UNIVERSITY OF MARYLAND EXTENSION

Vegetable & Fruit News

The University of Maryland Extension Agriculture and Food Systems and Environment and Natural Resources Focus Teams proudly present this publication for commercial vegetable and fruit industries.

Volume 10 Issue 5 August 15, 2019

Special Alert: Scout for Corn Earworm in Vegetable Crops

Kelly Hamby[1], Galen Dively[1], David Owens[2], Ben Beale[3], Peter Coffey[3], Andrew Kness[3], Alan Leslie[3], Erika Taylor[3], Kelly Nichols[3], Matthew Morris[3], and Emily Zobel[3]

[1]University of Maryland Department of Entomology
[2]University of Delaware Extension Entomology
[3]University of Maryland Extension

Moth flight activity for the corn earworm, also known as tomato fruitworm, has increased during the past week. Pest pressure varies across the state and Delmarva region. The early surge in activity is attributed to the record temperatures during June and July, which have accelerated larval development and shortened the generation time of this insect. Corn earworm has already caused significant damage to ears of sweet corn and early planted field corn. Note that Bt hybrids expressing single or multiple Cry proteins no longer control earworms due to the development of resistance; only hybrids expressing the Vip3a Bt protein provide good ear protection. These hybrids represent a relatively small portion of the planted acreage. Thus, significantly more adult moths are now recruited in corn compared to levels a decade ago.

Corn earworms are strongly attracted to and prefer fresh corn silks for egg laying. Outbreaks in other crops often follow a midsummer drought, which causes the corn to ripen earlier and become less attractive to the moths. As early planted corn fields dry down, moths will move into other vegetable and grain crops.

Corn Earworm in Sweet Corn:

Moth activity as evaluated by blacklight and pheromone trap monitoring indicates the severity of pressure and can inform the timing and frequency of insecticide applications. Generally, an insecticide spray is applied at early green silking as soon as the first moth is captured on the farm, and applications are repeated at 2 to 6 day intervals based on moth pressure. The corn growth stage, weather, Bt trait being used, tolerance for ear damage, as well as the persistence and efficacy of the foliar insecticides being used also help determine the appropriate interval.

Table 1. Regional Scentry heliothis pheromone trap captures.

Region	Site	Sampling Date	1-day Total	5-day Total	Weekly Total	Recommended Interval
Northern MD	Jarrettsville	8/6	—	77	—	3
	Street	8/7	—	18	—	4
Central MD	Beltsville	8/5	—	113	50	2 (fresh silks), 3 (later stages)
	Upper Marlboro	8/5	—	—	0	Spray at green silk and reassess
Western MD	Keedysville	8/6	—	—	15	4
	Tuscarora	8/6	—	—	13	4
Eastern Shore	Queenstown	8/8	2	—	—	4
	Salisbury	8/8	25	—	—	3
Southern MD	Bel Alton	8/7	—	11	—	4

Moths are attracted to ears with fresh green silks, where most eggs are laid. Complete silk emergence from all ears generally takes four to eight days after the first silks appear. After spraying at the early silking stage, new fresh silks emerge and are not protected. This means spray intervals should be tightest during fresh silk. In addition, when weather is in the 90s (°F), it takes 2 days for eggs to hatch and 2 hours for small larvae to move down the silk channel and begin feeding on the ear tip, where they are protected from foliar sprays. Thus, when moth pressure is high, it is critical to maintain a residual level of insecticide on silk tissue at all times. Sprays may be required up until 5 days from the final harvest date. However, if the weather is hot, pest populations are increasing, and more than five days have elapsed since the last spray, it may be necessary to apply a final treatment within 5 days of the final harvest. Recent temperatures and captures in parts of the state mean you should be mindful of corn earworm pressure, which may be higher than in recent years. Monitoring pressure using on-farm traps provides the most accurate information for making management decisions. We

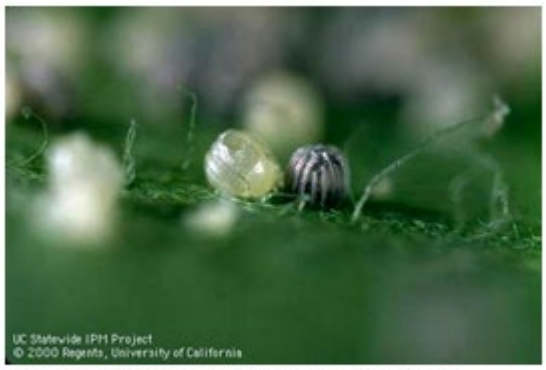
recommend using 2 pheromone traps and replacing the lures frequently, especially during periods of hot weather.

