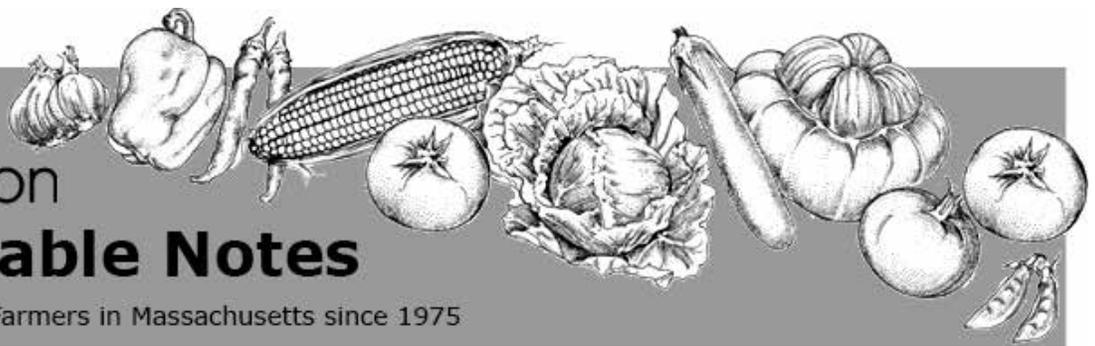




UMass  
Extension

# Vegetable Notes

For Vegetable Farmers in Massachusetts since 1975



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*There's nothing like the blues, greens, and purples of a fall brassica field! Photo: G. Higgins.*

## CROP CONDITIONS

There's a lot of food left to pick in the fields and farm crews have been busy working to pull everything in. Squash, potatoes, sweet potatoes, bunches of turnips and radishes, bundles of kale, and buckets of carrots. Frost warnings last night had growers wondering if they would get hit, and if they should bother to dig out the row cover and get tender crops covered or take the chance. It seems like most fields were spared any frost damage, except for maybe in some low spots in the cooler parts of the state. Some longer day squash varieties are still ripening and growers are hoping they will push a little further along before the plants give out—some sunny weather this weekend should help them put on some nice color! As our own field work is coming to a close, we are starting to switch gears, working on grant applications, publishing the Veg Notes newsletter monthly (next issue out mid-Oct), and planning winter meetings. We look forward to seeing many of you at our upcoming twilight meeting on managing packhouse and washroom pests on October 8—more information in the Events section of this issue. Registration is also now open for our big conference, the [New England Fruit and Vegetable Conference](#) in Manchester, NH December 10-12—hope to see you there!

## PEST ALERTS

### Alliums:

The fall flight of [allium leafminer](#) started last week, with oviposition found in leeks in Ulster County, NY. This pest was introduced to the US in 2015 and has been found consistently in PA, NJ, and NY since then. In MA, we have only seen it once, last year, in the far western part of the state. Allium leafminer attacks all alliums but is especially damaging to fall leeks because they are the only alliums still in the field. Western MA growers: If you see the characteristic row of white oviposition marks (see photo), contact us at [umassveg@umass.edu](mailto:umassveg@umass.edu) or (413) 577-3976.

[White rot](#) was reported in garlic on one farm in New Hampshire this week. As you sort garlic for planting this fall, keep an eye out for symptoms of diseases and insects and don't use infested bulbs for seed garlic. For descriptions of some common garlic bulb diseases, see the article in [last week's Veg Notes](#).

**Brassicas:** [Caterpillars](#), [flea beetles](#), [Alternaria](#), and [black rot](#)—all the usual suspects—are all still present in fields.

**Carrot:** [Alternaria leaf blight](#) has been reported on carrot foliage in several locations throughout the state. In severe cases, this fungal pathogen can defoliate a crop, making mechanical harvest impossible and manual harvest difficult. This pathogen can be carried on seed—[hot water](#) or fungicide treatment of seed can eliminate this as a source. Once the pathogen is present in a field, spores are spread by wind,



*Alternaria leaf blight on carrot.  
Photo: D. Egel*

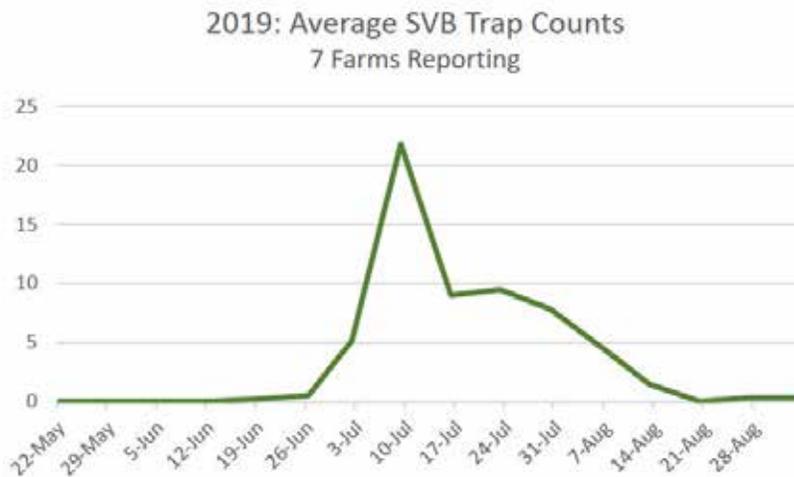


*Allium leafminer oviposition marks on onion leaf.  
Photo: E. Grundberg*

splashing water, workers, and equipment. Till under crop residue promptly after harvest to promote breakdown, as the fungus cannot survive in the soil without host residue. Rotate out of umbelliferous crops for a minimum of 3 years. Fungicides can be effective in controlling carrot leaf diseases if used preventively when conditions are favorable for disease spread—see the [New England Vegetable Management Guide](#) for current recommendations.

