



UMass  
Extension

# Vegetable Notes

For Vegetable Farmers in Massachusetts since 1975



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## CROP CONDITIONS

It's raining (finally) as I write this, which should help all those long-dry crops out there. There are more showers in the forecast this week, though it all might not add up to anything significant. Crops need water at critical points in their development and may need to be irrigated in order to avoid nutrient issues, such as tip burn in brassicas and blossom end rot in tomatoes and peppers, and to size up properly, as for garlic and onions. This [UMass Fact sheet on irrigating vegetable crops](#) provides critical water need periods, irrigation guidelines for different soil types, and some general irrigation tips.

Speaking of irrigation, we hosted Judson Reid of Cornell Cooperative Extension last night, who presented an excellent webinar on greenhouse fertigation. One point he drove home is that irrigation water pH needs to be held around 6.0, where many nutrients are most available to most crops, and should be adjusted with acid if need be. He demonstrated a great [alkalinity calculator tool from UNH Extension](#) (AlkCalc) for determining the amount of acid to add to change irrigation water pH, and talked about a similar UNH calculator for determining fertilizer formulations (FertCalc). He talked about some of the commonly used injectors, including Dosatron, which I'll note also offers some helpful online calculators, like this one for [stock tank solutions of water-soluble powder](#). If you missed it, there is a link to the full presentation on our website at our [Virtual Twilight Meetings page](#), where you can also catch up on any of the other programs we've done this spring.



*Judson Reid from Cornell Extension talks about proper fertigating to prevent K deficiency in greenhouse tomatoes during a UMass Virtual Twilight meeting on June 10.*

[Click here to view the recorded webinar!](#)

All manner of greens are rolling in now, and strawberries are coming into full swing with pick-your-own operations opening up this week. We're also seeing peas and some early beans, along with the first high tunnel tomatoes, high tunnel cucumbers and some squash and zucchini from the field. With the warm weather finally here to stay, many have put peppers, tomatoes, and egg-plants in the ground. Many CSAs opened their doors this week

to their seasons first shareholders, with now-familiar social distancing, scheduled pick-up, and face covering protocols. Farmers are meeting these challenges with their usual creativity, care, and gusto, and the show goes on!

Finally, we want to acknowledge the difficult time the world is going through now, with the COVID-19 pandemic and the collective reckoning that we are going through with this country's long and complicated history with race. We share the outrage at the systemic violence against Black people and people of color in our country, and we hope you all, amidst all of this on top of the increasingly busy growing season, are able to take care of and nourish yourselves, each other, and your communities.

# PEST ALERTS

## Alliums:

**Leek moth** damage is being reported throughout Vermont, where this pest is endemic. The range of leek moth has expanded from Ontario, where it was introduced in 1993, to include much of northwestern New England, bordering MA. Leek moth caterpillars cause damage to onion, leek, and garlic by feeding on leaf tissue as they make their way down to the bulb. There is another flight of leek moth in July-August which can be especially damaging. **Growers should be aware of this pest and report any suspicious damage.**

**Garlic** should be irrigated now, in order to size up properly and achieve big cloves. Several diseases of garlic are being reported, with likely culprits being **Fusarium**, which causes dark soft rot of bulb and neck tissue, and **potyviruses**, which cause stunting and streaking of leaf tissue. Potyviruses are spread by aphids, so spread from plant to plant is limited unless there is an aphid outbreak, but rogueing out infected plants is still a good idea as it will ensure that seed from infected plants is not saved. Most garlic diseases including viruses come in on saved seed and many can then overwinter in the field for long periods of time. Since it is difficult to get rid of problems once they arise, it is important to try to prevent them by buying in clean seedstock. Once disease is present, keep crops healthy by maintaining proper moisture and fertility. Excessive mulching leading to high moisture around the bulb and neck can be one cause of disease.

**Onion thrips** numbers are increasing with the warmer weather. For more details and control recommendations see the article in this issue.

## Fava Beans:

**Black aphids** (cowpea, bean, and pea are all possible culprits) are being reported on fava beans. Infestations during the bloom and early pod stages will reduce yield and crop quality by removing plant sap, impairing pod appearance, reducing seed fill, impairing nitrogen fixation, and by the presence of aphid honey-dew. Varieties differ in their susceptibility to aphid damage so choose those that are less prone to high infestations and damage. There are many natural enemies (lady beetles, lacewings, flower fly larvae, predatory midges, Braconid wasps) that help reduce aphid numbers. Fungi will control high aphid populations during warm, humid or wet weather. Insecticide treatments are usually not necessary but if an outbreak begins causing plant stress or numbers become high, consult the [New England Vegetable Management Guide](#) for recommended materials.

