



## Pepper Maggot, *Zonosemata electa*, in Sweet (Bell) Pepper

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### Introduction

The pepper maggot, *Zonosemata electa* (Say) (Diptera: Tephritidae), is native to eastern North America and is thought to have moved from the weedy perennial horse nettle, *Solanum carolinense* L., to domesticated crops like bell pepper and eggplant (Boucher et al. 2001, Boucher et al. 2003). Pepper maggot occurrence in pepper is patchy and sporadic; however, infestation levels can reach near 100% within a single field and a single maggot can destroy an entire pepper fruit. Generally, pepper maggot is controlled with routine cover sprays of insecticides to pepper fields but can become a serious problem for organic producers (Judd 1994, Boucher et al. 2003) and those that have deviated from broad spectrum insecticide use (Boucher and Ashley 1999, 2001; Boucher 2003).

### Biology

In Virginia, the pepper maggot undergoes a single generation per year (Boucher et al. 2003). The pepper maggot overwinters as a pupa within the soil with adults emerging over a 10–14-day period starting in early June and remaining active throughout mid-August (Judd et al. 1991). Adult flies are brightly colored with a pale-yellow head, green eyes, honey colored thorax, pale yellow abdomen, and clear wings with brown bands (Fig. 1). Females are about the same size as a housefly whereas males are slightly smaller. Females live an average of 23 days but can live up to 45 days, depending on environmental conditions (Judd 1994; Boucher et al. 2005). After mating, a female lays 54 eggs on average, depositing them into punctures created with her ovipositor in the skin of the pepper fruit (Judd 1994). Eggs are about 0.08 inches long, white, and "crookneck" shaped. Maggots emerge in ~8-10 days, burrowing into the pepper fruit and feed

~2-3 weeks. Fully-grown maggots are 0.39 to 0.47 inches long and creamy white to yellow in color (Fig. 2). Mature maggots exit the pepper, drop to the soil, and burrow 2-5 inches into the soil where they form a brown, oval-shaped puparium ~0.31 inches long (Fig. 2) and overwinter (Judd et al. 1991).



Figure 1. Pepper maggot adult. Ashley Bradford, Bugguide.net.



Figure 2. Pepper maggot larva (center) and pupa

(right) next to a pepper seed for scale. Ric Bessin, University of Kentucky.

## Damage

Pepper maggot develops exclusively on plants in the family Solanaceae, including the vegetable crops pepper and eggplant (Boucher et al. 2001). Larvae of both the European corn borer and the pepper maggot feed inside the pepper fruit by tunneling underneath the cap on the pericarp, and the damage they cause can appear similar. The first sign of a pepper maggot infestation is the appearance of elliptical holes 0.02 inches long by 0.01 inches wide in peppers 0.39 to 1.57 inches in diameter. The female's ovipositor creates these holes as she inserts her eggs just beneath the skin of young peppers (Judd 1994). Damage is greatest on fleshy, round or blocky fruit such as the horse nettle or cherry, apple, and cheese peppers. Damage is limited on slender, thin-walled cultivars such as banana, long-hot, cayenne, jalapeno, Tabasco, and serrano peppers. As infested peppers enlarge, the egg punctures become shallow depressions in the fruit, rendering the pepper fruit unmarketable (Ghidui and Kuhar 2012).

## Control of Pepper Maggot in Pepper

Field sanitation and rotation typically are used to control pepper maggot. Adult flies are attracted to rotting peppers so removing rotting fruit from fields reduces the fields attractiveness to egg-laying flies. Destroying infested fruit and cull piles, which act as reservoirs, can help minimize future infestations. Where possible, do not plant peppers in or near fields with a history of pepper maggot (Boucher et al. 2001, 2003). Alternate hosts such as horse nettle also should be eradicated from field margins to remove sources of infestation. A combination of trap cropping with hot cherry-pepper varieties and border row insecticide applications has also been used successfully by some pepper growers to reduce the incidence of damage to bell pepper (Boucher et al. 2003; Ghidui and Kuhar 2012).

## Monitoring Pepper Maggot in Pepper

Yellow sticky cards can be used to monitor the flight activity of adult pepper maggots. Traps should be placed around field margins and observed weekly. Traps baited with liquid ammonium hydroxide (Stills-style trap), and hung at a height of ~21 feet in

the tree canopy on the edges of pepper fields have been shown to be effective monitoring tools for pepper maggot (Boucher et al. 2001). Fruit oviposition scars also are useful site-specific indicators of pepper maggot presence/absence and may aid in determining if insecticide applications are necessary and in timing sprays (Boucher et al. 2005). In other states where pepper maggot has been a problem, sprays are applied when the flies are detected on the traps and reapplied weekly while the flies remain active (Ghidui and Kuhar 2012).

## Chemical Control of Pepper Maggot in Pepper

Several insecticides are currently labeled for pepper maggot control in pepper. Since chemical control measures should be applied prior to egg deposition by the pepper maggot, monitoring of adult pepper maggots is critical. For control recommendations, refer to the most recent Mid-Atlantic Commercial Vegetable Production Recommendations. VCE Publ. No. 456-420 (SPES-103P) <https://pubs.ext.vt.edu/456/456-420/456-420.html>.

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## Additional Resources

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