UMass Extension

# Vegetable Notes

For Vegetable Farmers in Massachusetts since 1975

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## In this issue:



*Skip Paul and Chris Clegg riding the Checci Magli no-till transplanter at last week's twilight meeting, while Jim Ward drives. The transplanter pulls a chisel down each row, workers drop each transplant into a carousel, sending it down a shoot, then two coulters cover the transplant roots with soil. See article this issue for more information. Photo: B. Schultz*

## Crop conditions

While pepper crops are reaching their full colors now, tomato season is nearing its finale, and crews are pulling the last of the fruit from the field. The last successions of sweet corn are being harvested now. High tunnels and hoop houses that held tomatoes, cucumbers, eggplants, and peppers are being cleaned out and prepped for winter greens plantings. Folks are turning their attention to harvesting fall crops like squash and pumpkins, hoping to get them binned up and out of the field before next weeks' forecasted rain. We've seen pumpkins, acorns, delicata, and butternut starting to come in for curing and even some acorns and delicata on stands. More bulk harvests on deck include potatoes and some early sweet potatoes. Other fall staples that survived the torrential rains and heat of August such as beets and carrots are bulking up. A lot of these fields have gotten quite weedy, making harvesting more challenging and causing more disease and rot in these root crops. However, fall field greens (spinach, lettuce, mesclun mix) are establishing nicely, encouraged by irrigation now that rains have been gone for a couple weeks.

## Pest alerts

**Brassicas**

Caterpillars are still active in brassica fields, we are seeing all species and all stages of growth including freshly laid eggs—don't forget to keep up your scouting and spraying. The most critical time to scout and apply controls is just prior to head formation. Treat plants between the start of heading and harvest if 20% or more of the plants are infested. Use a 10-15% threshold throughout the season for kale, collards and mustard. Do not use less than 50 gal spray material/A; higher volumes provide better coverage. Better coverage of lower leaf surfaces can be achieved by using drop nozzles. Use a spreader-sticker.

**Cucurbits**

Squash vine borer trap captures have remained low in MA, and winter squash and pumpkins will likely be harvested within the next month. Therefore, we feel that it is safe for growers to remove their squash vine borer traps now. If there is a second generation this year, eggs will take 7-10 days to hatch before larvae would start causing damage.

**Carrots**

**Rhizoctonia 'crater rot'** was identified in a field in Hampshire Co., MA causing dark sunken spots on roots, making the harvest and sorting of the crop difficult. *R. solani* is a natural inhabitant of the soil and can survive there indefinitely as a saprophyte in plant debris, infecting weed hosts, and as sclerotia (structures that survive unfavorable conditions). Infection of the crowns or roots may occur under favorable conditions of warm temperatures, abundant water, and excess nitrogen levels. Spread from plant to plant occurs when the plant canopy is dense. Lesions on roots continue to develop after harvest and in storage.

### Celeriac

**Bacterial leaf spot** caused by *Pseudomonas syringae* pv. *apii* was diagnosed this past week on celeriac in Franklin Co., MA. Its hosts include celery, celeriac, parsley, and fennel. Symptoms begin as water-soaked leaf spots that eventually turn a rusty brown. Spots may coalesce and affect entire leaves. The pathogen can be seed-borne and this is often the source of inoculum for outbreaks. The pathogen survives asymptomatically on the leaf surface until environmental conditions are conducive to disease development, when it can then enter the host through wounds or stomata. Disease is favored by warm temperatures, high humidity, and high nitrogen levels. The pathogen is spread by splashing water. **Management:** Start with clean seed or transplants. Increase air circulation to decrease humidity and minimize periods of leaf wetness. Avoid overhead irrigation if possible. Disinfest cultivation tools and workers' hands frequently to avoid spreading the pathogen. Avoid over-fertilization.

