UMass Extension
Vegetable Notes
For Vegetable Farmers in Massachusetts since 1975

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Even the Colorado potato beetles came out for the UMass Agricultural Field Day. Photo: K. Campbell-Nelson

Crop conditions

There was a great turnout at the UMass Agricultural Field Day this Wednesday with over 100 attendees. Highlights in vegetable crops included presentations from faculty members, Extension educators and graduate students on cover crop mixes for no-till sweet corn, cover crops for nitrogen fertility in potato, midterm fertility effects of biochar on sweet corn, using Fava beans as a cover crop before sweet corn, breeding heirloom tomatoes for increased disease resistance, efficacy trials for cabbage root maggot control in cabbage and turnip, and growing mustard as a biofumigant. Afternoon attendees were treated to a full session on producing malting barley in the Northeast followed by a tour and tasting at Valley Malt in Hadley, MA. Thanks to all those who came out!

Most of the state got through Tuesday's storm without too much damage from the forecast wind and potential tornadoes, but a lot of spots got a good dumping of rain. Despite some strange weather so far, growers report being pretty close to on schedule as far as planting and harvesting go. The one exception might be sweet corn, as a few planting dates were missed due to the dry conditions in May, and may lead to shortages in July. Farms across MA are now harvesting summer squash, zucchini, cucumbers, broccoli and cabbage, greens, fava beans, and the earliest carrots. Herb crops such as basil and spearmint are coming in and make welcome additions to boxed CSA shares. Wholesale market prices at the Boston Terminal market are $14-15/carton of broccoli, $26-30/bushel of cucumbers, $11-13/1/2 bushel of zucchini and $12-15/1.2 bushel of yellow straight neck squash. Folks are busy keeping up with weeds, whether through cultivation or post-emergent herbicide applications, planting long-season crops like Brussels sprouts and storage cabbage, and getting fungicide sprays on in advance of some more rain in the forecast.

Accumulated Growing Degree Days (F): 1/1/15 - 6/23/15

Location	GDD Base 50°F
Pittsfield, MA	650.5
S. Deerfield, MA	766.2
Northboro, MA	780.8
Dracut, MA	764.5
Boston, MA	767.6
Sharon, MA	770.9
Seekonk, MA	772
Burlington, VT	782.8
Middletown, RI	624.2

Pest alerts

Vegetable scouting sheets can be found on the UMass Extension Vegetable Program website. When not given here, refer to the New England Vegetable Management Guide for scouting thresholds and treatment options.

Allium: **Onion thrips** were found in a row of onions in Chittenden Co. VT that was under row cover until this week, but at low populations, numbers were also low in Washington Co. RI. Numbers continue to be low after heavy rains, but scout again soon! **Garlic bloat nematode** reported in ME. The nematode can be easily spread in infested soil, on equipment and infected seed and plant material. Symptoms include uneven stands, stunting, looping and bending of leaves, twisting and growth deformities. It can be controlled with long crop rotations including the elimination of volunteer onions, garlic and host weeds.

Basil: Some farmers are growing the new **basil downy mildew** tolerant variety Eleanora this year. Downy mildew was found on basil being sold at a garden center in

Nassau Co., NY this week. Diagnostic labs and extension educators in ME and VT are receiving reports of suspicious symptoms, but these have been diagnosed as probable cold damage and basil is growing out of this damage now.

Brassica: Diamondback moth continues to be above threshold in a broccoli crop in Washington Co., RI. Imported cabbageworm were found in the same field with only one larva, several eggs and adults present in the field but not at threshold. About 10% of a crop in Chittenden Co., VT had caterpillar feeding damage, but was below the threshold of 1 caterpillar per plant. Flea beetles on broccoli were above threshold in Washington Co., RI. A working threshold of 1 beetle per plant or >10% average leaf damage on 50% of the plants has proved effective in leafy greens and early stages of heading brassicas.

Location	Squash Vine Borer reported Week of 6/17/15-6/24/15
MA	
Amerst	70 over 2 wks
Deerfield	9
Barnstable	19
Burlington, VT	.
Kingstown, RI	1
NH	70
Litchfield	3
Hollis	3
Mason	0

Location	European Corn Borer reported week of 6/17/25 to 6/24/15
Western, MA	
Hadley	0
Sheffield	0
South Deerfield	4
Whately	0
Central & Eastern MA	
Leominster	1
Millis	.
Sharon	3
Swansea	29
NH	
Litchfield	13
Hollis	6
Mason	1
Burlington, VT	0
Kingstown, RI	0

