

# **INSECT MANAGEMENT**

**Common insect pests, beneficial insects, and management strategies**

## LEARNING OBJECTIVES

- Gain a basic understanding of the balance of insects on the farm/garden (pests and beneficial insects.)
- Be able to identify a number of common pests and suggest methods of control.
- Be able to identify several beneficial insects and discuss how they interact with crops and insect pests.



# INSECT CONTROLS ON FARM

- Remay- Fabric covers used over crop beds and rows to keep out insects.
- Beneficial/Predatory insects- insects that help control pest insect numbers by eating or otherwise killing species that are harmful to crop production. See also [http://youtu.be/\\_8R4G4JIQhA](http://youtu.be/_8R4G4JIQhA)
- Companion Plants- Plantings within a crop row or in a nearby pollinator strip to benefit a crop by attracting and housing beneficial insects for that crop.
- Bird Houses- Attracting and housing birds that can eat harmful insects is another organic method of pest control.



## INSECT CONTROLS USED ON FARM

- Hedgerows and Pollinator Strips- Rows of trees, shrubs, and other plants around the perimeter of farms or between crops that create isolated environments protected from external problems and can also attract birds and beneficial insects to control pests.
- OMRI Approved Insecticides- OMRI, The Organic Materials Review Institute, supports organic integrity by providing organic certifiers, growers, manufacturers, and suppliers an independent review of products intended for use in certified organic production, handling, and processing. [www.Omri.org](http://www.Omri.org).



# MONITORING INSECTS

- The most important step in pest control is monitoring.
  - Keep an eye on plants for any signs of insect damage.
  - Keep an eye on insect populations, both pests and beneficials.
- Small populations of pests can be naturally kept under control, especially if companion plantings have attracted enough beneficial insects.
- This video details a few ways to monitor insects  
<http://youtu.be/AS3gsSCEwbo>



# SAFETY WHEN SPRAYING

When a “save-the-crop” approach must be taken and sprays or dustings will be used, check that organic products meet OMRI standards.

Always follow the safety protocol on the product you use.

See this video for tips on spraying.

<http://youtu.be/B8WxFRe70qI>



# COMMON HARMFUL PESTS

- **Corn Earworm**
- **Squash Bugs**
- **Striped/Spotted Cucumber Beetle**
- **Cabbage Worm**
- **Aphids**
- **Colorado Potato Beetle**
- **Cutworm**
- **Flea Beetle**



# CORN EARWORM

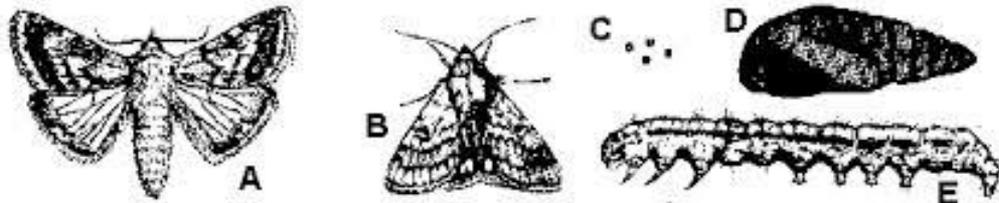


Fig. 79: Corn earworm. A-B, adult. C, Eggs. D, Pupa. E, Larva



- *Range*: From the lower half of Canada stretching to the extreme southern latitudes of southern America
- *Host plants*: Mostly corn and tomatoes. Occasionally found on some bean varieties.
- *Appearance/Habits*: Winters in soil as pupa. Brownish green moth emerges in spring. The moth then lays several thousand eggs on hosts. Several generations are possible in a season. Larvae burrow into cob through silk leaving tunnel of excrement in path.
- *Control*: Planting marigold near corn is helpful. Mineral oil applied to browning silk at tip of ear is helpful. (one dropper per plant maximum)

