UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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In this issue:

Crop conditions

Farms are going full tilt with tilling, seeding and transplanting, applying soil amendments & herbicides, laying plastic and forming beds, seeding spring cover crops and managing overwintered cover crops. Greenhouses are full of transplants. Plant and insect development are well behind last year. Welcome rain came on May 8-9 across the state, ending a long, dry, sunny, and increasingly dusty period. Growers have delayed field preparation as needed to conserve soil moisture before planting, and applied irrigation wherever possible to ensure survival of transplants and seed emergence. Harvest now includes rhubarb, asparagus, fiddleheads, scallions, ramps, greens, and fast-growing brassicas such as bok choi. Watch for flea beetles, maggot flies, and spinach leaf miner to be active now. Help UMass plant pathologists look for tomato and potato volunteers in your fields and high tunnels!

Scouting for volunteer tomato and potato plants

The UMass Extension Plant Diagnostic Lab and UMass Vegetable IPM team are conducting research on the distribution and overwintering status of *Phytophthora infestans*, the cause of Late Blight, in Massachusetts. The question of long term survival of the pathogen by oospores is not merely an academic one. If P. infestans produces oospores, then Late Blight becomes a perennial, intractable problem much like *Phytophthora capsici*. IPM scouts would like to collect volunteer potato and tomato plants this spring from potato and tomato fields, high tunnels, greenhouses, cull piles, and compost piles to see if they are infected with P. infestans. The **volunteer plants do not need to be symptomatic**, but coming from a location with previous infection would be beneficial. The lab is also interested in any Late Blight outbreaks this summer and is offering fee waivers for suspect Late Blight specimens submitted to the lab for confirmation again this year. We are particularly interested in any suspect Late Blight infections on potatoes.

Morning mist rises from the soil, after a good soaking rain. Hadley, MA, May 10, 2013.

Late blight started to re-emerge as a serious threat in the northeast in the 1980s and 90s after several decades without incidence. During the 1980s and 90s, new migrations of exotic strains were globally distributed and widespread resistance to fungicides (mefenoxam) developed. Along with the spread of new strains of P. infestans, the opposite mating type (A2) has been discovered on several continents, including the United States. In 2009, genotypes US8 and US22 occurred across New England and both are A2 mating types. US8 is particularly pathogenic on potato and resistant to mefenoxam, while US22 is a newly described genotype more pathogenic to tomato that is sensitive to mefenoxam. In 2010 and 2011, late blight was scarce in the region. A modest epidemic of tomatoes occurred in 2012 and was caused by US23, another newly described genotype, that is more pathogenic to tomato, mating type A1, and sensitive to mefenoxam.

When both mating types (A1 and A2) are present in the same field at the same time, sexual recombination occurs resulting in the formation of highly stable oospores and the creation of new genotypes. Both mating types have been found in several states in the same year (PA, VA, and FL). Oospores allow P. infestans to survive the winter and long periods of time (years) in the absence of a host. Without oospores, P. infestans must be reintroduced to the region from spores traveling on upper air currents, or carried in on infected tubers or transplants. The most likely inoculum sources for overwintering in Massachusetts have been volunteer potato plants from unfrozen tubers, and potato seed tubers saved year to year by growers. When tomatoes or potatoes do not freeze completely in cull piles, compost piles, or as tubers or tomato fruit left in the soil, the volunteer plants in the next growing season may be infected. These infected volunteers will serve as a local source of the pathogen in the new growing season. In addition, greenhouse grown tomatoes have become increasingly popular, and greenhouses provide an ideal environment for the pathogen to survive within living plants. Indeed, it has been conjectured that the initial outbreak of Late Blight in 2012 originated from greenhouse grown tomatoes.

