



UMass
Extension

Vegetable Notes

For Vegetable Farmers in Massachusetts since 1975



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CROP CONDITIONS

I don't need to tell you all this but, it's hot and dry out there! Many farms have been passed over by the few recent storms, especially in the southern parts of MA, and are bone dry and dusty. We all know how the hot hot weather makes us feel--sluggish and cranky, maybe?--but here is some info about the impacts of heat on our vegetable friends from Steve Reiners of Cornell University:

“Heat impacts vine crops like squash, melons, pumpkins and cucumbers both directly and indirectly. High temperatures lead to more male flowers at the expense of females. And it's the female flowers we need to get fruit. Plus, hot days keeps bees from foraging and pollinating. So even with female flowers, you may notice them fall off as bees failed to do their job.

Tomatoes are not immune to the heat either. Although we think of them as heat loving plants, they prefer more seasonable summer temperatures. Hot days over 90F and warm nights over 80F results in pollen sterility. Similar to squash, without viable pollen, you may notice flowers and pea-sized fruit fall off the plants. The condition is temporary, and fruiting will return to normal when it cools down. But that might explain the lack of fruit you might see about six weeks from now. That's just about when the fruit that should be setting now would be ready for harvest. Peppers too have a similar problem with fruit and flower excision. Snap bean flowers may also abort in the heat and result in split sets, which can reduce yields considerably.

The heat causes quality problems too. Cucumbers become more bitter due to a high level of cucurbitacin, a compound that occurs naturally in the fruit but usually at low levels. Stress of any kind tends to increase its level. Tomatoes and peppers will develop more blossom-end rot as drought

stress reduces calcium uptake. Sunscald is also a problem. Fruit exposed to temperatures greater than 95F can experience yellowing and browning while temperatures 5 to 10 degrees higher can cause necrosis and death of tissue. Maintain good foliage cover and fruit shading by managing diseases and optimizing soil fertility. Be careful when harvesting sensitive crops like peppers as broken branches expose previous hidden fruit. Silk emergence and pollen shed timing in sweet corn can be uncoupled by heat. Heat and dry winds also reduce pollen germination and pollen tube development. This results in missing kernels and poor tip fill.

Hot, stagnant air masses may lead to ozone damage on crops. Common ozone symptoms are small, irregular, shaped spots that range in color from dark brown to black (stipple like) or light tan to white (fleck like). These spots are found only on the upper surface of the leaf. Very young and old leaves are less susceptible to ozone while newly mature leaves are the most susceptible. With severe damage, symptoms may extend to the lower leaf surface. Flecks



Moving irrigation around is a big job on many farms this time of year.

from insect feeding are usually spread uniformly over the leaf surface while ozone flecks are concentrated in specific areas, usually most pronounced at the leaf tip and along the margins. The most sensitive crops include: Bean, Broccoli, Muskmelon, Squash, Onion, Potato, Radish, Spinach, Sweet Corn, Tomato. Intermediate crops include: Carrot, Endive, Parsley, Parsnip, and Turnip. Tolerant crops include: Beet, Cucumber, and Lettuce

The best thing you can do to reduce heat problems is to maintain your irrigation program. Dry soils make problems worse. To keep plants from wilting, water needs to move continuously from the soil into the roots and up through the leaves. The water is needed for photosynthesis which of course powers the plant. But it also cools the leaf as it evaporates. If it's dry, the small pores on the leaves called stomata close. That stops water from evaporating from the leaves. This not only shuts down photosynthesis but causes leaves to heat up.”

Despite the heat, the crops are growing well, markets are strong, and prices are high.

PEST ALERTS

Alliums

Onion thrips populations are very high and quality is low where they have gone uncontrolled. Harvest is starting now for early-maturing varieties so the window to control thrips may be past for most fields.

Cucurbits

Downy mildew is spreading through Pennsylvania but no new reports from New England were reported this week. At this time all growers should be actively managing for downy mildew in cucumbers using targeted fungicides on a weekly basis and at least using protectant fungicides on cantaloupe. The strain of the pathogen that affects cucumber can easily move into cantaloupe. For organic growers, copper can be effective in reducing disease severity and slowing disease spread, and will protect from other fungal and bacterial diseases—check REI, which can be up to 48 hours for some coppers.

Drought stress was observed in several squash fields this week, with wilting plants and marginal scorch of leaves, and exacerbating other problems like bacterial wilt, squash vine borer damage, and leaf diseases. Fruit set on these crops can be seriously reduced if water becomes limited.

Gummy stem blight has been diagnosed on several farms across the region this year. This disease is not commonly observed in summer crops in our region (except when it shows up as **black rot** on squash in the fall), and is considered more of a southern disease, but with more hot and humid weather with big rain events occurring now in New England, we are seeing conditions favorable for its development. The disease causes stem lesions, water-soaked lesion on the leaf margin, interveinal necrotic scorch, and randomly distributed circular lesions on leaves, wilt, yellowing, and eventually branch dieback and plant collapse. It can be seedborne and also overwinters on infested crop residue for about 2 years. Powdery mildew and insect feeding damage predisposes plants to damage from gummy stem blight. Fungicides can help reduce spread and later development of black rot on susceptible crops—consult the [cucumber disease section of the Guide](#) and look under “Anthracnose (*Colletotrichum*), Alternaria Leaf Spot, and Black Rot (*Didymella*)”

Striped cucumber beetles are back at it again, chewing on recently planted crops and spreading wilt throughout the field. Treatment should be considered when numbers reach an average of 1 beetle during the seedling-to-4-inch-tall stage.

