UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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Crop conditions

Fields are soaked and difficult to work. On the days when it does not rain, everyone is frantically trying to catch up on field work – planting, cultivating, sidedressing, spraying.. Farms are harvesting peas, beets, yellow squash, zucchini, lettuce, broccoli, radishes, greens, greenhouse tomatoes and cucumbers. Early plastic sweet corn is on schedule (there will even be some 4th of July corn this year), but everyone's regular sweet corn schedules will be full of gaps. Flea beetles are declining in Brassica crops, but are very heavy in eggplant. Skeletonized eggplants are not uncommon.

On the bright side, although it has been extremely humid and wet, it has not been extremely hot. Diseases that are favored by warm temperatures – including Phytophthora capsici – have not been as likely to develop as they might have been at warmer temperatures. Still, Phytophthora has been found in peppers in southern New England and points south.

Do you use the UMass Disease Diagnostic Lab when you think you have a disease problem? Do you know what disease you are dealing with? Are you sure that the chemical that you are buying will work against the disease that you have? The hardest part is getting the sample to the lab. Overnight mail can get them there from anywhere – far or near. However, it needs to be easy to pack it up. The vegetable team and the diagnostic lab are offering prepaid diagnostic kits to make it easier to use the lab. Each kit contains a box, bag, instructions for taking samples, a form to fill out, and mailing label, and can be purchased for the cost of one diagnostic sample ($50). Your diagnostic work is prepaid with the purchase of the kit. As a special offer, we are selling three kits (and three diagnostic samples) for $100. Contact Bess Dicklow at 413-545-3209 for more information. Or, come to the twilight meeting in Hadley on July 18 and pick up your kits!

Cutworms on sweet corn seedlings

Some growers are reporting serious cutworm damage in sweet corn that is at the seedling stage now. Cutworms can also damage in lettuce, brassicas. peppers, tomatoes, eggplants and other seedlings. On top of crops lost to flooding and soggy soils, this loss is especially discouraging. Corn is especially susceptible at the one to two leaf stage; by four to five leaves, cutworm feeding is not a problem.

Damage and identification. Feeding takes place at night. There may be some leaf feeding, but most often the stems are clipped. There are many species of cutworms that attack vegetables including black, variegated, dingy, spotted, dark-sided, or glassy cutworm. Spotted and variegated cutworms climb and feed above-ground, and black cutworms climb when they are young (less than half an inch long). Cutworms can be difficult to identify. Variegated cutworm has some pale yellow markings on its back, while black cutworm is nearly uniform gray to black with a greasy, rough appearance. (See Pest ID Supplement for photos). The cutworms we took from an infested sweet corn field this week were black cutworms, one of the most common in this area.

Adults of all cutworms are moths with dark gray forewings, often with various lighter or darker markings, and lighter hindwings. They are in the same group of moths (noctuids) as the corn earworm, fall armyworm, and cabbage looper, but with very different life cycles and habits. Usually we don't see them since they fly at night.

Moths are capable of migrating long distances. Black cutworm moths are reported to overwinter no farther north than Tennessee but migrate north very early in the season (March, April) and lay eggs. Thus, we see damage from their offspring in June.

Some cutworms spend the winter in the larval stage as deep as 5 inches (12 cm) down in the soil and they may be present in the soil at planting time, ready to feed on early spring transplants and seedlings. Other cutworms winter in the pupal stage. Adults from these emerge in May or June. Moths emerge from pupae of spring-feeding larvae later in the season. There may be one to two generations per year.

Where are cutworms a problem? Cutworms occur where moths chose to lay eggs and where conditions are good for survival. Females lay eggs on grass leaves, weeds, or the crop residude. Attractive habitats include weedy or grassy areas, and alfalfa. Corn and soybeans are among the least attractive egg laying sites. Black cutworm moths are reported to select low spots in the field that has been waterlogged or flooded. We have had plenty of those type

of areas this year! Eggs are also concentrated on low-lying weeds such as chickweed, curly dock, shepherd's purse, peppergrass, mustards such as yellow rocket, or plant residue from the previous year's crop. Note that the above list includes lots of winter annual weeds that grow in the fall – weeds that we often overlook. Larvae feed on weeds – and destruction of weeds just before planting can make the crop more vulnerable, since all other food has been just taken away from the existing population of larvae.

Monitoring. Pheromone traps can be used to monitor the adult flight. To sample cutworms, scout fields when seedlings are young to look for damage. Sample 50-100 plants in groups of 10 or 20. Larvae burrow in the soil and are difficult to find, though searching in the soil near a clipped stem usually turns up a cutworm. Estimate % stand loss to determine need for a spray. Damage may be more concentrated around field edges or in low areas.

