UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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In this issue:

Crop conditions

As harvest continues, some growers in Massachusetts are reporting better harvests than expected for a season that has been rated as 'the worst ever' more than once this season. However, many are looking at serious yield losses from disease, birds, weeds, or simply poor growth. Other Northeastern states are facing similar problems, and you can check out conditions in other states at the National Agricultural Statistics Service publication, "Crop Progress and Conditions" online. Summer weather conditions returned this week, but nights remain cool and dews are heavy. Foggy mornings have extended the periods of leaf wetness this week, so be on the lookout for diseases impacting your storage crops as you harvest carrots, onions, beets, potatoes, vine crops, cabbage. Peppers and tomatoes have been slow to ripen at many farms this year. We will continue to cover harvest and storage topics in upcoming issues, so stay tuned. See also the chart of Harvest and Postharvest Needs of Fall/Winter Storage Crops that accompanies this issue. As the harvest season is in full swing, the Food Safety and Modernization Act is on the minds of many growers. After a hearing today, Thursday, August 22nd with the Food and Drug Administration at Plainville Farm in Hadley, many may be motivated to submit comments on the proposed rulings. Detailed guidelines on submitting comments online and by mail to the FDA can be found at the Community Involved in Sustaining Agriculture (CISA) and at the Massachusetts Farm Bureau websites.

Pest alerts

Late blight was confirmed on tomato in Hampshire County, MA this week and the disease has spread throughout the Northeast and Mid-Atlantic due to favorable weather conditions this past week. This is a disease that has the potential to cause complete crop losses and sweep through a community, a county, and a whole region, very rapidly. Note that late blight is not yet confirmed in all counties in MA, nor in all New England states. Therefore, it is important that everyone do their part to slow its spread…

- Inform your local extension office when you suspect the disease is present.
- Inform your neighbors the pathogen is nearby so that they can protect their crops or gardens.
- Dispose of severely infected plants by bagging or covering with a tarp to kill plant tissue. Dispose of infected tomato crops by removing strings, stakes, and plastic, mowing, and either incorporating residue or removing it. This is a miserable job. Why bother? Here's why:
    - Leaving infected plants increases the total inoculum in the area, increasing the chance for a more aggressive strain to evolve or for two mating types to be present in the same field, which may lead to the formation of overwintering structures that would enable the pathogen to survive for years in the field!

U-Pick flowers add more than a bit of color to a vegetable farm in Western MA.

- Fruit can be infected at all stages. Green tomatoes or even mature ones growing on an infected plant may look fine but will likely develop disease symptoms, even once picked and left to ripen on the kitchen counter—this may result in the pathogen being spread by consumers discarding rotten fruit in their backyard compost piles, and this kind of spread cannot be tracked.

Everyone has to do their part by contributing to LB reporting efforts, managing their susceptible plants (tomatoes AND potatoes) effectively, and cutting down plants when infection becomes severe. Don't become a source of inoculum for your neighbors!

LB Forecast and Recommendations: If you don't have late blight on your farm yet, work out your tomato harvest schedules so that you can continue regular fungicide applications, and continue spraying potatoes as long as vines are green; vine kill as soon as tubers are the desired size. Based on recent and forecast weather conditions, the late blight models predict spray intervals ranging from 5-13 days depending on location (see Table 1). These recommendations are based on weather data collected at NEWA weather stations and assuming the cultivar is susceptible and that chlorothalonil is the fungicide sprayed. Some fungicides (eg, copper) may need shorter intervals, while others (systemic, oomycete-specific products) can remain effective for longer periods. For the best recommendations based on conditions at your farm sign up for the late blight Decision Support System (DSS) which incorporates these variables. Track disease progress at USA BLIGHT. Fees for late blight diagnosis for farms have been waived this year so if you suspect you have an infected plant contact the UMass Plant Diagnostic Lab at 413.545.3209.