## Cucurbits:

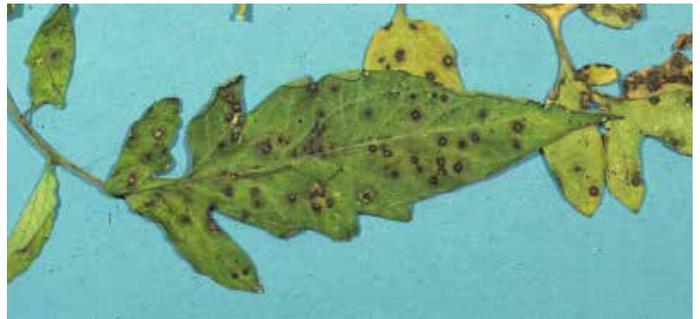
**Squash bug** adults are out now across the region and are laying eggs. Adults are long-lived and lay eggs over several weeks. A single female can lay up to 250 eggs. Yellow to bronze colored eggs are laid on the underside of leaves, often in the junction of leaf veins, in an orderly cluster and hatch in 7-10 days in summer conditions. Newly hatched nymphs are light green when small, with a brown head and dark legs, and are usually found in groups. Nymphs become light gray, then darker gray to brown and more solitary as they grow and molt through five nymphal stages. For control recommendations please see our squash bug factsheet: <https://ag.umass.edu/vegetable/fact-sheets/squash-bug>



*Leek moth damage on a garlic scape (left) and characteristic “window-pane” feeding damage on onion. Photos: S. Lewins and A. Ivy*



*Garlic plant displaying leaf streaking, symptomatic of a viral infection. Photo: G. Higgins*



[Striped cucumber beetles](#) are still out there chewing on foliage and spreading bacterial wilt. Treat now to prevent disease later. Consult the [New England Vegetable Management Guide](#) for management recommendations.

*Top left: Botrytis gray mold, showing characteristic fuzzy gray fungal growth on the surface of the leaf lesion. Top right: Leaf mold on the underside of a leaf. These spots are likely yellow on the top of the leaf. Bottom: Septoria leaf spot. Photos, top to bottom: G. Higgins, R.L. Wick, R.L. Wick.*

**Solanaceous:**

[Colorado potato beetle](#) eggs are hatching and larvae are present now MA. Targeting small larvae is most effective, since a smaller dose can kill them and their feeding damage will be less. Consult [last week’s issue](#) for current recommendations.

[Solanaceous flea beetles](#) are out now in CT and MA, chewing on eggplant, potato, jilo, and managu or African nightshade. Numerous tiny feeding “shot holes” can injure leaves and stunt or kill plants, especially seedlings. Management practices include clean cultivation, crop rotation, removing or avoiding spring weed hosts like horsenettle, use of row covers, and applying spot treatments targeting eggplants along the field edges. Treat newly set transplants if they have 2 flea beetles per plant, seedlings 3” to 6” tall if they have more than 4 beetles per plant, and plants over 6” tall if they have 8 beetles per plant. Full size plants rarely require treatment for flea beetles. Most insecticides registered to control CPB, including spinosad, will control FB.

**Tomato disease** season is now underway, with confirmed reports of [Botrytis gray mold](#), [leaf mold](#), and [Septoria leaf spot](#), and suspected cases of [bacterial canker](#) and [pith necrosis](#) in tunnel tomatoes. For fungal diseases like leaf mold, Botrytis and Septoria, it is critical to improve airflow and reduce humidity by venting, pruning, and checking placement of fans. Removing infected foliage can slow the spread of disease from leaf to leaf and plant to plant. Pith necrosis does not usually spread from plant to plant, and infected plants usually grow out of the condition. Bacterial canker, on the other hand, can spread rapidly and lead to significant losses, so getting a sample diagnosed is important—send pictures to [umassveg@umass.edu](mailto:umassveg@umass.edu) or submit samples to the [UConn Diagnostic Lab](#), which is currently accepting mail-in samples.

**Sweet Corn:**

[European corn borer](#) numbers are increasing at trapping sites in NH and NY but remain low in MA this week, with just 2 traps reporting captures; see table at right. However, scouting for ECB damage in pre-tassel corn in Norfolk county was above the 15% damage threshold. 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.

Corn Pest Trap Counts June 5-11, 2020		
Location	ECB-NY	ECB-IA
<b>Western MA</b>		
Sheffield	-	-
Whately	0	2
<b>Central MA</b>		
Bolton	0	0
Leominster		
<b>Eastern MA</b>		
Millis	0	0
Sharon	0	0
Seekonk	3	0
Swansea	3	2
<b>Eastern NY</b>		
Hurley, NY	35	9
<b>Southern NH</b>		
		<b>ECB NY + IA</b>
Hollis, NH	10	
Litchfield, NH	1	
Mason, NH	0	

## **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 *We are currently working remotely but checking these messages daily, so please leave us a message!*

**Email:** [umassveg@umass.edu](mailto:umassveg@umass.edu)

**Home Gardeners:** Please contact the UMass GreenInfo Help Line with home gardening and homesteading questions, at [greeninfo@umext.umass.edu](mailto:greeninfo@umext.umass.edu).