Cultural Management. Weedy land harbors the most cutworms, as the adult moths seem to prefer dense plant cover for egg laying. Crop residues may also attract higher populations. Therefore, crops that follow weedy crops, alfalfa, or no-till crops are more likely to be damaged by cutworms. Plant early transplants into fields that had low weed pressure the previous year, especially in the fall, or where crop residue was tilled under in the fall. There seems to be little information about specific relationships between what cover crops are planted in the fall, and cutworm infestations in the following year.

Plow fields in spring and keep weed free for at least two weeks before planting to starve young larvae and reduce egg-laying. Avoid planting susceptible crops close to sod, alfalfa or fallow areas. Summer plowing disturbs eggs and larvae and raises them to the soil surface where they are more vulnerable to predation and desiccation. Fall plowing will do the same. Plan rotations to avoid planting vulnerable crops after a grassy sod, and plow sod fields in later summer or early fall. Cultivate frequently to injure and expose hiding cutworms to predators.

Chemical Management. Post planting rescue treatments for corn include several pyrethroids, carbamates, and one organosphosphate (Lorsban). Direct sprays over the row and toward the base of the plant. For best results apply in the evening just prior to active feeding. Consult the *2006-2007 New England Vegetable Management Guide* for more details (www.nevegetable.org or in hard copy; call 413-545-2717 to order) and for products labeled for each crop group.

Organic options. Insecticide baits made of a concentrated solution of an allowed insecticide, mixed with bran and a bit of molasses have been reported to work. The bait can be sprinkled on the ground near the crops or made into patties that are placed along the rows. Bt sprays (ie, *Bt aizawi* or *kurstaki* directed at plant stems and foliage) work sometimes, but not consistently, possibly because large cutworms do not ingest a big enough dose of BT to stop feeding and die before they have caused damage. Collars around each seedling work on a garden scale but are impractical for field scale crop systems. Daily search and destroy missions -- by hand -- are a time-honored "biological" management for small plantings!

Biological management. Probably the most promising biocontrol organisms are beneficial nematodaes, which are available commercially and can attack soil insects such as cutworms. It is important to use the correct species. Two species of nematodes, *Steinernema carpocapsae* (Sc), or *Heterorhabditis bacteriophora* (Hb) are often used in combination because they attack insects in different levels sof the soil. This works well for cutworms that move up and down. The nematodes are shipped to you on a sponge. You mix them with water and apply to the soil. Follow the instructions that come with them. They can reduce cutworms and last for anywhere from 8 days to several weeks, according to various research trials. The nematodes reproduce in the soil and, if the conditions are good for them, large populations of the nematodes will build up and these will hold the population of cutworms down. Good soil moisture favors survival. Repeat applications may be needed.

--Ruth Hazzard (with thanks to the following sources: Capinera, Handbook of Vegetable Pests; Vern Grubinger (UVM), Brian Caldwell (NYS-NOFA),Eric Sideman(MOFGA), Rex Dufour (ATTRA)) Updated June 2006)

SWEET CORN UPDATE

This week will see the first harvest of early sweet corn. Plastic, light soils, and warm weather in March and April provided at least one success story for this difficult season. However there are growers still waiting to see tassels come out of the whorl. Plant and replant and hope for crop emergence, and give up on some low, flooding fields – that's the story for many.

Whatever stage your corn is at, if you want to know what's happening as it approaches silk stage, now is the time to install corn earworm traps. We are capturing low corn earworm numbers (3-4 per week) at certain locations in the state: Easthampton, Spencer, Tyngsboro. This level of flight warrants a 6-day spray schedule. However, other locations in the same region are not capturing moths. This is fairly typical for early, low level migratory flights that enter the state at this time of the year.

This is also a flight period for gypsy moths, which also come into CEW traps. These have darker, larger wings and feathery antennae.Corn earworm moths about 1 ½ inch

long with a dark brown dot on each forewing (the one on top) and a dark band across the outer edge of the hindwing (the one hiding underneath). Don't be alarmed if you see lots of moths of the wrong species! These are not corn pests.

European corn borer flight is declining but not over yet. Because of ECB flight, all silking corn should be sprayed on a weekly basis. If CEW is also active around your farm, at 3-4 moths/week, tighten the schedule to 6 days. Borers are present in emerging tassels. Scout and spray if >15 % infested. A second spray after 5-7 days may be needed if infestation levels remain high.

