UMass Extension
Vegetable Notes
For Vegetable Farmers in Massachusetts since 1975

Volume 29, Number 20 August 24, 2017

In this issue:

Crop conditions

Here in the Pioneer Valley many of us got a good dousing earlier this week, and in general have been getting enough rain that there has been little need for irrigating this year. Other parts of the state have stayed fairly dry though, especially southern Berkshire Co. and most of eastern MA, with Plymouth Co. listed as "abnormally dry" according to the drought monitor. Cool nighttime temperatures continue, slowing tomato ripening. From Little Compton, RI via the VT Vegetable and Berry News' Reports from the Field: "We are having tunnel tomato ripening problems due to cool nights. Dr. Rich McAvoy of UConn said to bite the bullet and turn on the heat at night because tomatoes really need a minimum of 62 degrees. For a few degrees of extra warmth the main cost isn't the fuel but the time and effort of closing up the houses every night!"

A farmer helps harvest cabbage from an on-farm research trial on nitrogen contributions from cover crops. Come learn more at our upcoming meeting on September 5th!

Growers are shifting focus now, getting started on big harvests like squash and potatoes and planning for others like pumpkins and sweet potatoes, to make sure they get completed before crews head back to school or before pests and diseases begin to take hold. One group of pests that usually goes under-appreciated until this time of year is weeds. All those weeds that escaped early and mid-season herbicide sprays and cultivation are now rearing their ugly (seed-) heads and burying long-season crops like butternut squash and sweet potatoes—see article this issue for tips and tricks for getting rid of mature weeds.

Pest alerts

As major harvests continue, take time to assess the myriad pest issues you have faced in a given crop, and consider management strategies to handle multiple issues at once. This week we report multiple issues in the same fields: White mold (fungus), black rot (bacterium), and cabbage aphid (insect) in one cabbage crop and brassica downy mildew (oomycete), black rot (bacterium) and cabbage aphid (insect) in another; also anthracnose, powdery mildew (fungi) and cucurbit downy mildew (oomycete) in the same field on both acorn squash and cucumbers. See pest alerts below to help make a plan! And give us a call this winter if you want to go over an IPM plan for next year.

Brassicas:

Brassica downy mildew: was reported in field arugula several weeks ago and now in cabbage in Franklin Co., MA. Yellowed areas with black dots or streaks occur on upper leaf surfaces and white crusty-looking sporulation occurs on leaf undersides. Affected tissues become susceptible to attack by secondary rotting organisms. Practice rotation with non-brassica crops, control brassica weeds, and destroy infested crop residues promptly after harvest. Many fungicides are labeled, see the New England Vegetable Management Guide for recommendations.

Cabbage aphids: are on maturing cabbage and Brussels sprouts in Franklin Co. and on cabbage being harvested in Hampshire Co., MA. Treat Brussels sprouts, broccoli, cabbage and cauliflower if greater than 10% of the plants are infested with aphids anytime after heads or sprouts begin to form.

Melon aphid: one farmer in Norfolk Co., MA succeeded in keeping the 3rd generation of cabbage root maggot from infecting his fall brassica root crops by using row cover, but when the row cover was removed he found his daikon, purple top turnip, hakurai, and radish were heavily infested with melon aphid! Not normally a pest of brassicas, aphid populations can build under row cover where beneficial insects might be excluded and where warmer temperatures speed their development.

Table 1. Sweetcorn pest trap captures for 8.16.17-8.24.17

Location	ECB	FAW	CEW	Spray Interval for CEW
Western, MA				
South Deerfield	1	43	30	*4 days*
Sheffield	0	-	10	*4 days*
Whately	0	-	9	*4 days*
Central, MA				
Leominster	0	-	62	*4 days*
Lancaster	7	0	1	*no spray*
Northbridge	1	0	3	*6 days*
Eastern, MA				
Concord	0	0	2	*6 days*
Ipswich	6	0	1	*no spray*
Falmouth	3	-	10	*4 days*
Dover	0	-	24	*4 days*
Millis	2	-	19	*4 days*
Sharon	0	-	36	*4 days*
Swansea	0	-	132	*3 days*
Seekonk	0	12	102	*3 days*
NH				
Litchfield	0	8	20	*4 days*
Hollis	1	1	14	*4 days*

European corn borer (ECB), Fall armyworm (FAW), Corn earworm (CEW)

Cucurbits:

Anthracnose was diagnosed on "Green Bowl" cucumber in Franklin Co., MA. Grow cultivars with resistance to the common races of anthracnose, avoid wounding fruit during harvesting. Immerse fruit in clean and fresh water containing 120 ppm chlorine to kill spores. Collect and burn or deep-plow residues after harvest. Use a two-year crop rotation.

