UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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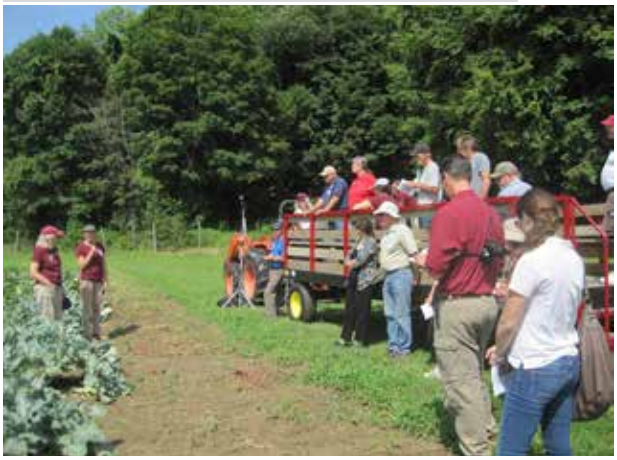
In this issue:

Crop conditions

July saw a good amount of rain showers around the state, and was punctuated almost weekly with dramatic thunder storms, and even a rare tornado on the coast. In most areas, the rain was well-timed and welcomed between stretches of hot days, while some growers had trouble this month getting into wet fields. The alternating rain and sun have been great for most crops, which are abundant at farm stands, and growers are reporting good sales. Harvests include sweet corn, summer squash, cucumbers, lettuce, beans, cabbage, greens, as well as fresh bulb onions and the first potatoes. One major casualty of the rain storms and high humidity in Western MA has been field tomatoes. Several growers have had to remove significant portions of their laboriously trellised crops due to late blight infestations. The disease has also been aggressive on potatoes this year. Weeds have been difficult to control this season on many farms. With so much harvesting to do, weed management can feel like a low priority at this point in the season, but timely cultivation during crop establishment before crop canopy can shade out weeds is critical to getting good yields down the road. On a lighter note, the UMass Agricultural Field Day went off without a hitch. The thunder storms on Monday had us a little nervous, but by Tuesday morning, the sun was shining (but not too much!) and the big tent was up at the South Deerfield Research Farm. The turnout was great! Growers, local residents, and others interested in the wide range of agricultural research projects happening at the UMass Farm took walking tours and wagon rides to hear from the researchers themselves on topics including amendments to enhance soil health and fertility, cover crops, pest control product trials, solar energy, and food safety. If you missed the field day, but would like to know more about any of the projects covered, you can see summaries of all of them in the event program at the UMass Vegetable Program website.



Field Day attendees learn about results of a study on cabbage root maggot on a wagon tour of the UMass Research Farm on Tuesday.

Pest alerts

Solanaceous crops: **Late blight** continues to spread, with new outbreak confirmed this week from a tomato field in Worcester Co. MA. Several samples from MA were genotyped as clonal lineage US-23, which is generally sensitive to methanoxam (Ridomil) and attacks both tomato and potato. For a map of late blight reports and photos of symptoms, see usablight.org. Get spray recommendations tailored to your local weather conditions and fungicide program using the MA DSS website here. In the presence of high disease pressure in your area or frequent heavy rains, you may want to apply fungicides more regularly than recommended by the DSS, as heavy rains weather fungicide more quickly. Late blight spores can be carried on storm fronts, and will infect unprotected tissue. **Tomato hornworm** was found defoliating tomato and eggplant in Franklin Co. MA and in Southern RI. This pest can be found in localized sections of the field, noticeable from defoliated branches or from its pelleted excrement. If any hornworm is found parasitized with the white cocoons of a Braconid wasp parasite, do not kill these, but move them to the edge of the field as the parasitoid wasp will hatch and move on to prey on more hornworms. Watch for new **Colorado potato beetle** adults that are emerging from the

soil, especially in eggplant, where feeding on petioles as well as leaves can reduce yield. Yellow striped armyworm was found in high tunnel tomatoes in RI this week. It is a fairly new pest in the north east.

Sweet Corn: Corn earworm captures remain low in most traps around MA, but higher captures are being found in Sharon MA, on the south-eastern coast (Rehoboth and Seekonk) and in Hollis, NH. See Table 2 for spray thresholds. Do not spray crops within 5 days to harvest. European Corn Borer trap captures also remain low in most parts of MA and in one location in VT, but two traps in the Connecticut river valley, MA have captured 31 and 11 corn borers indicating that the second flight has begun to increase. Scout pre-tassel to first silk corn and treat at a threshold of >15% of plants infested with ECB and/or FAW combined. In silking corn, the spray threshold is 12 or more ECB moths in both traps combined. Fall armyworm damage was found in whorl stage corn in several fields in MA and a corn field in RI. Be sure to scout fields at whorl stage to determine if treatment is necessary at a threshold of >15% of plant infested. FAW can also be a pest in tomato. One grower in Central MA is struggling to manage sap beetles, but other locations are not reporting problems with this pest.