Table 1. GDD and BLITECAST output for Late Blight Management

DATE: 8/22/2013	GDD Base 50F	Accumulated LB Severity Values - 7 days	Accumulated Rainfall - 7 days (in)	Recommended Spray Interval (days)
Pittsfield	1602.8	9	0.01	5
Ashfield	1736.1	0	0.00	6
Deerfield	1931.9	7	0.00	5
Belchertown	2056.2	2	0.00	5
Harvard	2020.8	1	0.00	7
Dracut	2041.0	1	0.03	5
Boston	2092.9	0	0.00	13
East Bridgewater	2073.3	3	0.00	5
Sharon	2486.7	9	0.06	5
Seekonk	2163.1	3	0.02	7
Barnstable	1956.6	6	0.11	6

Cucurbit Downy Mildew was confirmed this week on winter squash in Franklin County, MA and a new outbreak was reported on cucumber in Worcester County, MA. There were also new outbreaks on cucumber in Providence County, RI and several along Eastern NY along the MA border. This disease can take down a cucumber field very fast, leaving the leaves crispy and the fruit exposed. In addition to cucumber and winter squash, the pathogen has also been confirmed on giant pumpkin, butternut, and cantaloupe on Long Island, NY, indicating there are several pathotypes (pathogen strains able to infect different cucurbit crops) present nearby. The CDM IPM-PIPE is forecasting a moderate risk of spread to most of New England and a high risk for parts of Northern VT and NH. Scout cucurbit crops often and maintain a spray program alternating protectant fungicides with those with specific activity against Downy Mildew (eg. Ranman or Tanos).

Phytophthora capsici fruit rot of winter squash, watermelon & other vine crops are on the rise in MA. Brief but heavy rains earlier in August caused P. capsici to explode in some fields. Where the pathogen is limited to a discrete low, wet area, growers are disking infected areas to keep the pathogen from spreading to other parts of the field. Harvest these fields as soon as possible. Other pathogens of cucurbit fruits are present this time of year such as Fusarium, black rot, Plectosporium, scab, anthracnose and bacterial leaf spot. There is a free "Diseases of Cucurbit Crops: Scouting and Management Guide" on the Vegetable Extension Website to help you identify these pathogens. These diseases impact storage practices differently, so it is best to have them diagnosed by a plant pathologist to ensure that you will have squash to sell for winter markets. UMass Disease Diagnostic Lab: (413) 545-3208.

Brassicas: Cross striped cabbageworm is steadily increasing its range. It was found this week in Middlesex and Norfolk counties, and last year it spread through the Connecticut Valley. Look for heavier damage to single plants caused by the crowd of caterpillars that hatch from each egg mass. Imported cabbageworm and diamondback moth are also active. Bt insecticides will control these while conserving aphid predators.

Mexican bean beetles are still a threat to late bean plantings. Adults, eggs and larvae were found this week.

Powdery mildew of cucurbits is present in winter squash and pumpkin and building up to high levels in mature summer squash and zucchini. Protect your last plantings of summer squash with fungicides to keep them vigorous enough to produce quality fruit.

Squash Vine Borer second generation larvae are on the rise according to George Hamilton's extensive trapping network in New Hampshire. In MA, trap counts this week were 1 SVB in Deerfield and 9 SVB in South Deerfield. The second generation may infest *Cucurbita maxima* stems, or even fruit. Bury vines immediately after harvest. Harrow soil in the fall and turn under deeply in the spring.

Spotted Wing Drosophila. Numbers of SWD remain very high across the state. Berry growers are encouraged to continue spraying at 5-7 day intervals to prevent establishment of overlapping generations. Remember that SWD can also lay eggs in cracked tomato fruit so picking tomato plants clean and removing cracked fruit can lower the impact of this pest in nearby berry crops.

Sweet Corn Report

Fields are dry, but corn tends to be coming in well. Most growers have made it through the gap and poor tip fill created by June rains and subsequent high temperatures, though some report uneven ripening. The biggest issue on many farms has been birds, especially starlings and red-wing blackbirds.

European corn borer trap counts and pressure continue to be relatively low. Trap counts for corn earworm have decreased slightly since their as-yet peak numbers last week, but remain high enough to necessitate 4-5 day spray schedules in almost all sites reporting. Fall armyworm counts are still zero in all locations reporting, except for a count of 5 in Concord, MA and 12 in Mason, NH, and growers are not reporting signs of FAW in their fields.