-Bess Dicklow, UMass Extension

LATE BLIGHT RESISTANT TOMATO AND POTATO VARIETIES

Potato Potáto, Tomato Tomáto no matter how you pronounce it, both vegetable crops are susceptible to the late blight pathogen *Phytophthora infestans*. Due to the destructive nature of Phytophthora (Greek for "plant destroyer") infestans, fungicide applications have limited success after symptoms are present. Left unmanaged, late blight can completely wipe out a crop and easily spread to other fields in the area from wind dispersed spores. One very important and perhaps underutilized method for managing late blight in potatoes and tomatoes are to plant varieties that have been bred for resistance. Margaret McGrath of Cornell University conducted a trial in 2012 on several tomato varieties with Ph2 and/or Ph3 major genes for resistance. "Very good resistance of foliar symptoms of late blight was exhibited by all varieties evaluated that have the Ph2 and/or Ph3 major genes for resistance: which were Plum Regal, JTO-545, Legend OP, Matt's Wild Cherry, Jasper, Defiant PHR, Mountain Magic, Mountain Merit, and three experimentals. Best suppression of the US-23 genotype of the pathogen was achieved with tomato possessing both the Ph2 and Ph3 resistance genes. " (McGrath, 2013). Cv 'Iron Lady' is a new tomato variety, marketed by High Mowing Organic Seeds, with both the Ph2 and Ph3 resistance genes; it was not tested in the McGrath trial but is expected to have resistance to the US-23 *Phtophthora infestans* genotype.

Table 1. Severity of late blight on tomato varieties and experimental hybrids evaluated in 2012.

Variety or experimental	Late blight severity on leaves (%) [z] Aug 20		Aug 29		Sep 14		Sep 19		AUDPC [y]		Oct 12 [x]	
Mountain Fresh Plus	75.0	a	52.5	ab	67.5	ab	72.3	ab	2294.4	a	ND	
Brandywine	50.5	ab	47.3	ab	76.3	ab	85.0	a	2169.2	a	ND	
Juliet	70.0	a	37.8	abc	41.3	bcd	38.9	bcd	1703.6	ab	ND	
New Yorker OP	74.3	a	55.6	a	88.8	a	59.5	abc	2522.6	a	ND	
Legend OP	26.6	bc	18.9	bcd	42.8	bc	33.5	cde	906.0	bc	32.0	b
Plum Regal	11.3	c	12.7	cd	17.3	cd	13.5	de	428.5	c	81.3	a
JTO- 545 (plum)	18.4	c	11.8	cd	22.0	cd	17.3	de	502.9	c	75.5	a
Mountain Magic (campari)	0.3	c	0.1	d	0.1	d	0.1	e	3.2	d	0.0	c
Jasper (cherry)	1.8	c	0.2	d	1.9	cd	0.1	e	25.0	d	17.8	bc
Matt's Wild Cherry	0.2	c	0.3	d	0.1	d	0.1	e	4.6	d	5.8	bc
Mountain Merit	0.2	c	1.9	d	0.1	d	0.2	e	15.0	d	5.0	bc
Defiant PhR	0.2	c	0.2	d	0.6	d	0.0	e	8.9	d	5.5	bc
NC123S x CU-TR5	0.3	c	0.7	d	0.5	d	0.2	e	14.4	d	29.6	b
NC123S x CU-TR3	0.1	c	0.1	d	0.1	d	0.0	e	1.2	d	11.5	bc
Brandywine x CU-TR3	0.0	c	0.1	d	0.1	d	0.0	e	1.3	d	0.3	c
P-value (treatment)	*<0.0001*		*<0.0001*		*<0.0001*		*<0.0001*		*<0.0001*		*<0.0001*	

[z] Numbers in each column with a letter in common are not statistically different from each other.
[y] Area Under Disease Progress Curve (AUDPC) was calculated for late blight severity from 20 August through 19 September to obtain a measure of severity over multiple assessments.
[x] ND=not determined because too few leaves remained in plots to assess.

