GROWERTALKS

Pest Management

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Hungry, Hungry Caterpillars

Juang-Horng “JC” Chong

What’s the most well-known characteristic of caterpillars? (Hint: It has nothing to do with the fact that caterpillars are larvae of moths and butterflies, nor the fact that caterpillars have three pairs of true legs and five pairs of fleshy prolegs.) Children and parents who’ve read “The Very Hungry Caterpillar” by Eric Carle for the 3,000th time know that caterpillars are always hungry.

Caterpillars are sporadic pests in greenhouses and nurseries. When they do occur, they often munch on foliage in large numbers and can be devastating to the crops. Infestation starts by adult moths or butterflies flying into the nursery or (through opened sides or vents) the greenhouse, finding the plants that suit their liking and depositing several dozens to hundreds of eggs on or near the crops. The eggs hatch and immediately the little caterpillars start feeding on the foliage with their chewing mouthparts. If the infestation isn’t found and the treatment isn’t applied early, caterpillars can severely damage a crop in just a few days.

Types and damage

Several caterpillar species are pests of ornamental plants and some appear to prefer certain plant species. Cabbage looper, imported cabbageworm and diamondback moth prefer to attack ornamental kales and cabbages. Florida fern caterpillars are only found on ferns. I’ve seen European corn borer in the stem of mums, dahlias and asters. Beet armyworm and corn earworm have a broad host range, but they’re the most common species I’ve found on mums.

Pictured: Some caterpillar species, such as these Florida fern caterpillars, have various color morphs in the same population. Photo credit: Blake Layton, Mississippi State University Extension.

Corn earworm is also the most important caterpillar pest of hemp in my area. European pepper moth is becoming more problematic in my neck of the woods, infesting many species of ornamental and vegetable plants grown in greenhouses. Except for Madagascar periwinkle, the omnivorous leafroller feeds on every plant species I grow in my greenhouses.

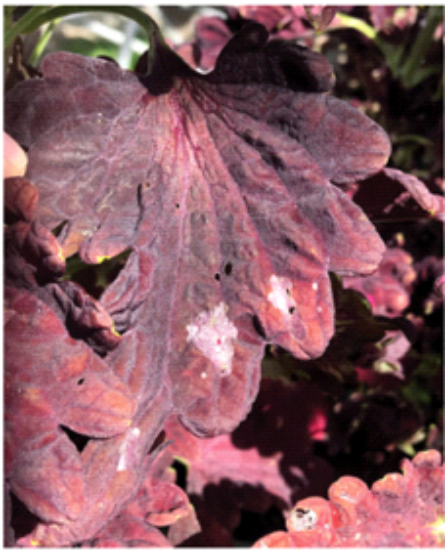
A population of very hungry caterpillars can denude a crop. Younger caterpillars or species of smaller body size skeletonize or chew small holes on the foliage or petals. Larger caterpillars can chew large holes or devour the entire leaf. Some species, such as the omnivorous leafroller, use their silk to tie several leaves tightly together and feed within this protective shelter. European corn borer can bore into the stems and European pepper moth can girdle the base of a plant, causing wilting, collapse and eventual death of the affected plants.

Defoliation isn't the only damage. Wounds created by European pepper moth are entries for pathogens. Frass pallets left on the leaf surface can be objectionable and those collected in tight places, such as hemp bud clusters, can become a substrate on which Botrytis and other fungi can grow, adding to additional pest and sanitation problems.

Control and prevention

Several factors are in our favor when it comes to managing caterpillar infestations. First, we know that infestations often start with moths and butterflies flying into the greenhouse or nursery. Excluding them from susceptible crops—such as mums, ornamental kales and ferns—with netting over the sides of the greenhouse can prevent infestations. Turning the light off during peak moth activity will also reduce attraction of moths into the production area. Removal of weeds, particularly flowering weeds, in and around the production area will also reduce attraction.

Caterpillar is the main life stage of management. Caterpillar development from eggs to adults (generally completed within two to four weeks) is relatively long. This longer developmental time gives us a greater window of opportunity for management to achieve successful control. Insecticides are most effective against young caterpillars, therefore, it's crucial to detect and manage the infestation early.



