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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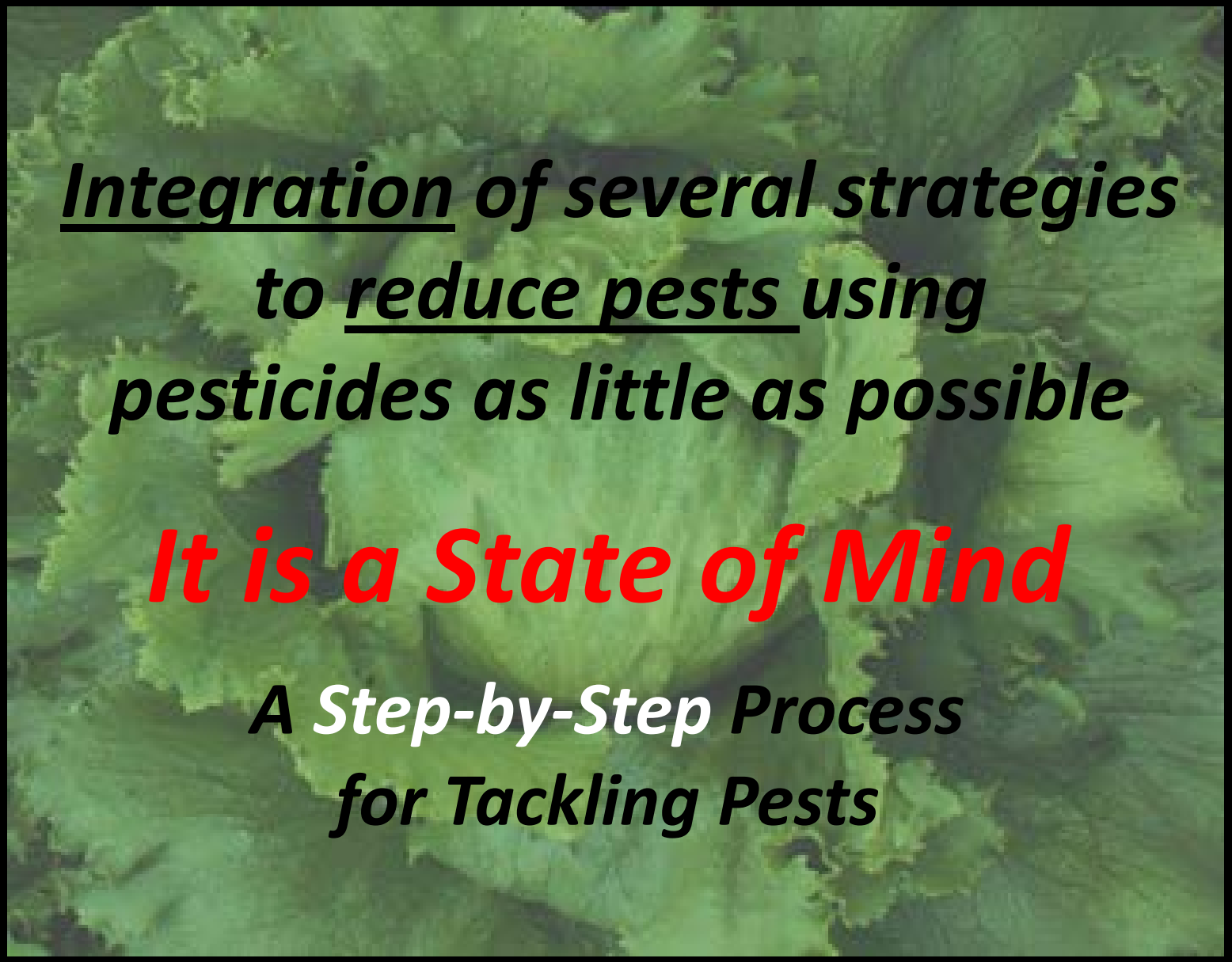
What is Integrated Pest Management?