Weeds are doing too well. Herbicides may have leached deep with the 15-25 inches of rain we've had, and cultivation is difficult in wet fields. Side dressing is needed, but hard to accomplish for those fields that are wet enough to get stuck in.

Weekly European Corn Borer and Corn Earworm Trap Counts (total for 7 nights):

Location	Z I	EII	Total ECB	CEW
Deerfield	4	7	11	0
Sunderland	0	2	2	0
N. Hadley	4	6	10	0
Whately	1	18	19	-
Hadley (1)	29	2	31	0
Hadley (2)	2	14	16	-
Easthampton	26	4	30	4
Feeding Hills	8	18	26	0
Dighton	40	42	82	-
Rehobeth	3	12	15	-
Still River	6	4	10	-
Concord	5	3	8	3
Leicester/ Spencer	20	21	41	0
Northbridge	52	24	76	0
Tyngsboro	23	7	30	4
Mason, NH	1	6	7	0
Hollis, NH	1	30	31	0
Litchfield, NH	16	9	25	0
Coventry, RI	11	16	27	0

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

Note: spray intervals can be lengthened one day if daily maximum temperatures are below 80 degrees F.

--Thanks to our scouting network: R.Hazzard, A.Duphily, K. Reidel, J.Mussoni, D.Dumaresq, D.Rose, J.Otto, T.Gallagher, J.Golonka, W.Kingsley, P.Willard, G. Hamilton

BACTERIAL SPOT AND BACTERIAL SPECK OF TOMATO AND PEPPER

Bacterial spot caused by *Xanthomonas campestris pv. vesicatora* (Xcv) is present wherever tomato and peppers are grown. In general, Xanthomonas pathovars have narrow host ranges. Xcv consists of different strains that vary in their pathogenicity to tomato, pepper, and nightshade.

The bacterium is able to survive on tomato volunteers and can overwinter in diseased plant debris. Seed is an important mechanism for survival and dissemination of Xcv. Disease development is favored by temperatures between 80˚ and 90˚ F and by heavy rainfall. The bacterium is spread by wind-driven rain, workers, farm machinery, and aerosols. It penetrates through stomates and wounds created by insects, wind-driven sand, and tools. Xcv affects all aboveground plant parts. On leaves, the spots are generally brown, circular, and water-soaked. Bacterial spot lesions do not have concentric zones or a prominent halo. When conditions are optimal for disease development, spots can coalesce to form long, dark streaks. A general yellowing may appear on foliage with many lesions giving the plants a scorched appearance, and the plants may exhibit severe epinasty. Only green tomato fruit is susceptible to infection and lesions are quite distinct, beginning as minute, slightly raised blisters with a halo that resemble the birds-eye spot caused by *Clavibacter michiganense* (bacterial canker). As lesions enlarge, they loose their halo and become brown, raised, and scab-like. Lesions on ripe pepper fruit may be scab-like or sunken.

Bacterial Speck of Tomato

Bacterial speck occurs on tomato not pepper. It is a cosmopolitan disease, generally of minor concern in New England, favored by low temperatures and high moisture. The bacterium Pseudomonas syringae pv tomato causes a fruit spot and foliage blight. This bacterium is also seedborne, spreads within fields in the same manner as bacterial spot, and may persist in weed species. Lesions on leaves

are round and dark brown to black with a halo that develops with time. Spots may coalesce, killing large areas of tissue. On fruit, small (1/16 inch), dark spots or specks develop with the tissue around them often more intensely green than unaffected areas.

Management of Bacterial Spot and Bacterial Speck

Although the two bacteria are unrelated, their life histories and management strategies are similar.

1. Buy certified seed from a reputable source or use seed treatments to reduce transmission.

2. Produce disease-free transplants by raising transplants in an area where production does not occur. Inspect all purchased transplants carefully and if transplants originate in southern states they should be certified.

3. Rotate fields to avoid carry-over on volunteers or crop residue.

4. Keep fields free from volunteers, weeds, and cull piles.

5. Avoid working in fields when bacterial diseases are present and the fields are wet.

6. Apply appropriate bactericides or combination pesticides.

In general, bacterial diseases of field crops are difficult to control with pesticides; copper/mancozeb solutions are most effective When a significant amount of disease is present, pesticides are usually not effective.

Chemical recommendations:

•acibenzolar-S-methyl (Actigard 50 WG): 0.3 to 0.75 oz/A (14 dh, REI 12 h).Do not apply more than six times per crop season or on less than a 7 day schedule. Under certain conditions, this product, when used on tomatoes, may lead to reductions in yield.