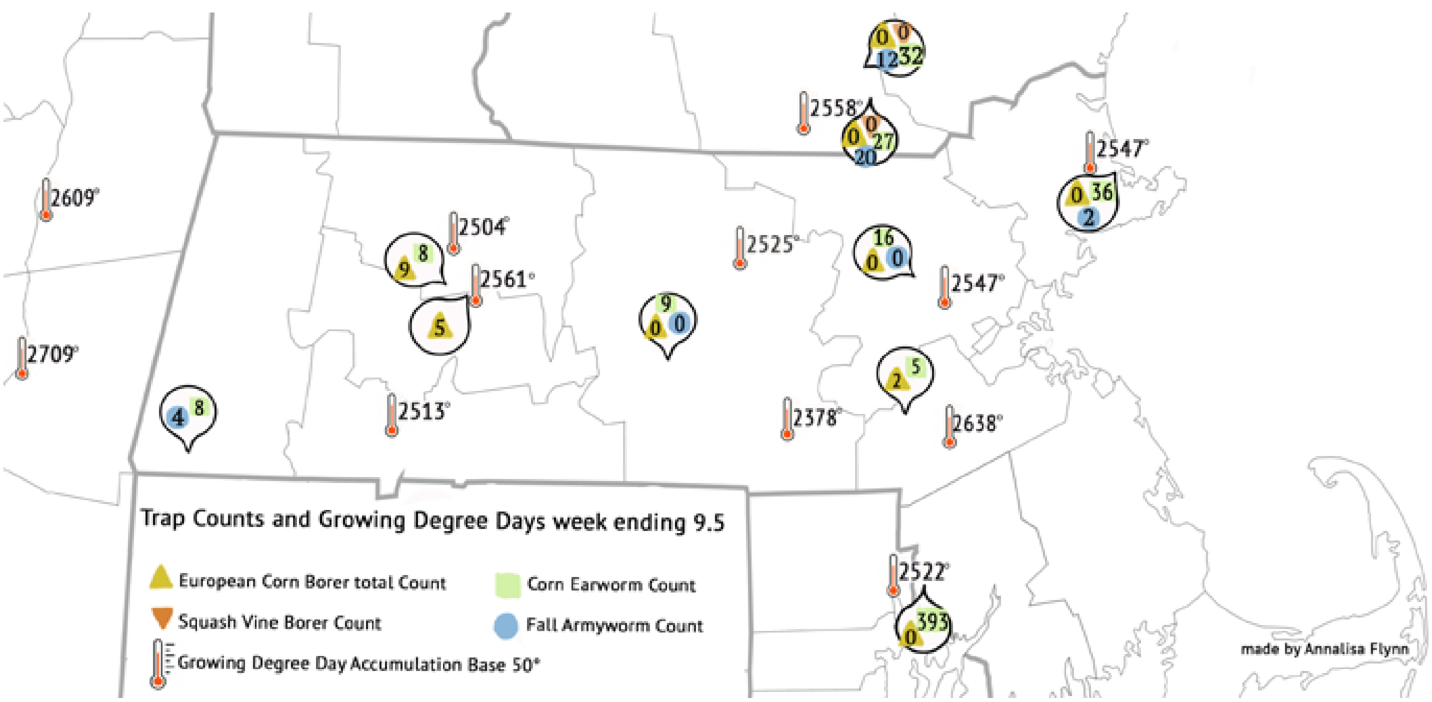
### Solanaceous

*Pink sporulation of anthracnose on tomato. Photo: K. Campbell-Nelson*

**Anthracnose** is being reported across the region on tomato fruit that has been harvested and sometimes even in boxes ready to go out. Spores can come in on clean fruit from the field and develop in storage under warm conditions (68-75°F). SaniDate used post-harvest will help to sterilize fruit surfaces. Anthracnose on tomatoes is caused by a few species of *Colletotrichum* fungi that can affect tomato, eggplant, potato and peppers, as well as celery and strawberry in the case of *C. acutatum*. *C. coccodes* is the most common and affects only ripe fruit while *C. acutatum* can infect immature green fruit. Small, circular, sunken spots appear on fruit that are characterized by numerous submerged, black fruiting bodies (acervuli) often in concentric rings. In humid conditions, salmon, pink or orange masses of fungal spores form in concentric rings on the surface of the lesions. In older lesions, black structures called microsclerotia may be observed with a hand lens—these look like small black dots. **Management:** Pepper cultivars with some resistance to anthracnose include Colossal, Brigadier, Paladin, and North Star. Paladin and North Star have shown some tolerance to *C. acutatum*. Cultural practices such as using disease free seed, rotating to non-host crops for at least 3 years, and avoiding overhead irrigation can reduce disease development.

### Sweet Corn

**Corn earworm** (CEW) populations continue to be present in alarming numbers, but only in isolated locations. One



trap in southeastern MA had 393 moths (see map)! Even though this is the last week we will be reporting sweet corn trap captures, please keep your corn earworm traps out as long as you have silking corn. Extension educators in New York shared that 2018 is the largest corn earworm population they have seen since 2012. We suspect a breakdown in the efficacy of pyrethroid insecticides are contributing to this high population—please avoid the use of pyrethroid (Group 3A) insecticides when managing corn earworm.

**European corn borer** and **fall armyworm** (FAW) captures remain fairly low. However, the northeast coast of MA and southern NH seem to have increasing numbers of FAW. Keep an eye out if you have whorl stage corn, but with low trap captures, this pest is likely not much of a threat to sweetcorn growers as they are nearing the last harvests. Some growers are reporting CEW look-alikes in their FAW traps. These are likely the phragmites wainscott moth. They are smaller than corn earworm, do not have green eyes when alive like CEW, and have a tufted tail end (photo). They are not a pest of sweetcorn.

*Phragmites wainscott moth. Photo: R. McLeod*

