UMass Extension
Vegetable Notes
For Vegetable Farmers in Massachusetts since 1975

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In this issue:

Crop conditions

Melons are starting to come in and pepper and eggplant harvests are becoming heavy. Onions are almost ready to harvest and some have been harvested already. Some growers are complaining about tomatoes coming in late, but many planted later than normal this year due to the cold spring, so this is somewhat expected. New potatoes are being dug and some large fields of table varieties have been vine killed. Kabocha and other winter squash are sizing up nicely.

Sweet corn fever is upon us! An overloaded trailer of sweet corn caused a traffic jam in Sunderland, MA on Wednesday after a busy morning of picking before thunderstorms. Some are looking forward to tasting new varieties such as 'Seminal Sweet'; but one grower we spoke with said that this time of year he sticks to the thick-skinned varieties, like 'Anthem', for protection against red-winged blackbirds. Just as the corn began coming in heavily, the pests showed up with more severe storms; 251 corn earworm in one trap in Bristol Co., MA! See article this issue for corn earworm management strategies.

Come see our new trial sprayer at the UMass Extension Vegetable Program Research Tour on August 14, in South Deerfield. More info in the "Events" section below. Photo: S. Scheufele

Many farms need more labor for the final harvest push of the season (through September); simultaneously, many college student laborers are looking to take a vacation before returning to classes. Our summer scout, Stockbridge School of Agriculture student Annalisa Flynn, has been busy showing farm crews around the state different pests and beneficial insects. She also creates the maps you see this year in Pest Alerts each week with growing degree-days and pest trapping data from farms around the state. We hope she never leaves!

We have three new *Vegetable Notes* sponsors to announce: Johnny's Selected Seeds, Certis USA, and the USDA Risk Management Association. Thanks!

Pest alerts

Alliums:

Purple Blotch (*Alternaria porri*) was reported in a field of onions in Hampshire Co., MA. It is likely present elsewhere as conditions for the disease are "extremely favorable" this week according to the Onion Disease Model on NEWA. Spores are produced and new plants are infected during periods of warm (77-85°F) humid weather. Symptoms appear 1-4 days after infection and black spores are produced by fresh lesions within 5 days (see photo). Spores are produced

Alternaria bonanza! This week we saw four different Alternaria *species: From left to right:* A. solani *on tomato,* A. brassicicola *or* A. brassicae *on brassicas, and* A. porri *on alliums. See the article in this issue for photos of* A. cucumerina *on cucurbits. Each of these species is specific to its own crop family.*
Photos: Clemson Univeristy (left), UMass Extension (center and right).

at night and released in the morning as humidity decreases. The spores are spread by wind and splashing rain or irrigation. Typical lesions occur when the leaf wetness duration is > 16 hours; flecking may occur at 12 hours. Bury infected plant material deeply after harvest. Harvest in dry weather and avoid injury to the necks. Allow onions to cure properly before leaf removal. See article this issue for more on onion harvest, curing, and storage.

Brassicas:

Alternaria leaf spot (*Alternaria brassicola* and *A. brassicae*) is spreading in fields of fall brassicas in MA, and RI. Spores overwinter in crop residue in soil, so chop up crop residues with tillage after harvest to speed up decomposition. Alternaria leaf spot of brassicas is favored by warm temperatures (60-78° F) and at least 12 hours of relative humidity of 90 % or more. The fungi sporulate profusely and are spread throughout fields by wind, splashing water, equipment, and workers, therefore, avoid harvest when fields are very wet and do not use overhead watering if possible.

Beans:

Mexican bean beetle larvae were found in one Middlesex Co., MA field and adults of the second generation on another farm. Adults are also seen as far north as Waldo Co, ME. Feeding damage over 10-20% can cause yield loss. Treat when defoliation exceeds 20% pre-bloom or 10% during pod development.

Potato leafhoppers (PLH) are on beans statewide in MA. Pay attention to varietal preferences, and try growing more resistant varieties in the future. As potato vines are killed off, PLH numbers in other hosts such as beans, eggplant and raspberries will increase. Seedling beans should be treated if they have 2 adults per foot of row. From 3rd trifoliate leaf to bud stage, treat when PLH exceed 1 nymph/leaflet or 5 adults per foot of row, and repeat application in 7 to 10 days, if necessary.