### **UMass Extension Services Suspension**

The following on-campus services are suspended until further notice, due to the COVID-19 pandemic:

- Soil & Plant Nutrient Testing
- Plant Disease Diagnostics
- Hot Water Seed Treatment
- Nematode Analysis
- Weed, Insect, Turfgrass, and Invasive Plant Identification
- Public access to all farm properties

*Until further notice, please do not send or deliver samples to campus, as we cannot process them.*

Corn started under plastic or row cover often reaches silk stage during the first flight of ECB, such that the first eggs hatch during ear development. As a result, ears can be heavily infested by this pest even though scouting in early tassel did not show any feeding damage or larvae. If plants are in silk and moths are active, it is important to protect developing ears. For the latest spray recommendations consult the [sweet corn insecticides section of the NEVMG](#).

### **Various:**

[Seed corn maggots](#) are being reported in high number (100s) feeding on seeds and seedlings of cucurbits and several other crops across New England. Unfortunately, practices that increase soil organic matter may worsen seedcorn maggot problems. Often growers use floating row cover over early crops in order to exclude insect pests, only to find these seedling pests causing trouble underneath the cover. This pest overwinters in soil, especially where there is a lush cover crop, and will seek out food and egg-laying sites as soon as they become active in spring.

## **HIGH TUNNEL TOMATOES: FERTILITY & TISSUE TESTING**

As summer days grow longer and warmer, high tunnel tomatoes grow steadily upwards, requiring weekly pruning, trellising, and other maintenance. As the plants continue to grow and fruit begins to ripen, the nutrient demand for calcium and potassium required to produce high quality, marketable fruit increases.

Many growers focus on calcium (Ca) at this stage in order to avoid [blossom end rot](#) (BER) later in the season. However, BER is more an imbalance of Ca within tomato plants themselves rather than lack of Ca availability, and more often than not, it is related to soil moisture fluctuation, heat stress, and sometimes, excessive nitrogen. Potassium (K) deficiency, on the other hand, in concert with excessive heat, can be an even greater problem for quality fruit production, resulting in blotchy ripening, yellow shoulders, and grey wall. Indeterminate

varieties in tunnels and greenhouses continuously carry heavy loads of fruit, so potassium demand remains high from early-summer onward.

Taking a high tunnel soil test in the early spring can help guide your soil amendment planning to sustain the heavy nutrient demands of high tunnel tomatoes. We recommend getting a field soil test AND a saturated media test for high tunnels; see more information below.

A survey of 20 high tunnels conducted in 2018 in Massachusetts, New Hampshire, Rhode Island, and Vermont showed that both potassium and nitrogen are removed in large quantities by high tunnel tomatoes. As a result of this study, fertility recommendations for high tunnel tomatoes are now more closely correlated with expected crop yield. In other words, high-producing hybrid, indeterminate plants, which are in the ground for 6+ months (and may be grafted) have significantly higher nutrient demands than a June-planted, determinate tomato. Intuitively, the more biomass your plant is expected to accumulate, the greater the nutrient demands. Specific yield-based nutrient recommendations can be found in the [High Tunnel Tomato section of the latest edition of the New England Vegetable Management Guide](#).

A few other practices that may help improve yield at this point in the season include:

- **Provide adequate soil moisture.** Install at least 2 drip lines per plant, up to 4 in sandy soil. Mulches may help keep

moisture even across the soil surface.

- **Keep up with pruning.** Prune side shoots when small. Remove foliage to first cluster.
- **Track performance.** Measure harvests, even if simply counting boxes. This is key to assessing management changes.
- **Monitor available AND reserve soil nutrients.** A field soil test extracts reserve nutrients and reports the nutrient levels that will theoretically become available to plants as the season progresses. In the warm, well-watered high tunnel environment, tomato plants will start growing quickly immediately, so it's important to know what nutrients are immediately available to those plants; this is measured using a saturated media extract (SME) test. Use both the field soil test and the SME to plan nutrient applications in the spring, and then take leaf samples monthly to inform fertigation or side-dressing during the season (more information on tissue testing is available below).
- **Scout and manage pests.** Do not let challenging insects (like aphids) or diseases (like powdery mildew) get ahead of you. Set up a regular scouting schedule and get in touch with us ([umassveg@umass.edu](mailto:umassveg@umass.edu)) for pest ID help. Scouting resources including a scouting form and tomato disease guide, are available [here](#).

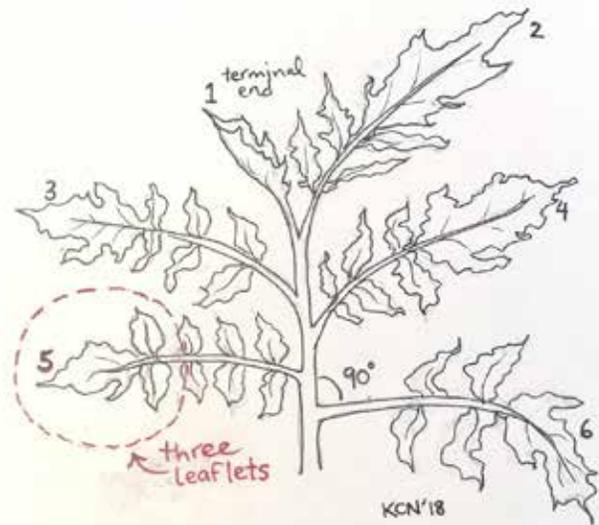
**Tissue testing** is one way to understand what nutrients your plants are actually taking up from the soil before you see deficiency symptoms in your plant or even worse, on your fruit. Many tunnels need a mid-season boost of K through fertigation or top-dressing. Aiming for 3% K in the most recently matured leaves, by dry weight, is a good goal. University of Delaware Extension recommends the following optimum tissue test values, for most recently matured tomato leaves at first flower: N 2.8-4.0%, P 0.2-0.4%, K 2.5-4.0%, Ca 1.0-2.0%, Mg 0.25-0.5%, S 0.3-0.6%.