Corn: European corn borer trap captures were zero in Washington Co., RI and Chittenden Co., VT. Silking corn in Worcester Co., MA was scouted and no ECB damage or caterpillars were found; nor was Sap beetle which has historically been an issue at this site. However, scouts in some fields in NH are starting to see upwards of 20-60% damage from ECB. Corn Earworm: With large thunderstorms predicted across MA this week, some growers concerned with the arrival of CEW made insecticide sprays onto their silking corn. Pay attention to the direction of storm fronts as this will affect when and where this pest arrives in MA. Corn is beginning to tassel in RI and traps are going out this week. Fall Armyworm traps went out in MA last week; none captured yet. Sometimes early captures are due to southerly storms blowing them up the coast, but these populations don't always stick around. Non-target moths in traps: several species of moths are attracted to some of the chemical compounds found in pheromone traps. Learning to identify these non-target moths is important as they are not pests in sweet corn and should not impact your pest management decision making process. We found lesser wainscot in fall armyworm traps (photo) this week and multiple other unidentified species in other traps. Alan Eaton, entomologist at the University of New Hampshire has written a useful factsheet titled: "Identifying Moths in Traps for Sweet Corn Pests"

Lesser Wainscot moths are non-target, non-pest moths that were trapped in Fall Armyworm traps at 2 locations in MA this week. Photo: K. Campbell-Nelson

Cucurbit: Striped cucumber beetles were found at high levels in an untreated summer squash field in Washington Co., RI and in the fingerlakes region of NY (photo). As squash is most likely in bloom at this time, insecticide treatments with medium and high bee toxicity should be avoided. Squash vine borer: Nine traps out of 10 are capturing SVB in NH; many are above the threshold of 5 per trap, with as many as 70 in one trap! This pest is definitely emerging earlier than the published models have established at 900 GDD (Base 50F). One Squash Bug egg mass was found in Hampshire Co. MA. And adults have emerged in NY, keep your eyes open for this pest in RI, NH and VT and scout for eggs as nymph populations can build up quickly and be difficult to control.

Solanaceous: Large Colorado potato beetle larvae were found above threshold on eggplant in Chittenden Co., VT; the threshold is 2 small or 1 large larvae per plant until fruiting stage in this crop. All stages of CPB were found on potato scouted in the same location, but still below threshold. The threshold for this pest is slightly lower in potato: 4 small or 1.5 large larvae per plant. Tarnished plant bug adults were also seen on blooming and fruiting eggplant in Chittenden Co.,

VT. This pest can cause fruit and flower drop at high numbers. **Three-lined potato beetle** adults were seen on tomatillo, but no larvae were present in Chittenden Co, VT. This pest can cause a lot of damage on tomatillo. Use floating row cover over tomatillos until bloom. **Powdery Mildew** was seen on high tunnel tomato in ME with cooler and drier conditions there than in MA.

Multiple: Large populations of **potato leafhopper** were seen on snap beans in Chittenden Co, RI. Pyrethrin is effective for adults - treat at a threshold of 1 per plant and, azadiractin is effective for nymphs.

The first **spotted wing drosophila** (male) was captured this week in NH. Two females were captured in NY, one in Hudson Valley, and one in the Finger Lakes region. Two males and 1 female were captured in RI. No SWD have been captured in MA as of 6/25/15. Timing of emergence this year is similar to that seen in 2013 which was earlier than 2014.

MANAGING SQUASH VINE BORER

Squash vine borer moths are now being caught in pheromone traps in MA, NH, RI and VT. Populations vary greatly from site to site even within the same town, so only make treatments based on scouting or trap captures.

Squash vine borer adult moth. Photo: A. Eaton.

Life stages and identification. Squash vine borer adults are day-flying moths with a 1- to 1.5-inch wingspan, black forewings, clear hind wings, and a bright orange abdomen. In flight, they can look like wasps. There is typically one generation each year in New England, with adults emerging between mid-June to early July, and peak flight in mid-July. A second generation in late August has been indicated by trap captures in MA and NH over the last few years, in seasons with particularly high degree day accumulation. Moths usually fly for a couple of weeks before egg laying starts. Eggs are small (~1mm) oval, reddish brown in color, and are usually found singly on squash vines, within a foot of the soil. Eggs hatch in 10-15 days. Larvae are cream-colored, about an inch long, and have a brown head capsule. Within hours of hatching, the larvae bore into stems, where they feed for up to 30 days before exiting to drop into soil, spin a brown cocoon, and pupate not far below the surface. They remain in the soil until the following spring, or may hatch as adults for a second flight in late summer.

Squash vine borer larva. Photo: J. Boucher.

Host crops and damage. Larval feeding within vines causes leaves and stems to wilt and collapse, reducing fruit yields, and can even sever a plant from its roots. Occasionally larvae will bore into fruit of hard squash and pumpkins. Thick-stemmed *Cucurbita* species including *Cucurbita pepo* (summer squash and zucchini, pumpkin) and *C. maxima* type winter squashes (e.g. Hubbard, Buttercup) are preferred and are most suitable for larval development. Yield of summer squash can be reduced by 1/3 if larvae exceed 5 per plant. Pumpkins can sustain high infestations without yield reduction. Generally vining as opposed to bush-type plants, can withstand higher infestations, as they tend to root at the vine nodes, allowing the vine to survive despite having borers within the stem. Butternut squash, cucumber and melon are considered resistant to this pest.

