

Squash Vine Borer

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Introduction

Squash vine borer, *Melittia curcurbitae* (Harris), is a moth that belongs to the family Sesiidae in the order Lepidoptera.

Description

Adult squash vine borers are robust, attractive moths with dark wings and conspicuous orange abdomens dotted with black spots (Fig. 1). The legs are marked with orange, black, and white, and the hind legs are noticeably feathery. Adults measure about 13 mm (0.5 inch) long with a wingspan of about 32 mm (1.25 inches). The dark wings are held folded at rest and there is a short fringe of hairs on the trailing edge. Squash vine borer is a member of the clearwing moth family; the translucent windows in the hind wings are visible when fully extended. The antennae are dark, somewhat flattened, and hooked at the tips. Overall, adult squash vine borers resemble paper wasps in appearance. They are active day fliers with a zigzag flight and easily travel from field to field.



Figure 1. Mating squash vine borer adults (Jeff Hahn, University of Minnesota Cooperative Extension).

Squash vine borer eggs are reddish-brown, flattened ovals about 1 mm (0.04 inch) long. Larvae are whitish with a dark head capsule. Mature larvae are stout, grub-like caterpillars with heavily segmented bodies, measuring 2.5 cm (1 inch) long when full grown. Pupae are a mahogany brown in color and measure about 19 mm (0.75 inch).

Life History

Squash vine borer has a complete life cycle of egg, larval, pupal, and adult stages. Eggs are laid singly on the host plant near the soil line. Larvae hatch in 8–10 days and soon bore into vine at the main stem or runner. Newly hatched larvae bore into the stems, which protect them as they feed and mature for several weeks. The appearance of wet, pulpy frass (fecal matter) at holes in the stem of a cucurbit indicates infestation by squash vine borer larvae (Fig. 2). Internal feeding eventually girdles the vascular system, causing wilting and death of the plant above the feeding site. Mature larvae burrow several inches deep in the soil to overwinter as either a mature larva or as a pupa in an earthen cell lined with tough silk. Adults emerge from the soil in the spring. Total developmental time from egg to pupa averages 62–65 days, and adults are relatively short-lived, living approximately 3–5 days (Canhilal et al. 2006). Adults feed on nectar. There may be 1 or 2 generations per year.

Common Host Plants

Squash vine borer attacks many different types of cucurbits: summer squashes, pumpkins and winter squashes, and gourds. Sometimes it is

found in muskmelons or other melons. Host attractiveness varies by the species of curcubit (Seaman 2013). Hubbard squash is a preferred host plant while cucumbers and butternut squash are largely avoided.



Figure 2. Base of infested curcubit plant with a squash vine borer larva (Alton N. Sparks, Jr., University of Georgia, Bugwood.org).

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Damage

Larvae bore into the base of a squash plant and feed internally, girdling the stem or runner (Fig. 2). Infestation of runners may only cause dieback of the vine, but infestation of the main stem will kill the plant. Larvae may attack developing fruits later in the season (Fig. 3). Infested plants may have more than one larva and bacterial decay can invade through the entrance holes. Often an infested plant will wilt and die before any damage is noticed. Examine the vine for wet, pulpy frass (fecal material) at borer entrance holes to distinguish squash vine borer damage from bacterial or Fusarium wilt diseases. Management of squash vine borer can

be difficult in small-scale production as just a few adult moths can infest many plants. Home gardens with only a few squash plants are more likely to lose entire crops than commercial fields with a larger number of plants set out.



Figure 3. Squash vine bore larva feeding on the underside of a mature pumpkin fruit (Jim Jasinski, Ohio State University Extension, Bugwood.org).

Distribution

Squash vine borer is found throughout eastern North America.

Cultural Control

Plant transplants early when possible; plantings made in early spring may bear a crop before squash vine borer can kill the vines. If feasible, consider a late planting of curcubits after the main flight period of squash vine borer, when adult females have finished laying eggs. Floating row covers can be used to exclude the female moths from laying eggs at the base of the vines. However, row covers must be removed to allow pollinators to visit the blossoms. Consider rotating fields of curcubits annually with non-curcubit crops to avoid squash vine borer overwintering in the same ground each year, but the adults are highly mobile and will likely find squash fields at some point during the growing season. Promptly crush or otherwise destroy any plants killed by squash vine borer to kill larvae still within the vines before they enter the soil to pupate. Spading, tilling, or disking in early fall

will kill pupae in the soil and suppress adult populations the following spring.

