UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

Volume 26, Number 15 July 24, 2014

In this issue:

Crop Conditions
Pest Alerts
Late Blight is Here, Now What?
Finishing the Onion Crop
Food Safety - Wash Water Sanitizers
Upcoming Events

Learning about soil structure at a previous UMass Agricultural Field Day.

Crop conditions

Corn harvests are coming in strong now and growers are reporting an excellent quality crop so far. Other crops being harvested now include garlic, peppers, tomato, eggplant, carrots, and melons. Fall brassicas, carrots, turnips and beets are filling in fields for fall harvest and storage. Other long season crops need the grower's attention now to ensure a healthy harvest for storage. In this issue of Vegetable Notes, see articles on finishing the onion crop and late blight management in potatoes and tomatoes to help get these crops to maturity. Yes – late blight has been found in MA this week, which changes the picture for managing these crops! Next week, at the UMass Agriculture Field Day from 10-4 on Tuesday, July 29th, come tour and hear results of research on energy efficient storage engineering, Jílo eggplant, fava beans, potato fertility, mustard cover crops to reduce *P. capcisi*, cabbage root maggot, *Alternaria* and black rot in brassicas, basil downy mildew, and much more! See the UMass Student Farm program in action and learn about how your land grant university is educating the next generation of farmers. Over lunch there will be a discussion of Commonwealth Quality, GAP Certification and postharvest sanitation. See the "Upcoming Events" section for a full schedule, there's a lot going on! Hope to see you there.

Pest alerts

Solanaceous crops: Late blight has been confirmed this week on both potato and tomato in Franklin and Hampshire Co. MA, and is also present in eastern NY, Long Island, and southern ME. For a map of late blight reports and photos of symptoms, see usablight.org. The late blight we have found in MA is more virulent on potato than in the past several years, and is also very aggressive on tomato. Scout both potato AND tomato for symptomatic water soaked lesions (see images) and begin protective or curative sprays with a late-blight specific fungicide immediately. Get spray recommendations tailored to your local weather conditions and fungicide program using the MA DSS website here. (See article this issue for important late blight management tips).

Late blight on Potato Photo:James G Kantzes, University of Maryland

Late Blight on Tomato leaf bottom. Photo: Katie Campbell-Nelson

Potato leafhopper (PLH) nymphs are building up and hopperburn is being seen in fields where numbers are high.. Red potatoes tend to be especially susceptible to PLH damage and show symptoms first. PLH adults and nymphs were above threshold of 1 nymph per 3 leaves or 1 adult per plant in potatoes scouted in Chittenden Co., VT.

Cucurbits: Cucurbit downy mildew is still a low risk in New England according to CDM-IPM-PIPE. However, it is moving closer; new outbreaks of **cucurbit downy mildew** have been reported in New Jersey, MD and MI. Powdery mildew has been spotted in squash fields in Franklin and Hampshire Counties, MA, Chittenden Co. VT. Treatments should begin when the disease is first observed. See the May 15th issue of Vegetable Notes for treatment options and tips on fungicide resistance management. High humidity increases risk of **scab** which was observed in yellow squash plants but not on fruit in Chittenden Co. VT. Squash bug adults are still laying eggs, and nymphs are hatching. **Squash vine borer** trap counts

remain high.

Alliums: As **onions** are beginning to bulb, consider the steps needed to protect your storage crops. **Purple Blotch** was found in Franklin Co. MA, and **Botrytis** and **thrips** continue to be widespread. Whether your onions are still green with strong necks, or are approaching maturity, make sure to manage these pests, because all of them can affect storability. These may also affect leeks. (See article this issue for more information). In **garlic: Fusarium**, **bloat nematode**, and **bulb mites** have all been diagnosed at the UMass Disease Diagnostic lab this year, and similar problems have been identified by the Vermont Diagnostic Lab. Check storage and seed garlic from this year's harvest carefully and cull diseased plants now to keep future garlic plantings trouble free.

