

# Common Vegetable Pests and using IPM for control

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# Outline

- Concept of IPM
- IPM tactics you can use
- Reduced risk pesticides
- Top 10 insect pests
- Where to get more information

# Concept of IPM

- Integrated pest management
  - Use multiple tactics to reduce pests
  - Promote plant health
- Use thresholds (economic or aesthetic)
  - Plan ahead with regular scouting
  - Get a proper diagnoses
- Limit chemical applications
  - Follow rates/harvest intervals
  - Think about good timing
  - Mix up chemical classes

# IPM tactics

- Regulatory
- Genetic
- Mechanical/physical
- Cultural
- Biological
- Chemical



# Regulatory Control

- Quarantines (USDA-APHIS-PPQ)
  - emerald ash borer, sudden oak death
- Exotic pest surveys (USU/UDAF)
  - Japanese beetle, imported fire ant
- Import/export restrictions
  - Certified “weed free” hay
  - Genetically modified foods



# Genetic Control

- Plant genetics
  - Tolerance with selective breeding
    - Increase yield or appearance
  - Resistance with bacteria (Bt)
    - Immatures get sick and die
- Insect genetics
  - Releasing sterile males

# Mechanical/Physical Control

- Barriers, screens
- Traps, bands
- Mulch
- Tillage
- Sanitation
- Hand removal



# Cultural Control

- Rotate crops, planting locations
- Seek resistant/tolerant plants
- Avoid susceptible plants (even favorites!)
- Start out with pest-free plants
- Diversify plant selection
- Keep plants healthy
- Set up zones for H<sub>2</sub>O, fertilization
- Scout regularly, keep notes



# Biological Control

- Predators, parasitoids, pathogens
  - Most vegetable pests have enemies
  - Will respond to low/moderate density
- Encourage natural enemies
  - Use native nectar-producing plants
  - Avoid monocultures



# Chemical control



- traditional pesticides
  - broad spectrum, long residual, toxic
  - pyrethroids, organophosphates, carbamates
- reduced risk “softer” pesticides
  - selective, short residual, earth-friendly
  - microbial (bacteria, nematode, fungi)
  - soap, oil, dust, mineral (zinc, copper, sulfur)
  - botanical (pyrethrum, nicotine)



# Microbials

- kill, reduce reproduction, or shorten the life
- usually specific to target species or to life stages
- depends on environment or host abundance
- control by pathogens may be unpredictable
- relatively slow acting; they may take several days or longer to provide adequate control



fungus



nematode



fungus

# Suffocants, Desiccants

- Soaps, oils, sucrose esters, dusts, DE
  - Smother to prevent breathing
  - acts by disrupting the waxy outer layer (cuticle) of soft-bodied insects, causing the insect or mite to dry out and die
  - Concern®, Safer®, Surround®, Sucroside®, Dri-Die®, Bonide®, Entrust®, Success®
- Kaolin clay
  - Physical barrier, excessive grooming

# Botanicals (aka plant derived)

- Neem (neem trees)
  - Trilogy®
- Pyrethrum (pyrethrum daisy)
  - Pyganic®, Evergreen®
- Rotenone (subtropical leguminous shrubs)
  - Pyrellin®
- Spinosad (bacterial fermentation)
  - Conserve®, Success®, Entrust®

# Top 10 specialists

- Asparagus beetle
- Cabbage looper
- Corn earworm
- Cucumber beetle
- Hornworm
- Imported cabbageworm
- Onion maggot
- Pea weevil
- Potato beetle
- Squash bug

# Top 10 generalists

- Aphids
- Armyworms
- Cutworms
- Earwigs
- Grasshoppers
- Leafhoppers
- Leafminers
- Spider mites
- Whiteflies
- Wireworms

# Aphids

- Many species on vegetables
- Overwinter as eggs on woody plants
  - Parthenogenic during the summer
  - Give live birth, only females produced
- 10+ generations/year
- Piercing-sucking mouthparts
  - Fluid feeders, remove phloem/plant sap
  - Can vector disease

# Aphids, cont.

- Feed on the underside of leaves
- Excrete honeydew, ants are attracted
- Often clustered on a plant
- Control options
  - Natural enemies: predators, parasitoids, pathogens
  - Scouting before bud break
  - Strong stream of H<sub>2</sub>O
  - Dormant oils - Safer®, Neem®, Eco-oil®