- L. McKeag and R. Hazzard, University of Massachusetts Vegetable Extension

Table 2. MA Corn Trap Counts 8/15/13 - 8/22/13

Location	Total ECB reported	CEW Nightly Average	CEW Weekly Total	Spray interval on silk
CT Valley				
South Deerfield	0	1.3	9	*4 days*
Sunderland	8	0.0	0	*no spray*
Hatfield	2	1.1	8	*4 days*
Hadley-1	9	0.7	5	*5 days*
Hadley-2	4	4.0	28	*4 days*
Feeding Hills	4	0.6	4	5 days
Central & Eastern MA				
Spencer	3	0.0	0	*no spray*
Tyngsborough	4	1.3	9	*4 days*
Lancaster	1	0.3	2	*6 days*
Concord	0	1.9	13	*4 days*
Sharon	6	1.1	8	*4 days*
Millis	1	0.9	6	*5 days*
Northbridge	9	0.7	5	*5 days*
Rehoboth	8	3.1	22	*4 days*
NH				
Litchfield	16	1.0	7	*4 days*
Hollis	1	0.7	5	*5 days*
Mason	3	0.7	5	*5 days*

Black Rot (Gummy Stem Blight) of Cucurbits

Black Rot is the fruit rot phase of the fungal disease gummy stem blight. It is one of the major pre and post-harvest fruit rots in the Northeast, especially in winter squash and pumpkin. It also affects greenhouse cucumber. The disease is most often noticed at harvest, but can be seen during crop and fruit growth when scouting inside the canopy.

Identification. Symptoms vary on different cucurbits. On pumpkin and winter squash, symptoms on the leaves begin as a marginal necrosis followed by larger, wedge shaped necrotic areas, often with a yellow halo. Stem cankers develop in the cortical tissue and a brown, gummy exudate is produced. On older plants, stem cankers lead to wilt and decline. On fruit, small, water-soaked spots develop. These lesions grow larger as the disease develops and exude gummy material. They often contain many black speck-like fruiting bodies. Black rot on butternut may appear as a superficial hardened tan to white area which can develop concentric rings. This typically occurs where the fruit touched the soil. Lesions may become hardened and dormant on mature fruit that is cured and stored under proper conditions, but chilling injury or high humidity may activate the disease and cause fruit collapse during storage. Check fruit weekly for signs of black rot.

Black Rot (Didymella bryoniae) symptoms on butternut (left) and pumpkin (right) .

Life Cycle. The pathogen, *Didymella bryoniae*, is both seed and soil-borne. In the field, the fungus can survive in infected plant residue for more than one year. Disease development is favored by relative humidity over 85% and leaf wetness periods greater than one hour and temperatures between 75-77°F. Leaves and stems can be affected as well as fruit, which can be infected through flower scars or wounds or possibly through direct contact with the soil when conditions are favorable. On fruit held for fall sales or winter storage, a water-soaked lesion develops, usually associated with an injury to the rind, and soon black rot develops. Large Halloween pumpkins are more susceptible to black rot than smaller pie types. Wounding, striped cucumber beetle injury, aphid feeding, and powdery mildew all predispose plants to black rot infection. Control of powdery mildew by chemicals or by planting PM-resistant varieties can significantly reduce black rot in pumpkins and winter squash.

Management:

- Rotate out of cucurbits for two years
- Powdery mildew tolerant cultivars should be selected and powdery mildew should be controlled, as this disease predisposes the crop to black rot.
- Use certified disease-free seed for all cucurbit plantings.
- Control cucumber beetles and aphids as these insects can increase the severity of black rot in your crop.
- Handle winter squash and pumpkin carefully during harvest to minimize wounding.
- Crop debris should be incorporated well, promptly after harvest. In reduced-till fields, mow before seeding cover crops.
- Cure pumpkin and squash at 85°F for two weeks before storage. An empty greenhouse may work well for this.
- Avoid chilling injury to winter squash and pumpkins as this activates dormant black rot lesions and increases losses in storage. Store fruit at 50° to 55°F and ~60% relative humidity.

