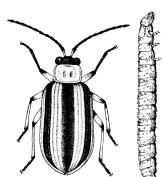
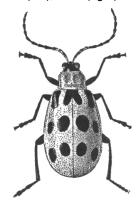
## **Cucumber Beetles**

- The **striped cucumber beetle** (*Acalymma vittatum*) is the key pest of cucurbits and its control usually takes precedence over all other pests, especially in the seedling stage.
- The **spotted cucumber beetle** (*Diabrotica undecimpunctata howardi*) is similar to striped cucumber beetle in importance, but it usually does not get numerous until mid-summer. The spotted cucumber beetle is also called the southern corn rootworm.
- The western corn rootworm beetle (*Diabrotica virgifera virgifera*) and northern corn rootworm beetle (*Diabrotica barberi*) feed in cucurbit flowers but do not vector bacterial wilt. Larvae of both of these species feed on corn roots, not cucurbit roots.
- Damage: Adults and soil-inhabiting larvae of the striped and spotted cucumber beetles cause stand loss and yield loss by several types of attack: 1) adults transmit bacterial wilt disease; 2) adults feed on leaves and stems in the spring, and later feed on blossoms and on fruit, especially the underside of small fruit; 3) larvae feed on roots, causing wilting; 4) larvae feed on rinds of fruit where fruit are in contact with soil. Damage by adult beetles is more serious than damage by larvae. Plants are most vulnerable immediately after they are transplanted, or as soon as seedlings emerge from the soil for direct-seeded crops, when they can be devoured by congregations of beetles. Damage can be worst on moist soils that are more favorable for development of eggs and larvae. Adults often congregate on certain plants, apparently due to an aggregation pheromone.
- Appearance: Adults are black and yellow beetles, 1/4 inch long. Larvae are white, 1/3 inch long when fully grown. The *striped cucumber beetle* has a black belly and sharply distinct stripes that extend to the tip of the wing covers, while the *western corn rootworm beetle* has a yellow belly and somewhat wavy stripes that do not extend to the tips of the wing covers. The *northern corn rootworm beetle* is solid pale green. The *spotted cucumber beetle* is greenish yellow with black spots and is somewhat larger than the other species.
- Life cycle: Cucumber beetles overwinter as adults in fields, hedgerows, and woodlands, usually within 1 mile of their origin. In the spring, adults feed on wild plants until the first cucurbits emerge. Fields closest to woodlands are often attacked first. Eggs of striped cucumber beetles are laid at the plant base or in cracks in the soil; larvae feed in soil for 2 to 6 weeks, then pupate in soil. There are usually two generations per year. Both the striped and spotted beetles can overwinter in Ohio, but the striped beetle is generally a more serious pest because it survives Ohio winters much better than the spotted beetle. Western corn rootworm and northern corn rootworm have only 1 generation per year; they overwinter as eggs on corn roots, and appear as adults in early July.
- Biological controls: A parasitoid tachinid fly (*Celatoria setosa*) attacks the adults. Wolf spiders and harvestmen prey on eggs at or below ground level.
- Cultural controls: Delay planting (wait until mid-June); plant excess seed; promote rapid germination and crop growth; use varieties resistant to bacterial wilt; plant a perimeter trap crop of buttercup or hubbard squash two weeks before the main crop.
- Mechanical controls: Cover the crop with row covers until blossoming. For mass trapping, an kairomone trap is under development by Trécé Inc.
- · Chemical control:
  - Application of systemic insecticide controls beetles for about 3 weeks; this includes commercial seed treatment with thiamethoxam (FarMore FI-400), or an atplanting soil treatment with imidacloprid (Admire Pro) or thiamethoxam (Platinum) or clothianidin (Venom, Scorpion). Seed treatment is recommended for directseeded crops but not recommended for transplanted crops.
  - If a systemic is not used at planting, then scout twice per week until the 4-leaf stage; spray if the average is more than 0.5 beetle per plant.
  - Do not spray when flowers are open to avoid killing bees. Spray in late evening in crops that have flowers that remain open for more than one day.
  - During peak activity of beetles, additional sprays might be needed every 5-10 days. Insecticide choices are carbaryl (Sevin), pyrethroids (Ambush, Asana, Baythroid, Brigade, Danitol, Mustang Maxx, Pounce, Warrior), neonicotinoids (Actara, Admire Pro, Assail, Belay, Scorpion, Venom), and malathion. Methomyl (Lannate) is allowed only on cucumber, melons, and summer squash. Organic growers can use either kaolin (Surround) or a mixture of spinosad (Entrust) and the bait Cidetrak-D, which contains cucurbitacin, a natural product that is a feeding stimulant and movement arrestant.



