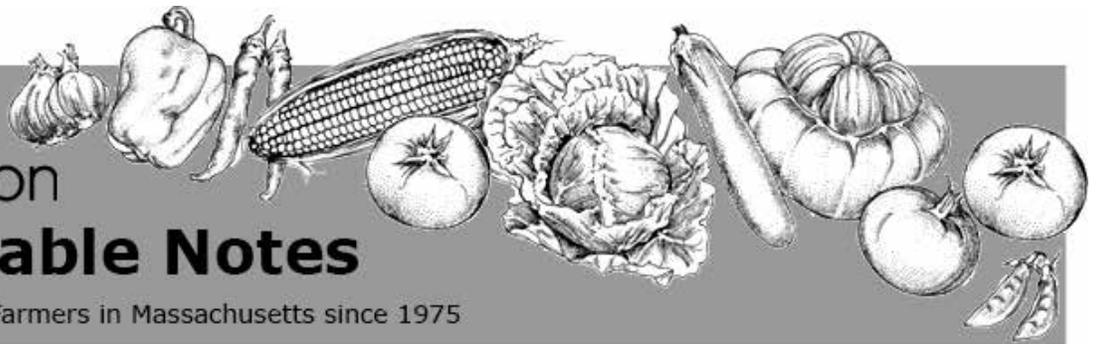




UMass
Extension

Vegetable Notes

For Vegetable Farmers in Massachusetts since 1975



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IN THIS ISSUE:

- Crop Conditions
- Pest Alerts
- Fall Weed Management Advice
- Aphid Biocontrol in High Tunnels
- Fungicide Recommendations for Alternaria Leaf Spot & Head Rot in Broccoli
- Events
- Sponsors



Dry weather is good for curing crops like onions and winter squash that are coming in now, and for garlic that has been curing for a several weeks now. This beautiful crop is from Verrill Farm in Concord, MA. Photo: S.B. Scheufele

CROP CONDITIONS

The season is transitioning from summer to fall now—just last week we were worrying that customers weren’t yet ready for pumpkins and winter squash that were coming in early, but with the recent drop in temperature, it feels suddenly like fall. Customers are ready for fall crops like squash, leeks and sweet potato coming in alongside summer crops, and many growers are not sad to see this season go. A lot of cucurbit foliage crashed this week, when leaves that were heavily infected with downy and powdery mildew and bacterial wilt crashed after a few nights of low temperatures. Disease is spreading faster now with the onset of fall-like weather, and preventive sprays in tomatoes, brassicas, and other fall crops that still have a ways to go are warranted. We are getting into the last corn successions now and insect pressure is lower—thank goodness! Another positive is that some farms have a bit of extra labor to bring in all these crops since many high school and college student employees who would normally be back to school have delayed starts or are going remote and so are able to stay on and help bring in all the late-August bounty!

PEST ALERTS

Alliums

[Purple blotch](#) was observed in leeks this week. Onions and garlic can also be affected by this fungal disease. The disease often begins on older leaves as small, sunken, water-soaked lesions with light centers. Lesions enlarge as disease progresses and turn purple to brown, often with yellow rings that create a distinctive bull’s-eye pattern. Leaves turn yellow/brown and wilt, and may be girdled. Earlier in the season, [fungicides](#) can reduce disease severity and slow spread, but may not be warranted now that harvest is underway. Field sanitation is important; remove or plow under plant debris, and cull volunteer plants. Infected plant material should be buried deeply. Harvest in dry weather and avoid injury to the necks. Allow onions to cure properly before leaf removal. Store at 34-38°F and humidity 65-70% in a well-aerated cooler.

Beets and Chard

[Cercospora leaf spot](#) is spreading through fall beet and chard plantings, due to cooler weather and longer periods of overnight dew.

Weedy fields have significantly more disease than fields with good airflow and sunlight penetration.

Brassicas

[Alternaria leaf spot](#) continues to spread through fall brassica fields, and we are getting reports of disease on the heads

of broccoli where it causes dark, sunken patches. See article this issue for detailed fungicide recommendations for this disease.

Cabbage root maggot flies are active now, so protect fall root crops like turnips and rutabagas with insecticide sprays or protective netting. While row covers are a valuable tool in spring, the added heat and reduced light has been shown to reduce root quality and yield in fall turnips and rutabagas. If row covers are used, select a non-heating type like Proteknet and apply before crop emergence or immediately after transplanting to ensure that aphids are not trapped under the cover—protected from all the natural enemies in the field, aphid populations can explode under the cover.

Cucurbits

Foliage is going down quickly now, with lots powdery mildew, downy mildew in cucumbers and cantaloupe, various leaf spots, squash vine borer, and bacterial wilt causing vines to collapse. Add to that the cool night-time temperatures and much foliage has died back suddenly, potentially exposing fruit to sunscald. For winter squash, it's better to harvest early and get the crop into proper curing and storage conditions than leave the crop exposed to the sun in the field. See the [article in last week's issue](#) for more information on winter squash harvest, curing, and storage.