•copper hydroxide (Chanp, Champion WP): 4 tbs/1000 sq ft (0 dh, REI 24 h). Greenhouse and Shade house crops .Begin applications when disease first threatens and repeat at 7-10 day intervals as needed. Do not apply in a spray solution with pH less than 6.0 or phytotoxicity can occur.

•copper hydroxide (Kocide 2000, KOP-Hydroxide): 1.5 to 3.0 lb/A (0 dh, REI 24 h). Begin applications when disease first threatens and repeat at 5-10 day intervals. Use higher rates when conditions favor disease development.

•copper salts of fatty acids (Tenn-Cop 5E): 3 pts/A. (0 dh, REI 12 h). Apply at the first sign of disease and repeat at 7-10 day intervals. Enhanced control obtained by tank mixing with Manzate 75 DF. Avoid spray solution with pH of less than 6.5 as phytotoxicity may occur.

•copper sulfate monohydrate, tribasic (Basicop): 2-4 lb/A (0 dh, REI 24 h). Begin when disease normally appears and repeat at 7-10 day intervals. Use higher rate when disease pressure is heavy.

•ethylene bisdithiocarbamate plus manganese plus zinc (Manzate 75 DF): 0.75-1.5 lb/A (5 dh, REI 24 h). Start applications at transplant. Repeat at 3-7 day intervals throughout season. Do not apply more than 22.4 lbs per acre per crop.

•mancozeb plus copper hydroxide (ManKocide): 2.5 to 5.0 lb/A (5 dh, REI 24 h). Begin applications when disease threatens and repeat at 7-10 day intervals as needed. Use higher rates and 3-7 days when disease pressure is severe.

•streptomycin sulfate (Agri-mycin 17): 200 ppm (REI 12 h). Use only up to transplant.

-- M. Bess Dicklow.

MEASURING INSECTICIDE FOR BACKPACK SPRAYERS AND SMALL PLANTINGS

Growers with diverse crops and small planting often need to be able to apply pesticide to beds or plots of several hundred square feet. It can be difficult to figure out how to calibrate a backpack sprayer for a spraying a small area. Some labels give rates for backpack sprayers (ie amount per gallon of water) and some only provide rates per acre (ie amount per land area treated). Rates may have to be calculated by converting from the rate per acre (ie, per 43,560 sq ft) to rates for a few hundred square feet. Careful division gives you the amount you need. However, this can result in needing to measure extremely small amounts of some products.

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. If you sell the crop to the public this is a serious matter.

3. Safety of applicator, workers and the public depends upon correct rates as well as following the label.

Read the label. Find and follow the following instructions:

--Personal protective equipment
--Agricultural Use Requirements
--Crops and pests listed. THE PESTICIDE MUST BE LABELED FOR THE TARGET CROP
--Restricted Entry Interval (REI)
--Days to Harvest (DH)
--Rate per acre (for tractor sprayer) or per gallon (for backpack sprayer)
--Mixing instructions (especially for backpack sprayers)

Mixing Method 1: Amount of insecticide per gallon to cover 330 sq ft per gallon.

If you calibrate your walking pace to use the desired

amount of water on the desired amount of land area, then you can measure both water and product to match your pace and your target area. We believe this is one the simplest approaches to backpack sprayer rates.

Test your pace so that you walk and spray at a rate that uses 1 gallon per 330 sq ft.

1. Fill sprayer with 1 gallon

2. Mark an area 330 square ft (eg, 110 X 3 ft., 55 X 6 ft, or 30 X 11 ft). Walk and spray. Use the desired amount. If you are off, try it again and change your pace.

CROP AREA

110 ft. x 3 ft. = 330 sq. ft.

(110 ft. x 3 ft. bed width or row spacing)

3. Measure the size of the bed you want to spray. (length X width = square feet)

4. Multiply to get the amount of water. Use the table below if applicable.

5. Determine the amount of insecticide you need. Usethe table below if applicable.

6. Mix the amount of insecticide needed to cover the area you want to spray.

7. Follow label instructions. Add insecticide to part of the water, mix, then add more water to reach the desired total. Spray at your measured pace.

Table 1. Below are rates for two insecticides (general use, allowed for organic) that can be used on a number of different vegetable pests.

