UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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Crop conditions

July weather has finally arrived this week with long awaited hot and humid temperatures, and the plants (and diseases!) are taking off. Despite the recent rains, many fields remained dry, so irrigation continues or is being resumed in many locations. Harvests of sweet corn, cucumber, summer squash, cabbage, beans, beets, broccoli, peas, and leeks are in full swing. Early summer squash fields are winding down, while some potatoes are just beginning to be harvested. Winter squash and pumpkins are filling fields with their vines and beginning fruit development.

Many growers are on spray schedules to control powdery mildew and bacterial diseases in cucurbits, peppers, and tomatoes. Sweet corn sprays are continuing despite low European corn borer pressure for those wishing to control the corn earworm caterpillar (see Sweet Corn section), which has now arrived in most parts of the state in above threshold quantities.

-P. Westgate, University of Massachusetts

Brassicas

A second peak in flea beetle populations is expected at the end of July and into early August, as a new generation of adult beetles emerges. Damage to brassicas (especially leafy varieties) in August 2002 and 2003 was high in many areas, and we expect to see the same trend this year. Lightweight, non-heating rowcover can be used to protect brassicas from flea beetles and other pests. To be effective, row cover should be applied before seedlings emerge from the soil, and the edges should be tightly sealed. For other management options for flea beetles, refer to the New England Vegetable Management Guide 2004-2005. Lepidopteran pests such as the diamondback moth, imported cabbageworm and cabbage looper are still causing problems (see the July 8th, 2004 issue for a thorough discussion of these pests, or refer to the Vegetable Management Guide for control options).

- C. Andersen and A. Cavanagh

Ipomea update

Insects are showing up in Ipomea crops. Tortoise Beetles and their damage have been detected in Sweet potato (*Ipomoea batatas*) and Tarnished Plant Bugs and their damage have been detected in Water Spinach (Ipomoea aquatica).

Tortoise Beetles in Sweet Potato

These insects commonly known as "goldbugs" feed on plants in the family Convolvulaceae. Rarely are tortoise beetles abundant enough to be considered damaging to the sweet potato tubers. The damage however may be devastating if the sweet potato leaves are the crop of interest as it is the case for some ethnic groups such as Africans.

Identification: The tortoise beetle is oblong-oval, basically bright gold or dark red, up to 8 mm long, with shell-like body. The larva has a dull yellowish to reddish brown body up to 12 mm long with black head, legs, spots, and spines. Adult and larva chew leaves leaving them riddled with holes. The typical form of injury is the creation of numerous small to medium-sized irregular holes. Both stages usually inhabit the lower surface, but eat entirely through the foliage.

Adult tortoise beetle

Recommended action: Alternate 2 applications of Aza-Direct (4 days apart) with 1 application of Spintor (once a week). Restricted entry interval is 4 hours and Preharvest interval is one day for both insecticides. You may also use Sevin XLR Plus. Restricted entry interval is 12 hours and Preharvest interval is 12 days.

Tortoise beetle damage on leaf

Tarnished plant bug in water spinach

Tarnished plant bug (TPB) has been detected in water spinach. The plants show holes on the leaves and blackened tips, sign of the insect feedings. The damage caused by TPB happens when the leaves are tiny. By the time you see the damage, it is too late. It is important to scout your crop often to know if you need to spray. Watch for the TPB adults or nymphs or signs of damage in the early stages of water spinach growth. White sticky traps can be used to detect the arrival of TPB in your water spinach crop. Place them at intervals above the canopy of water spinach, and notice when adults are captured.

Identification: The adult tarnished plant bug is a small (1/4 inch) pale brown or yellow colored insect with a triangular marking on its back. It has a flattened oval shape with a small head. Immature tarnished plant bugs or nymphs are smaller and bright green. Both adults and nymphs feed on stem tips and on the tiny new leaves that form on new shoots and branches. When the leaves emerge, they are full of holes or have a distorted shape. Tarnished plant bug feeding also kills the growing tip. This causes a blackened, dead area. The plant then makes many branches that are shorter than the original stalk.

Adult tarnished plant bug

Recommended action: If insecticides are needed spray when the crop is small and producing new leaves. Damage occurs soon after harvest, just when new growth begins. Recommended pesticides and their use are as directed for tortoise beetle.

