UMass Extension
Vegetable Notes
For Vegetable Farmers in Massachusetts since 1975

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In this issue:

Learning all about bugs at High Road Farm in Newbury yesterday! Those beds are mulched with salt marsh hay, a common sight on farms on the north and south shores.

Imported cabbageworm larva

Crop conditions

The weather is still relatively cool this week—for reference, this week last year, GDDs base 50°F around the state ranged from 600 to 827, compared to 532 to 683 this week. Temperatures are slowly rising though, as we head into the first few days of summer. Rain is forecasted across the state most days this week, although with small amounts of actual total rainfall expected. We'll see what it adds up to. Folks are out cultivating now while it's clear, continuing to plant and seed, and there are lots of crops coming out of the fields—summer squash and zucchini, the first cucumbers, carrots, beets, radishes, and salad turnips, greens galore—but the full-on summer harvests are yet to come. Some sweet corn is on track to be harvested for July 4; other fields were hit hard by the May frost and won't be harvested.

Pest alerts

Alliums

Onion thrips continue to feed in allium crops this week. Row cover will exclude thrips (use netting in place of spunbonded covers when it gets hot!), and regular pesticide applications can control them. Silver reflective mulch is another useful part of an integrative approach to thrips management. Thrips are likely to find the plants eventually but the reflective mulch can help keep them away longer. We've seen a few growers using it this season who are happy with the results. Save your weeding or harvesting in reflective mulch for cloudy days, though, as it is really bright to work in a reflective field!

Brassicas

Imported cabbageworm caterpillars are now active in brassica plantings, and adults are continuing to lay eggs. Scout brassicas now and treat heading crops if 20% are infested with caterpillars prior to head formation. Use a 15% threshold for heading crops after head formation and for leafy crops. Labeled conventional products include spinosyns (e.g. Radiant), pyrethroids (e.g. Fastac, Baythroid XL, Brigade, Asana, Danitol, Declare, Warrior, Pounce, Mustang) diamides (e.g. Vetica, Coragen, Exirel, Verimark), emamectin benzoate (e.g. Proclaim), indoxacarb (e.g. Avaunt), and tolfenpyrad (e.g. Torac). The diamides are more expensive but are systemic and have long residuals and will also pro-

Contact Us:

Contact the UMass Extension Vegetable Program with your farm-related questions, any time of the year. We always do our best to respond to all inquiries. **Office phone:** (413) 577-3976 **Email:** umassveg@umass.edu

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tect against flea beetles, cabbage root maggot, and cabbage aphid. Bt products (e.g. Dipel, Xentari) and/or Spinosad (Entrust) are the most effective OMRI-listed materials. Use a spreader-sticker to help materials adhere to waxy brassica leaves.

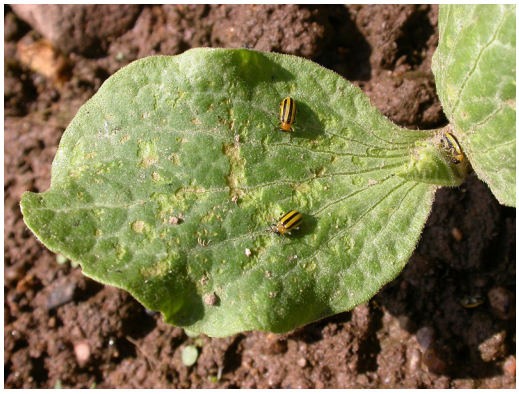
Buttoning is continuing to be reported in broccoli and cabbage that is heading now. Buttoning is the premature formation of the head. The head never fully develops and will never size up. Buttoning is a physiological response to stress. Buttoning occurring now was likely caused by the extreme temperature fluctuations that occurred in May. Broccoli and cabbage transplants that are overmature when planted out (in other words, held for too long as transplants) will often button. There is no way to reverse buttoning.

Cucurbits

Cucurbit downy mildew was confirmed last week in cucumber in southern NJ. The storm forecast for this weekend and next week is coming up from the south, potentially blowing CDM spores northward. We are recommending that growers apply a protectant to cucumber and cantaloupe crops now, before the rain arrives, since those crops are more susceptible than other cucurbits to CDM. CDM protectants include mancozeb, chlorothalonil, and copper (OMRI-listed options available). See the article in this issue for more information on CDM management.

Cucurbit downy mildew on cucumber. Photo: G. Higgins

Striped cucumber beetles are out en masse! We've heard from many growers that they've never seen so many SCB all at once. The variable temperatures this spring may have resulted in a lot of the beetles emerging all at once, as opposed to more gradually. There are 2 generations of SCB adults over the course of the summer, but the generations run into each other, making SCB control a constant battle as soon as they're out in the spring. There are several broad-spectrum conventional insecticides labeled for SCB, including carbamates, pyrethroids, and neonicotinoids. Avoid using foliar neonicotinoids (e.g. Actara [thoamethoxam] or Assail 30SG [acetamiprid]) if systemics in the same class were used. Two neonicotinoid products, imidacloprid (e.g. Admire and generics) and thiamethoxam (Platinum) are registered for use in cucurbits as an in-furrow, banded, drench, or drip irrigation application to the seed/seedling root zone during or after planting/transplanting operations. Note specific application methods and rates on labels. Commercially applied seed treatments (e.g. thiamethoxam, Farmore) are also available for early season control. SCB are difficult to control with OMRI-listed pesticides. Pyrethrin (Pyganic) and Azera (mixture of pyrethrin + azadirachtin) are labeled for SCB. Growers can also apply kaolin clay (Surround) to deter SCB. Spinosad (Entrust) is not labeled for and is not effective against SCB.



