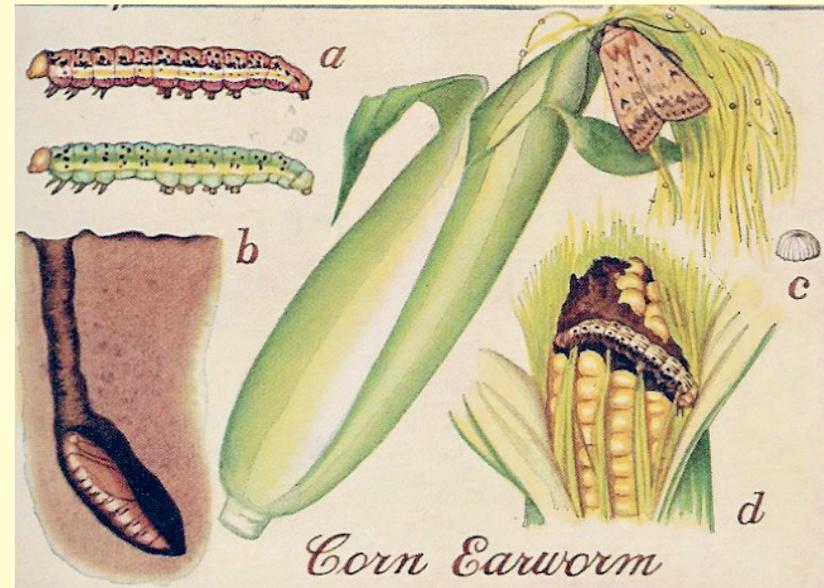
Corn worms



1. European corn borer

- Damage at tip or shank or side
- Two generations per year
- Damage in June & August
- Worm appearance:
 - dark brown head
 - body with rows of flat spots
 - body without microspines

Corn worms

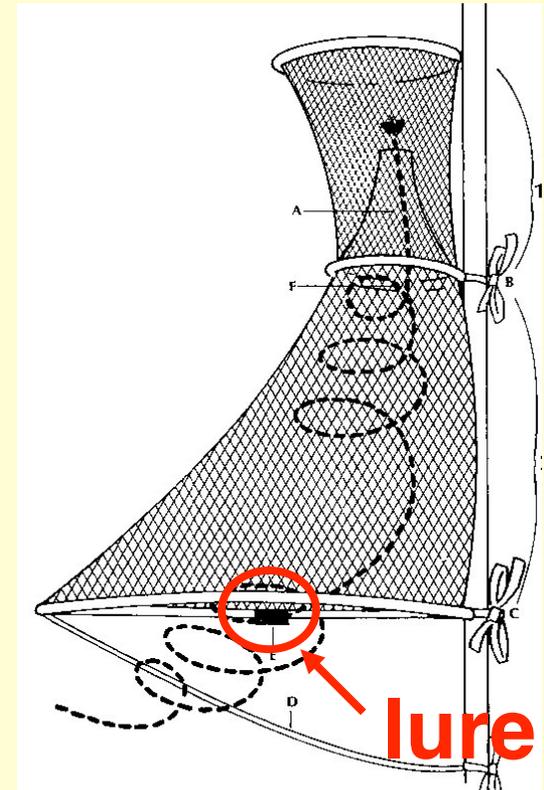


2. Corn earworm

- Damage at ear tip only
- Damage usually mid-August & later
- Worm appearance:
 - light brown head
 - body with long stripes
 - body covered with short microspines

Trap to Monitor Corn Earworm

- Pheromone lure
- Attracts male moths
- Highly effective



Organic Alternative for Earworm & Borer on Sweet corn: B.t. + Oil

(Ruth Hazzard, Univ. Mass.)