For conventional growers, soluble fertilizers with a K to N ratio of somewhere around 2:1 can help, according to research from Michigan. More N may be required for season-long production on indeterminate vines. For organic growers, you can top-dress sulfate of potash, as long as your irrigation moisture is able to reach it so it can dissolve, or, it can be dissolved in hot water for fertigation.

**How to take a tomato tissue sample:** Tissue testing on a monthly basis, or even one or two times earlier in the season, can help take some of the guess work out of high tunnel growing and. make sure that plants are taking up sufficient potassium, as well as other nutrients. At the very least, taking a sample at the on-set of fruit is a good time to ensure that nutrients are adjusted for a long and productive season. Here are the steps for taking an accurate tissue sample:

When sampling tomato leaves, take 3 leaflets from the tips of 30 leaves.

- Take the most expanded leaf below the first blooming flower cluster, which often is about 5 leaves down from the terminal. The 6th leaf is usually at a 90° angle to the stem (picture).
- Sample in the hour before or after noon (this is usually the peak uptake of nutrients for the day)
- Collect a representative sample of the planting from at least 15 plants of a single variety
- If there is spray residue on the leaves, briefly rinse them with distilled water and pat dry
- When sending to a lab, pack in paper bags, not plastic, so the material does not begin to rot
- If you are trying to diagnose a nutrient deficiency on some of your plants, send samples of both “healthy looking” plants as well as afflicted ones.



*Diagram of how to find the most recently mature leaf on a tomato plant, and what part of the leaf to sample for tissue testing.  
Illustration credit: K. Campbell-Nelson*

#### **Additional resources:**

- [University of Delaware Tomato Commodity Recommendations](#)

- [Refining Tomato Nutrition for Improved Packouts](#) – Steve Bogash, PennState

--Written by Katie Campbell-Nelson (UMass Vegetable Program) and Becky Maden (University of Vermont Extension)

## **WATCH FOR THRIPS IN ONION**

We are now seeing onion thrips (*Thrips tabaci*) in onions here in Western MA. This pest prefers hot, dry conditions, and save for a few showers in the forecast, it looks like that's what we'll have for the next few days, so it is a good idea to start scouting and manage populations before they get out of hand. This [UMass Scouting Sheet for alliums](#) can help you keep track of your scouting and guide your decision-making. The host range of onion thrips is wide, including many vegetable families, field crops such as alfalfa, wheat, oat and tobacco, weeds including amaranth, goldenrod, ragweed and sunflower, and ornamentals such as roses. Onions are their preferred host, though, and where they cause the most economic damage. Cabbage may be infested at any time in the season, but the most common thrips damage in brassicas in New England occurs later in the season on fall transplants, particularly once their favorite allium crops have been harvested. Succulent peas are sensitive to thrips feeding damage, and onion thrips can also cause damage in greenhouse tomato and cucumber.



*Onion thrips tend to congregate between the leaves of allium crops during the heat of the day. The silver speckling on the leaves is caused by thrips feeding.*

*Photo: UMass Vegetable Program*

**Identification and life cycle.** Onion thrips are tiny, slender insects that range in color from translucent to yellow to brown and are only 1/16" in length. They spend the winter as adults in crop remnants, alfalfa, wheat, greenhouses and weeds along the border of crop fields. Early spring reproduction can occur in field crops, especially wheat, before movement into onion. Adults insert eggs singly into plant tissue, adults and nymphs feed on leaves, and pupation occurs in the soil near the plant. Development time (base temperature of 52.7°F) is 140 GDD for egg, 180 GDD for larva (2 instars), and a total of 323 GDD for each generation. At summer temperatures, a generation can be completed in 2-3 weeks. Thrips have rasping mouth parts which they use to tear open plant cells to feed on plant juices.



*Adult onion thrips. Photo: J. Ogradnick*

**Damage.** In onions, damage is caused by adults and nymphs piercing cells and removing cell contents along leaf blades. Symptoms are irregular, blotchy whitening of the leaves (known as 'blast'), and if feeding is heavy, leaf curling or twisting and overall stunting of plant growth can occur. The result is reduced bulb size and lower overall yields, or if severe enough, plant death. Feeding that occurs during bulb formation and rapid bulb expansion has the most effect on yield. Scallions are particularly sensitive because the whole plant is marketed. In addition to direct injury, thrips damage can increase occurrence of purple blotch (*Alternaria porri*) and other bacterial diseases, as wounds caused by feeding allow for easy entry by pathogens. Thrips also vector the iris yellow spot virus which affects many allium crops.