### Cucurbits:

**Squash vine borer:** We just saw one generation of SVB this year (see figure at right). We did see a few larvae boring into winter squash fruit within the past two weeks. These are likely larvae resulting from the tail end of the first flight, which did trail on for more than a month this year. If you've had SVB in your cucurbits this year, chop up any crop residue thoroughly to destroy larvae and pupae and plow deeply. Larvae that remain in crop residue will emerge from the fruit to pupate and will overwinter as pupae in the soil. The deeper they are buried, the less likely that they will be able to successfully emerge next spring. Plan to rotate next year's cucurbits far from any infested plantings.



**Downy mildew** continues to spread through any butternuts and cucumbers that are still in the field. Conventional growers who have been spraying regularly for the past month or so are seeing good control, and resistant varieties have held up throughout the season. We've been harvesting from resistant varieties of cucumbers in our research plots since the end of July but even the best-performing varieties are going down now. Ideal spray programs for powdery and downy mildews can be tricky because they involve rotating between multiple different materials for the two pathogens. Take time this winter to look at recommended materials and make a plan if you'd like to improve control for next year—see the [June 13, 2019 issue of Veg Notes](#) for spray recommendations. Available cucumber varieties with resistance include Bristol, DMR 401, DMR 264, and Citadel.

### Sweet Corn:

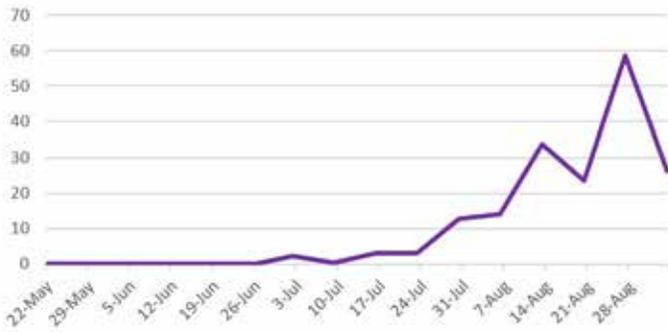
Here is a summary of corn pest activity for the season. See figures on the next page. Thanks to Colin Radon and Ainsley McStay, our summer field scouts, for collecting and compiling all of the trap data this year!

**European corn borer:** Corn planting was delayed due to the cold spring weather this year, but emergence of ECB was also delayed, with the first generation flight peaking around June 15<sup>th</sup>, about 3-4 weeks later than past years. The second generation of ECB emerged during the first two weeks of August. By this time, CEW was already present in the state and dictating spray schedules in most locations, but this second generation of ECB was a bit larger than we have seen in past years, and damage was observed on crops other than corn that are not routinely sprayed for caterpillar pests, such as garlic, peppers, and beans.

**Corn earworm:** Early-season storms coming up from the south brought CEW to our region beginning in late-June this year, but numbers stayed low until late-July, when CEW became the driver of corn spray schedules for the rest of the season. We saw large peaks of CEW in mid- and late-August. Most locations stayed on a 4- to 5-day spray schedule for much of the season, with a few sites tightening to a 3-day spray schedule in late-August. The few farms that still have traps up this week are still reporting trap captures, so corn that is still out in the field may still need protection. Overall, CEW pressure was similar if a little higher than last year, but is still down considerably from its peak activity back around 2010 when average weekly trap numbers were at 300. This is largely due to changing weather patterns, with fewer and/or later storms coming up from the south.

**Fall armyworm** followed the same pattern as CEW this year, though with much lower numbers than CEW. While growers are keeping up with CEW sprays to silking corn, folks are not always spraying whorl-stage corn late in the season, after the threat of ECB has passed, and so are seeing damage from FAW—keep spraying both silking and whorl-stage corn if FAW is being trapped in your area.

2019: Average CEW Trap Counts  
12 Farms Reporting



2019: Average ECB & FAW Trap Counts  
9 & 10 Farms Reporting



**Solanaceous:** [Pepper anthracnose](#) was reported on a farm on Cape Cod this week, resulting in close to 90% crop loss. This disease can be seed-borne—seed can be [hot water treated](#) if it is suspected to be coming into fields on seed. The pathogen also survives in the soil. Remove any infected fruit from the field and destroy, and till under crop residues as soon as possible to encourage speedy breakdown. Although the host ranges of the fungal pathogens that cause pepper anthracnose are still not completely known, rotating out of peppers, tomato, and strawberries for at least 2 years is recommended—longer is better.



