UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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In this issue

Crop conditions

The first confirmed case of late blight in Massachusetts was found in a tomato field in Hadley earlier this week. With the dissemination of this information, many growers have busy using preventative sprays on their tomato and potato fields. The news was disappointing and somewhat surprising to many considering the hot, mostly dry weather conditions we have had this season. Although this is only one isolated case, the positive diagnosis serves as a reminder of the importance of using protective sprays and careful monitoring of fields for the symptoms of late blight. Classic symptoms are large (at least nickel-sized) olive-green to brown spots on leaves with slightly fuzzy white fungal growth on the underside when conditions have been humid. Tomato crops should be protected with fungicides specific to downy mildew and inspected regularly for symptoms of blight. For detailed descriptions of symptoms, color pictures, instructions on how to handle suspected late blight infested plants and weekly updates visit www.umassvegetable.org. Samples should be sent to the UMass Plant Diagnostic lab immediately (413-545-3209).

Harvesting of summer vegetables continues, potato vines are dying back, garlic is harvested and drying. Peaches, raspberries and blueberries are attracting consumers to busy roadside stands and farmers markets helping to boost vegetable sales. Growers have been using the dry days to cultivate, apply pesticides and scout for insects and diseases. Rainfall from the passing storms this week delivered anywhere from a tenth to and inch and a half of rain per storm. More rain is needed and those who can are irrigating. The lack of rain has kept disease pressure low. Insect pressure is high; leaf hoppers, thrips, aphids and flea beetles are causing lots of damage. Corn earworm has made its way to the northeast and the second generation of European corn borer has begun.

Powdery mildew of cucurbits: 2010 update

Powdery mildew is a major production problem in cucurbit crops in all parts of the world. All cucurbits are susceptible, but the disease is less common on cucumber and melon due to the prevalence of resistant cultivars. Yields are reduced by a reduction in the number and/or size of fruit. Fruit quality can also be adversely affected by sunscald (due to defoliation), incomplete ripening, reduced storability (winter squash), and poor rind quality or discolored handles (pumpkins). In addition, infection by Powdery mildew may predispose plants to other diseases (Gummy stem blight).

Powdery mildew developing on the underside of a leaf

Symptoms occur on both sides of the leaf, stems, and petioles as white, powdery fungal growth. Symptoms develop first on older leaves, shaded lower leaves, lower leaf surfaces, and on older, fruit bearing plants. Infected leaves shrivel and die; plants may senesce prematurely. The pathogens are obligate parasites

and cannot survive in the absence of living hosts; initial inoculum for the Northeast is most likely airborne conidia originating in southern states. Other possible sources include greenhouse grown cucumbers and alternate hosts. Under favorable conditions, Powdery mildew develops rapidly; the time between infection and symptom expression can be as short as 3 days and many spores are produced. Conditions favoring infection include a dense plant canopy, low intensity light, high nitrogen fertilization, and high relative humidity (although infection can occur at relative humidity of less than 50%). Optimum temperatures for disease development are 68-80˚ F; infection can occur between 50-90˚ F. Temperatures of 100˚ F or above stop Powdery mildew development.

Plant resistant varieties where available; resistant varieties of squash and pumpkin are under development. Separate successive cucurbit plantings physically to prevent older plants from serving as an inoculum source for main crop. Scout fields regularly (particularly lower leaf surfaces) and apply fungicides early in disease development. Powdery mildew cannot be effectively controlled by fungicide applications after the disease is established. Powdery mildew develops best on the lower leaf surfaces; thus a successful fungicide program requires controlling the pathogen on both leaf surfaces.