Tomato

Broad mite damage is being reported on tomatoes and peppers, especially in tunnels but sometimes also in field crops. These tiny mites feed in the growing point and are therefore nearly impossible to find. Luckily, their damage—gray scarring on fruit and deformed fruit and leaves—is quite conspicuous and easy to diagnose, though difficult to prevent. If broad mites have been a problem in the past, it is wise to treat for them preventively in susceptible crops. Apply an insecticide at flowering and again four weeks later. For conventional growers, Portal XLO is an excellent choice to control these mites, as it works quickly to knock down mites and provides rapid cessation of feeding. It controls all motile stages of mites—larvae, nymphs, and adults—and has a 1-day PHI. For organic growers, oils and soaps are your best bet.

Pepper maggot damage is being reported in the field now. Adult flies lay eggs in the wall of pepper fruits in late-July through mid-August and the larvae tunnel into the placenta (seed head) or sidewalls, chewing as they grow, until they exit the fruit and drop to the ground to pupate until next July. Exit holes, present now, provide entry sites for soft rot bacteria, and this may be how you first notice you have a pepper maggot problem. You may also notice small dimples on the outside of the fruit (oviposition scars), the maggots themselves inside the seed cavity, or rot in the seed cavity associated with the maggot feeding. At this point in the season, there is not much that can be done to manage this pest. For next year, be prepared for these flies to emerge again from the affected field and rotate peppers away from this site if possible. Plan to use insecticides, exclusion netting, or other practices next year.



*Purple blotch lesions on leek.
Photo: G. Higgins*



Cercospora leaf spot in beet



Broad mite damage on pepper fruit. Photo: S. Bogash

Table 2. Spray intervals for corn earworm based on *Heliothis* net trap captures

Moths/Night	Moths/Week	Spray Interval
0 - 0.2	0 - 1.4	no spray
0.2 - 0.5	1.4 - 3.5	6 days
0.5 - 1	3.5 - 7	5 days
1 - 13	7 - 91	4 days
Over 13	Over 91	3 days

Sweet corn

All of our sweet corn pests are beginning to decline now, with numbers continuing to drop off since the peak a few weeks back after Hurricane Isaias. Corn earworm and fall armyworm are still present at moderate numbers though, with FAW causing damage in young corn. If CEW trap numbers aren't warranting a spray on your farm, be sure to scout for ragged FAW feeding damage. We may see another influx of CEW and FAW with Hurricane Laura making its way to the region this weekend.

Table 1. Sweetcorn pest trap captures for August 21-27, 2020

Location	GDD (base 50°F)	ECB NY	ECB IA	FAW	CEW	CEW Spray Interval
Western MA						
Sheffield	-	0	0	N/A	0	<i>no spray</i>
Southwick	2356	2	1	0	9	<i>4 days</i>
Whately	2359	2	0	N/A	2	<i>6 days</i>
Central MA						
Bolton	2231	0	1	7	1	<i>no spray</i>
Leominster	2195	2	0	0	6	<i>5 days</i>
Spencer	2170	0	0	0	0	<i>no spray</i>
Eastern MA						
Ipswich	2054	4	0	3	16	<i>3 days</i>
Concord	2182	1	1	0	3	<i>6 days</i>
Millis	2408	4	7	N/A	19	<i>3 days</i>
Sharon		-	-	N/A	-	-
Seekonk	2488	3	0	8	6	<i>5 days</i>
Swansea		0	0	3	5	<i>5 days</i>
- 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						

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

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

The [UMass Plant Diagnostic Lab](#) and the [UMass Soil & Tissue Testing Lab](#) are both now open.

FALL WEED MANAGEMENT ADVICE

Every year, summer crops start to come in, on top of spring crops that are still holding on, on top of fall crops that need to be planted, and somewhere along the way, weed management seems to get pushed to the back burner. Weeds that were missed a few weeks ago are starting to seem unmanageable now and it may seem like it's the end of the road for certain fields, in terms of weed management. Not so! There are three main activities that need to be completed now for good, year-round, weed management—late-season field scouting, preventing weed seed production, and controlling perennial weeds.

End of Year Weed Scouting. It is worthwhile to take the time to check fields for weed problems as fall gets closer and the field season begins to wind down. 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? Proper weed ID can help you to identify potential problems before they get out of hand, and can help you decide if you need to modify your weed control program. It will help to have a good field guide around to help identify weeds in the field, we recommend “Weeds of the Northeast” by Uva, Neal and DiTomaso.

Weeds like yellow nutsedge, field bindweed, and quackgrass are spreading perennials that 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 investing more time and resources into controlling when they are young or appearing in a field for the first time. 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 brassicas, peppers, and squash. Nightshades are difficult to control in tomatoes and other solanaceous crops for growers who rely on herbicides because they are all in the same family. Velvetleaf is hard to control in sweet corn. To learn more on understanding weed lifestyles check out our article “[The Secret Life of Weeds](#)” last published in 2017.

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. The New England Vegetable Management Guide 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 that 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. It will also, however, encourage lateral branching and eventually, 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.

Preventing maturation of weed seeds can be done by: hand-pulling and, ideally, removing plants from the field; mowing the weedy spots; mowing down whole fields if the crop is consumed by weeds; and burning the mowed weeds in piles or windrows. Burning this weedy plant matter at sufficiently high temperatures kills the weed seeds. Temperatures of 800-900°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.

Importantly, **herbicides should not be used to control plants over 6 inches tall**, which are typically able to survive or outgrow herbicide damage.