Pepper anthracnose. Photo: T.A. Zitter

## CLEANING & DISINFECTING THE GREENHOUSE

If you have had re-occurring problems with diseases such as damping off or insects such as fungus gnats or aphids, perhaps your greenhouse and potting areas need a good cleaning. Vegetable growers are now done using their greenhouses for fall transplants, and if they are not being used to cure root crops, now is a good time to clean the houses well before next season’s big rush. Some growers wait until the week before opening a greenhouse before cleaning debris from the previous growing season, but it is better to clean up as early as possible to eliminate over-wintering sites for pests and to reduce their populations prior to the spring growing season—pests are much easier to prevent than to cure.

**Cleaning.** Cleaning involves physically removing weeds, debris and soil, and is the first step prior to disinfecting greenhouse surfaces and equipment. Some growers use a wet/dry vacuum on concrete and covered floors to remove debris. Soil and organic residues from plants and growing media reduce the effectiveness of disinfectants. There are some cleaners specifically developed for greenhouse use, for example Strip-It, which is a combination of sulfuric acid and wetting agents formulated to remove algae, dirt and hard water deposits. High-pressure power washing with soap and water is also an option. Soap is especially useful in removing greasy deposits. Thorough rinsing is needed because soap residues can inactivate certain disinfectants such as the Q-salts.

Begin at the top and work your way down. Sweep down walls and internal structures and clean the floor of soil, organic matter and weeds. Disease-causing organisms can be lodged on rafters, window ledges, tops of overhead piping and folds in plastic. Extra care is needed to clean these areas as well as textured surfaces such as concrete and wood, which can hide many kinds of pests.

Install physical weed mat barriers if floors are bare dirt or gravel and repair existing mats to prevent weeds and make it easier to manage algae. Avoid using stone on top of the weed mat, as soil and moisture will then get trapped, creating an ideal environment for weeds, diseases, insects and algae.

Irrigation filters should also be cleaned to remove dirt and microbial buildup (or biofilm) at the end of the growing season. Growers often use products labeled for cleaning irrigation systems such as sulfuric acid plus wetting agent (e.g. Strip-It) or sanitizers containing hydrogen peroxide and peroxyacetic acid (e.g. SaniDate) to flush out slime and debris.

**Disinfecting.** Many pathogens can be managed to some degree, by the use of disinfectants. For example, dust particles from fallen growing medium or pots can contain bacteria or fungi such as *Rhizoctonia* or *Pythium*. Disinfectants will help control these pathogens. In addition to plant pathogens, some disinfectants are also labeled for managing algae, which is a



Greenhouse benches made of non-porous materials are easier to disinfect. Photo: UMass Floriculture

breeding ground for fungus gnats and shore flies.

**Greenhouse Benches and Work Tables.** If possible, use benches made of wire or other non-porous materials such as a laminate that can be easily disinfected. Wood benches can be a source for root rot diseases and insect infestations. Algae tend to grow on the surface of the wood creating an ideal environment for fungus gnats and shore flies, and plant pathogens can grow within the wood. Plants rooting through containers into the wood will develop root rot if conditions are favorable for pathogen activity. Disinfect benches between crop cycles with one of the labeled products listed below. Keep in mind that disinfectants are not protectants—they may eradicate certain pathogens, but will have little residual activity.

**Cleaning Containers.** Plant pathogens such as *Pythium*, *Rhizoctonia* and *Thielaviopsis* can survive in root debris or soil particles on greenhouse surfaces.

If a crop had a disease problem, then avoid re-using containers. Containers to be re-used should be washed thoroughly to remove soil particles and plant debris before being treated with a disinfectant, even if there is no evidence of disease in the crop. Debris and organic matter can protect pathogens from coming in contact with the disinfectant solution and can also reduce efficacy of certain disinfectants.

**Disinfectants for Greenhouses.** If possible, disinfectants should be used on a routine basis both as part of a pre-crop clean-up program and during the cropping cycle. There are several different types of disinfectants that are currently used in the greenhouse for plant pathogen and algae control listed here:

**Quaternary ammonium chloride salts (Green-Shield®, Physan 20®, KleenGrow™).** Q-salt products, commonly used by growers are quite stable and work well when used according to label instructions. Q-salts are labeled for fungal, bacterial and viral plant pathogens, and algae. They can be applied to floors, walls, benches, tools, pots and flats as disinfectants. Physan 20® is also labeled for use on seeds, cut flowers and plants. Carefully read and follow label instructions. Recommendations may vary according to the intended use of the product. For example, the Green-Shield® label recommends that objects to be sanitized should be soaked for 10 minutes, and walkways for an hour or more. Instructions recommend that surfaces be air-dried after treatment except for cutting tools. The label recommends soaking cutting tools for 10 minutes before use, then using the wet tool on plants. One way to do this is by having two cutting tools, one pair to use while the other is soaking. KleenGrow has higher organic tolerances and longer residual activity on hard surfaces.