Cucurbits: Powdery mildew is widespread in older summer squash and zucchini plantings, with new reports from Essex Co., MA this week. No PM has been seen in RI. Treatments should begin when the disease is first observed and scouting should include pumpkin and winter squash fields, where powdery mildew usually shows up later than in summer squash. See the May 15th issue of Vegetable Notes for treatment options and tips on fungicide resistance management. The risk for cucurbit downy mildew is still low in MA, according to CDM-IPM-PIPE; new outbreaks have been reported in MI and NJ within the last 7 days. Plectosporium has been reported by a grower in MA. Look for small, white, raised bumps on fruit, stems, and foliage. Apply protectant fungicides when the disease first occurs and ensure thorough coverage of foliage, vines, and fruit. Good control can be achieved by fungicide applications. Squash vine borer trap counts have dropped from previous weeks in Franklin Co. MA, Chittenden Co. VT, southern NH and RI. The first generation flight is likely slowing down and damage from the boring larvae has likely already occurred where the pest was present. A second flight may occur later in the fall and we will report on trap counts then.

Brassicas: Imported cabbageworm **and** Diamond-back moth caterpillars and pupae were found in a field in Chittenden Co. VT. Caterpillar populations were below threshold in pre-heading brassicas (35% of plants with caterpillars) but above threshold in another field which was being harvested (15% of plants with caterpillars). Look for materials with a short pre-harvest interval. Damage from flea beetles on small, newly transplanted fall brassicas can be severe this time of year and treatment to ensure a healthy establishment is recommended. **Anthracnose, Black Rot, and Downy mildew** can also be spreading now into fall plantings. Move fall transplants into distant fields if possible to escape flea beetle and disease problems. Because this summer has been relatively cool, root maggot may be an issue this fall. **Root maggot** damage has been reported in rutabaga by a grower in Southern Rhode Island.

Table 1. European corn borer (ECB), fall army worm (FAW), and corn earworm (CEW) trap captures for the week ending 7/31/14.

Location	ECB	FAW	CEW
Western, MA			
Sheffield	0	0	0
S. Deerfield	3	-	1
Hadley	31	0	0
Feeding Hills	1	1	1
Whatley	11	-	0
Central & Eastern MA			
Spencer	5	0	0
Tyngsborough	0	0	2
Concord	5	0	3
Millis	0	-	7
Sharon	4	-	22
Leominster	1	-	8
Lancaster	0	0	0
Seekonk	7	-	17
Rehoboth	6	-	10
NH			
Litchfield	6	5	3
Hollis	1	2	10
Mason	0	0	1
Burlington, VT	1	1	1

Table 2. Spray intervals for Corn Earworm

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 - 13	7 – 91	4 days
Over 13	Over 91	3 days

General: Leaf curl in celery caused by *Colletocricum acutatum* is a new disease reported in celery in MA. The same organism causes Anthracnose fruit blight in peppers.

Basil Downy Mildew has "taken over the basil in spite of sprays" reports one grower from Worcester Co., MA, and another grower reported this pathogen in Essex Co., MA.

Spotted Wing Drosophila**:** As of 7/28/14, two UMass SWD Trap Network locations in Western MA have caught 2 female (first location) and 2 male & 2 female (second location) SWD. Additional grower reports have also come in this week with the first trap captures of the season in MA, including one report of fruit infestations following the salt test has also come in. MA growers with ripening fruit should begin their spray programs if they have not done so already. In RI, last week one male and several dozen females were found in traps in a raspberry planting and this week, larvae were found in blueberry fruit.

IDENTIFYING BENEFICIAL INSECTS

Integrated Pest Management relies on multiple control strategies, minimizing the risk that pest populations will adapt to any single strategy. One essential strategy of IPM is the use of beneficial insects, either released or naturally occurring. Elimination of all pests is not the goal. Rather, the aim is to reduce pest incidence to below damaging numbers, while preserving enough to sustain natural enemy populations. Beneficial insects may be predators or parasitoids and they may be generalists or specialists (attacking only one host species). According to "Natural Enemies of Vegetable Insect Pests", characteristics of a good natural enemy include: high reproductive rates, host specificity, environmental adaptation, and life cycles synchronized with their host. This article will help you identify some of the most common and efficacious beneficial insects in New England so that you may enjoy the free pest control services you are receiving.

