UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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In this issue:

Crop conditions

Reports from around the state indicate crops are still ahead of schedule. Late blight has been confirmed for the first time in New England, on tomato from a backyard garden in Cheshire CT (New Haven County) this morning, 17 June 2010. The tomato plants were grown from seed, but could have been infected from nearby greenhouse, bedding plants or market farms. Cooler, moist conditions over the past week produced favorable conditions according to the late blight forecasting models and added cumulative SV. The 18 SV threshold for starting preventative fungicides has been reached in Connecticut Valley, eastern and southeastern MA, although north central and Berkshire locations are lower, from 6-11 SV. If there is other infected plant material out there, it could produce spores in the next week. Given a confirmed case in New England AND threshold SV across MS, protective fungicides are warranted. Continue to watch for and rogue out potato volunteers as your personal contribution to a successful New England tomato crop for 2010 and continue to scout potato and tomato fields for symptoms. Other potato news: potato leafhopper is showing up, many crops are reaching flowering/tuber set stage. Sweet corn is in silk and may achieve 4th of July harvest somewhere besides Hadley MA this season. Diseases are beginning to show up in cucurbits, mostly the less common foliar diseases and some bacterial wilt. The online edition of our new Cucurbit Disease IPM Guide is available http://www.umassvegetable.org/ and hard copies can be ordered through the UMass Vegetable Program at 413-57703976. It has lots of photos. Early season beetles are busy, varying from mild to ferocious in their activity this season. Will good crops be matched by good markets – and good prices?

Caterpillars in brassica crops

The major caterpillars on Brassicas – generally known as 'worms in cabbage' – include three species that differ in size and feeding habits, as well as how susceptible they are to certain insecticides. Getting acquainted with the pests helps you to know what kind of damage to expect and what to look for.

Imported cabbageworm; cabbage butterfly (Pieris rapae). This familiar white butterfly can be seen in the daytime fluttering, around cole crop fields. Each forewing has a dark border and one or two round black spots. Eggs are laid singly on the underside of leaves, about 1/8 inch in length, light green and slightly elongated, standing upright. The larvae, called imported cabbageworm, is gray-green, slightly fuzzy, and sluggish. Feeding and resting occur on the underside of leaves, and larvae feed more heavily in the head of cabbage or broccoli as they grow. The overwintering stage is the crysalis (pupa), which is green or brown, smooth with three pointed ridges on its back. There are 3-4 generations per year.

Imported cabbageworm (Pieris rapae) and parasitoid

Diamondback moth (Plutella xylostella). These caterpillars are smaller, light green, appear more segmented and more pointed in shape. When disturbed they wiggle vigorously and may drop off the plant on a string of silk. Feeding causes small, round holes and tends to be spread across the foliage and not necessarily concentrated in the head. The adult moths are tiny (<1/2 inch), light brown, and rest with their wings folded together like a tent. They overwinter in crop residue, but may also enter the region by migrating from southern states.

Diamondback moth (Plutella xylostella)

Cabbage looper (Trichoplusia ni). Cabbage looper usually does not survive the winter in New England, and arrives in migratory flights from farther south. Generally numbers are not significant until late July or August, and some years they do not occur at all. However, earlier flights do occur, probably as a result of early migratory flights. Adult moths are mottled gray-brown, about 3/4 inch long, with a distinct round silver-white mark on each fore-wing. Since they fly at night, they are rarely seen unless monitored with pheromone traps. The cabbage looper caterpillar is light green, with wavy white or light yellow lines down the back and sides. Full-grown larvae reach 1 ½ to 2 inches. At rest or when disturbed, cabbage loopers of any size will raise the middle of their body in a characteristic "loop" shape. Eggs are round, light green or yellow, and laid underneath the foliage. Monitor caterpillar activity by field scouting. Feeding tends to create ragged, large holes in foliage, on both frame leaves and heads.