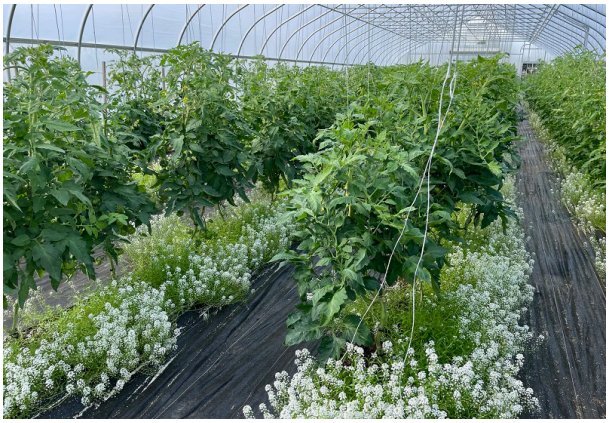
Striped cucumber beetles

Squash vine borer adults continue to be caught in low numbers in pheromone traps this week (see Table 1). Adults mate and lay eggs soon after emergence, so we'll expect to see the first larvae in a few weeks. Pheromone traps are used

Table 1. Squash vine borer trap captures for week ending June 21

Whately	0
Leominster	0
North Easton	2
Sharon	1
Southampton	0

to monitor adult emergence and time insecticide sprays. A spray is recommended in bush-type cucurbits if trap counts exceed 5/week and in vining-type cucurbits if trap counts exceed 12/ week. Conventional pesticides include Assail or pyrethroids (e.g. Brigade EC, Asana, Warrior, Perm-up/Pounce). Organic growers can use spinsoad (Entrust) or *Bt aizawai* strain (e.g. Agree WG). Sprays should be directed to the base of plants. Thin-stemmed cucurbit plants are not susceptible to SVB infestation.



Alyssum planted alongside high tunnel tomatoes, to attract beneficial insects at Appleton farm. Photo: S. B. Scheufele

Nightshades

Colorado potato beetle: Small and large larvae are feeding in potato and eggplant foliage now. The adults also feed on the foliage, but the larvae do most of the feeding damage. Chemical control is most effective if targeted at the small larvae, so scouting to determine when your field is at threshold for small larvae is important. See the article in this issue for more information and management recommendations.

We have been getting reports of **aphids** in high tunnel tomatoes. Some growers are successfully controling aphid populations using biocontrols and insectary plantings, like the alyssum in the picture at right. Parasitic wasps and predatory mites can be used to keep smaller aphid populations in check and should be released before or as soon as you notice an aphid infestation. Ladybeetles are only effective against larger populations. Insectary plantings like the alyssum in the photo to the right will also attract natural predators of aphids like parasitic wasps and syrphid flies. See the article in the August 27, 2020 issue of Vegetable Notes for more information on aphid biocontrol in high tunnels. The greenhouse and high tunnel tomato insect control section of the New England Vegetable Management Guide lists pesticides labeled for use in high tunnels, and the pepper insect control section notes whether materials are allowed for high tunnel use or not.

Sweet Corn

Corn earworm is being caught at 8/10 trapping sites this week. Historically we began trapping for CEW in mid-June, when we expected the first moths to begin trickling in. This year, several trapping locations got their traps up early and we are able to see more moths arriving earlier. CEW moths lay their eggs in corn silks, and the hatching larvae move into the ears from the silk. So corn that is not silking yet is not at risk for damage. Even if you are trapping enough CEW to warrant sprays on your farm (see Table 2), if you do not have silking corn yet, you should continue scouting for ECB and only spray if you meet the 15% infestation threshold. Bt corn does not consistently provide adequate control of CEW.

Table 2. Spray intervals for corn earworm based on moth captures in Heliothis net traps

Moths per night	Moths per 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

European corn borer is continuing to be caught in low numbers across the state (with the exception of 20 moths caught this week at one location in Essex Co.!). Reports of ECB larvae in corn fields remain low, though. If ECB is being caught on your farm or on a farm year you (see Table 2), corn with newly emerging tassels should be scouted weekly for the presence of ECB larvae by inspecting the tassels of 50 to 100 plants, in groups of 5 to 20 plants throughout the field. Treat if more than 15% of the plants have one or more larvae present. Timing sprays for tassel emergence reaches larvae in the whorl and the young tassel. A sprayer configuration with one nozzle directed into the tassel and a single drop nozzle to the upper parts of the plant gives the best control. At high levels of infestation, 2 applications may be needed to provide control. Bt corn with both the vip3A and cry1AB genes generally will control ECB without insecticide applications.