**Aphids and more sooty mold** are being reported on ears (and leaves). This is another reason to avoid the use of broad spectrum insecticides such as pyrethrin which will kill natural enemies of aphids. Consider a spinosad product such as Radiant, which will affect only caterpillars.

**White mold** was diagnosed on basil, green bean, potato, and hemp last week in VT, all on different farms and within a few days of one another—conditions must have been just right! *Sclerotinia sclerotiorum* overwinters in the soil as sclerotia (hard, black resting structures) and can persist there for many years. White mold develops after or during the flowering period, as the fungus uses senescing flower petals for nutrition to begin the infection process. Infection usually begins in leaf axils or stem joints where fallen petals have lodged, then the stems are invaded, become soft, and eventually die. The pathogen may also enter the plant at the soil line or through fruit. Growth of the fungus is favored by cool, moist weather, high humidity, and long periods of leaf wetness. A biological control agent, *Coniothryium minitans* (Contans) can reduce field populations of *S. sclerotiorum* by parasitizing sclerotia. Contans must be incorporated into the soil and is best applied 3-4 months before crop planting or in the fall.

## FUNGAL FRUIT ROTS OF PUMPKINS AND WINTER SQUASH

Many types of pathogens—fungi, bacteria, and viruses—can cause fruit rots, spots, and other abnormalities in pumpkins and winter squash that render them unmarketable. The most common rots, which happen to be caused by fungi, will be discussed below. Other less common fruit rots include bacterial leaf spot (*Xanthomonas campestris* pv. *cucurbitae*) and angular leaf spot (*Pseudomonas syringae* pv. *lachrymans*), both caused by bacteria, and other fungal diseases such as Alternaria rot (*Alternaria alternata*), blue mold (*Penicillium* spp.), crater rot (*Myrothecium roridum*), cottony leak (*Pythium* spp.), and Rhizopus soft rot (*Rhizopus stolonifera*). Viral diseases usually cause distortions of fruit and/or discolorations or ring-spots rather than fruit rotting. In general, a 2- to 3-year crop rotation is recommended where fruit rots have occurred, as the pathogens can survive in soil or crop residues. Many fruit rot pathogens can also be seed-borne, so buy certified disease-free seed from reputable sources or use fungicide treated seed when possible. For other chemical recommendations, please see the New England Vegetable Management Guide.