Satisfactory control of black rot can usually be obtained by regular applications of protectant fungicides, which may be applied alone or as part of a powdery mildew and downy mildew spray program.

-M. Bess Dicklow, updated by S. Scheufele, UMass Extension.

BLACK ROT OF BRASSICAS

High temperatures combined with high humidity can result in significant disease pressure in brassicas and this week we observed Black rot in several brassica fields in MA. This disease, caused by the bacterium *Xanthomonas campestris* pv. *campestris*, can be seed-borne, so prevention begins with purchase of disease-free seed and/or hot water treatment of seed. The bacterium also survives from season to season on crop residue which can remain in the soil for two or more years in the case of lignin-rich stalk tissue. Careful management of seed quality, crop rotations and crop residues are key to preventing this disease.

Symtpoms of Black rot (Xanthomonas campestris pv. campestris) on turnip

Black Rot of brassicas is one of the most devastating diseases of brassica crops, and can result in high losses of yield and quality. It occurs worldwide and infects all brassica crops. The causal bacterium, *Xanthomonas campestris pv. campestris*, plugs the water-conducting tissue of the plant with xanthan, a mucilaginous sugar. Symptoms can appear at any growth stage

as yellow, V-shaped lesions that extend from the leaf margin toward the base of the leaf, resulting in wilt and necrosis. It can also occur mid-leaf, as darkened dead patches of tissue between the veins. The pathogen may move into the petiole and spread up the stem or into the roots and become systemic. As the disease progresses, the veins of infected tissues turn black and the normal flow of water and nutrients is impeded. Symptoms on root crops may not be visible on foliage, but blackened veins appear in the roots. On heading crops, infection may spread into the leaves of the head. Black Rot is often followed by invasion by soft-rotting organisms.

Disease Spread. Its most important means of transmission is on seed, and as little as 0.03% infection can cause epidemics. The bacteria can persist in infected plant debris for up to two years, especially in cabbage and Brussels sprout debris; it survives on its own in the soil for 40-60 days. Symptoms may not appear in the greenhouse, allowing infected plants to be transplanted into the field. It is favored by warm temperatures and spread within the field by splashing water, wind, equipment, people, and insects. *X. campestris pv. campestris* can be spread long distances by infested seeds and transplants. The optimum temperature for the pathogen to grow is from 80ºF to 86ºF. Water, in the form of either rain or dew, is required for the disease to establish and grow.

Cultural Management:

- Select seed that has been certified as disease-free or treat seed with hot water (20- 30 minutes at 122˚ F) to eradicate the bacteria.
- Avoid dense seeding rates which can prolong periods of leaf infection and favor pathogen spread.
- Practice a three year crop rotation.
- Control cruciferous weeds, which harbor the pathogen.
- Avoid areas that receive run-off from areas previously planted to crucifers.
- Do not work fields when they are wet and avoid overhead irrigation.
- Do not locate cull piles near fields or storage areas.
- Promptly and fully incorporate crop residues after harvest to speed decomposition.

Chemical management:

Copper products may be effective in preventing disease when used before plant is infected and with continued sprays at 7-10 day intervals after symptoms develop. Ensure coverage of lower leaf surfaces.

-R Hazzard, Bess Dicklow, S. Scheufele

CHECKLIST FOR HARVEST AND STORAGE OF POTATOES

Careful field management at this time can reduce post-harvest losses in potatoes. Below is a checklist to help get you through harvest season and into storage. Growers may be aiming for short term or long term storage and sales, or some of each, and attention to harvest, curing, and handling issues can help maintain quality.

Disease Management

Diagnostics. Don't assume that every tuber rot is late blight. Send samples to the UMass Plant Disease Diagnostic Lab (413-545-3209) to get an accurate diagnosis as different tuber blights need different management and proper identification will allow for better management practices and prevention next year.. A good online resource on tuber diseases can be found here. However, finding a photo online that looks like your problem is not the same as having a plant pathologist confirm what is on YOUR tubers!