Multiple resistance genes in potato varieties have not been developed, however, according to the May 3rd Wisconsin Horticultural Update, potato varieties with some resistance include Jacqueline Lee (yellow type), Satina, Defender (russet type), and Missaukee (round white type). According to plant pathologist Amanda Gevens of the University of Wisconsin, "In potatoes we don't have well characterized, readily available late blight resistance in commercially used potato at this time. Varieties in development have a tolerance to late blight, but it is not complete resistance. So those varieties when released will still need to be managed in additional ways for late blight."

Cultural management and planting Phytophthora infestans tolerant varieties of tomato and potato are the best methods for managing Late Blight at this time. We look forward to seeing your volunteer plants this summer. Stay tuned for more Late Blight management tips as the summer progresses.

-Katie Campbell-Nelson, with credit to Amanda Gevens, Plant Pathologist, Univ. of Wisconsin and Margaret McGrath, Cornell Univ. Cooperative Extension, Suffolk Co.

PREPARING FOR PHYTOPHTHORA CAPSICI , 2013

Phytophthora blight of cucurbits and peppers caused by *Phytophthora capsici* has become a fact of life for vegetable growers. In addition to persisting indefinitely in infested fields, the pathogen can also be introduced and spread in irrigation and/or flood waters. There are some measures that growers can adopt to prevent P. capsici infection or lessen the impact of Phytophthora blight in infested fields.

1. Site selection: The pathogen, *Phytophthora capsici,* is soil-borne and will remain in the soil for years, perhaps indefinitely, in the form of long-lasting oospores. It is important to keep track of sites that are contaminated with P. capsici. Do not rent land for susceptible crops without investigating the history of disease problems (there are other important soil-borne pathogens as well). Avoid moving soil from contaminated land to clean fields. Use a power washer to remove soil from tillage and planting equipment and tractor tires. Avoid fields with heavy, clay soils that are poorly drained for susceptible crops unless you are prepared to spend time and money to improve soil drainage. Wherever possible, avoid planting susceptible crops in contaminated soil. Practice long rotations and do not grow cucurbits, peppers, eggplant or tomato for at least five years in fields where disease has occurred.

2. Water management: P. capsici can move through the air during windy storms and hurricanes but is much more likely to move in water and with soil than air. The pathogen is dependent on water to initiate disease and to move it from plant to plant. Disease will always begin in low spots or areas that do not drain readily. Improving drainage in fields will prevent the disease from getting started. It is critical to manage water so that there is never standing water anywhere in fields for longer than 24 hours. Preventive measures can be taken and include:

- Use a V-ripper or other sub-soiling tool between rows, or a deep zone tillage tool in-row, to break up hardpan and encourage drainage pre-plant and as needed during the season, especially after significant rainfall events to speed drainage of water.
- Plant non-vining cucurbit crops (i.e. summer squash) and peppers in dome-shaped raised beds of at least 9 inches height. Use a transplanter that does not leave a depression around the base of the plant.
- Where beds run across the slope, cut breaks in the beds to allow water to drain. Don't allow raised beds to become dams that hold water.
- Clear away soil at the ends of rows. Where raised beds reach the field edge, open up the end of the row to create drainage ditches.
- Make sure the flow of water from within the field leaves the field – dig ditches if necessary!
- Don't plant low areas, where the disease will begin if the pathogen is present, to susceptible crops — plant a cover crop, corn or another non-susceptible crop, or leave it fallow.
- Check your irrigation system for leaks and fix them – don't allow puddles of water to sit near your irrigation pumps or lines.

3. Irrigation Sources: P. capsici spores can be present in surface water including ponds, streams, and rivers. Late summer irrigation from rivers or streams with contaminated fields upstream can contaminate previously uninfected fields as well as increase the inoculum load in infested fields. The

Phytophthora blight moving through a field of peppers.

pathogen can also spread from irrigation ponds that have infested fields draining into them. It is not known if P. capsici is able to over winter in ponds or rivers, so the danger of infection from these sources increases later in the season as the disease develops on fields upstream. Late season floods from hurricanes or tropical storms like Irene are a good opportunity for P. capsici contamination. Soil erosion resulting from these storms can also move the pathogen both into surface waters and into adjacent fields. Irrigation sources such as wells and municipal water sources have a negligible chance of P. capsici contamination. Sand filtration systems or treatment of irrigation water with copper ions or ozone are often used by greenhouse and nursery growers to eliminate pathogens from recirculating water systems and irrigation ponds. These may not be viable options for vegetable growers.