*An early* Phytophthora *lesion (above) and sporulation (below). Photos: M.T. McGrath and T.A. Zitter*

**Phytophthora Blight (*Phytophthora capsici*, an oomycete pathogen):** Perhaps the most serious fruit rot in wet years, infection with *Phytophthora* begins as a water-soaked or depressed spot, most often occurring at the site of fruit contact with the soil. The pathogen produces a white, yeast-like growth that contains many fruiting bodies (sporangia) and affected fruit may be completely covered. The pathogen survives in the soil for many years, and disease can develop and spread rapidly when soil moisture is high and temperatures are between 80-90°F. Entire fields may be destroyed very quickly. **Tips for Managing Phytophthora Blight:** Manage soil moisture by sub-soiling, avoiding over-irrigating, selecting well-drained fields, and avoiding areas of fields that do not drain well. Destroying diseased areas at the start of an outbreak can be effective in reducing the spread of disease. Planting pumpkins into cover crop mulch or following the biofumigant cover crop 'Caliente' mustard has been shown to reduce severity of outbreaks in research trials. Pumpkins with hard, gourd-like rinds are less susceptible to Phytophthora blight: 'Lil' Ironsides', 'Apprentice,' 'IronMan,' 'Rockafellow,' and 'CannonBall' have been reported as moderately-resistant, and 'IronMan,' 'CannonBall,' and 'Rockafellow' also have resistance to powdery mildew. Newer oomycete-specific fungicides can be affective in reducing severity of Phytophthora blight in squash and other hosts such as peppers and tomatoes.


*Fusarium fruit rot of pumpkin. Photos: T.A. Zitter*

**Fusarium Fruit Rot (*Fusarium solani* f. sp. *cucurbitae*):** Pumpkin fruits are attacked by *Fusarium* at the soil line, and the severity of infection varies with soil moisture and the age of the rind when infection occurs. Surfaces of fruit that are in contact with the soil develop tan to brown, firm, dry and sunken lesions which may occur in concentric rings and remain firm unless invaded by secondary organisms. *Fusarium* can survive in seed but does not affect the germination or viability of the seed. *Fusarium* produces abundant resting spores (chlamydospores) in the soil, but only persists there for 2-3 years. Wounding is not necessary for infection to occur. Cultivars vary in their resistance with larger pumpkins generally being more susceptible.

**Black Rot (*Didymella bryoniae*):** Also called gummy stem blight when it occurs on other plant parts, this disease produces a distinctive black decay. Initially, a brown to pink, water-soaked area develops, in which numerous, black fruiting bodies (pycnidia) are embedded. Black rot on butternut may appear as a superficial, hardened, tan to white area which can develop concentric rings. Large Halloween pumpkins are more susceptible to black rot than smaller pie types. The pathogen is soil- and seed-borne and can overwinter in infected crop debris as dormant mycelium or chlamydospores. Wounding is not required for disease initiation, but wounding by striped cucumber beetles, aphid feeding, and powdery mildew infection all lead to increased susceptibility.

*Characteristic black rot symptoms on pumpkin (left) and butternut (center). Black fruiting bodies embedded in a black rot lesion (right). Photos: T.A. Zitter*


*Sunken lesions caused by anthracnose. Photo: K. Campbell-Nelson*

**Anthracnose (*Colletotrichum orbiculare*):** Cucurbit anthracnose is common on the fruit and foliage of watermelons, squash, melons, and cucumbers in humid regions. Young fruit may turn black and die if their pedicels are infected, while older fruit develop circular, noticeably sunken, dark-green to black lesions which may produce a salmon colored exudate under moist conditions. The pathogen is both seed- and soil-borne and can cause serious crop losses. Infected fruit may have a bitter or off-taste, in addition to lesions, and can deteriorate quickly due to the invasion of secondary rot organisms. *C. orbiculare* survives between crops in infected crop debris, volunteer plants, and weeds in the cucurbit family. The fungus does not require a wound to initiate infection and is spread by splashing water, workers, and tools in warm, humid weather.

