Common Insect Pests and Management Strategies on the Vegetable Farm

Knowing the Good from the Bad and using Integrated Pest Management to Improve Production
Who Am I?

• Research Professor of Entomology

**Biological Control of Key Pests**
- Hemlock Woolly Adelgid (HWA)
- Western Flower Thrips (WFT)
- Brown Marmorated Stinkbug (BMSB)

• Extension Entomologist

**Insect Identification**
- The Public
- Master Gardeners
- UVM Plant Diagnostic Lab

**Public Awareness of Exotic Pests**
- Asian Longhorned Beetle (ALB)
- Brown Marmorated Stinkbug (BMSB)

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What is Integrated Pest Management?

Integration of several strategies to reduce pests using pesticides as little as possible

It is a State of Mind

A Step-by-Step Process for Tackling Pests
Some Common IPM Practices for Vegetable Insect Pests

• **Survey/scouting and detection:** Plant inspection, trapping, soil sampling
  
  • **Cultural control:** Tilling, weeding, planting time, irrigation, rotation, fallowing, etc.
  
  • **Barriers:** Screening, floating row covers
  
  • **Trapping:** Pheromones, sticky cards, plants
  
  • **Biological control:** Releases, sprays
  
  • **Biorational insecticides:** Pest specific and non-persistent
The IPM Process

Steps towards developing a plan of attack

Integrated Pest Management Worksheet

Date: _______________ Crop: __________________________

Damage (When, Where, What type): ____________________________________________

Pest Identification: __________________________________________________________

Common Name: _____________________________________________________________

Pest Life Cycle:

How many generations/year? __________

How many eggs laid/female? __________

How long to complete one generation? _________________________________________

What are the ideal conditions? ______________________________________________

Other key information on the biology: __________________________________________

Recommended Management: _________________________________________________

Threshold for Action: _______________________________________________________

Cultural Control

Biological Control:

Natural Enemies (naturally occurring or commercially available: __________________

Chemical Control:

Future Prevention:
Five Top Vegetable Insect Pests

- Cucumber Beetles
- Tarnished Plant Bug
- Squash Bug
- Cabbage Worms
- Colorado Potato Beetle
Cucumber Beetles

Striped cucumber beetle
*Acalymma vittatum*

Spotted cucumber beetle
*southern corn rootworm*
*Diabrotica undecimpunctata howardi*

Scouting:
- Inspect plants 2-3 times/wk early in the season, weekly later
- Focus early season scouting at field margins, and randomly within field later season
- Sticky traps or pheromone traps
Cucumber Beetles

**Damage: Chewing**

- Shot-hole feeding on foliage and flowers
- Skeletonize flowers reducing yields
- Larvae tunnel into base of plant stems
- Transmit bacterial wilt and virus diseases
Cucumber Beetles

Biology

Adults overwinter in hedgerows and weedy places, emerge when it gets warm and seek flowering plants to feed on pollen.

Migrate to plants, attracted to smell. Feed on plants, mate, lay eggs in soil around plants.

Larvae feed on roots and tunnel in stem.

Preferred Hosts
Gourds, winter and acorn squash, zucchini, cucumber, yellow squash

Less Preferred hosts
Pumpkins, muskmelon, butternut squash, watermelon

Spotted cuke beetles also feed on non-cucurbit crops including corn, sweet potato, etc.

Adults release pheromone to attract other beetles.

A female lays 30-120 eggs, 1-3/day
Life cycle takes 12-40 days
2-3 generations/yr

Return to hedgerow at the end of the season.
Cucumber Beetles: Management

**Damage threshold:**

- Seedlings: when feeding threatens plant health
- Mature plants: 5 or more beetles per plant averaged among 25 plants

**Cultural:**

- Crop rotation (1/2 mile away)
- Use black plastic mulch
- Delay planting until late June
- Use a dense planting rate
- Cover with floating row covers (remove when plants flower)

**Trapping:**

- Plant trap crop at field edge (Blue Hubbard), not disease susceptible variety

**Biological Control:**

- Tachinid fly, nematodes (*Steinernema riobravis*) for larvae

**Chemical Control:**

- Apply a foliar pesticide spray (repeat applications every 5-10 days are advised)
Tarnished Plant Bug (TPB)

*Lygus lineolaris*

**Scouting:**
- Plant inspections and tapping, sweep netting for adults & nymphs
- Put up white sticky traps and check weekly

**Preferred Hosts**
- **Flowers:** sunflower, daisy, gladiolus, etc.
- **Fruits:** apples, strawberries, etc.
- **Vegetables:** chard, lettuce, broccoli, eggplant
- **Weeds:** Red-stemmed pigweed
- **Field crops:** alfalfa, small grains

**Adult**

**Nymph**
TPB Damage

Damage symptoms

- Brownish “sting” marks on stems
- Flower drop
- Distorted flowers
- Distorted fruit
- Cat-faced strawberries
- Brownish damage on flowers
Adults overwinter in hedgerows and weedy places. Emerge when it gets warm and seeks suitable food source.

Lay eggs inside plant tissue.

Molt several times before becoming an adult.

Adults migrate to vegetable and fruit fields from alfalfa fields after flowering or mowing.

Return to hedgerow at the end of the season.