Cultural strategies. Crop rotation can be an effective strategy to reduce damage, as it will take emerging adults longer to find and lay eggs within a host crop. Move cucurbit plantings to distant fields year to year, and do not plant this year's summer squash into last fall's pumpkin field. Fall or spring plowing can destroy or bury pupae, and reduce populations. Row covers may prevent egg-laying, but may also interfere with pollination. Trapping data indicating the presence of adults and peak flight may help determine when row covers are necessary, so that covers can be removed for pollination when plants are at less risk of infestation.

Monitoring: Pheromone traps (Heliothis net traps work best) can be used to monitor adult flight (sources for traps and pheromone lures include Gempler's, Great Lakes IPM, Trece). Traps should be placed in a susceptible crop, with the bottom of the trap just above, but not blocked by, the plant canopy. Traps may have to be moved up as the plants grow. Once the first adult moths are captured, check the bases of stems for eggs or entry holes of larvae. If not using a pheromone trap,

you can look for yellowish-orange frass coming out of entry holes around the base of plants. Cutting open the stem just above the hole is a good way to find out if damage has just begun or if the larvae are already well developed in the field. If the damage has just begun, it may still be early enough that a spray targeted at the base of plants will control hatching larvae.

Chemical control. Targeting larvae as they hatch is important for effective control because they can't be reached once they are well protected inside of stems. A working threshold when using organic products is 1 adult per trap per week, starting within a week of seeing the first adult, according to a 2013 Rutgers Extension publication. When using conventional products the threshold is 5 adults per trap per week. For vining crops, the plants may be able to tolerate more damage and the threshold can be higher. A 2014 fact sheet from UNH suggests a threshold of 12 moths per trap per week for vining-type squash or pumpkins. A total of 2 to 3 applications 5-7 days apart targeted at the plant base may be necessary for as long as adults are being caught in traps. See New England Vegetable Management Guide for treatment options. Many of the insecticides labeled for this pest are broad-spectrum materials with high toxicity to bees and are not recommended for use during bloom when the vine borer is active. Squash bees and bumble bees may spend the night inside of blossoms, so targeting sprays at the base of plants, rather than at blossoms and foliage, can also help to protect pollinators. Several selective products labeled for cucurbits (with low or medium bee toxicity) including spinetoram (Radiant), spinosad (Entrust), and *Bacillus thuringiensis* are labeled for squash crops and have been shown in trials to provide control when used as described above. Bt aizawi (Xentari) was somewhat more effective than Bt kurstaki (Dipel) or spinosad in some trials.

--updated for 2015 by Lisa McKeag from article by Ruth Hazzard, UMass Extension Vegetable Program. Sources include the fact sheets mentioned above and B. Caldwell et al, Resource Guide for Organic Insect & Disease Management; New England Vegetable Management Guide.

FORECASTING TOOLS FOR LATE BLIGHT MANAGEMENT

With cooler temperatures and rainy days forecast for the next several days, it may be time to start thinking about first sprays for late blight in potato and tomato. So far this year late blight (LB) has been confirmed in Florida, where both potato and tomato have been infected with LB strain US-23 and US-11, and in North Carolina where potato was infected with a strain yet to be determined. Managing LB successfully means being proactive and preventing disease before it starts. This means scouting your own fields to be sure you catch the very first infected plants and pull them out, but also paying attention to what is happening around you by finding out where the disease has been reported, which strains are present and which hosts are being affected this year. Luckily there are a lot of LB experts and climate resources there to help you answer these questions and make spray decisions without much thought or effort on your part. Here we will describe how to take advantage of some of these resources.

LB is favored by cool, wet weather–this means cloudy days, cool temperatures during the day or night, rain events, and high humidity or long periods of overnight dew. The exact conditions required for the late blight pathogen to infect a plant and produce new spores are known and have been used to develop models that can forecast when disease is likely to occur or spread. These models are based on severity values, which are calculated based on the temperature and the duration of leaf wetness period given current and forecast weather. For local sources of inoculum such as volunteer potatoes or contaminated seed tubers, the threshold for initiating late blight spray programs is 18 severity values accumulated since potato foliage emerged. That threshold has already been met in many parts of MA, and other areas are forecast to reach the threshold next week. Once the threshold is reached, that means if a local source of the pathogen is present, LB could develop on any susceptible plant tissue. However, if the pathogen is brought into MA on infected tomato transplants, as we've seen in past years, this threshold does not need to be met because under the right conditions, if the pathogen is present it will start producing spores. For risk-averse growers, this means a first protectant spray to prevent LB might be warranted whenever favorable conditions are forecast. Other growers may choose to wait until a disease outbreak is reported in their region, despite favorable environmental conditions–if this describes you please understand that if susceptible tissue is not protected before LB symptoms are present it may already be too late, prevention is key! To find out where the disease has been confirmed this year visit the national LB monitoring project, USABlight. Once the threshold is reached to initiate spray programs or the disease is present, these same models can be used to tell you when to spray based on the current and forecast weather. Below is an explanation of how these LB forecasting models work, the differences between different LB forecasting tools available on NEWA, and how to use our new MA DSS webpage, which will provide spray interval recommendations to MA growers that are updated daily based on current weather forecasts for 41 locations across