Cucurbit downy mildew: is spreading on cucumbers and cantaloupes and was diagnosed for the first time this season on acorn squash in Franklin Co., MA this week. At this point in the season, a healthy crop of cucumber is hard to find anywhere due to many other diseases (powdery mildew, anthracnose, bacterial wilt), however, consider growing only downy mildew resistant cucumber varieties in late summer plantings: http://vegetablemdonline.ppath.cornell.edu/Tables/TableList.htm. Come see how some of these varieties are doing at our upcoming Twilight Meeting on September 5th.

Eggplant:

Verticillium wilt: symptoms are now being seen across MA and was confirmed on eggplant in Worcester Co., MA. A yellowing of lower leaves followed by wilting is the first sign of disease. Lesions have a characteristic V-shaped pattern which is widest at the leaf margin. When the stems of infected plants are cut lengthwise, the vascular tissue exhibits a brown discoloration. *Verticillium* species survive in the soil and on infested crop residues as microsclerotia or resistant mycelium and in symptomless weed hosts. There is no effective chemical treatments for Verticillium Wilt, short of soil sterilization by steam, broad spectrum fumigants, or soil solarization. Consider green manures, especially of cruciferous crops, to stimulate natural microflora and reduce plant pathogen activity and survival.

Pepper Maggot: outbreaks are being reported now in fields where this pest is established. Damage was severe in one field where 70% of eggplant fruit was affected and in peppers where 90% of the crop was affected. In the future, plant cherry bomb varieties, which are preferred by the pest, near the edge of field where they were last year to serve as a trap crop.

Tomato:

Root knot nematode was found causing serious damage in a high tunnel tomato crop in NY and plants have been removed. Suggestions for managing this tunnel into the future include: plant mustard cover crop now alongside winter greens and mow, irrigate, and incorporate in 5-7 weeks. Interplant with marigolds next year. Prior to planting try biological controls Majestine (Marrone bio) or Melacon (Certis). Consider grafted tomatoes for resistance to nematodes, or plant tomatoes in soil bags for the next few years to keep them completely out of infested soil.

Late blight- is now in Hartford Co., CT on tomato, likely spreading from the western MA source reported several weeks ago.

Sweetcorn:

Rust: was found on Silver Queen corn in Franklin Co., MA and on other varieties in Long Island and Western NY these past few weeks. Here is a list of varieties and their levels of resistance to rust: aRRestor, Excellency, and Prevailer possess specific resistance with 0% rust severity and fungus unable to sporulate; Sweetie, Miracle, Country Gentleman, Sucro, Sugar Time have partial resistance; Dandy, Gold Dust, Golden Glade, Patriot, Tendertreat EH, Sugar Loaf have moderate resistance; Seneca Horizon, Gold Cup, Seneca Sentry, Kandy Corn EH, Jubilee, Sweet Sal, Commander, Stylepak, Merit, Silver Queen, Florida Staysweet, and Sweet Sue have the least resistance.

Corn earworm (CEW): Very high numbers are being captured in coastal fields (Swansea and Seekonk), though numbers are also increasing further inland, including at our research farm in South Deerfield which is now at a 4 day spray schedule (Table 1).

Fall armyworm (FAW): is being captured now at high numbers in some fields. Not too many growers are trapping for FAW and it is emerging as a more important pest of sweet corn than ECB. Damage is expected about one week after arrival of adult moths. Scout pre-tassel or whorl-stage corn and treat if 15% or more of plants are infested. In emerging tassels, combine counts for ECB and FAW.

European corn borer (ECB): has remained low all season, and the second flight of this pest was virtually absent.

Western bean cutworm peaked in NY August 1-8 and much lower numbers are being trapped now. In MA only 1 moth has been captured this season in South Deerfield and this newer invasive pest is likely not causing damage in sweet corn.

IDENTIFYING BENEFICIAL INSECTS

While scouting in the field for insect pests, also keep an eye out for the insects that are working in your favor. Your pest management decisions should be based in part on the natural controls that are already at work! It is important to be able to identify which insects are doing harm to your crops, and which are doing harm to the pests. Many different insects either prey upon or parasitize other insects that are pests of vegetable crops. Some are generalists and will feed on a variety of insect species, while others are more discriminating–this is generally true of the parasitoids, which lay their eggs within the eggs or body of a specific host. The most effective natural enemies on farms tend to be those that either consume voraciously (e.g., green lacewing larvae, which feed on aphids and many other small insects) or those that are host-specific (e.g., *Diaeretiella* spp., a wasp which parasitizes aphids exclusively). They should have high reproductive rates and life cycles that coincide with those of their hosts or prey.