An important component of fungicide programs are materials which can move to the lower surface (systemic or translaminar). Systemic fungicides, due to their single site mode of action, are prone to resistance development and the powdery mildew fungi have demonstrated the ability to develop resistance to this type of fungicide: (benzimidazoles (Topsin M) and strobilurins (Flint, Cabrio, Amistar) are largely useless now due to resistance. All strobilurin fungicides, including Pristine, a combination product, have been removed from recommendations due to widespread resistance in pathogen populations. FRAC Group 3 fungicides (Demethylation inhibitors (Rally, Procure) are only effective at highest labeled rate due to the emergence of resistance to these materials. Managing resistance is an important consideration when selecting a fungicide program. Current recommendations for managing resistance consist of an alteration of effective high-risk materials of two or more chemical classes at 7 day intervals, with a protectant fungicide included in every application. Systemic materials should only be applied once per season, and always mixed with a protectant. A protectant fungicide has multi-site activity, low resistance risk, and will control strains resistant to the systemic chemical.

Application of a protectant fungicide alone until powdery mildew is first seen in the field is recommended. At the first sign of powdery mildew in the field, immediately apply myclobutanil (Rally, Group 3) at the highest labeled rate mixed with a protectant such as chlorothalonil (Bravo). Use the one of the following in an alternating program: Quintec plus a protectant (quinoxyfen, Group 13), Procure plus a protectant (triflumizole, Group 3, highest labeled rate), sulfur (Microthiol, Kumulus, MicroSulf, Group M2), potassium bicarbonate (Armicarb, Kaligreen, Group M) neem oil (Triology, Group M) or mineral oil (JMS Stylet Oil, Group M). All Group M fungicides have protectant activity, make good tank mixing partners, and have low risk of resistance development. See the NE Vegetable Management guide for more recommendations (available online at www.nevegetable.org).:

Zitter, Thomas. 2009. Cucurbit Fungicides (Labeled & Rates/A) as of June 2009. www.vegetablemdonline.ppath.cornell.edu/NewsArticles/Cuc_LabeledRts

TARNISHED PLANT BUGS

Tarnished plant bug adults and nymphs feed on several different vegetable crops, and in some fields they can cause significant damage. There are several species of tarnished plant bugs in the US, but the most common in central and eastern US is *Lygus lineolaris*. Adults are about 6 mm long (1/4 inch), brown or tan or greenish with darker markings on their wings and back. Nymphs are bright green and progress through 5 molts (instars) from first hatch to the adult stage. The nymphs can be mistaken for aphids, but move much faster when disturbed. Overwintered adults lay eggs in spring, depositing eggs in stems and leaf ribs in host plants. These adults and nymphs attack strawberry flowers in May. A new generation of adults (which is what we are seeing now) will produce another brood in the late summer, for a total of 2 or possibly 3 generations per year.

Feeding: Adults and nymphs have piercing sucking mouthparts (stylets) which are used to penetrate plant tissues and suck up cellular contents. TPB select succulent, nutritious tissues such as new growth or newly forming fruits (just after blossoming). While feeding, the bugs secrete a toxic substance from their salivary glands, which kills cells surrounding the feeding site. Usually the first signs of damage are small brown spots on young leaves. As the tissue grows, healthy tissue expands while dead tissue does not, which results in holes and distorted, malformed leaves, buds or fruit. Terminal shoots and flowers may be killed.

Damage: Over half of the cultivated crops in the US are listed as hosts. In strawberry, this distorted growth of fruits is known as cat-facing. In lettuce, leaf stems and ribs are injured, causing localized discolored scars and scabs. In celery, feeding on tender stalks produced large, brown colored wilted spots and blacking of joints, know as "black-joint'. In beans, feeding on flowers causes them to drop, and feeding on seeds in young pods causes pitting and blemishing of pods. In tomatoes, eggplants and peppers, feeding may occur on flowers and stems, causing flower drop. Fruits may also be attacked leading to indentations, bumps, or yellowing of the flesh where the fruit is "stung" by the piercing mouthparts of nymphs or adults. These could be confused with stink bug damage, but they do not have the white pithy areas beneath the skin that is typical of stick bug damage. It is not common to see this damage, but if the damage occurs it may help to determine the cause. In pepper and in basil, feeding in emerging leaves causes distortion and browning of leaves. In apples, adults feed on fruit buds and cause fruit dimpling and scabbing, or dropping off (abscission) of the buds.