Q-salts are not protectants. They may eradicate certain pathogens, but will have little residual activity. Contact with any type of organic matter will inactivate them. Therefore, pre-clean objects to dislodge organic matter prior to application. Because it is difficult to tell when they become inactive, prepare fresh solutions frequently (twice a day if in constant use). The products tend to foam a bit when they are active. When foaming stops, it is a sign they are no longer effective. No rinsing with water is needed.

**Hydrogen dioxide and peroxyacetic acid (ZeroTol® 2.0, OxiDate® 2.0, SaniDate®12.0).** Hydrogen dioxide kills bacteria, fungus, algae and their spores immediately on contact. It is labeled as a disinfectant for use on greenhouse surfaces, equipment, benches, pots, trays and tools, and for use on plants. Label recommendations state that all surfaces should be wetted thoroughly before treatment. Several precautions are noted. Hydrogen dioxide has strong oxidizing action and should not be mixed with any other pesticides or fertilizers. When applied directly to plants, phytotoxicity may occur for some crops, especially if applied above labeled rates or if plants are under stress. Hydrogen dioxide can be applied through an irrigation system. As a concentrate it is corrosive and causes eye and skin damage or irritation. Carefully read and follow label precautions. Note that OxiDate® and SaniDate are organic products.

**Sodium carbonate peroxyhydrate (GreenClean Pro Granular Algaecide®)** is a granular and is activated with water. Upon activation, sodium carbonate peroxyhydrate breaks down into sodium carbonate and hydrogen peroxide. GreenClean is labeled for managing algae in any non-food water or surfaces. Non-target plants suffer contact burn if undiluted granules are accidentally spilled on them.

**Chlorine bleach.** There are more stable products than bleach to use for disinfecting greenhouse surfaces. Chlorine

bleach may be used for pots or flats, but is not recommended for application to walls, benches or flooring. When used properly, chlorine is an effective disinfectant and has been used for many years by growers. A solution of chlorine bleach and water is short-lived and the half-life (time required for 50 percent reduction in strength) of a chlorine solution is only two hours. After two hours, only one-half as much chlorine is present as was present at first. After four hours, only one-fourth is there, and so on. To ensure the effectiveness of chlorine solutions, it should be prepared fresh just before each use. The concentration normally used is one part of household bleach (5.25% sodium hypochlorite) to nine parts of water, giving a final strength of 0.5%. Chlorine is corrosive. Repeated use of chlorine solutions may be harmful to plastics or metals. Soak objects to be sanitized for 30 minutes and then rinse with water. It should also be noted that bleach is phytotoxic to some plants, such as poinsettias. Bleach should only be used in a well-ventilated area.

**Alcohol (70%)** is a very effective sanitizer that acts almost immediately upon contact. It is not practical as a soaking material because of its flammability. However, it can be used as a dip or swipe treatment on knives or cutting tools. No rinsing with water is needed. Alcohol, although not used as a general disinfectant is mentioned here because it is used by growers to disinfect propagation tools.

**OMRI-listed organic disinfectants** include OxiDate 2.0, SaniDate 12.0 and PERpose Plus. Ethyl or isopropyl alcohol is used to disinfect tools. Organic growers should always check with their certifying organization before using any material new in their growing practices. For list of products, visit the [OMRI website](#).

This information is supplied with the understanding that no discrimination is intended and no endorsement of any particular product is implied. Due to constantly changing regulations, we assume no liability for suggestions. If any information in this article is inconsistent with the label, follow the label.

**Managing Algae.** Algae are a diverse grouping of plants that occur in a wide range of environments. Algae growth on walks, water pipes, equipment, greenhouse coverings, on or under benches and in pots is an ongoing problem for growers. Algae form an impermeable layer on the media surface that prevents wetting of the media below and can clog irrigation misting lines, and emitters. Algae are a food source for insect pests like shore flies and cause slippery walkways that can be a liability risk for workers and customers. Recent studies have shown that algae are brought into the greenhouse through water supplies and from peat in growing media. In a warm, moist environment with fertilizer, the algae flourish.

Proper water management and fertilizing can help to slow algal growth. Avoid over-watering slow-growing plants and especially crops early in the production cycle. Allow the surface of the media to dry out between watering. Avoid excessive fertilizer runoff and puddling water on floors, benches, and greenhouse surfaces. The greenhouse floor should be level and drain properly to prevent the pooling of water prior to installing a physical weed mat barrier. Algae management involves an integrated approach involving sanitation, environmental modification and frequent use of disinfectants.

*-Prepared by Tina Smith, UMass Extension Educator, Greenhouse Crops and Floriculture Program (retired). Updated for 2019 by L. McKeag. For references and resources, see the online version of this article [here](#).*

## **POSTHARVEST HANDLING AND STORAGE BASICS**

Harvested vegetables are living things that carry on the process of respiration and other biological and chemical processes even after they have been picked. How produce is handled after harvest will directly affect quality characteristics such as appearance, flavor, texture, and nutritional value. Attention to postharvest quality can increase repeat sales and support higher prices.