**Monitoring.** Scout plants along field margins where infestations build early, as well as checking across the field. Scout weekly to determine if populations are increasing. Look closely between the leaf blades, especially in the center of the plant around the growing tip, to find the light yellow nymphs or darker adults. Though tiny, you can see the slender, yellow nymphs moving about on the leaf when the leaves are parted. Count number per plant and note number of leaves per plant to determine if thresholds are reached. The number that constitutes an economic threshold varies with the stage of plant growth, efficacy of insecticide to be used, water availability, and health of the plants. A widely used threshold is 1-3 thrips per leaf, or 30 per plant.

**Cultural practices** can reduce thrips numbers by delaying or inhibiting their establishment in the crop, or by reducing

survival. These include:

- Incorporate or remove crop residue at the end of the season.
- Rotate into fields where no alliums or brassicas were grown for the past 2 years.
- Avoid planting onions or cabbage near alfalfa, wheat or clover; thrips may migrate to onions when these crops reach maturity or are cut and harvested.
- Avoid importing plants or sets from other farms or regions, or using last year's onions for sets.
- Maintain sanitation and scout regularly in the greenhouse to avoid thrips on transplants.
- Use straw mulch, which has been shown to slow population buildup.
- Alternate onion rows with carrot rows, which has been shown to reduce thrips in onion
- Use reflective plastic mulch.
- Provide adequate water for onion growth: onions need consistent, adequate moisture, and dry soil conditions worsen the effects of feeding damage.
- Heavy rain or overhead irrigation can lower populations (but may increase risk of foliar disease).
- Use selective insecticides to conserve minute pirate and insidious flower bugs, which are the most effective predators, as well as other natural enemies.

**Chemical Control:** Thrips move from the protected growing tip up the leaves during the evening, so that's the best time to spray. Use moderate to high pressure, 100 gal water/A, and appropriate nozzle spacing to achieve the best possible coverage. Wetting agents or spreader-stickers are strongly recommended so that insecticides don't quickly wash off the waxy foliage. If repeat applications are needed, use a 7 to 10 day spray interval. Use a shorter interval in hot weather. Rotate between insecticide groups after 2 applications to help prevent resistance. Note that products labeled for thrips control may not have the same rates or allowances even for different onion crops. Dry bulb onions, fresh eating onions, and other crops such as brassicas are often labeled differently. Please see the [New England Management Guide](#) for control options—there are many effective materials for conventional and organic growers alike. Always read the label carefully before applying any pesticide.

## NEW HOME-GARDENING COLUMN: GROWING YOUR OWN FOOD WITH FRANCO & BETO



With the uncertainties around COVID-19 and the economy, growing your own food is appealing as a way to help alleviate food insecurity, do something fun that is compatible with social distancing, and produce healthy and nutritious food! To become a successful gardener is not complicated; for the most part, the needed skills can be easily mastered. Join us for this series of weekly articles which provide research-based information on how to grow your own vegetables and herbs in Massachusetts.

This column is written by Frank Mangan, Extension Professor of Vegetable Crops at the UMass Stockbridge School of Agriculture, and his Ph.D. student, Heriberto Godoy Hernandez. It will be available in both English and Spanish. Some of the content has been adapted from the [New England Vegetable Management Guide](#), a collaborative effort by members of the Extension Vegetable Programs of the New England states. Additional expertise on specific topics is provided by UMass Extension Specialists.

Each issue will cover a Vegetable or Herb of the Week, as well as an additional topic. **This week's issue** features peppers as the Vegetable of the Week, and also covers water management for vegetables and herbs in your garden.

[Click here to go to Growing Your Own Food with Franco & Beto](#)

Because onion thrips have a history of developing resistance to insecticides, rotation of insecticide resistance classes is important. Timely scouting and early response can help conserve materials and reduce the total number of sprays. The Cornell Vegetable Program has been researching onion thrips spray rotation schedules for the past several years with all of this in mind. Their most current (2019) spray plan can be found here: <https://cyp.cce.cornell.edu/submission.php?id=587#>. All of the materials listed are currently registered in Massachusetts.

--UMass Vegetable Program

## **MANAGING CUCURBIT POWDERY MILDEW SUCCESSFULLY IN 2020**

--Written by Margaret Tuttle McGrath, Cornell University, Long Island Horticultural Research and Extension Center



*Powdery mildew on squash.  
Photo: UMass Vegetable Program*

Effectively managing powdery mildew is essential for producing a high-quality cucurbit crop. This foliar, fungal disease is common wherever cucurbits are grown, including in the northeastern U.S. This is because the pathogen produces an abundance of asexual spores (the powdery growth) easily dispersed by wind, thus it can spread widely, and the pathogen can produce a sexual spore in fall that enables it to survive over winter. Leaves affected by powdery mildew die prematurely which results in fewer fruit and/or fruit of low quality (prone to sunscald, poor flavor, poor storability).

Powdery mildew is managed with resistant varieties and fungicides. An integrated program with both management tools is the best approach for achieving effective control because the pathogen is adept at evolving new strains resistant to individual tools such as resistant varieties or a specific conventional fungicide. It is more difficult for new pathogen strains to develop when an integrated program is used, and effective control is more likely.