Two-spotted spider mites were seen on green beans in a field in Middlesex, Co, MA, and in RI last week. They build up in hot dry weather, so the rain may be a help. Unfortunately, broad spectrum insecticides used to control leafhopper can kill off beneficials, which normally control spider mites. Avoid early-season, broad spectrum insecticide applications for other pests and use selective products whenever possible. Registered products for mites on beans may not provide complete control of the pest. With most miticides, use 2 applications approximately 5 to 7 days apart, to help control immature mites that were in the egg stage and protected during the first application. Coverage of the lower surface of the leaves is important. If further applications are needed, switch to an alternate resistance group to help prevent or delay resistance.

Cucurbits:

Alternaria leaf spot (*Alternaria cucumerina*) was diagnosed on cucumbers in Hampshire, Co., MA. See the article in this issue on leaf spots of cucurbits for more information.

Cucurbit powdery mildew has not been reported in RI, but in MA has started to come in on older successions of sum-

mer and zucchini squash and is spreading to ripening winter squash and pumpkin fields. Come see our trial at the UMass research Farm on August 14th to learn about alternative fungicides for this disease with pollinator protection in mind. Register here: https://www.surveymonkey.com/r/X3JYR55

Phytophthora fruit blight was diagnosed on cucumber from a wet field in Hampshire Co., MA. It showed up after heavy rains. Wait for dry weather, and harrow sections of the field where the disease breaks out so that zoospores do not readily spread to more healthy living plants in case of more rain. Be sure to clean equipment before moving it to unaffected fields.

Broad mite symptoms in pepper, from Worcester

Solanaceous:

Broad mites were diagnosed on peppers in Worcester Co., MA. The symptoms started in transplants from a greenhouse and persisted all season in the field. Flower buds are very stunted and the crop will never developed fruit. Last year in New Hampshire, a large outbreak of this pest began from peppers that were raised in a greenhouse with hanging flower baskets above them that were infested. Carefully inspect transplants before accepting them.

Early blight (*Alternaria solani*) is spreading on tomatoes in farms in MA. This species of *Alternaria* also affects potatoes and occasionally eggplant but is not the same species that causes leaf spots on brassicas.

Sweet Corn: Pest numbers are up!

European corn borer: The second generation larvae of this pest are active in sweet corn now, and one field in tassel was at threshold for treatment in Hampshire Co., MA. Their trap count combined total was 8 ECB moths. It is always a good idea to scout when your corn is in tassel even if trap counts are low. According to GDD (see map) most of MA is right in the treatment window for this generation of ECB (table).

Corn earworm: One farm on the MA south coast counted 251 CEW in their trap this week! Meanwhile, a farm just a few miles down the road only captured 8 CEW in their trap. This is a good reminder to always trap for corn pests on your own farms since distribution can be highly variable. See article in this issue for management recommendations.