Squash vine borer damage is common now in thick-stemmed crops like zucchini and winter squash, as well as squash fruit (especially delicata). If you see yellowed, wilted, or collapsing plants, look in the stems for a hole with sawdust-like frass pouring out and, if found, check inside the stem to find the borer inside. Though there is nothing to be done



*Gummy stem blight on watermelon.
Photos by D.Langston*

Table 1. Squash Vine Borer (SVB) trap captures July 24-30, 2020	
Location	SVB
Deerfield	1
Westhampton	-
Whately	0
North Easton	18

at this time, it is helpful to determine the cause of the damage, which can resemble that of bacterial wilt, drought stress, or other diseases, and if damage is high, consider managing for this pest next year—the borers overwinter in the field and can buildup within a field over time.

Solanaceous

Broad mite damage is being reported in peppers and tomatoes in the field, causing severe damage. Broad mites feed in the growing tip, and inject a toxin as they feed that causes the growing tip to become distorted or die. Plants become severely stunted and twisted and fruit develops an unmarketable gray scar tissue. Early in an infestation, if only a few plants are heavily infested, pull and bag those plants and treat the remaining plants. For more information and control options please see [last week's issue of Veg Notes](#).



Verticillium wilt of eggplant.

Potato leafhopper damage, known as “hopperburn” due to the yellowed and scorched look that plants get, is showing up in potato and eggplant, as well as beans. In eggplant the damage can resemble Verticillium wilt, which is also showing up in many fields right now. In potatoes, growers often wonder if treating plants this late in the season is worthwhile—we know that hopperburn causes reductions in potato yield, so if your potatoes are not close to the harvest date are still sizing up, they should be protected. This may mean that early season varieties may not be worth treating, while long season, later-maturing varieties could still put on more growth and should be treated.

Verticillium wilt was diagnosed in eggplant on several more farms this week. The disease causes a yellowing of lower leaves followed by wilting is the first sign of disease. Lesions have a characteristic V-shaped pattern which is widest at the leaf margin. Brown, necrotic tissue within lesions is surrounded by a large, irregular area of yellowing due to a systemic leaf toxin produced by the fungi. Symptoms are subtle and may be confused with insufficient moisture or other vascular wilts. The pathogen survives in the soil for extended periods and there is no chemical control, short of soil sterilization by steam, broad spectrum fumigants, or soil solarization. Avoid planting into infested fields.

Sweet corn

Corn earworm (CEW) is widespread but numbers are mostly still in the single digits, indicating a 4-5 day spray schedule in silking corn in most places in MA. The second generation of **European corn borer (ECB)** is getting underway in earnest now, especially at warmer and/or sandier locations. Again, be aware that carrot seed moths are common in traps now, and may interfere with trap numbers. This generation of ECB can cause problems in peppers and beans. Use a threshold of 7/week in peppers, and 2/night in beans to determine if sprays are necessary. **Fall armyworm (FAW)** has exploded this week, with high numbers in monitoring traps, especially along the river valleys where the pest moves more easily with storms. With numbers of adults high this week, watch for damage in the field next week. FAW can cause significant injury to whorl and even seedling stage corn, and can be tough to manage because it is resistant to pyrethroids

Table 3. 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

Table 2. Sweetcorn pest trap captures for July 24-30, 2020

Location	GDD (base 50°F)	ECB NY	ECB IA	FAW	CEW	CEW Spray Interval
Western MA						
Sheffield	-	5	0	-	0	<i>no spray</i>
Southwick	1559	1	0	0	5	<i>5 days</i>
Whately	1594	6	0	-	3	<i>6 days</i>
Central MA						
Bolton	1560	2	0	2	1	<i>no spray</i>
Leominster	1667					
Spencer	1406	1	0	0	5	<i>5 days</i>
Eastern MA						
Ipswich	1402	4	0	0	16	<i>4 days</i>
Concord	1513	2	1	0	2	<i>6 days</i>
Millis	1651	6	1	-	3	<i>6 days</i>
Sharon	1668	0	0	0	0	<i>no spray</i>
Seekonk	1585	30	0	10	10	<i>4 days</i>
Swansea	1495	3	1	0	10	<i>4 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						

(IRAC 3A) and because larvae are often covered by their own excrement, interfering with insecticide coverage. Treat when 15% or more plants exhibit FAW injury alone, or in combination with ECB injury. In emerging tassels, combine counts for ECB and FAW. For example, if 10% of plants have FAW and 12% have ECB, the combined infestation is 22%, above the 15% threshold.