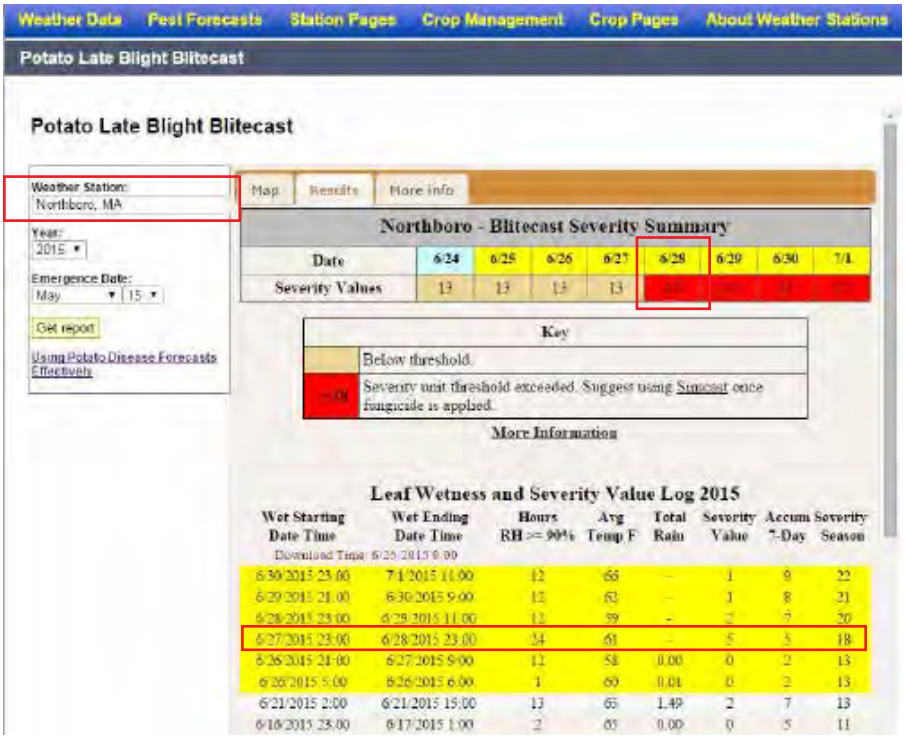
the state.

First! Scout early and often. Here are some tips to help you find the first outbreaks of LB on your farm Also, check out this helpful YouTube video from eOrganic with lots of scouting tips and photos: https://www.youtube.com/watch?v=uCzIFVfyNow. The basic principle is:

- Primary inoculum often arises from infected seed tubers or volunteer potatoes in the field or cull pile or compost heap, so check for volunteers in the compost pile or in last year's potato field as well as early potato fields
- Look in wetter areas first: low-lying areas, field edges along creeks or ponds, areas prone to morning fog, near irrigation equipment that may cause puddles to form, in areas near woodlots or any area that is shaded or protected from the drying effects of wind. Areas where it is difficult to apply fungicides such as edges and corners should also be examined.
- Look at healthy, moist tissue first: LB infections will start on succulent leaves, so look at new growth which may be unprotected by previous fungicide sprays, and look within the canopy where foliage stays moist longer.
- Know your enemy: lesions look wet and dark-olive, brown or grayish, unless the lesion has dried out during a sunny spell–then they can look dry and tan-brown. If it's moist, white, fuzzy sporulation may be present on the underside of the leaf. Fruit rot is brown and hard, not soft.

Late Blight Forecasting

The Network for Environment and Weather Applications (NEWA) is a great resource with lots of available weather data (growing degree days, hourly-daily-and monthly precipitation and temperature) and pest forecasting tools. If you don't already know it, check it out, there's probably a weather station near you that you can use if you don't have your own on-farm weather station or to double-check your own weather station or app. NEWA collects information from a network of weather stations across New England and New York—in MA there are 41 of these networked stations so it's easy to find one near you. The LB models available there incorporate the current and past weather data as well as the temperature and relative humidity forecasts from the National Weather Service to calculate LB severity values. The Simcast and DSS models also take into consideration the past and forecast precipitation to calculate "Fungicide Units," which account for fungicide residues weathering off of leaves during rain events. These models also give spray recommendations that incorporate cultivar susceptibility and fungicide sprayed.