Sweet corn growers mainly rely on timely and effective insecticide sprays to minimize ear damage by corn earworm and other ear invading insects, and it is important to rotate insecticide classes within a season. The cheaper pyrethroid (Group 3A) products have been the popular choice but their control efficacy has significantly declined due to resistance in corn earworm populations. When first introduced, pyrethroids provided greater than 95% control of corn earworm, but currently control efficacy has declined to around 50% due to resistance development. The reality is that pyrethroids no longer provide enough ear protection on many farms, so growers need to consider incorporating other modes of action into spray programs. Spray mixtures of Lannate (carbamate insecticide, Group 1A) plus a high rate of pyrethroid have become a common practice to circumvent the potential resistance problem. This is particularly true if sap beetles and stink bugs are also a target, but be mindful that this will harm beneficials. The diamide chlorantraniliprole (Coragen and a component of the pre-mix Besiege) provides excellent control. Coragen (Group 28) is also less harmful for beneficial insects, such as minute pirate bugs that may consume earworm eggs in the silks. Spinosyns (Group 5; e.g. Blackhawk, Radiant) have some efficacy when incorporated into a spray program but cannot be relied on exclusively. No matter the insecticide used, to achieve effective control the first spray should be timed at early silking, followed by sprays on a prescribed schedule based on moth pressure, with adequate spray coverage of the ear zone. ALWAYS read and follow instruction on the pesticide label; the information presented here does not substitute for label instructions.

As an alternative, the most potent bioinsecticide for sweet corn insect control is provided by transgenic hybrids expressing one or more insect-active toxins from the bacterium, *Bacillus thuringiensis* (Bt sweet corn). Three types of Bt sweet corn are commercially available: Attribute® hybrids (expressing Cry1Ab toxin), Attribute® II hybrids (expressing Cry1Ab and Vip3A), both from Syngenta Seeds, and Performance Series™ hybrids (expressing Cry1A.105 and Cry2Ab2 toxins) from Seminis Seeds. Although these hybrids provide 100% control of the European corn borer, they do not provide enough control of corn earworm and other lepidopteran pests depending on the expressed toxins and thus supplemental insecticide sprays are often needed to ensure quality ears, especially during high moth activity. Attribute® sweet corn still provides good control of fall armyworm during pre-silk growth stages but only moderate ear protection; no effective control of western bean cutworm; and variable but generally poor to fair control of corn earworm. Performance Series™ sweet corn provides very good control of fall armyworm during the vegetative and ear development stages but no effective control of western bean cutworm and only poor to fair control of corn earworm. Timing of supplemental sprays in Attribute® and Performance Series™ sweet corn is less critical and wider spray intervals are generally allowed compared to non-Bt sweet corn under the same insect pressure. In both types, fresh silk tissue is consistently more toxic to newly hatched larvae, causing intoxication and delayed growth; so those larvae that survive are exposed longer before entering the ear. Pyrethroids and other insecticides may actually work better because larvae are weakened by the Bt intoxication. The first spray can be applied at full silk, usually three or four days later than the first application in non-Bt sweet corn. A second spray 3 to 4 days later may be necessary if heavy moth activity continues, and sometimes three applications are needed. Attribute® II sweet corn provides excellent control of all foliage feeding and ear invading worms, thus no insecticidal sprays are required, except for secondary pests such as sap beetles; however, the absence of worm damage that attracts beetles significantly reduces the infestation risk of this pest. Stinkbugs are not controlled by Bt.

Corn earworm feeding on tomato.
Image: Tom Kuhar

Corn Earworm in Other Vegetables:
Corn earworm is a major pest of tomato, pepper, snap bean, lima bean, and many other vegetable crops. Sampling plans and thresholds have not been developed for many of these crops, but a general rule of thumb based on trap captures is that treatments may be warranted at nightly captures of 20 moths or more (see information from Virginia Tech), which is occurring in some parts of our state. Visual inspection of the crop to detect eggs and small larvae will help select insecticide materials and determine pressure. Beneficials will feed on the eggs and small larvae. Consider looking for beneficials when scouting and using materials that are less harmful for these natural enemies.