- **‘Zea-later II’ applicator**
 - Hand-held
 - \$100 (Johnny’s Selected Seeds)
- **Mix:**
 - 900 ml food-grade corn oil
 - Lecithin 5% (emulsifier)
 - 28.6 grams DiPel DF (a B.t.)
 - 100 ml water
- **Treat:**
 - Once, 5 days after silking begins
 - Squirt 0.5 ml of oil mix into each ear tip



Corn Worm Management

- **Planting date:**
 - Early & late plantings difficult
 - Middle plantings easiest
- **Traps for monitoring**
 - Excellent for corn earworm
 - Good for European corn borer
- **Chemical control:**
 - BT for 1st generation borer
 - Oil + BT in ear tip for earworm
 - Spinosad for both pests
- **Biocontrol:**
 - Encourage generalist predators
 - New *Trichogramma* egg parasitoid

Aphids



- **Appearance:**
 - Small, soft, 2 ‘tailpipes’
 - Every species with winged & wingless forms
- **Damage:**
 - Suck sap, cause leaf puckers
 - Deposit honeydew
 - Transmit viruses
- **Common species:**
 - Potato aphid (tomato)
 - Green peach aphid (lettuce, pepper)
 - Melon aphid (cucurbits)

How aphids colonize plants

Winged female adult



Nymphs (wingless)



Wingless female adults



Nymphs (wingless)



Wingless nymphs

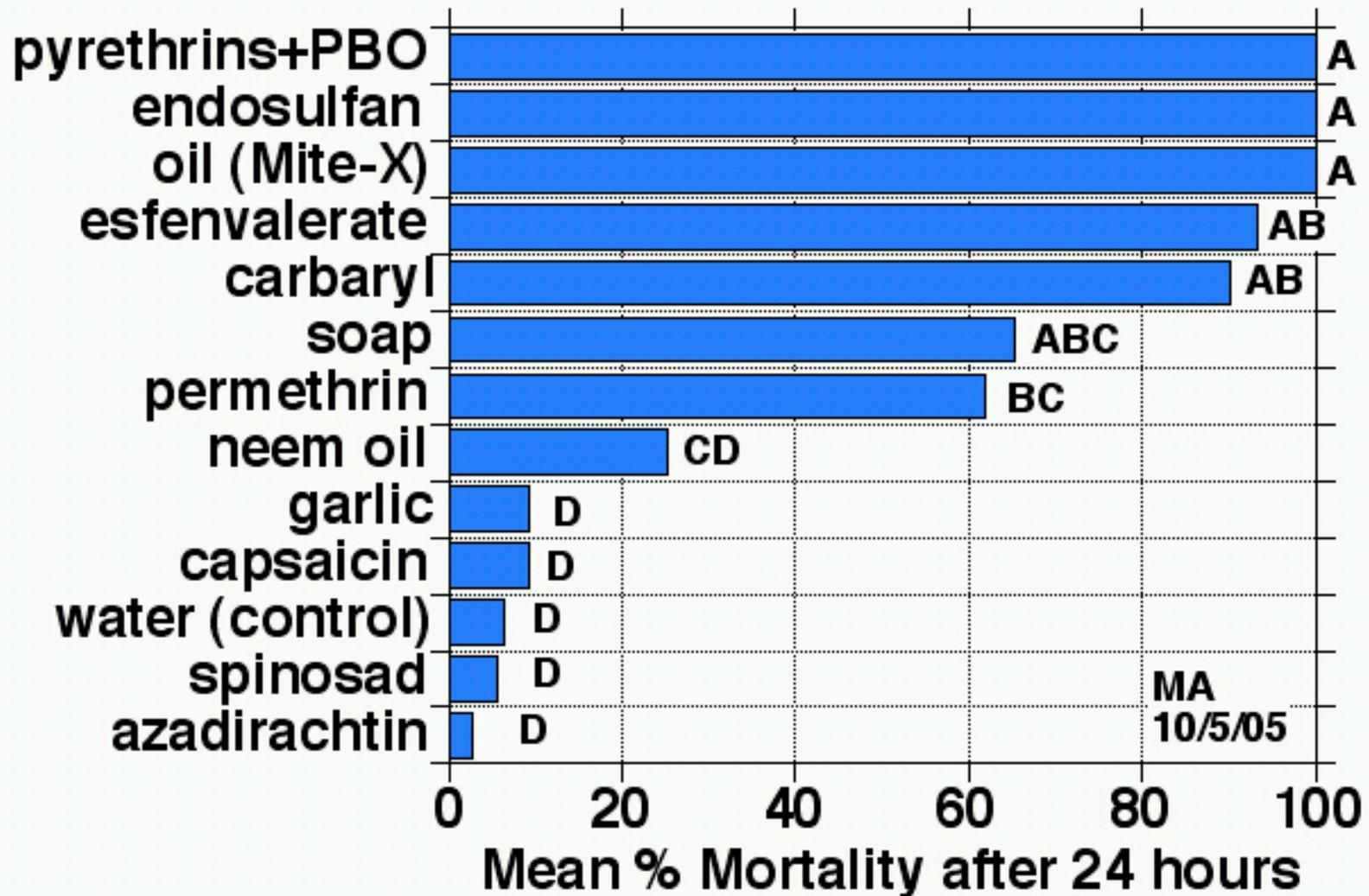
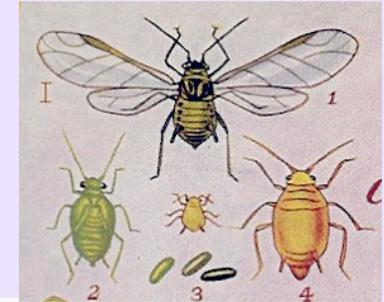
Wingless female adult