4. UMass research: The UMass Extension Plant Diagnostic lab is conducting research on the distribution and genetic nature of the populations of P.capsici and P. infestans (Late Blight). The goal of this research is to develop a risk map for Massachusetts farms based upon historical occurrences and population structure of the pathogens. The project also includes development of an early detection system based upon molecular (DNA) techniques that can detect the pathogen before symptoms develop. Early detection equals earlier and more successful treatments. The UMass Vegetable team and diagnostic lab will also be baiting streams and rivers in the Connecticut River valley for P.capsici and other Phytophthora species. Vegetable IPM scouts will be looking for P. capsici infections or potential infections in fields with a history of disease after flooding rains. You can help by bringing suspect P. capsici infections to the Diagnostic Lab (no fee). All cucurbit fruit rots are not caused by P. capsici, so have your problem confirmed and help promote research!

-Bess Dicklow, Nick Brazee and Rob Wick, UMass Extension Plant Pathology.

New Dual Magnum Massachusetts State Label (24C) for Several Vegetable and Fruit Crops

Growers in MA may use Dual Magnum on a number of crops, but need to obtain a state (24C) label. To obtain this label, log on to **www.farmassist.com**

If you are new to this site, you can create a username and password. On the main page under products (top far left) select "Indemnified labels". On the next page select "Massachusetts" and "Dual Magnum"

You can then select the crop you want but first you must agree to the indemnification which protects the company from liability if you injure your crop. This is the same indemnification that has been in place for several years when the label only covered transplanted cabbage and pepper. Once you click "I agree" to the indemnification, the label will appear with all the directions which you can print out.

The following crops are covered by supplemental label MA0816012AA0312 MA120001for control of galinsoga and yellow nutsedge: asparagus, transplant bell pepper, cabbage, carrots, garden beets, dry bulb and green onions, spinach, swiss chard, pumpkins, caneberry crop subgroup 13A (blackberry, red raspberry, and black raspberry, broccoli (Direct seeded or transplanted), melon crop subgroup 9A (cantelope, muskmelon & watermelon, cucumber, garlic, highbush blueberry, and leafy Brassica greens subgroup 5B.

Any questions, please send Rich Bonanno an email at rbonanno@umext.umass.edu or call 978 361 5650.

-Rich Bonanno, UMass Extension Weed Specialist.

Disease Prevention During Tomato Transplant Production

Tomato yield and quality depend on starting with healthy transplants. Most growers in New England produce their own transplants. However, transplant exchange with other farms is fairly common and has the potential to spread diseases to new farms or regions. It may be wise to isolate purchased seedlings in a separate greenhouse for some time before transplanting them into the field, in order to ensure they are insect and disease-free. This article will review some common diseases of tomato that may get started in the greenhouse.

Bacterial Diseases. Bacterial diseases can be present on greenhouse tomato seedlings long before symptoms become obvious. Bacterial speck (*Pseudomonas syringae pv. tomato*), bacterial spot (*Xanthomonas campestris pv. vesicatoria*) and bacterial canker (*Clavibacter michiganensis subsp. michiganensis*) can get established in the greenhouse and can be moved into the field by transplants. Bacteria can be introduced into the greenhouse on the tomato seed or crop residue, and are then spread between plants by water. They reproduce rapidly when conditions are warm and wet. When greenhouse humidity is especially high, the bacteria can become encapsulated within tiny airborne water droplets and may move within the greenhouse via water aerosols. Overhead watering allows bacteria to move readily from diseased transplants to adjacent healthy transplants.