This screenshot shows output for the Northboro station from Blitecast. Here we can see that the model is forecasting the threshold of 18 severity values will be reached on 6/28, where the severity values row changes from beige to red.

Blitecast is used to time the first fungicide application on potato. Choose the weather station closest to your or the one that is most similar to the conditions found on your farm. Enter the earliest date that potato foliage was present in your area, usually the date that foliage emerged from overwintered potatoes in cull piles. When you click "get report" you will get a table showing actual and forecast severity values based on National Weather Service forecasts for the chosen weather station. Dates in the top row of the table in blue are based on actual weather data, while dates in yellow are based on forecast weather. When the 18 severity value threshold is reached or forecast, the box displaying the severity value number turns to red, indicating that a threshold has been reached. Apply a fungicide, as soon as you can after the threshold has been reached, to any potato fields with plants larger than 6-8 inches tall.

Simcast is used to time subsequent fungicide applications on potato and tomato and incorporates cultivar susceptibility and fungicide weathering. Spray recommendations are based on an assumption that chlorothalonil is the material being sprayed. Once you've chosen the nearest weather station and entered the information requested, click the "get report" button. On the report page you can see blight units increasing over time, and fungicide units decreasing over time, indicating fungicide residue being lost. Actual weather data is indicated in blue in the top row. Forecast weather is indicated by yellow for forecasts that include rainfall, and orange for forecasts that don't include rainfall. The National Weather Service only forecasts rainfall three days into the future. Once a treatment threshold is reached, for either Blight Units or Fungicide Units, a change in color to red will signal that the threshold has been reached, and a spray is recommended.

The Decision Support System (DSS) tells you exactly when to spray next based on when and what you last sprayed, based on past, current and forecast weather data. Like Simcast, pesticide recommendations can be obtained for both potato and tomato, and take into account the susceptibility of the cultivar. What is different about DSS is you can chose materials other than Bravo, including coppers. If you set up your own DSS account, you can also enter data specific to your farm such as irrigation history to get even more precise recommendations. For the most accurate and site-specific late blight forecasts, growers can sign up for their own DSS accounts which are available for free.

This year, in addition to publishing a weekly pest report on late blight outbreaks and progress, Vegetable Notes readers will have access to a MA-wide DSS website housing NEWA Decision Support System (DSS) output for each of our 41 NEWA weather stations, thanks to our colleagues at Cornell University who developed and maintain these resources. This is a really powerful tool—it takes the guesswork out of deciding when to spray and allows you to make fungicide applications only when needed based on pathogen biology and local weather conditions–and you don't even have to think about it!

Using the UMass DSS Web Page. Follow the link to: http://blight.eas.cornell.edu/blight/MA. First, choose the town closest to your farm and select potato or tomato based on the host crop of interest. You will then get output that looks like the figure to the right. To use the table, first choose the date you last sprayed, listed across the top of the table in green. Next choose the active ingredient or product that you last sprayed, listed along the left-hand side. The table includes six of the most commonly used fungicides for control of late blight, including copper hydroxide which can be used by certified organic growers and home gardeners. Next, choose whether the cultivar being grown is susceptible, moderately susceptible, or moderately resistant to late blight—follow these links to determine the susceptibility of commercial potato or tomato cultivars. The intersection of the last spray date column and the fungicide/host resistance row is your recommended spray date. Dates in red are based on past weather or weather forecast within the next three days and are

6/25/2015 Forecasted Late Blight Critical Threshold
Location: SouthDeerfield Crop: tomato

Forecasted Late Blight Critical Threshold									
Last Fungicide Applied			Next Spray Date						
active ingredient	example fungicide product	cultivar susceptibility[1]	Date	Date	Date	Date	Date	Date	Date
Last Spray Date			6/18	6/19	6/20	6/21	6/22	6/23	6/24
chlorothalonil	Bravo WS	S	6/24	6/24	6/25	6/28	6/28	6/29	6/30
		mod S	6/27	6/27	6/27	--	--	--	--
		mod R	--	--	--	--	--	--	--
copper hydroxide	NuCop	S	6/24	6/24	6/25	6/26	6/27	6/29	6/30
		mod S	6/26	6/26	6/26	7/1	7/1	7/1	7/1
		mod R	6/30	6/30	6/30	--	--	--	--
cyazofamid	Ranman 400 SC	S	6/26	6/26	6/27	6/30	6/30	7/1	--
		mod S	6/30	6/30	6/30	--	--	--	--
		mod R	--	--	--	--	--	--	--
dimethomorph	Forum SC	S	6/26	6/26	6/26	6/29	6/29	6/29	6/30
		mod S	6/30	6/30	6/30	--	--	--	--
		mod R	--	--	--	--	--	--	--
fluopicolide	Presidio	S	6/26	6/26	6/27	6/30	6/30	7/1	--
		mod S	6/30	6/30	6/30	--	--	--	--
		mod R	--	--	--	--	--	--	--
mandipropamide techn	Revus	S	6/26	6/26	6/26	6/30	6/30	6/30	6/30
		mod S	6/30	6/30	6/30	--	--	--	--
		mod R	--	--	--	--	--	--	--
propamocarb hydrochl	Previcur Flex SC	S	6/26	6/26	6/27	6/30	6/30	7/1	--
		mod S	6/30	6/30	6/30	--	--	--	--
		mod R	--	--	--	--	--	--	--