Aphid control

- **Encourage natural enemies by avoiding use of broad-spectrum insecticides**
- **Suffocate with spray of insecticidal soap**
- **Reflective mulch to prevent colonization by winged aphids**

Melon Aphid

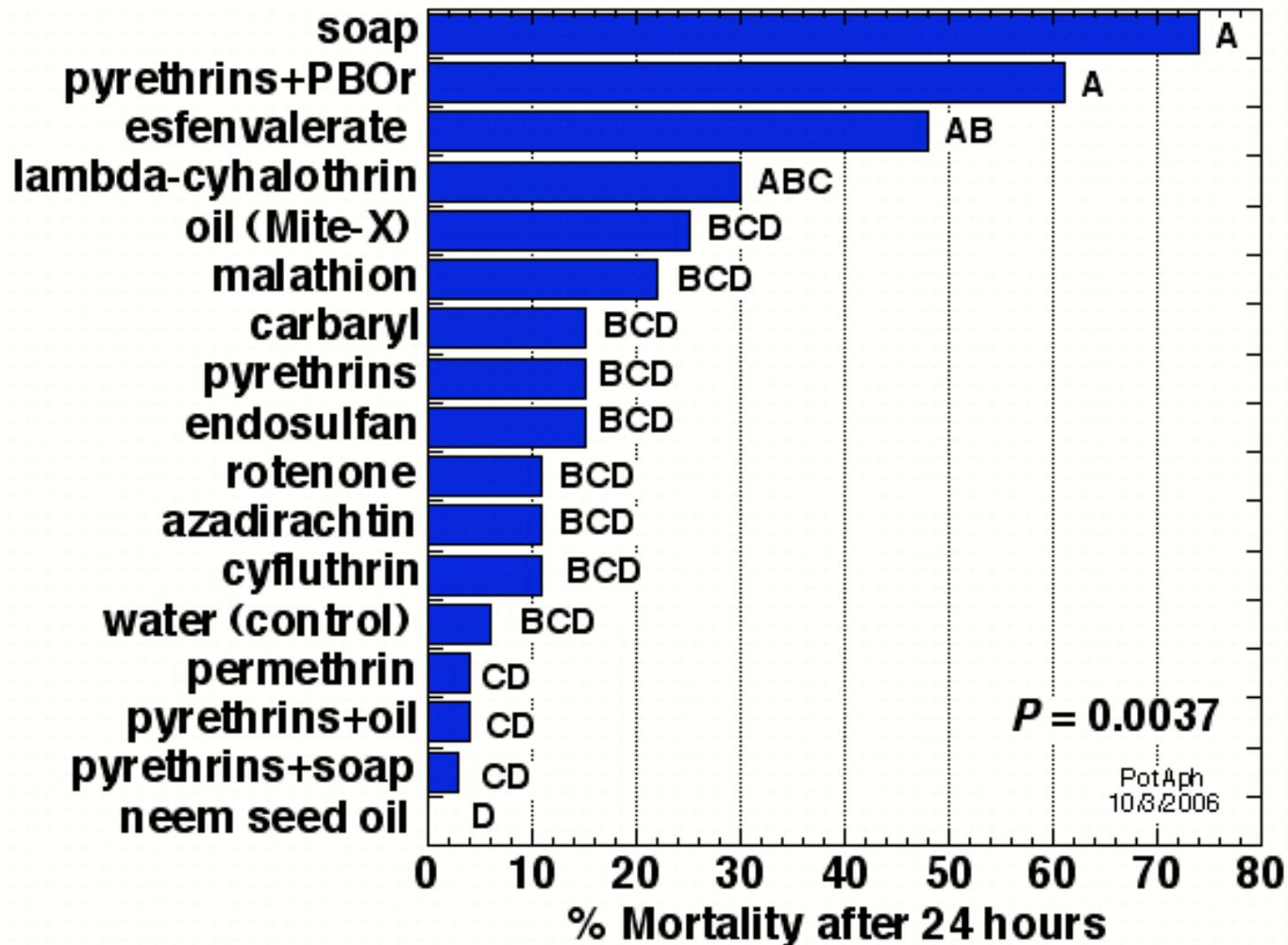
tested on pumpkin leaves, 10/5/05;
3 replicates/treatment, 10 aphids/replicate