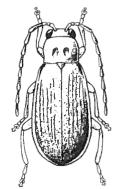
striped cucumber beetle adult (left), larva (right)



spotted cucumber beetle



western corn rootworm beetle



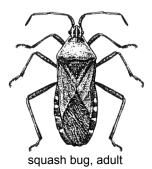
northern corn rootworm beetle

## Squash Bug

- Damage: The adults and nymphs feed by sucking sap from leaves and stems. Feeding causes plants to wilt, and patches of leaf tissue to turn black and dry. Young plants can die, or plants may live but not develop fruit. The squash bug can be a serious pest of winter and summer squash, gourds, and pumpkins but does not usually attack melons or cucumbers.
- Appearance: Adults of the squash bug (Anasa tristis) are dark brown, 2/3 inch long. Eggs are brown, shiny, oval, and usually in clusters on the underside of leaves where two veins meet. Nymphs are initially green, later grey. Adults of another species, the horned squash bug (Anasa armigera), are similar but slightly smaller, with lighter colored legs and body, and a pair of short horns near the base of the antennae.
- Life cycle: The squash bug overwinters in the adult stage in debris at field margins, under sheds, firewood, or other protected places. It emerges to mate and lay eggs in June. Eggs are laid on the undersides of leaves, and hatch in 1 to 2 weeks. For about one month. nymphs feed during the daytime and hide under debris on soil at night. There is one generation per year.
- Biological control: A parasitoid tachinid fly (Trichopoda pennipes), sometimes called the featherlegged fly, attacks the adults. Its white oblong eggs are often seen on the outside of the adult squash bugs. Several species of parasitoids attack the eqgs of squash bug.
- · Cultural controls include crop rotation with non-cucurbit crops, promoting rapid early growth of the crop, and sanitation: destroy overwintering sites by removing crop refuse, plowing, and mowing field edges.
- Mechanical control in small plots includes hand picking of eggs, nymphs, and adults, and use of board or shingle traps which are placed on the ground under plants and checked every morning so that bugs hiding beneath them can be destroyed.
- · Chemical control: adults are difficult to kill by insecticides. Nymphs are more susceptible to insecticides but can be difficult to hit due to their location on undersides of leaves in canopies than can be dense. Pyrethroids (Ambush, Asana, Baythroid, Brigade, Danitol, Mustang Maxx, Pounce, Warrior) are most effective. Carbaryl (Sevin) generally does not work well for controlling this pest. Methomyl (Lannate) is effective but is allowed only on summer squash. Spinosad (Entrust) kills the nymphs but not the adults.

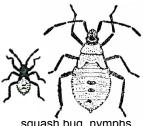
## Squash Vine Borer

- Damage: The squash vine borer (Melittia cucurbitae) can be a serious pest of zucchini and other squash and gourds. Larvae bore into stems, usually at the base, causing plants to wilt suddenly and die beyond the point of attack. There is a narrow window of opportunity for controlling this pest because it is protected once it bores into the stem.
- Appearance: Larvae are fat white grubs with brown heads, 1 inch long when fully grown. The adult is a wasp-like moth that has a black and orange body, metallic green forewings, transparent hindwings, and hairy black and orange hindlegs.
- Life cycle: This pest overwinters as a full-grown larva in a cocoon in the soil. In the spring it pupates, and in June it emerges as a moth. The moth is active during the daytime and lavs eggs at the base of plant stems. Eggs take 6 to 15 days to hatch. Larvae bore into stem and feed for about one month. It usually has one generation per year in Ohio but has a partial second generations in hot years.
- · Cultural controls include destroying vines after harvest to kill any larvae that remain inside them; disking soil to destroy overwintering cocoons; and crop rotation with non-cucurbit crops. A border row planted 2-4 weeks earlier than the main crop can act as a trap crop.
- Mechanical controls: A traditional method of control that is feasible in small plots is to slit the stem below the wilted part, remove the borer, and cover the wound with soil above the injury to promote additional root formation. Stems can be wrapped with nylon or plastic to prevent or discourage egg-laying.
- · Chemical control: Borers can be managed by sprays of insecticide directed at stem bases during the time of egg hatch. Egg hatch can be estimated by monitoring moth activity with a pheromone trap placed close to the canopy. Moths usually emerge from early-June to mid-July. Sprays at 7- to 10-day intervals from mid-June until late July are usually effective. Pyrethroids (Ambush, Asana, Baythroid, Brigade, Danitol, Mustang Maxx, Pounce, Warrior) give good control. Other choices include carbaryl (Sevin), and pyrethrins + PBO (EverGreen).