Adult Tarnished Plant Bug

We also find TPB damage in water spinach, which is grown as a succulent green for Asian markets (Note: this crop is on the US Noxious Weed list because it is invasive in tropical areas. It may be grown legally in Massachusetts ONLY with the proper permit. Contact Frank Mangan 978-422-6374 for more information if you are interested in growing this crop). TPB feeding occurs in the tiny new leaves in internodes. Holes are punctured in the folded tiny leaves and cells are killed, and as these leaves open up this results in symmetrical holes and distortion of the leaves. Brown scars occur in the internodes. Plants develop more branches in response to dead terminals, which makes them less marketable. Markets want long, single stems with as little branching as possible.

Weeds and field crops are also host plants: Tarnished plant bugs attack a large variety of weeds, flowers, forage crops, and orchard crops. Weed hosts include wild carrots and other umbelliferous crops, redroot pigweed (and other amaranths), lambsquarters, mustards, shepardspurse, rocket, goldenrod, and mullein. Alfalfa is a favored host, and harvesting alfalfa often stimulates major lygus migrations. Other legume hosts include vetch, lupine, and fava beans. Where weedy areas or field crops surround vegetable fields, continuous re-infestation of vegetables is possible.

Management: Vegetation management on the whole farm is very important for these highly mobile pests. Focus on removing sources of infestation outside the crop. Disk or rototill weeds along field borders to reduce weed hosts, or keep them mowed all season. Similarly, keep grassy areas on the farm mowed short, to reduce their attractiveness as hosts. However, disturbing non-crop areas by mowing can encourage movement of TPB into your crop, so it should be avoided at critical periods when the crop is vulnerable.

There are natural enemies of TPB, including a parasitic wasp, which was released for control of TPB in alfalfa (Peristenus digoneutis). This was released in New Jersey and has spread throughout the Northeast, and can cause up to 50% mortality. However, it currently does not reduce the numbers sufficiently to prevent damage in key crops. Common predators, such as ladybeetles, spined soldier bugs and insidious flower bugs also prey on nymphs.

White sticky traps placed above the canopy are used in strawberry and can be used in vegetables to indicate when adults are present. Economic thresholds have been determined for crops where TPB is a key pest, but not in most vegetable crops. It is difficult to sample tarnished plant bugs directly on plants, because they are very mobile and like to hide. In strawberry, nymphs are shaken off the flower clusters onto a flat surface and sprays applied if 4 out of 30 clusters have nymphs.

If damage is unacceptably high, use insecticide applications. Labeled products for TPB on lettuce are listed in the 2010-2011 New England Vegetable Management Guide and include several synthetic pyrethroids and carbamates. Pyganic may be used by organic growers. Avoid applications during bloom periods. Insecticide labels often list "lygus bug" instead of specifically "tarnished plant bug".

TOMATO HORNWORM

Late July and early August are usually the time when we see tomato hornworms. These large caterpillars typically appear in small numbers and cause their impressive feeding damage to just a few leaves or plants. Larvae consume large amounts of foliage on peppers, tomatoes, eggplant, potatoes, and related solanaceous weeds. Now is the time to scout, by searching leaves for damage, frass or larvae. Often one sees defoliated stalks or the characteristic dark-green droppings (fecal pellets) before the caterpillar is located.

There is one generation per year in northern areas. The adults are large moths, predominately gray or gray-brown with lighter markings. They are commonly referred to as sphinx, hawk, or hummingbird moths. The adult tomato hornworm (*Manduca quinquemaculata*) is known as the five-spotted hawk moth while the adult tobacco hornworm (*Manduca sexta*) is called the Carolina sphinx. The wingspread may reach five inches and the hairy, robust abdomen has yellow spots. They emerge from over wintered pupae in the soil in late spring or early summer. The moths are commonly seen at dusk, hovering hummingbird-like over beds of petunias and other flowers with long corollas. Nectar is extracted through their long, coiled, tube-like mouthparts.