Predatory Midge (*Aphidoletes aphidimyza*)

Identification: Aphid midges are flies which resemble tiny mosquitos and are effective predators in their larval stage. Adults are very small (2-3mm), delicate, mosquito-like flies with long legs and long antennae. They feed on honeydew (aphid excrement). The larvae are small (2mm) legless maggots, usually orange or yellow and feed mostly on aphids.

Life Cycle: Adults fly at night and are rarely seen during the day. They are active from mid to late summer. Their eggs are minute (less than 0.3mm), oval and orange, laid in clusters or singly around aphid colonies. When ready to pupate, larvae drop to the ground and spin cocoons in the soil. The adults emerge in 10 to 14 days, mate, and lay up to 70 eggs in a one-week lifespan.

Predatory midge larva feeding on aphids.

Beneficial Aspects: The larvae are one of the most successful predators against aphids and mites on annual and perennial plants. This predator has a wide geographic range and feeds on many aphid species.

Effectiveness: As an important part of biological control for greenhouse crops, they are widely sold in the U.S. In its lifetime one larva can kill from 10 to 30 aphids.

Hover Fly Larvae (Diptera: Syrphidae)

Identification: Hover Fly (also known as Syrphid Flies or Flower Flies) are often found hovering over various flowers for nectar and pollen. Adult flies resemble bees to ward off predators. Their bodies are black or brown with distinct stripes or dots of white or yellow on their abdomen and/or thorax. Syrphid larvae are predatory of aphids. They are green, pink or brown in color with long tapered bodies towards the head.

Life Cycle: The life cycle varies among species and depends on the environmental conditions and availability of food. Single, white eggs are laid onto a leaf near a food source. The eggs hatch within 3 days and the larvae pass through several instars (molts) in a period of 1 to 3 weeks. They'll turn into tan-brown teardrop-shaped puparium either on the host plant or the soil. Unless the pupal stage remains for overwintering, adults emerge in 1 to 2 weeks. In the course of a year, over seven generations can occur.

Syrphid fly larva.

Beneficial Aspects: Larvae are voracious predators of soft bodied insects, mainly aphids. They are found throughout North America and are often found on crops and plants attacked by aphids and other pests. Adults intentionally lay their eggs next to colonies of aphids to ensure the success of

their offspring. They are also prominent pollinators. These flies are attracted to flowering plants, especially weedy borders and garden plantings. They prefer small, flat or umbelliferous flowers like wild carrot, Queen Anne's Lace, herds, horseradish, and wild mustard.

Effectiveness: It's unknown how effective the species is for commercial production but they are favored for gardens and small plots. However, each larva can consume up to 400 aphids during development. When syrphid larvae are abundant, the aphid population can be reduced by 70 to 100%.

Spined Soldier Bug (*Podisus maculiventris*)

Spined soldier bug.

Identification: A type of stink bug with a wide host range among various important pests. The spined soldier bug is the most common species of Podisus and is found throughout the United States. Adults' coloring range from pale brown to tan with an approximate size of 8.5 - 13mm long. They are shield shaped with noticeable spurs on their "shoulders" immediately behind the head. What separates the soldier bug from other similar looking insects is their distinctive dark line on the tip of each forewing. Young nymphs are red and black; older nymphs have marks with red, black, yellow-orange and cream bands and patches. The nymphs are round rather than shield-shaped.

Life Cycle: Females lay over several hundred gray, cream, or gold, barrel-shaped eggs in clusters of 20-30 eggs, on leaves or twigs. Eggs hatch in 5-9 days. Growth from egg to adult lasts about 30-35 days and adults live from 1-4 months.

Beneficial Aspect: Their prey includes over 100 different species. They'll target primarily immature insects with their piercing sucking mouth parts. Their prey includes the following pests: European corn borer, diamondback moth, corn earworm, beet armyworm, fall armyworm, cabbage looper, imported cabbageworm, Colorado potato beetle, Mexican bean beetle

Effectiveness: They're recorded to have consumed over 100 late instar fall armyworm larvae during a season.

12-Spottted Lady Beetle (*Coleomegilla maculata*)

Twelve Spotted Ladybeetle feeding on Colorado potato beetle eggs.

Identification: These lady beetles are pink to red in color, oval in shape, 5-6 mm long, and have six black spots on each forewing. The oval-shaped pronotum behind their black heads is usually pink or yellowish with two big black markings on it. The larvae of this beetle grow to about 5 mm in length and are long, dark, and alligator-like. The eggs are ellipsoid and 1 mm long.