Symptoms of both bacterial speck and bacterial spot appear as dark blotches and/or spots on the leaves. Sometimes these spots are nearly black, but they can also be light brown. A yellow "halo" can surround these spots but may not always be present.

Bacterial canker looks different than other bacterial diseases. Canker causes a light browning along the leaf mid-veins and extends down the petiole. It is easy to overlook canker infection because it can mimic other disorders, including stress from drying. Bacterial canker symptoms do not appear to be "disease-like" compared to bacterial speck and spot.

Bacterial Disease Control. For growers who make succesion plantings of tomatoes, it's not too late to be concerned about seed sanitation. Start with tomato seed that has been tested for bacterial pathogens and commercially treated with chemicals or hot water. If this is not possible, seed can be hot-water treated at home. Some lots of seed can be vulnerable to heat treatment. Always treat a small amount of seed (50 to 100) of each lot before treating the remainder of the lot. After the test treatment, air dry completely and then moisten for a germination test. Include untreated seed of the same lot for comparison. Treated seed should be used in the current season. Hot-water treatment should be done as follows. Place seed in cheesecloth and tie in a loose pouch. Bring a large kettle of water to the recommended temperature. Use an accurate laboratory thermometer. Soak the seed for the specified amount of time. Maintain the correct temperature for the duration. After treatment, plunge seed into cold water, remove the seed and thoroughly dry at 70°F to 75°F, and then assess germination. Hot water treatment may be an option for those who are looking for relief from bacteria and are growing organic transplants and have limited treatment options.

Keep the greenhouse environment and foliage as dry as possible to limit the spread and development of bacterial diseases. Both conventional and organic growers can apply copper fungicide sprays to help limit diseases. Copper can be alternated or used in combination with Streptomycin (i.e., AG Streptomycin and Agri-mycin 17). Check with state extension officials to ensure streptomycin is registered in your state. This product may only be used in the greenhouse, but the protection it offers will extend into the field.

Fungal Diseases. Early blight (*Alternaria solani*) and Grey mold (*Botrytis cinerea*) can cause problems as the seedlings grow and the lower leaves age, overlap and develop a canopy. Early blight causes leaf lesions that first appear on the oldest leaves and resemble a bulls-eye target with concentric rings. Grey mold is ubiquitous in the environment and produces fuzzy grey spore masses on leaves and stems. It is not uncommon for grey mold to infect older tomato transplants via the cotyledons which are clinging to the stem. The pathogen then progresses into the stem and may constrict and girdle it.

Spores of these fungi are spread by wind and require periods of leaf wetness of four to six hours in order to germinate and grow into the plant and cause disease. If the relative humidity is high during the day and the temperature drops even a degree or two, the moisture in the air can condense onto the foliage as a fine film and provide enough water for the spores to germinate and infect the plant.

Grey mold is primarily a greenhouse problem but may also occur in low and high tunnels if there is inadequate ventilation and air movement. Once plants are moved outside, there is better air circulation and Botrytis becomes less of a problem. Early blight is a common problem in field production where it can overwinter in tomato plant debris. It can also occur on seedlings in the greenhouse.

Late blight is not usually a problem in transplant production in the Northeast, but care should be taken when buying transplants produced elsewhere and plants should be inspected for early symptoms. The most common early symptoms on tomato transplants are small brown lesions on leaves and stems, with white fungal growth developing under moist conditions.

Fungal Disease Control. Control measures include keeping the foliage dry, providing good air ventilation, spacing plants as they grow, and heating when needed to dry out the greenhouse. Try to maintain relative humidity below 85 percent. Water that accumulates under benches and tight plant spacing can contribute to pockets of high relative humidity that favor fungal disease. Preventative fungicides are available for these and other fungal diseases of tomato seedlings. See Table 24 in New England Vegetable Management Guide for transplant recommendations, and outdoor or greenhouse tomatoes for production areas.