Management. Foliar diseases, especially late blight, are still a threat as vines begin to die or vine killing methods are implemented. Late blight spores can be carried by rainwater onto tubers and cause problems in storage if they are not controlled prior to harvest. Late blight spores are only produced on live tissue. To avoid the risk of late blight infection, vine kill if late blight is present on the farm.

Cull potatoes in the field to avoid storage problems.

If black scurf (*Rhizoctonia* spp.) or silver scurf (*Helminthosporium solani*) are present they will increase in severity as long as tubers remain in the soil. Wireworms can also cause tuber damage. If markets are ready or suitable storage is available, avoid these diseases and pests by starting harvest as soon as skins are set. If the soil is wet during the harvest, soil may adhere to the tubers during harvest and promote infection by soft rot organisms.

Harvest and Storage

Vine killing stops tuber growth at the desired maturity, stabilizes the tuber solids, controls hollow heart disorder, promotes skin set and allows for easier digging and harvesting. Vines may have died down naturally but if they are still green, mechanical or chemical methods or a combination of the two can be used to kill potato vines.

Skin set. Allow 10-14 days for tuber skins to mature in the field after vine kill before harvest. Most tuber diseases require a wound to infect potatoes and good skin set greatly reduces the amount of wounding at harvest and increases the storability of tubers.

Pulp Temperatures. Potatoes should be harvested when temperatures of the fleshy interior of tuber (pulp) allow for successful curing and storage. Acceptable pulp temperatures vary based on storage ventilation systems, varieties, availability of cooling air, and timeliness. If potatoes are harvested during hot weather (above 80°F) and cool off slowly, the likelihood of storage rot is increased. If active refrigeration is available, potatoes could be harvested at 62 to 65°F pulp temperature. Storage areas with no refrigeration should not be loaded with potatoes with a pulp temperature above 60°F. If pulp temperatures are higher than recommended at the time of harvest, it is more difficult to manage critical environmental conditions in storage. Time your harvest when cooling air is available to allow open outside doors and 3 to 6 hours of fresh air per day. Questionable potato lots should be harvested closer to 55° F if they must be stored.

Wounding and bruising prevention. Avoid harvesting at temperatures lower than 45°F as this increases the occurrence of bruising. Check harvesting and transporting equipment to make sure it is working properly and does not bruise or wound tubers. Potatoes should not be allowed to drop more than 4" to 6" and all equipment surfaces should be padded. Harvest when the soil is moist but not too wet. Tuber pulp temperatures around 60-65°F make the potatoes less susceptible to bruising and wounds compared to lower temperatures.

Grading. Grade out diseased tubers as quickly as possible—the longer they are mixed with healthy tubers the higher the chance of disease spread. Potato fields that have been saturated with water will be especially prone to post-harvest diseases. Bacterial soft rot (*Erwinia* spp.), Fusarium dry rot, pink rot (*Phytophthora erythroseptica*), and Pythium leak are four serious tuber rotting pathogens that cause the most significant losses in storage. These pathogens can be brought in on infected tubers or survive on storage debris. Many of them take only a few weeks to destroy a tuber and then spread through the storage pile. Note that fields that were flooded by river water are considered contaminated and should not be harvested.

Curing. The 'curing', 'suberization' or 'wound healing' period immediately after harvest is critical to successful storage. During the curing stage cell walls fill with suberin, leading to the formation of cork and respiration rate slows down. Hold tubers at 50-60°F and high relative humidity (95%) for 10-14 days to allow wounds to heal before cooling potatoes for storage. Lower RH results in poor suberization. Airflow over and through the pile is important to supply oxygen and prevent condensation. However, do not overdry the potatoes during curing. Potatoes affected by freezing injury, Pythium leak, late blight or soft rot will break down at normal curing temperatures. Grade out the rot and sell immediately, or cool rapidly to 45°F with low to medium RH.