Perennial weed management. The best time to control perennial weeds is in the fall. All perennial weeds have storage structures (taproots or rhizomes) below ground that enable these plants to survive the winter and regenerate themselves the following year. Tilling perennial weeds in the fall will kill top growth and fragment the storage organs but will not kill the weed. Frequent tillage will, over a long period, 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 glyphosate. 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 belowground 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 glyphosate, which provides top kill but does not kill the whole weed. Applying glyphosate at the proper time is key. 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 glyphosate at the right time to control perennial weeds. [See article below for more on late-season weed control.—Ed.]

--Written by Rich Bonanno, former UMass Extension Weed Specialist, now Associate Dean, CALS and Director, NC State Extension

APHID BIOCONTROL IN HIGH TUNNELS

High tunnel tomatoes and peppers are still rolling in, but we're nearing the end of their season and growers are starting to plan for seeding fall greens in tunnels. Aphid populations may have built up over the duration of the summer tunnel crop; if so, it's a good idea to take the time now to plan for control in your coming fall crop or next spring's crop. There are both chemical and biological control options for managing aphids in high tunnels; this article will outline biological control and the aphid identification that's necessary for effective control, but you may choose to spray an insecticide, either to treat crops that are currently being harvested or as cleanup sprays before terminating a crop. For a list of conventional and OMRI-approved insecticides for aphid control in protected culture, see [Table 19: Fungicides and Bactericides Labeled for Vegetable Transplants](#) in the New England Vegetable Management Guide.

Planning Ahead for Successful Aphid Biocontrol

Correctly identifying the species of aphid affecting your crop is an important first step before selecting which biocontrol organisms will be effective:

Green peach aphids vary from green to pink to red. They can be distinguished from the melon/cotton aphid by the length and color of the cornicles (the pair of tube-like protrusions extending from the end of the abdomen). Green peach aphids have long (approximately the length of the body) cornicles and only the tips are black. In addition, the head has a distinct indentation at the base of the antennae (see photo). Hosts include peach, apricot, and over 200 species herbaceous plants including vegetables and ornamentals.

Melon/cotton aphid: The cornicles on melon/cotton aphid are short (approximately 1/3" or 8.0 mm, the width of the body) and vary in color from light yellow to very dark green (making them appear black). The antennae are typically shorter than the body. Melon/cotton aphids do not have a distinct indentation at the base of the antennae like that of the green peach aphid. Its host range includes hundreds of species such as pepper, eggplant, spinach, asparagus, okra, and it is particularly damaging on cucurbits.

Foxglove aphid: Foxglove aphids have green flecks located at the base of their cornicles. In addition, they have black markings on their leg joints and antennae. Foxglove aphids tend to fall off plants when disturbed and they can cause severe leaf distortion, more so than the green peach and melon/cotton aphid. This aphid has many hosts including foxglove, lettuce, potato, clover and bulbs.

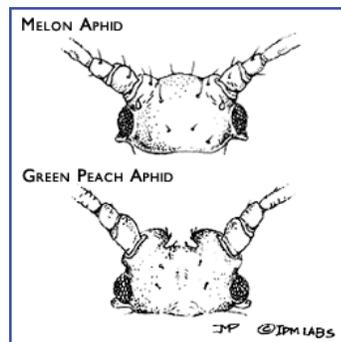
Potato aphid may be difficult to identify because their sexual forms produce both green and pink aphids, however



Green peach aphids.
Photo: UC Statewide IPM Project



Melon aphids. Note the two aphid mummies, just above the vein. Photo: M. Spellman



Difference in head shape between melon and green peach aphids. Photo: IPM Labs

they move more quickly than the other aphids. These aphids complete 2-6 generations on their winter host of rose plants before moving on to their summer hosts, which include potato and tomato. Therefore, this aphid pest is not typically seen in tunnels until later in the season but they have been reported as a growing problem among high tunnel tomato growers and keeping an eye out for them early is a good idea.



Foxglove aphid. Note dark green spots at the base of each cornicle. Photo: D. Gilrein, Cornell Univ.

Potato aphid. Photo: Joseph Berger, Bugwood.org

Cabbage aphids are not typically considered a tunnel pest, but have been reported in tunnels with overwintered brassicas. Mature females are greyish green with dark heads and cornicles. Adults produce a powdery wax coating that makes them appear dusty. Cabbage aphids are restricted to brassica species.

Root aphid: The primary root aphid (*Pemphigus* species) overwinters as eggs and infests plants in the spring and fall. Root aphids may be misidentified as mealybugs because they are covered with white wax although they are smaller than mealybugs. Root aphids have reduced cornicles that resemble rings, which are located on the end of the abdomen. These cornicles are difficult to see with the naked eye but can be seen when magnified.



Cabbage aphids.

Biological Control Using Aphid Predators. In general, aphid predators are better at controlling high aphid populations, compared to parasitoids, as they are not as efficient at finding low numbers of aphids within the crop.

Ladybeetles are effective at controlling high aphid populations but are highly dispersive and will leave the tunnel in search of food if aphid populations are too low. They can be effective if released under row cover in winter greens. Adults and larvae feed on a wide variety of aphid species.

Predatory midges (*Aphidoletes aphidimyza*) are another generalist aphid predator that can be purchased and released in your tunnel. They are active in summer months but when day lengths shortens to less than 15 hours (September-March), they enter diapause and become inactive. Larvae feed on aphids and adults feed on pollen and aphid honeydew. Banker plants used to support *Aphidius colemani* will also support *Aphidoletes* midges. The midges pupate in the soil, so place banker plants in a tray with moist sand to provide pupation sites if your tunnel has plastic mulch and weed mat.