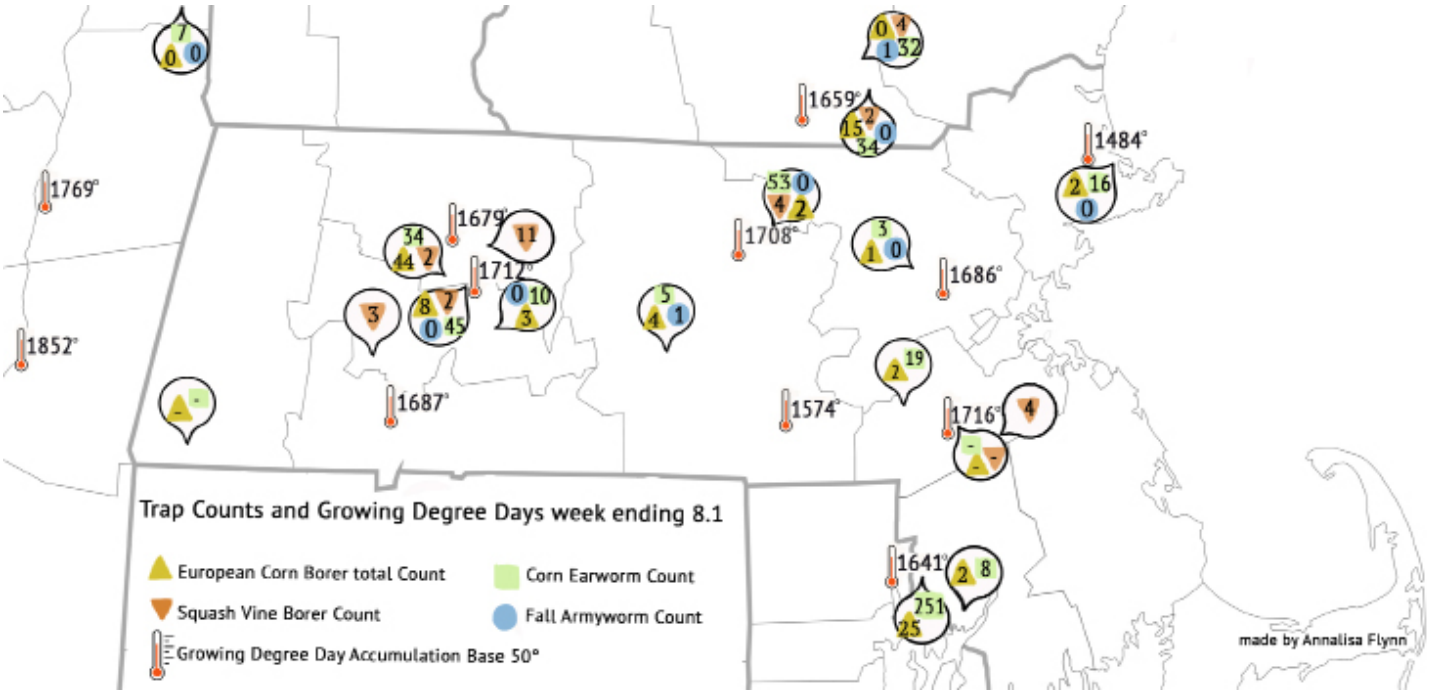
European corn borer (bivoltine) development estimated using a modified base 50F degree day calculation.

Development Stage	Accumulated Degree Days
First Generation	
First spring moths	374
First eggs	450
Peak spring moths	631
First generation treatment period	800-1000
Second Generation	
First summer moths	1400
First eggs	1450
First egg hatch	1550
Peak summer moths	1733
Second generation treatment period	1550-2100

J. W. Apple, Department of Entomology, University of Wisconsin-Madison

Fall armyworm trap counts remain low, but scouting in one field where there were no traps, we found the characteristic frass and damage in a small amount of whorl stage corn (well below threshold). There are likely no farms in need of pesticide applications to control this pest in whorl stage corn. The corn in desperate need of attention at this time is tasseling and silking corn.

FAW larvae (left) have a "Y" shape on their heads. FAW damage in whorl-stage corn (right). Photos: K. Campbell-Nelson



HARVEST AND POST-HARVEST TIPS FOR BEST ONION BULB QUALITY

Written by Christy Hoepting, CCE Cornell Vegetable Program

As a general rule of thumb, cool and wet growing seasons result in higher yields and bigger bulbs that tend to be of lesser quality mostly due to various bulb rot problems. Moderate seasons are favorable for onion growth, but ample rainfall and cooler temperatures also tend to favor leaf and bacterial diseases. Hot and dry growing seasons tend to result in smaller bulb size, but of very good quality. When onions are intended for storage, best management practices should be followed throughout harvest, curing and storage to ensure best bulb quality.

Pulling and windrowing

- Ideally, onions should not be pulled until at least 50% of the plants have lodged (Fig. 1). Another indication is to pull on the individual plants: if they easily come out of the ground, they are ready for pulling. If not, this is an indication that the roots are still functioning and that the plant has not yet completed bulbing.
- After lodging, bulb size increases an additional 25 to 33%. See article, "Harvesting Storage-Bound Onions That Are Still Standing".
- Do not pull onions and leave them in the hot sun when temperatures are in the high 80s and into the 90s, because they can get sunscald, especially if the relative humidity is high and they are pulled on the green side. Secondary bacterial pathogens invade tissue damaged by sunscald resulting in rotten bulbs. See article, "Concerns Harvesting Onions During Hot and Humid Weather".

Fig. 1. Proper lodging on onions. Photo: C. Hoepting

  - A common technique used for field drying is to orient the pulled onions so that the leaves lay over top of the bulbs.
  - Some growers move the pulled onions with the tops on into a greenhouse or high tunnel to dry (Fig. 2). Temperatures should be held below 85 ◦F, which will probably require leaving everything wide open. Black shade curtain/cloth over the house can also help to moderate temperature. Ensure good air movement.

