K-STATE
Research and Extension

Home and Horticultural PESTS

Tomato and Tobacco Hornworms

Hornworms are the larvae of a wide variety of moths in the Sphingidae family (Order: Lepidoptera). They are named for the distinctive spine that protrudes from the rear abdominal segment. Common names include sphinx moth (when disturbed, larvae rear their heads and resemble the Egyptian Sphinx), hawk moth (for their fast flight), and hummingbird moth (for their ability to hover and probe flowers for nectar).

Of the more than 125 species of sphingid moths in North America, the two most familiar to vegetable gardeners are the tomato hornworm (*Manduca quinquemaculata*) and the tobacco hornworm (*Manduca sexta*). Moths of both species possess a wingspan of up to 5 inches. The unfurled proboscis may reach 4 inches in length. Tomato and tobacco hornworms can be distinguished by the number of orangish-yellow spots on the abdomen and wing pattern (Figure 1).

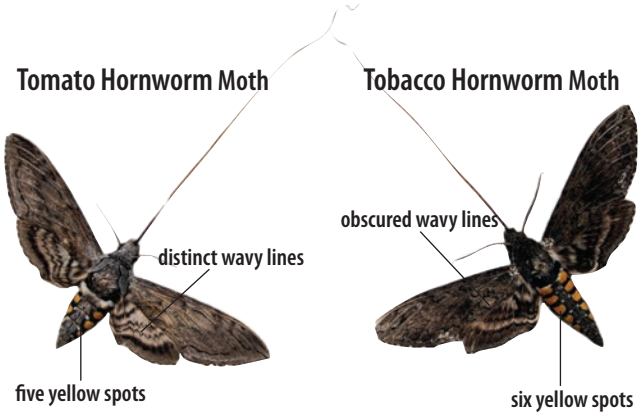

Figure 1.

Larvae are similar to each other in shape, size, and color. Both are various shades of green. The tomato hornworm possesses a black horn and eight light-colored chevrons. The tobacco hornworm has a red horntail and seven diagonal lines (Figure 2).

Figure 2.

Tomato and tobacco hornworms undergo complete metamorphosis, progressing through egg, larva, pupa, and adult stages (Figure 3).

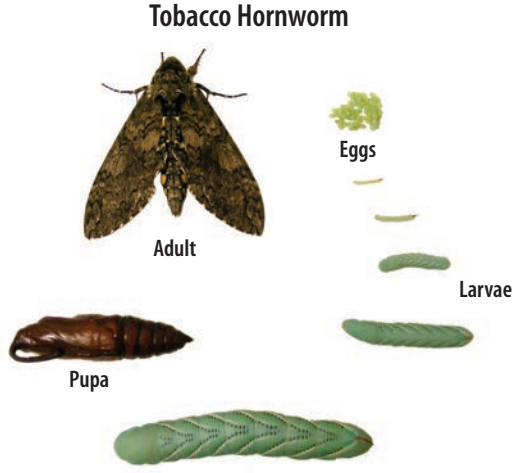

Figure 3.

Seasonal Life History

In Kansas, moths of both species are present throughout the summer. Two flight peaks suggest tomato and tobacco hornworms each produce two generations per year.

Tomato and tobacco hornworms overwinter as pupae protected within delicate earthen cocoons (Figure 4a). Spring tillage breaks cocoons and exposes pupae (Figure 4b), which can be found in the garden. The pupa is mahogany brown, 2 to 2.5 inches long, with a handle-like structure (Figure 4c) containing what will become the moth's proboscis (mouthparts).

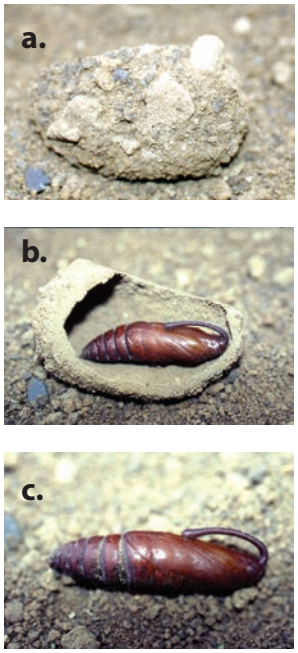

Figure 4.