The spherical greenish-yellow eggs are deposited singly on the undersides of host plant leaves. The eggs hatch in approximately one week and larvae begin feeding on foliage. Larvae feed for 3-4 weeks, molt five times, and may reach four inches in length and 1/2 inch in width when full grown. Both species are green with a distinct "horn" on the top of the tail end. The sides of the tomato hornworm are marked with a series of white marks resembling a "v" laying on its side and pointing toward the head. The white marks on the sides of the tobacco hornworm form a series of seven diagonal lines. The tip of the tomato hornworm's horn is black while that of the tobacco hornworm's is red.

Full-grown larvae burrow 3-4 inches into the soil and form dark brown, two-inch long pupae. A sheath for the mouthparts projects from the head of the pupa and curves downward, resembling the handle of a pitcher.

A parasitic Braconid wasp is an important and fairly common natural enemy of the hornworms. The wasps lay their eggs inside the body of the caterpillars. After feeding within the caterpillar body, the larvae of the wasps eat out through the skin and spin the cocoons on the caterpillar surface. The adult wasps later cut out circular lids and escape from the cocoons to attack other hornworms. If one is hand-picking hornworms, those with cocoons of parasitic wasps on their back should not be killed.

Parasitized Tomato Hornworm

Controls: There is no set economic threshold for this pest in tomato. Where damage is unacceptable, or if there are high numbers, foliar sprays can be used. Use a selective material that will conserve beneficial insects, because those predators and parasites are very likely keeping your aphid populations under control. Insecticides which are specific for caterpillars include Bacillus thuringiensis (Bt) kurstaki or aizawi strain (Dipel DF, Agree, or Xentari, etc.), indoxycarb (Avaunt), tebufenozide (Confirm 2F), or spinosad (SpinTor 2SC or Entrust). Several synthetic pyrethroids are also labeled (note: these could result in aphid outbreaks). Although Bt usually works best on small larvae, in this case it will work very well even against large hornworms. In peppers, any controls used for European corn borer should control hornworms.

Thanks to sources: Utah Sate Univ.Extension Fact Sheet # 74, Purdue Vegetable Crops Hotline # 409 (Frankie Lam)

PEPPERS: WATCH FOR ECB, APHIDS AND PEPPER MAGGOT

European Corn Borer: The second generation of European corn borer has made an appearance in many locations throughout the state this week. This second flight is right on schedule this year and adults are laying eggs which will hatch very quickly if temperatures remain in the high 80's and 90's. Moths lay flat, white egg masses on the underside of leaves.

Eggs hatch in 4-9 days, depending on temperature. ECB caterpillars are whitish or gray with a pattern of dark spots and a black or dark brown head. This dark head capsule distinguishes them from pepper maggots, which are completely white. Young larvae usually enter the fruit by tunneling under the cap. They leave a pile of light brown frass on the surface. Often this is the only indication that a pepper is infested until two or three weeks after the borer enters, when bacterial soft rot causes the fruit to decay. Because ECB caterpillars don't spend much time feeding in foliage, there is a fairly short window for gaining control with insecticide applications. Biological control is also an option – see below.

The severity of ECB in peppers varies in MA and around New England. Some farms – typically in areas where farming is less dense and ECB populations have not built up – do not see much damage from this pest. In the Connecticut Valley and in Southeastern MA, an unsprayed pepper field is likely to have anywhere from 10 to 100% of the fruit infested. In some cases, it seems that sweet corn – which ECB prefer over peppers – helps to draw ECB away; in other cases, presence of sweet corn near peppers provides no benefit at all. Use flight counts and historical experience to help you decide which applies to you. Getting good ECB control is especially critical when you want to sell ripe, colored peppers.