Green lacewing larvae also feed on many aphid species. Adults feed on pollen and nectar. Lacewings can be purchased as eggs or larvae; larvae tend to survive better than eggs. Release far apart from each other, as larvae are cannibalistic. In summer months, if temperatures rise above 95°F, lacewings will move out of the tunnel. Lacewing activity and life cycle slows as temperature drops, but one report from Purdue University reported that adults remained active and laying eggs at 52°F.



Aphid mummies parasitized by Aphidius parasitoid. Photo: T. Smith

Biological Control Using Parasitoids. Aphid parasitoids in the genera *Aphidius* and *Apheleus* are wasps that lay their eggs in the host aphid. The resulting wasp larva develops within the aphid, eating the host from the inside and creating a tan or pink, dome-shaped shelter called a “mummy”. Adult parasitoids emerge from aphid mummies and continue the cycle. Parasitoids are effective for controlling low populations of aphids and preventing outbreaks but are not effective at managing high populations. They are generally more efficient than aphid predators at seeking out the aphid hosts at low levels. Parasitoids are less effective at cold and hot temperatures and function best in the range of 65-77°F and with 70-85% relative humidity. *Aphidius* does not enter diapause, however, and can be used at

colder temperatures.

Aphid parasitoids are host-specific in terms of the aphid species they attack—see Table 1 for parasitoid-host information. Currently no parasitoids are commercially available for cabbage and root aphids. Mixtures of different parasitoid species are commercially available and should be used when multiple aphid species are present or when you cannot identify the aphid species in your tunnel. Parasitoids are shipped either as adults or aphid mummies, from which parasitoid adults soon emerge. To increase the parasitoids’ effectiveness, place small groups of the aphid mummies in cups near aphid colonies. Do not let these aphid mummies get wet. Release rates may vary depending on the parasitoid species. Containers often contain approximately 250 aphid mummies, which can treat 5,000 ft² at the high release rate (for high aphid populations) or 25,000 ft² at the low release rate (for less severe outbreaks).

Aphid parasitoids must be applied preventively to suppress aphid populations. They are less effective when aphid populations are high and already causing plant damage. Release parasitoids on a regular basis to sustain their populations during the growing season. Avoid releasing parasitoids near sticky cards to prevent capturing the released parasitoids. When scouting, look for aphid mummies that have circular holes on one end. These are the exit holes created by adult parasitoids during emergence. Aphid parasitoids are sensitive to pesticides. Release parasitoids preventively on crops you know are susceptible to aphids, so that the parasitoids will be present when aphids are first noticed.

	Biocontrol Agent	Target Species	Effective Conditions	Notes
Predators	Ladybeetles Convergent ladybeetle (<i>Hippodamia convergens</i>) Two-spotted ladybird beetle (<i>Adalia bipunctata</i>)	All aphid species, in addition to other pests	Year-round	Only effective for high populations and if structure is enclosed
	Predatory midge (<i>Aphidoletes aphidimyza</i>)	All aphid species	Inactive September-March unless supplemental light is provided or temperatures remain above 78°F	
	Green lacewing (<i>Chrysoperla rufilabris</i>)	All aphid species	Optimal: 60-80°F. Will leave tunnel above 95°F. Lower temp limit unknown but remain active at 50°F.	Good for high populations
Parasites	<i>Aphidius colemani</i> (parasitic wasp)	Green peach and melon aphids	65-77°F, 70-85% relative humidity	Does not enter diapause so is effective during low winter light
	<i>Aphidius matricariae</i> (parasitic wasp)	Green peach and tobacco aphid	65-77°F, 70-85% relative humidity	Does not enter diapause so is effective during low winter light. Susceptible to hyperparasitoids in summer.
	<i>Aphidius ervi</i> (parasitic wasp)	Foxglove and potato aphid	65-77°F, 70-85% relative humidity	Does not enter diapause so is effective during low winter light. Susceptible to hyperparasitoids in summer.
	<i>Aphelinus abdominalis</i> (parasitic wasp)	Foxglove and potato aphid	65-77°F, 70-85% relative humidity	

Parasitoids are themselves susceptible to parasitism from other wasp species—these wasps that parasitize parasitoids are called hyperparasites. Hyperparasites will move into tunnels throughout the summer and lay eggs within aphids that have already been parasitized by *Aphidius* species. The hyperparasite larva then feeds on the *Aphidius* larva and an adult hyperparasite emerges from the aphid mummy. The exit holes of the aphid mummies can be used as an indicator of the hyperparasitoid population; *Aphidius* wasps leave a round, smooth-edged exit hole while hyperparasitoid wasps leave a slightly irregular exit hole with jagged edges. If you plan on using parasitoids for aphid control year round in your tunnel, the wasps and/or banker plants will need to be re-introduced once the tunnel has been closed up for the winter and the existing hyperparasitoid population has died. For more information on aphid hyperparasites, see the UVM fact sheet [Hyperparasitoids of Aphid Predatory Wasps](#).

Banker Plant Systems. Banker plant systems are used to maintain parasitoid populations within a tunnel when host pest populations are low, so that the parasitoids do not leave the tunnel looking for hosts. The trade-off of using time and space to grow banker plants and maintain the non-pest aphid population is that you don't need to continually order and release parasitoids in your tunnels.