Western bean cutworm (WBC) was caught in a monitoring trap this week in NH, the first in our region for the year. WBC is a native of North America that has recently expanded its range eastward from the Great Plains region. It is endemic now in NY, but does not usually show up or cause much damage to sweet corn in MA. Females look for late-whorl stage corn (or dry beans) to lay eggs in masses of 20-200 on leaf tissue. Larvae hatch and consume foliage on their way to the ear, where damage is concentrated in the tip, but may occur on the sides as well. The patchy nature of this pest and its cryptic nature make it a challenge for pest managers. The caterpillars looks similar to corn earworm, but does not have lines down the sides of its body like corn earworm does and has three distinct light-brown lines on its “neck” just behind its head—let us know if you see them by emailing umassveg@umass.edu

Sap beetle numbers are increasing now. Varieties with poor tip cover and/or ears that have been damaged by birds are most susceptible. Scout silk for sap beetles when silks begin to wilt and through harvest. Inspect the silk area at the tip and the husks of 50-100 ears across the field, and determine the percent of ears infested with adults, eggs, or larvae. If 10% of ears are infested within the last 7-10 days before harvest, a spray may be warranted. Pyrethroids used to control European corn borer (ECB) and corn earworm (CEW) infestations will reduce sap beetle, but if populations are high, a combination of pyrethroid and methomyl (Lannate) may provide additional control. Efficacy trials have shown that sprays on the 3rd and 6th days of silk were most effective, and additional, later sprays did not improve control. Carbaryl (Sevin), lambda-cyhalothrin (Warrior II), bifenthrin (Hero), and methomyl (Lannate) are more effective than most other insecticides. However, carbaryl cannot be used during the early silk period while corn is shedding pollen and does not allow for hand harvesting after use.

HARVEST AND CURING TIPS FOR ONIONS

Deciding when and how to harvest onions, then where and how to cure them can be challenging. When are they really ready to be pulled? Is the weather too wet or too hot to field cure? How did my onion field get so weedy? What should I do if there is a lot of foliar disease in my crop Here are a few tips from [University of Minnesota Extension](http://www.umn.edu/extension) we found helpful to accompany our usual onion harvest article:

Harvest: Optimum harvest from the standpoint of maximum storage life (before bulb sprouting), occurs while the onion foliage is still partially (30-40%) erect, and long before maximum yield is attained (when tops are completely down and dry). Since yields may increase 30-40% between the stage when tops begin to go down, and the leaves are fully down and dry, it is tempting to leave onions to cure in the field as long as possible. The optimum time for harvest therefore, must be a balance between highest yields and reduced bulb storage quality. Furthermore, excessively field-drying onions increases the risk of bald onions in storage. From UGA Extension: <http://bit.ly/2hOqy9I>: “Maturity is best determined by pinching the neck of the growing onion. Necks of immature onions are stiff, while necks of optimally mature onions are soft and

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: See the News section of this issue for more info.



Proper lodging on onions. Photo: C. Hoepfing

limber. When the necks are so weak that they cannot support the tops, the onions are over-mature. Simply observing the percentage of tops having fallen over is not a true indication of maturity, since the tops can be knocked over by strong winds, rain or become limp from lack of moisture.”

Digging and windrowing: To facilitate curing onions for harvest and storage, onion rows are undercut, lifted and windrowed for field curing. Rod-weeder diggers and knife undercutters are most often used. After an appropriate interval, the undercut onions are lifted and windrowed. This may be done with tops on or off, but most commonly with tops on to protect the onions from sunscald damage. Windrows are often mechanically “fluffed” to facilitate curing and later combined to facilitate loading. This will also shorten the drying period and should be done after each rainfall. After field drying has occurred, the onions may be topped and placed in storage buildings.



Topped and cured onions are brought into a well ventilated barn to bring them down to temperature slowly for storage. Photo: R. Hazzard

Topping: If onions are to be bulk-stored it is best to store them without their tops. This facilitates handling, loading and unloading the storage. If onions are to be topped and stored, tops must be totally dry, or only the dry portion cut and removed. Cutting through any portion of the top while it is still green or moist may result in excessive *Botrytis* neck rot in storage. In very wet years, do not top onions until after they have been cured. When all or a portion of the onion top is left on, the remaining tops are removed during grading and packing using roller toppers at the storage or packing facility.

Curing: Onions should be adequately cured in the field, in open sheds, or by artificial means before or in storage. Adequate curing in the field or in open sheds may require 2 to 4 weeks, depending on the weather. The best skin color develops at 75 to 90°F. This should be continued until the outer skins and neck are dry. Onions are considered cured when the neck is tight and the outer scales are dry and make a rustling sound when handled. This condition is reached when onions have lost 3 to 5% of their weight. If not adequately cured, onions are likely to decay in storage. The common form of decay is gray mold rot (*Botrytis*), which occurs at the top of the bulb - hence its name “neck rot”. High temperatures and high humidity (80%) during curing with good air circulation favor development of desirable skin color.

Here are our low-tech recommendations for curing and storage in New England: A greenhouse or hoophouse provides a good environment for curing, where temperature, airflow, and moisture can be controlled. Be sure to keep the temperature in the house **below 85°F**, which will probably require turning on fans and/or leaving sides and doors wide open—consider using a black shade curtain over the house to help moderate temperature. Curing can be done in the field, but it is harder to achieve good conditions for curing in an uncontrolled field setting. Avoid field-curing onions if rain is forecasted and, if it does rain, let the onions dry fully before handling—don’t handle the bulbs when they are wet. If the field is weedy, it may be excessively moist and air circulation may be limited; these conditions are not suitable for curing. Temperature and sun are also factors to consider—sunshine and temperatures in the 80s will enhance the bronze color in the skins, but extremely hot sun and temperatures in the 90s can cause sunscald. Onions curing on a sandy soil will heat up more quickly than those curing on a heavier soil.

