



UMass  
Extension

# Vegetable Notes

For Vegetable Farmers in Massachusetts since 1975



Volume 29, Number 19

August 17, 2017

## IN THIS ISSUE:

- Crop Conditions
- Pest Alerts
- Abiotic Disorders of Tomato in 2017
- Scout for Onion Thrips in Brassicas
- Pumpkin and Winter Squash Harvest, Curing and Storage
- Events
- Sponsors



*To spray this organic tomato variety trial, Katie drove the Rears RMCO, with a hydraulic fold boom and an auxiliary tank, 1 mph with a nozzle pressure of 60psi to put out 20 gal of water to 0.25A. In the tank was 2 quarts Cueva, 5 oz. Serenade Optimum and 2 oz. NuFilm for protection against late blight already found elsewhere on the farm. Photo, H. Godoy*

## CROP CONDITIONS

Tomatoes finally seem to be ripening. Meanwhile other warm season crops have been gaining momentum: watermelon, peppers, eggplant and multiple successions of cucumber, zucchini, summer squash, and sweet corn. Potatoes are being harvested for fresh market and processing, but storage potatoes and other storage crops like winter squash need to hang on a little longer. One focus this season has been to keep foliage healthy long enough for crops to ripen properly.

To spray or not to spray, that is the question. Some fall cucurbit fields have dense, lush foliage and the beginning signs of powdery or downy mildew, while others are totally consumed by powdery mildew leaving spaghetti squash or kabocha in the full sun. See tips on harvest and storage of winter squash in this issue. Dense foliage such as found in a healthy winter squash, pumpkin or tomato field requires large volumes (75 gal/A) of water and adequate pressure (60-80 psi) to get enough coverage and penetrate to all parts of the canopy. All these factors must be adjusted to your drive (or walking) speed (2-4 mph) in order to apply the correct amount of material. Many who grow fruit and vegetables have air blast sprayers, which force air out with the spray material. However, if bacterial disease or small-spored fungi are in the field, an air blast sprayer can spread the disease across it! The benefit of an air blast sprayer is that leaves get blown over, providing excellent control within the canopy. Note that vegetable and fruit air blast sprayers blow air in different directions (up and across for fruit, down and across for vegetables). If disease is already in the field, a boom sprayer is preferable, especially now that dual 45-degree nozzles exist, which can provide coverage at multiple angles to the crop canopy. In general, air blast sprayers are excellent for contact materials which need to cover all sides of a leaf, while boom sprayers are helpful for translaminar or systemic materials which can penetrate leaves and move through the plant to varying degrees. The paradox is that systemic and contact materials are often applied together in one tank.

## PEST ALERTS

### Bean

[Bean anthracnose](#) was found in Worcester Co., MA.

This pathogen survives between crops in infected crop residue and can be disseminated in seeds, air, and water. Lesions are more common on leaf petioles, the lower surface of leaves, and leaf veins where they



*Bean anthracnose on pods (left) and leaf underside (right). Mexican bean beetle larvae also present on leaf. Photos, E. Bush, bugwood.com (left) and S. Scheufele (right)*

are elongate, angular, and brick-red to purple becoming black. Pod infections occur as tan- to rust-colored lesions that become sunken cankers with a raised black ring and brownish-red border. Production of pathogen-free seeds in dry areas has reduced disease incidence and severity. Certain cultivars of bean are resistant to anthracnose. Rotate with non-host crops such as cereals and corn, for 2-3 years. Promptly incorporate crop debris after harvest to hasten decomposition.

**Mexican bean beetle** larvae and skeletonized bean leaves are being seen now. Release *Pediobius foveolatus* wasps to suppress populations of this pest.