[1]Susceptibility Abbreviations: S = susceptible

Output from the MA DSS page. If your nearest weather station is South Deerfield and you last sprayed copper on 6/20 you should spray again on 6/25 if a susceptible variety is planted, or 6/30 if a resistant variety is planted (5 days later!).

thus more reliable. Dates in black are based on the last four days of the seven day forecast and are therefore less reliable. If no date is specified it means that a spray is not recommended within the period when weather forecasts are available. As mentioned earlier, the UMass DSS page is updated daily and recommendations will change just as the weather forecast does from day to day.

In recent years, late blight has driven spray programs for disease control in potato and tomato fields, but in the absence of this disease it is still important to manage early blight (*Alternaria solani*) and Septoria leaf spot (*Septoria lycopersici*). There is also a forecasting tool for these diseases known as Tomcast. According to this model, most parts of the state are still below the thresholds for initiating spray programs for these diseases. More details on Tomcast and managing fungal diseases of tomato and potato will appear in future issues of Vegetable Notes.

--Written by Susan B. Scheufele, UMass Extension Vegetable Program

PRODUCE WASH WATER SANITIZERS: AN OVERVIEW

Food borne pathogens such as *Salmonella* and *Escherichia coli* O157:H7 may be present in raw or incompletely composted manure, and when manure is used as a crop amendment, runs off into fields or water, or is carried into fields or processing areas by workers or animals, these pathogens can be passed along to fresh produce. Using a sanitizer in produce wash water can help to maintain clean wash water free of microbial loads. However, choosing and sourcing a sanitizer can be difficult, especially on the small farm scale. This article provides an overview of two effective sanitizing agents – chlorine-based sanitizers and peroxyacetic acid – to help alleviate the stress of deciding which sanitizer is best for certain applications. Note that other types of sanitizers are available such as ozone and chlorine dioxide but the following have been chosen because they are the most readily available for small-scale Northeast growers.

Chlorine-based sanitizers. Chlorine is popularly used as a produce wash water sanitizer due to its documented efficacy and low cost. Though many different chlorine bleach products are available in stores, any product used for this agricultural purpose must be registered with the EPA and specifically labeled for fruit & vegetable washing (1). In the table below, two examples of Clorox bleach are given which are allowed for this use. Certain conditions need to be taken into account when using chlorine, such as the temperature and pH of the wash water as well as the presence of organic matter, since chlorine reacts with organic matter and becomes inactive. Bleach is inexpensive, but managing these factors can lead to added cost. Be aware that the Clorox label states that for fruit and vegetable washing, the concentration of available chlorine in the water may not be more than 25 ppm, and use rates are given accordingly. Fact sheets and other food safety resources may recommend preparing wash solutions at higher concentrations using household bleach, but be sure to follow the label for whichever product you are using. Using free chlorine test strips to measure ppms will help you determine product use rates to stay within the allowable limit. The FDA permits the use of chlorine for food contact, and the EPA regulates it as a general use pesticide.

Peroxyacetic acid. Peroxyacetic acid (PAA) is a combination of acetic acid and hydrogen peroxide. It is effective in reducing the microbial load of wash water by a variety of mechanisms (2). While on the more expensive side for initial cost, peroxyacetic acid does not react with organic matter in the same way chlorine does, and is active over a broad pH range, so dunking solutions don't have to be changed as frequently between batches (1). The FDA does not permit PAA to exceed 80 ppm in produce wash water, and the EPA regulates PAA as a general use pesticide.

Considerations. This guide is intended to help you make a decision as to which type of sanitizer will work best for you. The total cost per use must take into account both the initial cost of each product, as well as the cost of frequent solution changes and monitoring for conditions such as pH. As discussed, chlorine is reactive to organic matter and may require more per use than indicated in the table. Further studies regarding this reactivity will be carried out in the future to compliment this document. You should have a standard protocol that all workers can follow for whichever method you choose, and keep a log book to document sanitizer use rates and conditions such as pH. An example of this kind of log is provided in the UMass GAP manual as a Word document which can be downloaded and tailored for use on your own farm.