In the case of aphids in high tunnel crops, banker plants are used to maintain and distribute populations of *Aphidius colemani*, which parasitizes green peach and melon aphids, throughout a tunnel. Grass plants are in pots and inoculated with bird-cherry oat aphids (*Rhopalosiphum padi*), which feed only on grasses. *A. colemani* is then released onto the banker plants, where the bird-cherry oat aphids serve as hosts and function to distribute the parasitoids throughout the tunnel. Recent research from the University of North Carolina found that this system worked best using wheat or barley as the banker crops, compared to oats or rye.

There has been limited research on how many banker plants are needed for a given area, but regardless, banker plants need to be distributed evenly throughout the tunnel, as *A. colemani* does not migrate far from the point of release/emergence (only 3-6 feet). One rate recommendation given is one banker plant per 1000 sq. ft. Adjust your banker plant rates based on your experience. As with all parasitoid systems, banker plants need to be in place before the pest aphids are even noticed in order to provide sufficient control. Starter aphid banker plants are available from several biological control suppliers. One starter kit is enough to get your banker plant system started for the season, as long as you're growing your own pots of oat, rye or barley.

Entomopathogenic fungus: The entomopathogenic fungus, *Beauveria bassiana*, is commercially available as the products Mycotrol and BotaniGard. Because aphids have high reproductive rates and molt rapidly, especially during the summer, repeat applications are typically required. *Beauveria bassiana* is most effective when aphid populations are low. This fungus may not be compatible with the convergent ladybird beetle (*Hippodamia convergens*) depending on the concentration of spores applied.

Compiled from the following resources:

[Aphids on Greenhouse Crops](#), by Tina Smith, UMass Extension

[Managing Aphids in the Greenhouse](#), [Aphid Banker Plants](#), and [Biological Control of Aphids](#) by Leanne Pundt, UConn Extension

[Aphid Management in Winter Tunnel Greens](#), Cornell Cooperative Extension

Other helpful resources:

[Aphid Banker Plant System for Greenhouse IPM: Step-by-Step](#), by Margaret Skinner & Cheryl Frank, UVM Entomology Research Lab and Ronald Valentin, BioBest

[Scheduling Biologicals](#), by Linda Taranto, D&D Farms and Tina Smith, UMass Extension

--UMass Extension Vegetable Team

FUNGICIDE RECOMMENDATIONS FOR ALTERNARIA LEAF SPOT & HEAD ROT IN BROCCOLI

--Written by Christy Hoepting, CCE Cornell Vegetable Program. From Cornell Veg Edge newsletter, Vol. 16 Issue 20, August 19, 2020

ALS is caused by *Alternaria brassicicola* and is specific to brassica/crucifer/Cole crops including broccoli, cabbage, cauliflower, Brussels sprouts, kale, etc. and weeds (e.g. mustards such as Shepherd's purse and field pennycress). It can survive in soil and crop debris and can be spread onto plants from splashing soil and over longer distances aerially. Optimum temperatures for ALS are 75° to 82°F, but when leaf wetness is prolonged for 20 hours or more, ALS can produce many spores outside of the optimum range of temperatures. Downy mildew (DM) is similar to ALS in its survival, spread and requirement for leaf wetness, and its optimum temperature range is 50 to 60 °F. Beginning in August and throughout the fall, heavy dew and remnants of hurricanes usually result in favorable conditions for both ALS and DM.



Alternaria leaf spot (left) and head rot (right) in broccoli. Photos: C. Hoepting

Fungicide “Cheat Sheet” for Alternaria Leaf Spot and Head Rot in Broccoli and Other Cole Crops									
Product and Rate/A	Active Ingredient	FRAC ¹ Group	PHI	Restricted Use ²	Maximum Use	Rotation Restrictions ³	Labeled-Crops	Disease Control	
								ALS ⁵	DM ⁵
Bravo Weather Stik 1.5 pt	chlorothalonil	M5	7 days	No	11.7 pts (= 7 apps)		ALL ⁴	Mediocre	Good
Quadris 6-15.5 fl oz	azoxystrobin	11	0 days	No	90 fl oz (= 5-15 apps)		ALL ⁴	Mediocre	Good
Switch 10-14 oz	cyprodinil + fludioxonil	9 12	7 days	No	56 oz (= 4-5 apps)	2	ALL ⁴	Excellent	None
Priaxor 6-8.2 fl oz	fluxapyroxad + pyraclostrobin	7 11	3 days	Yes	24.6 fl oz (= 3 apps)	2	ALL ⁴	Best	Good
Endura 6-9 oz	boscalid	7 11	0 days	No	18 fl oz (= 2 apps)	2	ALL ⁴	Excellent	None
Luna Sensation 5-7.6 fl oz	fluopyram + trifloxystrobin	7 11	0 days	Yes	15.3 fl oz (= 2 apps)	2	ALL ⁴	Excellent	Good
Inspire Super 16-20 fl oz	cyprodinil + difenoconazole	9 3	7 days	No	80 fl oz (= 4 apps)	2	ALL ⁴	Very Good	None
Quadris Top 12-14 fl oz	azoxystrobin + difenoconazole	11 3	1 day	No	56 fl oz (= 4 apps)	1	ALL ⁴	Very Good	Good

¹FRAC: Fungicide Resistance Action Committee group. Fungicides that belong to the same FRAC group are at risk for developing cross-resistance. For best fungicide resistance management practices, fungicides belonging to different FRAC groups should be rotated.