## Brassica

### **Diamondback moth** (DBM)



and Imported cabbage-worm (ICW) are above threshold in many fields throughout

MA. We've been seeing much more DBM than in recent years—this caterpillar

has developed resistance to most insecticides, including some *Bacillus thuringiensis* products. The use of *B. thuringiensis* is still recommended because it favors survival of parasitoids but rotation of insecticide classes is important. Even *B. thuringiensis* products should be rotated, and current recommendations generally suggest alternating the *kurstaki* and *aizawa* strains. See Table 1 for treatment thresholds.

Crop	Stage	% Infested Plants
Cabbage & Broccoli, Cauliflower	pre-cupping (before head formation begins)	35%
Cabbage & broccoli	head formation to maturity	15%
Cauliflower	After heading	10%
Kale, collards & other greens		10-15%

## Cucurbits

**Angular leaf spot** was diagnosed on winter squash in Windom Co., CT and Bristol Co., MA. The bacteria (*Pseudomonas syringae* pv. *lachrymans*) overwinter in infested crop debris and can survive in dry leaves for 2-3 years. Take note of which varieties this disease is diagnosed on and avoid planting susceptible ones in the future. Avoid entering fields for cultivation and harvest when the foliage is wet. Spray with copper (e.g., Kocide) or copper/mancozeb (ManKocide) every 7-10 days and discontinue sprays when disease spread halts.



*Cucurbit angular leaf spot*

**Cucurbit downy mildew** continues to spread and was diagnosed on melon and cucumber in CT, RI, and NH this week. Last week it was diagnosed in cucumber, melon and butternut squash in MA. At this time, weekly sprays with oomycete-specific materials are recommended in cucurbit fields in addition to materials for powdery mildew. See article in [June 29, 2017 issue of Vegetable Notes](#).

**Powdery mildew** is responsible for defoliating some winter squash fields, which can reduce storage quality and flavor. Keep that foliage healthy! See article in [June 15, 2017 issue of Vegetable Notes](#) for fungicide recommendations for powdery mildew.



*Downy mildew (left) and powdery mildew (right) on cucumber leaf. Note that downy mildew lesions are limited by the leaf veins, while powdery mildew is not. Photos, M. Hausbeck, MSU (left) and UMass Vegetable Program*

**Phytophthora Blight** has been seen in the lower portion of a mini pumpkin field (though adjacent white pumpkins appear unaffected) in Hampshire Co., MA. The farmer plans to harrow that section of the field starting at the unaffected edge and working down toward the affected area, then cleaning his equipment thoroughly to avoid spreading the soil-borne disease. *Phytophthora capsici* can cause root, crown, and fruit rot in pepper, tomato, eggplant, and all cucurbits and thrives in warm, wet weather. Plant resistant varieties whenever possible; pumpkins with hard, gourd-like rinds are less susceptible to *Phytophthora* fruit blight. 'Lil' Ironsides', 'Apprentice', 'IronMan', 'Rockafellow', and 'CannonBall' have been reported as moderately resistant. 'IronMan', 'Can-

nonBall’, and ‘Rockafellow’ also possess powdery mildew resistance. Bell peppers that are relatively more resistant include ‘Conquest’, ‘Paladin’, and ‘Emerald Isle’. ‘Jester’ acorn squash also has had reported resistance by some growers. Mustard biofumigation or reduced tillage and heavy mulching have been shown to have some effect on reducing incidence of this disease.



*Phytophthora* lesion (left) and sporulation (right) on pumpkin. Photos, M. McGrath (left) and T. Zitter (right)

## Eggplant

**Two-spotted spider mites** were found infesting Jilo eggplant in Middlesex and Franklin Cos., MA in high-tunnel and greenhouse production near peppers and tomato which were unaffected—Jilo appears to be a preferred crop of this pest.

## Tomato and Potato

**Leaf mold** was found in outdoor and indoor tomato at different farms in Hampshire Co., MA and in NH. Leaf mold does not occur where relative humidity is less than 85%; therefore, it is rarely found in the field. Staking and pruning to increase airflow through the crop and promote leaf drying reduces disease spread. In the greenhouse, maintain night temperatures higher than outside temperatures. Sanitize greenhouse thoroughly in between crop cycles.