Transplanting and Disease. Reducing the stress induced by transplanting will encourage plant vigor and lessen disease problems in the field. Harden off transplants by placing them outside, out of full sun and in a sheltered location for one week prior to transplant is highly recommended. This allows the plants to accumulate carbohydrates, thicken stems, and form a protective waxy layer on leaves which will help strengthen plants and protect them from disease. Ensure that transplants have formed an adequate root ball, as this will help the plant recover more rapidly from the shock of transplanting. Soil temperatures should be around 65 degrees for most warm season crops before transplanting. Black plastic mulch can increase soil temperatures more rapidly. Try to transplant on a semi-cloudy day with minimal wind. Rye windbreaks between the rows can be used to offset wind induced stresses on transplants. A starter fertilizer solution added to the transplant water or hole will help plants recover more rapidly and help to avoid any transplant shock. If transplants are wounded by wind or rough handling, a copper application after transplanting may help protect against spread of bacterial diseases.

-*Adapted from article by Mary Hausbeck, Michigan State University, Department of Plant Pathology,"How to prevent tomato seedling diseases at http://www.greenhousemanagementonline.com, and from* "*Vegetable Transplant Care" from Long Island F&V Update*

CABBAGE AND ONION MAGGOT FLIES ARE ACTIVE

Cumulative growing degree days and indicator plants tell us that the onion maggot fly (Delia antiqua) and cabbage maggot fly (Delia radicum) flies are active across the state (see Tables 2 and 3). Data from weather stations around the state show we have reached 250 GDD (Celsius, base 4C) in all regions except in the Berkshires. They are each likely to be found on or near their host crop – Aliums for onion maggot, and Brassicas for cabbage maggot. A good indicator of cabbage maggot flight is blooming of the common roadside weed, yellow rocket (Barbarea vulgaris); good photos can be found at the online UMass Weed Herbarium (a great resource for weed ID!). First generation eggs are reported to be laid when the common lilac is in full bloom. Onion maggot emerges slight later, while seedcorn maggot is active earlier.

First generation peak flight (50% emergence) of key maggot fly pests (GDD in Celsius, Base T = 4 degrees C)

Seedcorn	Onion	Cabbage
200	250-300	250

Life cycle and damage. These maggot flies spend the winter as small brown pupae in the soil. Adults emerge in spring and can travel up to a mile in search of host plants. Both maggot flies are rather delicate, hump-backed gray-brown flies, about 5-7 mm long. Eggs are laid on host crops, in soil at the base of the stem. Cool, moist soil conditions favor survival of the eggs, and soil temperatures that exceed 95 F in the top 2-3 inches will kill them. Larvae feed on roots and can completely destroy the root system. The first sign of a problem is wilting of the plant on sunny days and yellowing or purpling of outer leaves. Later, plants collapse, wilt down, and die. On inspection of the root area you may find the legless white maggots feeding, or the small brown, oblong pupae. In Brassica root crops such as turnips, radishes and daikon, maggot feeding tunnels on or in the root render it unmarketable.

In onions, newly hatched larvae crawl behind the leaf sheath and enter the bulb, and feed on the roots, stem, and developing bulb. Feeding damage also encourages entry of soft rot pathogens.

Avoiding damage by later planting. The first flight and egg-laying period is generally most intense in the first half of May, depending on accumulated growing degree days – thus, it will vary with the season and location. After the first flight is over, and as soils heat up, fewer eggs are laid and those that are laid are less likely to survive. Planting from late May into June will likely be safer than the first half of May.

Monitoring cabbage for eggs. If you have transplants hardening off in a cold frame or outdoors, flies may find them and lay eggs in the flats. To check for eggs in the field or in flats, look for the 1/8-inch long, torpedo-shaped white eggs that are laid along the stem, or in and on the soil near the stem of young transplants. A pencil point or knife helps stir the soil to look for them. Field scout by checking 25 plants, in groups of 2-5 plants, scattered around the field. If you find an average of 1 egg/stem or more, significant crop damage is likely. Eggs may be more abundant in wetter areas of the field. Egg numbers may build up rapidly after the first eggs are seen. Scout successive plantings.