**Scab (*Cladosporium cucumerinum*):** Scab can affect all parts of cucurbit plants, but is most serious because of the disfiguring scabby lesions that develop on fruit. The disease is favored by heavy fog, heavy dews, or light rains, and temperatures at or below 70˚F. The spores (conidia) are borne in long chains, are easily dislodged, and spread long distances on wind. On foliage, the first sign of the disease is pale-green, water-soaked lesions which turn gray and become angular as they are contained by leaf veins. On fruit, spots first appear as small sunken areas which can be mistaken for insect injury. The spots may ooze a sticky liquid and become crater-like as they darken with age. Dark green, velvety layers of spores may appear in the cavities and secondary soft-rotting bacteria can invade. Severity of symptoms varies with the age of the fruit when it becomes infected. *C. cucumerinum* overwinters in infected crop debris and soil, and may also be seed-borne. Spores produced in the spring can infect in as little as 9 hours, produce spots within 3 days, and produce a new crop of spores within 4 days.

*Scab on pumpkin. Photo: T.A. Zitter*

**Plectosporium Blight (*Plectosporium tabacinum*):** Like scab, Plectosporium blight affects many plant parts but is most damaging when it affects cucurbit fruit. Pumpkins, yellow squash, and zucchini are the most susceptible. Lens to diamond shaped, white to tan, lesions occur on stems, leaf veins, petioles, and peduncles, while fruit lesions are more rounded. Severe stem and petiole infections can result in death of leaves and defoliation. Infected stems are dry and brittle. On fruit, the pathogen causes white, tan, or silvery russeting; individual lesions can coalesce to form a continuous scabby layer. Plectosporium blight is favored by wet weather; in wet years, crop losses in no-spray and low-spray fields can range from 50 to 100%. No resistant cultivar of pumpkins has been reported and it has not been reported to be seed-borne.


*White russetting from Plectosporium blight on pumpkin. Photo: T.A. Zitter*

**Management of Fungal Fruit Rots:** Start with disease-free seed or use fungicide-treated seed. Do not save your own seed if disease is present in the field. Select well-drained fields with good air circulation to promote rapid drying of foliage and fruit. Rotate out of cucurbits for 2 or more years. Fungicide sprays can reduce diseases which start in the foliage and then splash on the fruit e.g. Plectosporium, Scab, Anthracnose. Spraying copper can reduce infection of fruit by the foliar diseases angular leaf spot and bacterial leaf spot. Destroy and plow crop residues promptly after harvest to prevent their spreading and hasten their breakdown in the soil. Control of powdery mildew can significantly reduce black rot infection of pumpkins. Avoid chilling injury to winter squash and pumpkins in storage as this can allow for spread of some diseases in storage. Store fruit at 50-55°F and ~60% relative humidity.

*—M. Bess Dicklow, UMass Plant Diagnostic Lab (retired)*

# HARVESTING AND CURING POTATOES

Potato production has been increasing in recent years in Massachusetts. The 2012 Ag Census showed an almost twofold increase in both acreage (from 2,616A to 3,898A) and the number of farms growing potatoes (from 205 to 425) since 2007. This increase includes large farms that focus solely on potato production (>1,000 acres) as well as diversified farms. No matter the scale, harvest and curing principles remain the same. Storage will not improve the quality of tubers, so harvest when environmental conditions are ideal and pay careful attention to pre-harvest preparation to ensure that the highest quality potatoes come out of the field.