**Late blight** was confirmed this week on potato (cultivar ‘Natasha’) in Hampshire Co., MA and many new outbreaks on tomato are being reported. Both potato and tomato crops are considered to be at risk for this disease in MA and regular protective sprays are necessary. See the [August 3rd issue of Vegetable Notes](#) for management recommendations.

## Sweetcorn

**Corn earworm** moths were being trapped in high numbers near the coast in MA and NH last week, and now some central MA locations such as Leominster are capturing high numbers too (92/week), putting them at a 3-day spray schedule (see table 2).

**Fall armyworm** are being captured at very low numbers (unlike CEW). Keep scouting silking corn to keep your late summer sweet corn clean!

**European corn borer** trap captures remain low in MA and NH. We are no longer seeing a strong second generation flight of this pest as we used to 10 years ago.

## Multiple

**White Mold** was found in tomato in Middlesex Co., MA and in bean in NH. This disease has over 300 plant hosts, so is difficult to rotate away from. Hard, black survival structures resembling black beans (sclerotia) are produced on or within diseased tissue and can survive in the soil for 5-8 years. Sclerotia germinate and produce apothecia (that resemble tiny mushrooms) which release ascospores that are wind-dispersed, bringing the disease to new fields where it has not been before. A biological agent, *Coniothyrium minitans* (Contans) can reduce field populations of *S.sclerotiorum* by parasitizing sclerotia. Contans must be incorporated into the soil and is best applied 3-4 months before crop planting or in the fall. Mustard biofumigation is another practice which has shown some success.

**Spotted Wing Drosophila:** Numbers are still very high across the region. George Hamilton (UNH Extension) noted this week that at locations that have not been spraying he is catching over 100 fruit flies per trap while at sites that are spraying he traps out fewer than 5 flies—it’s good to know what non-control looks like.

**Table 2. Sweetcorn pest trap captures for 8.9.17-8.16.17**

Location	ECB	FAW	CEW	Spray Interval for CEW
<b>Western, MA</b>				
Amherst	2	-	-	-
Whately	2	-	1	no spray
<b>Central, MA</b>				
Leominster	2	-	96	3 days
Lancaster	4	0	9	4 days
Northbridge	0	0	7	5 days
<b>Eastern, MA</b>				
Concord	2	0	17	4 days
Ipswich	0	1	9	4 days
Dover	1	-	6	5 days
Millis	4	-	19	4 days
Sharon	0	-	62	4 days
Swansea	0	-	4	5 days
Seekonk	0	2	92	3 days

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

## ABIOTIC DISORDERS OF TOMATO IN 2017

With stretches of cool weather in June, when tomatoes began flowering and fruiting, then periods of cool nights and warm days in July, and now hot and humid (kind of) August weather, tomato crops have struggled to ripen this season. During last season's drought, abiotic disorders of tomato were more frequently related to lack of moisture. This year, with sufficient rainfall, we are more often seeing disorders related to temperature fluctuations and high humidity. Here are some of the disorders we have seen in 2017, with identification tips and management strategies:

**Catfacing** is a physiological disorder of field and greenhouse tomatoes. Tomato is considered “catfaced” if the blossom scar is enlarged or perforated. Often times, the fruit becomes extremely misshapen, but fruit distortion is not necessary to classify it as “catfaced”. This disorder has not been extensively researched and is not fully understood. Cold temperatures during flowering have been shown to increase incidence of catfacing, as have extreme fluctuations in night versus day temperatures. Damage from thrips to the side of the pistil of tomato flowers can also cause this disorder, and under some conditions, pruning and high nitrogen levels can increase catfacing incidence. Catfacing can increase chances of fruit becoming infected via the rough blossom scar by black mold, a disease caused by several different fungi. **Management:** Avoid excessive pruning and nitrogen fertilization. Avoid low greenhouse temperatures for both greenhouse-grown tomatoes and transplants. Use cultivars that are less prone to catfacing—heirloom tomatoes tend to be more prone to this disorder than hybrid varieties.