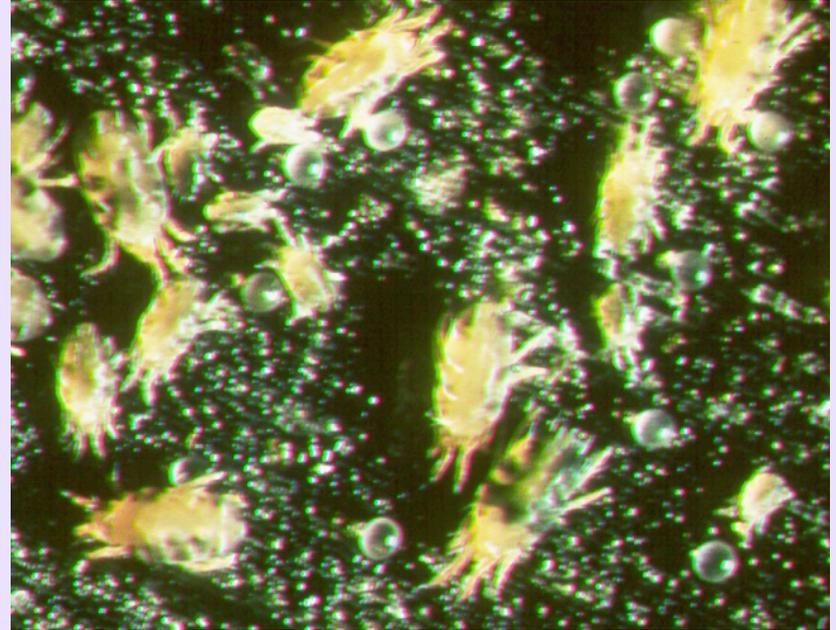
Potato Aphid

tested on tomato leaves, 10/3/2006

3 replicates/treatment, 10 aphids/replicate



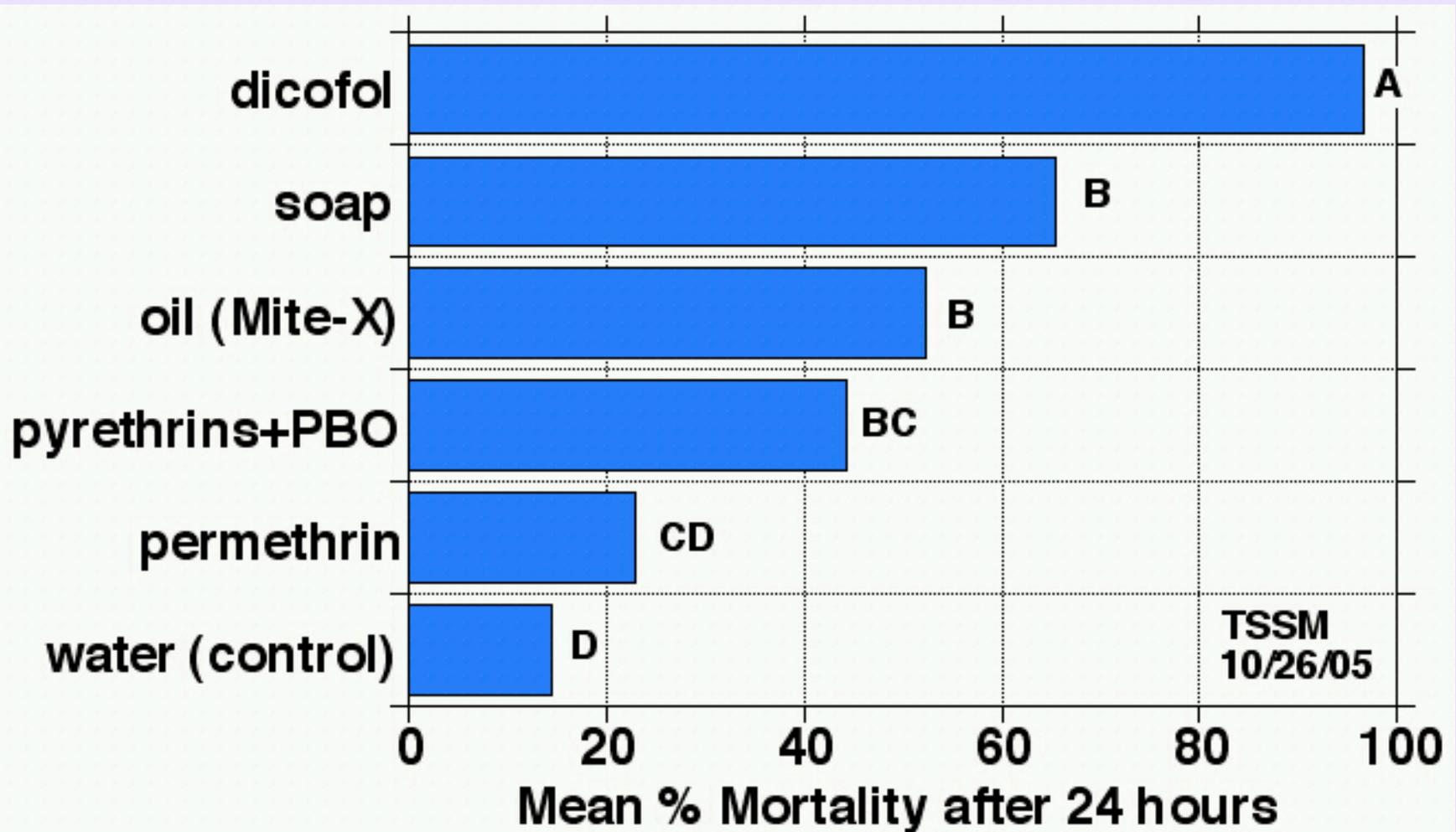
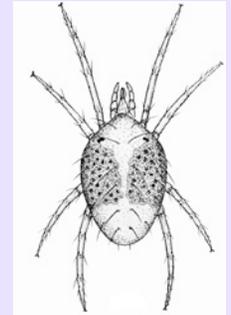
Two-spotted spider mite



- Tiny, white with 2 black spots, 8 legs
- Suck sap from leaves
- Webbing usually present
- **Most common on beans, melons**
- Thrive in hot dry weather
- Many natural predators
- Control: soap or oil sprays

Two-spotted spider mite

tested on snap bean leaves, 10/26/05;
3 replicates/treatment, 30 mites/replicate



Slugs



- **Not insects!**
- **Chew leaves, stems**
- **Leave slime trails**
- **Hide during the daytime**
- **Cultural control:**
 - **Delay mulching until soil warm**
 - **Border garden with dry scratchy material**
- **Chemical Control :**
 - **Baits on soil around plants**
 - **Iron phosphate or metaldehyde**



the end