The principals of Integrated Pest Management (IPM) include capitalizing on these natural controls to manage vegetable pests, along with using cultural practices and making strategic applications of appropriate chemical controls that interfere with the work of natural enemies as minimally as possible. The goal of IPM is not to eliminate all of the pests from a crop, but to reduce the populations of pests so that they are not causing economic losses, while maintaining enough of the pest population to sustain their natural enemies. It is often the larval stages of predators that do the bulk of the feeding; the adult stages of many beneficial species may only feed on pollen or nectar, so maintaining flowering plants– whether wildflowers at the edges of fields, or sweet alyssum interspersed within the crop– can help to provide both food and shelter for beneficial insects.

Predators

Predatory Midge (*Aphidoletes aphidimyza*) 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. 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. The larvae are very successful predators of aphids and mites. In its lifetime one larva can kill from 10 to 30 aphids. They are widely sold in the U.S. as an important part

Predatory midge. Photo by A. Eaton.

of biological control programs in greenhouse crops.

Hover Flies (Diptera: Syrphidae) (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. Hover fly larvae are predators of aphids. They are green, pink or brown in color with long tapered bodies towards the head. 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 pupa, either on the host plant or the soil. 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. Theadults are also prominent pollinators, and are attracted to flowering plants, especially weedy borders and garden plantings. They prefer small, flat or umbelliferous flowers like wild carrot, herbs, horseradish, and wild mustard. Each larva can consume up to 400 aphids during development. When hover fly larvae are abundant, the aphid population can be reduced by 70 to 100%.

Syrphid fly larva. Photo by M. Spellman.

Spined Soldier Bug (*Podisus maculiventris*) is the most common species of *Podisus*, a kind of stink bug, and is found throughout the United States. Adults are pale brown to tan and about 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 the 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. Females lay hundreds of 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. Their prey includes over 100 different species including: European corn borer, diamondback moth, corn earworm, beet armyworm, fall armyworm, cabbage looper, imported cabbageworm, Colorado potato beetle, Mexican bean beetle. They'll target primarily immature insects with their piercing sucking mouth parts. They are recorded to have consumed over 100 late instar fall armyworm larvae during a season.

Spined soldier bug.

12-Spottted Lady Beetles (*Coleomegilla maculata*) are pink to red in color, oval, 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 5mm in length and are long, dark, and alligator-like. The eggs are ellipsoid and 1mm long. Twelve-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 in number) 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. Twelve-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. 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.

12-spotted ladybeetle. Photo by M. Spellman.

Multicolored Asian Lady Beetles (*Harmonia axyridis*)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

Multi-colored Asian ladybeetles.

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. Asian lady beetles cycle from egg to adult in about a month 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 about two weeks. 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. 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).


Lady beetle pupa - sometimes mistaken for CPB larva! Photo by J. Boucher.

Green lacewing (*Chrysopa* and *Chysoperla* spp) adults are pale green, with a slender soft body, about 1/2" long, and four delicately veined wings. Eggs are laid on filamentous stalks attached to plant tissues. Eggs hatch about 4 days after being laid. Larvae are alligator-like, with a flattened body that tapers at one end, have long, curved mandibles, and are usually pale with darker markings. They measure from 1/8 to 4/5 of an inch. Larvae develop through three instars, and then pupate in silken cocoons attached to plants. The adults of most species are not predaceous, feeding mostly on nectar and pollen. The larvae, however, are voracious predators, and will consume large numbers of a wide range of soft-bodied insects, including other lacewing larvae. Lacewings are found naturally in New England, and are also available commercially, as they are very effective at cleaning up outbreaks of aphids and other pests in greenhouses.


Lacewing eggs. Photo by L. McKeag.

Parasitoids

The beneficial parasitoids that are important in vegetable crops aren't often seen as most of them are tiny wasps. There are thousands of species of parasitic wasps, most of which are highly specialized to use a particular species or family as a host. Several species are naturally occurring in New England, or have been successfully introduced, and others are commercially available for release. These wasps lay their eggs in either the eggs or larvae of their hosts, where the wasp larvae feed on the insides of the host, and pupate in or on the host before emerging as adult wasps. Often what will be visible in crops to indicate parasitoid activity will be either the parasitized host or the pupating parasite.