²Restricted Use: DEC spray license required to use.

³Rotation Restrictions: Number of applications before you must rotate to another FRAC group

⁴ALL Cole crops includes broccoli, cabbage, cauliflower and Brussels sprouts. Often, kale, collards, kohlrabi and mustard greens also on label.

⁵ALS: Alternaria leaf spot and head rot. Relative disease control based on 2018 on-farm fungicide trial. DM: downy mildew. Best control of DM is provided by Orondis Opti/Ultra, Revus and Presidio.

Fungicide recommendations for ALS in broccoli. Fungicide “Cheat Sheet” sheet provides roster of fungicides labeled in Cole crops for use on ALS. The relative control of ALS was based on results from an on-farm trial conducted in 2018 under severe ALS pressure (Hoeping) – for more information on this trial, see newsletter article in Veg Edge May 15 2019 (https://rvpadmin.cce.cornell.edu/pdf/veg_edge/pdf161_pdf.pdf) and presentation at Empire Expo 2019 (<http://www.hort.cornell.edu/expo/pdf/20190115-all-day-hoeping.pdf>).

- Spray fungicides preventatively before disease establishes itself, because lower frame leaves serve as inoculum to infect heads. Bravo would be an economical choice at this timing.
- Once the canopy fills in, aeration is reduced and leaf wetness is prolonged. Begin application of systemic/translaminar fungicides with very good to excellent activity on ALS at this time.
- All fungicides listed in the Cheat Sheet except Bravo, are at risk of ALS developing resistance. See ALS Fungicide Cheat Sheet/labels for rotation restrictions and seasonal maximum use rates. Be mindful of pre-mixes that have more than one FRAC group per fungicide that need to be managed for fungicide resistance.

Sample fungicide program for control of Alternaria leaf spot and head rot in broccoli.					
Designed for high ALS disease pressure, uses best products from full canopy fill through harvest, no more than 2 apps per FRAC, no more than 2 apps before rotating to another FRAC, avoids use of FRAC 11. When disease pressure is low, one can always back off from such a “strong/expensive” program.					
Week	Crop Stage	Fungicide	FRAC Group	PHI (days)	Activity on DM
1 & 2	1-2 weeks after transplanting, prior to ALS infection	Bravo WS 1.5 pt	M5	7	Good
3	Pre-heading, large canopy	Switch 14 oz + penetrating adjuvant	9, 12	7	None
4	Heading begins	Switch 14 oz + penetrating adjuvant	9, 12	7	None
5	Harvest begins	Priaxor 8.2 fl oz (R) + penetrating adjuvant	7, 11	3	Good
6	During harvest	Endura 9 oz + penetrating adjuvant	7	0	None
R: Restricted Use - requires a DEC spray license to use. Substitute with Quadris Top (FRAC 3, 11) as a non-restricted use option.					

- For best fungicide resistance management practices:
 1. Do not apply more than 1-2 applications before alternating to another FRAC group.
 2. Do not use more than 2 applications per FRAC group per crop. Bravo is the exception to this, because its multi-site mode of action reduces its risk for fungicide resistance and may be used up to 7 times.
- Use an adjuvant with fungicides that have translaminar or systemic activity (all fungicides except Bravo) for improved efficacy.
- Do not apply a copper bactericide in the same tank mix with an adjuvant, or excessive leaf burn injury may occur.
- Save products with 0 (Endura, Quadris, Luna Sensation), 1 (Quadris Top) or 3 days (Priaxor) PHI for close to and during harvest.
- Downy Mildew: Note that Endura and Switch have no activity on DM. ALS fungicides with good DM activity include Bravo and those with FRAC 11 (Quadris, Quadris Top, Priaxor, Luna Sensation). Best control of DM is provided by Orondis Opti/Ultra, Revus and Presidio. Note that these fungicides do not have activity on ALS.
- **Be aware that it is highly suspected (not officially confirmed) that ALS has developed fungicide resistance to Quadris (a.i. axoystrobin). Therefore, use of Quadris and other FRAC 11 fungicides (such as Cabrio) are not recommended for control of ALS.** Premixes with FRAC 11 that contain FRAC 3 or 7 (such as Quadris Top and Priaxor) are okay, because it is the FRAC 3 and 7s that are doing the work.
- **Do your fungicide spray program “puzzle” ahead of time.** Although there are a lot of fungicide options, it can be

tricky to not exceed 2 apps per FRAC per crop, especially when so many products contain premixes of two FRAC groups. It is a good idea to design a 4-week program to use from full canopy fill through harvest. Prior to this, Bravo should suffice. Start with the products that you want to use during harvest with 0 PHI and work backwards to avoid no more than 2 apps per FRAC. Although expensive, Switch (FRAC 9, 12) is an excellent rotation partner with the many FRAC 3 and 7 products.

NEWS

URBAN AGRICULTURE SURVEY

What do you need from your local Cooperative Extension? UMass Extension is collaborating with land-grant schools across the Northeast U.S. to gather your experiences and thoughts about **urban agriculture and the kind of support urban growers need to be successful**. As budgets get tight, we want to be able to demonstrate to current and future funding sources that it is critically important to invest in urban agriculture.