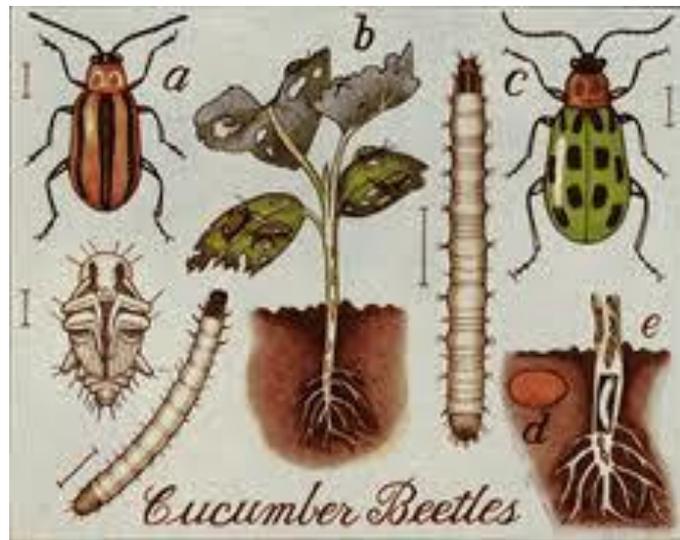
# SQUASH BUGS



- *Range:* Common throughout the US from Central America to Canada.
- *Host Plants:* Squash bugs attack all vining plants, congregating enthusiastically on squash and pumpkins.
- *Appearance/Habits:* Dark brown, sometimes light spotted brown. Hard shell. Three to four inches long. There are five nymph stages before the adults appear in eight weeks. Leaves eaten by squash bugs begin to wilt, blacken, and die. Smaller week plants may be have 40 percent die off rate.
- *Control:* Companion planting with radishes, nasturtiums and marigolds is beneficial.



# STRIPED/SPOTTED CUCUMBER BEETLE



- *Range*: Native to United States and from Mexico to Canada.
- *Host Plants*: The striped cucumber beetle is a pest of the cucurbit family. The spotted cucumber beetle is a much more general feeder effecting up to 250 different vegetables, flowers, weeds and grasses.
- *Habits*: Cucumber beetles affect the garden host plants in numerous harmful ways. They feed on all portions of the host. They can carry cucumber wilt as well as mosaic virus.
- *Control*: Protect transplanted starts with Remay. Straw mulch can slow spread of adults considerably. Predators of cucumber beetles include braconid wasps, nematodes, and soldier beetles.

# CABBAGE WORM



- *Range:* Imported worm/moth arrived on this continent in the late 1800's and can be found throughout the US.
- *Host Plant:* Specializes in members of the cabbage and mustard family but can also be found in other brassicas and some lettuce.
- *Appearance/Habits:* Springtime when temperature becomes warm enough pupa hatch into white butterfly with three or four black spots on their wings. Butterflies lay yellow oval shaped eggs hatching into soft green caterpillars. Caterpillars eat large uneven holes in foliage. They feed for roughly three weeks and pupate. There can be as many as five generations in a season.
- *Control:* Companion plant with tomatoes, onion, garlic, and other alliums. Remy can be effective if used early on in the season. Encourage Braconid wasps by planting strawberries near possible host plants or around gardens.



# CABBAGE WORM CONTROL

## How To Control Cabbage Worms



### Dusting Plants

- Sprinkle damp leaves with corn meal, rye flour or a mixture of one part salt to two parts flour. Cabbage worms that eat this coating will bloat and die.

### Handpicking

- Handpicking in the early morning makes a sizable dent in the worm infestation right away.

### Badminton Racquet Technique

- The white cabbage moths can be ubiquitous in the home landscape. Kids can be enticed to kill the moth on the fly with a badminton racquet. This technique requires some skill in avoiding damage to garden plants and flowers.



# CABBAGE WORM CONTROL

## Netting or Fleece Cover

You can make barriers from a material that allows sun, air, and rain to get through but prevents the adult, white butterfly from getting access to your plants. Nylon netting, fine screening, or agricultural

fleece are all effective barriers, preventing the butterfly from laying eggs at the plant's stem. Cover transplants or newly seeded area with the preferred material immediately after transplanting or seeding so the moth can never get to plants and lay eggs on them. Drape the barrier material

directly over the plants and seal all the edges to the ground. Provide lots of extra material so when the plants grow larger they don't strain against the covering.