-Touria El-Jaoual, UMass Extension Vegetable Team

THE FACTS ABOUT DEER REPELLENTS

Understanding How Repellents Work

Repellents disrupt and reduce instances of deer feeding on plants for a short period and must then be reapplied. Repellents are most effective when used in orchards, nurseries, gardens, and on ornamental plants. Their value for row crops and forages is limited because of their expense, application restrictions, and variable results. The use of repellents can help to protect vulnerable landscapes, but they are usually expensive and require regular application. Repellents are most effective when used as part of an Integrated Pest Management (IPM) program that may include other repellents, scare devices, fencing, vegetation management, and population control.

Repellents fall into three categories: taste, odor, and combination taste and odor. Taste-based repellents are applied directly to plants and repel deer because of their foul taste. They are most effective on dormant trees and shrubs. New growth that occurs after treatment is unprotected. Contact repellents may reduce the palatability of forage crops and should not be used on plant parts that are intended for human consumption, unless it is labeled for that use. Since taste-based repellents require actual eating of the plant material, large amounts of damage may occur by multiple numbers of deer sampling a plant and then moving on.

Odor-based repellents repel deer by their foul smell or odor. Generally, odor-based repellent products usually out-perform taste-based products. Some odor-based repellents can be applied directly to plants while others can be located near plants you want to protect. Border applications of area repellents may protect large areas at a relatively low cost. Crops grown for human consumption cannot be protected by odor-based repellents when applied directly, except for a very few labeled for that purpose.

Combination odor and taste-based repellents provide the benefits of both types of repellents and allow for a range of combinations. They are becoming more available. In areas with high deer densities and browsing pressure, crops and landscapes can be damaged if only a taste- or odor-based repellent is used and many deer sample the plants. By combining odor- and taste-based active ingredients, effectiveness may be increased. Different formulations allow the user to change the repellent and keep the deer on guard by providing a change in the range of odors and tastes.

Applying a Commercial Repellent:

Application methods for commercial repellents range from machine sprayers to manual backpack sprayers to handheld sprayers purchased at department stores. For large farms and commercial operations, machine sprayers are most economically efficient. The number of applications can be reduced by using compatible repellents (there are very few) in regularly scheduled pesticide programs.

Apply repellents on dry days when temperatures are above freezing and rain is not expected for a number of hours so they can dry properly. Whereas young trees should be completely treated, limiting repellent application to the terminal growth within reach of deer (6 feet above the deepest snow) can reduce the cost of treating older trees.

Repellent applications are divided into two general classes based on the time of the damage: 1) winter or dormant season, and 2) summer or growing season. Dormant season damage is most common in nurseries, orchards, forest seedlings, residential landscapes, and Christmas tree crops.

It is most difficult to control due to the lack of other food sources. Growing season damage is most common in field and row crops. Apply repellents before the anticipated periods of deer browsing. The objective is to make the planted material unattractive to deer, so that they feed elsewhere. Once a feeding pattern has been established, repellents are usually less effective. It is important to note that if no alternative food source is available or if deer pressure is too high, even the best-planned repellent program may fail. This is why it is essential to analyze your situation.

As a preventative measure, the first repellent application of a summer control program should take place within 2 weeks of bud break. During the growing season, repellents should be applied as necessary to protect new growth, usually every 3 to 4 weeks. For some crops, it may be possible to disrupt deer feeding simply by spraying a wide strip on the border of the planting. For dormant season protection, mid fall and early winter applications are recommended.

Considerations in Choosing a Specific Repellent:

•Effectiveness and Longevity

Studies of the effectiveness of different repellents on nursery plant species and residential landscapes show large differences in all these factors. In general, it is unrealistic to expect more than 5 to 6 weeks of protection from any commercial repellent when you have high deer populations and browsing pressure during the dormant season. Protection may be longer when the conditions and seasonal factors are less severe.

Repellents can be effective for short-term forestry applications on seedlings that only need a few years of protection to grow out of the reach of deer. In agricultural applications, repellents may be suited to short-term crops such as strawberries or vegetables that only need protection during the growing season when other food sources are available for deer and they can be discouraged from frequenting the target area.

•Cost and Ease of Use

Repellents are not usually cost-effective in managing deer damage over a long period for either commercial growers or residential homeowners. Studies in New York have shown that the cost of a repellent spray program for reducing deer damage year round in orchards exceeds the cost of high-tensile deer fencing after only a few years. Money spent on repellent applications could be wasted if unusual weather conditions force deer to eat crops because of the loss of alternative foods.

Many residential homeowners are not as concerned as commercial growers about the cost factors and the use of repellents in residential landscapes is increasing. However, even residential homeowners will soon find that the long-term cost of repellents can be prohibitive and require repeated applications. Table 3 lists a representative list of repellents, their active ingredients, and the cost per ounce for different mixtures. Some repellents can be purchased as ready-to-use (RTU) or as a concentrate and then mixed with water for use as needed. In general, RTU products are more expensive per ounce than concentrates. Purchasing larger quantities of either RTU products or concentrates will also reduce the per unit cost.

