



UMASS
EXTENSION



Vegetable Notes

For Vegetable Farmers in Massachusetts

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CROP CONDITIONS

Crops are healthy and growing well in most areas, though the challenges to crop health are also growing. These include scattered hail which causes severe damage to some fields; heavy rains and high humidity which have encouraged disease; and dry conditions where the thunderstorms have passed by. Sweet corn harvest has begun in earnest across the state. Ears from these early planting may be small but quality is good, and the demand and price have started off very well. Field tomatoes are starting to come in, and peppers will be close behind. Strawberry season is over, but blueberries and raspberries are in. Garlic is maturing and will be ready for harvest within a couple of weeks. Fall crops such as late season Brassicas are being planted.

We are reaching the point in the season when diseases become worrisome. Phytophthora crown rot has been found in peppers and summer squash, most likely carried over from previous years' infections in the same field. Angular leaf spot is widespread in squash and pumpkins. Early blight and Septoria leaf spot have been observed in tomatoes, as have bacterial diseases. We are tracking the movement of cucurbit downy mildew toward New England from both south and west (for more details, see article below). Planning for an effective spray program that will address all of the diseases each crop will face is a challenge.

UPDATE ON THE TOMATO SALMONELLA OUTBREAK

Many growers are concerned about the potential impact of the incidence of Salmonella poisoning from tomatoes on sales of New England-grown tomatoes. The good news is that the FDA has declared many states and countries to be safe sources of tomatoes. The list of states which are not associated with the outbreak includes all of the New England States as well as New York.

Red roma, plum and red round tomatoes have been implicated in the outbreak, but the source is still under investigation and those from New England states are fine. All grape, cherry and tomatoes with vines attached are okay, regardless of the source. Raw jalapeno and serrano peppers as well as cilantro are being investigated for possible links to illnesses in this continuing outbreak.

Here is an excellent website from the USDA that is updated daily on the salmonella outbreak from tomatoes: <http://www.fda.gov/oc/opacom/hottopics/tomatoes.html>.

-adapted from Steve Reiners, Cornell Cooperative Extension, Veg Edge, July, 2008 Volume 4, Issue 7

DOWNTY MILDEW UPDATE

Downy mildew has been reported in western New York this week, and based on the forecast from the NCSU (<http://www.ces.ncsu.edu/depts/pp/cucurbit/>) tracking program, New Jersey is at high risk this week. It has not been reported in MA yet and we are currently at only moderate risk, but it is likely that it will be here soon.

A contact protectant fungicide can be used alone when the forecasted risk of downy mildew is moderate and before downy

mildew has been found in the area. An EBDC fungicide (e.g. maneb or mancozeb) is a good choice when powdery mildew is not also a concern, otherwise a chlorothalonil fungicide (such as Bravo) is a better choice – and we haven’t seen any powdery mildew yet, though it may be here soon. Fungicides specific for downy mildew should be reserved for when risk is relatively high or when the disease has been reported in our area.

Fungicides with specific activity for downy mildew that are systemic in the plant include Curzate, Tanos, Ranman, Previcur Flex, Forum, and Gavel. Gavel can be used on cucumber, melon, summer squash, and watermelon but not currently on pumpkin and winter squash because it contains mancozeb. Reason and phosphorus acid fungicides are also labeled, but they have not performed as well against the cucurbit downy mildew fungus as the other fungicides in some trials. Strobilurin fungicides (Quadris and Flint) and Ridomil may be less effective as evidence suggests that the pathogen has developed resistance to these types of fungicides. In university fungicide efficacy experiments, Ranman and Presidio have performed slightly better than Previcur Flex. Tanos and Curzate are ranked next and are considered slightly better than Forum, Revus, Gavel, and phosphorus acid fungicides. To delay resistance all systemic materials should be rotated with a fungicide from a different active ingredient class (FRAC group) and mixed with a contact fungicide – see the label for restrictions.

- adapted from material by Meg McGrath

PEPPERS: WATCH FOR ECB, APHIDS AND PEPPER MAGGOT

European Corn Borer

The second generation of European corn borer moths is likely to begin in the next two weeks, depending on your location. It is this second flight, which usually begins the last week of July, which causes damage to pepper fruit. 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



European corn borer caterpillar in pepper. Photo by Jude Boucher, UConn.

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. 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 (Z I) and the other with a lure for the New York strain (E II), 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 main-

tained. 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 (7dh) can be used at 10-day intervals; insect growth regulator (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 check the 2006-2007 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 parasitic 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. UMass Vegetable Program is repeating on-farm trials in 6 pepper fields this year. In 2007, these trials showed equivalent control in unsprayed and sprayed blocks in release fields, with the exception of one late season harvest sample.

Wasps can be ordered from IPM Laboratories (Ph 315 497 2063; Carol S. Glenister, carolg@ipmlabs.com) and should be ordered ASAP. See article from May 1 Vegetable Notes for more details on IPM Labs' pricing and shipping policies. 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. Last year, this pest showed up in southern New Hampshire – probably one more indication of the warming climate.