A female lays 200-300 eggs (4-5/day)
Egg stage takes 6-14 days
Nymphal phase takes 15-30 days
Adult lives 30-60 days
2-3 generations/yr
TPB Management

Damage threshold for beans:
- 0.5-1.0 TPB per sweep for blossom and early fruiting stage

- Cultural:
  Remove weeds and debris within and around field
  Mow around field edges to prevent flowering of weeds

- Biological Control:
  Encourage parasites & predators (not reliable)

- Chemical Control:
  Apply foliar pesticide spray (repeat applications are critical)
Squash Bug
Anasa tristis

Scouting:

• Look out for wilting leaves
• Check leaves for egg masses and insects
Squash Bug

**Damage: Piercing & Sucking**

- Feed on stems at the base of the plant, disrupting sap and nutrient flow.
- Produce wounds that serve as disease entry points.
- Inject toxin into plant tissue turning it black.
- Feed on unripe fruit disfiguring or killing it.
Squash Bug Biology

Same basic life cycle as tarnished plant bug

Cucurbit Hosts

Squash (esp. Hubbard, butternut and marrow), pumpkin, cucumber, melon

A female lays up to 800 eggs on preferred hosts (pumpkin)
Nymphal phase lasts 4-6 weeks
Adults live 75-130 days
1 generation/yr though present throughout growing season
Feeding continues until frost
Squash Bug Management

Damage threshold: One egg mass per plant

• Remove and **DESTROY** debris during growing season and in the fall to remove overwintering sites
• **Cover young plants with floating row covers**
• Routine inspection to detect pest early
• **Plant resistant varieties (butternut, acorn)**
• Keep plants healthy, watered and fertilized
• Hand pick and destroy eggs and adults
• Trap bugs under boards and newspaper and collect
• Apply chemical insecticides
Cabbage Worms

Imported cabbageworm
*Pieris rapae*

Cabbage looper
*Trichoplusia ni*

Diamondback moth
*Plutella xylostella*
Cabbage Worm Damage

Damage: Chewing

- Small holes in leaves
- Caterpillar droppings
- Tattered defoliated leaves
Cabbage Worms: Biology

• **Imported cabbage worm**
  - Overwinters as pupae
  - Larvae feed mostly on crucifers
  - Emerges in spring flies to host
  - Lays 300-400 eggs
  - From egg – adult takes 3-6 weeks
  - Adults live 2-3 weeks
  - 3-5 generations/yr

• **Cabbage looper**
  - Similar life cycle as imported cabbage worm
  - From egg – adult takes 18-25 days
  - Larvae feed on crucifers and other hosts (beans, lettuce, celery, beets, potato, etc.)
  - Lays 300-600 eggs
  - Adults live 10-12 days
  - 3-4 generations/yr

• **Diamondback moth**
  - Overwinters as adults
  - Larvae only feed on crucifers
  - Lays 250-300 eggs
  - From egg – adult takes 25-30 days
  - Adults live 12-16 days
  - 3-4 generations/yr
Cabbage Worm Management

• **Imported cabbage worm**
  - Floating row covers
  - Several natural enemies (parasites & predators)
  - Insect viruses (NPV)
  - *Bacillus thuringiensis* (Bt) (kurstaki)
  - Chemical pesticides

• **Cabbage looper**
  - Same as above
  - Thresholds vary with crop
  - Bt resistance noted

• **Diamondback moth**
  - Sampling by plant inspection and pheromone traps
  - Weather has a major impact on population levels
  - Parasites
  - *Bt* (kurstaki and aizawa) ROTATE to avoid resistance
  - Chemical pesticides also effective
Colorado Potato Beetle

*Leptinotarsa decemlineata*

**Scouting**
- Plant inspection

Early detection is critical to target early larval stages.
CPB Damage

Small larvae are easier to kill with pesticides

77% of foliar damage is done by large larvae

Preferred Hosts

Potato, tomato and other Solanacea plants

Plants can lose up to 30% of their foliage without a loss in yield
CPB Biology

Females lay 500+ eggs over 4-5 wks
Adult lives 30-60 days
2-3 generations/yr

Eggs hatch into larvae in 4-9 d
Larvae feed for 2-3 wk and crawl into the soil to pupate
Adults overwinter in hedgerows, emerge to lay eggs when it gets warm
Adults emerge from pupae after 5-10 days

Females lay 500+ eggs over 4-5 wks
Adult lives 30-60 days
2-3 generations/yr
CPB Management

• Cultural control
  Crop rotation (at least ¼ mile)
  Trenches lined with plastic
  Straw mulch
  Flame throwers (early season)

• Biological control
  Several natural enemies, but not effective
  Bt (tenebrionis) effective against small larvae (less than 1/4 inch)
  Hand picking

• Insecticides
  Rotation is key to avoid resistance
WANTED!

DEAD OR ALIVE

- Lady beetles
- Syrphid flies
- Lacewings
- Parasitic wasps
- Parasitic flies
- Predatory bugs
Lady Beetles

Syrphid Flies (Hover Flies)
Lacewings

Parasitic Wasps
Parasitic Flies

Predatory Bugs
New and Emerging Pests

- Brown Marmorated Stinkbug

- Spotted Wing Drosophila
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Steps towards developing a plan of attack

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<tr>
<td>Results of Scouting:</td>
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<td>Natural Enemies Present? □ Yes □ No □ Don’t know</td>
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<td>Action Threshold Reached? □ Yes □ No □ Don’t have one</td>
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Another Approach to Keeping Records

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Beauty is in the Eye of the Beholder