Storage. After the curing period, cool potatoes gradually and steadily to the holding temperature suited to your goals: 38-40°F for tablestock and seed potatoes, 45-50°F for chipping, and 50-55°F for French fry stock. Before storing potatoes, facilities should be cleaned and thoroughly disinfected. Eliminate free moisture in storage areas. Inspect your storage facility to ensure the insulation, fans, humidifiers, and ventilation system are working. If any of these are in poor condition it could result in losses due to disease. For more details on vine kill, harvest and storage see New England Vegetable Management Guide, http://nevegetable.org/crops/varieties-13

Potato postharvest disease control: new publication

Phosphorous acid has proven effective in reducing tuber-to-tuber spread of pathogens responsible for potato late blight and pink rot during mechanical harvesting and tuber transfer in a situation where the diseases are present at harvest. While

Phosphorous acid is an effective post-harvest treatment to control these two pathogens, the application system can be a weak link. To address these concerns, there is a new publication entitled "Application Equipment for Potato Post-Harvest Disease Control" by Steven B. Johnson, Ph.D. Crops Specialist and Extension Professor, University of Maine Cooperative Extension.

-updated by Katie Campbell-Nelson. R Hazzard, S. Scheufele and M.B Dicklow; compiled from the following sources: Vegetable Crop Update, U of WI, 8/13/10, edited by C. MacNeil, CCE, CVP for Veg Edge, Cornell CES; New England Vegetable Management Guide; Potato Production in the Northeast: A Guide to Integrated Pest Management.

PREVENTING DEER DAMAGE

The population of deer in Massachusetts continues to grow, and damage on vegetable and fruit crops can be serious. Deer can be especially damaging in vine crops and now that fall pumpkins and winter squash are maturing, it is critical to take action to prevent damage if you are in a high-pressure deer area. There are several options available for managing deer damage on your farm. Factors such as the amount of crop land that you're trying to protect and the time and resources available will determine which options you choose.

Electric fencing is the most cost-effective measure to prevent deer damage. For small fields of a few acres or less, portable fences of electric wire, woven rope, or tape will provide relief from deer. Solar or battery-powered chargers make it possible to set up a fence even in remote locations. Woven ropes and tapes enhance protection by being very visible to deer, even at night, while providing an electric shock on contact. They are also more visible to people. As few as two strands of electric wire can be used to protect crops; three strands are better. In a two-wire fence, the first wire should be at a height of 10-12 inches and the second at 30-36 inches. A three-wire fence can have strands at 12, 24, and 40 inches. Double fences - that is, two fences in parallel, spaced about 3-5 feet apart - can be very effective if deer are jumping over a single fence. The outer fence can be a single strand at approximately 36 inches.

Deer are well-insulated over most of their body with fur, dampening the shock of an electric fence. Baiting the fence, with store-bought lures or a metal tab or piece of aluminum foil smeared with peanut butter, will entice the deer to contact the fence with its more sensitive nose and tongue, and help to educate a deer to respect the fence. Space the bait about 30 feet apart around the perimeter and keep the fence baited for at least a few weeks after the fence is installed. Be sure to regularly check the strands to ensure that they have adequate charge – about 2.5 kilovolts for a baited fence. Portable voltage readers can be purchased for as little as about $10. Make sure fence lines are well maintained as weeds or grass touching the wires will reduce the charge. Electric fence supplies can be found easily on the internet, at farm supply centers or through fencing specialty companies.

Permanent fencing is the most effective long-term solution to deer damage. In this case it is the fence itself, not an electric shock, that provides the deterrent. A non-electric fence should be at least 8 feet high and either have a lower bottom wire than a movable electric fence – about 6 inches off the ground - or be of mesh construction.