Aphidoletes aphidimyza *is a parasitic wasp often released in greenhouses to control aphids. Photo by J. Gross.*

Caterpillars are commonly parasitized by braconid and icheumonid wasps. The braconid wasp, *Cotesia rubecula*, was introduced to New England from China in 1988, and is now established in Massachusetts. This wasp parasitizes imported cabbageworm larvae. You may see their small white cocoons on brassica leaves. Diamondback moth eggs are parasitized by the ichneumonid wasp, *Diadegma insulare*, which occurs naturally in Eastern North America. *D. insulare* females require sources of nectar to be effective DBM parasitoids, so maintain wildflower stands near brassica fields to encourage their activity. You may be more familiar with the pupae of another parasitic wasp, *Cotesia congregatus*, which lays its eggs under the skin of the tomato and tobacco hornworms. The larvae feed within, then emerge to pupate on the surface, eventually killing the host. If you see a hornworm in your tomato crop with many white cocoons on its back, don't kill it – either leave it be, or move it to another area where it can't continue feeding, to allow the wasps to

Aphid mummies.

develop.

Aphids also have many parasitic wasps that rely on the aphids' bodies to produce and feed their young. If you see puffy, tan or golden aphids among an aphid colony, these are aphids with one of these wasps pupating within, and are called aphid "mummies". Sometimes you will see a small hole in the mummy, indicating that the adult wasp has emerged. The braconid wasp *Diaeretiella rapae*, parasitizes many species of aphid, but is particularly fond of cabbage aphids. Keep an eye out for these mummies when scouting for aphid colonies to get an idea of the level of the biological control you're getting.

-Adapted by Lisa McKeag from original article by Kristina Fahey and Ayana LaSalle, Stockbridge School of Agriculture Students.

FALL WEED MANAGEMENT ADVICE

At the end of the season when weeds are towering above your heads, or at least above your pumpkin crop, it can seem like the end of the road and nothing is left to be done. Not so! There are three main activities that need to be completed now for good,year-round weed management—fall field scouting, preventing weed seed production, and controlling perennial weeds.

Here are some late-season weed management tips for those of you who might be wondering, "where did I leave that cultivating tractor?" Photo by L. McKeag.

End of Year Weed Scouting. It is worthwhile to take the time to check fields for weed problems at this time of year. A quick scouting can identify problems that will be expensive to solve if they get out of control and can provide clues that will help in designing a weed management program for next year. Mapping weedy spots, and keeping some kind of permanent record of weed surveys, can help you evaluate your weed management over the years. Make a map of each field and fill in the following information:

How many? If weeds are very dense, they may be having an impact on yields. This is especially true if these weeds emerged early in the season, when competition is greatest. If weeds were actively growing during the period of greatest crop growth, consider changing the weed management program.

Which weeds? Identifying weeds can help identify potential problems before they get out of hand, and can help you decide if you need to modify your weed control program. Weeds like yellow nutsedge, field bindweed, and quackgrass are spreading perennials which have underground parts that enable them to spread throughout whole fields. Because these weeds can be very damaging, and are very difficult to control, they are worth "nipping in the bud". In addition, keep an eye out for annual weeds that are new to a field or are increasing in numbers. Some weeds can be very difficult to control in some or all of the crops in your rotation. Galinsoga, for example, is hard to control in cole crops, peppers, and squash. Nightshades are difficult to control in tomatoes for growers who rely on herbicides for control because they are in the same family as tomatoes. Velvetleaf is hard to control in sweet corn.

Where are the weeds? Weeds in the rows or planting holes are much more damaging to crop yields than between-row weeds. Weeds in rows may be an indication that cultivation equipment needs adjustment, or cultivation needs to be done earlier.

What worked? It is also useful to look at the whole field and evaluate the effectiveness of your weed control efforts. If some weeds are generally escaping, identify them. They may point to weaknesses in your herbicide or cultivation program. If mostly grasses, or mostly broadleaves are escaping, it may require an adjustment of either the rates or the

timing of grass or broadleaf herbicides. You may also find the New England Vegetable Management Guide useful. This manual contains a chart listing the effectiveness of vegetable herbicides on most of the common weeds in New England. Use this guide to find an herbicide labeled for your crop that might give better control than the one which was used.

Preventing Weed Seed Production. Annual weeds produce incredible amounts of seeds. Annual grasses normally produce 3,000 to 5,000 seeds per plant, small seeded annual weeds such as pigweed and lambsquarters can produce 100,000 to 250,000 seeds per plant, and larger seeded broadleaf weeds such as velvetleaf and smartweed can produce 5,000 or more seeds per plant. Perennial weeds can also produce seeds, in addition to surviving through other storage structures like rhizomes or tubers. Once fields are harvested, they should be tilled or disked as soon as possible to prevent seeds from maturing. Be especially concerned with weeds that are new to a field or are in abundant supply. If time is short, one alternative is to mow the weeds. This will remove the primary seed stalk but will also encourage lateral branching. Eventually, however, these branches will produce seeds and must be destroyed. For some weeds, like Galinsoga, seed maturation may continue after mowing or pulling–these plants should be removed from the field if possible.