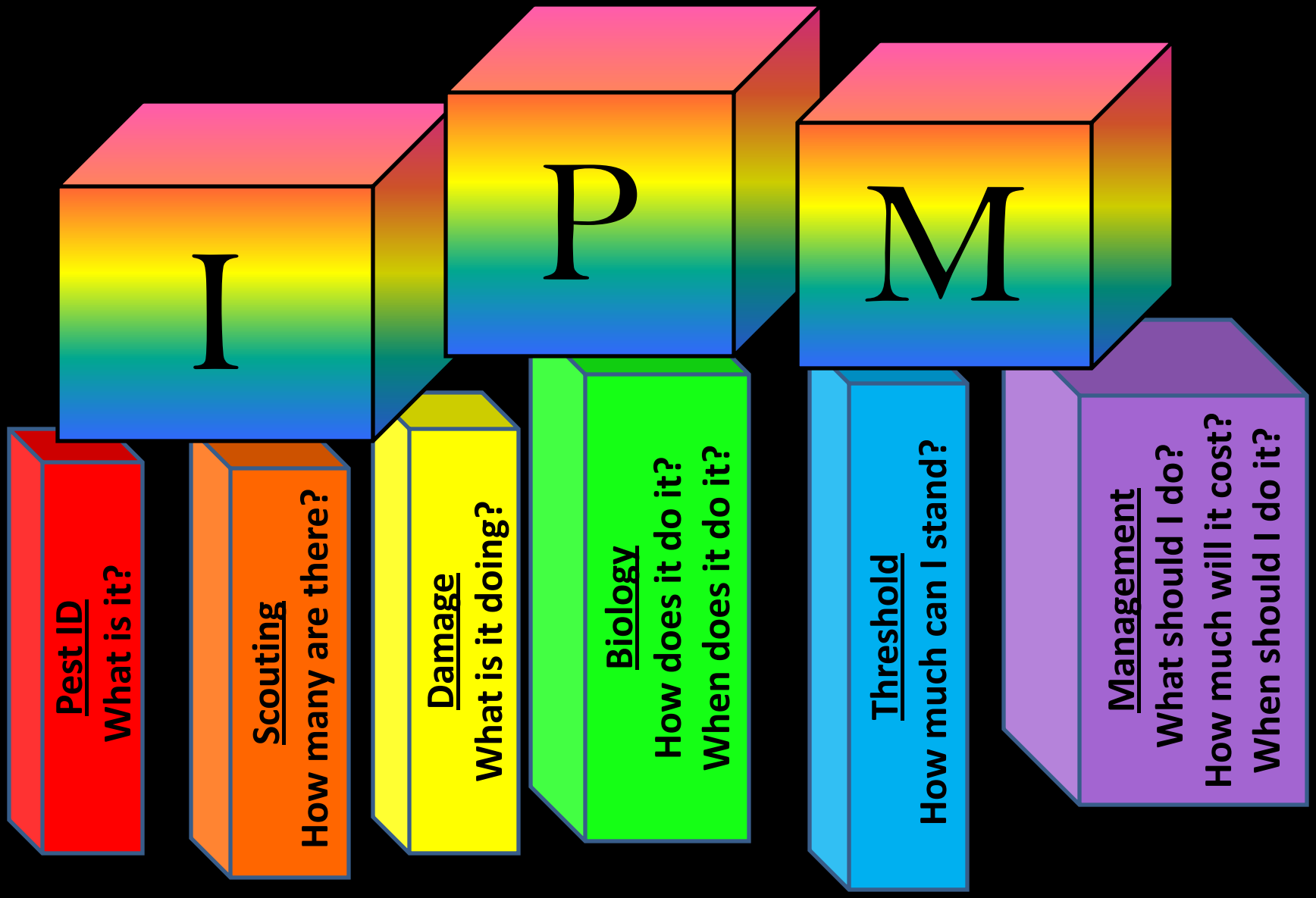


***Integration* of several strategies to *reduce pests* using pesticides as little as possible**

It is a State of Mind

A Step-by-Step Process for Tackling Pests

The Building Blocks



Some Common IPM Practices for of 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

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:

The IPM Process

Steps towards developing a plan of attack

Five Top Vegetable Insect Pests

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

Cucumber Beetles

Striped cucumber beetle
Acalymma vittatum

Larvae

Eggs

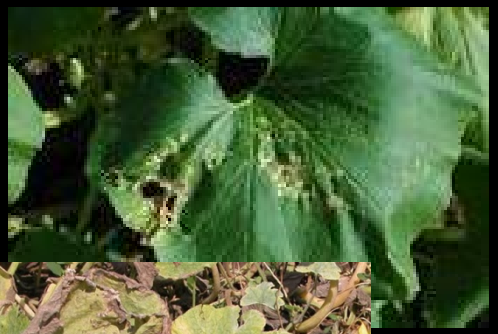
Spotted cucumber beetle
southern corn rootworm
Diabrotica undecimpunctata howardi