ECB monitoring: Flight is detected by placing two white nylon mesh Heliothis Scentry™ traps in weedy areas near pepper fields. These are the same trap that are placed on the edges of sweet corn fields. Traps should be placed 50-100 feet apart with the base at the top of the weed canopy. Bait one trap with a lure for the Iowa strain (ZI) and the other with a lure for the New York strain (EII), as both of these strains occur throughout New England. Check traps once or twice a week from the third week of July.

ECB threshold: Insecticide applications should begin one week after trap counts reach 7 per week (or one per night). This week delay provides an ample time margin for mating, egg-laying and egg hatch to occur before the larvae can enter the fruit. During the period when ECB moths are active, a regular schedule of insecticide applications should be maintained. This flight period usually lasts through August. At the end of the flight, when trap captures drop below 20 per week, insecticides should no longer be needed.

Insecticides: The intervals recommended for insecticide applications depend on the active ingredient used. Acephate products (Orthene 97, 7dh) can be used at 10-day intervals; insect growth regulator methoxyfenozide (Intrepid, 1 dh) at 7 to 10 day intervals; synthetic pyrethroids (products range from 1 to 7 dh); spinosad (1dh) at 7-day intervals; and Bacillus thuringiensis products twice weekly. Days to harvest restrictions for these insecticides vary from 0 to 7 days, and often dictate the choice of material. Intrepid is a selective insecticide that conserves natural enemies while controlling ECB and is easier on parasitoids than any other products with the exception of Bt. Feeding stops within hours, but it takes several days for the larvae to die. If you are concerned about pepper maggot, use of an Acephate product for the first ECB spray will also control the end of pepper maggot flight. For more details on registered products check the 2010-2011 New England Vegetable Management Guide.

Using Trichogramma wasps for biological control of ECB in pepper

Sweet corn is not the only crop where ECB can be controlled with the parastic wasp, *Trichogramma ostriniae*. Most of what you have read about using T. o. in corn applies to peppers, with some important differences. Peppers are susceptible to the second generation of ECB, because that's when there's fruit on the plants. ECB will invade fruits that are > ½ inch across. Trichogramma attacks only the egg stage, so timing is critical. We recommend that you begin releases the week that flight begins and continue weekly releases for a total of 4 weeks. Release 90,000 to 120,000 wasps per acre and spread the cards out throughout your pepper block. Higher rates are needed in peppers compared to sweet corn because the tolerance for damage is virtually zero and ECB larvae attack the fruit directly. Four releases are needed because the egg laying period for the second generation is longer than for the first generation of ECB. Fortunately peppers are also a higher value crop and worth the extra cost. After four releases, Trichogramma will have reproduced in the field and biocontrol should continue.

Wasps can be ordered from IPM Laboratories, www.ipmlabs.com or Ph 315.497.2063 and should be ordered ASAP. Wasps can also be used in combination with insecticide; if so, choose a selective material (see above) that will not kill wasps.

Pepper Maggot Fly: Pepper maggot fly (*Zonosemata electa*) is closely related to the apple maggot fly and has one generation per year. Adults emerge in mid to late July and are active for several weeks. Because flies lay eggs directly into pepper fruit, the damage often goes unseen until it is too late. In New England, pepper maggot has typically been a southern New England pest, Connecticut, southeastern MA, and scattered locations farther northward. It is often a farm-by-farm or field-by-field phenomenon without any clear reason for high or low populations that occur in a particular place.

The best way to detect activity is to look for stings on the fruit, and these are easiest to spot on cherry peppers.