Topping and harvesting

- Do not harvest onions when conditions reach 90 °F and 90% relative humidity, because black mold could develop. Harvest dry onions during the cooler part of the day as long as they are not wet from dew or rain or wait until a cooler day. See article, "Concerns Harvesting Onions During Hot and Humid Weather".
- Storage-bound onions should only be topped when the neck is dry and has no green tissue (i.e. the tissue does not slide when you roll the neck between your fingers). Bacterial diseases, Botrytis neck rot (caused by the fungal pathogen, *Botrytis allii*) and black mold can enter into and move through green tissue into the bulbs. These diseases do not infect or move in dry tissue. (Fig. 3).

Fig 2. Onions drying in a high tunnel covered with shade cloth. Onions are placed on benches with lot's of air circulation. Photo:C. Hoepting.

- Leave 2-3 inches of neck on the bulb when topping. This increases the distance from the cut surface to the bulb for fungal and bacterial pathogens to travel. Theoretically, if the neck dries down before the disease gets to the bulb, the bulb should be sound in storage.
- If onions are "dying standing up" due to excessive leaf dieback caused by disease or other stress, and they are not lodging, they should be pulled and note that it may take a bit longer for the necks to dry on these onions. See article, "Harvesting Storage-Bound Onions That Are Still Standing".
- Conduct harvest practices when the weather is dry. Ideally, onions should not be handled when wet to prevent skin quality issues from brown stain, caused by *Botrytis cinerea* and black mold. When wet harvested onions are placed into boxes, it takes longer for them to cure properly, and the added moisture can stimulate disease development and rooting, which in turn will stimulate sprouting.
- Avoid bruising during harvest procedures. Bruises provide direct entry points for diseases to get started.
    - Reduce drops to 6" and pad sharp surfaces.
    - On mechanical harvesters, minimize mechanical injury during harvesting by adjusting the chain speed to make sure the chain is always full. This will help reduce rolling and bumping of the bulbs.

Curing

- For optimum storage quality, onions must be cured soon after harvest. Curing decreases the incidence of neck rot and bacterial diseases, reduces water loss during storage and is desirable for development of good scale color.
- Optimum conditions are 68-86°F and 70% relative humidity for at least 12 to 24 h. Best skin color develops at 75-90°F.
- Artificial curing can be done with outside air, which is heated to approximately 77°F or 3-5 °F above the ambient air temperature. Higher temperatures, up to 90°F can be used if onions are of high quality with several layers of good skins.
- Avoid temperatures greater than 90°F, because this is favorable for development of bacterial diseases.
- Avoid temperatures greater than 82°F, because Black mold is more likely to develop at this temperature.
- A lower temperature, down to 68°F should be used if onions are poorly skinned, have been touched by frost or have bacterial diseases.

Fig 3. Freshly pulled storage-bound onions will not be topped until the neck is dry and tight to ensure best bulb quality. Photo: C. Hoepting.

- Relative humidity should not fall below 65% or exceed 80%. RH going into the boxes should ideally be 50% and less than 100% coming out.
- Airflow should be no less than 3 cubic feet per minute per cubic foot of product.

Onion Storage

- To ensure maximum storage life, onions should be stored after curing (Fig. 4). The optimum temperature for long-term storage of onions is 32°F with 65-70% relative humidity, but it is important to bring them down to this temperature slowly.
- Get them out of the sun or protect them from direct sunlight; exposure to light after curing will induce greening of the outer scales.
- Damaged or rotten bulbs should be graded out before putting them into storage. Damaged bulbs give off moisture which is favorable for development of diseases in storage. Rotten bulbs can ooze onto healthy bulbs and stain them.
- Avoid condensation by not circulating air onto onions that is a warmer temperature than the onions.

Fig 4a. Various small-scale onion stores. The optimum temperature for long-term storage of onions is 32°F with 65-70% relative humidity with regular air circulation. Photo: Teimo

LEAF SPOTS OF CUCURBITS

There are several diseases that cause leaf spots on cucurbit crops and they can often be hard to tell apart. Below are descriptions and photos of some the more common fungal and bacterial leaf spots found on cucurbit crops in MA that we hope will help you tease them apart in the field. Of course a diagnosis from a trained pathologist in the lab is ideal, but we understand it is not always possible to test every spot you may encounter.