Storage: To ensure maximum storage life, onions must be promptly stored after curing. Get them out of the sun as exposure to light after curing will induce greening of the outer scales. The optimum temperature for long-term storage of onions is 32°F with 65-70% relative humidity, but it is important to bring them down to this temperature slowly. In fact, holding onions in a barn or garage so that they cool along with the average outdoor temperature in late-summer and fall works quite well. Avoid cooling bulbs to well-below the average daily temperature because they will draw moisture from the warmer air, which can lead to disease. If you are selling the onions within a couple of months, keeping them in an un-insulated barn is fine. An insulated storage room is needed for longer-term storage.

Harvest Tips for Best Quality

1. **Be sure onions are well-dried and necks are tight** (i.e. the tissue does not slide when you roll the neck between your fingers) before topping. Bacterial diseases and *Botrytis* Neck rot can move through green tissue into the

bulbs. These diseases do not move in dry tissue.

2. **Leave 2-3 inches of neck on the bulb.** This increases the distance from the cut surface to the bulb for these pathogens to travel.
3. **Minimize mechanical injury during harvest & topping.** Reduce drops to 6" and pad sharp surfaces. Bruises provide direct entry points for diseases to get started.
4. **Grade out damaged onions before putting them into storage.** Damaged bulbs give off moisture, which is favorable for development of diseases in storage.

--Written by John Howell, Andrew Cavanagh, & Ruth Hazzard. Updated by S.B. Scheufele

GENERAL MANAGEMENT STRATEGIES FOR RHIZOMATOUS PERENNIAL WEEDS

--written by Elizabeth Buck, Fresh Market Vegetable Specialist CCE Cornell Vegetable Program
Originally published in Cornell's VegEdge newsletter on August 1, 2018



Perennial sowthistle showing underground rhizomes. Photo by C. Hoeping

Perennial rhizomatous weeds include Canada thistle, perennial sowthistle, field & hedge bindweeds, horsetail, yellow nutsedge, and quackgrass. All of these weeds have running stems that go through the soil and have many buds along their length, called rhizomes. In the spring, some of those buds emerge as vigorous, troublesome shoots. The rhizome stems store carbohydrate reserves over the winter and serve as propagation material.

Tillage and other field operations serves to propagate these rhizomes. Each pass with a chisel plow, for example, will distribute rhizome pieces up a field. New horsetail plants, for example, can emerge from a ¼ inch long segment buried a foot below the surface. As you can imagine, this makes mechanical control challenging. The key management objective for all perennial weeds is to kill the overwintering, underground tissues. In the case of perennial rhizomatous weeds, this is often most efficiently achieved through the use of translocating herbicides applied between mid-summer and early fall.

Translocating herbicides are taken up by the plant and move in the phloem, following the flow of sugar to the strongest, most actively growing sinks. In late summer and early fall, perennials are sending resources to the overwintering structures, like rhizomes, to prepare for winter. In the spring, resources are flowing from the below ground rhizomes to the new shoots, and the rhizomes are being physically depleted. Around bloom that balance begins to shift for many perennial species as they partition more of their photosynthetic resources to the underground overwintering structures. Thus, applications of translocating herbicides are often more effective in the long run when applied at or after bloom.

Glyphosate and several group 4 herbicides (dicamba, 2,4-D, Stinger) are examples of translocating herbicides. Other herbicides can be fall-applied to target rhizomes on a case-by-case basis, like the Group 1 material quizalofop (Assure II) for quackgrass rhizomes. Translocating herbicides work best when the weeds are unstressed and of an appropriate (label specified) size at time of application. The weeds should remain undisturbed for a couple weeks following application to achieve the greatest effect. Adjuvants, tank-mix partners, and water alkalinity can all influence the efficacy of some common translocating herbicides. Use caution when applying translocating herbicides near horticultural crops. Read labels carefully regarding crop safety and environmental conditions at application, and consider using a hooded sprayer for applications near crops.

Pre-emergent herbicides generally have little impact on emerging rhizome shoots because they are designed to control seedlings, not established plants. In-season contact herbicides can knock back the top growth of most perennial rhizomatous weeds. This has a two-fold effect on the rhizomes:

- 1) reduces the amount of photosynthates transported to below-ground storage
- 2) can force the rhizome to further expend energy reserves by generating replacement shoots.

This two-fold approach underpins the cultural and mechanical control strategies for rhizomatous broadleaf perennials.

Step 1 is to weaken the rhizome by depleting the energy reserves. Step 2 is to limit the amount of energy that is allowed to go back into the ground to replenish old rhizomes and grow new ones.

Rhizome depletion occurs every time new shoots emerge. The larger the rhizome, the more energy it has to grow shoots. Keep in mind that not every bud on a rhizome turns into a shoot – several are held back in case the plant needs to regenerate shoots. Here two tactics develop:

1) Forced Depletion via recurrent regeneration

Start with smaller rhizome pieces and always keep them sending resources upward. Do this by eliminating shoots several times over the course of the season using cultivation, mowing, etc. However, and this is critical: taking a mechanical approach means committing to making many control passes throughout the season. Remember that every time ground infested with rhizomatous perennials is worked the weed is propagated and there are many times more weeds to control. That means there are many more opportunities to lose control of individual plants and make the problem worse if repeated operations to limit top growth do not occur or are ineffective. Be careful not to spread the rhizomes while cultivating – work towards the center of the patch and remove dangling rhizome pieces from equipment. Successfully eliminating top growth multiple times not only depletes rhizomes, it also effectively prevents the development of new rhizomes. This tactic can be used to reset the stage of top growth so weed size better aligns with heights specified on translocating herbicide labels.