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

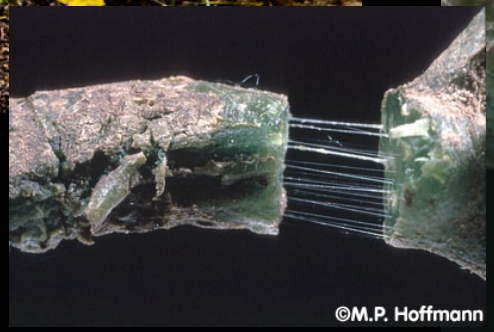
Pupa

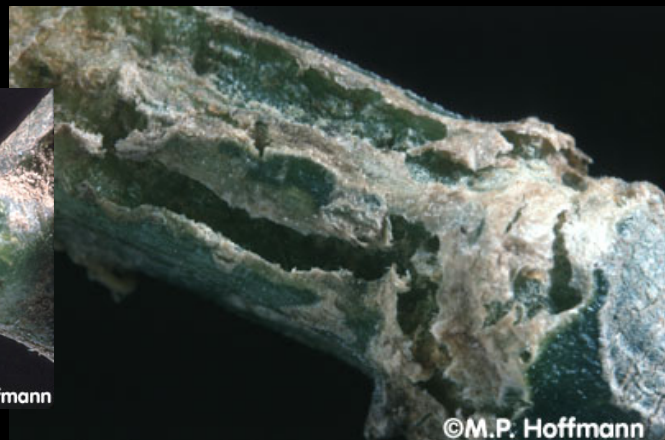
Cucumber Beetles



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

Return to hedgerow at the end of the season

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

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

Adult

Nymph

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

Scouting:

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

TPB Damage

Damage symptoms

- Brownish “sting” marks on stems
- Flower drop
- Distorted flowers
- Distorted fruit
- Cat-faced strawberries
- Brownish damage on flowers

TPB Biology

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

Eggs

Nymphs

Scouting:

- Look out for wilting leaves
- Check leaves for egg masses and insects

Adult

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

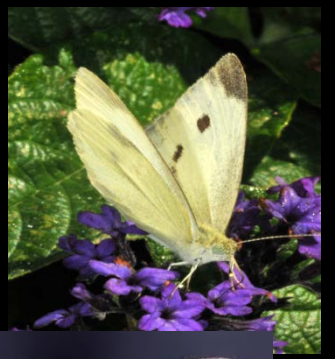
Damage threshold: One egg mass per plant

- 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

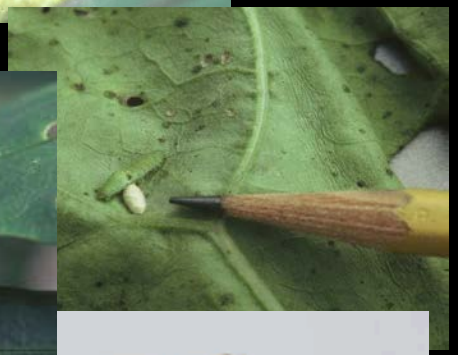
- Small holes in leaves
- Caterpillar droppings
- Tattered defoliated leaves

Cabbage Worms: Biology

- Imported cabbage worm
  - Overwinter 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

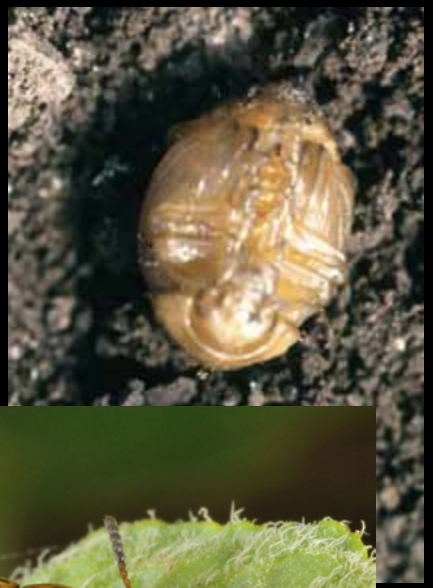
Cabbage Worm Management

- **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 larvale stages.