Ready-to-use products are easier to use than those that require mixing and are most popular with residential users. Some of the products have mixing requirements that make them difficult to use and may not appeal to some users. Residential homeowners are increasing looking to the use of electric and non-electric fencing options instead of repellents as the realities of cost, marginal effectiveness, and regular application become apparent. Fencing may pose problems due to aesthetic considerations, local covenants, access, and other concerns, but these problems can addressed by educating community associations and neighbors. Many residential homeowners are finding the use of bird netting during the winter a reasonable alternative to the use of repellents. In the residential environment, there are large differences in the effectiveness and longevity of different repellents with similar costs. Users of repellents should ask their local cooperative extension office for current research on this topic.

-Adapted from: Jonathan S. Kays, Regional Extension Specialist - Natural Resources, Maryland Cooperative Extension. Information provided by Rob Berghage and Jim Sellmer; Penn State Department of Horticulture.

DEER STOPPER BRAND DEER REPELLENT LISTED AS ORGANIC

The population of deer in Massachusetts continues to grow, and damage on vegetable and fruit crops can be serious. Temporary electric fencing can be an effective barrier if installed early. However, many growers are looking for methods that will succeed in smaller areas, or where fencing is not practical. Repellents are another option.

The Organic Materials Review Institute, which researches, educates and publishes brand name lists of materials allowed and prohibited for use in the production, processing, and handling of organic food, has listed Deer Stopper, a topical spray that lasts 30 days regardless of weather. Call (888) 411- DEER for more info and visit http://www.omri.org for a complete list of OMRI-considered materials.

We published this article last year in our IPM newsletter but were not aware of any farmers who had used it or any trials where it was tested. We would like some feedback from growers who maybe tried it. Please send an email to akcarter@pssci.umass.edu and let us now if it worked or didn't work and how.

-Anne Carter-

Deer fencing

Fencing, the construction of a barrier between the crop and the deer, is the most effective long-term solution to deer damage. The basics of fencing apply to both electric and non-electric fencing. It is important to understand that deer can easily jump a fence 10 feet high, but much prefer not to. Deer prefer to go under or through a fence than to jump it if at all possible. Thus, the bottom wire of an electric fence should be no more than 10 or 12 inches off the ground and non-electric fences should either have an even lower bottom wire (about 6 inches) or be of mesh construction.

Fence maintenance is critical in both applications. If a tree falls on the fence or a hole is cut in the fence, the fence should be repaired immediately. Once deer have gotten inside and discovered the crop, it will be harder to keep them out, even with an electric fence. No gaps should exist in the fence, access must be provided through gates that are closed at all times. Fences should have a clear perimeter, at least 5 or 6 feet on the outside of the fence, so deer have to cross an opening before encountering the fence. This also enhances visibility of the fence to the deer. Deer will blunder into a fence placed tight to a wooded edge and can actually damage or take down sections of a fence simply because they do not see it very well, especially smooth wire designs. Having a clear border will increase the effectiveness of the fence and aid in maintenance.
Electric fence supplies can be found at farm supply centers or through fencing specialty companies. Three fencing specialists in the Northeast are:

- **Wellscroft Farm** 167 Sunset Hill- Chesham Harrisville, NH 03450 (603) 827-3464
- **Kiwi Fence Systems** 1145 E. Roy Furman Hwy. Waynesburg, PA 15370 (724) 627-5640
- **Walnut Grove Farm** 50 Cartland Rd. Lee, NH 03824 (603) 659-2044

-R.Hazzard

Pepper update

•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. Reflective mulches can be used to reduce virus transmission. The silver surface deters aphids from landing on pepper plants.

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.

•Pepper Maggot Fly
Pepper maggot fly (*Zonosemata electa*), which is closely related to the apple maggot fly, has one generation per year. Adults emerge in mid to late July and are active for several weeks. 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. Females insert their eggs directly into the pepper fruit. 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.

Adult pepper maggot fly

Pepper maggot monitoring: Adult flies can be monitored with yellow apple maggot sticky traps baited with a vial of strong ammonia. Placement is important. The best capture rate occurs when traps are placed in maple trees near the field. Other types of trees will do, however, the traps need to be placed higher (around 20 feet). It is more practical, but less reliable, to place traps on 4-foot stakes in the brush or weeds or in the lower canopy at the field border. Traps placed in pepper fields are ineffective.