2) Limit carbohydrate storage via induced stress

Perennial weeds are less likely to overwinter if they have weak rhizomes. They also are less tolerant of other stresses. For example, heavy competition from cover crops, drought, or disease have a better chance of finishing off a weak rhizome than one left to grow all summer. This same logic applies to fall herbicide use – a weaker rhizome is easier to kill. Rhizomatous perennial problems are the perfect scenario for making full use of as many tools in the weed control tool box as possible, to best exploit all the weaknesses in the biological cycles of these difficult plants. Unfavorable crop rotations, dense cover crops, and narrower crop rows or higher planting density are some examples of other toolbox techniques that will stress perennial weeds. Note that to date, there is insufficient evidence to support the use of light exclusion methods (tarping) for long-term suppression or killing of rhizomatous perennials.

Though overwintering plants are a primary concern, seeds deposited into the seed bank can permit re-infestation down the road. Aim to control the plants before the seed can mature by attacking populations shortly after flowering begins. Cultivation can be insufficient to deal with large escaped plants in bloom, and the timing often prohibits herbicide use within a vegetable field. In these cases, consider taking a mower or weed whacker to patchy, isolated stands of large weeds that are in bud or flower. Many weeds can finish immature seeds on severed portions of the plant so strive to make timely mowing-type operations, especially if the weeds have already flowered. Luckily, seedlings are far easier to kill than established plants. When caught early, mechanical or chemical control can be effective against seedlings of perennial rhizomatous weeds.

Special Note on Yellow Nutsedge: Currently, yellow nutsedge (YNS) is initiating and setting up the bulk of their little tubers (which form at the terminal end of the rhizomes), as typically happens during mid to late July. If severed from the main plant now, the partially formed nutlets will not be viable and the main plant will struggle to produce replacements. The window for taking advantage of this vulnerable developmental state is small, maybe 2-3 weeks. To sample YNS for the appropriate staging, dig several up throughout the field/patch being careful to dig up the whole rhizome instead of pulling and breaking them off. The rhizome tips swell and become rounded when initiating tubers. The nutlets then become fully rounded, then start to get a brownish coating on them. They need to be disturbed before this coating is fully developed and set. The window for control is between the clearly initiated tuber and the light brown, soft/incompletely coated stages. Making the field operation before the second half of July provides plants with enough time to set a second, decent crop of nutlets.



*Yellow nutsedge with nutlets.
Photo by S. Dewey*

Tackling perennial rhizomatous weeds may be a multi-season task, but it is achievable. With a good weed map, dedication, and perseverance, these troublesome weeds can be conquered.

PRE-COOLING VEGETABLES FOR SALE AND STORAGE

Produce quality cannot be improved after harvest, only maintained. Peak harvest season is also the time when crops are carrying the most field heat, which needs to be removed in order to achieve good shelf life. Wholesale or large scale farms tend to harvest crops before peak ripeness, while direct retail farms (which tend to grow more specialty varieties that have poor storage qualities) tend to harvest crops close to peak ripeness. Cooling and storage techniques will be slightly different depending on the type of operation and crops grown, but the principles covered in this article are important for all.

Start with these harvesting tips from Trevor Suslow, Vegetable Crops Specialist at UC Davis in California:

1. Harvest during the coolest time of day (early morning) to maintain low crop respiration.
2. Avoid unnecessary wounding, bruising, crushing, or damage from humans, equipment, or harvest containers.
3. Shade the harvested product in the field to keep it cool. By covering harvest bins or totes with a reflective pad or even just some newspaper, you greatly reduce heat gain from the sun, water loss, and premature senescence.
4. If possible, move the harvested product into a cold storage facility or postharvest cooling treatment as soon as possible. For some commodities, such as berries, tender greens, and leafy herbs, one hour in the sun is too long.
5. Do not compromise high quality product by mingling it with damaged, decayed, or decay-prone product in a bulk or packed unit.
6. Only use cleaned and, as necessary, sanitized packing or transport containers.



Creative conversion of the Town of Amherst Information Booth into an insulated walk-in cooler powered by a Cool Bot for a road side stand at Sunset Farm in Amherst, MA

Once out of the field, pre-cooling is an important step to take before crops are marketed or go into longer term cold storage. This step can also reduce the overall refrigeration needed at peak harvest times. Pre-cooling will extend aesthetics, flavor, and nutritional quality of the crop. Pre-cooling is not an important step for crops that are field-cured such as winter squash, pumpkins, or onions.

What does pre-cooling do?

- Suppresses enzymatic degradation (softening) and respiratory activity (water loss/wilting)
- Slows or inhibits the growth of decay microorganisms such as molds and bacteria
- Reduces the production of ethylene (a ripening agent) or minimizes the crop's reaction to ethylene
- Improves market flexibility by allowing the farmer to hold crops longer.