**Optimum Environmental Conditions for Harvest**

As cooler weather approaches, conditions become favorable for harvest and curing potatoes for long-term storage. Optimum environmental conditions for harvest include soil temperature of 45-65°F, tuber temperature should be 50-50F, and soil moisture should be approximately 60 and 80 percent of field capacity for loam and sandy soils, respectively. This level of soil moisture ensures that soil clods are not so hard that they damage skins during harvest but not so moist that they remain stuck to potatoes as they are brought into storage. Temperatures below 45°F will increase tuber bruising and temperatures above 60°F can increase transpiration and drying of potatoes or development of disease in storage. Vine-kill should take place about 2-3 weeks before these environmental conditions are expected. This year, planting dates varied widely, as some were delayed in planting due to our long, cool spring. Many early-planted fields have been killed and harvested already in the Pioneer Valley, but most fields are just reaching the vine-kill stage, or may have died back early due to hopperburn and disease.

**Pre-Harvest Preparation**

**Maturity** is indicated by the ability of the tuber to resist skinning during harvest. Periodically dig a few plants to see how easily the skins peel. Sugar content is a maturity index for processing potatoes, with both immaturity and over-maturity resulting in higher sugar levels. Mature potatoes resist bruising and have lower respiration rates than immature potaotes.

**Vine killing** stops tuber growth at the desired size after bulking, 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, mow or use a vine desiccant to kill the plants once tubers are mature. Killing vines also reduces the risk of late blight causing tuber infections, as the pathogen requires a living host to grow and produce spores.

**Skin set** is achieved by allowing 2-3 weeks for tuber skins to mature in the field after vine kill. During bulking, the outermost layer of potato skin is only loosely attached to underlying tissues, to allow for rapid growth of the tuber without the skin cracking. The cells in this layer are soft and easily damaged. Vine kill on mature potaotes will initiate "skin set" – the outermost layer of skin cells will begin to bind tightly to the underlying tissues and produce suberin, creating a tough, durable skin that is resistant to infection and dehydration. Good skin set greatly reduces the amount of wounding at harvest and increases the storability of tubers.

**Harvest practices to prevent wounding and bruising**

Check harvesting and transporting equipment before harvest begins to make sure it is working properly and does not bruise or wound tubers, and continue to inspect during harvest to determine injury points. Potatoes should not drop more than 4-6" and all equipment surfaces should be padded. Replace bare chains with rubberized links where possible, except for the primary chain. Adjust chain and ground speed so that chains are loaded to full capacity during harvest, and potatoes will "flow" rather than drop from one chain to another. In many cases, increasing ground speed helps to achieve this. Adjust the digger blade so that potatoes flow onto the upper surface of the chain rather than bumping into the front. Ensure that digger blades will cut cleanly through the soil – control weeds prior to harvest to avoid tangling, and sharpen blades before harvesting.

**Curing:** During the first 2-3 weeks of storage, wounds and bruises from harvest are suberized to prevent invasion of pathogens. This process is called curing, and it is essential for completing skin set.

**Maintain temperatures at 50-60°F.** Harvesting when pulp temperatures are already in this range is ideal. The ability to move from field to curing temperatures will depend on storage ventilation systems, varieties, availability of cooling air, and humidity controls. If potatoes are harvested during hot weather and cool off slowly, the likelihood of storage rot is increased. If active refrigeration is available, potatoes can be harvested at 62-65°F pulp temperature and cooled effectively. Storage areas with no refrigeration should not be loaded with potatoes with a pulp temperature above 60°F.

**Maintain relative humidity at 85-95%.** Low relative humidity will result in poor suberization. During the curing phase, tubers will lose moisture through cuts and bruises and incompletely suberized skin. As much as 2-4% of the tuber weight can be lost in the form of water during the first month in storage. If managed properly, this water loss can be minimized and, if captured, this lost moisture can be used to maintain the high relative humidity needed during curing for 3-6 hours per day. A humidifier can also be used to maintain proper humidity.