# Asparagus beetle, *Crioceris asparagi*

- Spotted asparagus beetle, *C. duodecimpunctata*
- Found wherever asparagus is grown
- Overwinters as adults
- 2-3 generations/year
- Eggs laid on egg in rows, brown-colored
- Larvae feed on ferns, brown/dark gray



# Asparagus beetle, cont.

- Adults attracted to young plants
- Damage to ferns and young spears
- Control options
  - Monitor early, harvest frequently
  - Sanitation, remove volunteer plants
  - Neem, Entrust, Surround, Success



# Corn earworm, *Helicoverpa zea*

- Prefer corn, will eat many veggies
- Can not overwinter in cold climates
- Highly mobile, able to migrate
- 2 generations/year
- Eggs deposited on leaf hairs or silk
  - 500-3000 eggs/female
  - Look on leaves under flower clusters



# Corn earworm, cont.

- Larvae feed on kernels, reproductive parts
  - Green/brown caterpillars
  - Numerous black spines
- Control options
  - Plant early
  - Fall tillage kills pupae
  - Mineral oil, Bt, Success®
  - Pyganic®, Ornazin®



# Earwigs, *Furficula auricularia*

- Feed on a wide variety of plants
- Attracted to decaying animal matter
- 1 generation/year
- Overwinter as adults
  - Chewing mouthparts
  - Dark red/brown, small wing pads
  - Generally crawl
  - Nocturnal, hide under debris



# Earwigs, cont.

- Nymphs and adults cause damage
- Look for holes in foliage
- Check garden at night
- Simple traps will work
  - Bran flakes, fish oil, toxicant
  - Rolled newspapers
  - Flat boards
  - Surround®



# Grasshoppers, *Melanopus* spp.

- Several species found in UT
- Prefer tall broadleaf plants, weeds
  - Will feed on most veggies
- Chewing mouthparts
  - Plant defoliators
- Overwinters as eggs in undisturbed soil



# Grasshoppers, cont.

- Like hot/dry weather, susceptible to disease
- Control options (large scale)
  - Natural enemies: parasitoids of nymphs
  - Wheat bran + toxicant on borders
  - *Nosema locustae*
  - Bonide®, Botanigard®



# Hornworms, *Manduca quinquemaculata*

- Feed on solanaceous plants, tomato
- 1-2 generations/year
- Eggs on lower foliage
- Larvae eat upper foliage
  - Very large brown or green caterpillar
  - 5 pair of prolegs, abdominal horn
  - Chewing mouthparts
  - Usually consume the entire leaf (not holes)
  - Last instar eats 90% of total



# Hornworms, cont.

- Adults are nocturnal, dull grey
  - wing span 8-13 cm
  - Siphoning mouthparts for nectar
- Overwinter as pupae
- Control options
  - Visual inspection
  - Hand removal before last instar
  - Fall tillage will kill pupae



# Imported cabbageworm, *Pieris rapae*

- Easily confused with other white butterflies
- Found on crucifers, flowers, weeds
- ~3 generations/year
- Eggs laid singly on lower leaves
- Larvae are velvety green, white stripes
  - 5 prolegs, chewing mouthparts



# Imported cabbageworm, cont.

- Adults are white with black wing spots
- Control options
  - Many natural enemies
  - Naturally occurring pathogens
  - Proclaim®, Ornazin®, Ecozin®



# Leafminers

- Beetle, moth, fly, or sawfly larvae
- Tomato, pepper, spinach, squash, pumpkin
- Females deposit eggs within leaf tissue
- Larvae make long, slender, winding, white tunnels in leaves
- Many natural enemies available
- Healthy plants should be able to tolerate considerable injury; Bonide®, Spinosid®



# Pea weevil, *Bruchus pisorium*

- Only feed on peas
- 1 generation/year
- Adults lay eggs on pea pod
- Larvae feed on developing peas
- Overwinters as adults in pods
- Control options
  - Sanitation, careful harvesting
  - Early planting



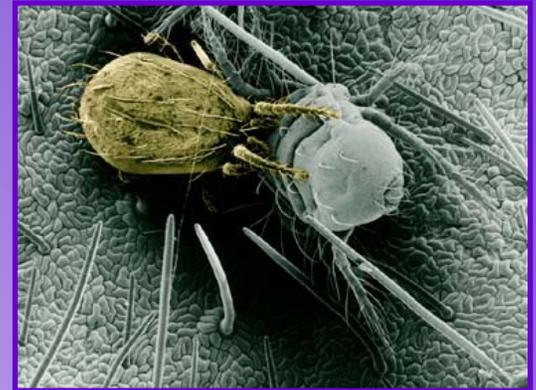
# Spider mites, *Tetranychus* spp.