Basil downy mildew (*Peronospora belbahrii*) was confirmed last week in field-grown basil Middlesex Co. and the week before at a box store in Franklin Co., MA. Researchers at UMass have found *Peronospora belbahrii* in or on commercial seed. It is important to ask your seed supplier if the seed has been tested before planting or purchasing seed for next year. Come to the July 29th, UMass Agriculture Field Day to learn more about a field trial on basil downy mildew (See events section for more information).

Sweet Corn: **Corn earworm** captures remained low this week in trap reports from central and western MA (<4 or between 4 and 7 moths per week, calling for a 6 or 5 day spray interval, respectively). However, counts rose in the coastal southeast of MA (>7 moths, calling for a 4 day interval). With frequent storms moving through over the next few weeks, having a trap on your own farm will give you timely alerts to help you achieve the most effective spray schedules. Move the trap into fresh silk at least every 2 weeks. **European Corn Borer** second flight is on the rise – captures went up at all locations. In the absence of CEW, use weekly sprays on silk for ECB. Peppers should also be protected at this time. **Fall armyworm** damage was found in whorl stage corn this week – scout for damage and treat if > 15% have fresh damage or caterpillars in the whorl. Many of the newer, selective products for ECB or CEW also are effective against FAW. **Birds** are the biggest problem right now for many sweet corn growers, as large flocks of redwing blackbird are drawn to feed in ripening corn. A constant, multi-tactic battle is needed to keep each block from being attacked as it gets ready to harvest. Visual devices such a scare-eye balloons, auditory devices such as cannons or bird-bangers and recorded distress calls, repellents with the active ingredient methyl anthranilate -- and a famer with a gun and shellcrackers -- may all be needed to win the battle. Auditory and visual deterrents work best when they are moved around and for noisemakers, randomized. The goal is to keep birds unsettled and on the move. Foliar deterrents with methyl anthranilate that are registered for use in corn in MA include Bird Shield and Avian Control. In addition, creating a feeding site, by disking each block immediately after harvest, helps attract birds away from the current harvest block. Note that right to farm laws in MA allow noise associated with 'commercial agricultural and farming operations and activities conducted in accordance with generally accepted agricultural practices' -- which includes propane-fired cannons. However, try to use 'best practices' which include pointing propane-fired cannons away from the direction of neighboring houses, using them only in the daytime, setting them for longer time intervals and lower volume to the extent that is consistent with scaring birds away.

Table 1. European corn borer (ECB), fall army worm (FAW), and corn earworm (CEW) trap captures for the week ending 7/24/14.

Location	ECB	FAW	CEW
Western, MA			
Sheffield	4	-	0
S. Deerfield	0	-	1
Hadley	15	0	1
Feeding Hills	8	0	0
Central & Eastern MA			
Spencer	0	0	0
Tyngsborough	3	0	1
Concord	6	0	3
Millis	7	-	7
Sharon	3	-	3
Lancaster	2	0	2
Seekonk	3	-	36
Rehoboth	2	-	14
NH			
Litchfield	0	3	2
Hollis	0	4	3
Mason	0	0	0
Burlington, VT	3	-	1

Table 2. Spray intervals for Corn Earworm

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

LATE BLIGHT IS HERE, NOW WHAT?

Late blight has been confirmed on potato and tomato plants in Hampshire and Franklin Counties, MA and is likely widespread across the region. While the weather may seem hot and relatively dry during the day, relative humidity is still high (above 70% in most of the state) and nighttime temperatures are dipping down to 55°F resulting in lots of morning dew that lasts long into the day within the dense plant canopy. Last year, growers who used resistant tomato varieties and/or started spraying fungicides preventatively and kept up regular fungicide sprays were able to maintain their crops despite the presence of disease nearby. This disease progresses rapidly—whole fields can be completely destroyed within two weeks of symptom onset—so preventative action and early detection are imperative. Use of late-blight specific fungicides is advised on all tomato and potato crops in MA and adjacent areas of neighboring states. See the New England Vegetable Management Guide for a complete list. According to the University of Maine Potato Program, (updated 2014) the following products offer good or excellent control in potato after signs of the disease are present:

cymoxanil (Curzate 60 DF): 3.2 oz/A. (14 dh, REI 12h, Group 27). Use only in combination with a labeled rate of a protectant such as manzate, chlorothalonil or triphenyltin hydroxide.

famoxadone plus cymoxanil (Tanos): 6 to 8 oz/A. (14 dh, REI 12h, Groups 11 & 27). Must be tank mixed with an appropriate contact fungicide with a different mode of action. Do not alternate or tank mix with other Group 11 fungicides.

propamocarb (Previcur Flex): 0.7 to 1.2 pt/A. (14 dh, REI 12h, Group 28). Must be tank mixed with a contact fungicide. See label for rates and timing.