Control of postharvest quality essentially comes down to limiting respiration rate (lowering temperature), controlling water loss (maintaining proper relative humidity), minimizing physical damage to the product (harvesting and handling with care), and avoiding contamination (handling, washing, and storing appropriately).

### **Limiting Respiration**

Respiration is a temperature-dependent biochemical process that converts carbon



*Photo: UMass Vegetable Program*

(mainly sugars) in plant tissue to carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O) while producing some heat. Rates of respiration vary by the crop (see [Gross 2014](#), Table p. 7 and pp. 68-75, reference below), and should be taken into account when sizing cooling equipment. Fortunately, we can significantly reduce respiration, and therefore maintain high product quality, by reducing product temperature (precooling) and keeping it low (holding or storage cooling). This concept is known as establishing the “cold chain”- a chain of reduced temperature that connects the field to the consumer, ensuring the highest quality produce possible by minimizing respiration.

From the moment of harvest, product quality will deteriorate. Intentional pre-cooling of produce directly after harvest helps quickly reduce the rate of respiration and initiates the cold chain. Examples of pre-cooling include scheduling harvest activities at cooler times of day, shading harvested product in the field prior to transport, forced air cooling through the packed product with refrigeration, hydrocooling with cool water, and vacuum cooling via evaporation. Once cooled to storage temperature, reliable, refrigerated storage is necessary to maintain high quality.

It is important to note that not all crops can be cooled to the same temperature without resulting in cold or freeze injury and some crops are sensitive to the method of cooling. Crops have different susceptibility to chilling or freeze injury depending on their physiology. Good guidance is available (see [Gross 2016](#), pp. 62-67) and is summarized in [Table 16 of the New England Vegetable Management Guide](#). Common pre-cooling methods are also noted in Table 16. Additionally, a computer-based crop storage planner is available for determining appropriate grouping of your crops and estimating overall respiration load (see [Callahan 2016](#)). Chilling injury is also an important consideration when considering particularly sensitive fall-harvested crops, e.g. winter squash, and the possibility of lower nighttime temperatures. Notes on chilling injury guidance for these crops are provided in the appropriate crop chapter of the NE Vegetable Management Guide and in the references noted above.

### **Controlling Water Loss**

The control of water loss requires careful attention to the relative humidity (RH) of the air surrounding stored product in addition to temperature. RH is a measure of the amount of water vapor in air compared to the maximum amount that can be saturated in that air at a given temperature. Most, but not all, crops are ideally stored at higher RH to prevent water evaporation into the air leading to water loss. The loss of water reduces the weight of the crop and also can lead to lower quality and poor appearance.

Some crops, such as onions, garlic and winter squash, are purposefully “cured” or dried resulting in drier outer skin and cured harvest wounds to allow for long term storage. Because this results in a paper-like layer, these crops are generally stored at lower RH to prevent development of postharvest disease such as molds and fungi on this outer skin. Other than these examples, most crops are best stored at 90-95% RH with specific guidance provided in Table 16, in the crop storage planner noted above, and in the literature (see [Gross 2016](#)).

### **Minimizing Physical Damage**

Generally speaking, produce crops live a very gentle life until harvested. Starting with harvest, produce is moved and handled for the first time and, typically, many times after. With each movement there is a risk of physical damage. Even if the damage is not obvious, it can result in bruising or other damage that becomes evident later and can lead to postharvest disease and infiltration by pathogens, which are encouraged by damaged cell tissue. Even during harvest, crops can suffer “harvester blight.” For the majority of crops, gentle handling, crates with smooth and clean surfaces, and conveyance with elastic and soft belts and rollers is recommended.

### **Avoiding Contamination**

Sorting and culling are also important practices at this stage. As the saying goes, “one bad apple can ruin the bunch”. Sorting allows for different sizes and grades of product to be stored and sold separately, and culling can separate damaged or lower quality product from the main lot for sale, rescue donation or compost depending on the defect. The removal of obviously damaged product from the lot helps minimize cross contamination with postharvest pathogens to a larger portion of the population.

Produce can be rinsed to remove soil and debris, and often a sanitizer is added to the rinse water to prevent cross-contamination of plant and human pathogens from one item of produce to another in the same batch (see the following references: [LaBorde, Samuels, and Stivers 2016](#), [Bihn et al. 2014](#)).

Once packed and ready for storage or transport, care should be taken to avoid contamination of product with other contaminants such as foreign matter and unintentional water such as condensate from refrigeration systems.