Cabbage looper (Trichoplusia ni)

Field Scouting for caterpillars. It is especially important to check cabbage or broccoli plantings as they begin forming heads. Greens such as collards, kale, and Chinese cabbage should be scouted earlier, since all leaves are marketed. Check randomly-selected plants throughout the field looking for caterpillars or fresh feeding damage on the top or underside of leaves. Often it is easier to spot the feeding damage first, then find the caterpillar. Classify plants as infested (has one or more caterpillar) or non-infested, and calculate the percent of plants infested. In the Northeast, there is generally no need to treat young plants unless weather conditions delay plant development and at least 35% of them are infested with any of these pests. Treat plants between the start of heading and harvest if 20% or more of the plants are infested. The most critical time to scout and apply controls is just prior to head formation. Use a 10-15% threshold throughout the season for kale, collards and mustard. These thresholds are based on research trials that showed that use of the thresholds produces 98-100% clean heads, the equivalent of weekly sprays but with far fewer insecticide applications.

Do not use less than 50 gal spray material/A; higher volumes provide better coverage. Better coverage of lower leaf surfaces can be achieved by using drop nozzles. Use a spreader-sticker.

Diamondback moth (DBM) has become resistant to many synthetic and microbial insecticides. Even if you are getting excellent control of this pest with the materials presently being used, you should alternate between effective materials to retard development of resistance. Newer materials and the aizawai strain of Bacillus thuringiensis will usually provide better control of resistant DBM than older products. Use transplants grown in New England to avoid importing DBM that have already developed resistance to one or more classes of insecticides.

Insecticides. Use selective products to protect beneficials that keep aphids under control – they also eat insect eggs and small caterpillars! In the area of caterpillar control there are many selective products available. Spinetoram (Radiant SC), spinosad (Entrust), Avaunt (indoxycarb), Pyganic (pyrethrin), Confirm 2F (tebufenozide), Intrepid (methoxyfenozide) and Rimon 0.83 EC (novaluron). The last two are insect growth regulators which have very low toxicity to non-target insects and humans. Bacillus thuringiensis products that contain Bt aizawi (eg Xentari, Agree) and Bt kurstaki (eg Di-

pel, Krymax, Biobit) work well; Bt aizawi is recommended when diamondback moth is the dominant species. Coragen (chlorantraniliprole) is an effective systemic that can be applied through drip; Synapse (flubendiamide) is another diamide (see May 13, 2010 issue for more on the diamide group). Products approved organic production, include Dipel, Xentari, Entrust and Neemix (azadiractin). There are also a number of more broad-spectrum products (synthetic pyrethroids and carbamates) which are effective (see 2010-2011 New England Vegetable Management Guide for details).

Biological Control. Populations are suppressed by natural enemies, which include parasitic wasps that attack larvae. A new parasitoid of imported cabbageworm that was released in 1988 has become well established and is reducing the severity of imported cabbageworm in MA. See accompanying article.

-- R. Hazzard

MEASURING INSECTICIDES FOR BACKPACK SPRAYERS AND SMALL PLANTINGS

Growers with diverse crops and small plantings often need to be able to apply pesticide to beds or plots of several hundred square feet. It is important to use the correct amount of insecticide in your backpack sprayer when spraying a small area.

Calibration and mixing require some basic math, as do a lot of aspects of farming! The methods for backpack sprayers and tractor sprayers are essentially the same. Figure out the area to be sprayed and how much pesticide is needed for that area. Measure the amount of water you need to cover a known area, using the same equipment and walking or driving speed that you will use when spraying. Then 'do the math' so that the insecticide and the water rates both match your target area.

Why does it matter? Why do you need to be careful about these rates?

1. Effective control of the pest depends on correct rates.
2. You are legally responsible for following the label instructions. This is especially important when you are selling the crop to the public.
3. The safety of the applicator, workers and the public depends upon correct rates and using pesticides according to instructions on the label.

Read the label. Find and follow the following instructions:

--Personal protective equipment (PPE) – what you must wear when mixing and spraying.

--Agricultural Use Requirements – this tells what protective equipment you should wear.

--Crops and pests listed. The pesticide MUST be labeled for the target crop.

--Restricted Entry Interval (REI) – during this time, no one should work in the sprayed area unless they are wearing protective equipment.