Angular leaf spot

This disease can affect all cucurbits, but cucumbers are most commonly affected. It is caused by the bacterium *Pseudomonas syringae* pv. *lachrymans*. This disease is usually among the first to show up because it is seed-borne. It will start to appear in the early to mid-season. Small, round water-soaked spots appear on leaf tissue, and expand until they are confined by veins, giving them the characteristic angular look. Under moist conditions a milky white exudate containing bacterial cells may ooze out of the lesion on the lower leaf surface. These wet-looking spots will dry out and turn yellow-brown or the dead tissue may fall out leaving a “shot-hole” appearance. Yellowing of the leaf between lesions may occur where disease severity is high. Similarly, water-soaked spots may appear on stems and petioles, drying out to form a whitish crust. Spots can also appear on fruit, where they begin as tiny and water-soaked, but dry to form whitish, chalky, spots. These spots cause internal decay of fruit. Fruit that is infected early may be deformed. Affected plants will grow poorly and produce less fruit. Affected fruit is unmarketable.

As with other bacterial diseases, outbreaks of angular leaf spot are often initiated from infected seed. Bacteria proliferate in warm, moist weather and are spread from plant to plant by splashing rain or runoff, as well as by insects or workers moving through the field.

Use drip irrigation to reduce the spread of bacteria by overhead irrigation. Don't work in wet fields or work in clean sections of the field first and infected sections last to avoid spreading the disease to unaffected areas or to new plantings.

If you catch the disease early, copper may be effective in reducing its spread. Till in residues quickly after harvest to get infected tissue breaking down quickly. Bacteria survive on residues as long as it is present, up to two years. Resistant varieties are available.

Angular leaf spot on zucchini. Photo: S. Scheufele

Scab

This disease is caused by the bacterium *Cladosporium cucumerinum* and can be a significant problem for summer and winter squash, pumpkin, melon, and watermelon. Lesions may occur on leaves, stems, petioles, and fruit, with fruit spots being the most damaging. Leaf spots are small, pale-yellow to white, and again the dead tissue in the center of the lesion may fall out leaving a "shot-hole" appearance. Leaf lesions may not occur and only stems or fruit are affected. Lesions on stems are elongate and light colored, and if numerous may cause the internodes to shorten, giving the plant a deformed virus-like appearance. Scab lesions on fruit are sunken, irregular cavities with corky margins, and may produce a golden brown ooze which dries into brown beads. Sporulation on lesions may occur, giving them an olive-green, felt-like appearance.

This disease usually occurs in mid-summer and is favored by cool dry days and rainy or dewy nights. The pathogen survives in crop residues which persist one to two years in soil. Tolerant varieties of cucumber are available. Chlorothalonil, mancozeb, or polyoxin D can be used preventively, at the first sign of disease.

Scab on zucchini. Photo: T. A. Zitter

Anthracnose

This disease affects mostly melons, watermelons and cucumbers; squash and pumpkins are less susceptible. The disease is caused by the fungus *Colletotrichum orbiculare* which, like other anthracnose fungi, causes characteristic black, sunken lesions on affected fruit. Leaf spots are light brown or reddish and appear near veins so may cause leaf distortion. These lesions dry out and the dead tissue may fall out, again leaving a "shot-hole" appearance. On stems and petioles, lesions are elongated and tan. Lesions on fruit are large, circular, sunken areas that turn black and may produce a pink ooze under humid or moist conditions.

The fungus can be seed-borne and also survives on crop residue or volunteer plants (maybe in your compost or cull pile). Humid, rainy weather is necessary for disease to occur. There are three races of the fungus that affect different crops. Resistant cucumber and watermelon varieties are available, but there are not resistant melon varieties. There are many fungicides labeled for control of anthrac-

"Shot-hole" appearance of anthracnose leaf spots. Photo: R. L. Wick

nose, please see the New England Vegetable Management Guide for recommendations.

Alternaria leaf spot

This disease affects all cucurbit crops but is most common on cantaloupe. The disease is caused by the fungus *Alternaria cucumerina* which, like other *Alternaria* species, can cause a characteristic target-like spot. Usually, leaf spots are small and start out as tan flecks that enlarge and merge together. These larger spots (up to a half inch) may exhibit the concentric rings common of all *Alternaria* fungi.