## References

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*--Written by Chris Callahan, Agricultural Engineer, UVM Extension.  
Excerpted from 2018-2019 New England Vegetable Management Guide.*

## FALL SOIL TESTING

Although soil samples can be taken any time, many prefer to take samples in the fall because this allows time to apply any needed lime to adjust pH, plant a cover crop to recover any leftover nutrients, make a nutrient management plan, and order materials well in advance of spring planting. It is best to take soil samples at the same time of year for the most consistent and reliable results. Avoid sampling when the soil is very wet or soon after a lime or fertilizer application. If a field is uniform, a single composite sample is sufficient. A composite sample consists of 10 to 20 sub-samples taken from around the field and mixed together. To obtain sub-samples, use a spade to take thin slices of soil representing the top 6" to 8" of soil. A soil probe is faster and more convenient to use than a spade. Make sure to remove any thatch or other organic debris such as manure from the surface before taking your sample, as this will result in inaccurate soil organic matter levels. Put the slices or cores into a clean container and thoroughly mix. Take about one cup of the mixture, dry it at room temperature spread out on paper, put it in your own zip lock bag, and tightly seal it. Label each sample on the outside of the bag. On the submission form to the lab for each sample, indicate the next crop to be grown, recent field history, and any concerns.

In many cases, fields are not uniform. There are many reasons for this, including uneven topography, wet and dry areas, different soil types, and areas with varying previous crop and fertilizing practices. For example: "There was a tractor mishap in this field years ago and a ton of lime was dumped right here." In such cases, the field should be subdivided and composite samples tested for each section. Alternatively, problem areas can be avoided entirely.

Soils should be tested for organic matter content every two or three years. Be sure to request this as it is not part of the standard test. A standard soil test at the UMass Soil Lab costs \$20; with organic matter it costs \$26.

### Submitting soil samples

Depending on your goals, different tests are appropriate. In addition to standard soil tests, other services are available including: [Pre-Sidedress Soil Nitrate Test \(PSNT\)](#), [manure or compost analysis](#) (from the University of Maine), [soilless greenhouse media](#), [soil texture](#), and plant tissue analysis. (Click on each link to access the submission form).

**A fall nitrate test**, or "report card nitrate test", as some university labs call it, indicates how closely crop nitrogen (N) uptake has been matched with nitrogen supply for the season. High (> 20 ppm) or excessive soil nitrate content in the fall



*Soil probes make soil sample collection easy and fast.*

*Photo: UMass Vegetable Program*

indicates that too much N fertilizer was applied in the prior season, and a fall cover crop would be beneficial to conserve this remaining N for the following season. Use the [Pre-Sidedress Soil Nitrate Test](#) form to submit a nitrate test soil sample, or check the box for nitrate on the standard soil test submission form; it is only an additional \$6.

**A standard soil test** that includes other macro- and micronutrients can help you make the best choice to fit a particular crop to a given soil nutrient profile for the following season. When submitting your soil sample for testing, include the crop code on the form for the crop to be grown in that field the following year. Haven't prepared your crop rotation plans yet? No worries. You may ask for recommendations for up to 3 different crops without extra charge. Use this form for [Commercial Vegetable and Fruit Crop Soil Submissions](#). Use this form for [Home Garden Soil Submissions](#).

### **Interpreting results and choosing amendments**

For specific information on interpreting your UMass Soil Test results, see [this factsheet](#) that accompanies each soil test report.

**Soil pH:** Most New England soils are naturally acidic (4.5-5.5) and need to be limed periodically to keep the pH in the range of 6.0 to 7.0 desired by most vegetable crops and beneficial microbes. The lab report will recommend the amount of lime to apply based on active and exchangeable acidity as well as the crop(s) to be grown. Active acidity is a measure of the H<sup>+</sup> ions in solution, while exchangeable acidity is a measure of H<sup>+</sup> ions adsorbed on soil humus and clay colloids. Soils with a higher cation exchange capacity (CEC) have a greater potential for higher exchangeable acidity. Therefore, more lime will be needed to raise the pH in a high CEC organic matter soil than in a low CEC sandy soil with the same amount of active acidity. Lime can be applied any time, but fall is preferred to allow several months to raise the pH. Split applications (half in the fall and half in the spring) may also be effective.

**Compost** is often applied as a method for increasing soil organic matter. However, do not overlook the fact that composts contain nutrients which are soluble and available for crop use just like commercial fertilizers. While only about 10% of total N analysis in compost is available to the crop each year, 80-100% of P analysis in compost has been shown to be available, increasing the potential for losses to the environment if not applied to actively growing crops. Phosphorous content also varies in compost from 0.1-3%, so analysis is important for determining rates of application. Sheet composting is not a recommended practice on bare fields in the fall unless a cover crop is planted. A compost analysis should be completed to measure nutrient availability and to determine if the product is finished before applying to the field. Unfinished compost applied to the field may harbor pathogens or harm crops as it continues to decompose. Ammonium content <100mg/kg and C:N ratio of 20:1 indicates a finished compost. Higher amounts of ammonia indicate active decomposition, or unfinished compost, and the C:N ratio is reduced as microbes break down carbon content in the pile and convert it to CO<sub>2</sub>. Matured compost applications are usually made in the spring; however, testing may happen in the fall in order to estimate plant available nutrients for next year's crop and help determine future compost application rates.