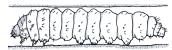




horned squash bug, adult



squash bug, nymphs



squash vine borer: larva in stem



squash vine borer: adult with wings folded



squash vine borer: adult with wings spread

#### Aphids

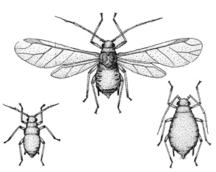
- Damage: The melon aphid, the green peach aphid, and the potato aphid feed by sucking sap from cucurbit leaves. Damage due to their feeding activity includes curled leaves, stunted or distorted vines, lower yield, poorly developed prematurely ripe fruit, and poor melon flavor. Damage is also due to their transmission of several virus diseases such as watermelon mosaic virus, cucumber mosaic virus, and papaya ringspot virus.
- Appearance: Aphids are soft-bodied, 1/16 to 1/8 inch long, with a characteristic pair of cornicles ('tail-pipes') projecting from the back end of the abdomen. There are both winged and wingless adult forms. Immatures are nymphs, which resemble wingless adults but are smaller.

• The **melon aphid** (*Aphis gossypii*) is green to greenish-black, or yellowish, with white legs, black feet, and black cornicles. The winged forms are shiny; the wingless forms are dull due to a slight waxy powder. They feed on the undersides of leaves and spread to terminal shoots. They may be more abundant on the lower part of the plant. Wingless forms are usually 0.9 to 1.8 mm in length.

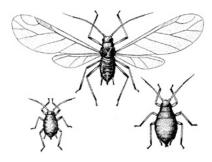
• The green peach aphid (*Myzus persicae*) varies in color from light green to translucent to pink; the cornicles are the same shade as the body. The body is egg-shaped, with the width of the abdomen about the same from the thorax to the bases of the cornicles, the cauda (tail) is short, and cornicles are slightly swollen at the tip. The winged form has a dark patch in the middle of the back. Wingless forms are usually 1.2 to 2.3 mm in length.

• The **potato aphid** (*Macrosiphum euphorbiae*) is much larger than the green peach aphid and is yellow, green, or pink, with a darker dorsal ridge. The body is elongate and wedge-shaped. The cornicles are longer than the distance between their bases. Wingless forms are usually 1.7 to 3.6 mm in length.

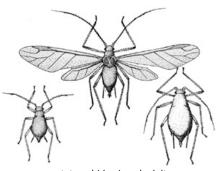
- Life cycle: Aphids have complex life cycles. Most species overwinter as eggs: green peach aphid eggs on peach or related trees, potato aphid eggs on roses, and melon aphid eggs on live-forever (*Sedum purpureum*). Once eggs hatch in the spring, the aphids go through many generations without males, and females give birth to live young rather than laying eggs. In the fall, males are produced and they go through the sexual part of their life cycle before eggs are laid on winter hosts. There can be many generations per year.
- Biological controls: Aphids have many natural enemies, including lady beetles, lacewings, hover flies, and parasitic wasps.
- Cultural control includes disking or plowing fields as soon as possible after harvest, row covers until blossoming, and controlling weeds around field margins. Reflective mulches can be used to repel winged aphids as they are seeking a fields to colonize.
- Chemical control: Aphids are easier to kill by insecticides when infestations are low. before leaves begin curling and thus protecting the aphids from spray droplets. The melon aphid is more difficult to control than the other aphid species. Some insecticides are registered for use on all cucurbits while others are allowed on only some cucurbit crops, so be sure to read labels carefully before applying any product. Neonicotinoids (Admire Pro, Actara, Assail, Belay, Platinum, Scorpion, Venom) are systemics that are very effective for aphid control but should be used with care once flowers appear to avoid harming pollinators. Other chemicals used for control include pymetrozine (Fulfill), flonicamid (Beleaf), sulfoxaflor (Closer), oxydemeton-methyl (MSR or Metasystox-R); malathion can be used after vining. Dimethoate and methomyl (Lannate) can be used for aphid control on melons but not pumpkins. The use of carbaryl (Sevin) for control of cucumber beetles should be avoided because it is highly toxic to many natural predators of aphids and thus can cause aphid resurgence. Pyrethroids (Ambush, Asana, Baythroid, Brigade, Danitol, Mustang Maxx, Pounce, Warrior) can kill light infestations of aphids but do not do a good job on control of heavy infestations of aphids. Insecticidal soap, such as M-Pede or Des-X, is a less harsh option, and an option for organic growers. Stylet oil does not kill aphids but can be used to block virus transmission; it must be applied twice per week at high pressure.