## Pantyhose Cover

Use the stocking part of pantyhose or a regular nylon stocking to cover cabbage heads as soon as they start to form. The nylon stretches as the cabbage grows, allowing air, sun, and moisture in but keeping the cabbage butterfly out.



# CABBAGE WORM CONTROL CONTINUED

## Intercropping or Companions

- In experiments done with cabbage, all interplants or companions tested seemed to attract more moths of the imported cabbage worm into the plots for egg laying than if no interplants had been used. Catnip and tansy were most attractive. Catnip companion plantings also increased imported cabbage worm on broccoli. Nasturtiums demonstrated no effect on imported cabbage worms on collards, although gardeners often recommend them. Tansy interplanted with broccoli actually increased imported cabbage worm larvae. Other research is now in progress, but it appears that many of the customary companion plantings designed to reduce imported cabbage worm have no scientific basis.

## Attract Beneficial Insects

- Parasitic (Non-stinging) Wasp - **Braconid** and **trichogramma wasps** parasitize the eggs of imported cabbage worms. They can be attracted to your yard by flowers that look anything like daisies.

<http://gardening.yardener.com/Control-Cabbage-Worm-With-No-Insecticides>



# APHIDS



Brian McCormack, University of Minnesota



Boof

Empress of Dirt

- **Range:** There are many different species of aphids that can be found throughout the United States
- **Host Plants:** Aphids can be found attacking and colonizing on an incredible number of plants. The real garden danger arrives in the form of communicable diseases the aphids can bring to your garden.
- **Appearance/Habits:** Aphids will come in a variety of colors ranging from green, brown, red, yellow, to black. They are generally a wingless soft-bodied insect that colonizes a garden when a few winged aphids land on a suitable host and quickly deposit a number of wingless young on the tender edible part of plants. The young feed on plant sap, maturing in about 10 days, and are ready to produce the next generation. This process repeats until plants become so stressed and weak that winged aphids are reproduced, fly off in search of a new host, and the process repeats. Affected plants decline in overall health until becoming very weak and covered in sticky aphid colonies until eventually die. Large aphid colonies in your gardens will also encourage an unwanted ant population as ants show up to "farm" aphids excretion as a food source. Protecting the aphid colony from natural predators.
- **Control:** Ladybugs and lacewings are the natural predators of aphids but the aphids breeding is so vigorous it generally can out compete the predators. Removing and destroying affected plants is important in control of the general population in your garden.