This disease usually occurs in mid-season and can reduce late-season fruit production. Fruit lesions may also occur as sunken lesions with dark, olive-green, felt-like sporulation present in rings. The fungus survives on crop residue in the soil as long as it is present. A two year rotation away from cucurbit hosts is usually sufficient.

Alternaria leaf spot on cantaloupe. Photo: G. Holmes

Septoria leaf spot

This disease is less common, occurring in cool summers or late fall. The disease is caused by the fungus *Septoria cucurbitacearum* which causes small, almost white, round spots on leaves and superficial raised tan bumps on fruit. The fungus survives on crop residue in the soil which persists one to two years. Spores are spread from plant to plant via splashing rain or overhead irrigation.

Septoria leaf spot on cucumber. Photo: R. L. Wick

Management

The impacts of these bacterial and fungal diseases can all be reduced through sanitation and use of pesticides, whether conventional or organic.

- Start with quality seed, and/or fungicide treated seed. If saving your own seed avoid collecting seed from fruit with any defects.
- Use a 2-year rotation for cucurbit fields
- Don't work in affected fields when they are wet
- Use fungicides or bactericides when you see the first leaf spots to slow the spread of disease. Submit a sample to the UMass Plant Diagnostic Lab so that you can choose an effective pesticide for the disease you have. Consult the New England Vegetable Management Guide for recommendations.

--Written by Susan B. Scheufele

Corn earworm management

Corn earworm (*Heliothis zea*) moths migrate annually into the Northeast, traveling north on storm fronts, and may arrive anytime from late June through September. They arrived late this year because the Gulf stream pushed storms northward without much help from the Jet stream to push them eastward. However, with the last few storms, the corn earworm population has grown, and one farm on the south coast of Massachusetts captured 251 moths in their trap this week! Populations usually don't peak until August when trap captures may exceed 90 moths per week. Heaviest numbers are found in coastal areas and up the major river valleys. The severity of infestations varies from year to year and may change suddenly during the season. For example, in 2014, we did not get a lot of Atlantic coastal storms, and corn earworm populations were low.

Identification

Known as the tomato fruitworm, cotton bollworm, or corn earworm, this lepidopteran noctuid (night-flying) pest feeds on corn, tomato, cotton, green beans, clover, vetch, lettuce, peppers, soybean, and sorghum. Sweet corn, especially when silking, is a preferred host in New England, and losses may reach 50% if populations are not managed. Adult moths are light tan with a distinctive dark spot on each forewing, with a dark band near the margin of the hind wing, and a wingspan of 1.2 to 1.5 inches. Live moths have bright green eyes. Rounded, ribbed eggs less than 1/16th of an inch in diameter are laid directly on fresh silk. Eggs develop a red ring encircling them 24 hours after being laid, and the black head capsule is visible just before they hatch. Corn earworm larvae may be brown, tan, green, or pink, with light and dark longitudinal stripes. Corn earworm can be distinguished from fall armyworm and European corn borer by the plain, golden brown head capsule and small bumps and spines that give the body a rough texture. The larvae reach 1.5 to 2 inches when full-grown.

Corn earworm eggs (Photo: Bill Hutchinson), larvae, and adult.

Life Cycle

Adults arrive in Massachusetts ready to lay eggs. Egg laying takes place mostly in the evening as this is a noctuid moth, and each female is capable of laying 500 to 2000 eggs during her two-week life span. Even though many eggs may be laid in each ear, usually only one larva is found per ear because they are cannibalistic. Eggs hatch in 2.5 to 6 days, or within 48 hours when temperatures get into the 90s. Caterpillars crawl down the silk channel within one hour of hatching and feed on the kernels at the tip, leaving unsightly frass. In the tip they are protected from insecticide sprays. Control measures must be timed to prevent larvae from entering the ear. Larvae feed for 3 to 4 weeks as they go through 5 growth stages before chewing out through the corn husk and burrowing in the soil to pupate. Another generation of adults may emerge from these pupae, as more adults are simultaneously carried North on storms. Therefore, later in the season, infestations may not correlate to storms bringing in new adults.