Life Cycle: 12-spotted lady beetles overwinter in large groups at field edges beneath leaf litter or stones. They come out in early spring to disperse and find sites to lay eggs and feed on pollen, insect eggs, and small larvae. Females lay their eggs (200-1000 eggs) near aphids or other prey from spring to summer. Larvae emerge from the eggs and feed on prey until they attach themselves to leaf surfaces to pupate. The pupal stage lasts 3-12 days, then adults emerge and live for close to a year. Two to five generations of these lady beetles may occur each year.

Beneficial Aspect: 12-Spotted lady beetles are most important as predators of aphids, but they feed on mites, insect eggs, and small larvae as well. Plant pollen makes up a larger part of their diet than it does for other lady beetles, which allows their populations to build up in high pollen crops such as corn.

Effectiveness: Their searching ability for prey egg masses is excellent and they can contribute significantly to mortality of Colorado potato beetle eggs and small larva in potato. However, lady beetles prefer aphids to all other pests, which is not favorable for growers when worse pests are present, but at least they keep aphid populations in check!

Multicolored Asian Lady Beetle (*Harmonia axyridis*)

Identification: These lady beetles are convex in shape and somewhat larger than native lady beetles at 7mm long and 5.5mm wide. Their wings are colored yellow, orange, or red and may or may not have black spots on them. They can have up to 19 spots, but their appearance is quite variable throughout the species. A disk-shaped pronotum covers their head. The pronotum is cream or yellow in color and has a distinctive black design on it that is shaped like an 'M'. The larvae of these beetles are long, flat, and black with orange markings and black spines. Eggs are ellipsoid and yellow and found in clusters of twenty or so.

Life Cycle: Asian lady beetles cycle from egg to adult in a month or so and multiple generations of these beetles occur every year. Eggs are laid underneath leaves of various plants. In three or more days they hatch and the larvae thrive on aphids for two weeks or so. The beetle then enters the pupal stage, from which adults emerge after several days and live for about a year. Adults overwinter in sheltered locations (including indoors) and mate in the spring.

Beneficial Aspect: These beetles prey on aphids and scale insects especially. They are not native and are considered both beneficial (for their predation on pest insects) and a nuisance (because they often overwinter in large groups in houses, and because they can be a pest in grapes).

--Written By Kristina Fahey and Ayana LaSalle, Stockbridge School of Agriculture Students, Updated by Katie Campbell-Nelson, 2014

Resources:

Hoffman, M.P. and Frodsham, A.C. "Natural Enemies of Vegetable Insect Pests". 1993. Cornell University.

Cranshaw, W. "Garden Insects of North America." 2004. Princeton University Press, Princeton.

PEPPER DISEASE CONTROL

Pepper plants and ripening fruit are more susceptible to fungal and bacterial diseases during periods of high humidity and rainfall such as the recent weather in Massachusetts. Fungicides and bactericides can be used effectively in combination with cultural practices to manage diseases but only with correct identification of the pathogen, correct choice of materials, well timed applications, proper calibration and rates, and resistance management also plays a role. Pesticides are not usually needed to manage pepper diseases in Massachusetts, but there are some situations in which they can help to protect healthy plants and limit disease spread. See Table 1 for a quick guide to effective products for disease control and some tips on resistance management. In all cases, pesticides must be used according to label instructions. Consult the New England Vegetable Management Guide for a more complete list of chemistries registered for use on peppers.

Anthracnose (*Colletoctricum coccodes, C. gloeosporiodes,* and *C. acutatum*[1])

Anthracnose caused by C. acutatum. Photo by RLWick.

Identification: Symptoms are usually first noticeable on ripe fruit, although green fruit is also infected by *C. acutatum*. Latent infections can become a serious post-harvest problem. Tiny lesions may also occur on leaves and stems which can be overlooked and can serve as an initial source of inoculum for fruit. Small, circular, sunken spots appear on fruit that are characterized by numerous submerged, black fruiting bodies (acervuli) often in concentric rings. In humid conditions, salmon, pink or orange masses of fungal spores form in concentric rings on the surface of the lesions. In older lesions, black structures called microsclerotia may be observed. With a hand lens, these look like small black dots.

Control: Cultivars with some resistance to Anthracnose include Colossal, Brigadier, Paladin, and North Star. Paladin and North Star have shown some tolerance to *C. acutatum*. Cultural practices such as using disease free seed, rotating to non-host crops for at least 3 years, and avoiding overhead irrigation can reduce disease development. Follow these guidelines for using fungicides effectively for Anthracnose:

- If symptoms of anthracnose occur, get a diagnosis from the UMass Diagnostic Lab before turning to fungicides because *C. acutatum* is the most aggressive of the *Colletotrichum* speacies, while the other two species may not require fungicide treatment.
- Apply fungicides when pepper plants begin flowering and environmental conditions are favorable for disease development (68-75°F and long leaf wetness periods).
- Use a weather based disease forecast model to schedule sprays such as TOM-CAST. Even though this model was designed for tomato, it has utility for timing fungicide sprays in pepper.