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



The egg-laying 'sting' on fruit is the best indicator of pepper maggot activity. Photo by Rebecca Grube, UNH.



Pepper maggot in pepper. Photo by Jude Boucher, UConn.

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.

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.

-R. Hazzard and A. Cavanagh, University of Massachusetts
-J. Boucher, University of Connecticut Extension

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-A. Cavanagh, UMass Extension

FLEA BEETLES: PLANT LATE BRASSICAS FAR FROM SPRING CROPS.

Mid July is often a time of year when adult FB numbers decline, because a large part of the population is underground, in larval and pupal stages. After larvae feed on roots, they pupate in the soil, then emerge again into the light as adults—ready to feed on foliage. The time when you will first see these new adults depends on when eggs were first laid on spring Brassica crops, and on soil temperatures since then. Dissections of flea beetles collected from the field in the Connecticut Valley April and May detected eggs present in early May this year; hence new adults are likely to be emerging now.

In fields where Brassica crops are always present, because succession crops are planted close together, it may appear that flea beetles never go away all summer. In fact, they are likely to increase dramatically and feed heavily in early August because of the new summer adults. If you plant fall brassicas close to your spring crops, you make it easy for these beetles to find food. Fall broccoli, cabbage, kale as well as greens such as arugula, bok choi, nappa and salad mix can get heavily damage or even killed by flea beetle feeding. However if you manage your plantings so that fall brassicas are in a different, separated field than spring crops, you can significantly reduce your problems in fall crops. How far? As fas as possible, any distance helps. Barriers such as forest, streams, roads, houses, are helpful. Shorter distances delay the arrival, longer distances delay and reduce the population enough to reduce or eliminate the need for row covers or sprays.

Use of Komastuna as a trap crop around the waxy type of brassicas (broccoli, kale, collard, cabbage, etc). may reduce invasion of late crops by flea beetle. The whole perimeter is planted to one or two rows of komatsuna (or another Brassica rapa crop, which are highly attractive). On an organic farm, the border can be sprayed with Entrust. This is best combined with field rotation to reduce the pressure and can help prevent the need for sprays on the main crop.

BUCKWHEAT AS A SUMMER COVER CROP

Buckwheat is an excellent summer cover crop to follow early summer vegetables such as peas, lettuce, and early Brassicas. After harvesting these crops, Buckwheat can be drilled at 48-70 lb./A (1-1.4 bushels/A) or broadcast at 60-90 lb./A (1.2-1.5 bushels/A). Buckwheat will cover a soil quickly and keep weeds out of the field. It will also attract beneficial in-

sects to the field, loosen topsoil and rejuvenate low fertility soils. To keep it from becoming a weed problem in subsequent years, mow it down at the beginning of flowering, about 60 days after seeding. After mowing, it can be disked and planted to a fall cover crop like rye, wheat or oats. For cultural information on Buckwheat refer to

<http://www.nysaes.cornell.edu/hort/faculty/bjorkman/buck/guide/index.html>

--adapted from Thomas Bjorkman, Cornell Cooperative Extension.

SWEET CORN REPORT

Early corn is being harvested in many places and selling well. Growers are getting good money for corn at the wholesale and retail level. The flight of the first European corn borer generation is over but we are still seeing a few caterpillars feeding in the tassels. Across the state, borer infestation levels were low but the second generation should be emerging within the next week or so. Keep checking traps weekly, if flights reach 12 or more per week in fresh silk a spray is necessary to control populations before they enter the ears. This is the time of year when sweet corn pest management switches from a focus on European corn borer to corn earworm.

Corn earworm traps are up in fields with fresh silk. Two traps per field are recommended and should be placed in corn with fresh silk. Lures should be changed every other week as well as moving the traps to new fresh silk. We have been catching corn earworm flight that is over threshold in half of the locations where traps were this week with highs of 8 moths in Northbridge and 60 in Nantucket County. We can expect trap counts to rise as the weeks continue and more storms arrive from the southern states. Keep in mind that trap capture thresholds are much lower for CEW than ECB. See table below for thresholds. Flight monitoring is the best way to protect your fields from an earworm infestation. Sprays should be directed at the silks of ears with the use of drop nozzles. Low speeds and high pressure are also a good way to ensure coverage. Adult CEW moths are busy laying eggs on the fresh silk as soon as they are found in fields.

No fall armyworm captures have been reported. It is time to put up traps to start monitoring for the adult moths in whorl stage corn.

Location	Z1	EII	Total ECB	CEW
Berkshires/Champlain Valley				
Pittsfield	0	0	0	1
CT Valley				
South Deerfield	0	0	0	-
Sunderland (1)	1	0	1	0
Sunderland (2)	1	0	1	.5
Whatley	0	1	1	1
Hadley (1)	1	0	1	0
Hadley (2)	0	0	0	3
Amherst (1)	0	2	2	-
Amherst (2)	0	0	0	-
Granby	0	0	0	5.5
Easthampton	3	0	3	5
Nantucket County				
Nantucket	2	2	4	60
Central & Eastern MA				
Dracut	0	4	4	2
Rehoboth	0	0	0	0
Still River	1	0	1	2
Concord	0	1	1	4
Leicester/Spencer	0	0	0	1
Northbridge	0	0	0	8
Tyngsboro	0	0	0	0
Lancaster	-	-	-	-
NH				
Litchfield, NH	-0	1	1	7
Hollis, NH	0	1	1	2
Mason, NH	0	1	1	3

Corn earworm thresholds.