**Leaf roll** is often seen just after plants are heavily pruned during dry soil conditions, but oddly enough, leaf roll disorder also has been found to be caused by excess soil moisture coupled with extended high temperatures. If the tomato plant's top growth is more vigorous than root growth and we are hit with a dry, hot period, the foliage may transpire water faster than the root system can absorb it from the soil. In order to conserve water, the plant will roll up its leaves to reduce the surface area from which water can evaporate. Leaf rolling can also result from growing high-yielding cultivars under high nitrogen fertility programs. Cultivars selected for high yield or early ripening tend to be the most susceptible, and indeterminate varieties are more sensitive than determinant types. The good news is that leaf roll rarely affects plant growth, fruit yield, or fruit quality. Some viruses can look similar to tomato leaf roll, but if the symptoms appear suddenly, involve many of the plants in a field, and largely affects lower leaves, it is probably just physiological leaf roll. **Management:** Reduce symptoms by maintaining consistent, adequate soil moisture (~1 inch per week during the growing season, which will also help with calcium up-take, reducing blossom end rot problems). Do not prune heavily during hot, dry conditions or over-fertilize with nitrogen.



*Photo, C. Steinberg*

**Stitching/Zippering** is the term for when a thin, brown, necrotic scar extends from the stem scar down toward the blossom end on fruit. The longitudinal scar has small transverse scars along it, making it resemble a zipper or seam. Fruit can have one or several scars. This disorder does not affect the edibility of the fruit, but may render fruit unmarketable. Zippering occurs when anthers (the pollen-producing flower part) become fused to the ovary wall of newly forming fruit. This disorder occurs more frequently in cool weather. **Management:** Choose varieties that are less susceptible to stitching/zippering. Avoid low greenhouse temperatures.



**Yellow shoulder:** Liz Maynard of Purdue extension wrote about the following three causes of yellow shoulder in tomatoes: “**Genetics:** Varieties that have green shoulders in immature fruit are more likely to show the disorder. If you aren't sure whether a variety has the gene for green shoulders, check with the seed supplier, or review the tomato cultivar descriptions available from the North Carolina State University site at <http://cuke.hort.ncsu.edu/cucurbit/wehner/vegcult/vgclintro.html>. **High Temperatures/Sun:** Yellow shoulders are often found on tomato fruit exposed directly to the sun. On plants pruned to a single stem there may be many fruit in this situation. Loss of foliage due to disease can also expose fruit to the sun. If tomato fruit gets extremely hot it may exhibit sunscald, with the skin and flesh turning white and sunken on the exposed area of the fruit. Covering plants when the first fruit begin to ripen with shade cloth, whether in the field or



*Photo, P. Bachi*

over a high tunnel can reduce temperature and shield fruit. **Nutrition:** Inadequate potassium (K) is linked to this disorder. Research in processing tomatoes has shown that adequate potassium early in tomato plant development is necessary. Soil conditions that influence potassium availability, such as levels of magnesium and calcium are also a factor. The ‘Hartz Ratio’ calculator at Ohio State University <http://www.oardc.ohio-state.edu/tomato/HartzRatioCalculator.htm> provides a way to assess risk of the disorder in processing tomatoes based on soil properties.” **Management:** Plant cultivars without the tendency for “green shoulders”, use shade cloths, and maintain adequate levels of K fertility throughout the season.