Five types of Pre-cooling:

1) Room Cooling – is not really a method of pre-cooling since it is often the final resting place of a crop on the farm in an insulated room or container with refrigeration units such as a Cool Bot. This method tends to be slower at cooling than others. Room cooling may be too slow to prevent wilt-ing, premature ripening, or decay depending on the crop, how it is packed, or arranged. However, for small farms, this may be the only cooling method available.

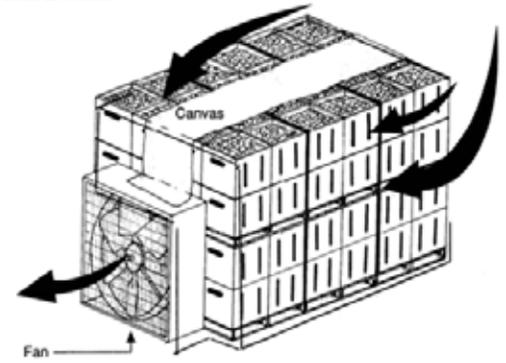
2) Forced Air Cooling – adding fans to a room cooling system to push cool air through ventilated produce bins will



Hadad produce cooler prototype

increase the rate of cooling by 75 to 90%! This is a simple method for farms that already have cooling units. To save energy, use a thermostat placed in the harvest boxes to auto-matically shut off the fan when the produce reaches the desired temperature. Alternately, Robert Haddad, Vegetable Specialist at Cornell Cooperative Extension has developed a prototype for pre-cooling several boxes of produce before they go into the storage unit (photo). In a cooler, stacking arrangement for increased air flow is important to speed up cooling time. Five percent vent hole space on the sides and ends of the boxes is ideal, and containers should be aligned so that vent holes are lined up on all sides to encourage air flow. Forced air cooling should be done before adding bags, wrappers or dividers to produce as this also slows the rate of air flow through containers. Some crops such as cabbage are very dense and it can take 4-5 hours for a pallet to cool down using this method. Forced air and room cooling usually require the least added infrastructure for cooling vegetables. For more details on forced air cooling and recent research findings from UVM Extension see the [June 27, 2019 issue of VegNotes](#).

Figure 2. Forced-air Tunnel



In forced air cooling, create a wind tunnel in your cooler to remove field heat from vegetables for several hours before turning off the fan for longer term storage.

- 3) **Hydro-cooling** – uses cold water to remove heat from crops. This can be as simple as dunking crops in a tub of water or rinsing them with a hose on wire mesh benches or as complicated as purchasing a commercial hydro-cooler. In these more expensive systems a pump moves chilled water into contact with warm produce and the warmed water is then re-cooled and recycled. For cooling the water, many hydro-coolers have a vapor-compression refrigeration system similar to an air conditioner or refrigerator, while others use ice to cool the water. There are several different types of hydro-coolers out there, from conveyor belt systems for palletized produce to batch or truck hydro-coolers, which may be more economical for smaller scale and diverse growers. If you are using a hydro-cooling method for pre-cooling produce you can also remove potential pathogens, or prevent introduction of pathogens, from fresh eating crops by adding a sanitizing agent to the hydro-cooling water. See article in the [June 25th, 2015 issue of Vegetable Notes](#) for appropriate wash water sanitizers.
- 4) **Top Icing** – is effective for some cold tolerant crops such as broccoli, kale, or green onions. A slurry of liquid ice injected into containers is most effective for covering the crop. More expensive water proof containers are needed for this cooling method, and ice adds to the weight of the product for transportation, however, some grocery stores require this method of produce delivery.
- 5) **Vacuum cooling** – is accomplished by making the crop sweat (evaporative cooling) but at a low pressure (using a vacuum) so that the temperature at which the crop starts to sweat is lowered to 34-36°F. Using this technology you can lower the temperature of leafy greens to 34°F in less than half an hour–this method is very efficient. It is most useful for crops that have a large surface area and a lot of water, since they will lose some in the process. This is the industry standard for cooling lettuce and spinach. Research has found that other crops like cucumber, eggplant, carrot, turnip, broccoli and pepper can also be cooled this way. For these less moist crops, adding water (dunking in a tub or rinsing with a hose) before vacuum cooling is helpful. Crops with a large surface area to mass ratio are most appropriate for this cooling method. Vacuum cooling is the most expensive method described here, requiring high infrastructure investment, but also the most energy efficient for large quantities of crops because it cools only the produce. At least one large greens producer in Massachusetts has a vacuum cooler.

Which of the above method you chose for your farm will depend on the cost to install and operate, the temperature of your crop at harvest, the respiration rate of your harvested crop, your packaging requirements, volume and mix of crops, and market expectations. For example, potatoes have a lower respiration rate than asparagus and sweet corn, making potatoes a better candidate for forced air and room cooling and asparagus and sweet corn better candidates for hydro-cooling and top icing.

--Written by Katie Campbell-Nelson, UMass Vegetable Program

MA PESTICIDE LICENSE INFO: LICENSES, STUDY MANUALS, & EXAMS

Pesticide License Exams - The MA Dept. of Agricultural Resources (MDAR) has begun opening dates to hold exams for new exam applicants. Individuals will be able to begin signing up for new exams beginning July 9, 2020. The exams will be held at the Colonial Inn in Gardener under a covered tent. Safety precautions will be sent to the examinees ahead of time so that they can be prepared when coming to the exam site. Please be aware that space is still limited, but MDAR is continuing to work on an online exam process, and will be adding some additional dates for the beginning of August. Safety of examinees and MDAR employees has been their priority when organizing this. To register, go to <https://www.mass.gov/pesticide-examination-and-licensing>.