Powdery mildew management program often needs adjustments as the pathogen and management tools change.

**Resistant varieties** are now available in most crop groups with new varieties released most years. Resistance in cucumber is standard in modern varieties and is so strong it is easy to forget this cucurbit type is susceptible until an Heirloom type is grown. Watermelon is infrequently affected in the northeast. Resistance in other cucurbit types is not adequate used alone (without fungicide applications) to prevent impact of powdery mildew on yield. Tables of resistant varieties are at <http://vegetablemdonline.ppath.cornell.edu/Tables/TableList.htm>

**Fungicide program.** The most important component of an effective management program for powdery mildew is an effective fungicide program. The challenge is getting fungicide to the lower surface of leaves where the pathogen develops best. Most fungicides approved for organic production have contact activity. Sulfur and oil have demonstrated some ability to control powdery mildew on the lower surface indicating some ability to redistribute. Sulfur is volatile. For conventionally managed crops there are mobile fungicides able to move through leaves with targeted activity for powdery mildew. Because these fungicides have targeted activity, they are prone to resistance development and additional fungicides must be added to the program when there is a need to manage other diseases such as downy mildew and Phytophthora blight.

For conventionally managed crops, alternate among targeted, mobile fungicides and apply them with a protectant fungicide to manage resistance development and avoid control failure if resistance occurs, and also to comply with label use restrictions (most mobile fungicides are not permitted used exclusively). The powdery mildew pathogen has a long history of developing resistance to fungicides (it was the first occurrence of resistance in the U.S.), thus a diversified fungicide program applied to resistant varieties when possible is critical for success. 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.

**When to apply fungicides.** The action threshold for starting applications is one leaf with symptoms out of 50 older leaves examined. Examine both surfaces of leaves. Starting treatment after this point will compromise control and promotes resistance development. Powdery mildew usually begins to develop around the start of fruit production. Protectant fungicides applied before detection will slow initial development. After detection, continue applying fungicides weekly. Conditions are favorable for powdery mildew throughout the growing season; this pathogen does not need a period of leaf wetness to infect.

**Recommended targeted fungicides.** Alternate among targeted, mobile fungicides primarily in the following three chemical groups, plus apply with protectant fungicide to manage resistance development and avoid control failure if resistance occurs, and also to comply with label use restrictions. All targeted fungicides are at risk of resistance developing; FRAC Code 50 and U13 are the only chemistries that resistance has not yet been detected to. Labels are available at: <http://www.cdms.net/Label-Database>.

**Vivando** (FRAC Code 50, formerly U8) has exhibited excellent control in fungicide evaluations. Activity is limited to powdery mildew. It is recommended used with a silicon adjuvant. Do not mix with horticultural oils. It can be applied three times per year with no more than two consecutive applications. REI is 12 hr. PHI is 0 days. **Proливо** is a new fungicide with a new active ingredient in this FRAC group as of 2018. It was not as effective as Quintec for managing powdery mildew on lower leaf surfaces in a fungicide evaluation conducted at LIHREC in 2016 in which Vivando was not included.

**DMI fungicides** (FRAC Code 3) include Proline\*, Procure, Luna Experience\*†, and Rhyme\*† (these considered most effective) plus Aprovia Top\*, Inspire Super\*, Mettle, and Rally. Resistance is quantitative. Highest label rate is recommended because the pathogen has become less sensitive to this chemistry. Efficacy has varied in fungicide evaluations. Proline is thought to have the greatest inherent activity. Procure applied at its highest label rate provides a higher dose of active ingredient than the other Code 3 fungicides. Five applications can be made at this rate. REI is 12 hr for DMI fungicides. PHI is 0 days for some including Procure; 7 days for others including Proline. Inspire Super (FRAC Code 3 and 9) is recommended for other labeled diseases. It is expected to provide some control of powdery mildew. but there are other FRAC 3 fungicides with greater intrinsic activity for powdery mildew that are better choices when this is the only disease developing. TopGuard is labeled but not recommended because it has Code 11 ingredient plus same DMI ingredient in Rhyme. \*Fungicides labeled for additional cucurbit diseases; see section on other diseases.

**Gatten** (FRAC Code U13) is the newest fungicide; it was introduced in 2018. REI is 12 hr. PHI is 0 days. Activity is limited to powdery mildew. It can be applied five times. 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.

#### **Recommended used sparingly:**

**Quintec** (FRAC Code 13) was consistently effective in fungicide evaluations conducted on Long Island until 2019 when it was significantly less effective than Vivando for the first time in the fungicide evaluation conducted annually on Long Island. This was not surprising because insensitivity to a high concentration of Quintec (similar to the dose when applied in the field) has been detected in some pathogen isolates collected from commercial fields and/or fungicide-treated research fields at the end of the growing season on Long Island since 2015. Resistant isolates evidently were sufficiently uncommon most of the season in 2015-2018 not to impact Quintec efficacy. Because resistance has developed, Quintec is now recommended to be used less than the label permits, which is a crop maximum of four applications. Apply no more than twice consecutively. Activity is limited to powdery mildew. It is the only mobile fungicide that does not move into leaves: it redistributes to foliage where spray was not directly deposited, including the underside of leaves, through diffusion and a continual process of absorption and desorption in the cuticular waxes of foliage. Labeled for use on non-edible peel crops: melons, pumpkin, and winter squash. REI is 12 hr. PHI is 3 days.