Copper is the best organic product for this pathogen, but it acts as a protectant only.

Scout your potato and tomato fields multiple times per week (daily if possible), focusing first on low-lying areas, shady field edges, areas prone to morning fog, wet areas next to streams, ponds, or near overhead irrigation rigs, or any area that is protected from the drying effects of wind and sun. Areas where it is difficult to apply fungicides such as edges and corners, new growth that has not been previously sprayed, or tall plants above the height of spray booms should also be closely examined. Look deep within the dense canopy, where sunlight and wind cannot penetrate, and leaves remain wet through much of the day. Frequent scouting is necessary because the pathogen has a latent period of several days, meaning that the plant can be infected for days or even a week before any symptoms are observed. Once the pathogen begins to produce new spores, the explosive phase of the disease has started. Individual lesions can produce 100,000 to 300,000 sporangia per day, and each sporangium is capable of initiating a new infection that will become visible within three to four days and produce sporangia within another day or two under optimal conditions. Sporangia can germinate directly but in the presence of free moisture they can also produce 1 to 8 zoospores, each capable of initiating an infection, increasing the reproductive capacity of the pathogen up to 8-fold.

Due to its destructiveness and the aerial dispersal of sporangia from field to field and farm to farm, late blight is considered a community disease and everyone needs to participate in preventing its spread. If significant disease is present on your tomato or potato plants, we recommend that you promptly destroy these sources of inoculum and inform neighbors growing susceptible crops so they can take action to protect their plants. Here we provide information to help you make decisions about how to manage your crops once the disease is present on your farm.

Potato Considerations

It has been several years (since 2009) since we had a late blight outbreak severely affecting potato in MA. Furthermore, most potatoes are in the bulking stage but not ready to harvest, making it difficult to decide how to move forward.

If late blight is present in your potato field, all tubers should be considered at risk, as sporangia produced on leaf and stem lesions can be washed off the plant by water and into the soil where they can infect the growing tubers. In conventional fields where preventive spray programs have been in place, continue spraying according to the late blight decision support system and incorporate the aforementioned targeted fungicides into your spray programs immediately to hold back the disease and protect tubers from infection. On organic farms where disease symptoms are widespread it is advisable to kill potato vines quickly, as copper is the only fungicide available and will not provide sufficient protection from late blight once symptoms are widespread. In the case that disease symptoms and sporulation is widespread, **foliage must be killed** as soon as is possible to prevent sporangia spreading to the soil and infecting tubers. The pathogen can survive on any liv-

ing tissue, so plants should be thoroughly mowed, flamed, or herbicide-killed so that no living tissue remains. If you plan to use herbicides to kill potato vines, two products are labeled for vine kill in potato: **1) glufosinate-ammonium (Rely)** at 3 pt/A (9 dh, REI 12h). NOT for seed. Minimum spray volume of 20 gal/A. This is the same active ingredient as Liberty herbicide. It is rainfast in four hours, acts as a contact, burndown herbicide similar to paraquat, but with a toxicity profile more like Round-up—that is, safer for the handler to use; and **2) diquat (Reglone)** at 1 to 2 pt/A (7 dh, REI 12h). This product is suitable for seed and storage. Always use a spray adjuvant (0.1 to 0.5% v/v NIS). Use a minimum spray volume of 20 gal/A. It is rainfast in 30 minutes. A second application may be made depending on density of vine growth. A five-day interval is recommended between applications and not more than 4 pt/A may be applied in one season. Endothall (Desicate II) is no longer manufactured, and paraquat (Gramoxone) is no longer registered as a vine dessicant.