- 4 pairs of legs, hairy body
- Overwinter in debris
- Wide host range
- Feed on lower leaf surface
  - Piercing mouthparts
  - Plants look dirty, webbed
  - Can look speckled, yellowed



# Spider mites, cont.

- Very successful pests
  - Small size, many generations per year
  - Tolerance of pesticides
  - Like hot and dry weather
- Control options
  - Many natural enemies
  - Keep plants healthy, remove weeds
  - Strong stream of H<sub>2</sub>O
  - Bonide®, Micro Sulf®, Surround®



# Squash bug, *Anasa trititis*

- Feed on cucurbits, squash/pumpkin preferred
- 1-3 generations/year
- Eggs deposited on lower leaves
- Nymphs are gregarious
- Overwinters as adults in debris



# Squash bugs, cont.

- Adults are dark brown
  - Piercing-sucking mouthparts
  - Transmit toxic saliva into the plant
  - Wilting, black foliage
- Control options
  - Plant early, early detection, sanitation
  - Difficult to kill large nymphs/adults
  - Apply chemicals to base of plant: Neem®, Bonide®, Surround®

# Summary

- Use cultural control methods first
  - Monitor your garden (early!)
  - Encourage natural enemies
  - Promote diversity and plant health
  - Sanitation, date of planting
- Apply reduced risk pesticides second
  - Slower acting, may need multiple applications
- Use traditional pesticides sparingly

# More Information

- <http://extension.usu.edu/cooperative/ipm/>
- *Handbook of Vegetable Pests*. 2001.  
J.L. Capinera. ISBN 0121588610.
- *Garden Insects of North America*. 2004.  
W. Cranshaw. ISBN 0691095612.
- *Insects that feed on trees and shrubs*. 1991.  
W.T. Johnson and H.H. Lyon. ISBN 0801426022.

# Thank you!

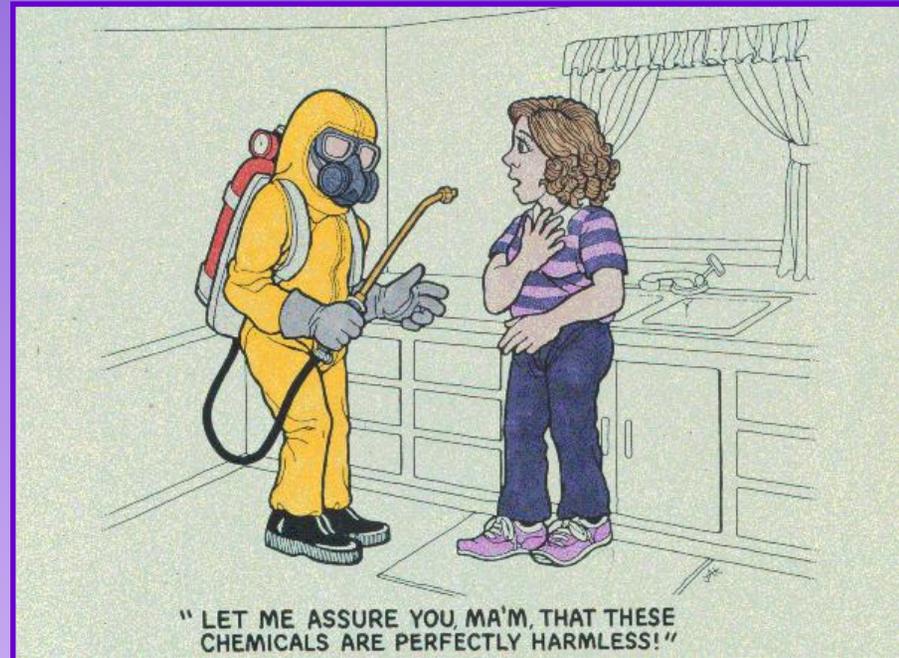
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# *Bacillus thuringiensis* (Bt) mode of action

1 – caterpillar consumes foliage treated with Bt

2 – toxins bind to gut wall receptors, caterpillar stops feeding

3 – the midgut wall breaks down, allowing normal bacteria in body cavity

4 – caterpillar dies of septicemia infection in 1-2 days