--Days to Harvest (DH) – how long you must wait after a spray before harvesting

--Rate per acre or concentration per gallon (for backpack sprayer)

--Mixing instructions

Converting metric and english measures. Conversions are key to your calculations. Below are some conversion ratios:

16 dry oz (by wt) = 1 lb

One ounce (dry weight) equals 28.45 grams.

32 fl oz = 1 qt.

128 fl oz = 1 gal

Liquid measure in (fluid) ounces is already a volume so it is easier to measure. One fluid ounce equals 6 teaspoons (tsp) or 29.6 milliliters (ml). An inexpensive measuring device for ml can be found in the children's medicine section of drug stores.

43560 sq ft = 1 acre

Calibration and mixing method for a pesticide with a labeled rate per acre.

The following method is described step by step, using a specific example as a model. Adapted from New England Vegetable Management Guide.

Step 1: Determine how much water you'll need. Determine number of fl oz of water needed per unit area of the field (e.g. per sq ft). You can use any size area that works. The following example uses 250 sq ft.

Calibration steps:

1. Measure out a 250 sq. ft. area. (eg 10 by 25 ft)
2. Using only water in the sprayer, spray the test plot at the same speed (use a comfortable pace), pressure and boom height at which you will treat the larger area. Record the number of seconds that it takes to spray the test plot. Repeat the process 2–3 times and find the average time.
3. Measure the amount of water (fl. oz.) used to spray the test plot. This can be accomplished by collecting the spray output from your sprayer set at the same pressure and collected for the same number of seconds you found in step 2. This gives you fl oz per 250 sq ft.
4. This can be converted to fl oz/sq ft. or used as described below.

Step 2. Determine the amount of spray mixture needed for the field area to be sprayed.

Example: Let's assume you want to apply a dry insecticide for Colorado potato beetle on a potato field, area of 30 X 300 ft = 9,000 sq ft. The label rate is 2 oz. of insecticide per acre.

From calibration, use the the time it took to cover the 250 sq. ft. calibration plot. For the following example, assume the sprayer output for 60 seconds was 12 fl.oz. Set up a ratio, cross multiply and divide.

$$\frac{\text{Spray needed for test plot}}{\text{Area of test plot (sq ft)}} = \frac{\text{spray needed for field area}}{\text{area of field area}}$$

$$\frac{12 \text{ fl. oz.}}{250 \text{ sq. ft.}} = \frac{\text{total amount of spray needed in fl. oz.}}{9{,}000 \text{ sq. ft.}}$$

$$\frac{12 \text{ fl. oz.} * 9{,}000 \text{ sq. ft.}}{250 \text{ sq. ft}} = \text{total amount of spray needed in fl. oz.}$$

Step 3. Determine the amount of pesticide needed for the field area.

Set up a ratio and cross multiply.

Example:

$$\frac{2 \text{ oz.}}{43{,}560 \text{ sq ft}} = \frac{\text{total amount of insecticide needed in oz.}}{9{,}000 \text{ sq ft.}}$$

43,560 sq ft * amt of insecticide needed in oz. = 2 oz * 9000 sq ft

$$\text{Amt of insecticide needed in oz.} = \frac{2 \text{ oz} * 9000 \text{ sq ft}}{43{,}560 \text{ sq ft}}$$

Step 4. Mix water and pesticide, then spray the field. Measure the appropriate amount of water to sprayer, add part of it, then add the appropriate amount of pesticide, agitate, add remaining water, agitate again. Note: for liquid pesticide, pesticide + water = total spray mixture. Therefore, subtract the amount of pesticide needed from the total spray mixture needed to determine the amount of water to use.

Mixing method for labeled rate per gallon in a backpack sprayer.

All pesticide labels will give rates to be used per acre. Some labels also provide a rate of product to use per gallon, specifically for backpack sprayers. If this is given, add that amount of insecticide to each gallon of water. Spray enough to cover the crop foliage, but not to runoff on the ground. The following rates for two commonly used organic insecticides are

Product	Amount per gallon	Amount per 3 gal (1000 sq ft)	Rate per acre
Entrust	.43 gm (¼ tsp)	1.3 gm (3/4 tsp)	2 oz
Surround WP	2 cups	6 cups	50 lb

listed on the product label:

If a gram scale is unavailable, then it is possible to measure Entrust by volume. Based on repeated samples, we have found that there is 1.7 gm per teaspoon (shaved level and tamped slightly) of Entrust powder. For Entrust, do not use more than 3 gallons of water per 1,000 sq ft.