**Manure** is an excellent source of nutrients, however, as manure ages and decays, considerable nutrient loss occurs from leaching, surface runoff, or volatilization of ammonia into the atmosphere. Manure may also contain pathogens such as *E. coli* and *Salmonella*. If manure is used, vegetables should not be harvested before 120 days after application (or 90 days for vegetables that do not contact the soil, such as peppers). This is a requirement for organic production and for farms covered by the Food Safety Modernization Act and is recommended for all growers. In most cases, manure should be applied in the fall or to a non-food rotation crop. Fall-applied manure should be incorporated immediately and a winter cover crop should be planted to protect N from leaching. Make manure applications in cold weather to reduce volatilization, but not to frozen ground as this increases surface runoff potential. In no-till systems, research has shown that manure can be effectively surface applied to a growing cover crop to reduce nutrient losses, but not to bare ground. In order to make accurate nutrient applications to best fit your crop needs, a manure analysis should be conducted. The University of Maine has a manure testing lab; here is their [Manure Sample Submission Form](#). Be sure to submit your samples in a tightly sealed container or the postal service will be very unhappy with you!

**Cover crops** planted in the fall, preferably before September 15<sup>th</sup>, are an excellent way to capture and store nutrients for your crops in the following spring. While your soil test results will not recommend cover crop selection, here are some general guidelines for fall-planted cover crops and their spring contributions of plant available nitrogen (PAN) per acre:

**Legume cover crops** provide up to 100 lb PAN/A. To maximize PAN contribution from legumes, kill the cover crop at bud stage in the spring.

**Cereal cover crops** immobilize up to 50 lb PAN/A. To minimize PAN immobilization from cereals, kill the cover crop during the early stem elongation (jointing) growth stage.

**Legume/cereal cover crop mixtures** provide a wide range of PAN contributions, depending on legume content. When cover crop dry matter is 75% from cereals + 25% from legumes, PAN is usually near zero.

**Micronutrient** application recommendations cannot be determined accurately by soil labs in New England because deficiencies in crops have not been widely measured in our soils. However, the soil test results do report the ranges found in all the soils that come through the lab so that you may compare where your soil falls in regards to other soils in New England. For recommendations on specific micronutrients needed for crop growth, such as boron, see the [New England Vegetable Management Guide section on micronutrients](#). Preferred timing of micronutrient applications in the fall versus spring has not been determined.

**Other nutrient** applications should be avoided until spring when a growing crop is best able to use the applied nutrients in water soluble form and avoid leaching, runoff, or volatilization.

**Need further assistance interpreting your soil test results?** Contact the soil lab or any of the following Extension Educators:

**Vegetables:**

UMass Vegetable Team

Phone: (413) 577-3976

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

**Greenhouse:**

Jason Lanier

Phone: (413) 545-2965

Email: [jdl@umass.edu](mailto:jdl@umass.edu)

**Cover Crops:**

Masoud Hashemi

Phone: (413) 545-1843

Email: [masoud@psis.umass.edu](mailto:masoud@psis.umass.edu)

*--Written by Katie Campbell-Nelson, UMass Vegetable Extension, 2015. Updated for 2019 by Genevieve Higgins*

## **E**VENTS

### **ACIDIFIED CANNED FOODS WORKSHOP & WEBINARS**

Producing shelf-stable acidified canned foods can help to add value to produce and help to increase markets, extend the agricultural season, and reduce waste. However, in order to successfully sell and distribute shelf-stable products, such as salsas, sauces, and/or acidified pickled products, processors must comply with the Code of Federal Regulations (21CFR114). This project identified and developed 12 shelf-stable acidified canned food recipes and converted them into scale-appropriate product formulations, established the appropriate food safety controls, and had all the product formulas reviewed by a regulatory approved Process Authority to issue a validated scheduled process for commercial use. These programs will include the overall product development process, review the product formulation manual, discuss some of the product development challenges that occurred during development, and discuss how processors can request access to these product formulations for their own market use to produce at their own commercial facilities.

#### **3-Hour Workshop:**

**When:** Tuesday, September 24, 2019, 5:30-8:30pm

**Where:** UMass Food Science Pilot Plant, 102 Holdsworth Way, Amherst, MA 01003

**Registration:** Register by Friday, September 20 at 5pm. [Click here to register for the workshop](#). There is a \$20 program deposit fee, which will be reimbursed after the completion of the program.

#### **1-Hour Webinar:**

**When:** Wednesday, September 25, 2019, 12:30-1:30pm OR Thursday, September 26, 2019, 6-7pm

**Registration:** [Click here to register for one of the webinar times](#).

Questions? Contact Teddy Phan at [ttphan@umass.edu](mailto:ttphan@umass.edu)

*This program is supported by the University of Massachusetts, the Massachusetts Department of Agriculture through the USDA Specialty Crop Block Grant, the Franklin County Community Development Corporations' Food Processing Center, Commonwealth Kitchen, and the Northeast Center to Advance Food Safety (NECAFS)*

## FSPCA PREVENTIVE CONTROLS FOR HUMAN FOOD CERTIFICATION TRAINING - BLENDED COURSE

**When:** Monday, October 7, 2019, 8am-5pm

**Where:** UMass Life Sciences Laboratories, Rooms S320 and S330, 240 Thatcher Way, Amherst, MA 01003

**REGISTRATION:** [Click here to register for this workshop](#). \$119 per person. Registration deadline Monday, September 30. For more details see the event website, linked to above.