Other Crops

Leafminer was seen causing damage in amaranth in Middlesex Co. this week. Leafminers lay their eggs on the undersides of host leaves, and the larvae chew their way into the leaves then tunnel between the leaf layers. Infested leaves

can be removed and destroyed (don't put them in cull piles where the larvae will be able to complete their life cycle!). Systemic and translaminar insecticides will also be effective against larvae within the leaves. Materials labeled for spinach and beet leafminer should be effective against leafminers in amaranth, but make sure the crop is on the label!

Table 2. Sweetcorn pest trap captures for week ending June 21

Location	GDD* (base 50°F)	ECB NY	ECB IA	FAW	CEW
Western MA					
Feeding Hills	564	5	0	0	4
Southwick		4	0	0	3
Granby	608	-	-	-	-
Whately	668	1	0	-	3.5
Central MA					
Lancaster	683	-			
Leominster		0	7	0	5
Northbridge	540	-	-	-	-
Worcester	625	-	-	-	-
Eastern MA					
Bolton	613	2	0	-	-
Concord	573	3	0	0	3
Methuen	600	-	-	-	-
Ipswich	532	20	0	0	5
Millis	-	0	0	n/a	-
North Easton	609	0	0	0	1
Sharon		0	0	n/a	4
Sherborn	607	1	0	0	0
Seekonk	580	0	0	0	0
Swansea		1	0	-	-

- no numbers reported for this trap
n/a this site does not trap for this pest

*GDDs are reported from the nearest weather station to the trapping site

Colorado Potato Beetle Management

Colorado potato beetle (CPB) larvae are active now and feeding voraciously on foliage. This pest can quickly skeletonize potato and eggplant leaves and does significant damage to those crops every season. Both adults and larvae feed on the plants, but the larval damage is most severe, with the larger larvae causing 85% of the feeding damage. Adults are also much harder to kill with pesticides than the larvae, due to their hard outer wing case and the fact that they consume relatively little leaf material that may be treated with insecticide. For these reasons, it's critical to control CPB when larvae are small. Good control of CPB in June will not only protect vulnerable crops now; it will also reduce the number of beetles in the next generation that will overwinter to feed on next year's crops.

Colorado potato beetle adult laying eggs in potato.

Life Cycle: In the Northeast, CPB feeds on solanaceous crops and weeds, including horsenettle, Eastern black nightshade, eggplant, potato, and tomato (primarily seedlings). CPB overwinters in the adult stage, generally in soil (up to 12 inches deep) in the woods and brushy borders next to host crops, though some burrow into soil right in the field. In spring, the beetles emerge to search for host plants. Adult CPB are fairly slow and clumsy; they can fly when temperatures are warm enough, but more often they walk into fields from overwintering sites. Heavy feeding may occur on edges of non-rotated fields. If beetles do not find host plants via walking they will fly in search of food. Once they reach a host plant, adults feed, mate, and lay eggs. One female can lay up to 300 eggs in her lifetime. Eggs hatch in 7 to 10 days, depending on temperature. Feeding damage and larvae are easily seen on leaves. Larvae go through four molts before they pupate – each form of the larva is called an "instar".

Just-hatched Colorado potato beetle larvae. Photo: K. Campbell-Nelson

In the first instar, the larvae are about the same size as the eggs and in the second instar they are about ⅛" long. Mature, fourth instar larvae are hump-backed and plump, and reach ⅝" before they drop to the soil and pupate. Adults emerge from pupae after 10 to14 days, leaving round exit holes at the soil surface. In southern New England there is a second generation of eggs, larvae, and adults in late-July, while in northern New England there is only one generation. Beetles fly or walk out of fields in August, seeking overwintering sites at field edges.

Monitoring & Thresholds: The scouting procedure below was established for potato, but a similar process can be used in eggplant. Spray thresholds for both crops are listed in Table 1. There are no established thresholds for CPB in tomato, as it is not a preferred crop.

Scout weekly. Scout for beetles on 30 to 50 plants (or individual stalks when plants are taller than 18"). One recommended procedure is to walk the field in a V-shaped pattern and stop at 10 sites across the field. Randomize your selection of sites using a set number of paces (e.g. stop every 10 to 30 paces, depending on field size). At each location, select 3 to 5 plants or stalks, depending on the size of the plants. Alternatively, select plants or stalks individually at random across the field. Count adults, large larvae (greater than half-grown), and small larvae (less than half-grown) separately. A spray is warranted if any of the following thresholds are met:

If you are getting near the spray threshold, pay extra attention and scout again in 3-4 days. The New England Vegetable Management Guide recommends this tighter scouting schedule if numbers are above 15 adults, 75 small larvae, or 30 large larvae per 50 plants/stalks.

Table 1. Spray thresholds for Colorado potato beetle

Potato Thresholds per **plant** (<18" tall) or **stalk** (>18" tall)	Eggplant	
	Plants less than 6" tall	**Plants more than 6" tall**
0.5 adults	2 small larvae	4 small larvae
4 small larvae		
1.5 large larvae	1 large larva	2 large larvae
10% defoliation		

Use these **scouting sheets** to help keep track of the CPB populations: Potato, Eggplant, Tomato. These can be used for several different insects and diseases in each crop.