Corn earworm eggs turn black when parasitized by wasps.
Image: Jack Kelly Clark.

Lima beans: Monitoring should begin at full bloom and samples should be taken in at least 10 locations in the field. Sample by placing a 3 foot drop cloth between two rows and then shaking the plants on both sides of the row over the (sampling 6 total feet of row). Count the fallen larvae and estimate the average size. If you are using a product that is effective on larger larvae, treatment should be delayed until at least 1/3 of the larvae have reached approximately ½ inch in size. The treatment threshold is 1 or more larvae per 6 foot of row. Since the 2008 season, numerous reports of control failures with pyrethroids (Group 3A) used for earworm control have been reported from the Mid-Atlantic region and states to our south. This insect has developed moderate to high levels of resistance to this class of insecticides, so growers need to consider other modes of action. If a pyrethroid (e.g., Asana, Bifenthrin, Hero, Mustang Maxx, Warrior) is used, the highest labeled rate timed for small to medium, rather than large worms, is recommended. Combination products such as Besiege that include a pyrethroid as well as a diamide (Group 28) can be useful to simultaneously manage multiple insect pests. Coragen (Group 28) and Intrepid (Group 18) are effective and are less harmful to natural enemies. Intrepid is an insect growth regulator so applications should target small larvae only. Spinosyns (Group 5; e.g. Blackhawk, Radiant) and carbamates (Group 1A; e.g., Lannate) are also effective. It is important to rotate insecticide classes within a season. ALWAYS read pesticide labels carefully and follow all instructions; the information presented here does not substitute for label instructions.

Snap beans: A standard drop cloth can be used to detect small larvae as described above, and larval size is an important consideration for selecting spray materials. Treatments may be warranted when captures exceed 20 moths per night and local corn crops are mature. A 5-7 day spray interval may be necessary thereafter. Treatment recommendations are as described above (see lima beans).

Tomatoes: Eggs can be detected on the leaves directly below the flower clusters, typically on the highest clusters on the plant. For a reduced spray approach, inspect 20-30 plants for signs of eggs, and consider initiating sprays if ~10% of the plants have at least 1 egg, with subsequent sprays at 3 damaged fruit per 100 unripe (Kuhar et al. 2006). Given the number of insect pests (armyworms, hornworms, stinkbugs, etc.) that occur in tomatoes, a 7-10 day interval once fruit begins to set is often used for insect management. Pyrethroids (Group 3A) offer poor to moderate control of corn earworm in the Mid-Atlantic, and will not control heavy infestations or large worms. In addition to the products mentioned above, several other effective insecticide options are labeled for tomato, including Avaunt (Group 22), Proclaim (Group 6), Rimon (Group 15), and Exirel (Group 28). It is important to rotate insecticide classes within a season. ALWAYS read pesticide labels carefully and follow all instructions; the information presented here does not substitute for label instructions.

Further Resources:

Mid-Atlantic Commercial Vegetable Recommendation Guide: http://extension.udel.edu/ag/vegetable-fruit-resources/commercial-vegetable-production-recommendations/

Virginia Tech Fact Sheet Corn Earworm on Vegetables: https://www.pubs.ext.vt.edu/3103/3103-1537/3103-1537.html

University of Delaware insect trapping program: http://extension.udel.edu/ag/insect-management/insect-trapping-program/

Kuhar, T.P., B.A. Nault, E.M. Hitchner, and J. Speese. 2006. Evaluation of various sampling-based insecticide spray programs for management of tomato fruitworm in fresh-market tomatoes in Virginia. Crop Protection 25: 604-612.

Downy Mildew on Cucurbits

By Kate Everts
Vegetable Pathologist
University of Delaware and University of Maryland
keverts@umd.edu

August 14, 2019

Downy mildew was first reported in Maryland on cucumber in June. It has been slow to spread until recently. However, we have now confirmed downy mildew on cucumber, pumpkin, cantaloupe, and butternut squash within the state. Downy mildew has been reported on acorn and yellow squash in adjacent states. All cucurbits should be protected with fungicide applications that target down mildew as long as weather remains conducive to spread. Effective materials are listed in the Mid-Atlantic Commercial Vegetable Production Guide.

Early symptoms of downy mildew on cucumber

2019
Mid-Atlantic Commercial Vegetable Production Recommendations

On-Line at: Commercial vegetable Guide