**Uniform air movement** is necessary during curing to remove heat from the field and from respiring tubers, to supply oxygen, and to prevent condensation within the pile. Monitor temperatures within the tuber bins or pile to avoid heat buildup, which increases tuber rot. In a through-the-pile forced air ventilation system, fans should be operated minimally – usually 1-2 hours per day provides sufficient oxygen but minimizes moisture loss.

**Curing and storage must take place in the dark** since even low light levels can cause development of chlorophyll (greening) and solanine, a toxic, bitter compound, in tuber skins, rendering tubers unmarketable. 1-2 weeks in low light can result in greening, and higher light levels cause faster greening.

**Curing infrastructure:** Curing may be accomplished within the space that will be used for storage, or in a different location. Diversified farms and those who are in the process of building up their fall/winter storage infrastructure may find it more challenging to provide the appropriate conditions for curing. On a small scale (up to about 1100 cubic feet), curing can be accomplished using a Cool-bot and humidifier in an insulated space. A combination of vents and fans to exhaust warm air and bring in cool air, controlled with relative humidity and temperature sensors, can make best use of outdoor conditions to manage the indoor environment. Good environmental control is very difficult in an open barn situation.

**When tuber quality is poor:** Potatoes affected by freezing injury, Pythium leak, late blight, or soft rot will break down at normal curing temperatures. If this is the case, eliminate the curing period–grade out the rot and sell immediately, or cool rapidly to 45°F with low to medium relative humidity. Questionable potato lots should be harvested closer to 55° F if they must be stored. Chilling injury is cumulative and is worse the longer the tubers are in chilling temperatures. Freezing occurs at 30°F, but chilling injury can occur after a few weeks at 32°F.

**Disease Management**

We still haven't seen late blight in Massachusetts this year, so it should not be an issue on tubers this fall. When late blight is around, spores can be carried by rainwater onto tubers and cause problems in storage. The pathogen can only survive on living tissue, so vine kill is key in disease management if late blight is present on the foliage. 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 space is available, minimize the effects of these diseases and pests by starting harvest as soon as skins are set.

If the soil is wet during harvest, soil may adhere to the tubers and promote infection by soft rot organisms. 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 (see "Potato Tuber Diseases" in August 24, 2017 Vegetable Notes). A good online resource on tuber diseases can be found at http://vegetablemdonline.ppath.cornell.edu/factsheets/Potato_Detection.htm#Click2. 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! Send samples to the UMass Plant Diagnostic Lab to get an accurate diagnosis. Proper identification is key as different tuber blights require different management techniques. Grade out diseased tubers before storage as much as possible, as some diseases can spread in storage.

**Cooling and Storage**

After the curing period, cool tubers as soon as possible but gradually and steadily to the holding temperature. Ideal holding conditions are as follows: 80-90% relative humidity and 38-40°F for tablestock and seed potatoes, 45-50°F for chipping, and 50-55°F for French fry stock.

**Sterilizing Storage**

An important aspect of potato disease control in storage is providing a pathogen-free environment. All storage and potato handling surfaces should be thoroughly cleaned and disinfected prior to putting the crop in storage. Surfaces should be well-moistened with disinfectant spray. Spray bin walls until there is slight runoff. Recommended disinfectants are quaternary ammonium compounds such as Hyamine 2389. Bins or equipment treated with quaternary compounds must be rinsed with clean water before coming into contact with potatoes to be used for human consumption. Read disinfectant labels carefully regarding use on walls or floors versus use on food-contact surfaces and to determine suitability for your needs. Organic produce may not come in contact with surfaces that have been treated with quaternary ammonium compounds. Chlorine, ozone, and peroxyacetic acid are approved disinfectants for organic produce.

**Sprout inhibitors** may be needed, depending on storage goals, storage conditions, and cultivar. Potatoes harvested in warm temperatures will be more likely to sprout in storage. Later maturity varieties usually have a longer period of dormancy (2-3 months).