Wait at least two weeks after vine kill to harvest tubers from affected fields. This will allow infected tubers to rot away in the soil, and uninfected tubers will put on skin tissue that will protect them from wounding during harvest and lower the chances of infection during harvest and storage. Harvest when soil is not excessively wet, and do not wash tubers. Tubers should be dry when placed in storage. Remove any obviously infected tubers before putting them in storage. Infections generally begin in tuber cracks, eyes or lenticels. Infected tuber tissues are copper brown, reddish or purplish in color. Sporulation may occur on the surface of infected tubers in storage or in cull piles. Infected tubers are often invaded by soft rot bacteria.

Tomato Considerations

As with potato, where growers have been keeping up with regular fungicide spray programs and disease is not widespread, continued spray programs can keep the disease at bay. In conventional fields where preventive spray programs have been in place, continue spraying according to the late blight decision support system and incorporate at least one of the targeted fungicides listed below into your spray programs immediately. Always follow label instructions and be careful to rotate different mode of action chemistries (FRAC codes) with each application and tank-mix targeted fungicides with a protectant fungicide such as maneb, mancozeb, or chlorothalonil.

Mefenoxam fungicides (Ridomil Gold Bravo, Ridomil Gold Copper and Ridomil Gold MZ WG) are highly effective, systemic materials on late blight strains US-22 and US-23 but other strains have developed resistance to this material. Genotype US-24 has been identified in New York this year and has intermediate resistance to this class of fungicide, so it is best to avoid using them.

propamocarb HCl (Previcur Flex) and Presidio SC (fluopicolide) also have systemic action within the plant and will thus protect new growth and unsprayed areas

mandipropamid plus difenoconazole (Revus Top), dimethomorph (Forum), cymoxanil (Curzate) and famoxadone plus cymoxanil (Tanos) have translaminar activity so are targeted and will move some into the plant but won't give as good control as systemic materials.

Strobilurin fungicides (Group 11—includes Quadris Opti, Quadris Top and Cabrio) are labeled for late blight but are not considered to be as effective as the materials listed above

Ranman, Gavel, and Zoxium should be considered as contact fungicides (compare to chlorothalonil or mancozeb) when used against late blight

On organic farms where copper has been sprayed regularly to prevent disease onset, continue spraying regularly and follow the recommendations on the late blight decision support system. There are no targeted materials to use, but look for copper products with high metallic copper equivalencies to get the best protection. Be sure to get good coverage throughout the canopy. Fungicides are recommended on blight-resistant varieties as most resistance is not total and will depend on which blight genotype strain is present. If late blight symptoms are present in isolated patches, remove affected plants plus a border of several healthy looking plants around the infected plant(s) to reduce disease spread. Where disease symptoms are widespread or in untreated areas such as U-pick fields, whole rows or blocks may need to be removed. Follow these tips for removing plants:

Rogue out plants by cutting trellising, cutting the base of stem or uprooting the plant, placing the plant in a trash bag and removing bags to a landfill.

For larger areas of staked tomatoes there are several options for removing or destroying the crop after strings are cut and stakes are removed: mow thoroughly, pull plastic, and incorporate residue; use herbicide to kill the crop; or pile

residue and cover with a tarp or large sheet of plastic to prevent further spread of spores and eventually kill the tissue. Where possible, do this work under sunny skies, as strong sunlight will kill spores released into the air.

Herbicide may be used to kill plants while still on the trellis.

Many growers are tempted to try to continue harvesting seemingly unaffected fruit from plants with late blight infections present. However, once plants are infected all fruit is susceptible and symptoms will develop on fruit even after they are harvested. In previous years, it has not been uncommon to see infected fruit in markets. Infected plants should be promptly removed from the field in order to reduce disease spread throughout your field, prevent spread to your neighbors field, and save your consumers from the experience of taking their tomatoes home only to rot on the counter.

Late blight comes later in high tunnels compared to tomato crops in the field, but high tunnels do not guarantee protection. Fulvia leaf mold, botrytis and powdery mildew are all quite common in high tunnel tomatoes and are often confused with late blight. However, late blight can occur in high tunnel tomatoes and if it is found, crop removal is critical. Incorporating residue is not recommended since soils may not freeze, and live tomato tissue may survive winter providing a form of "green-bridge" and potential source of inoculum the following spring. Open the house to let it freeze deeply. Avoid continuous cultivation at above-freezing levels through the winter after a tomato crop.