Controls & Prevention:

Rotation. The single most important tactic for CPB management is to rotate potatoes, eggplants, and tomatoes to a field that is at least 200 yards from the previous year's fields. Barriers such as roads, rivers, woodlands, and fields with other crops are helpful, because CPB adults are such slow and clumsy movers. This single practice delays and reduces colonization by adults, and therefore reduces the number of eggs and larvae in the field later.

Crop health. Starting with healthy seed and maintaining good crop nutrition help plants grow well and withstand feeding injury.

Physical barriers such as trap crops, straw mulch, and trench traps may delay and reduce infestation.

Straw mulch. It has been well documented that when potatoes or eggplants are mulched with straw, fewer CPB adults will settle on the plants and fewer eggs will be laid. This can be accomplished on larger plantings by planting into a rye cover crop, mowing down the rye, then pushing the rye straw over the plants after they emerge. For smaller plots, straw may be carried in.

Perimeter trap cropping. Potato trap crops may be planted earlier than the main crop to attract beetles before the main crop emerges, or planted between overwintering sites and this season's crop. Flame, vacuum, or spray the border crop before beetles move into the main crop. Another approach is to plant 3 to 5 rows of potatoes treated with a systemic insecticide in a perimeter around the field; this treated border will kill up to 80% of the colonizing beetles. Planting main potato crops later than normal may also cause beetles to leave the field before potatoes emerge, resulting in lower beetle numbers.

Trenches. This is a common recommendation, but we've never actually seen it in practice! The recommendation is to install plastic-lined trench traps next to overwintering sites at least 1 week before adults emerge, with trenches 1 to 2' deep and 6 to 24" wide at the top. They can be U- or V-shaped with side walls sloping at angles between 65° and 90°. Beetles walking from field borders fall into the trench and cannot fly out. Let us know if you've ever tried it and if you've run into any pitfalls (maybe literally!).

Flaming. Flame weeders can be used to kill colonizing adult beetles in potatoes when the crop is less than 5" tall. Move rapidly using a tractor-mounted or hand-held flamer. **The goal is to scorch beetles**, not burn them to death—injury to antennae and legs renders them unable to orient and climb plants, and burning them to death will result in excessive plant damage. At this early stage, healthy emerging potatoes have sufficient reserves to regrow foliage and establish well.

Biological control. Predators and parasites of CPB help suppress populations and prevent crop injury. Natural enemies that attack CPB eggs or larvae include twelve-spotted ladybeetle (*Coleomegilla maculata*), spined soldier bug (*Podisus maculiventris*), a carabid beetle (*Lebia grandis*), and a parasitic tachinid fly (*Myiopharus doryphorae*). The fungus *Beauvaria bassiana* (e.g. Mycotrol) has been shown to suppress beetle populations, though it does not provide immediate control. If insecticides will be used, use selective rather than broad-spectrum products to conserve these natural enemies. Be aware that ladybeetle egg masses look very similar to CPB egg masses, though lady beetle eggs are more yellow and slightly smaller (~1mm) than CPB eggs (~1.7 to 1.8mm), which are more orange.

Hand removal. For smaller plantings and early infestations, walking through the crop to squish egg masses or drop adults into buckets of soapy water can be very effective to delay the build-up of damaging populations.

Chemical Controls & Pesticides: Scout to determine if a damaging population is present. Labeled conventional products include pyrethroids, neonicotinoids, novaluron (e.g. Rimon), cyromazine (e.g. Trigard), and diamides (e.g. Verimark, Exirel). In recent years, we have observed resistance to both neonicotinoids (e.g. Assail, Belay, Venom, Actara, Cruiser, Platinum) and synthetic spinosads (e.g. Radiant) in New England. When using products that control only larvae or only small larvae, scout for eggs, note egg hatch, and apply controls before larvae reach third instar to avoid the worst feeding injury. For materials that control all stages, you may wait and scout for adults and larvae to determine the need to apply insecticides.

Resistance management must be part of every potato grower's plan. CPB has a remarkable capacity to develop resistance to insecticides. Based on a fifty-year track record, we can expect that any insecticide that is used repeatedly on the same population of CPB (that is, those in the same field or farm) will lose its efficacy in less than five years. Where potato production is concentrated and rotation has been limited, resistance may develop on a region-wide basis. It's up to you to manage resistance in the population of beetles on your farm and keeping insecticides effective with careful rotations is a worthwhile investment. In the New England Vegetable Management Guide, as well as on pesticide labels, each insecticide has a IRAC (Insecticide Resistance Action Committee) Group Number, which identifies chemistries with the same mode of action. Growers should note the resistance group number of each insecticide, rotate classes of insecticides, and avoid using the same chemistry more than once per year or even better, once every other year. **Do not use the same chemical class on successive generations in the same year.** Use newer chemistries first. For conventionally managed fields, there are enough different products to do a two-year rotation that will effectively control CPB while effectively delaying resistance to any one product.