Sources:

(1) http://anrcatalog.ucdavis.edu/pdf/8003.pdf

(2) https://store.extension.iastate.edu/Product/Guide-to-Liquid-Sanitizer-Washes-with-Fruit-and-Vegetables

--Written by Marie Lawton and Amanda Kinchla, UMass Extension Food Safety Specialist and Lisa McKeag, UMass Extension Vegetable Program

	Brand Name	Active Ingredients	Company Contact	Where to Buy	Label Instructions	Desired ppm active ingredient[1]	Amount sanitizer per 100 gal tank	Standard operating procedure[2]
Peroxyacetic acid	Tsunami 100 *EPA # 1677-64*	11.2% Hydrogen peroxide, **15.2% Peroxyacetic acid**	Ecolab Inc. Institutional Division 370 N. Wabasha St. St. Paul, MN 55102 1-800-352-5326	*contact - Ecolab* 4 gal ~ $110	36-575 ppm total product (5-80 ppm peroxyacetic acid)	80 ppm peroxyacetic acid (FDA regulation)	6.7 oz $1.45/use	1. Remove soil 2. Prepare 80 ppm solution 3. Submerge produce 4. Monitor PAA level with strips, adjust as needed 5. Contact time ~ 90 s 6. Drain and dry
	SaniDate 5.0 *EPA # 70299-19*	23.0% Hydrogen peroxide, **5.3% Peroxyacetic acid**	BioSafe Systems, LLC 22 Meadow St. East Hartford, CT 06108 1-888-272-3089	*Johnnys.com* 2.5 gal ~ $159 *Helena Chemical Co.* 5 gal ~ $280 *Crop Prod. Serv.* 5 gal~$218	462 - 1636 ppm total product (24 - 85 ppm 100% peroxyacetic acid)	80 ppm peroxyacetic acid (FDA regulation)	19.3 oz $9.59/use	1. Remove soil 2. Prepare 80 ppm 3. Submerge produce 4. Monitor PAA level with strips, adjust as needed 5. Contact time ~ 90 s 6. Drain and dry
Chlorine	Clorox Regular Bleach *EPA # 5813-50*	**6% Sodium Hypochlorite**	The Clorox Company P.O. Box 493 Pleasanton, CA 94566	*online - amazon.com -Walmart~ $3.50*	25 ppm available chlorine	25 ppm free chlorine (label)	5.33 oz $0.55/use	1. Remove soil 2. Prepare 25 ppm 3. Submerge produce 4. Monitor Cl levels 5. Monitor pH 6. Monitor turbidity 7. Rinse required
	Clorox Germicidal Bleach *EPA # 5813-100*	**8.25% Sodium Hypochlorite**	The Clorox Company P.O. Box 493 Pleasanton, CA 94566	*online – amazon.com* 4.5 gal ~ $27.95 *-Walmart~ $32*	25 ppm available chlorine	25 ppm free chlorine (label)	3.88 oz $1.02/use	1. Remove soil 2. Prepare 25 ppm 3. Submerge produce 4. Monitor Cl levels 5. Monitor pH 6. Monitor turbidity 7. Rinse required

[1]Suggestion based on recommendations for chlorine, see publication by Trevor Suslow for various commodities http://ucfoodsafety.ucdavis.edu/files/26414.pdf

[2]*Sample* standard operating procedure

UMass Food Science Extension, Kinchla, Issued 2_2015.

NEW PLANT NUTRIENT REGULATIONS

Farmers in Massachusetts are advised to keep informed about changing plant nutrient management regulations. The Massachusetts Department of Agricultural Resources (MDAR) has developed statewide plant nutrient regulations that went into effect for non-agricultural land managers on June 5, 2015. The new regulations for agricultural producers will take effect on December 5, 2015.

To access these regulations on the MDAR website, go to:
www.mass.gov/eea/agencies/agr/pesticides/plant-nutrient-management.html

For Best Management Practices in Vegetables visit the UMass Extension website:
https://ag.umass.edu/agriculture-resources/nutrient-best-management-practices

For more information or questions about the regulations, contact Hotze Wijnja at MDAR: hotze.wijnja@state.ma.us or 617-626-1771.

Ruth Hazzard, Vegetable Specialist of 26 years to retire

Invitation to an Open House Reception for Ruth Hazzard

To celebrate her retirement from UMass Extension

Monday June 29, 2015, 4-7 PM

UMass Cold Spring Orchard Research and Education Center, 391 Sabin St, Belchertown MA 01007

Hosted by her friends and colleagues at UMass Extension and the Stockbridge School of Agriculture.

Please contact Kathleen Carroll at kcarroll@umext.umass.edu or 413-545-0895 to RSVP

Events

IPM Field Walks

In this series, learn to identify and scout fruit and vegetable pests and select integrated pest management strategies that work for you whether you are a beginner, experienced, organically certified or not! We will walk farm fields with Extension Educators and farmers in Massachusetts, Rhode Island, and Vermont to learn how each farm is practicing IPM. Bring a hand lens if you have one. This series is funded in part by a Northeast IPM Center grant.