--UMass Extension Vegetable Program with contributions from R. Hazzard, M.B. Dicklow, R.L. Wick, S.B. Scheufele, K. Campbell-Nelson

FINISHING THE ONION CROP

Onions are a very popular crop for direct market growers- most customers will grab some onions along with their tomatoes and cukes- and can be well worth the production effort. Proper production and storage provides steady sales right into the winter markets. Bulbs must be in a good state of health to bring in the late season income.

The starting point for successful onion storage is proper plant nutrition during the growing season. Most critical is adequate but not excessive N, particularly after bulb formation has begun. Delayed maturity and slow field curing occurs for the simple reason that the plants just *want* to keep growing because they are not limited by a lack of N. In lighter soils and in our generally rain-fed climate, N application should be split to avoid leaching. Check the New England Vegetable Management Guide for the N recommendation, bearing in mind N credits from previous cover crops and organic matter content. Also follow recommendations for P and K based on soil testing, and make sure there is adequate supply of S, Ca, and Mg. Supplement these as needed. Also maintain soil pH between 6.5 and 6.8 to insure nutrient availability. If using organic nutrient sources, remember that N continues to be released well into the summer, which is later than additional N supply is desirable!

Water management varies depending on onion growth stage. We can't control stray hurricanes during maturation but we can control irrigation. Overwatering in the early season can leach out N and S, and in the later season, can hasten the development of diseases which can carry into storage. However, onion bulbs are approximately 90% water so there certainly is a place for water during the later growth stages. Needless to say, drip irrigation is preferable in order to avoid the combination of wet foliage and hot weather.

Purple Blotch (Alternaria porri) on Onion

Many are turning to the use of plastic mulches with drip tape underneath for both weed control and water management. Recent work at Cornell and Penn State (https://extension.umass.edu/vegetable/sites/vegetable/files/pdf-doc-ppt/Stop-the-Rot-2011.unlocked.pdf) demonstrated a *higher* incidence of **bacterial bulb rots** *with the use of black plastic mulch*, most likely due to higher soil temperature and less air circulation at the soil surface. Reflective silver mulch, black biodegradable mulch, and bare ground had 1.8 to 2.8 times higher marketable yield than black plastic mulch. These researchers also found that closer spacing, contrary to what you might think, had *lower* incidence of bacterial bulb rots for the reason that the extra jumbo bulbs produced at wider spacing have thicker necks and delayed maturity, which makes them more susceptible.

Leaf blight (Botrytis squamosa) on Onion

Right now is prime time for the development and spread of the common *Alternaria* disease known as **Purple Blotch**, which kills foliage prematurely and can cause bulbs to rot in storage. The

fungus overwinters as mycelium on infected plant debris; rain and persistent moisture is necessary for infection. Planting orientation that favors rapid leaf drying can help reduce infection. Yellow storage varieties are more resistant than white sweet varieties. A four year crop rotation is also recommended if this pathogen is found in your crop. A preventative fungicide program where inoculum is known to be present can be very effective. This will also control ***Botrytis* leaf blight**.

Thrips can also live in stored onions, reducing their marketability, but control may be difficult due resistance to insecticide, *and* because at any given time, 60% to 75% of the population is in the egg stage, which will not be harmed by insecticide (http://extension.usu.edu/files/publications/factsheet/ent-117-08pr.pdf). Thus, it's important to avoid a heavy buildup of the population prior to harvest. See New England Vegetable Management Guide for treatment options.

Finally, an interesting paper by Jim Christopherson (of Keithly-Williams Seeds) on the late stages of onion crop development, published on-line (http://www.pnva.org/files/files/DryBulbOnionMaturity-JCh.pdf), provides interesting insights on practices that lead to successful onion storage.