Perennial weed management. The best time to control perennial weeds is in the Fall. All perennial weeds have storage structures (tap roots or rhizomes) below ground that enable these plants to survive the winter and regenerate themselves the following year. Fall tillage of perennial weeds will kill top growth and fragment the storage organs but will not kill the weed. Frequent tillage will, over a long period of time, control perennial weeds but, in most cases, this is not practical.

Perhaps the best control technique for perennial weeds is an application of glyphosate (Roundup) before the plant goes dormant. Perennial broadleaf weeds such as bindweed or dandelion should be sprayed while they are still actively growing which is usually before a hard frost. Perennial grasses, such as quackgrass, can be sprayed as late as mid-November. Use 10 to 20 gallons of water per acre when spraying Roundup. Two quarts of the herbicide will provide much better control at 10 gallons of water per acre than at 40 gallons of water per acre. Spraying on a mild afternoon following a cold or cool morning is best to encourage translocation of the herbicide to the below-ground storage structures. Disking or tilling two weeks after application will also improve control of the weeds.

Many growers fight perennial weeds such as quackgrass in corn fields year after year because their primary goal in the fall is to plant a cover crop. This is usually followed by a spring application of Roundup which provides top kill but does not kill the whole weed. Applying Roundup at the proper time is the only way to achieve good control. Delaying the seeding of a cover crop may be a necessary evil in the fight against perennial weeds.

In conclusion, remember to scout and map your fields, prevent weed seed production, and apply Roundup at the right time to control perennial weeds.

We recently discovered this online resource, USDA-ARS Integrated Weed Management Resource Center, http://integratedweedmanagement.org/ and they had this to say about fall weed management:

> **When the Time Comes to Hand Pull Weeds**
>
> Prolific weeds like horseweed (aka marestail) and pigweeds [also grasses, lambsquarters, galinsoga...] are beginning to flower and will drop hundreds of thousands of seeds per plant in the coming weeks. Those seeds will stay in the soil and cause increased weed problems in future years. At this point, what can you do?
>
> While the best time to manage these prolific weeds is prior to planting, some stubborn plants can remain in and around fields through the late-season. Potential reasons for this include 1) ineffective herbicide control, 2) herbicide resistance, 3) small stands persisting on field edges, roads, and by buildings, 4) plants that are cut off during small grain harvest that recover, branch out, and push on to produce seeds.
>
> At this point in the season, a grower's first reaction to escaped weeds may be to reach for herbicides. However, growers cannot simply rely on herbicides to control large plants (over 6 inches) which are typically able to survive or outgrow herbicide damage. This is where the integration of manual removal may come into play to avoid spreading thousands or millions of seeds.
>
> **Options for managing mature weeds:** Growers aiming to eliminate individual mature weeds have several

options, all with pros and cons that the grower must weigh.

- First, they may be manually pulled using a hoe, weed hook, or by hand. Pulled plants should be moved out of the field to prevent regrowth and seed drop. While certainly time-consuming, physically removing the plants is the most definite way to ensure they cannot contribute to the weed seed bank, and this can save lots of money in the long run.
- A second option for late-season management is to mow the area of the field that contains a severe infestation. If the weeds have not yet produced seeds, this should substantially decrease the quantity of dropped seeds. The grower would need to weigh the cost of terminating the crop where the infestation exists, but should keep in mind that preventing this weed infestation now can save a substantial amount of money on weed control next year.
- Third, when faced with a severe mature infestation that has produced seeds, a grower may choose to not only mow the affected section of the field, but also burn the mowed weeds in piles or windrows. Burning this weedy plant matter at sufficiently high temperatures kills the weed seeds. Temperatures of 800-900 degrees F are required to kill most weed seeds. In order to achieve this temperature range, it is important to form the plant matter in windrows or piles and then wait for it to dry, in order to create the density and dryness needed.
- Windrows may also be formed at harvest-time and then burned – this technique is referred to as "narrow windrow burning." It is becoming widely adopted in Australia, and is being tested by Virginia Tech and the University of Arkansas for use in US cropping systems.