[1] *C. acutatum* is also a pathogen of celery causing a disease known as 'Leaf curl' which was diagnosed in MA by the UMass Plant Diagnostic Lab in 2014. This is a newly diagnosed pathogen in the state on celery and has affected peppers for several years in MA.

- Strobilurin (e.g. Cabrio, Quadris) or Group 11 fungicides are effective in managing the disease, but must always be tank mixed then rotated with one or more fungicides with different modes of action to reduce the likelihood of resistance development in the pathogen population.

Phytophthora Blight (*Phytophthora capsici*)

Identification: Symptoms include root and crown rot, stem cankers, and fruit rot. Root infection leads to wilt and eventual death of plants. Distinctive black lesions are seen on infected stems, leaves or fruit after a field has flooded. The pathogen also infects leaves causing water-soaked, circular, brown lesions. Leaf and stem lesions often result from splash dispersal of the pathogen onto the upper portions of the plants. Fruit can also be infected resulting in fruit rot. In high humidity, lesions may be covered with white sporangia.

Stem lesions of Phytophthora blight on pepper.

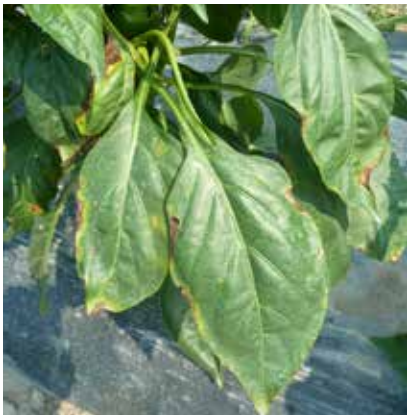
Control: Some cultural practices such as improving drainage or using a mustard cover crop to "biofumigate" soils have shown some efficacy in helping to manage this pathogen, as fungicides alone are not sufficient. The following is a list of tips on maximizing fungicide efficacy from Meg McGrath of Long Island Extension who conducts a lot of research on *Phytophthora capsici*:

- Only use fungicides as part of an integrated program with cultural practices.
- Use a preventive schedule; don't wait for symptoms to develop to start fungicide applications.
- Rotate among classes of targeted fungicides for resistance management. Resistance to mefenoxam (Ridomil, Group 4) and cyazofamid (Ranman, Group 21) has developed in some fields. Cyazofamid resistance has only been detected in the southeastern US, so it can still be a good component of fungicide programs for New England, but growers should be cautioned about over-using it.
- Use the new fungicide dimethomorph + ametoctradin (Zampro, Group 40 +45) in place of dimethomorph alone (Forum, Group 40).
- For best results, apply phosphorous acid fungicides (e.g. Phostrol, Fosphite, Group 33) tank mixed with another targeted fungicide.
- Note that while propamocarb (Previcur Flex, Group 28) is a good choice for late blight, it is not effective for *P. capsici*.

Symptoms of Phytophthora blight on pepper fruit.

Bacterial Leaf Spot (*Xanthomonas campestris* pv. *vesicatoria*)

Identification: Lesions are small (1-3mm) and do not have concentric zones or a prominent halo. On leaves, the spots are generally brown, circular, and look water soaked. 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. Infected leaves frequently drop, reducing the photosynthetic capacity of the plant. On tomato, leaves and green fruit are susceptible to infection and lesions are quite distinct, beginning as minute, slightly raised blisters with a halo. As lesions enlarge, they lose their halo and become brown, raised, and scab-like. On pepper, ripe fruit is affected and lesions may be scab-like or sunken.



Bacterial leaf spot on pepper foliage with copper spray residue.

Bactericides: Prevention is the most effective means of controlling bacterial leaf spot. Because the pathogen is seedborne, it is important to start with certified disease free seed or treat seed with hot water. Cultivars with resistance *to X. campestris* pv. *vesicatoria* are available. Adequate fertility is an important strategy to keep plants healthy. The same cultural practices for avoiding Anthracnose and Phytophthora blight apply to Bacterial Spot. Chemical control of this bacterial pathogen is different from the other two fungal pathogens mentioned.

- Apply bactericides at the sign of first symptoms and when conditions are likely for the spread of this disease (high

humidity, rain splash, night temperatures warmer than 60°F and harvesters moving inoculum through the field).

- Bactericides are only marginally effective in controlling bacterial diseases; sanitation and environmental control are important management principles. In the case of widespread infection, chemical controls are ineffective.
- Copper products are the only effective bactericides. Mixtures of copper and mancozeb give better control.
- Do not use high pressure, air-blast sprayers which cause increased leaf infection in rows adjacent to spray alleys and spread bacterial diseases across rows.