Equipment needed:

Chemical resistant gloves

Measuring container for water (units in fl oz)

Measuring device for small quantities of liquid, in fl oz or ml.

Measuring devices for solids: cup, ¼,1/2 and 1 tsp.

--R. Hazzard, adapted from New England Vegetable Management Guide.

NEW PARASITOID CONTINUES TO SUPPRESS IMPORTED CABBAGEWORM ALL SUMMER

History of project. Cole crop growers in MA traditionally have had to control imported cabbageworm (Pieris rapae) in their broccoli, Brussels sprouts, and cabbage. In 1988, I imported and released a potentially more effective and safer parasitoid of this pest from China. This braconid wasp (Cotesia rubecula) established and spread and in spring of 2007, I measured its presence in organic, conventional and home garden cole crops in MA and found that C. rubecula was present at all 20 sites in the survey, with high levels of parasitism (75%, averaged over all 20 sites). Because this parasitoid kills caterpillars when they are less than 1/3 grown (4th instar larvae), over 70% of the damage that might be done by a healthy caterpillar is prevented. In the 2007 survey, only 10% of the larvae encountered had reached the highly damaging mature stage (5th instars) that does most of the feeding. Additionally in the 2007 survey, I found that the once common parasitoid, Cotesia glomerata had been largely replaced in the spring by the newer, more effective species, C. rubecula. Over 99% of all P. rapae parasitoids recovered in the spring 2007 survey were C. rubecula.

New data. The 2007 surveys were all done in May and June, during the first generation of P. rapae caterpillars. The question remained whether the high level of parasitism seen in spring would hold up over the summer. Also, it was also possible that the originally introduced parasitoid, C. glomerata, would become more common later in the year. To answer these questions, in 2009 I repeated the survey done in 2007, visiting 19 sites in MA, one in Burlington, VT and one in Charleston, RI. Based on the collection of 719 P. rapae larvae (or pupae or parasitoid cocoons), I found that parasitism of P. rapae in late summer (September-October) of 2009 was again 75%, the same as in the spring of 2007. Also, I found that while C. glomerata increased somewhat in relation to C. rubecula (being 12% of all parasitoids collected), C. rubecula remained the dominant parasitoid, accounting for 88% of all parasitism. It was also present at all 21 of the sites surveyed.

Conclusions. This new information shows that the classical biological control project against imported cabbageworm started back in 1988 at UMASS has been successful and that the new parasitoid is now providing a high and consistent level of mortality, making production of organic or low-spray cole crops in MA easier. Reports of this same parasitoid have been obtained from neighboring states, with 91% parasitism (about 2/3 due to C. rubecula) from a site in RI and 67% (all due to C. rubecula) in Burlington, VT. Cotesia rubecula has also been recovered near Ithaca, New York. How far from MA this new parasitoid has spread is unknown, but appears to be spreading quite far and should affect control of this pest in many states in the northeastern US quite soon.

- Roy Van Driesche, PSIS/Entomology Division, University of Massachusetts

Endosulfan cancelled

EPA Moves to Terminate All Uses of Insecticide Endosulfan: The U.S. Environmental Protection Agency (EPA) is taking action to end all uses of the insecticide endosulfan in the United States, because new data generated has shown that it can pose unacceptable neurological and reproductive risks to farmworkers and wildlife and can persist in the environment. Endosulfan, an organochlorine insecticide first registered in the 1950s, is labeled on several vegetables under the tradename Thionex. Makhteshim Agan of North America, the manufacturer of endosulfan, is in discussions with EPA to voluntarily terminate all endosulfan uses. EPA is currently working out the details of the decision that will eliminate all endosulfan uses, while incorporating consideration of the needs for growers to timely move to lower-risk pest control practices. For more information: http://www.epa.gov/pesticides/reregistration/endosulfan/endosulfan-cancl-fs.html