# COLORADO POTATO BEETLE

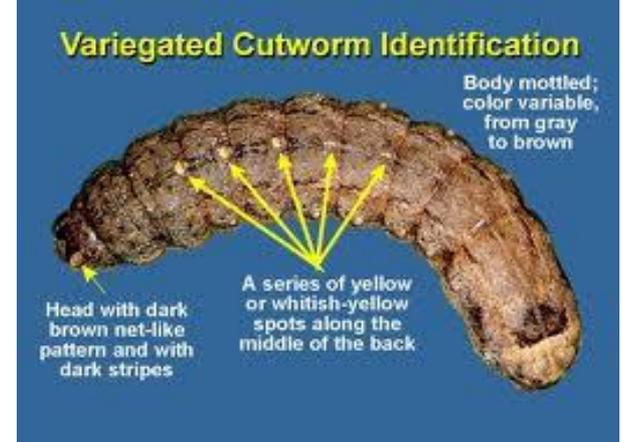


- *Range:* The Colorado Potato Beetle is a native pest United States and began its destructive reign as the Great Plains east of the Rockies fell under heavy cultivation in the 20's. It has now spread to all parts of the USA east of the Rockies as well as some other isolated pockets.
- *Host Plants:* Potato plants are a favorite of these voracious larvae, but the CPB will enjoy a wide variety of plants in the nightshade family such as tomato, peppers, and eggplants.
- *Appearance/Habits:* Colorado Potato Beetles are large wide beetles growing to ½ " in size. Adults are yellow and black striped hard shell beetles. They will lay an egg mass of yellowish orange eggs on the underside of the host foliage. After the hatch, a large deep red larva will emerge and can very easily skeletonize a plant in little time.
- *Control:* Aggressive hand picking of larvae is EXTREMELY important for control of spread as well as health of infested plants. Once larvae emerge and are established on plant a dusting of wheat germ will be ingested causing bloat resulting in death



# CUTWORM

- *Range:* Throughout the majority of the USA.
- *Host Plants:* Cutworms attack a wide variety plants.
- *Appearance/Habits:* Cutworms generally appear as a plump caterpillar that can vary greatly in color.



They can appear solid or variegated in color, often a greenish black with some stripes. When in moth form they generally are brownish black. They are often recognizable curled up around the base of plants laying in the soil. Cutworms can do severe damage to crops in a variety of ways: They can chew through the stalk of a plant leaving the entire plant toppled from the base. They can climb, eating the fruits and stems, they can burrow, chewing on the root structure, and with Army cutworms they will chew the growth tip of plants before moving on to the next available target.

- *Control:* By turning the soil over in the fall after intense cutworm pressure you can expose the larvae, or you can deeply bury any pupae. Thorough cultivation in the spring after the plants emerge and frequent cultivations through out the season will expose cutworms to predators. Dig around base of plant destroyed by cutworm to find worms responsible. Planting sunflowers as a trap crop around the garden will attract cutworms and expose them for disposal. Wood ashes around the base of plants may be strong deterrent.

# FLEA BEETLE

- *Range:* Throughout the United States.
- *Host Plants:* Flea Beetles will chose various host depending on what variety of beetle is present.  
Pressure on plants in the Brassicas family can become especially tough as spring turns to the hot summer of Oregon and weed host plants dry up and leave the irrigated garden plants extremely attractive to flea beetles.
- *Appearance/Habits:* Flea Beetles are generally very small shiny black hopping beetles that will jump for safety when approached by the farmer. Its this characteristic that makes Flea Beetles an extremely challenging garden pest to deal with. There plant damage is easily recognizable by the hundreds of small irregular holes chewed through the foliage of weakened plants. It often looks like tiny shotgun peppering on the leaves.
- *Control:* Because of the challenge in catching and killing flea beetles without the use of pesticides, the organic farmer has the best opportunity to avoid heavy infestation by applying a good regimen of diversification, crop rotation, and adequate watering. Under watered plants are more susceptible to heavy populations. There has been some effective control using bug vacuum systems. Early use of Remay may help the spread and heavy pressure.



# BENEFICIAL AND PREDATORY ALLIES



## **Lady Beetle (Lady Bug)**

- *Prey/Habits:* The Lady Bug feasts on many small soft-bodied insects such as aphids and spider mites. A single Lady Bug can consume up to 500 aphids a day. They often are most valuable for the farmer or gardener when contained which is why they are often employed in a greenhouse type situation. The larvae of ladybugs are strictly predators, but the adults will sometime feed on pollens and nectars. They are not harmful to plants. Lady Beetles born in the summer time may only live a few weeks to a month however over wintering Lady Beetles can survive up to ten months. The Lady Beetles sold in stores are generally of the variety Hippomania Converges or the convergent Lady Bug. The problem with this variety is they have a tendency to flee the sight. Another drawback is that they are generally incapable of laying eggs.
- *Appearance:* The larvae are black and longer than the adults with speckled yellow or orange dots on there back. The adults are shiny and generally red with some black spotting on there back.