For organically managed fields, the selection of insecticides is limited to fewer active ingredients including

spinosad (Entrust), azadirachtin (Azatin), pyrethrin (Pyganic), and *Beauvaria bassiana* (Mycotrol O, Botanigard), which can be tank-mixed and/or rotated. The *Bt* product Trident that was developed a few years ago for CPB control is still off the market due to formulation issues. With few products to choose from, it's more important to time pesticide applications so that they are as effective as possible and therefore reduce the need for subsequent applications.

See the potato and eggplant insect control sections of the New England Vegetable Management Guide for full lists of labeled materials.

Do not try to kill every beetle in the field. Potato crops can withstand 15% defoliation without affecting yields. Avoid treating potatoes for CPB late in the season, as defoliation less than two weeks before senescence will have little effect on final tuber bulking.

--UMass Vegetable Program

Managing Cucurbit Downy and Powdery Mildews

--Recommendations written by Meg McGrath.Introduction and recommendation adaptation for Massachusetts by G. Higgins and L. McKeag, UMass Extension Vegetable Program.

For many years, we've published the results and recommendations from Meg McGrath's annual bioassays and fungicide trials for resistance development in the cucurbit downy and powdery mildew pathogens. Meg retired this year from her position as plant pathologist at the Cornell Extension Long Island Horticultural Research and Extension Center (LIHREC). She and her work will be missed by all her colleagues and the many growers she's helped over the years. Her fact sheets and other resources on downy and powdery mildews are still available on the Cornell Extension website, and you can find the full collection of resources from the LIHREC here. The most recent downy and powdery recommendations, from 2022, are below. Happy retirement, Meg!

Cucurbit powdery mildew (**PM**) is a fungal disease of cucurbit crops that begins developing in New England in mid-summer every year. The fungus produces round patches of powdery white sporulation on the tops and bottoms of cucurbit leaves and severe infections will lead to extensive defoliation. The similarly named **cucurbit downy mildew** (**DM**) is a different pathogen; powdery mildew is a true fungus, whereas downy mildew is a fungal-like organism called an oomycete. Downy mildew spores land on host leaves, infect and grow within the leaf, and produce fuzzy gray sporulation only on the undersides of leaves. Lesions are angular because the pathogen cannot grow across the leaf veins. Both pathogens can be transmitted over long distances by wind. Neither downy nor powdery mildew infects cucurbit fruit directly, however leaves infected by either pathogen will die prematurely, resulting in significant yield losses and/or decreased fruit quality.

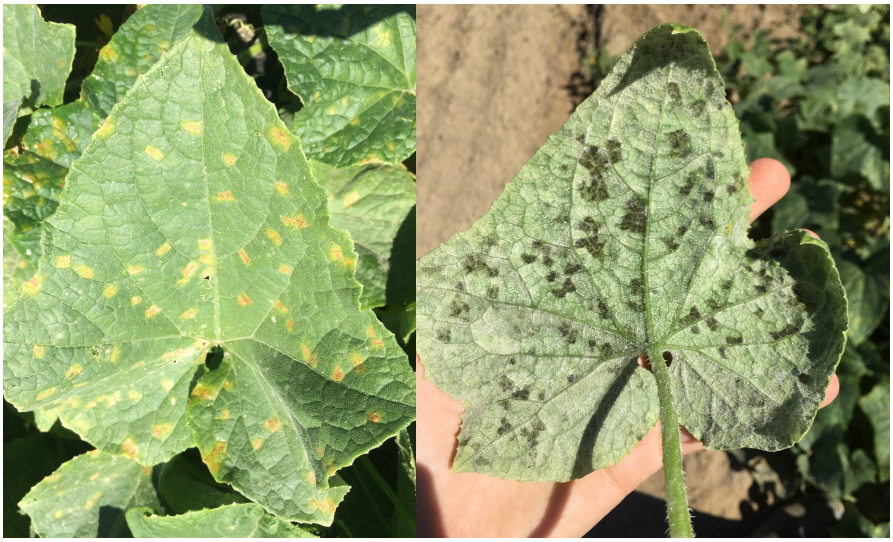
Cucurbit powdery mildew on the underside of a squash leaf.

While several of the management recommendations are the same for preventing disease spread by these organisms, the distinction is important because not all the fungicides that control powdery mildew will control downy mildew, and vice versa. Also, **downy mildew** is caused by an obligate parasite, meaning that it must have a living host to survive. For that reason, it does not overwinter in the Northeast, where winter temperatures kill cucurbit crops. Instead, it travels north from warmer regions on storms as the season progresses. The **powdery mildew** pathogen, on the other hand, can produce a sexual spore in the fall that enables it to survive over winter in New England.