Postemergence yellow nutsedge control

Yellow nutsedge is a perennial sedge (not grass) that emerges in early May from a small tuber or 'nutlet'. The plants will begin to form new tubers in July and August, so it is important to manage it before this occurs. In general, between-row cultivation will not control emerged nutsedge well, but only move the plants down the row with the cultivator and spread it in the field. However, in fallow fields, regular tillage during the season can manage this weed well for future crops. There are a few postemergence herbicide options that are now available. Sandea (halosulfuron) is an herbicide that is now registered on a variety of vegetable crops. It is in the sulfonylurea class of herbicides and is effective at very low rates. It is important that application equipment be well calibrated to avoid over-application. Sandea can be applied preemergence or postemergence in several crops. The crops that Sandea can be used on include asparagus, sweet corn, tomatoes, beans, cucumbers, pumpkins and some melon types. For pumpkins, applications can be made to direct seeded crops after seeding but before 'cracking'. Postemergence applications should not be made until the crop has two to five leaves. A nonionic surfactant, but not a crop-oil, should be added for optimal control. Although Sandea will control or suppress yellow nutsedge and a number of broadleaf weeds, lambsquarters will not be controlled with postemergence applications. Weeds should be in the 1-3 inch stage when treated. Weeds that are larger than this will not be well controlled. Slight stunting and yellowing of the crop has been observed within a few days of postemergence applications. Usually the crop recovers quickly with little effect on yield.

- (A. Senesac, Cornell's Long Island Research Lab)

Corn report

The earliest sweet corn is starting to show silk. These fields are in warmer parts of the state where plastic, row cover and/or transplants were used. Most corn is in whorl stage or entering pretassel. Succession planting will continue for several more weeks.

European corn borer flights have remained low into this week throughout the state with trap counts not even close to double digits. Infestation levels in the field are below thresholds at most locations. Usually this is the time of year we are past the peak of the ECB flight, so it is possible that we will not see a large flight this June. The borers that have hatched and are now busy feeding within the whorl and in the developing tassel, making their way down the stalk. Temperatures in the 90's are forecasted for the weekend so ECB activity may spike. Continue to scout.

Location	Z1	EII	Total ECB
CT Valley			
South Deerfield	1	2	3
Sunderland	0	0	0
Hadley	0	0	0
Southwick	0	0	0
Hatfield	2	3	5
Feeding Hills	4	3	7
Central & Eastern MA			
Rehoboth	0	2	2
Concord	2	3	5
Northbridge	0	1	1
Tyngsboro	0	0	0
Lancaster	0	2	2
Littleton	6	4	10
Dracut	0	9	9
Spencer	1	0	1
Framingham	1	0	1
Litchfield, NH	0	4	4
Hollis, NH	0	2	2
Mason, NH	0	1	1

Bees, pollen and insecticides. Selective products for ECB provide good control while being somewhat easier on natural enemies present in the field. There are many beneficial insects in corn that feed on aphids, small larvae and pollen. Honeybees move into corn when pollen is released. The following recommended ECB control materials are listed as 'highly toxic to bees' in the New England Vegetable Management Guide (Table 20, pg. 49) and should be avoided at pollen release to protect bees: Avaunt (indoxacarb), Lannate (methomyl) Warrior (and generic products with lamda-cyhalothrin) and Pounce (permethrin). In general, carbamates and synthetic pyrethroids are highly toxic to bees. Unfortunately, these are also very effective against caterpillars that invade corn during silking. However, there are alternative options that are easier on bees. The spinosyn group including the new product Radiant (spinetoram) and Entrust (spinosad) has a toxicity rating of medium, while and Belt (flubendiamide), Intrepid (methosyfenozide) and Bt have low toxicity ratings. Belt is diamide, a new class of insecticide chemistry that was introduced in the past 3 years. Diamide products work by activating insect ryanodine receptors that play a key role in calcium release during muscle contraction. Upon ingestion of treated plant tissue, the insect rapidly stops feeding, then becomes paralyzed and starves to death. This class is particularly effective against caterpillars, but some products also work against Colorado potato beetle and leafminers. Mammalian toxicity is low, making these products safer for applicators and field workers. Impact on beneficial insects and pollinators is also low. It is also labeled for fall armyworm. Intrepid (methoxyfenozide) is an insect growth regulator that causes a premature molt, which is lethal. It must be ingested and is labeled for corn borer. It is non toxic to bees and beneficials. Although you may not be too concerned about bee toxicity if your tassels are just emerging, beneficial toxicity is important to keep in mind regardless of plant stage.