Jerry Brust, IPM Vegetable Specialist at the University of Maryland, researches the management of abiotic disorders in tomato; he recommends using white plastic mulch laid early in the season to keep the crop cooler and using shade cloth on your most marketable varieties. In over 5 years of trials, Brust’s research has shown that a 30% filtering shade cloth increases marketable yields by 20-50%, depending on the year (photo, at right). A 4ft-wide shade cloth covering even a quarter of the crop canopy is sufficient to achieve this increase in yield, and the cloths may be used for many years. Other general recommendations for improving tomato health and avoiding abiotic disorders include maintaining a healthy root system, raising soil pH above 5.2, and providing even irrigation throughout the season (particularly during fruit set).



Harvest bins of tomato fruit; bin on left from plants covered with shade and bin on right from plants that were not covered  
Photo, G. Brust

While unfortunately it’s too late this season to correct any of these disorders, it’s useful to be able to identify them and thus avoid making unnecessary fungicide and fertilizer applications which might, in the end, lead to phytotoxicity.

--Compiled by G. Higgins and K. Campbell-Nelson from the references below

## References

- Brust, Jerry, IPM Vegetable Specialist, University of Maryland; jbrust@umd.edu. “Other Fruit Problems with the 2016 Tomato Crop” Weekly Crop Update, Delaware Cooperative Extension. August 26, 2016.
- Johnson, Gordon, Extension Vegetable & Fruit Specialist; gcjohn@udel.edu “Blossom End Rot Now Showing Up”. Weekly Crop Update, Delaware Cooperative Extension. June 26, 2015.
- Maynard, Liz, Assistant Professor of Horticulture, emaynard@purdue.edu, 219-531-4200. “Yellow Shoulder and internal white tissue in tomatoes” Veg Crop Hotline, Purdue Extension. August 7, 2014.
- Scott, J.W. 2014. “Zippering” and “Catfacing”. Compendium of Tomato Diseases and Pests, 2nd ed., eds, J.B. Jones, T.A. Zitter, T.M. Momol, and S.A. Miller.

## SCOUT FOR ONION THRIPS IN BRASSICAS

While growers have been scouting for and battling onion thrips (*Thrips tabaci*) in their alliums for a couple of months now, the struggle doesn’t end with the onion harvest. Onion thrips can be a significant problem on cabbage, where thrips feed on inner leaves of the head which are difficult to target by spraying. Damage may also occur on leafy brassicas such as broccoli, kale and collard, especially fall crops that are planted near a maturing onion crop. Thrips damage manifests as rough, golden or brown scars on the undersides of open leaves, scars and discolored layers within cabbage heads, and generally reduced vigor in plants. Inspection with a 10X lens shows wounds to the epidermis from the rasping mouthparts, and scars from wounds that healed over. Thrips damage can be confused with oedema, a physiological disorder that causes small, bump-like protrusions to form on leaf surfaces.



Onion thrips damage on cabbage. Photo, G. Holmes, bugwood.org

Tolerant varieties are the most cost-effective means of controlling thrips in

cabbage, but are generally not available in other brassicas. Cabbage varieties that have shown tolerance in trials\* include Benelli, Cairo, Superkraut 86, Bravo, Brutus, Cheers, Huron, and the various Vantage varieties. Varieties that are rated as susceptible include Atlantis, Bajonet, Charmant, Checkmate, Market Prize, and Rinda. There are a great number of varieties, and not all have been tested. Also, available varieties change. Some seed catalogues rate thrips tolerance. Consult your seed suppliers and search recent research trials regarding thrips tolerance on new varieties. The [Cornell Organic Production and IPM Guide for Cole Crops](#) has an extensive list of cabbage varieties and their thrips tolerance.