CPB Damage

Small larvae are easier to kill with pesticides

77% of foliar damage is done by large larvae

Preferred Hosts

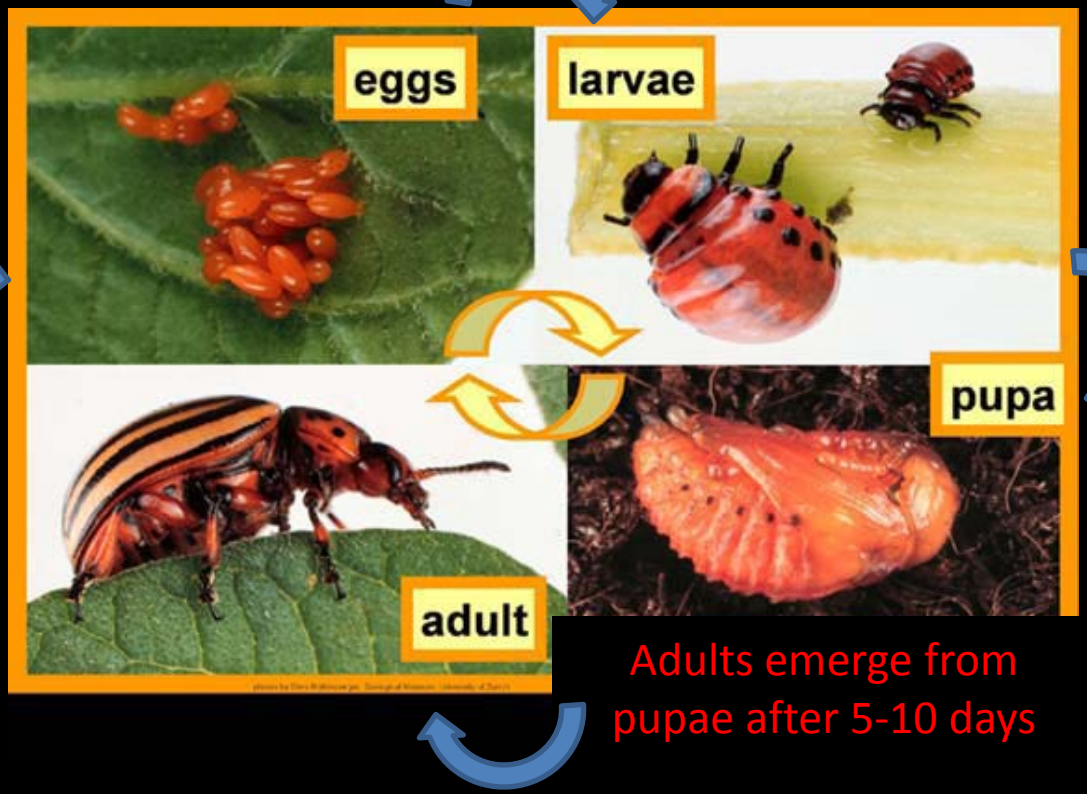
Potato, tomato and other Solanacea plants

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

CPB Biology

Larvae feed for 2-3 wk and crawl into the soil to pupate

Eggs hatch into larvae in 4-9 d



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)

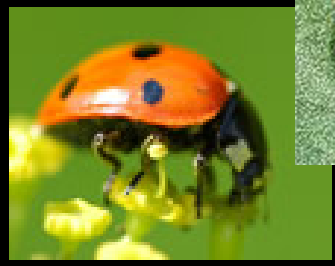
- Biological control
  - Several natural enemies, but not effective
  - *Bt* (tenebrionis) effective against small larvae (less than 1/4 inch)
  - Hand picking
- Insecticides
  - Rotation is key to avoid resistance

~~DEAD OR~~ ALIVE

- LADY BEETLES
- SYRPHID FLIES
- LACEWINGS
- PARASITIC WASPS
- PARASITIC FLIES
- PREDATORY BUGS

Lady Beetles

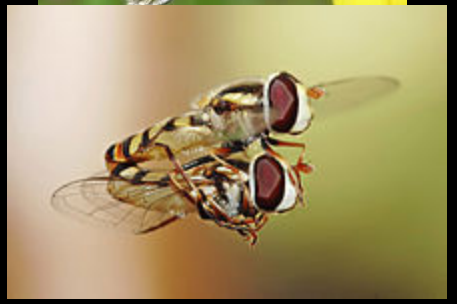


Syrphid Flies (Hover Flies)





Lacewings

Parasitic Wasps

Parasitic Flies

Predatory Bugs

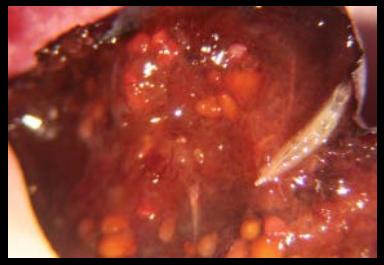
New and Emerging Pests

- Brown Marmorated Stinkbug





- Spotted Wing Drosophila





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Cultural Control

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Chemical Control:

Future Prevention:

The IPM Process

Steps towards developing a plan of attack

Management Strategy Record

Date:_____ Crop: _____ Pest: _____

Scouting Methods Used: _____

Results of Scouting: _____

_____

Natural Enemies Present? ❑Yes ❑No ❑ Don't know _____

_____

Action Threshold Reached? ❑Yes ❑No ❑ Don't have one _____

_____

Action Taken: _____

_____

Cultural Control: _____

_____

Biological Control: _____

_____

Chemical Control: _____

_____

Future Prevention: _____

_____

Level of Success: _____

_____

Other Notes: _____

Keeping Track of your Success

Why reinvent the wheel?

Pest Management Record

Date	Pest	Crop	Method of Management	Results

Another Approach to Keeping Records

Beauty is in the Eye of the Beholder