Online Exams - MDAR is pleased to announce that we are moving forward with online examinations. We are in the very early stages of setting up the exam online with the vendor. The priority is to put the Commercial Applicators Exam online first. As we are in the early stages of development it is unclear how long this will take and the exact details of how this will all work, but generally speaking an examinee will be able to go online and take the exam in a secure manner anywhere they have computer access. We are also trying to set it up so that an examinee can take the exam at any time of day and any day of the week, but that is a point we need to continue to work on. I would like to note that there will be an additional fee associated with taking the exam online. As we are in the very early stages of this development I cannot tell you what the exact fee is, but I can tell that that it is minimal given the flexibility this new system allows. As we move forward I will continue to provide updates and if you have any follow up questions, please let me know.”

Pesticide Exam Preparation Workshops - The UMass Extension Pesticide Education Program is offering these workshops to help applicants prepare to take the Massachusetts Pesticide Applicator’s License exam. Topics covered: Pest Identification, Pesticide Types and Formulations, Pesticides and Human Health, Pesticide Label, Pesticides and the Environment, Integrated Pest Management, Pesticide Laws and Regulations, and Practice Exam. For more information, go to https://www.umass.edu/pested/training_workshops/registration_form13.htm.

Pesticide Manuals - To order a copy to study prior to taking the exam, go to https://www.umass.edu/pested/study_materials/index.htm.

Recertification Credits - UMass Extension’s Pesticide Education Program will resume offering online workshops in the fall that offer recertification credits. For info on how to register for these, go to https://www.umass.edu/pested/recertification/current_workshops.htm

For holders of Massachusetts pesticide licenses whose current three-year retraining or recertification cycle ends on July 1, 2020, the MDAR Pesticide Program has extended the time permitted to earn credits to December 31, 2020 as well as the number of computer-based or online credits that are acceptable for these specific individuals. This means that individuals with a three-year retraining cycle ending on July 1, 2020 may obtain any portion or all of the needed training credits from online sources and have until December 31, 2020 to do it. For more information, go to <https://www.mass.gov/doc/pesticide-license-recertification-processes-and-related-impacts-from-covid-19/download>

Temporary Licenses - If your pesticide license has expired and you are unable to re-take the pesticide exam in 2020, the Mass. Dept. of Agricultural Resources will issue temporary pesticide licenses, without an exam, if certain criteria are met. For an individual with an expired license who wants to obtain a temporary Massachusetts Pesticide Applicator License, the license must have an expiration date of December 31, 2017 or after; the license was in good-standing when it expired; and the applicator has not had a pesticide violation within the past three (3) years; among other criteria. This significantly impacts pest control services; especially, seasonal businesses such as lawn care and mosquito and tick services. For more info on this update, go to <https://www.mass.gov/guides/covid-19-resources-for-agriculture> under Addressing COVID-19 Impacts, Bulletins and Guidance. You can find the specific bulletin at <https://www.mass.gov/doc/mdar-bulletin-17-temporary-pesticide-license/download>. These temporary licenses will expire on December 31, 2020. If you will want to be licensed in 2021, you will be required to take the pesticide exam.

NEWS

MASSACHUSETTS RESIDENTS ASKED TO REPORT RECEIPT OF ANY UNSOLICITED PACKAGES OF SEEDS

The Massachusetts Department of Agricultural Resources (MDAR) has been notified that several Massachusetts residents have received unsolicited packages that appear to have originated in a foreign country and contain seeds. While the exact types of seeds in the packages are unknown, the seeds are thought to be invasive plant species, and not believed to be harmful to humans or pets but could pose a significant risk to agriculture or the environment.

MDAR encourages Massachusetts residents that receive or have received an unsolicited package of seeds to not plant the seeds and immediately complete a [form](#) on MDAR's website to provide important information to state plant regulatory officials.

Residents that receive a package should hold on to the seeds and all packaging, including the mailing label. A representative from the U.S. Department of Agriculture or MDAR will be in contact with instructions regarding the collection or disposal of the seeds.

Invasive plant species can threaten the integrity of local ecosystems and displace native plants, including rare and endangered species. The most effective approach to mitigating the risk of invasive plant infestation is to take steps to ensure they are not planted.

Unsolicited packages of seeds have been received by people in several other states across the United States over the last several days. On Tuesday, July 28, 2020, the U.S. Department of Agriculture issued a [press release](#) announcing that it is working with state plant regulatory officials to investigate the situation. The USDA urges anyone who receives an unsolicited package of seeds to immediately contact their state plant regulatory official or plant health director.

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 Aug. 28, 2020. Read more about these changes [here](#), or contact your local FSA office

NORTHEAST BIPOC FARMER RELIEF FUND NOW ACCEPTING APPLICATIONS

The Northeast BIPOC Farmer Relief Fund is now accepting applications from BIPOC (Black, Indigenous and People of Color) folks living in the Northeast who work in agriculture and have been economically impacted by the COVID crisis. Applications will be accepted through August 10th.