Powdery & Downy Mildew Management

The most important components of an effective management program for powdery and downy mildews are resistant varieties and properly timed fungicides. Both diseases develop best on the undersides of leaves, so mobile (or translaminar)

fungicides are needed to achieve successful control. Resistance to certain fungicides is widespread for both pathogens; fungicide recommendations change as new resistance develops or as new products are released. Always implement a resistance management program; do not wait until there is a problem. The goal is to delay development of resistance, not manage resistant strains afterwards. Again, because downy mildew is an oomycete and not a true fungus, targeted fungicides that control powdery mildew will not control downy mildew, and vice versa. Phytophthora blight, also caused by an oomycete, will usually also be controlled by fungicides that are effective for downy mildew.



Cucurbit downy mildew symptoms on the top of a cucumber leaf (left) and sporulation on the underside (right). Photos: G. Higgins

Select resistant varieties. There are PM-resistant varieties of many types of cucurbits, and DM-resistant cucumber varieties available.

Sign up to receive alerts about downy mildew occurrence and routinely check the Cucurbit Downy Mildew website to know where the disease is occurring and what crops are affected. [Note, this website has historically provided both occurrence and forecasting reports, but the forecasting function has been suspended for 2023 due to a lack of funding.]

The website is an important tool for determining when fungicide applications are warranted. Cucurbit plants are susceptible to downy mildew from emergence; however, this disease usually does not start to develop in the Northeast until later in crop development when the pathogen is dispersed by wind into the region. The pathogen is thought to only be able to survive over winter in southern Florida, and from there spreads northward. There has been no evidence that the pathogen is surviving between growing seasons where winter temperatures kill cucurbit crops (outdoors above the 30th latitude). Tracking occurrences and paying attention to forecasted storms can alert you to when protectant and/or targeted sprays are warranted.

Inspect crops routinely for symptoms of both powdery and downy mildew, beginning at the start of crop development. Scouting routinely for early symptoms is important to ensure targeted fungicides are applied starting at the onset of disease development. Click here to view images of symptoms of downy and powder mildews.

Make preventive and targeted pesticide applications based on forecasted and reported risk. For both powdery and downy mildews, apply protectant fungicides weekly before symptoms develop in your crop. For powdery mildew, begin these preventive sprays when crops start producing fruit or when powdery mildew is reported in the area. For downy mildew, begin when the disease has been reported in the area and weather forecasts indicate that storms may be moving in this direction. When you first detect PM in your crop by scouting, add a PM-targeted material. When the DM risk level increases in your area, add a DM-targeted material. Targeted materials will be different for PM (a true fungus) and DM (an oomycete). Rotate between FRAC groups for the targeted materials.

Add new fungicides to the program when they become available; substitute new for older products if they are in the same FRAC group, unless efficacy trials indicate they are not as effective.

Protectant materials include:

- **Sulfur**: very effective, inexpensive product for **PM**. Has no efficacy for **DM** or other diseases.
- **Oils**: Effective for **PM** but not **DM**. Several botanical and mineral oils are available (search Table 23 in the New England Vegetable Management Guide for "oil").
- **Chlorothalonil and copper**: Effective against **both PM and DM**. Copper is less effective against DM than chlorothalonil or mancozeb but is effective against bacterial diseases.
- **Mancozeb**: Recommended when only DM is occurring.

Powdery mildew fungicides recommendations:

When powdery mildew is present, apply targeted fungicides weekly with contact fungicides (sulfur, chlorothalonil, and oil are more effective than copper; biopesticdes are also a good choice) and alternate amongst available chemistry based on FRAC Group code. It is prudent to decide now what products to use each week to have a plan in place ready to implement. Use highest label rates to control moderately resistant isolates if present.

- **Vivando** can be applied up to 3 times with no more than 2 sequential applications. It is a good choice for the last application considering the long residual activity observed in the 2018 fungicide evaluation; it is also recommended used at other times during the season.
- **DMI fungicides** (FRAC 3) are also a good choice in the program, particularly for the first application. Proline is the most effective. It is also labeled for Fusarium. Crop limit is 2 applications. Procure is also very effective. It can be applied 3 times; 4 times to direct-seeded crops when the intermediate rate is used.
- **Gatten** (FRAC U13) is the newest fungicide; it was introduced in 2018. REI is 12 hr. PHI is 0 days. It can be applied 5 times. Activity is limited to powdery mildew. It was as effective as Vivando for managing powdery mildew on lower leaf surfaces in a fungicide evaluation conducted at LIHREC in 2019 but not in 2018.
- Quintec, Torino, Endura, and QoI fungicides are not recommended.

Example recommended alternations of targeted fungicides:

- 6 applications: Proline, Vivando, Proline, Vivando, Procure, Vivando
- 6 applications: Procure, Vivando, Procure, Vivando, Procure, Vivando 6 applications: Proline, Proline, Vivando, Vivando, Procure, Vivando
- 8 applications: Proline, Procure, Vivando, Proline, Procure, Vivando, Procure, Vivando

Assess control achieved on the underside of leaves toward the end of the season when there is still a good canopy.

Downy mildew fungicide recommendations:

There is more information available about each material, including maximum number of sprays and application recommendations, available at Dr. McGrath's Cucurbit Downy Mildew Management website.