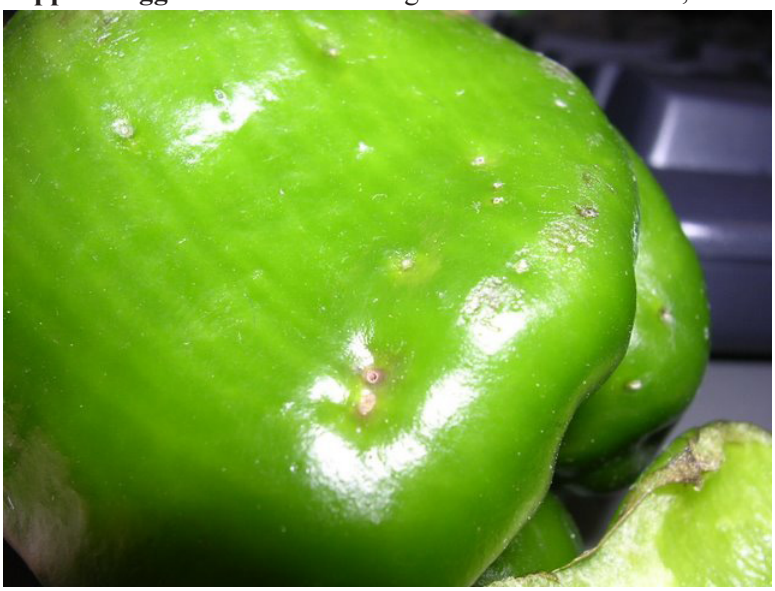
Pepper maggot flies are smaller than a house fly, bright yellow with three yellow stripes on the thorax, green eyes, and clear wings with a distinct banding pattern. On a daily basis, flies enter the field and return to the surrounding forest, passing across the border areas. Females insert their eggs directly into the pepper fruit and leave a small dimple – an oviposition sting or scar.

The legless white maggots feed and tunnel inside the fruit, especially in the placenta. Maggots reach about ½ inch in length over a period of about two weeks, and have no distinct head capsule. When they are ready to pupate, they exit at the blossom end, leaving tiny round exit holes. These holes allow for the entry of pathogens into the fruit. Sometimes the oval brown pupae can be found inside the fruit. Often damage is detected only because of premature ripening or decay of the fruit.

Pepper maggot monitoring: Maggots prefer to lay eggs in the small round fruit of cherry peppers. When these are planted in the border rows they work very well as indicator plants. The egg-laying stings appear as depressions or scars and are easy to find on these small, round fruit. By timing insecticide applications with the first occurrence of the stings on the indicator plants' fruit, damage to the main crop can be avoided with a minimum of spraying. If cherry peppers are not part of your crop mix, look for stings on bell peppers.

It's too late for this year, but if this pest is a concern for your farm, consider using perimeter trap cropping which is very effective. Plant one row of cherry peppers around the perimeter of the crop- hot cherry peppers can be used to create a perimeter trap crop system to protect against pepper maggots. Two or three rows of hot cherry peppers can be planted around the perimeter of the pepper crop, encircling it like castle walls. These peppers are more attractive to the maggot flies than the sweet bells, so the flies will build up in the perimeter, allowing for a perimeter spray that will reduce pest populations and protect the main crop. Perimeter trap crop systems can be as effective as whole field sprays while drastically reducing pesticide costs.

Pepper maggot threshold: If stings are observed on fruit, make two insecticide applications, 10-14 days apart, with a material labeled for pepper maggot. Pepper maggot fly activity can be very localized, and varies by farm, by region, and by year. Many farms never have a problem with this pest. Some may have it and not realize it, because it is possible to confuse maggot damage with damage caused by European corn borer. Check nearby fruit carefully for proper identification if fly has been captured. If a given farm has a history of pepper maggot activity, and pepper maggot, then it is recommended that an insecticide be applied on that farm. Farms that have never had a problem with this pest generally do not need to be concerned except that, the range of this pest seems to be expanding.



Pepper maggot fly oviposition scars appear as tiny 'stings' in the center of a slight dimple on pepper fruit

Aphids: Aphids fly into pepper fields in June and July. The most common species is green peach aphid (Aphis gossypii), which is light green, yellow green, or pink, with no distinctive markings. Aphids can easily be seen with the naked eye, but a 10X hand lens allows you to observe them more clearly. Wingless females use their piercing-sucking mouthparts to feed on the underside of leaves. Females produce smaller, light-green nymphs, which feed in clusters nearby.