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 day	3.5 - 7	5 days
1.0 - 13.0	7 - 91	4 days
Over 13	Over 91	3 days

BRIEF UPDATES ON PEST CONDITIONS

Spider mites: Two spotted spider mite has been found in greenhouse tomatoes on several farms. A fast-acting predatory mite that is commercially available is Phytoseiulus persimilus. This predator feeds only on spider mites. It is best released when mite populations are first noticed, in hot spots of mite activity. Adults are bright red incolor, pear shaped, long-legged and slightly larger than spider mites. High humidity (>75%) and temperatures (>68F) for at least part of the day are good conditions for *P. persimilus*. For chemical control, good coverage of leaf surfaces is important. Chlorfenaspyr (Pylon Miticide) is labeled for greenhouse tomatoes and has some translaminar activity. Bifenazate ('Acramite' for field use, 'Floramite SC' for greenhouse, 3 dh) provides a quick knockdown. It may be necessary to make two applications, approximately 5 to 7days apart to help control immatures that were in the egg stage on the first spray. Watch also for field infestations in eggplant.

Leafhopper: Numbers are building up in potatoes and beans and nymphs are being found in addition to adults. Check your fields and look for the light, fast-moving adults that fly up when the canopy is shaken, and look under the leaves for bright green nymphs that scamper sideways. Controls should be applied to prevent injury.

Squash Vine Borer: While we have continued to catch only one moth per week at our trapping site in Deerfield, several locations in southern NH are reporting moth catches of up to 20 moths per week. Squash vine borers are day-flying moths, with bright orange markings on their backs and legs. They resemble wasps. Most eggs are laid on the stem within a foot of the soil. Hatching larvae tunnel into the stem and, if plentiful, cause wilting, reduce squash yields or even sever the stem from the roots. Summer squash and zucchini are highly susceptible. Pumpkins can tolerate damage without yield loss, and butternut squash are resistant. Insecticides should be targeted at the base of the stem, to kill newly hatching larvae before they bore into the stem. More information can be found in the New England Vegetable Management Guide (online at www.nevegetable.org).

Mexican Bean Beetle: Biological control is a cost-effective strategy. Order *Pediobius* wasps from NJ Dept of Agriculture or other sources for release timed so that wasps attack beetle larvae. (see article in Vegetable Notes, June 5, for more details)

Phytophthora capsici has been found in peppers and summer squash. Scout fields for symptoms, especially if you have had heavy rains. If you find a localized outbreak in a large planting, disk in the infected area and surrounding 15-30 feet to bury the debris and reduce the spread of spores in air and in soil water. See new England Vegetable Guide (online at www.nevegetable.org) for fungicides that may delay infection of nearby plants; however, these do not provide full control. Manage water and soils to prevent standing water. Clean equipment between fields.

Tomato early blight and *Septoria* leaf spot have been observed. A 10-day spray schedule with alternating chemistries (eg a protectant such as chlorothalonil alternative with a strobilurin such as Cabrio) provides good control. Tighten the schedule up if it's wet; extend it if it's dry. Organic growers can use copper products.

--R. Hazzard. Sources: Jude Boucher and Leanne Pundt, University of Connecticut; George Hamilton, Univ. of New Hampshire; Tina Smith and Andy Cavanagh, Univ. of Massachusetts; New England Vegetable Management Guide.

SUMMER MEETING DATES – MARK YOUR CALENDAR!

Massachusetts: Flower Growers' Summer Field Day – 2008; July 23, 2008; The Castle Hill Crane Estate, Ipswich, MA., "The Great Ideas Summer Conference!" for more details contact Paul Lopes, 508-295-2212 ext. 24, lopes@umext.umass.edu or Tina Smith, 413-545-5306, tsmith@umext.umass.edu

New Hampshire: Tractor and Farm Safety Workshops. Late afternoon and early evening of July 23 at Wilson Farm of NH in Litchfield and on July 24 at the Lancaster Fairgrounds in Lancaster. More details will be available as the event nears. Please contact George Hamilton at george.hamilton@unh.edu or 603-641-6060 for additional information.

Rhode Island: Vegetable Twilight Meeting. August 18, 4:30 to 7:30. URI Agronomy Farm, Kingston, RI. For more information contact Kristen Dame (401) 874-2967 or (401) 935-7308 or kdame@mail.uri.edu.

Massachusetts: Verrill Farm Twilight Meeting, Concord MA, Tuesday, August 19. Sponsored by UMass Extension and New England Vegetable and Berry Growers Association.

Massachusetts: Bonanno Farm Twilight Meeting, Methuen, MA, Wednesday, September 24. Sponsored by UMass Extension and New England Vegetable and Berry Growers Association.

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