# BENEFICIAL AND PREDATORY ALLIES

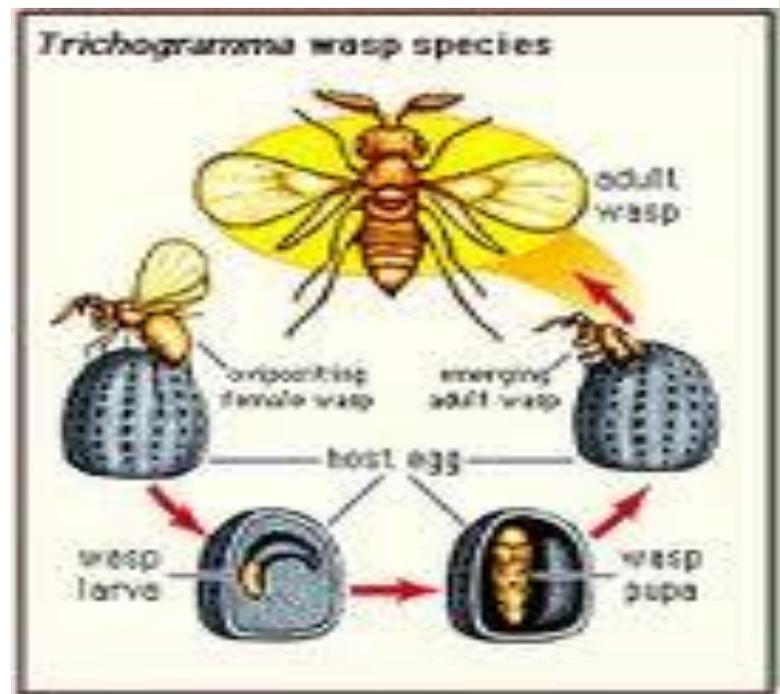


## Lacewings

- *Prey*: Lacewings feed primarily on caterpillars, small beetles, soft-bodied insects such as aphids, and some larvae. Both larvae and adults are predatory, and use their modified jaws to suck the liquid inners out of their prey.
- *Habits*: Lacewings will mate and lay their eggs on any surface like windows, sides of homes etc. They will molt several times before spinning a silk cocoon and disappearing to pupate. They will emerge relatively quickly and can go through multiple generations in a season
- *Appearance*: Lacewings are generally a green-bodied long insect with two pairs of wings. Their wings are covered with a lacey veining pattern that is quite delicate. They have large compound eyes next to long antennae.



# BENEFICIAL AND PREDATORY ALLIES



## Trichogramma Wasps

- **Prey:** Trichogramma Wasps are amazing predators as they parasitize other insects egg masses. They are known to attack over 150 different insect species such as cabbage loopers, hornworms, cutworms, as well as many different moth larvae.
- **Habits:** Adult wasps seek out eggs following odor. The parent wasp then deposits her egg inside the host egg. Once the wasp hatches, it begins to consume the contents of the egg. The larva then pupates, and eventually chews out of the egg as adult and flies off to locate next host egg.
- **Appearance:** One of the smallest insects on the planet, they look just like larger wasps but are not much bigger than the head of a pin. Wasps have two pair of wings and the females are equipped with a stinger. This is used for probing possible host eggs.

# BENEFICIAL AND PREDATORY ALLIES



## Praying Mantis

- *Prey:* The Mantis will eat just about anything that suits its appetite, feasting largely on any insects that happen by. They have been known to eat birds. The mantis will either stay absolutely still and wait for its prey to walk by, or it will slowly and purposefully creep towards its prey. It will then strike out with its folded forelegs, grasping or even impaling its prey. These beneficial garden friends do not differentiate between allies and pests in the garden.
- *Habits:* The mantis is a strange creature with stranger habits. When the mantis mates, the female will often kill the male in the throws of passion. The male can continue to have fruitful intercourse for several minutes after he loses his head. The mantis often sways back and forth when it moves possibly simulating the wind influenced movements of the tree or foliage its hiding on.
- *Appearance:* The mantis is a large insect, measuring from a centimeter being the smallest variety, to the largest being six inches. Most mantises are green or greenish/brown, however tropical mantis can be pink. They have swiveling heads that can turn a full 180 degrees, and their main defense against larger predators is their camouflage. Some mantises have hollow bodies that they use as an echo location chamber to "hear" bat frequencies and therefore avoid being eaten by hurling themselves to the ground.