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 drasticly reducing pesticide costs.

Hot cherry peppers placed in the border rows can also be used 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 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 More information about perimeter trap cropping can be obtained by contcting Ruth Hazzard or Andy Cavanagh at UMass extension or refer to: http://www.hort.uconn.edu/ipm/veg/htms/trpcrops.htm

Pepper maggot threshold: If one fly is captured, or 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 infested fruit carefully for proper identification. If a given farm has a history of pepper maggot activity, and pepper maggot fly has been captured nearby, 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.

European Corn Borer

European corn borer (*Ostrinia nublilalis*, ECB) has two generations per year in most of New England. It is the 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 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.

ECB moth- second generation ready for flight

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). 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.

The intervals recommended for insecticide applications depend on the active ingredient used. Acephate products can be used at 10-day intervals; synthetic pyrethroids 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. Two spinosad products have been added to the list of labeled pesticides. Spintor 2SC and Entrust – which is an organic formulation – can both be applied at 7 day intervals. Both of these products have a days to harvest restriction of 1 day.

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

BIOLOGICAL CONTROL FOR PEPPERS AND SWEET CORN WITH TRICHOGRAMMA

The first generation of European corn borer moths is gone, and the second generation borer moths are yet to come. Expect to see increases in the borer population starting next week and peaking in the 2nd to 3rd week in August. If you are interested in using Trichogramma wasps to control the 2nd generation of ECB, you should place an order for them this week. Trichogramma brassicae can be obtained through IPM labs in NY (315-497-2063; www.ipmlabs.com). The moths should be released at the beginning of moth flight and then weekly for 4-5 weeks. We have experience with another species, Trichogramma ostriniae, which proved to be very effective. While this species is not commercially available this season, it will be in the near future.

-Pam Westgate, University of Massachusetts Extension

SWEET CORN UPDATE

Corn earworm is here! Trap counts are up across the state. Those sites reporting from the coast have had counts of 40 moths and upwards per trap. Thresholds for silking corn are 2 or more moths per week, which most growers are finding. This means that if you want caterpillar-free corn, you will need to take control measures. Check table to see what the corn earworm captures look like near you.

Organic/no spray option:
Corn earworm can be controlled by applying a small amount of oil and Bt directly to the silk of each ear using a hand held device, such as the Zea-later, which was designed specifically for this purpose (the Zea-later can be obtained through Johnny's selected seeds, 207-861-3900); however, any device that can deliver ½ ml of oil per ear can be used. Only one application per planting is needed. More details are provided in our new fact sheet "Organic insect management in sweet corn", which can be obtained for a small shipping and handling charge by contacting the University of Massachusetts Extension bookstore at 413-545-5538.

Spray option
Organic growers who wish to spray can try using Entrust, the organic version of spinosad, for corn earworm control. Check labels before use for rate recommendations.
A 6-day spray schedule is recommended for silking corn that is under low pressure. Fields which are under high pressure should be sprayed more frequently (see table below). Corn earworm larva can best be controlled with proper coverage using drop nozzles on spray equipment. Drop nozzles allow spray to be concentrated at the silks of the ears where larvae are most likely to be found. If drop nozzles are not available low volume aerial sprayers can be used at low speeds at a high pressure to optimize coverage.

-P.Westgate

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

SWEET CORN TRAP COUNTS 7/15- 7/21

Town	Date	ECB Z1	ECB E2	Total ECB	CEW	FAW	%PT
Berkshires/ Champlain Valley							
Sheffield	7-20	0	0	0	5	0	0
Westminster, VT	7-21	0	0	0	0	1	0
Pittsfield	7-21	0	0	0	1	0	0
CT River Valley							
S. Deerfield	7-21	3	0	3	0	0	0
N. Hadley	7-21	0	4	4	8	0	0
Hatfield	7-21	1	0	1	2	0	0
Hadley	7-21	0	0	0	4	0	0
Feeding Hills	7-20	2	1	3	11	0	0%
C.&E. MA							
Dighton	7-19	0	1	1	25	0	0
Dracut	7-21	1	2	3	3	0	0
Still River	7-19	0	0	0	18	0	0
N. Andover	7-15	0	0	0	0	0	2%
Concord	7-19	4	0	4	22	0	42%
Ipswich	7-16	0	0	0	2	0	2%
Leicester/ Spencer	7-21	0	0	0	9	1	2%
Northbridge	7-21	1	1	2	18	1	2%
Tyngsboro	7-19	0	0	0	4	0	20%
Seekonk	7-21	2	2	4	29	0	0
Sharon	7-21	3	0	3	17	0	0

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