The Current Good Manufacturing Practice, Hazard Analysis, and Risk-based Preventive Controls for Human Food FDA regulation is intended to ensure safe manufacturing/processing, packing and holding of food products for human consumption in the United States. The regulation requires that certain activities must be completed by a “preventive controls qualified individual” who has “successfully completed training in the development and application of risk-based preventive controls.” This course developed by the FSPCA is the “standardized curriculum” recognized by FDA; successfully completing this course is one way to meet the requirements for a “preventive controls qualified individual.” To complete the course, a participant must be present for the entire workshop and actively participate in all of the presented exercises.

Upon completion of this course, the trainee will become a FDA-recognized “Preventive Controls Qualified Individual” (PCQI). The course covers:

- How to create a Food Safety Plan meeting the FDA requirements as required by the Food Safety Modernization Act (FSMA).
- How to conduct a Hazard Analysis, and differentiate between prerequisite programs and risk-based preventive controls.
- Guidelines for choosing Critical Limits, setting up monitoring programs, and implementing corrective actions when deviations occur.
- Documentation for all aspects of the PCHF-required Food Safety Plan including verification and validation activities, monitoring, corrective actions, and records review.

For additional important program information, visit the event website, [here](#). Questions? Contact Chris Von Achen, [cvo-nachen@umass.edu](mailto:cvo-nachen@umass.edu).

## PESTS AND PETS, MANAGING ANIMALS IN THE PACKHOUSE

**When:** Tuesday, October 8, 2019 from 5 pm to 7 pm

**Where:** UMass Agricultural Learning Center, 911 North Pleasant St., Amherst, MA 01003

Packhouse pests, including birds and rodents, affect produce quality and pose food safety risks. They can also be hard to get rid of! New food safety regulations require that covered farms have a pest control program to minimize food safety risks. Learn how to implement a pest control program on your farm and how to manage risks posed by even beloved animals, like cats and dogs. Speakers include:

- Amanda Brown, UMass Student Farm Enterprise - designing a new packhouse and getting certified by the Commonwealth Quality Program
- Hans Estrin, UVM Extension - considerations for building or retrofitting your wash/pack space with an eye toward food safety
- Natasha Wright, Braman Termite & Pest Elimination - tips and techniques from the professionals
- Jim Ward - How we control birds at Ward's Berry Farm
- Wally Czajkowski - How we control rodents at Plainville Farm

The meeting will be followed by a light dinner and time for questions and discussion

**REGISTRATION:** This event is FREE, but please RSVP so we can plan ahead for dinner. Register here: <https://www.eventbrite.com/e/pests-and-pets-managing-animals-in-the-packhouse-tickets-72589287513>

**\*\*1 pesticide recertification credit available\*\***

Contact Lisa McKeag at 413-545-1051 or [lmckeag@umass.edu](mailto:lmckeag@umass.edu) for more information

## [NEW ENGLAND VEGETABLE & FRUIT CONFERENCE AND TRADE SHOW](#)

**Where:** DoubleTree by Hilton, 700 Elm St., Manchester, NH

**When:** December 10-12, 2019

**REGISTRATION:** <https://newenglandvfc.org/registration>

Registration is now open for the 2019 New England Vegetable & Fruit Conference and Trade Show! This program was planned collaboratively by growers and Extension professionals from throughout the region. It features more than 30 educational sessions over 3 days, covering vegetable, berry, and tree fruit crops and various special topics. Farmer-to-farmer sessions bring speakers and farmers together for informal discussion, and our extensive trade show has over 120 exhibitors.

Get more details, including the full program, at the conference website, linked to in the title of this event.

## [VERMONT VEGETABLE & BERRY GROWERS ASSOCIATION ON-FARM 2019 WORKSHOP SERIES](#)

The Vermont Vegetable & Berry Growers Association is holding a series of nine on-farm workshops from June through November this year. For more information on all workshops in this series, please click the linked event title above.

Attendance at these events is free for members of the Vermont Vegetable & Berry Growers Association. The cost is \$10 per-person for non-members, payable on-site. Refreshments will be served. Membership in the VVBGA costs \$55 per farm, per calendar year. The VVBGA works with University of Vermont Extension to deliver education and applied research for its growers.

**Wednesday, September 25, 3-6 pm.** Mighty Food Farm, 280 Rod and Gun Club Rd., Shaftsbury, VT 05262. Lisa MacDougall grows vegetables, berries and cover crops on 20 acres of hillside land and in five high tunnels for CSA and wholesale markets. She will host a tour of her new wash/pack facility with Chris Callahan and Andy Chamberlain on hand to discuss design considerations. Vern Grubinger and Becky Maden will assist with discussion of fall cover crops, nutrient management, erosion control, and high tunnel vegetable production.

**Questions?** Contact Vern Grubinger, 802-257-7967 x303. To request a disability-related accommodation, contact Dana Rupert, 802-257-7967, three weeks prior to an event so we may assist you.

**THANK YOU TO OUR SPONSORS:**



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

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