Avoid thrips by not planting cabbage or fall brassica crops near alliums or field crops such as alfalfa, clover, wheat, or oat, as thrips may migrate to brassicas when these crops are cut or harvested. Scout young plants for presence and feeding injury. Begin applications when damage is first noticed; in cabbage, apply foliar treatments before heads form. In fall brassicas, the need for thrips control may coincide with sprays for flea beetle or caterpillars and some insecticides control both. Broad-spectrum products include neonicotinoids (Admire Pro, Assail) and numerous synthetic pyrethroids (including Warrior, Pounce, Baythroid, Brigade, and Mustang). Biorational or organic products include spinosad (Entrust, OMRI listed; has both contact and ingestion toxicity), spinetoram (Radiant SC), novaluron (Rimon 0.83EC, insect growth regulator for immature stages only; not for mustard greens), and pyrethrin (PyGanic EC5.0, OMRI listed; contact activity only). Repeat applications at 7 to 10 day intervals based on scouting. Use a shorter interval in hot, dry weather. Use a spreader-sticker for better coverage. Apply in early evening, using high pressure and 100 gal water/A for best results. Systemic insecticides applied as a side dress up to 4-6 weeks after transplanting may provide adequate control in long-season cabbage. Rotate between insecticide groups to help prevent or delay resistance development.

\* Information on the relative tolerance/ susceptibility of storage, kraut and summer cabbage varieties evaluated in Cornell trials from 2005 to 2009 is available online at the Cornell Vegetable Program website: <http://cvp.cce.cornell.edu>; from the sliding menu on top, click on “cabbage”; you will need to “view the complete list of cabbage content” to see all the reports.

- UMass Vegetable Program

## **PUMPKIN AND WINTER SQUASH HARVEST, CURING AND STORAGE**

It feels a little early to be thinking about winter squash, but we're seeing fruit at various stages of ripeness out there and in a year marked by frequent rains, folks might be starting to make plans for getting crops out of the field. Winter squash and pumpkin fruits that remain in the field face a daunting list of diseases, insects and weather events that could threaten fruit quality. Once the fruit reaches maturity, prompt harvest and careful postharvest handling is generally preferable to leaving fruit in the field, particularly in a relatively wet season, such as this one. This is especially true if you know that your pumpkins or squash are in fields that were previously infected with *Phytophthora* blight (*Phytophthora capsici*). This disease can blossom quickly after heavy storms.

**Harvesting vs leaving in the field.** Since the pumpkin market lasts from Labor Day to Halloween, pumpkins may need to be held for several weeks before they can be marketed. When is it best to bring them in, and when to leave them in the field? If the vines are in good condition, the foliage can protect the fruit from sunscald. If foliage is going down from powdery mildew or downy mildew, this may help with ripening and make harvesting easier, but also increases the risk of sunscald or injury to pumpkin handles. There can be extra work involved in bringing fruit in early and finding good storage locations, especially for growers who normally have pick-your-own harvest. However, we recommend that growers harvest as soon as crops are mature and store under proper conditions, if it is feasible. If you need to hold fruit in the field for pick-your-own or any other reason, using a protectant fungicide (e.g. chlorothalonil) along with one of the targeted powdery mildew products can help protect from black rot, powdery mildew and some of the other fruit rots. Scout for insects feeding on the fruit and handles, which may include squash bug nymphs or adults and striped cucumber beetle, and control them if damage is evident. See the [New England Vegetable Management Guide](#) for treatment recommendations.

As we move into September, the other major factor in deciding when to harvest is avoiding chilling injury. Chilling hours accumulate when squash or pumpkin is exposed to temperatures below 50°F in the field or in storage. Injury increases as temperature decreases and/or length of chilling time increases. This is particularly important for squash headed into long term storage.

**What about pumpkin handles?** For decorative pumpkins, in some cases it's the handle that sells the pumpkin. Pumpkins may not be marketable if the handle is broken off or dried up. There are different views on when is the best time to cut handles, and many factors are involved. Whether or not handles shrink and shrivel after cutting is affected by plant stress, genetics (variety), moisture and temperature conditions, and disease. There are many diseases that can affect handles, including powdery mildew, *Plectosporium*, *Fusarium*, black rot, and *Alternaria*. Proper curing and storage conditions are key.