**Carboxamide aka SDHI fungicides** (FRAC Code 7) include Luna fungicides, Aprovia Top, Miravis Prime, Fontelis, Endura, Pristine, and Merivon. Last two also contain the same QoI fungicide (Code 11), which is no longer effective for powdery mildew. Resistance to boscalid, the FRAC Code 7 active ingredient in Endura and Pristine has been detected routinely on Long Island since 2009 and likely is the reason their efficacy has varied in fungicide evaluations. Full cross resistance was documented between several carboxamides, including those in Pristine, Merivon and also Fontelis, but not Luna fungicides, through laboratory assays conducted with pathogen isolates resistant and sensitive to boscalid. However, Luna Sensation has exhibited limited control in fungicide evaluations conducted in 2017-2019 at LIHREC. Luna Experience is the best choice because it also contains tebuconazole (Code 3), which needs to be

considered when developing an alternation program. Luna Sensation is not recommended because it also contains trifloxystrobin (Code 11); resistance to this chemistry is very common. Aprovia Top, Luna Experience, and Miravis Prime are the only Code 7 fungicides recommended. Limit use. Aprovia Top and Luna Experience have the advantage that they contain a second active ingredient with activity for powdery mildew (Code 3). All have 12 hr REI. PHI is 0, 7, and 1 day respectively. Maximum number of applications is 2-5, depending on product and rate. Low rate isn't recommended.

#### **Recommended used sparingly if at all:**

**Torino** (FRAC Code U6) exhibited excellent control in fungicide evaluations until recently. It failed in an experiment in North Carolina in 2016 and at LIHREC in 2017, where resistance to Torino was detected in pathogen isolates. Torino resistance was also detected in 2018. Activity is limited to powdery mildew. It can only be applied twice to a field in a 12-mo period. Consecutive applications are not recommended. REI is 4 hr. PHI is 0 days.

**No longer recommended.** Resistant pathogen strains are sufficiently common to render the following fungicides ineffective: Topsin M (FRAC Code 1; MBC fungicide), QoI fungicides (Code 11), which include Quadris, Cabrio and Flint, and SDHI fungicides (Code 7) containing boscalid (Endura and Pristine) or an active ingredient that has exhibited full cross resistance in laboratory testing of pathogen isolates (Merivon). Resistant strains continue to be detected very commonly every year on Long Island where monitoring is being conducted.

**Recommended protectant fungicides.** Many fungicides have contact activity for powdery mildew; mancozeb is an exception. They include chlorothalonil, sulfur, copper, mineral oil, and several biopesticides. Sulfur is one of the most effective and least expensive products. Its activity is limited to powdery mildew, thus it is especially useful early in disease development when other diseases are not a concern, including as a preventive application. Microencapsulated formulations are recommended. Melons are sensitive to sulfur especially when hot; there are PM-tolerant varieties.

#### **Fungicides Labeled for Other Diseases in Addition to Powdery Mildew.**

- Proline (FRAC 3). Fusarium blight and gummy stem blight.
- Rhyme (FRAC 3). Gummy stem blight.
- Luna Experience (FRAC 3 and 7). Alternaria leaf spot, anthracnose, gummy stem blight, and belly rot.
- Aprovia Top (FRAC 3 and 7). Anthracnose, Alternaria leaf blight, gummy stem blight, and Plectosporium blight.
- Inspire Super (FRAC 3 and 9). Alternaria leaf blight, anthracnose, gummy stem blight, Plectosporium blight, and Septoria leaf spot
- Miravis Prime (FRAC 3 and 12). Alternaria leaf blight and spot, gummy stem blight, and scab.

#### **In summary, to manage powdery mildew effectively in cucurbit crops:**

1. Select resistant varieties,
2. Inspect crops routinely for symptoms beginning at the start of fruit development, and
3. Apply targeted fungicides weekly with protectant fungicides and alternate amongst available chemistry based on FRAC Group code, starting at the action threshold of 1 affected leaf out of 50 older leaves. Add new fungicides to the program when they become available; substitute new for older product if they are in the same FRAC group.

*Please Note: The specific directions on fungicide labels must be adhered to – they supersede these recommendations, if there is a conflict. Check labels for use restrictions. Any reference to commercial products, trade or brand names is for information only; no endorsement is intended.*

## **NEWS**

### **COVID-19 SIGNS FOR FARM BUSINESSES AND FARMERS MARKETS AVAILABLE AS PDFs**

MDAR has produced a series of signs for farmers and market managers to download and print for use at their farm businesses. Signs are available in [English](#) and [Spanish](#) and can be found at the MDAR COVID resources page: <https://www.mass.gov/guides/covid-19-resources-for-agriculture>.