While late-season control measures are labor-intensive, eliminating escaped weeds is an important measure for preventing seed dispersal and new infestations especially in no-till fields. Just a few plants can produce enough to infest an entire field in a couple of seasons. Manual removal this year could save significant money, time, and labor in future years.--Re-published from the USDA-ARS Integrated Weed Management Resource Center, http://integratedweedmanagement.org/index.php/2017/08/11/when-the-time-comes-to-hand-pull-weeds/

--Rich Bonanno, UMass Extension Weed Specialist

IDENTIFYING POTATO TUBER DISEASES

Potato harvest is underway for some early processing varieties and will be beginning soon for fresh eating, direct-market sales There are many diseases that affect potato tubers so as you begin to sort through your potato harvest this year, take a moment to check for disease symptoms. Proper identification will help you decide which tubers will store well and which should be sold as tablestock, and will give you a better idea of which soil-borne diseases are present in your fields, improving your future crop rotations.

Early blight. Photo by S. Jensen.

Common Scab (*Streptomyces* spp.) produces tan to dark brown, circular or irregular lesions which are rough in texture. Scab may be superficial (russet scab), slightly raised (erumpent scab), or sunken (pitted scab). The type of lesion is dependent on potato cultivar, tuber maturity at infection, organic matter content of soil, strain of the pathogen, and the environment. Common scab is controlled or greatly suppressed at soil pH levels of 5.2 or lower, though a closely related but less common species of *Streptomyces* known as acid scab can survive down to 4.0.

Early blight (*Alternaria solani*) usually affects potato foliage but tuber infections can also occur. Tuber lesions are dark, sunken, and circular often bordered by purple to gray raised tissue. The underlying flesh is dry, leathery, and brown. Lesions can increase in size during storage and tubers become shriveled.

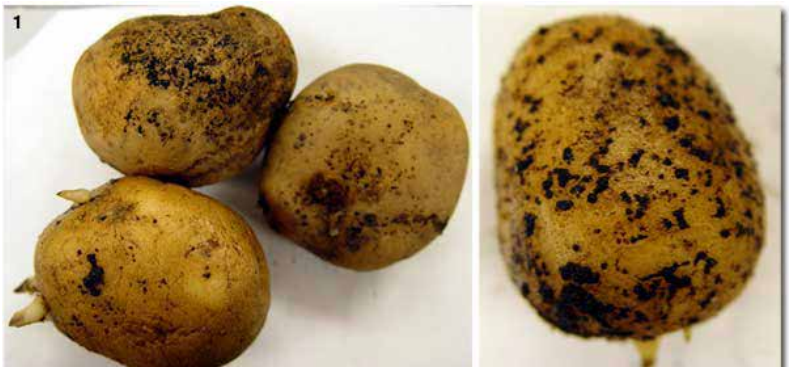
Fusarium Dry Rot (*Fusarium* spp.) causes internal light to dark brown or

Dry rot caused by Fusarium *spp. Photo by C. Averre.*

black dry rot of the potato tuber. The rot may develop at an injury site such as a bruise or cut. The pathogen penetrates the tuber, often rotting out the center. Extensive rotting causes the tissue to shrink and collapse, usually leaving a dark sunken area on the outside of the tuber and internal cavities.

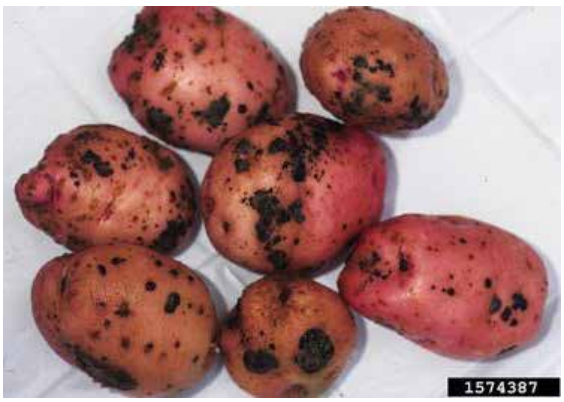
Black Dot (*Colletotrichum coccodes*) On potato foliage symptoms are nearly indistinguishable from early blight and on tubers it produces tiny black sclerotia (fungal resting structures). Symptoms on tubers can be easily mistaken for silver scurf.

Silver Scurf (*Helminthosporium solani*) affects only tuber periderm (skin). Lesions are initiated at the stolon end as small pale brown spots which may be difficult to detect at harvest but will continue to develop in storage. In storage, lesions may darken and the skin may slough off and many small circular lesions may coalesce to form large affected areas. Tubers may also become dried out and wrinkled due to excessive moisture loss in storage.



Black scurf caused by Rhizoctonia solani. *Photo from MI State Univ.*

Black Scurf and Rhizoctonia Canker (*Rhizoctonia solani*) Black scurf is purely cosmetic and does not reduce yield, even in storage. Irregular, black hard masses on the tuber surface are overwintering structures (sclerotia) of the fungus. Presence of these sclerotia may be minimized by harvesting tubers soon after vine-kill and skin set. While the sclerotia themselves do not cause damage, they allow the pathogen to survive in the soil and serve as evidence of its presence. In cool, wet soils, *R. solani* can cause dark, sunken lesions on underground sprouts and stolons. These lesions can cut off the supply of nutrients, killing tubers, or can reduce the transfer of starches to the tubers, reducing their size. Cankers can also form on the tubers themselves, usually at the stolon or in lenticels. Cankers on tubers which can be small and superficial but may be large, sunken and necrotic.