Further reading below:

http://www.seminis.com/sitecollectiondocuments/onion-disease-guide.pdf

http://www.extension.umn.edu/garden/fruit-vegetable/yellow-storage-onions/index.html

http://www.omafra.gov.on.ca/english/crops/facts/95-063.htm#Root and Bulb Diseases

-by Andy Radin, University of Rhode Island, 2014

FOOD SAFETY – WASH WATER SANITIZERS

Outbreaks of foodborne-illnesses from fresh produce in recent years have inspired new on-farm food safety regulations, and prompted farmers at all production scales to consider new practices aimed at reducing the risks of microbial pathogen contamination on their produce. Post-harvest sanitation is a key area where some of these improvements can be made. One sanitation practice is the addition of chemical sanitizers to vegetable wash water. More and more, smaller-scale farmers and food producers are adopting the use of sanitizing agents in wash waters to manage potential pathogens. Protocols for the use of these sanitizers were not necessarily written for the ranges of scale and level of infrastructure that exist on New England's farms and more appropriate methods and rates are still being determined, as are the regulations and guidelines surrounding food safety.

The purpose of adding a sanitizer to vegetable wash water is not to try to sanitize the produce being washed, but to ensure that, if any item is contaminated with a microbial pathogen before it goes into a dunk tank, the wash water itself doesn't become a source of contamination for every other piece of produce that passes through it. Because sanitizers are pesticides – they are used to kill harmful microorganisms – each must have an EPA registration number, and must be used in accordance with its label.

The anti-microbial activity of sanitizer solutions can be affected by several factors, including the presence of organic matter, and the pH and temperature of the solution. Different sanitizers are impacted by different variables. Chlorine is significantly impacted by temperature and pH, as well as the presence of organic matter, while peracetic acid (PAA) sanitizers are less affected by organic matter. These factors can be challenging to control in a farm wash room, so it is important to utilize available tools and practices for managing them. Remove as much soil and debris as possible from crops before they go into the sanitizer solution. Some crops, like zucchini or carrots, might be brushed or sprayed before being dunked in the sanitizer solution to remove excess soil and debris, while more delicate crops like salad greens can be pre-washed in plain water. This will reduce the amount of organic matter present in the wash water tank and prolong the activity of the sanitizer. See the University of Vermont's leafy greens wash water study and video on using triple washing to reduce E. coli in wash water.

Monitor pH levels in the water with pH test strips. You can also monitor the concentration of sanitizer with test strips specific to the product being used. For instance, chlorine levels can be measured with chlorine test papers, which will tell you the parts per million of free chlorine present. It is critical that you use test strips for free chlorine (not total chlorine), which measures the levels of the active, anti-microbial form of chlorine in the water. Also, be sure to get strips that mea-

sure differences within the solution's targeted concentration range. Low range strips are available that allow you to measure between 0 and 7 parts per million in 1 ppm intervals, while high range strips will measure from 0 to several hundred ppm in 25 or 50 ppm intervals. There are also other strips specific to either PAA or chlorine dioxide. You need to know which sanitizer chemistry you are using to know which strips to use. There are a variety of products on the market , from several different producers. Some examples include: LaMotte, Industrial Tech Systems, and HACH. These strips can be found on-line, at restaurant supply stores, or some farm supply stores.

The particular concentrations and other methods for use and monitoring will be on the product label. Some sanitizers may require a certain amount of surface contact time, others may require a rinse step. Again, the label is the law. Organic growers should check with their certifying agency to be sure a sanitizer is allowed with their certification.

A helpful resource list of sanitizers is the Organic Materials Review Board (OMRI) list of processing & handling products. The section called Processing Sanitizers and Cleaners lists the categories and chemistries, product names, and some specifications particular to organic production. OMRI screens products for compliance with USDA organic standards, but the result is a good compilation of products that can be useful to all growers. You can also search the National Pesticide Information Retrieval System database to determine EPA registration status of a chemical or specific product.

Below are some of the most common active ingredients used for vegetable wash water sanitation, and an example of a labeled product. No endorsement is intended for any of the products listed in this article. Information is provided for educational purposes only.