Product	Rate Per Acre	Amount Per 1/2 Gallon (165 sq. ft.)	Amount Per Gallon (330 sq. ft.)	Amount Per 2 Gallon (660 sq. ft.)	Amount per 3 Gallons (990 sq. ft.)
Entrust* (Spinosad)	2.2 oz/A	0.25 gram	0.5 gram	1.0 gram	1.5 gram
Surround*	50 lb/A	1 1/2 Cups	3 Cups	6 Cups	9 Cups

**NOTE: Both products above are dry powder. Some labels provide conversions of volume to weight, but many do not. If gram scale is unavailable, then it is possible to measure Entrust by volume. Based on repeated samples, our average volume was 1.7 gm per teaspoon (shaved level and tamped slightly) of Entrust powder. One ounce (dry weight) equals 28.45 grams. Liquid measure in (fluid) ounces is already a volume so it is easier to measure. One fluid ounce equals 29.6 milliliters (ml). An inexpensive measuring device for ml can be found in the children's medicine section of drug stores.*

--Ruth Hazzard and Pam Westgate, University of Massachusett Extension Vegetable Progra
Prepared for Small Farmer Training, June 2006

CATERPILLARS IN BRASSICAS

Cabbage, broccoli, collards, kale and other brassica crops may be showing feeding damage from imported cabbageworm and diamondback moth. The collective group of three caterpillar types –generally known as 'worms in cabbage' – differ in size and feeding habits, as well as how susceptible they are to certain insecticides. Below are descriptions. See also www.umassvegetable.org for photos. Cabbage looper has not been observed yet, and usually comes late in the season. See *2006-2007 New England Vegetable Management Guide* for insecticides. There are many effective options!

Imported cabbageworm; cabbage butterfly (*Pieris rapae*). This familiar white butterfly can be seen in 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 caterpillar, 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.

Diamondback moth (*Plutella xylostella*) 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 adults 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.

Field Scouting for caterpillars: It is 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 at least 25 randomly-selected plants throughout the field looking for caterpillars on the top or underside of leaves. Feeding damage can be found on the underside of leaves or in the center of the plant where heads are forming. 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. Spray if the threshold is reached.

It should be noted that these thresholds do not imply that 10 or 15 % of the harvested crop will be infested! They 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.

Action thresholds for caterpillars in crucifers:

Crop and Stage	% Infested plants
Cabbage & Broccoli, Cauliflower - pre-cupping (before head begins)	35%
Cabbage & Broccoli	15%
Cauliflower	10%
Kale, Collards, & other greens	10-15%

CUCURBITS

Fields are soaked. Soggy and boggy areas in low sections or between raised beds are common. If you can get into the field, before vines run, now is the time for an extra pass through the field with a subsoiler. Once vines fill in its too late. Drainage is critical to prevent *Phytophthora capsici*, and drainage is truly difficult with current levels of rainfall.

Zucchini and summer squash harvest is going strong for the earliest transplants on plastic. For fall vine crops, we see a wide range of crop stages – some are vining and starting to flower, while others that were planted late are just emerging. Striped cucumber beetles are still out and about, still moving into fields from outside the field. You will see them in flowers, in cracks in the ground, underneath cotyledons, and on leaves. Stem damage was also common in the past two weeks, on new transplants (that were often overgrown and spindly from waiting out the rains). The cause seemed to be a combination of cuke beetle feeding and strong winds. Spotted cucumber beetles are appearing. These generally do not reach damaging levels in vine crops in our area, unless the numbers combined with striped cucumber beetle are high (>1 per plant before first two leaves, >2 per plant later).

Squash bugs adults and eggs are common, but nymphs have not yet been observed.

We have seen symptoms of one of the common bacterial leaf diseases, bacterial leaf spot or angular leaf spot (ALS) in butternut and are waiting confirmation from the Diagnostic Lab of which disease is present. Both cause similar leaf symptoms but only bacterial leaf spot will affect fruit. ALS is fairly common at this time of year and often crops grow out of it. Wet conditions favor these diseases, so it may occur more widely this season. It first appears as small water-soaked spots on the leaves. These spots expand until they reach a leaf vein and are limited by the surrounding veins. This results in the spots having a squared-off or angular shape. The spots become more obvious after they dry and turn tan. They may also drop out leaving holes in the leaf.

Serious loss of leaf tissue can occur under conditions favorable to the disease. Some cucumber varieties are resistant, but nonresistant varieties and other vine crops should be treated if the disease is present in the field. Copper spray materials offer some protection and can help limit the spread of the disease. The activity of these materials can be enhanced by tank mixing them with mancozeb fungicides.

Contact the UMass Disease Diagnostic Lab (413-545-3209) if you think you have this or other cucurbit diseases. Powdery mildew has been reported in southern New Jersey but not farther north.

Vegetable Notes, Ruth Hazzard, editor and Kate Reidel, Assistant Editor. 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.