Monitoring

When corn earworm captures in pheromone traps are above two per week, we know that a damaging population is present. Monitoring moth flight with pheromone traps is key to season-long control, both to respond quickly to changes in flight and to avoid unnecessary sprays. Non-target moths can often end up in traps and accurate identification is important for decision making. Reports of moth trap captures at selected locations are provided in most New England states. The most accurate and timely flight information will be obtained by monitoring your own fields. Heliothis net traps baited with Hercon *Heliothis zea* pheromone lures are commercially available and widely used in the region. Spray thresholds (see Table 1) are based on trap counts. Use two traps on each farm. Place traps in blocks with fresh silk and move one trap into fresh silk each week. Blocks with fresh silk will give you the highest and most accurate counts. Counting moths twice weekly is the most accurate way to monitor and will help you avoid missing a sudden jump in the CEW population on your farm. Calculate the average nightly catch (divide total count by the number of nights since the last count). Replace lures every two weeks. Use 2 traps on each farm and move one each week into fresh silk.

Control

Control depends upon maintaining insecticide coverage on the silks, unless you are using transgenic hybrids which express the *Bacillus thuringiensis* (Bt) toxin in leaves, silks, and kernels. Bt transgenic corn has been commerically available since 1996. In 2015, 81% of corn and 84% of cotton grown in the U.S. were Bt transgenic crops. Research published in 2016 indicates that there is field resistance among corn earworm to transgenic corn. This has likely developed as a result of rapid adoption of Bt field corn and cotton production, lower 'refuge' compliance, and high tolerance of corn earworm to Bt toxins.

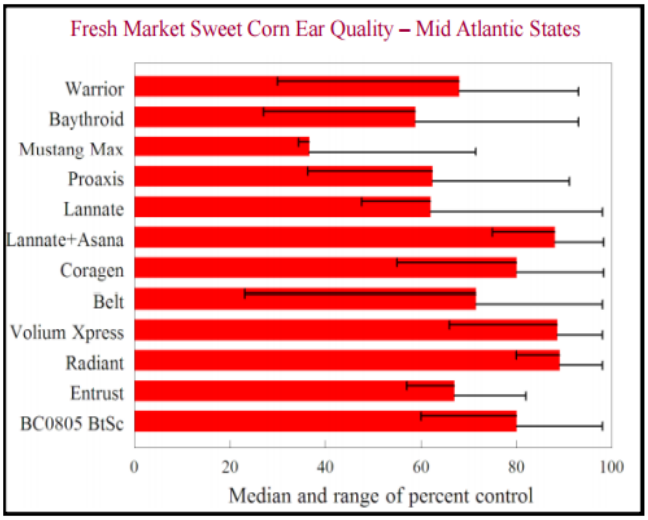
Directed sprays to the ear zone provide the best coverage. Repeat applications to silk every three to six days depending on trap captures according to the chart to the right. The spray intervals assume use of synthetic pyrethroid or carbamate products. Some newer products in the diamide class (Coragen, Belt, or mixtures such as Voliam Xpress and Besiege) have a longer residual that should allow the spray interval to be extended by one or two days. If maximum daily temperature is below 85°F for two to three days, spray intervals may be extended by one day. Continue treatments until five to seven days before final harvest or until silk is completely dry and brown. Use selective materials instead of broad spectrum insecticides to conserve natural enemies of aphids and other pests.

Table 1: Spray Intervals for corn earworm based on moth captures in Heliothis net traps.

Moths/Night	Moths/Week	Spray Interval
0 - 0.2	0 - 1.4	no spray
0.2 -0.5	1.4 - 3.5	6 days
0.5 - 1	3.5 – 7	5 days
1 - 13	7 – 91	4 days
Over 13	Over 91	3 days

The newer, selective products for corn earworm, fall armyworm, and European corn borer provide good control while being easier on beneficial insects that are present in the field and safer for applicators to handle. These provide good alternatives to the synthetic pyrethroids (e.g. Warrior) and carbamates (e.g. Lannate) that were the mainstay of corn earworm control for many years. As with other products, control is better when application equipment is set up for good coverage of the ear zone. Based on review of published trials, the following products have provided good control:

- **Radiant** (spinetoram): consistently equivalent efficacy with Warrior in trials - highly effective.
- **Belt** (flubendiamide): equivalent efficacy to Warrior in some trials, slightly less in others.
- **Coragen** (chlorantraniliprole): slightly less effective on corn earworm than Warrior but easier on beneficials and people.
    - A rotation of Coragen, Belt, and Radiant is recommended to avoid resistance development. Growers we have spoken with who have been trying these products have also reported effective control. The products mentioned above can be mixed with broad spectrum pyrethroids. However, given that there are many beneficial insects in corn, it's good to have more selective products available.
- **Besiege** (a mixture of Coragen and Warrior active ingredients, each at lower rates): highly effective, often better than Warrior.
- **Entrust** (spinosad): In organic fields, this material has been observed to give good control of corn earworm. Foliar sprays of Entrust will be effective for control of European corn borer in the tassel, as well as for control of light to moderate populations of corn earworm. High populations (over 30 per week) may not be fully controlled by this product.