Sodium hypochlorite, the active ingredient in household bleach, is probably the most commonly used sanitation product on farms. If bleach is going to be used as a sanitizer in wash water, or on food-contact surfaces, the particular product must be registered with the EPA, and be labeled for this use. Not all bleach products have this label, and many formulations of bleach have added fragrances or other chemicals that would make them unsuitable for vegetable washing. There are hypochlorite products on the market that are labeled specifically for produce washing, both in liquid and tablet form, and at different concentrations.

Clorox Germicidal Concentrated Bleach (8.25% sodium hypochlorite) does have an EPA registration, and is labeled for use as a fruit and vegetable wash, as well as for sanitizing food contact surfaces. Be aware that the Clorox label states that for fruit and vegetable washing, the concentration of 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 chlorine test strips to measure ppms will help you determine product use rates to stay within the allowable limit. AFCO and Birko are two other companies that sell hypochlorite products for use in fruit and vegetable wash waters.

As mentioned above, the level of active chlorine in the water will vary with the condition of the wash water. Chlorine is very sensitive to deactivation by organic matter, so pre-rinsing vegetables and changing the sanitizing solution frequently are important steps in maintaining the sanitizer's effectiveness. Remember that the pre-rinse water will have a high organic load and therefore will be the highest risk water for contamination if it is not routinely changed or treated. Chlorine is most active as an anti-microbial agent at a pH between 6.0-7.5. It is important to target this range. Above 7.5, the sanitizer will not be as effective, but if pH is too high you can add citric or acetic acid (white vinegar) to lower the pH. Caution: below 6.0 the solution may form a toxic chlorine gas. An excellent and accessible resource that includes detailed information on the use of pH and chlorine test strips is Top FAQs about Produce Wash Water Management for Small-Scale and Direct Market Farms, a webinar originally presented by Trevor Suslow, an Extension specialist from the University of California Davis, Center for Produce Safety.

Peracetic acid, also known as Peroxyacetic acid or PAA dissolves into acetic acid and hydrogen peroxide in water, is much less sensitive to organic matter and is active over a broad pH range – 1.0 to 8.0. There are several sanitizer products available through companies such as BioSafe Systems and Ecolab, Inc. and through retailers such as Johnny's Seeds.

Sanidate 5.0 is labeled for use as a vegetable wash water sanitizer. As described in the University of Vermont greens washing study, adding a full-dose of a Sanidate 5.0 to leafy greens wash water reduced the generic *E. coli* levels in the water after the first rinse by 99.1% compared to a single wash in plain potable water. There are variety of other product names that use this chemistry. EcoLab sells a product called Tsunami, Spartan sells PAA Sanitizer FP.

Chlorine dioxide, is a gas that is effective at a broader pH range and lower concentrations than hypochlorite, and is less affected by organic matter. It may be more expensive . You traditionally need a dosing unit to penetrate the CLO2 into your water source. Research has shown that this is an effective treatment but there is an initial investment to get it installed.

Oxine , made by Bio-Cide International, is registered with the EPA and labeled for use in vegetable washing systems.

For more information on wash water sanitation, please see the following resources:

Washington State University Post-harvest Information Network: Wash Water Sanitation: How Do I Compare Different Systems?

University of California, Davis publication: Postharvest Chlorination: Basic Properties and Key Points for Effective Disinfection

Penn State Bulletin: Use of Bleach as a Disinfectant in Post-harvest Washing Systems

UVM Produce Safety Study Report on Leafy Greens Washing

- by Lisa McKeag , with help from the above resources and UMass Extension Specialists, Amanda Kinchla and Rich Bonanno

UPCOMING EVENTS

UMass Agricultural Field Day

When: Tuesday, July 29, 2014, 10:00am to 4:00pm

Where: UMass Animal and Crop Research Center, 89-91 North River Road, South Deerfield, MA 01373

Contact Madeline Madin, cdle@umext.umass.edu, 413-545-5221 for more information on this event.

Schedule:

10:00-10:20 Parking and registration. Open poster session with the Student Farm Enterprise.

10:20-12:20 Participants will be split in two groups and the groups will switch for the afternoon session.