melon aphid: winged adult female (center); immature female (left), wingless adult female (right)



green peach aphid: winged adult female (center); immature female (left), wingless adult female (right)



potato aphid: winged adult female (center); immature female (left), wingless adult female (right)rootworm beetle

## **Spider Mites**

- Damage: The two-spotted spider mite (*Tetranychus urticae*) spins webbing and sucks sap from the undersides of leaves, causing a speckled or bronzed look. Its feeding can impair the size, flavor, and sugar content of melons, and can cause leaves to die if populations are very heavy. It can be most damaging when weather is hot and dry; these conditions promote rapid reproduction and growth.
- Appearance & life cycle: Adults are 8-legged, 1/60 inch, white bodied with two dark spots. Nymphs are smaller and darker. A new generation of mites can be produced in just 10 days. They overwinter as adults in ground cover.
- Management: Spider mites are usually controlled by natural enemies. If outbreaks occur, the crop can be sprayed with abamectin (Agri-Mek), bifenazate (Acramite), spiromesifen (Oberon), or etoxazole (Zeal). Other choices are insecticidal soap (M-Pede), oxamyl (Vydate), oxydemeton-methyl (MSR [Metasystox-R]), and malathion. The spider mite population at some locations is no longer susceptible to organophosphates such as MSR and malathion. The pyrethroids bifenthrin (Brigade) and fenpropathrin (Danitol) can be used at the maximum rate but are usually effective only if the mite population is not large. Note that dimethoate, fenpyroximate (Portal), and dicofol (Kelthane) are allowed on some but not all cucurbits.

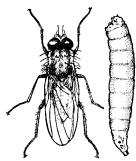
### Seedcorn Maggot

- Damage: The seedcorn maggot (*Delia platura*) feeds on organic matter in the soil, including seeds before or after sprouting. This pest can be a problem in early plantings when germination is slow, as occurs in cool, wet springs. Stand loss results if there are 4 maggots per cucumber seed, or 2 maggots per winter squash seed (in contrast to 40 maggots per corn seed, or 20 maggots per soybean seed). Seedlings may emerge but be leafless or show light feeding damage on leaf margins.
- Appearance & life cycle: Maggots are small white legless larvae, 1/4 inch long; the adult form is a gray fly. They overwinter as larvae in puparia in soil, and flies emerge in April or May and search for soils high in organic matter to lay eggs; recently worked soil seems to be favored for egg laying. Although there are 3 generations per year, the first generation is generally the only important one.
- Management: Injury can be avoided by planting under conditions that promote rapid seed germination and growth, and by fall plowing. Do not plant for 3 weeks after incorporating organic matter, including cover crops and weeds. Use seed that has been treated with insecticide.
- **Squash beetle:** The squash beetle (*Epilachna borealis*) is a southern species that is occasionally seen in Ohio. It is a lady beetle but this species is a pest, not a predator like most lady beetles. Both the larvae and adults feed on the underside of cucurbit foliage, although they can also attack blossoms and fruits. Squash beetle resembles its relative, the Mexican bean beetle; the squash beetle adult has 7 spots on each wing cover while the Mexican bean beetle has 8 spots. Larvae are yellow with branched spines, and reach a length of 3/8 inch. Adults are round, 1/3 inch long, and dull reddish or yellowish brown with black spots.
- **Pickleworm & Melonworm:** These pests do not overwinter in Ohio; they live in more southern states but the moths can occasionally migrate to northern areas late in the season. The larva of the pickleworm (*Diaphania nitidalis*) feeds for 2 to 4 weeks, first on buds and young fruit, also blooms and stems, and later on maturing fruit, where it makes shallow cavities in the rind, or bores through the rind and feeds on the fruit interior. The brown headed larva is initially yellowish white with dark spots; later the spots disappear and the color becomes yellowish green; it is 3/4 inch long when fully grown. The adult is yellow brown with a purplish tinge, with a brush at the tip of the abdomen. Pickleworm moths lay eggs on buds, leaves, stems, or young fruits. The larva of the melonworm (*Diaphania hyalinata*) feeds on foliage, or on fruit if no foliage is present. The larva has 2 light stripes down its back; it reaches a length of 0.75 to 1.25 inches.
- **Other occasional pests:** cutworms, pale-striped flea beetle, leafhoppers, European corn borer.

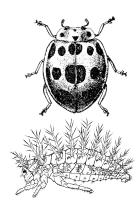
Celeste Welty, Extension Entomologist, Ohio State Univ.; August 1994, revised February 2001, July 2013, June 2014, January 2017.



two-spotted spider mite



seedcorn maggot: adult (left); larva (right)



squash beetle: adult (top); larva (bottom)



pickleworm (larva)



pickleworm (adult)