- **July 1st, 4-6pm**
  Matunuck Vegetable Farm, South Kingston, RI - 0.6 mile south of US Route 1 on Matunuck Beach Road, on the right-look for High Tunnel behind a stone wall. Learn how to scout for key pests and diseases of early summer on cucurbits, brassicas, beans, tomatoes and more. We will discuss a variety of control and prevention measures with the farmer and Extension Educators Andy Radin, URI and Katie Campbell-Nelson, UMass. **2 pesticide recertification credits available.**
- **July 22nd, 4-6 pm**
  Waltham Fields Community Farm, 240 Beaver Street, Waltham, MA
  Learn to calibrate a backpack sprayer, select effective OMRI approved materials and calculate the economic threshold of vegetable crops after being trained to scout in the field with farmers Erin Roberts and Zannah Porter and UMass Extension staff Lisa Mckeag, Susan Scheufele and Rich Bonanno. **2 pesticide license contact hours available in the vegetable category.**
- **July 27th, 4-6 pm**
  Simple Gifts Farm, 1089 North Pleasant Street, Amherst, MA
  Come to this field walk to learn how to use pheromone traps to monitor Squash Vine Borer, use a microscope to identify plant pathogens, and learn to scout multiple vegetable crops with farmer Jeremy Barker Plotkin, UMass Extension staff Katie Campbell-Nelson, Lisa McKeag and Plant Diagnostician Angie Madieras. Leave after a discussion of control strategies for these pests on organic farms. **2 pesticide license contact hours available in the vegetable category.**
- **August 25th, 3:30-6pm**
  Hurricane Flats, 975 S. Windsor St. South Royalton, VT
  Join us to learn how to scout for disease and insect pests in the field and discuss effective organic control strategies with farmer Geo Honigford, Ann Hazelrigg and Gabriella Maia (UVM Disease Diagnostic Laboratory) and Katie Campbell-Nelson (UMass Extension Vegetable Program). Sponsored by Vermont Vegetable and Berry Growers Association and NOFA-VT.

Professional Development Soil Health Workshop Series

The University of Massachusetts Extension has been funded by the Sustainable Agriculture Research and Education Professional Development Grant (2014-2017) to provide educational opportunities to Agricultural Service Providers and Farmers in Soil Health topics.

- **July 16th, 3-5 pm**
  Diagnosing Streams: Flood Protection Remedies for Farm and Forested Lands, 89-91 River Rd. South Deerfield, MA
  Christine Hatch, UMass Extension Assistant Professor, Geosciences, and Benjamin Warner, UMass PostDoc, Geosciences will present the latest science on “diagnosing streams” and provide best practices for farm and forest

land managers to protect their land from the effects of stream flooding. Their goal is to help agriculture, forestry, and rural communities develop greater resiliency during extreme weather events. Christine and Benjamin are members of a New England "Fluvial Geomorphology" research group. The group has studied successes among restoration responses to Hurricane Irene in Massachusetts and Vermont and will be sharing findings from this work with Agricultural Service Providers in Massachusetts.

- **August 25th, 3:30-6pm**
  Soil Tests for New England and interpreting them for Phosphorous Management, 89-91 River Rd. S. Deerfield, MA
  Tom Morris, University of Connecticut Professor, Plant Science will present methods of different soil extractions and tests, with a focus on those appropriate for New England soils. With his experience in field research on nitrogen and phosphorous, Tom will present Agricultural service providers with a basic understanding of the chemistry of Phosphorous in the soil, how it behaves, how best to assess P status of soil in different growing systems, how to assess potential loading from soil applications of fertilizer, compost or manure, and how to mitigate soil with excess Phosphorous aside from not adding more (e.g., cover crops or other ways to use up or sequester phosphorous to prevent off site movement or contamination.
  Tom Akin, Natural Resource Conservation Service Agronomist will present work on evaluating a new soil extraction method for New England with data from Massachusetts farms. The new Haney Soil Health Test is being tested in Massachusetts to evaluate it's ability to better predict active carbon and other indicators of soil health.

2015 NOFA Summer Conference

When: Friday, August 14 to Sunday, August 16, 2015
Where: UMass Amherst Campus

This year's main conference features 144 individual sessions with 27 different topic areas. Workshops address organic farming, gardening, land care, draft animals, homesteading, sustainability, nutrition, food politics, activism, and more. The theme for this year's Conference is "Healing the Climate, Healing Ourselves: Regeneration through Microbiology".

This year's conference will include sessions with UMass personnel:

- Amanda Brown, Director of the UMass Student Farm; Tour of the UMass Ag Learning Center
- Lisa McKeag, Extension Vegetable Program; Pest Scouting in the Field at Simple Gifts Farm
- Susan Scheufele, Extension Vegetable Program; Integrated Pest Management in Brassicas

THANK YOU TO OUR SPONSORS

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