Table 1. RELATIVE EFFECTIVENESS OF VARIOUS CHEMICALS FOR PEPPER DISEASE CONTROL

++++ Excellent; +++ Good; ++ Fair; + Poor; - Not effective; NA not labeled

				RELATIVE CONTROL RATING			
Active ingredient (e.g. trade name)	**FRAC group1**	**Preharvest interval (Days)**	**Resistance Management Guidelines**	**Anthracnose**	**Bacterial spot**	**Phytophthora blight (crown and stem rot)**	**Phytophthora blight (fruit and foliage rot)**
azoxystrobin (Quadris)	11	0	High risk, rotate with other FRAC Groups. Do not make consecutive applications.	+++	-	-	++
azoxystrobin + difenoconazole (Quadris Top)	11 + 3	0		+++	-	-	-
femoxadone + cymoxanil (Tanos)	11 + 27	3		+	-	-	-
pyraclostrobin (Cabrio)	11	0		++++	-	-	-
pyraclostrobin + fluxapyroxad (Priaxor)	11 + 7	0		+++	-	-	-
chlorothalonil (Bravo, Echo 720)	M	3	Low risk, multi-site	+	-	-	NA
mancozeb (Manzate Pro-Stick, Dithane F45)	M3	7	fungicides, use alone or tank-mix with high risk single site fungicides.	++	+	+	+
mancozeb + copper hydroxide (ManKocide)	M1 + M3	7	Mostly low risk, however, resistance to bacterial spot has developed in tomato in the southeastern US.	++	+++	+	+
fixed copper[3]	M1	check label		+	+++	-	++
streptomycin sulfate6 (Agri-Mycin, Firewall)	25	NA	Greenhouse use only	-	+++	-	-
cyazofamid (Ranman)	21	0	Resistance has developed in southeastern US; rotate with other FRAC Groups.	-	-	+++	++++
dimethomorph (Acrobat, Forum)	40	4	Tank-mix and rotate with other FRAC Groups.	-	-	-	+
dimethomorph + ametoctradin (Zampro)	40 + 45	4		-	-	+++	++++
fluopicolide (Presidio)	43	2		-	-	+++	++++
mandipropamid (Revus)	40	1		-	-	+++	++++
mefenoxam[2] (Ridomil Gold SL)	4	NA	Rotate with other FRAC Groups. Resistance has developed in *P. capsici.*	-	-	++++	NA
mefenoxam + copper (Ridomil Gold Copper)	4 + M	7		+	++	NA	++++

[1] Fungicide Resistance Action Committee groups listed according to their mode of action. Numbers distinguish the different fungicide groups; whereas letters refer to M: multi-site activity.
[2] *P. capsici* becomes resistant to mefenoxam quickly. Ridomil Gold may be applied to pepper at transplanting, but is NOT registered for control of Phytophthora blight; the foliar blight phase of Phytophthora cannot be controlled with foliar applications of Ridomil Gold.
[3] Fixed coppers include: Champ, Champion, Cuprofix Ultra, Kocide, MasterCop, Nordox, Nu-Cop.

--Written by Katie Campbell-Nelson, UMass Extension

CULLING GARLIC: DON'T PLANT OR STORE INFECTED BULBS

There are several opportunities to inspect garlic cloves for symptoms of nematode and disease infection. Whether you cull as you harvest, as you put them in the barn or greenhouse to cure, or as you cut and sort them for seed or storage, I encourage you to take a careful look at some point to avoid disease spreading through a storage crop or contaminating

another field or next years' crop by planting infected bulbs this fall. Most disease symptoms we see on garlic bulbs or cloves result from infections that occurred in the field, so identifying them now will tell you which fields to avoid planting garlic into in years ahead, as most of these pathogens persist for many years in the soil. Below are listed the symptoms of the most common diseases that will affect garlic seed and storage crops.

Fusarium rot causing red discoloration of bulb. Cloves appear water soaked. Photo by Oregon State Univ.

White Rot (*Sclerotium cepivorum*) causes white fluffy growth around the stem plate and bulb and small sclerotia—hardy resting structures that allow the pathogen to persist for years—about the size of poppy seeds form on the bulb, often around the neck. This disease will continue to grow and spread in storage if humidity is not kept low.

Fusarium Basal Rot (*Fusarium oxysporum* f. sp. *Cepae*) causes red to purple discoloration of bulb exterior and sometimes a white fluffy mycelial growth at the base may be observed. If the bulb is cut open, one or several cloves may appear brown and watery. Later, the stem plate becomes pitted and a dry rot develops. The disease continues to develop in storage.