## MA FOOD SECURITY INFRASTRUCTURE GRANT PROGRAM ANNOUNCED

The Commonwealth of Massachusetts has launched a grant program to support farms and other food businesses and institutions that have been affected by the COVID-19 crisis. The goal of the Food Security Infrastructure Grant Program is to ensure that individuals and families throughout the Commonwealth have access to food, with a special focus on food that is produced locally and equitable access to food. The program also seeks to ensure that farmers, fisherman and other local food producers are better connected to a strong, resilient food system to help mitigate future food supply and distribution disruption.

Projects will be funded on a rolling basis through September 15.

[The RFR](#) has a long list of examples of the kinds of projects that are eligible, and broadly states: “Projects will support the immediate and projected needs of the Commonwealth’s local food system, including (i) information technology needs; (ii) facility adaptation to new safety guidelines; (iii) storage, processing, and delivery equipment to adapt to supply chain disruptions and to serve food insecure residents, and (iv) other strategies that connect local food production with food insecure communities and residents and increase food equity for all residents.”

The full application and instructions are available [here](#). Some key details:

- Funding is available for a range of sized projects, from very small to as much as \$500,000.
- Applicants may submit up to three proposals.
- Evaluation criteria include demonstrated evidence of impact and need, a commitment to equity, sustainability and scalability of the project, and other factors.
- Funding is on a reimbursement basis, so funds will be distributed only after costs have been incurred and receipts submitted.
- Funding is for capital infrastructure and equipment purchased must be new.
- Funding may not be spent on labor or food.
- There is no match requirement.

More information about this program is available here: <https://www.mass.gov/service-details/food-security-infrastructure-grant-program>.

The Administration also released a [Notice of Opportunity \(NOO\)](#) to strategically **onboard new agricultural vendors for the Healthy Incentives Program (HIP)**.

To find out more about the Food Security Infrastructure Grant Program, please use the following link: [www.mass.gov/service-details/food-security-infrastructure-grant-program](http://www.mass.gov/service-details/food-security-infrastructure-grant-program)

To find out more about the Notice of Opportunity for new vendors for the Healthy Incentives Program (HIP), please use the following link: [www.mass.gov/healthy-incentives-program-hip-notice-of-opportunity-noo](http://www.mass.gov/healthy-incentives-program-hip-notice-of-opportunity-noo)

## EVENTS

### MINI-TWILIGHT MEETINGS FOR COMMERCIAL VEGETABLE GROWERS

Join us Wednesdays at 6pm for virtual mini-Twilight Meetings! On each call, we will have a topic lined up for demonstration and discussion, with a presentation of new information on crop, pest, and farm management topics followed by plenty of time for Q&A about the topic at hand and farmer-to-farmer discussion of the issues of the week. Farmers can join by phone or by computer—those who join by computer will be able to see some shared photos and presentations.

#### Upcoming Topics:

- **June 24, 6pm: Weed Management for Vegetable Crops with Bryan Brown, New York State IPM Program**  
Stop drowning in weeds! Use their biology against them. Setup a cultivator to maximize effectiveness. Find low-cost ways to integrate mulch. We will cover these topics and more plus plenty of time for your questions.

*1 pesticide recertification credit is available for this webinar.*

**How to join:** [Click here to register and receive the sign-in information.](#)

**Recordings of Past Calls:**

April 22: [Early-season pest scouting](#)

April 29: [COVID-19 business relief programs](#)

May 6: [Organic pest management](#)

May 27: [Cleaning, Sanitizing, & Disinfecting on the Farm: COVID-19 and Beyond](#)

June 10: [Greenhouse Fertigation with Judson Reid of Cornell Cooperative Extension](#)

**PYO FOR MASSACHUSETTS BLUEBERRY FARMS**

**When:** June 17, 2020, 6:00pm

**Registration:** <https://umass-amherst.zoom.us/meeting/register/tJllc-qprD4rHN29rBY6D-0BZf-zv1sHx-LI4>

After registering, you will receive a confirmation email containing information about joining the meeting.

Hosted by UMass, MDAR & Mass. Cultivated Blueberry Growers Association, this webinar will provide an overview of MA state guidance on good practices for PYO blueberry operations during the 2020 season given the COVID-19 pandemic. It is co-sponsored by the Massachusetts Cultivated Blueberry Growers Association, UMass Extension, and the MA Dept. of Ag Resources. We will go over the main points of guidance in the MDAR 2020-16 PYO Bulletin as it applies to blueberry farms, provide some examples of how some farms are set up, and field questions from attendees.

**PESTICIDE APPLICATOR TRAINING WORKSHOPS AVAILABLE ONLINE**

The 2020 Pesticide Recertification workshops scheduled for this spring were rescheduled due to concerns about the spread of COVID-19. These workshops have been converted to a remote/online format so that everyone can obtain information and continuing education contact hours in a safe manner. You can now register for our online Zoom workshops. Workshop registration fee is \$40/person/workshop by credit or \$10 discount if paid by check. To see the whole list of workshops offered, go to: [https://www.umass.edu/pested/recertification/current\\_workshops.htm](https://www.umass.edu/pested/recertification/current_workshops.htm)

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*Vegetable Notes. Genevieve Higgins, Lisa McKeag, Susan Scheufele, co-editors.*

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