Soil Drench. Target the seed furrow or the base of the plants after transplant-

Table 2. 2013 Seasonal Growing Degree Days (from Jan. 1)

DATE: 5/8/2013	GDD	
Location	Base 4ºC (39.2ºF)	Base 50ºF (10ºC)
Belchertown	256.1	131.4
S. Deerfield	248.8	126.9
Stow	271.8	120.7
Bolton	257.0	123.3
Dracut	247.4	96.9
Tygnsboro	243.4	104.2
East Bridgewater	252.2	94.3
Boston	264.5	106.9
Pitsfield	185.6	83.1

Source: UMass & NOAA weather stations connected with NEWA. Warmer microclimates may experience a faster accumulation of growing degree days. Find GDD from weather stations across the state at: http://newa.cornell.edu/

ing, and use at least 100 and up to 200 gallons of water per acre to help the insecticide penetrate to the root zone. Insecticide options are limited to two organophosphate (Group B) insecticides, Chlorpyrifos (eg Lorsban 4E, 75 WG, or 15G) and diazinon (Diazinon AG500). Check label for specific crops allowed and other restrictions including options for soil drench in direct seeded and transplanted crops, or transplant drench. An organic product that may have repellent effects is Ecotrol G, a granular treated with a mix of essential oils.

Floating row covers provide an effective barrier against this pest. Place the cover as soon as the transplants are set. Use in a rotated field, as flies left in soil after late season Brassicas could emerge under the cover. Replace cover after weeding operations. As soil temperatures rise, first flight ends and crops grow large, covers can be safely removed.

Table 3. Cabbage Maggot Stages and Coresponding Growing Degree Days

Cabbage Maggot Stage	Accumulated Degree Days at base 4^{o}C
1st Emergence	161 +/- 8.1
25 percent	204 +/- 2.8
50 percent	251 +/- 7.9
75 percent	304 +/- 36.6
95 percent	387 +/- 7.7

Model by: J.L. Jyoiti and A.M. Shelton

Cultural practices and natural controls. Crop rotation contributes to keeping populations low; greater distances are more effective. Fall tillage to bury crop residues and to expose over-wintering pupae is also important. For onions, bury or haul away onion cull piles. In a vigorous Brassica crop, cultivation that brings soil up around the stem may help encourage formation of adventitious roots from the stem, which can help compensate for root loss even if maggots are present.

Naturally-occurring fungal diseases occasionally will reduce onion maggot numbers, particularly when flies are abundant and relative humidity is high. During a fungal epidemic dead, diseased flies, can be seen clinging to the highest parts of plants along field edges. Predaceous ground beetles, which eat onion maggot eggs, larvae and pupae, can also be important in reducing maggot numbers. Because these soil-inhabiting beetles are susceptible to insecticides, broadcast soil insecticide treatments should be avoided whenever possible.

Nematodes for biological control. Soil application of the entomopathogenic nematodes, *Steinernema feltiae* , has shown efficacy in trials even at low soil temperatures (10C) Apply by suspending nematodes (infective juveniles) in water and treating transplants prior to setting in the field (as a spray or soaking drench), or in transplant water used in the water wheel transplanter, as a drench after transplanting, or a combination of pre-plant and post-plant applications. Rates of 100,000 to 125,000 infective juveniles per transplant have been shown to be needed to achieve reduction in damage.

-R Hazzard, UMass Extension.

GET READY FOR SWEET CORN SCOUTING SEASON!

European Corn Borer (ECB) moths have two generations per growing season in Massachusetts; the first one emerges in late May or early June, while the second generation begins to emerge in mid July. Be ready for scouting your sweet corn this season by visiting http://extension.umass.edu/vegetable and downloading the UMass Extension publication, **Using IPM in the Field: Sweet Corn Insect Management Field Scouting Guide**, or email umassvegetable@umext.umass.edu to request a free copy. This illustrated guide provides identification tools and instructions to start a monitoring program for pests of sweet corn, such as ECB, on your farm.