Bloat nematode causes browning of scales and dessication of cloves. Photo by B.Watts, UMaine.

Stem and Bulb Nematode (*Ditylenchus dipsaci*) damage can be mistaken for Fusarium basal plate rot, with bulb decay occurring both at the neck and the basal plate of the bulbs. The bulb tissue begins softening at the neck and gradually proceeds downward; the scales appear pale gray to dark brown, and the bulbs become shrunken, soft, and light in weight. Under moist conditions, secondary invaders such as bacteria, fungi, and onion maggots induce soft rot and decay of the bulbs. Affected bulbs may still be sold as food, but be clear with customers that garlic infested with stem and bulb nematode should not be planted, this is how it gets introduced to new fields and once present it cannot be eradicated.

Downy Mildew (*Peronospora destructor*) Affected bulbs may be smaller and shriveled, with a blackened neck, and outer scales will become water-soaked. Some bulbs may sprout prematurely.

Botrytis mycelia and sclerotia. Photo by Oregon State Univ.

Botrytis Bulb Rot (*Botrytis allii*) infections start in the fields but symptoms usually do not develop until the bulbs have been moved into storage—a good reason to check your curing garlic periodically! Affected bulb tissue is initially water soaked, but later turns dry and necrotic. Sclerotia—those hardy black resting structures—form in the neck or adhere to the rotten outer scales of the bulb.

Penicillium Decay (*Penicillium* spp.) is a major cause of decay of bulbs in storage and can spread to healthy bulbs via airborne spores. The fungus causes fuzzy, blue-green growth on diseased cloves, usually starting at the base.

Disease Prevention Tips for Harvest and Storage

- Do not irrigate within 10 to 14 days of harvest. Avoid harvest after heavy rains.
- Avoid mechanical injury and bruising of bulbs during production and harvest. Avoid pulling on the neck to get them up or banging cloves together to remove mud and dirt from roots.
- Properly cure bulbs. Cure in a well-ventilated area at 70-80˚F. Practices that hasten curing include undercutting bulbs to sever all roots, avoiding nitrogen fertilization later than two months after seeding, and proper plant spacing. Under wet conditions when bulbs cannot be cured adequately, artificial drying with forced hot air followed by normal storage should be considered.
- For long-term storage, garlic is best maintained at temperatures of 30 to 32 °F with low RH (60 to 70%). Good airflow throughout the vented bins or other storage containers is necessary to prevent any moisture accumulation. Under these conditions garlic can be stored for more than 9 months.

--Written by Susan B. Scheufele, UMass Extension

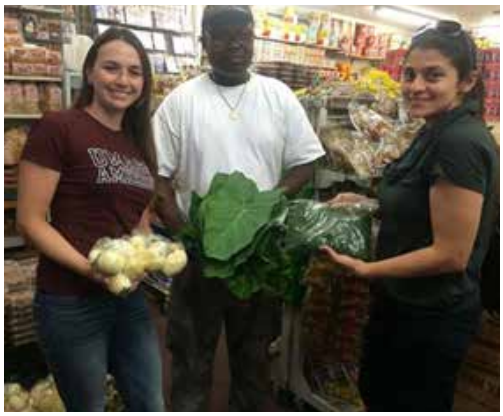
THE NEW UMASS AMHERST URBAN AGRICULTURE AND NUTRITION PROGRAM

Faculty and staff of the Stockbridge School of Agriculture, UMass Extension Vegetable Program, Department of Nutrition, and the UMass Extension Nutrition Education Program have initiated a holistic, grant-funded project to increase

fruit and vegetable consumption of residents in Worcester, MA. Worcester is the second largest city in New England and, like many urban areas in our region, immigrant populations are increasing. Latinos are the largest ethnicity in the Worcester public school system (38%), followed by non-Hispanic whites (36%), African Americans (14%) and Asians (8%). Hence, Hispanics, African Americans, and Asians together comprise 60% of the Worcester Public School System.

Our goals are to increase the fruit and vegetable consumption in the Worcester East Middle School and catchment area, and to increase locally-grown fruits and vegetables in the schools and markets in Worcester.

Please like us on Facebook to learn more about this project -https://www.facebook.com/umassurbanag/info, or contact Zoraia Barros, zbarros@umass.edu, (413) 658-4278 or Frank Mangan, by email at fmangan@umass.edu or by phone at (508) 254-3331.



Peter Bobson (center), owner of Monrovia Africa Market in Worcester alongside Aline Marchese (left) and Zoraia Barros (right) of the Stockbridge School of Agriculture holding three crops popular among Africans, that have been grown locally.