Scout any corn where tassels are beginning to poke up out of the whorl. Look for feeding damage, frass, or the small black-headed larvae. If you pull out the tassel and its tightly-wrapped leaves, you may see tiny feeding holes. Borer caterpillars are usually in one of the layers of whorl leaves, or inside feeding on the young tassel. When 15% of plants are infested, a spray is recommended. The best time to control ECB is as the green tassel pokes up out of the whorl. Borers are moving out of the tassel at that time, and easily reached by pesticides. Scout again 3-4 days after spraying. At high levels of infestation or where new eggs are still hatching, it often takes two sprays, 5-7 days apart to bring populations under control.

If your corn is silking, it's a good time to set up corn earworm traps. It's always better to find out about CEW flights before they get into the ear!

- Amanda Brown & Ruth Hazzard

PRE-SIDEDRESS NITRATE TEST: NOW IS THE TIME FOR SAMPLING

Many crops have reached or will soon reach the stage when it's time to decide whether and how much nitrogen to apply as a side dress or top dress. The pre-sidedress nitrate test (PSNT) (also known as the June Nitrate Test) can help you to determine the current level of nitrogen in the soil. If you have a soil probe, the sampling takes about 20 minutes per field (probes are available from many ag suppliers for $40 to $75.) The amount of nitrate-N (reported as parts per million N03-N) in the soil is a good indicator of whether more N will be needed to complete crop growth.

To take a sample for nitrate testing, take 10 to 15 subsamples or cores from the field. Sample slices or cores should be taken to a depth of twelve inches if possible. Avoid sampling fertilizer bands or other areas which have high concentrations of N fertilizer. Generally the best place to sample is between the rows. If plastic mulch is used, samples should be taken from under the plastic. With a soil probe you can just sample through the plastic, leaving small holes that cause no problem. Be sure to avoid any trickle irrigation tape under the plastic. Mix all the samples together and submit about one cupful to the UMass Soil Testing Lab, West Experiment Station, University of Massachusetts, Amherst MA 01003. You may contact the soil testing lab 413- 545-2311 or consult their website at www.umass.edu/plsoils/soiltest

Cloth bags are ideal for sending PSNT samples to the Soil Testing Laboratory. These bags are more convenient to use because it is not necessary to dry the samples, as long as the laboratory receives them within four days. With plastic bags you should dry the samples unless you can deliver them within 24 hours, and ship overnight, or next-day delivery. The lab will do the PSNT within one working day of receipt and inform you of the results. The charge for this test is $6.00 (include a check made out to the University of Massachusetts). Be sure to request a Nitrate (PSNT) test.

The PSNT is a tool growers can use to optimize N application. Research conducted for several years at UMass, along with several years of on-farm experience, showed that an appropriate threshold for peppers and winter squash is about 30 ppm

nitrate-N. Above this level, sidedressing or topdressing supplemental N would be of no value and will likely decrease yield of butternut squash and peppers. Research in Connecticut has shown similar results in pumpkins. There is increasing agreement that a threshold of 30 ppm is appropriate for most vegetables except for sweet corn, for which the threshold is 25 ppm. Using the PSNT can save money and time, improve crop yield, and reduce the likelihood of N leaching and water contamination. Barring unusual weather conditions, PSNT levels in a field tend to be fairly consistent from year to year. Once these values are known for a field, a grower probably does not need to test every year. As a tool, the PSNT should be used along with a grower's experience and knowledge of fields. Interpretation of PSNT results should be made with regard to weather conditions such as leaching rains or soil temperatures.

- John Howell, Frank Mangan, and Ruth Hazzard, University of Massachusetts

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More details will be available soon at

www.umassvegetable.org

or contact Ruth Hazzard, rhazzard@umext.umass.edu

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