Black scurf on red skinned potatoes. Photo by G. Holmes.

Pink Rot (*Phytophthora erythroseptica*) and **Pythium Leak** (*Pythium* spp.) Pink rot infections start at the stolon end and result in rotten and discolored periderm with a clear delineation between healthy and diseased tissue. When exposed to air, tuber flesh turns pink and then brown-black. *Pythium* spp. that cause leak infections invade tubers through harvest wounds and continue to develop in transit and storage. Infections result in internal watery, gray or brown rot with well-defined red-brown lines delineating healthy and diseased tissue.

Pink rot cause by Phytophthora erythroseptica. *Photo from Univ. of MN.*

Late Blight (*Phytophthora infestans*) affects potato foliage and tubers. Foliar symptoms start with brown to black, water soaked lesions on leaves and stems which produce visible white sporulation at the lesion margins under humid conditions. Whole plants and fields may collapse rapidly. Tuber infection is initiated by sporangia from foliage being washed down into the soil and usually begins in wounds, eyes, or lenticels. Lesions are copper brown, red or purplish and white sporulation may occur on tuber surfaces in storage or cull piles. Infected tubers are susceptible to infection by soft rot bacteria which can turn entire bins of potatoes in storage into a smelly, rotten mass.

Potato Virus Y can cause necrotic ring spots on tubers, depending on which strain of the virus is present, which potato variety is grown,

Late blight causing water-soaked spots on tubers. Photo by RW Saamson.

and the time of infection. Affected tubers have roughened rings of darker brown or reddened skin. Necrosis beneath the rings may extend into the tuber flesh. Necrotic symptoms in tubers often increase after storage. Potato varieties vary in their susceptibility to PVY and the symptoms they exhibit on foliage and on tubers; Yukon Gold is particularly susceptible to tuber necrosis. If you think you are seeing symptoms of PVY on foliage or tubers, please contact Sue at sscheufele@umext.umass.edu.

Physiological Disorders

Necrotic ringspots on Yukon Gold potatoes caused by PVY.

Black Heart is caused by lack of oxygen during storage which causes the tissue to die from the inside out and turn black. The condition is not reversible but if you notice it quickly and correct your storage conditions you can prevent the whole crop from being affected.

Brown Center and Hollow Heart are internal physiological disorders of potato which often occur together. Brown center is an area of dead pith cells which turn brown, while hollow heart is a star- or lens-shaped hollow area in the center of the tuber. These disorders make fresh-market tubers unattractive and can reduce repeat sales. Severe hollow heart negatively impacts the quality of chip-processing potatoes and can result in shipments not making grade. Both disorders are related to stress, and occur at a higher incidence when growing conditions abruptly change during the season. Brown center and hollow heart likely form during tuber initiation but could also form during tuber bulking. If the disorder occurs during the early part of the season, then it is most often preceded by brown center and forms in the stem-end of the tuber, while late-forming hollow heart usually occurs near the bud-end with no brown center symptoms occurring. Conditions such as when soil temperatures are less than 56°F for 5–8 straight days, or when available soil moisture is greater than 80% cause brown center to start forming. Incidence of brown center and hollow heart also increases with periods of stress caused by high or low soil moisture, especially if heavy rains occur suddenly after a dry spell. Large tubers are more prone to develop the disorder, so using closer spacing and making sure not to have too many skips in the row can reduce incidence of brown center and hollow heart. There are also differences in the susceptibility of potato varieties: 'Atlantic', a widely grown potato for chip processing, is relatively susceptible to both disorders. In 'Russet Burbank', susceptibility to both brown center and hollow heart is highest soon after tuber initiation when the tubers are small.

Hollow heart symptoms. Photo by B. Phillips.

-Written by Susan B. Scheufele

Events

Low Cost Aerated Composting Systems for Small Acreage Operations

When: Wednesday, August 30, 2017 from 10:00 am to 12:00 pm

Where: Rocky and Anne Adriance Farm, 77 Teawaddle Hill Rd., Leverett, MA 01054

Rocky and Anne Adriance will be hosting a demonstrative composting workshop on their farm. Please join us to learn about innovative composting techniques. This event is sponsored by the UMass Crops, Dairy, Livestock, Equine Extension team, Friends of Lake Warner and the Mill River, and Hampden Hampshire Conservtion District. Lunch will be provided.