Targeted fungicides below are **currently recommended**:

- Orondis (FRAC 9)
- Omega (29)
- Ranman (21)
- Zampro (40 + 45)
- Zing! or Gavel (22)
- Ariston, Curzate, or Tanos (27)
- Previcur Flex (28)

Targeted fungicides below are **not recommended:**

- Presidio (43)
- Revus and Forum (40)

Click here for Meg McGrath's complete guide to the most current DOWNY mildew fungicide recommendations.

Click here for Meg McGrath's complete guide to the most current POWDERY mildew fungicide recommendations.

Potassium and vegetable crops

--Written by Gordon Johnson, Extension Vegetable & Fruit Specialist; gcjohn@udel.edu.
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Currently, potassium fertilizer prices are about one third of the 2022 peak price. However, expect prices to rise in the future. This is because potassium deposits that are mined (largely in Canada and Russia/Belarus) are a finite resource. US deposits are much smaller and are diminishing and most of our potash comes from Canada. Even with high prices, vegetable growers should not limit potassium fertilization because of the effects on vegetable quality.

Potassium deficiency on cucumber leaves. Photo: G. Johnson

For vegetable growers, potassium (K) is a nutrient that is essential for quality, especially in fruiting vegetables. Research by Jerry Brust at the University of Maryland has shown the critical role that potassium plays in tomato fruit ripening and quality (see https://sites.udel.edu/weeklycropupdate/?p=13902 for more information). My research has shown that potassium plays an important role in sugar levels in watermelons.

Potassium influences fruit quality through its effects on sugar accumulation (soluble solid levels), acidity, size, appearance, and color. Fruiting vegetables such as cantaloupes, watermelons, and tomatoes have high potassium requirements as do fruit crops such as grapes, peaches, and strawberries. Potassium is critical for improving quality of fruits by maintaining desirable sugar to acid ratio and ripening of fruit and is the most important nutrient regulating the quality of fruits. Potassium is also required for high levels of production in legume vegetables such as beans, peas, and edamame.

Unlike nitrogen, phosphorus, calcium and magnesium, potassium does not form part of the structure of the plant and plant compounds; rather, the role of potassium is to regulate vital physiological functions such as carbon assimilation, translocation of proteins and sugars, water balance in plants, turgor pressure in plant cells, and root development. Potassium is involved in many other aspects of plant physiology such as activation of many enzymes, photosynthesis, respiration, and regulation of stomatal opening.

Often potassium deficiency in vegetables is found in soils testing high in potassium due to issues with potassium uptake, root function, and source-sink issues with fruits (high fruit demand). Potassium deficiency symptoms occur when plants cannot extract adequate potassium from the surface soil. Remember that the majority of vegetable root systems are located in the top six inches of soil where the plant obtains much of its needed water. Inadequate potassium uptake can occur due to root restricting problems such as compaction and with reduced root function due to high soil temperatures, particularly in black plastic mulch. In addition, when the soil test potassium level is below optimum, potassium deficiencies will be likely. Grid sampling for soil nutrient evaluations has found that there is a large variability in soil test potassium levels. This means that certain areas of fields may be below critical potassium levels for good vegetable production.

Potassium uptake increases dramatically in vegetables during rapid vegetative growth just prior to flowering and during reproductive growth and uptake peaks just before flowering begins. A deficit of potassium during the late vegetative stage or during the reproductive stages will be reflected quality problems in many vegetables.

Potassium is taken up by plants primarily through the process of diffusion rather than the process of mass flow (how nitrogen is taken up). The slow rate of diffusion and limited distance that potassium can move by diffusion means that potassium is not as easily available to crop plants as nitrogen. Deficiency symptoms appear first on the oldest leaves because potassium is mobile in plants. Because potassium is taken up by diffusion, symptoms often occur during drought periods or when irrigation has been limited.

To manage potassium in vegetable crops, the keys are to maintain high levels in soils, manage irrigation so that water deficits do not occur and potassium diffusion to roots is not interrupted, add additional potassium though fertigation or side dressing prior to flowering, and to consider foliar potassium additions during peak use periods in high demand crops.

Deficiency symptoms begin as yellowing of leaf edges on oldest leaves. As potassium is mobilized from older leaves and moved into growing points, symptoms will progress and necrotic areas will develop.

News

EPA Seeking Comment on Bilingual Labeling

The EPA Bilingual Labeling Requirements under the Pesticide Registration Improvement Act of 2022 (PRIA 5) require EPA to solicit all stakeholders on the best methods to make bilingual labeling accessible to farmworkers and increase awareness of the program. PRIA 5 amended the Federal Insecticide, Fungicide, and Rodenticide Act, requiring Spanish language translation for key health and safety sections of the end-use pesticide product labels. Public input that includes environmental justice perspectives with solutions will be key in helping the Agency develop a strong starting point for addressing historical disadvantages for farmworkers.

Comments must be submitted by **August 21, 2023**.

Federal Register Notice on Open Comment Period: https://www.regulations.gov/document/EPA-HQ-OPP-2023-0270-0003

Bilingual Labeling Docket: https://www.regulations.gov/docket/EPA-HQ-OPP-2023-0270/document

Events

UNH Extension Twilight Meetings

UNH is hosting a series of meetings on the following topics. There are several meetings next week!