Pictured top: Young caterpillars skeletonize or create small holes on the leaves, while older and larger caterpillars create larger holes or consume the entire leaf.
Middle: Some caterpillar species, such as the omnivorous leafroller, use silk to tie several leaves together to create a shelter.
Bottom: Caterpillar frass pellets are often visible on the leaf surface. Photo credit: JC Chong.

Luckily, infestation is usually very easily detected. Defoliation, tied-up foliage and frass pallets are easy to see during a scouting session. Plant wilting caused by stem girdling by European pepper moth can also be easily found and diagnosed. Webbing, such as those created by European pepper moth on medium surfaces, can indicate their hiding places. Although sticky card, pheromones and blacklight trapping have been suggested as methods of monitoring moth and butterfly dispersal, these methods may not be feasible in all operations.

While predators and parasitoids likely keep the caterpillar population relatively low outdoors, there are few viable biological control solutions for greenhouses. *Bacillus thuringiensis* (Bt) subspecies *aizawai* (e.g., Xentari) and *kurstaki* (e.g., Dipel and Thuricide) are very effective when applied against young caterpillars (thus highlighting the importance of early detection). Other entomopathogenic fungi (Botanigard and Ancora), bacteria and their products (Grandevo and Venerate), and nematodes (*Steinernema carpocapsae*) are also registered for caterpillar management.

With the exception of neonicotinoids, which hadn't performed satisfactory and consistently in my research, the majority of insecticides registered for caterpillar management are very effective. Carbamates, organophosphates, pyrethroids, abamectin (Avid), emamectin benzoate (Enfold), chlorfenapyr (Pylon), spinosad (Conserve) and tolfenpyrad (Hachi -Hachi) are very effective. Azadirachtin (Ornazin, etc.), novaluron (Pedestal) and methoxyfenozide (Intrepid) are insect growth regulators that are also registered for managing caterpillars. The insect growth regulators are most effective against young caterpillars.

Testing insecticides

I've evaluated one particular group of insecticides—the anthranilic diamides (IRAC Group 28)—for their efficacy against caterpillars. There are three compounds in this group: chlorantraniliprole (Acelepryn), cyantraniliprole (Mainspring) and cyclaniliprole (Sarisa and Pradia).

The first study was conducted in 2018 to evaluate the efficacy of Acelepryn and Mainspring, applied as foliar sprays at 2, 4 and 6 fl. oz. per 100 gal. against beet armyworm on chrysanthemum. Beet armyworm hatchlings were fed with leaves containing residue of up to 35 days. In this study, Mainspring and Acelepryn achieved greater than 90% mortality for up to 28 days after treatment and more than 80% for up to 35 days after treatment. Acelepryn sprayed at 6 fl. oz. per 100 gal. maintained 100% mortality for up to 35 days after treatment. Acelepryn and Mainspring

seemed to be equally effective and lower application rates seemed to perform as well as the higher rates.

The second study was conducted in 2019 to evaluate the efficacy of Mainspring and Acelepryn applied as a sprench at 4 and 8 fl. oz. per 100 gal. against European pepper moth infesting coral bells. The treated plants were maintained for 49 days and attacks were recorded. Mainspring and Acelepryn at both rates did an excellent job of preventing attacks. Live caterpillars were found only in untreated plants. On average, 57% of the untreated plants suffered foliage damage and 13% of the untreated plants died from the infestation or associated stem rot diseases. Only 3% of plants treated with Acelepryn and Mainspring at 4 fl. oz. per 100 gal. suffered low levels of foliage damage, but no plant treated at 8 fl. oz. per 100 gal. suffered any damage even at 49 days after treatment. No plants treated with Mainspring or Acelepryn died during the experiment.

Both studies suggested that Mainspring and Acelepryn are very effective in preventing attacks and managing infestation by caterpillars. Even at the low label rate of 4 fl. oz. per 100 gal., Acelepryn and Mainspring knock down the existing caterpillar infestation quickly and can provide 28 days of protection to the treated foliage. **GT**

Juang-Horng "JC" Chong is a professor and extension specialist at Clemson University.