For further information about the composting practices to be demonstrated please visit our CDLE factsheets:

- Aerated Composting Bins
- Low Cost Aerated Static Composting Piles

Please RSVP by Monday August 28th by emailing Kelly Kraemer kkraemer@umass.edu.

For any questions or comments please contact Kelly Kraemer @ 413-545-5221 or kkraemer@umass.edu

Twilight Meeting: UMass Vegetable Program's Research Tour and Pest Roundtable

When: Tuesday September 5th, 2017, from 4 pm to 7 pm

Where: UMass Crop Research and Education Center, 91 River Rd. Deerfield, MA 01373

Join UMass Extension educators and specialists at the UMass Crop Research and Education Center to tour our ongoing research and participate in a roundtable discussion. Research trials include: cucurbit disease management, cabbage aphid control, and nitrogen contributions from cover crops for vegetable fertility. After a field tour, we will have a roundtable discussion with UMass Extension Specialists where you can get crop or pest management questions answered over dinner! Registration is free, but please pre-register so we can order food accordingly.

3 Pesticide credits will be available.

Co-sponsored by Sustainable Agriculture Research and Education program (SARE) and USDA - National Institute for Food and Agriculture (USDA-NIFA)

Click here to register: https://www.surveymonkey.com/r/8PY65KC

Contact: Sue Scheufele at 413-577-3976 or sscheufele@umass.edu

Twilight Meeting: Produce Wash Station Design, Use and Maintenance: Improving Efficiency & Complying with Food Safety Requirements

When: Tuesday, September 26, 2017 - 4:00pm to 6:30pm

Where: Atlas Farm, 635 River Road, Deerfield, MA 01342
(*note:* this meeting is at the main farm on River Rd, and NOT at the Atlas Farm store on Routes 5 & 10 in S. Deerfield)

A functional wash and pack area can improve both workflow and produce safety. FSMA's Produce Rule states that equipment, tools, and buildings must be of adequate design and able to be cleaned and properly maintained. We will discuss the range of options available for growers of different scales to meet these requirements. We'll tour the wash house with a recirculating washer-conveyer at Atlas Farm with owner, Gideon Porth and hear about the design of a mobile wash station by Amanda Brown from the UMass Student Farm. We will also cover how to develop Standard Operating Procedures (SOPs) and keep sanitation records. Extension Educators will be on-hand to give input and answer questions on the following topics:

- Infrastructure upgrade decision-making – Chris Callahan, University of Vermont Extension Agricultural Engineer
- Developing useful SOPs – Amanda Kinchla, UMass Food Science Extension
- Produce safety regulations -- Lisa McKeag, UMass Extension

A light dinner will be provided.

Co-sponsored by UMass Extension and Community Involved in Sustaining Agriculture (CISA)

Click here to register: https://www.surveymonkey.com/r/8QWR52Q

Contact: Lisa McKeag at 413-577-3976 or lmckeag@umass.edu

Massachusetts No-Till Conference 2017: Dairy and Vegetables

When: Monday, October 30, 2017 - 9:00am to 3:00pm

Where: Carter and Stevens Farm, 500 West Street, Barre, MA 01005

Topics will include:

- Why no-till works! (Kate Parsons, NRCS Resource Conservationist)
- Nutrient management in No-till systems(Tom Morris, UConn Plant Science Professor)
- Pest and Disease Management for No-Till (Katie Campbell-Nelson, UMass Extension Vegetable Program)
- No-Till Planter Demo
- Cover crops
- Farmer Presentations

Sponsored by the USDA Natural Resources Conservation Service (NRCS), Massachusetts Association of Conservation Districts, and Worcester County Conservation District, UMass Extension, and Sustainable Agriculture Research and Education (SARE)

To register contact: Lisa.trotto@ma.usda.gov

THANK YOU TO OUR SPONSORS

FARM CREDIT EAST

Vermont Compost Company — Feed the Soil

NEW ENGLAND VEGETABLE & BERRY GROWER'S ASSOC.

CERTIS The Biopesticide Company

Vegetable Notes. Katie Campbell-Nelson, Lisa McKeag, Susan Scheufele, co-editors.

Where trade names or commercial products are used, no company or product endorsement is implied or intended. Always read the label before using any pesticide. The label is the legal document for product use. Disregard any information in this newsletter if it is in conflict with the label.

The University of Massachusetts Extension is an equal opportunity provider and employer, United States Department of Agriculture cooperating. Contact your local Extension office for information on disability accommodations. Contact the State Center Directors Office if you have concerns related to discrimination, 413-545-4800.