Fence maintenance is critical in both applications. If a tree falls on the fence or a hole is cut in the fence, it should be repaired immediately. Once deer have gotten inside and discovered the crop, it will be harder to keep them out, even with an electric fence. No gaps should exist in the fence; access must be provided through gates that are closed at all times. Fences should have a clear outer perimeter, at least 5 or 6 feet on the outside of the fence, so deer have to cross an opening before encountering the barrier. This also enhances visibility of the fence to the deer. Deer will blunder into a fence placed tight to a wooded edge and can actually damage or take down sections of a fence simply because they do not see it very well, especially with smooth wire designs. Having a clear border will increase the effectiveness of the fence and aid in maintenance. Permanent tall wire fences while more expensive may be a worthwhile investment on the home farm, or where you will always be planting vulnerable crops. Moveable electric fences make sense in fields that are rented, far from the home farm, or are planted to different crops each year.

Scare devices can be effective when deer populations and pressure are fairly low. There are devices that make noises, squirt water, give off bright light, or are made to look like predators. Some are motion sensitive. Placing these tools at field edges where deer are entering can help to scare them off, and can be used in addition to fencing. Deer get accustomed to these devices pretty quickly, though, so they must be moved frequently.

Repellents reduce deer damage by making the target crop taste or smell unpalatable to deer. All repellents are billed to

reduce, not eliminate, deer damage and don't provide reliable protection when deer densities are high. To achieve this reduction, they must be consistently applied and reapplied as directed. Once a feeding pattern has been established, repellents are usually less effective. Repellents fall into three categories: taste, odor, and combination taste and odor. Different formulations allow the user to change the repellent and keep the deer on guard by providing a change in the range of odors and tastes.

For protecting vegetable and fruit crops, make sure that a product is approved for use on edible crops. Certain taste-based repellents can be used on edible plants such as vegetable crops, fruits, berries, nuts and herbs, but they must be washed off prior to eating. The following repellents are approved for use on edible plants: Hinder, Millers' Hot Sauce, Deer Stopper, Plant Pro-Tec, Deer Buster Deer and & Rabbit Repellent, Repel. Some growers report that foliar applications of fish emulsion, which is sold and applied as a nutrient supplement, have an additional benefit of repelling deer. There are also numerous home-made products that may work as repellents.

Repellents should be applied before damage is likely to occur, when precipitation is not expected for 24 hours, and temperatures will remain between 40° to 80°F for that period. Hand-spray applications may be cost effective on small acreages, while machine sprays will reduce costs for larger areas. If the materials are compatible, spray costs may be reduced by adding repellents to pesticide sprays.

Maintaining optimal densities of deer populations through habitat management and hunting can help to keep deer pressure in vegetable crops low. The Massachusetts Division of Fisheries and Wildlife sets management goals and regulates hunting during three designated seasons. For more information on white-tailed deer and this control strategy, see the official Massachusetts website on Deer Management.

-adapted by L. McKeag from an article by R. Hazzard with thanks to the following sources: : John E. McDonald, Jr., formerly US Fish & Wildlife; Craig Hollingsworth, UMass; Richard Ashley and Norman L. Gauthier; UConn; Maryland Dept of Agriculture (http://www.dnr.state.md.us/wildlife/ddmtrepell.asp); Massachusetts Division of Fisheries and Wildlife; http://www.electric-deer-fence.com; growers who build deer fences.

Upcoming events

Twilight Meeting at Tangerini's Farm

When: Wednesday, September 18, 4pm to 7pm
Where: Tangerini's Spring Street Farm, 139 Spring Street, Millis, Massachusetts 02054

Join us at Tangerini's Farm for a vegetable twilight meeting, hosted by Laura and Charlie Tangerini. Theirs 67-acre working family farm was established in 1995 on land that has been in agriculture since the early 1800's. They run a year-round CSA and in 2010, they built a custom-designed, half-underground storage facility for winter vegetables that has three bays with separate temperature and humidity controls. We will talk about their production and storage practices, as well as the work they have been doing with UMass Extension to implement IPM strategies on their farm. We will also have as a guest Laura Vitella, who runs Cover Crop Marketing and with whom Laura put together an e-book for CSA first-timers called "The CSA Survivial Guide," to discuss strategic marketing for farmers.

Vegetable Notes. Ruth Hazzard, Katie Campbell Nelson, Lisa McKeag, Susan Scheufele, co-editors. Vegetable Notes is published weekly from May to September and at intervals 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.