Please fill out [this survey](#) to help us get a better understanding of what urban agriculture looks like and the important role that Extension plays!

The survey should take less than 30 minutes to complete. It is open to all individuals who are at least 18 years old and grow food plants or engage in other agriculture in urban areas in the Northeast U.S.

The survey is available online at this link: https://udc.iad1.qualtrics.com/jfe/form/SV_3t0bgrmjwRG0WTH

This research has been approved by the University of Maryland Institutional Review Board (project # 1013685-4). If you have any questions, please contact Neith Little at nglittl@umd.edu and Dr. Matthew Richardson at matthew.richardson@udc.edu

APPLICATION DUE TOMORROW! ADDITIONAL COMMODITIES ELIGIBLE FOR CORONAVIRUS FOOD ASSISTANCE PROGRAM (CFAP)

The USDA, Coronavirus Food Assistance Program (CFAP) adds additional commodities, and expands funding for seven previously funded commodities. USDA's Farm Service Agency (FSA) is accepting applications through **August 28, 2020**. Read more about these changes [here](#), or contact your local FSA office.

2020 GRANTS & INCENTIVES FOR NORTHEAST AGRICULTURE

[Farm Credit East](#) has created a report which contains grants and other incentives available in the Northeast states of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York and Rhode Island. The listings include grant programs, tax incentives and loan programs from various funding sources available to agricultural producers and other entities involved in agriculture or related industries. Please note that as grant programs often change, this list should not be viewed as a comprehensive compilation of all grant opportunities.

Please visit [link for Report](#), as well the [grant writing page](#) for more information on Farm Credit East's grant writing services.

IMPORTANT REMINDERS FOR FEDERAL CROP INSURANCE POLICYHOLDERS & NONINSURED CROP DISASTER ASSISTANCE (NAP) PARTICIPANTS

Loss Reporting: 2020 has presented farmers with challenging weather conditions and producers covered by a Federal Crop Insurance policy are reminded to monitor their crops for insurable damage throughout the growing season. If you notice damage, contact your crop insurance agent within 72 hours of discovery, 15 days before harvesting begins and within 15 days after harvesting is completed on the insurance unit. Three other important reminders:

- Check with your Federal Crop Insurance agent to review any prevented planting options.
- Direct marketed crops must have a yield appraisal before harvest, if a loss is anticipated.
- **Do not destroy** any crop evidence needed to support your claim without clear direction in writing from the insurance adjuster.

Producers having NAP coverage have similar loss reporting requirements and should contact their local FSA Office to report losses and review any prevented planting options.

Remember, if ever in doubt about filing a notice of loss, always contact your agent or FSA!

Losses on Crops Not Insured under Federal Crop Insurance nor Covered under NAP or Physical Losses: Even if you suffer losses on noninsured crops or crops not covered by NAP or physical losses such as building, equipment, etc., you should still notify your local FSA Office about the loss(es). FSA is responsible for monitoring crop conditions for disaster designation purposes and also may have other programs that could provide assistance. UMass Extension works in partnership with the USDA National Institute of Food and Agriculture and the Northeast Extension Risk Management Education Center to educate Massachusetts producers about Federal Crop Insurance and USDA Disaster Assistance Programs. For more information, please contact UMass Risk Management Specialists Paul Russell at pmrussell@umass.edu or Tom Smiarowski at tsmiarowski@umass.edu.

EVENTS

UMASS VEGETABLE PROGRAM: AGRICULTURAL WATER TWILIGHT SERIES

The UMass Extension Vegetable Program is offering a series of online twilight meetings all about water! We will welcome Extension specialists and farmers from Massachusetts and beyond to cover a range of water-related topics.

Part I: Water Use Regulations, Water Monitoring Tools, and Efficient Irrigation

Wednesday, September 16, 2020 - 6:00pm to 7:30pm

Speakers:

- **Rachel Schattman, UMaine Agroecology Lab** - Water use regulations in New England
- **Joshua Faulkner, UVM Extension** – Moisture monitoring technologies and irrigation efficiency
- **Tim Wilcox, Kitchen Garden Farm, Sunderland, MA** – Tile drainage, wells, and irrigation equipment

Register here: <https://umass-amherst.zoom.us/meeting/register/tJcud-mgpzovGdejLQQ66TRpmx3yyBITJ1V-%C2%A0>

Part II: Water System Mapping and Water Testing for FSMA

Wednesday, September 23, 2020 - 6:00pm to 7:30pm

Speakers:

- **Massachusetts Department of Agricultural Resources Produce Safety Inspection Program** - Massachusetts' draft produce safety regulations and update on water testing rules
- **Scott Monroe, Purdue Extension** - Water sampling, understanding risks to source water and understanding water test results
- **Phil Tocco, MSU Extension** - Water distribution system mapping and inspections

Register here: <https://umass-amherst.zoom.us/meeting/register/tJMvde2hrDspHtIxtBWDbCe75aHup0t6Z4aR% C2%A0>

Part III: Post-harvest Water Quality and Sanitizer Use

Wednesday, September 30, 2020 - 6:00pm to 7:30pm

Speakers:

- **Amanda Deering, Purdue Extension** - Background on the different sanitizer materials available or practical for small-medium scale growers and how to measure and monitor them
- **Phil Tocco, MSU Extension** – Sanitizer use demonstration