This Relief Fund is providing support to BIPOC folks because they have received COVID relief funds at disproportionately lower rates than white individuals, while the COVID crisis has impacted BIPOC communities at disproportionately higher rates than white communities. Both of these disparities are the result of structural racism. The amount recipients will get from this initiative is not by any means meant to rectify the racism in how previous (and current funds) have been distributed, but it is one small step to acknowledge and address these disparities.

For more info and application link, [click here](#).

The grant funds are being provided by Farm Aid, and Rural Vermont is excited to be among the farm and food systems organizations in the Northeast that are collaborating on this initiative.

NORTHEAST CLIMATE ADAPTATION FELLOWS VEGETABLE & FRUIT PROGRAM FOR COMMERCIAL FARMERS & AG ADVISORS NOW ACCEPTING APPLICATIONS

The Northeast Climate Adaptation Fellowship is open to commercial farmers in the Northeast U.S. who grow vegetables and/or small fruit and to agricultural advisors who work with vegetable/small fruit farms in this region. **Application Deadline: October 1, 2020**

Climate change is bringing challenges for vegetable and small fruit growers. For farmers to reduce their risk, they need to adapt. To address this increasing need, the Climate Adaptation Fellowship was created. The program provides a peer-to-peer curriculum for farmers and advisors. Its framework is designed to integrate climate science with a land manager's knowledge.

Participants in the vegetable and fruit program will enhance their knowledge of climate impacts to vegetable and fruit

farms in the Northeast. Accepted fellows will complete the program in pairs (farmers and advisors) to develop personalized farm adaptation plans and outreach materials to share with peers.

Learn more: [See flyer](#), [Visit CAF website](#)

NATIONAL TOMATO BROWN RUGOSE FRUIT VIRUS (TOBRFV) GREENHOUSE SURVEY

As a follow up to the initial find of ToBRFV in Florida in December 2020, the USDA is now requiring an emergency survey for ToBRFV in all states. As a result, the Massachusetts Department of Agricultural Resources (MDAR) is seeking to determine the location of commercially grown tomato, pepper, or eggplant, at high yields, under a structure (not field grown) in MA. Plants can be either fruiting or not yet fruiting hosts (not just for seedlings as before), and includes plants intended for local distribution as well as non-local. These sites will need to be surveyed by MDAR staff as soon as possible.

Growers should contact Joanne Klein directly at joanne.klein@mass.gov or call/text at 857-324-3404.

For more information on Tomato Brown Rugose Fruit Virus, refer to: <http://ag.umass.edu/greenhouse-floriculture/factsheets/tomato-brown-rugose-fruit-virus-tobrfv>

UMASS EXTENSION LAB SERVICES

The UMass Soil & Plant Nutrient Testing Lab is now accepting new mail-in samples for ROUTINE SOIL ANALYSIS and PARTICLE SIZE ANALYSIS orders ONLY. Please do not send orders for other types of analyses at this time. Processing time will be longer than usual since we are operating with reduced staff and staggered shifts. Thank you for your patience and understanding. For more information, please visit their website at www.ag.umass.edu/services/soil-plant-nutrient-testing-laboratory.

The UMass Plant Diagnostic Lab is also now receiving mail-in samples. For more information, please visit their website at www.ag.umass.edu/services/plant-diagnostics-laboratory.

PAYCHECK PROTECTION PROGRAM (PPP) UPDATES

The Paycheck Protection Program (PPP) has reopened the application period until August 8, 2020. The PPP original application period closed on June 30, 2020.

As a recap, PPP is a program administered by the U.S. Small Business Administration (SBA) with applications being processed through an SBA-approved lending institution. While PPP is a loan, an important point to note is that the loan will be fully forgiven if the funds are used for payroll costs, interest on mortgages, rent, and utilities (at least 60% of the forgiven amount must have been used for payroll). Forgiveness is based on the employer maintaining or quickly rehiring employees and maintaining salary levels. Forgiveness will be reduced if full-time headcount declines, or if salaries and wages decrease. The period used to cover eligible costs and expenses has also increased from 8 weeks to 24 weeks from loan disbursement, making it easier for PPP recipients to meet the 60% payroll requirement. Special consideration under PPP is provided for seasonal businesses such as farming operations.

More detailed information, including a list of SBA-approved lending institutions that process PPP applications can be found at: <https://www.sba.gov/funding-programs/loans/coronavirus-relief-options/paycheck-protection-program>

PPP is a program you should definitely look into if you employ agricultural workers on your farming operation!

OPEN APPLICATION PERIOD FOR FOOD SECURITY INFRASTRUCTURE GRANT PROGRAM

The Executive Office of Energy & Environmental Affairs (EOEEA) is accepting online applications for The Food Security Infrastructure Grant Program (FSIG) on a rolling basis now through September 15th, 2020.

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. Participants selected to participate in the Program will be provided with reimbursement grants broken into three funding categories: \$0 to \$10,000; \$10,000 to \$75,000; or \$75,000 to \$500,000.

Eligible projects include: (i) information technology needs; (ii) facility adaptation to new safety guidelines; (iii) storage,

processing, and delivery equipment, and (iv) other strategies that connect local food production with food insecure communities and residents. Project categories are broken into three funding sections.

For more information, or to submit an online application go to: www.mass.gov/service-details/food-security-infrastructure-grant-program. Please refer to the Request for Response (RFR) available on this website for full Program details. To apply online please review the RFR and then click on the 'Food Security Application Questions' to submit your application.

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