Moth emergence and mating begins in mid-June. Round, greenish eggs are deposited on the undersides of leaves. Preferred host plants are members of the Solanaceae family — tomato, potato, eggplant, and moon flower. Larvae emerge within a week and feed for 30 to 50 days. Mature larvae enter the soil for pupation, which leads to emergence of second-generation moths that will deposit eggs. Mature second-generation larvae will transform into overwintering pupae.

Damage

While hornworms may be of little economic concern in commercial production fields, in home gardens, a single defoliated plant may be unacceptable. Small larvae feed for weeks going undetected because they do not consume much leaf tissue. Larvae in the final feeding stage can cause visible leaf damage as shown in the photo top right (Figure 5). A plant with several hornworms can be stripped of leaves, seemingly overnight. Yet hornworms may be difficult to locate because they are hidden by foliage as they move from one feeding site to another (Figure 6). Larvae feed on green fruit, which can scar and reduce marketability of larger fruits (7a). Cherry tomatoes may be completely destroyed (Figure 7b).

Noninsecticidal Control

Hornworm damage is sporadic. Several detection methods can be used. Blacklight traps help detect moths during flight periods. This technique requires diligent, nightly trapping. Presence of moths does not necessarily mean they will deposit eggs in the garden.


Figure 5. Leaf damage, upper right.


Figure 6. A hornworm larva camouflaged by foliage.


Figure 7a.


Figure 7b.

One management technique is to inspect foliage and destroy eggs, or remove and discard egg-laden leaves. Begin looking for eggs where moths are seen during daylight hours (Figure 8). Eggs are primarily deposited on lower leaf surfaces. They are small and translucent, making them difficult to see (Figure 9). Scouting for them can be time-consuming, especially on lush plants.

Another option is to locate and remove larvae while they are small and non-damaging. This tactic requires patience. Because of their small size (5mm), it is nearly

impossible to locate newly hatched larvae. More developed larvae can also be overlooked because they blend into foliage. Typically, larger larvae are encountered just days before they stop feeding and begin pupation.

Figure 8

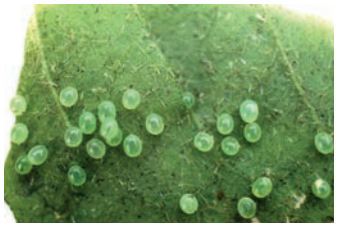

Figure 9

Although fecal pellets can make it easier to find hornworms, it can still be difficult to locate them amid thick foliage. Larvae often feed upside down, and remain hidden, except for prolegs that cling to plant stems. Larvae eat constantly and eliminate feces (frass) (Figure 10), which accumulates on lower leaves and beneath plants (Figure 11).

Once located, hornworms can be eliminated by handpicking. The "horn" cannot sting or puncture. When handled, hornworms thrash and may regurgitate stomach contents.

Figure 10. Feeding larva eliminating frass

An alternative to destroying hornworms is to place them in a container with tomato foliage, keeping them alive to find out if they are parasitized by braconid wasp larvae. If present, wasp larvae will exit the host and produce white cocoons that attach to the hornworm (Figure 12). Cocoon-laden hornworms should be returned to the garden. Eventually, tiny adult wasps (Figure 12, inset) will emerge and insert eggs into other hornworm larvae.

Insecticidal Control Considerations

Figure 11

Some home gardeners routinely apply insecticides to combat hornworms. They spray automatically, assuming that hornworms will occur. Unfortunately chemical control is not such a simple matter. Because of the continual presence of hornworm moths during their two-generations-per-year life cycle, numerous sprays would be required throughout the growing season. Rather than many quick, superficial sprays, a few slow, deliberate, penetrating sprays are needed to ensure thorough coverage of all foliage.

Home gardeners may find it difficult to select the best product from the many registered insecticides. In 2012, 479 products were registered for use in Kansas against hornworms, 278 for use against tomato hornworms, and 132 for use against tobacco hornworms. Most products have a broad-spectrum effect, which means they not only kill targeted pests but may suppress and possibly eliminate, naturally occurring beneficial organisms that could eliminate early stage hornworms. Home gardeners can avoid harming beneficial insects by choosing any of the following: Bt products that target lepidopterous larvae; spinosad products with excellent activity on lepidopteran larvae but low levels of activity on beneficial and nontarget species; or nonresidual products containing neem components.

Figure 12. Hornworm covered with white cocoons that will produce parasitic braconid wasps (inset).

Figure 3., Tobacco Hornworm, by Lisa Brummet, research assistant, Kanost Lab, Department of Biochemistry and Molecular Biophysics

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