Most of the time, beneficial insects such as ladybeetles and lacewings keep aphid numbers under control in peppers. By avoiding unnecessary insecticide applications, these natural enemies can be conserved. Use of broad-spectrum insecticides, particularly synthetic pyrethroids, to control other pests may cause aphid outbreaks. High numbers cause a buildup of sticky honeydew secretions on leaves and fruit.

Green peach aphids can vector viruses such as cucumber mosaic virus (CMV). Insecticides are not effective in controlling these viruses because the transmission occurs rapidly at low population numbers.

Aphid monitoring: From mid June to September, examine the underside of four leaves per plant on 25 plants chosen at random. Count aphids found. Calculate the average aphids per leaf (divide total by 100).

Aphid threshold: 10 per leaf. If five per leaf are found, check again within a week to determine if numbers are rising or falling.

ORGANIC CONTROL FOR CORN EARWORM IN SWEET CORN

Now that corn earworm has been found in the state it is time to take control measures. While foliar sprays of Bt or Entrust will be effective for control of European corn borer in the tassel, additional measures may be needed for control of corn earworm. Foliar sprays of Entrust can control CEW when the pressure is light; however, direct silk applications of vegetable oil mixed with a pesticide will reduce corn earworm and corn borer damage to ears by coating the silk channel and the kernels in the tip where CEW (and also some ECB) larvae feed. This method may be used alone or in combination with foliar sprays. Certified organic growers must be careful to select approved materials. A handheld oil applicator (the Zealater™) designed to make this hand-application method economical and comfortable, is available from Johnny's Selected Seeds (1-877-564-6697). The UMass Extension Vegetable program has an eight-page publication, **Organic Insect Management in Sweet Corn: Scouting, Thresholds and Management Methods for Key Caterpillar Pests in Sweet Corn,** describing the pests, monitoring methods, materials, tools, timing, and how to integrate oil applications with other methods. Information on direct silk treatment for CEW control can also be found in the **Using IPM in the field, Sweet Corn Insect Management Guide** available through the UMass Extension Vegetable Program, Johnny's Select Seeds, and on line at www.umassvegetable.org. Contact the Vegetable Program office (413-545-3696) to obtain a copy or visit our website.

Success with the direct oil method takes attention to detail and timing. Here is a summary of some key points:

Timing. Corn should be treated with 0.5ml (not 5.0ml!) of oil, once during early silk stage. Action should be taken when >2 corn earworm moths are found per week in a trap in your area. The best time to apply oil is generally 5-7 days after silk growth starts, or 3-4 days after silk is full grown. At this time, the tips of the silks have just begun to wilt and turn brown and pollination is nearly complete. A good way to check the timing is to carefully husk a couple of representative ears and examine the kernels. The ideal time to treat is when the silk is still attached to the top 1" or less of the kernels.

Applications made too early after silk do not give better control, but may result in a higher rate of "cone" tips. This occurs when oil interferes with silk pollination resulting in unfilled kernels in the tip. While partially filled tips are a relatively common occurrence in sweet corn, cone tips caused by oil can be more pronounced.

Oil applied too late after silk initiation can result in more feeding damage to the kernels caused by caterpillars that entered the ear prior to the oil. There is a window, somewhere between 5 and 8 days after silk initiation, that provides the best combination of corn earworm control and ear fill.

Materials. We recommend using corn oil or soy oil with added spinosad (Entrust). Organically certified growers will need to use a dry formulation of pesticide and can add an emulsifier to the oil to keep the pesticide suspended in the oil. We have had luck with liquid lecithin. Add 5% volume of liquid lecithin to the oil before adding the dry material that has been suspended in water. Liquid lecithin is the consistency of molasses: we strongly recommend that you add it directly to the oil instead of measuring into a separate container first. Lecithin will mix more readily with oil than water, making cleanup difficult: be careful not to spill the lecithin. Use the labeled rate of pesticide per acre in corn. Add this to the approximately 2 gallons of oil it takes to treat 1 acre.