# BENEFICIAL AND PREDATORY ALLIES

## Tachinid Fly

*Prey:* The tachinid fly will parasitize grasshoppers, beetles, larvae, caterpillars etc. They will often take on large hosts such as the tomato hornworm. Some not all species are host specific, only preying on there chosen diet.



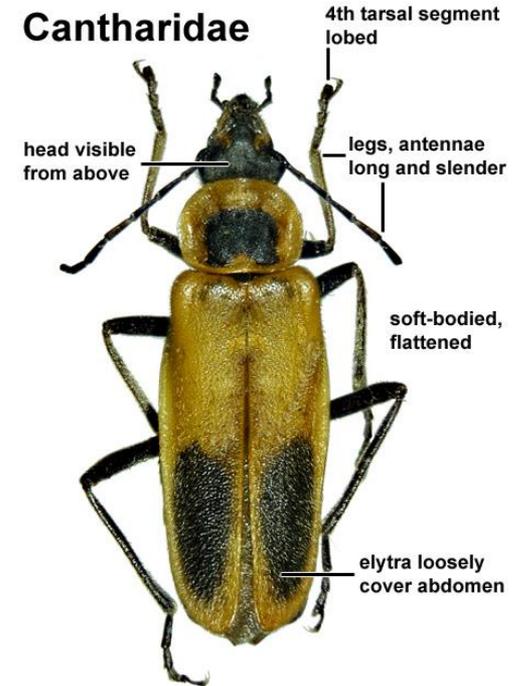
- *Habits:* The female tachinid fly will lay her eggs on the host insect skin, however sometimes the eggs will be injected into the body of the host. The larvae then hatch and feed on host insect. Sometimes the host ingests the fly's eggs only to have the fly destroy the host upon hatching. Adults enjoy pollen and nectar as well, and can serve dual purpose in the garden as pollinators.
- *Appearance:* This large fly often will be seen with a blue metallic abdomen. There are over 1400 North American species in the family Tachinidae. Adults have incredibly distinct bristles on the end of their abdomens. They are a similar size to the common housefly but can occasionally resemble bees.



# BENEFICIAL AND PREDATORY ALLIES

## Soldier Beetle

- *Prey:* Soldier Beetles enjoy aphids, beetle larvae, larvae, and many other common pests. Adults and larvae soldier beetles are both predatory
- *Habits:* Some soldier beetles can be attracted by growing nectar rich flowers in the garden. Adult females lay their eggs in the soil, and larvae emerge shortly thereafter and begin to feed. Adults will often relax and wait by a good source of pollen, feeding on pollen and nectars until a good prey comes along. The adults will take advantage of the prey insect that has landed to do the same.
- *Appearance:* Soldier Beetles, (a.k.a. leatherwings), get their name from the soft uniform like clothed appearance of their wings. They're about half an inch in length and generally have a yellow or reddish underbody with brown or black wings. Larvae are velvety in nature with large protrusions from their heads.



## ASSESSMENT/REVIEW

- Identify a common harmful pest. Discuss its range, host plants, appearance, habits, and methods of control.
- Identify a common beneficial insect. Discuss its appearance, habits, and its prey.



# WEBSITES FOR ADDITIONAL RESOURCES

- <http://extension.entm.purdue.edu/>
- <http://extension.entm.purdue.edu/radicalbugs/default.php?page=home>
- <http://web.pppmb.cals.cornell.edu/resourceguide/pdf/resource-guide-for-organic-insect-and-disease-management.pdf>
- <http://www.omri.org/>
- <http://www.extension.umn.edu/garden/insects/>
- <http://entomology.tamu.edu/>
- [http://www.clemson.edu/extension/hgic/pests/plant\\_pests/veg\\_fruit/](http://www.clemson.edu/extension/hgic/pests/plant_pests/veg_fruit/)