Register here: <https://umass-amherst.zoom.us/meeting/register/tJErcOCqrTwiGNaUN7Sn79DyZEG0zMUi6tma% C2%A0>

VIRTUAL PRODUCE SAFETY ALLIANCE GROWER TRAINING

Due to the COVID-19 pandemic, many states are now offering [remote Produce Safety Alliance \(PSA\) Grower Training \(GT\)](#) courses to help growers satisfy the FSMA Produce Safety Rule requirement outlined in § 112.22(c) that requires ‘At least one supervisor or responsible party for your farm must have successfully completed food safety training at least equivalent to that received under standardized curriculum recognized as adequate by the Food and Drug Administration.’ A [list of upcoming PSA GT courses](#) can be found on the PSA website. Remote PSA GTs are often limited to

residents of the host state, as they may be subsidized by state funds. However, some states do not have funds set aside to support attendance at PSA GTs and other states do not have an in-state team trained to deliver the PSA GT.

To meet the needs of domestic growers who do not currently have access to other PSA GT options, and for those to whom the [online PSA GT](#) course is not a good option, the PSA team will be offering a remote PSA GT course on September 8-9, 2020. The course is only available to domestic participants because of the need to ship manuals so everyone has one before the start of the course. The registration fee is \$130 and will include a PSA Grower Training Manual and a Certificate of Course Completion from the Association of Food and Drug Officials (AFDO).

The course will be delivered using the Zoom videoconference platform. In order to be eligible for the Certificate of Course Completion from AFDO, you must be present for and participate in all course modules. Your video must be visible to the presenters (virtual backgrounds are acceptable, but we must be able to see you to verify participation). If you are new to Zoom, visit our page of tips for [Preparing to Join a PSA Grower Training Zoom Meeting](#).

When: September 8-9, 11am-4:30pm. Make sure you are available for those times on both dates before registering.

Registration: <https://producesafetyalliance.cornell.edu/training/grower-training-courses/remote-psa-grower-training-course-sept-8-9-2020/>. This course is limited to 20 participants. You will be contacted for your payment details once we meet the course minimum of 10 registrations. If we do not meet the minimum by Monday August 24, the course will be canceled. We plan to offer additional PSA team-led GT courses later this fall and will share those dates when they become available.

PREVENTIVE CONTROLS WEBINAR FOR SMALL AND MEDIUM FOOD PROCESSORS

Is your business a small or medium food processor? If yes, have you ever thought about what food safety laws you should be following, and what the possible consequences are for not doing so? This 1-hour webinar is the first in a series of three specifically designed for small and medium sized processors affected by the Food Safety Modernization Act's Preventive Controls for Human Foods Rule. The webinar will give you an easy-to-understand overview of the FDA Preventive Controls Rule and will help you learn what it means to be in compliance with these laws. This webinar is the first in a series of opportunities to learn about and receive subsidized training and technical assistance to bring your business into compliance with the Preventive Controls Rule – more details on future programs to come.

When: The webinar will be held on the 3 dates listed below. To be eligible for future programming and technical assistance, you must attend **one** of the sessions below.

- August 20, 12pm - 1pm
- August 27, 8am-9am
- September 10, 7pm - 8pm

Registration: https://umassamherst.col.qualtrics.com/jfe/form/SV_6QA5XrtoOPyFZ2d

Please contact us at valueaddedfood@umass.edu for information regarding this series of events.

VIRTUAL LISTENING SESSION: FEASIBILITY OF INSURING LOCAL FOOD PRODUCTION

The USDA, Risk Management Agency (RMA) is soliciting feedback about improved Federal Crop Insurance coverage options for farmers selling to local food markets including but not limited to farmers markets, Community Supported Agriculture (CSAs), road-side stands, restaurants, retailers, schools, and institutions. Federal Crop Insurance options for farmers selling to these local markets have been very limited and RMA will use the feedback to help identify potential changes and/or additions for producers growing specialty crops and supplying local markets. The sessions will be conducted by Agralytica, a private entity contracted by RMA to conduct these virtual listening sessions.

When: The session for Region 2 (which includes all New England States) will be conducted on **Tuesday, September 1st at Noon**. While producers in Region 2 are encouraged to participate in this session, they may join other scheduled sessions shown on the link below.

How to join: The link below contains the instructions for accessing the virtual listening sessions. Additional feedback can also be provided to Agralytica following instructions on the last page of the link.

Link: <https://www.rma.usda.gov/-/media/RMAweb/Specialty-Crops/Virtual-Listening-Sessions-Feasibility-of-Insur->

[ance-for-Local-Foods.ashx?la=en](#)

RMA is required under the 2018 Farm Bill to improve and expand coverage options available to specialty crop producers. The 2020 growing season has presented a variety of challenges and obstacles for specialty crop producers. This is an excellent opportunity to provide feedback on the types of products that could improve production risk management options for your farming operation. Please take advantage of this opportunity!

UPCOMING UNH WEBINARS

- Wed, Sept 9, Noon-1pm. [Crop storage: Hold on to what you've got. North Country Lunch and Learn.](#)

For years Lunch and Learns were a staple of Coos County Cooperative Extension's connection with the community. We will be bringing back the Lunch and Learns as a way for people to get together as we continue to practice social distancing. Do your part for society by eating lunch in front of your computer! These occur monthly on various topics and hope everybody can learn something new and interesting. Learn more and register at the link above.

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