For the Bt product that we used in our trials (Dipel DF) this translated to approximately 3 tablespoons of Bt per liter of oil for an application rate of 1/2 lb Bt per acre.

For 2 oz per acre of Entrust (assuming 16,000 ears/acre), use 0.25 oz per liter of oil, this is approximately 4 tsp per liter of oil. If you have any questions about using the Zealater or direct silk treatments for control of sweet corn pests, please contact Ruth Hazzard or Amanda Brown at brown@umext.umass.edu or 413-545-3696.

SWEET CORN REPORT

Harvesting of sweet corn continues at a steady clip as prices at many roadside stands began to fall this past week. Plants in the eastern part of the state are still in need of water since that part of the state has not been delivered the same amount of rainfall as the Connecticut valley and western portions of the state. Plants with adequate water are looking healthy and

Location	ZI	EII	Total ECB	CEW
CT Valley				
Sunderland	1	2	3	4
Hadley	15	6	21	5
Southwick	17	10	27	1
Hatfield	4	3	7	7
Feeding Hills	2	0	2	3
Central & Eastern MA				
Rehobeth	0	10	10	63
Concord	0	6	6	5
Northbridge	16	4	20	1
Spencer	0	1	1	1
Lancaster	5	1	6	0
Littleton	0	20	20	5
Tyngsboro	1	0	1	0
Framingham	11	0	11	4
Western MA				
Sheffield	1	0	1	5
NH				
Litchfield, NH	0	0	0	12
Hollis, NH	0	0	0	3
Mason, NH	18	0	18	1

are producing sweet, full ears. Overall this has been a good year for sweet corn.

The short break from spraying for the usual pests is over. Corn earworm has arrived across the state and adults are laying eggs on fresh silk. Many growers are on a 4-6 spray schedule for CEW and are starting to see the second flight of European corn borer. If you are catching more than 2 moths per week, a 6-7 day spray schedule is recommended (see table below). Because CEW lay their eggs directly on the silk, eggs are difficult to find in the field unless the population is VERY high. We rely on pheromone trap catches rather than scouting to make CEW management decisions. Drop nozzles with high pressure directed at the silks are good for accurate coverage. Conventional materials such as Warrior will work well in heavily infested areas. Radiant is less toxic and can be used in fields with low to moderate infestations. Entrust is recommended for organic growers and the use of the zea-later (see article above). Remember to keep moving your traps to fields with fresh silk, check them twice a week and change the lures bi-weekly. Staying on top of CEW populations in your fields is the best way to determine if control action is necessary.

Fall armyworm adult moths have not been found as of yet, however damage has been seen in whorl stage corn. Scout whorl stage corn for obvious ragged feeding damage and yellow to orange color frass from FAW.

Corn Earworm Threshold		
Moths/Night	Moths/Week	Spray Interval
0-0.2	0-1.4	no spray
0.3-0.5	1.5-3.5	every 6 days
0.6-1	3.6-7	every 5 days
1.1-13.0	7.1-91	every 4 days
Over 13	Over 91	every 3 days

UPCOMING MEETINGS

Field Day at the UMass Crops Research and Education Farm August 11th www.umassvegetable.org for more information

NOFA-MA 36th Annual Summer Conference, August 13-15 www.nofasummerconference.org for more information

Vegetable Notes. Ruth Hazzard, editor and Amanda Brown and Andrew Cavanagh, assistant editors. Vegetable Notes is published weekly from May to September and at intervals during the off-season, and includes contributions from the faculty and staff of the UMass Extension Vegetable Program, other universities and USDA agencies, growers, and private IPM consultants. Authors of articles are noted; author and photographer is R. Hazzard if none is cited.