Results of trials conducted by Ben Beale and Galen Dively (University of Maryland) and Joanne Whalen (University of Delaware).

References:

Hazzard, R and Howell, J Eds. "New England Vegetable Management Guide 2014-2015 Ed.": https://nevegetable.or

Brown, A, Hazzard, R and Westgate, P. "Sweet Corn Insect Management Field Scouting Guide": https://ag.umass.edu/vegetable/publications/guides/sweet-corn-ipm-scouting-guide-record-keeping-book

Dively, G. "Regional Impacts of a High-Dose Resistant Crop" Presentation to National Research Council, April 2015: https://vimeo.com/122426527

Weinzierl, R. "Managing corn earworm, cutworms and armyworms in vegetable crops" presentation, February, 2015: https://web.extension.illinois.edu/mms/downloads/47270.pdf

--Written by Katie Campbell-Nelson

Massachusetts Tomato Contest to be held on August 21st

The 34th Annual Massachusetts Tomato Contest will be held in the KITCHEN at the Boston Public Market on Tuesday, August 21st. Tomatoes will be judged by a panel of experts on flavor, firmness/slicing quality, exterior color and shape. Always a lively and fun event, the day is designed to increase awareness of locally grown produce.

Farmers who want to submit entries can bring tomatoes to the market between 9:00 am and 10:45 am on August 21st or drop their entries off with a registration form to one of the drop off locations on August 21st. Drop off locations include sites in Amherst, Northboro, Topsfield and North Easton. These tomatoes will be brought in to Boston on Tuesday.

For the complete details, including drop off locations, contest criteria and a registration form, go here.

The 34th Annual Tomato Contest is sponsored by the Massachusetts Department of Agricultural Resources, New England Vegetable and Berry Growers Association and Mass Farmers Markets in cooperation with the Boston Public Market and The Trustees.

Events

UMass Extension Vegetable Program Research Tour and Round Table

Featuring presentations on the following topics:

- Cucurbit downy mildew resistance in cucumbers - Sue Scheufele
- Pollinator protection in butternut squash - Sue Scheufele
- Mulches for flea beetle control in brassicas - Sue Scheufele
- Natural predators of cabbage aphid - Sue Scheufele
- Corn genetics - Madelaine Bartlett
- Organic fertilizer effects on yield and nitrate in lettuce varieties - Omid Zandvakili
- Fusarium wilt of basil - Kelly Allen
- Bee size and disease transmission - Lynn Adler
- State incentives for solar photovoltaic arrays on farms - Zara Dowling & River Strong

When: Tuesday, August 14th, 2018 from 4:00 PM to 7:00 PM (Rain date: August 16th)

Where: UMass Crop and Animal Research and Education Farm, 89-91 River Rd., South Deerfield, MA 01373

CLICK HERE TO REGISTER: https://www.surveymonkey.com/r/X3JYR55

Click here to request special accommodations for this event.

Reduced Tillage and Transplanters for Vegetable Farmers

Featuring: Farmer Jim Ward and his reduced till vegetable cropping systems which he has practiced for over 10 years with the help of an Unverferth Deep Zone Tiller, Davidian Farm's two-row Monosem vacuum precision planter mounted with Dawn Biologic roller crimpers (first ones in the state!), the UMass Research Farm's grain drill and roller crimper, and Brookdale Fruit Farm's new line of no-till transplanters from Checchi-Magli. There will also be demonstrations on Soil Health with Maggie Payne, Soil Scientist at NRCS.

When: Tuesday, August 28th, 2018 from 4:00 PM to 7:00 PM

Where: Ward's Berry Farm, 614 S Main St., Sharon, MA 02067

CLICK HERE TO REGISTER: https://www.surveymonkey.com/r/XF8JQYD

Click here to request special accommodations for this event.

THANK YOU TO OUR SPONSORS:

Vegetable Notes. Katie Campbell-Nelson, Genevieve Higgins, Lisa McKeag, Susan Scheufele, co-editors.

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