**What about eating quality?** For pie pumpkins and winter squashes, it's important to consider harvest and curing when thinking about flavor and texture. Dr. Brent Loy, professor emeritus of plant genetics at the University of New Hampshire and a researcher with the NH Agricultural Experiment Station, has worked for many years on developing new varieties of squash and pumpkins and had this to say about maximizing eating quality with proper harvest period in the proceedings from the 2011 Empire State Producers Expo:

When should squash be harvested? Most of the popular edible varieties of squash have relatively small fruit size, and near-full size is attained by 20 days after fruit set. Accumulation of flesh dry matter and therefore starch content peaks between 30 to 35 days after pollination. However, squash maturity can be defined as completion of seed fill, which occurs about 55 days after fruit set. Rind color is not a good indication of maturity. For example, acorn squash turn a dark green, mature-looking color within two weeks of fruit set, 40 to 50 days before they should be harvested! By the same token, butternut squash turn a fairly mature tan color by about 35 to 40 days after pollination, some two to three weeks before they should be harvested. If the fruit is harvested before the seed is fully developed, then assimilates for seed fill are remobilized from the flesh to the seeds during subsequent storage. Under conditions of poor plant health or premature harvest, movement of carbohydrates from the fleshy mesocarp tissue to seeds can reduce flesh quality substantially, especially in varieties with inherently low dry matter.

Keeping track of when fruit set occurs may not realistically fit into a grower's crop scheduling, so a reasonable rule of thumb for kabocha and acorn squash is to begin harvesting squash when the ground color of the fruit (part of the fruit that lays on the soil) reaches a dark orange color. Butternut squash does not show orange ground color, so harvest should not begin until at least two weeks after squash turn tan color. Maturity dates listed in seed catalogs are often in error, especially for acorn squash, where maturity is often stated as being between 70 to 76 days when in reality the actual maturities are probably closer to 90 to 100 days. Studies in New Zealand suggest that buttercup squash harvested at 40 days after fruit set may have a harder rind and be more resistant to storage diseases than squash harvested later. However, the sugar content is low in immature kabocha squash, so I recommend harvesting prior to 55 days only when vines have begun to go down, so as to minimize sunburn damage and fruit discoloration.

**Post-harvest: ripening and curing.** Ideally, pumpkins should be harvested when fully mature, but as long as they have started to turn color, they will ripen off the vine if held under the proper conditions. While not ideal, this may be preferable to leaving them in the field under risky conditions. If necessary, pumpkins can be ripened in a well-ventilated barn, high tunnel or greenhouse. The best temperatures for ripening are 80-85 degrees Fahrenheit with a relative humidity of 80-85%. According to Dr. Loy, studies with kabocha squash have shown that storing squash for short periods at high temperatures (ca. 80-85°F) can accelerate post-harvest increases in sugar levels. Night temperatures should not drop below the sixties. These are the same conditions as those used for curing. A period of curing is often recommended for squash or pumpkin showing non-hardened skin or surface damage. However, curing squash is not consistently beneficial if the squash is free of damage and already well-matured. The curing period is typically about 10 days. During this process the fruit skin hardens, wounds heal, and immature fruit ripens—all of which prolongs the storage life.

**Storage.** Storage life depends on the condition of the crop when it comes in and your ability to provide careful handling and a proper storage environment. All fruit placed in storage should be free of disease, decay, insects, and unhealed wounds. When harvesting squash and pumpkins, it is important to handle the fruit with care to avoid bruising or cutting the skin. Despite their tough appearance, squash and pumpkin fruit are easily damaged. The rind is the fruit's only source of protection. Once that rind is bruised or punctured, decay organisms will invade and quickly break it down. Place fruit gently in containers and move bins on pallets. Use gloves to protect both the fruit and the workers. Removal of the stem from squash (butternut, Hubbard, etc.) will also decrease the amount of fruit spoilage in the bins because the stems frequently puncture adjacent fruit, facilitating infection. This is especially important for butternut. These fruits need a period of curing to heal the stem scar, which can be done in windrows in the field if weather is favorable.