Group A: Projects on northern end of the farm. **nergy Efficient Food Storage Systems**

Native Pollinator Instillations

Agriculture and Solar Energy Dual Land Use

Evaluation of Organic Sources of Nitrogen for Production in a High Tunnel Frank Mangan, Zoraia Barros, Aline Marchese and Viviane Barros

Establishing a Cost Effiecient Seeding Rate for Hairy Vetch as Cover Crop Masoud Hashemi, Sarah Weis

Cover Crop and Nitrogen Management for Sustainable Potato Production Emad Jahanzad, Allen V. Barker, Masoud Hashemi

Integrating Pig and Vegetable Production Frank Mangan, Zoraia Barros, Aline Marchese and Viviane Barros

Establishing the Carbon Footprint in Agricultural Systems Viviane Barros

GROUP B: Projects on southern end of the farm.

Management of Basil Downy Mildew in Organic Systems Susan Scheufele, Robert Wick

Evaluation of Biological and Alternative Fungicides to Control Fall Diseases of Brassicas Susan Scheufele, Ruth Hazzard

Evaluation of Conventional and OMRI-Approved Insecticides to Reduce Cabbage Root Maggot Damage Susan Scheufele, Ruth Hazzard

Amending Soil with Biochar and Rock Dust Emily Cole, Kate Gervais, Stephen Herbert, Masoud Hashemi

Growing Fava Beans in Massachusetts Fatemeh Etemadi, Masoud Hashemi, Francis Mangan

Floral Traits Affecting Disease Transmission in Bumble Bees Lynn Adler

Mustard as a Biofumigant Cover Crop Katie Campbell-Nelson, Ruth Hazzard

Evaluation of Selections of jiló (Solanun gilo) for Production and Markets in the Northeastern United States Aline Marchese

12:20-2:00 Lunch

Commonwealth Quality and Good Agricultural Practices Certification

Zoraia Barros, Frank Mangan, Aline Marchese and Viviane Barros

Assessing Commercial Rapid Quality Control Tools for on-Farm Postharvest Sanitation Management

Amanda Kinchla

2:00-4:00 **Groups switch to see the other projects.**

NOFA Summer Conference

When: August 8-10th, 2014 (All Day)

Where: University of Massachusetts, Amherst

The Northeast Organic Farming Association (NOFA) invites you to attend its 40th Annual Summer Conference, featuring 150 workshops on farming, gardening, land care, nutrition, & food politics; full and half day preconferences; and 100+ exhibitors. This is a family-friendly event with conferences for children and teens, a country fair, and organic meals! Budget conscious accommodations are available, including camping and dorms.

This year's keynote speaker Elaine Ingham is a soil scientist and researcher, teaching growers to foster microbial life in soils. Register now at http://nofasummerconference.org/

Vegetable Program Twilight Meetings

August 13th, 2014 4-7 pm
Foppema's Farm, Northbridge, MA

Join UMass and the Foppema family to hear about their IPM and food safety strategies in key vegetable and fruit crops.

Rich Bonanno, UMass Extension weed specialist will discuss weed identification and management.

Mike Botelho from the Mass Dept. of Ag Resources will talk about the Commonwealth Quality Program (CQP) certification, and post-harvest handling and wash room sanitation as part of CQP's food safety component.

UMass Extension small fruit specialist, Sonia Schloemann will give a Spotted Wing Drosophila management update.

Pesticide applicator recertification credits will be offered.

August 27th, 2014
Brigham Hill Community Farm, Grafton, MA

IPM Field Walks

August 14th, 2014 3:30-6:00 pm
High Meadows Farm, 742 Westminster West Rd., Putney, VT

August 22nd, 2014, 3-5 pm
The Farm School, 488 Moore Hill Road, Athol, MA 01331

Vegetable Notes. Ruth Hazzard, Katie Campbell-Nelson, Lisa McKeag, Susan Scheufele, co-editors. Vegetable Notes is published weekly from May to September and monthly during the off-season, and includes contributions from the faculty and staff of the UMass Extension Vegetable Program, other universities and USDA agencies, growers, and private IPM consultants. Authors of articles are noted.

Where trade names or commercial products are used, no company or product endorsement is implied or intended. Always read the label before using any pesticide. The label is the legal document for product use. Disregard any information in this newsletter if it is in conflict with the label.