- Sweet Corn IPM
- Food safety and wash and pack sheds
- High tunnel crop production

See this link for a full event list.

UConn Extension: Diagnosis and Management of Plant Diseases in Ornamental Greenhouses Workshop

When: Thursday, June 29, 2023

Where: Jones Auditorium, Connecticut Agricultural Experiment Station, 123 Huntington St., New Haven, CT. The entrance to Jones Auditorium is at the north end of the building, on the side away from Huntington Street. In addition to the parking lots on campus, there is street parking on Huntington Street and East Rock Road.

Registration: $40 per person. Registration includes boxed lunch. Online registration at Greenhouse Training Store. If you would like to pay by check, please contact Leanne Pundt (860-626-6855 or leanne.pundt@uconn.edu). Registration will end at 5:00 p.m. on Thursday, June 22, 2023. The registration fee is refundable 48 hours before the event. Please note there is a maximum capacity of 70 attendees. Walk-in registrations are not an option. Click here to register.

Up to 5 pesticide recertification credits are available for selected talks.

With questions about registration or refunds please contact Carla Caballero at carla.caballero@uconn.edu. With questions about the program or payment, please email Leanne Pundt leanne.pundt@uconn.edu.

Twilight Meeting: Irrigation Systems and Management at Warner Farm

When: Thursday, July 13, 4:00 pm - 6:00 pm

Where: Warner Farm, 23 South Main Street, Sunderland, MA, United States

Registration: Free! Click here to register.

Warner Farm, a CSA and wholesale farm as well as the home of Mike's Corn Maze, located in Sunderland, MA, has been developing its irrigation capacity since the late 1970s. The farm's rich sandy loam has been growing fruit and vegetable crops for centuries and as a changing climate brings changing precipitation patterns to New England, Warner Farm is poised to respond effectively in times of drought.

Join CISA, the UMass Extension Vegetable Program, and Dave Wissemann of Warner Farm on July 13th at 4:00pm for an up close look at how they are optimizing their water resources and water distribution systems to ensure the sustainable production of crops throughout the season and in the face of increasingly uncertain growing conditions. The workshop includes a farm walk to see irrigation equipment and set up and a detailed explanation of how the farm's systems are designed and maintained. Following the farm walk, join us for further discussion and some locally produced drinks and snacks.

Twilight Meeting: Sawyer Farm Reduced-Till Perennial Clover Trials

When: Thursday, July 20, 4:00 pm - 6:00 pm

Where: Sawyer Farm, 19 Sawyer Road, Worthington, MA, United States

Registration: Free! Click here to register.

Over the past several seasons, farmers at Sawyer have been experimenting with different ways to plant row crops into perennial white clover and reduce tillage using a series of innovative practices. Join Sawyer Farm's Lincoln Fishman for a close look at transplanter shoe adaptations designed to reduce soil disturbance and weed competition in perennial clover and cash crop production. Berkshire Conservation District will also display their no-till drill seeder, which is available for rentals and can be used for mixed or single species applications from clovers and orchard grass to rye and soybeans.

This in-person workshop will be followed with an on-farm networking opportunity. The workshop will take a close look at the system and the research underway with UMass through a SARE Partnership Grant, and is part of CISA's 2023 Adapt Your Farm to Climate Change Webinar and Workshop Series: On-farm Climate Change Adaptation Case Studies from western Massachusetts.

This event is co-sponsored by CISA and the UMass Extension Vegetable Program.

Twilight Meeting at Parlee Farms

When: Tuesday, August 15

Where: Parlee Farms, 95 Farwell Rd, Tyngsborough, MA 01879

Join UMass Extension to hear about pumpkin varieties grown at Parlee Farms, as well as sweet corn IPM and automated irrigation systems.

South Deerfield Research Farm Field Day

When: Wednesday, August 16

Where: UMass Amherst Crop and Animal Research and Education Farm, 91 River Rd., South Deerfield, MA

Come hear about active research going on at the farm, including Vegetable Program trials on heat mitigation strategies, cucumber and basil downy mildew resistant varieties, sprayer technology, and more! We'll also have a presentation on automated irrigation systems from Toro.

Twilight Meeting at Heart Beets Farm: Sweet potato production and fall pest management

When: Thursday, September 21, 4-6pm

Where: Heart Beets Farm, 181 Bayview Ave, Berkley, MA 02779

Join UMass Extension to hear about sweet potato production at Heart Beets Farm, and to learn timely info about fall pest management.

Eastern MA CRAFT Meeting: [Geothermal Water Use and Good Agricultural Practices at Farmer Dave's]

When: Saturday, October 21, 4-6pm

Where: Farmer Dave's, Dracut, MA

Thank you to our 2023 sponsors!

Vegetable Notes. Genevieve Higgins, Lisa McKeag, Maggie Ng, Susan Scheufele, Hannah Whitehead co-editors. All photos in this publication are credited to the UMass Extension Vegetable Program unless otherwise noted.