Delicata, acorn, buttercup squash and pumpkins can be stored for 1-3 months, while butternut has the potential to be stored for 5-6 months, given healthy fruit is stored under proper conditions. For longer-term storage, select fruit that are free from disease and haven't been subject to much chilling (below 50°F). Chilling injury is of particular concern with squash intended for storage because it increases the likelihood of breakdown. If squash has been exposed to chilling injury it should be marketed first and not selected for long-term storage. Be sure that storage areas have the capacity to maintain temperatures above 50°F throughout the storage space.

Pumpkins and winter squash should be stored in a cool, dry, well-ventilated storage area. Ideal temperatures are between 55° and 60°F with relative humidity of 50 - 70%. High relative humidity provides a favorable environment for fungal and bacterial decay organisms. Higher temperatures increase respiration and can cause weight loss. Lower humidity can cause dehydration and weight loss. Temperatures lower than 50°F cause chilling injury. In a greenhouse, temperature can be managed with ventilation on sunny days; heaters will be needed for storage into November and beyond. An inner curtain can reduce heat loss. Large fluctuations in temperature favor condensation on fruit within the bin, which encourages disease. Fruit temperature should be kept as close to the temperature of the air as possible to avoid condensation, which can lead to rot.

Few farms have the infrastructure to provide ideal postharvest conditions—especially when many growers are increasing their production of fall crops that need to be cured and stored for several months. Fortunately, finding a method that is 'good enough' often does the job. Even if it is difficult to provide the ideal conditions, storage in a shady, dry location, with fruit off the ground or the floor, is preferable to leaving fruit out in the field.

--R. Hazzard, compiled from multiple sources. Updated for 2017 by Lisa McKeag

#### **Reference:**

Loy, Brent. 2011. Maximizing Yield and Eating Quality in Winter Squash – A Grower's Paradox. Proceedings from the 2011 Empire State Growers Expo. Available at: <http://www.hort.cornell.edu/expo/proceedings/2011/Vine%20Crops/Maximizing%20Yield%20and%20Eating%20Quality%20in%20Winter%20Squash%2011.pdf>.

## **EVENTS**

### **Low Cost Aerated Composting Systems for Small Acreage Operations**

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

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

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

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

- [Aerated Composting Bins](#)
- [Low Cost Aerated Static Composting Piles](#)

**Please RSVP by Monday August 28th** by emailing Kelly Kraemer [kkraemer@umass.edu](mailto:kkraemer@umass.edu).

For any questions or comments please contact Kelly Kraemer @ 413-545-5221 or [kkraemer@umass.edu](mailto:kkraemer@umass.edu)

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

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

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

Join UMass Extension educators and specialists at the UMass Crop Research and Education Center to tour our ongoing research and participate in a roundtable discussion. Research trials include: cucurbit disease management, cabbage aphid control, and nitrogen contributions from cover crops for vegetable fertility. After a field tour, we will have a roundtable discussion with UMass Extension Specialists where you can get crop or pest management ques-



tions answered over dinner! Registration is free, but please pre-register so we can order food accordingly.

**\*\*3 Pesticide credits will be available.\*\***

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

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

Contact: Sue Scheufele at 413-577-3976 or [sscheufele@umass.edu](mailto:sscheufele@umass.edu)

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

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

**Where:** Atlas Farm, 635 River Road, Deerfield, MA 01342

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

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

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

A light dinner will be provided.

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

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

Contact: Lisa McKeag at 413-577-3976 or [lmckeag@umass.edu](mailto:lmckeag@umass.edu)

### **Massachusetts No-Till Conference 2017: Dairy and Vegetables**

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

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

Topics will include:

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

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

**To register contact:** [Lisa.trotto@ma.usda.gov](mailto:Lisa.trotto@ma.usda.gov)

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

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