UPCOMING EVENTS

UMass Extension Vegetable and Fruit Twilight Meeting: Food Safety , IPM and the Commonwealth Quality Program

When: August 13th, 2014 4-7 pm

Where: Foppema's Farm, Northbridge, MA, 1605 Hill St, Northbridge, MA 01534

Join UMass Extension faculty and staff and the Foppema family to learn about how the farm is using food safety and IPM strategies in their vegetable, tree fruit and berry crops.

Foppema's Farm is a 75 acre fruit and vegetable farm located in Northbridge, Massachusetts. The farm is family owned and operated by the Ken Foppema family. Ken and Lisa and their four sons (along with a wonderful staff of employees) grow and sell produce from the farm out of a beautiful post and beam farmstand built in 1998. They sell wholesale and at farmers markets, and through pick-your-own, especially at nearby Keown Orchards which is now part of their farm.

The farm participates in the **Commonwealth Quality Certification Program** and they are taking steps to increase their implementation of the **food safety standards** as well as the **sustainability and IPM standards** that are part of this program. We will tour their wash room and packing area, and discuss specific steps that help to ensure food safety when **field packing greens**. Mike Botelho from the Mass Dept. of Ag Resources will talk about the Commonwealth Quality Program (CQP), its food safety standards, and the market access that can be gained through CQP. You'll see some of the CQP promotional materials, that can be customized to highlight aspects of your farm.

On the IPM side:

--Rich Bonanno, UMass Extension weed specialist, will discuss **weeds**: types of weeds, how they grow, how to identify them, and how to manage them on a very diverse farm like Foppema's.

--UMass Extension small fruit specialist, Sonia Schloemann will give a **Spotted Wing Drosophila** management update.

--Jon Clements will tour the apple orchard and discuss the **fire blight** outbreak of 2014, and how to manage fire blight.

--Ruth Hazzard, UMass Extension Vegetable specialist with Lisa McKeag, Extension Assistant and Ken Foppema will discuss how the Foppema's are using **IPM in onions** to solve a key disease problem.

Upcoming UMass Extension IPM Field Walks

August 14th, 2014 3:30-6:00 pm
High Meadows Farm, 742 Westminster West Rd., Putney, VT

August 22nd, 2014, 3-5 pm

The Farm School, 488 Moore Hill Road, Athol, MA 01331

Enter Your Prize Winning Tomatoes in the 30th Annual Massachusetts Tomato Contest!

When: Monday, August 18th from 9:30 am – 1 pm

Where: The new location of the Boston Public Market Farmers' Market, 136 Blackstone Street, Boston (on the Greenway).

Tomatoes will be judged by a panel of experts on flavor, firmness/slicing quality, exterior color and shape. Always a lively and fun event, the day is designed to increase awareness of locally grown produce. Farmers who want to submit their tomatoes can bring them to the Boston Public Market Farmers' Market between 9:30 am and 10:45 am on August 18th or drop their entries off with a corresponding registration form to one of the locations designated around the state. For the complete details, including contest criteria and a registration form, click here or at www.mass.gov/agr.

The contest is sponsored by the New England Vegetable and Berry Growers Association in cooperation with the Massachusetts Department of Agricultural Resources and Mass Farmers Markets, and is hosted by the Boston Public Market Association. This friendly contest is open to commercial tomato growers and is designed to increase consumer's awareness of local agriculture.

Apply Now for the Massachusetts Agricultural Food Safety Improvement Program (AFSIP): Applications Open till August 20.

The Agricultural Food Safety Improvement Program (AFSIP) supports agricultural operations that are looking to upgrade their food safety measures and thereby maintain or increase their competitive market access while reducing food safety risks. Participants selected to participate in the program will be reimbursed up to $20,000 or 75% of their total project costs.

AFSIP will fund practices that help minimize the risk of microbial contamination and food-borne illnesses. In addition, eligible upgrades will increase competitive market access by meeting buyer demands for demonstrated practices that work towards protecting public health and food safety.

Projects will be broken into a produce category and an aquaculture category. Some examples of projects in the produce category include wildlife fencing, packing shed walls, ceilings and light fixtures, field harvest systems, hand washing sinks, restrooms, drainage systems, and water systems. Some examples of projects in the aquaculture category include ice machines, harvest gear, and testing/monitoring equipment.

For more information and to access application forms please visit the MDAR website or contact Laura Maul, laura.maul@state.ma.us, (617)-626-1739.

UMass Extension Vegetable Program Twilight Meeting

When: August 27th, 2014
Where: Brigham Hill Community Farm, Grafton, MA

Vegetable Notes. Ruth Hazzard, Katie Campbell-Nelson, Lisa McKeag, Susan Scheufele, co-editors. Vegetable Notes is published weekly from May to September and monthly 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.