Below is a list of the traps and lures that you will need to get started. Order now from Great Lakes IPM, Inc. (800-235-0285, www.greatlakesipm.com) or other IPM suppliers, such as Gempler's (1-800-382-8473, www.gemplers.com).

1. Scentry Heliothis net traps for monitoring both European corn borer (two traps) and corn earworm (two traps) (total: 4 traps)
2. Universal Moth Trap for monitoring fall armyworm (one trap)
3. Trécé lures for European corn borer (Iowa strain, IA or ZI; and New York strain, NY or EII)
4. Scentry lure for fall armyworm (type: two-component PSU lure)
5. Hercon lure tape for corn earworm

6. Hercon vapor tape for Universal Moth Trap

Store lures in the freezer until use; if kept in the freezer, lures will stay fresh for many years. Brands listed have proven reliable in New England.

If you are scouting on your farm this season and would like to contribute trap captures to Vegetable Notes, email umassvegetable@umext.umass.edu. Our scouting network relies on Extension, farmers, crop consultants, and volunteers who report weekly from across the state.

Nutrient Management Guide for New England Vegetable Production

Newly published this winter, this 50-page manual is intended to help vegetable farmers understand some of the basics about what happens in the soil and how it impacts crops, and also to offer some insight on soil and nutrient management practices and how they affect soils, crop productivity and profit. The first part of this manual discusses the physical, chemical and biological properties of soil, which are quite interdependent. Developing a healthy soil requires attention to all three. The second part is about management practices to achieve healthy soils. It is also about the various sources of nutrients and soil amendments and how the management of these resources is necessary for optimum vegetable crop production.

The manual was written by John Howell, drawing upon his 30 years of experience assisting vegetable farmers with soil and nutrient management, and the knowledge of soil scientists from around the Northeast.

The manual is available online at the UMass Vegetable program website, http://extension.umass.edu/vegetable, and is also available from the UMass Vegetable Program office, 413 577-3976.

Twilight Meeting June 3: Organic Crop Production: Soil, Pest and Food Safety Issues for Farmers

Monday, June 3, 2013 5:00 - 7:00 PM

Sponsored by: UMass Extension Risk Management/Crop Insurance Educ. Program and the Waltham Fields Community Farm

Location: Waltham Fields Community Farm, 240 Beaver Street, Waltham, Massachusetts

Program:

Introduction and Farm Overview. Claire Kozower and Amanda Cather, Waltham Fields Community Farm; Tom Smiarowski and Paul Russell, UMass Extension Risk Management Specialists

Challenges of Organic Soil Fertility Management. John Spargo, UMass Extension Assistant Professor - Soil Fertility and Nutrient Management & Director, Soil and Plant Tissue Testing Laboratory

Diseases & Insect Concerns for Organic Producers. Ruth Hazzard, UMass Extension Vegetable Specialist

Food Safety Issues & Weed Management in Organic Operations. Rich Bonanno, UMass Extension Weed and Food Safety Specialist

Registration: There is no registration cost for attendees. Preregistration not required. The program is funded by the U.S. Department of Agriculture Risk Management/Crop Insurance Program. For further information contact UMass Risk Management Specialists Paul Russell at pmrussell@umext.umass.edu or Tom Smiarowski at tsmiarowski@umext.umass.edu or Claire Kozower of Waltham Fields Community Farm at claire@communityfarms.org. Dress accordingly, held rain or shine.

Vegetable Notes. Ruth Hazzard, Katie Campbell Nelson, Lisa McKeag, Susan Scheufele, co-editors. Vegetable Notes is published weekly from May to September and at intervals during the off-season, and includes contributions from the faculty and staff of the UMass Extension Vegetable Program, other universities and USDA agencies, growers, and private IPM consultants. Authors of articles are noted.