Butternut squash and other varieties classified as *Curcubita moschata* are less favored host plants for squash vine borer and may be planted instead of *C. maxima* varieties that are more preferred by the pest (Seaman 2013). A trap crop of Hubbard squash (*Curcubita maxima*) can be planted to attract squash vine borer away from summer squash (Boucher and Durgy 2003). The goal is to have the Hubbard squash in a more attractive stage of development than the cash crop when the squash vine borer arrives. Treat or destroy the trap crop after the peak egg-laying period to kill any developing larvae before they enter the soil to pupate. Many heirloom summer squashes and winter squash varieties classified as *Curcubita maxima* will root along running vines when in close contact with the soil, which may be an advantage over bush-type curcubits. The varieties with supplemental rooting may better withstand squash vine borer attacks at the base of the stem. Supplemental rooting can be encouraged by heaping moist soil over the vines at multiple locations along the vine. If squash vine borer is found at the base of the vine, the vine can be severed ahead of the damage to isolate the larva with the hopes that supplemental roots farther along the vine will allow the rest of the vine to live.

Commercial pheromone traps for squash vine borer are available to detect adult populations in the field. Degree days can also be used to predict adult flight. Adults emerge from the soil at approximately 1000 degree days in the early summer (begin measuring on Jan 1 starting with a 50°F base), usually when vines begin producing runners. Wisconsin growers monitor plants weekly for signs of infestation beginning at 950 degree days (Delahaut 2005). Sprays, if used, should be applied when adults are first seen.

For home gardens, stems infested with squash vine borer can be slit open along the vine to locate and remove the caterpillars. Destroy any larvae found so they cannot re-infest the plants. Encourage rooting at the slit by heaping moist soil over the injured stem. Alternatively, use a stiff wire to probe the damaged part of the stem through the entrance hole to kill the larva without slitting open the stem. Home gardeners can wrap the base of vines with a barrier such as aluminum foil, netting, pantyhose, etc. to prevent larva from boring into the vine. Adults are attracted to yellow colors similar to the shade of squash blossoms; trap adults in shallow yellow pans or bowls filled with water. These control methods are generally too labor-intensive for large plantings.

Organic/Biological Control

No satisfactory biological control agents are commercially available for squash vine borer. General practices to conserve natural enemies should be followed. Azadirachtin, neem oil, pyrethrins, and spinosad are labeled for use against squash vine borer. Kaolin clay sprays may also be used as a crop protectant. Certified organic growers should always check that an organic method is approved by their certifier. Direct sprays to the basal portion of the plant where female squash vine borer are likely to deposit eggs. For home gardens, slowly inject a Bt (*Bacillus thuringiensis*) formulation labeled for caterpillars into each entrance hole. This technique is not feasible for large plantings as the work must be done by hand.

Chemical Control

In general, cultural control methods are more effective in managing squash vine borer than relying on chemical controls (Adam 2006). Begin treating with a registered insecticide when adults are first seen. Chemical sprays should be directed towards the base of the vines and along stems under the foliage canopy. Larvae must be killed before they enter the vine where they are protected from insecticides.

Repeat applications following labeled rates until egg-laying by squash vine borer has ceased. For treatment recommendations for squash vine borer, see the current Mid-Atlantic Commercial Vegetable Production Recommendations (VCE Publication 456-420) for commercial fields or the Home Grounds and Animals Pest Management Guide (VCE Publication 456-018) for home gardens. Use of spinosad or spinetoram for looper control in commercial fields will also suppress squash vine borer populations. As with all pesticides, follow the label instructions carefully with regards to rates and precautions.

Note: Spotted cucumber beetle and squash bug are two other major pests of cucurbits. Their management should be integrated with that for squash vine borer.

Useful References

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