-- K. Campbell-Nelson, M.B. Dicklow, and R. Hazzard

# FARMERS AND THEIR REDUCED AND NO-TILL EQUIPMENT

Four farmers shared their experiences practicing reduced and no-till at a twilight meeting last week. They demonstrated key equipment they've adopted to an eager audience of over 50 people at Ward's Berry Farm in Sharon, MA on August 28th, 2018. Other farmers came to the meeting with questions regarding how to transition to no-till, what crops to grow, how to use reduced tillage in organic systems, and to learn from other's mistakes. The program ended with a rainfall simulation on tilled and no-till land lead by Kate Parsons of NRCS (see photo at right). While the price tag for this equipment may be shocking (prices included where known), some of the presenters have benefited from NRCS Conservation and Innovation Grants or the MDAR ACRES Program to help purchase the equipment. Below are the farmers who presented and the tips they have for using the equipment:

*This NRCS rainfall demonstration showed that the most soil eroded off of tilled field samples (middle), and the field sample with living cover had the least*

**Jim Ward, Ward's Berry Farm, Sharon, MA**

- 15 years practicing reduced tillage in: pumpkin, sweet corn, and now beans
- Equipment used: Unverferth Deep Zone Tiller, Monosem vacuum precision planter (2 row, 3 point hitch with fertilizer shoe: $15,000), Vicon Spreader, Disc Harrow.

Jim switched over to reduced tillage in his sweetcorn and pumpkins when he noticed that his soils had dropped to less than 2% organic matter. He was having trouble keeping fertility in his soils, and noticed that he had to irrigate more. Since reducing tillage, Jim has increased soil organic matter across his farm to 5%, and has noticed many benefits in his pumpkin crop, where fruit matures on cover crop residue rather than on bare ground. In mid- to late-May, Jim rolls, flail mows, or herbicide kills his rye (and sometimes vetch) cover crop when it has flowered and has the most mulch potential. Then, the zone tiller pulls a shank about 18" deep (adjust to the depth of your plow pan in order to break it up) and creates a seed bed about 6" wide. Forty-five horsepower is needed to pull each shank. He then seeds with a Monosem vacuum seeder. When weeds escape through cover crop residues, Jim uses herbicides during the season At the end of the season, Jim mows down his crop with a flail mower, spreads cover crop seed with a Vicon spreader, then lightly disturbs the soil surface with a disc harrow to incorporate the seed. Jim plants 150 lbs winter rye seed/A, and recently has experimented with annual rye and crimson clover which allows him to get into fields earlier in the spring. Jim is not sure that no-till can be practiced organically. Even when the cover crop can be successfully terminated mechanically (by roller crimper, mowing, or tarping) weeds will eventually come in, and the labor required to pull or mulch is impractical over time. In order to grow annual vegetable crops, eventually, some form of tillage is required to manage weeds. **Lessons learned:** Jim has experimented with many methods of terminating cover crops before planting: rolling, mowing, terminating with herbicide, and has found that each situation calls for a different strategy. Sometimes, when planting a crop after a thick rye and vetch cover, he has found that he has to flail mow the vetch even after terminating with herbicide because vetch will bind up in the machine and rip huge swaths of cover crop out of the ground, creating an uneven seedbed.

*Unverferth Deep Zone Tiller. Top: showing 18" shank. Bottom showing 6" seedbeds set for sweetcorn. Photos: B. Schultz*

**Mike Davidian, Davidian Farm, Northborough, MA**

- 1 year growing no-till sweetcorn
- Equipment used: a 2-row Monosem vacuum precision planter with down pressure ($20,000) mounted with 2 Dawn ZRX crimpers

Mike decided to switch to no-till production to save money. With this piece of equipment, he will use less labor, fewer passes over the field, and less equipment overall to produce sweet corn. Mike got his new toy (his is the first one in MA) in July, and he drove it over a cover crop of very mature rye, seeding sweet corn as he went along. He did not prepare the field at all. The Dawn Biologic rollers are hydrolically powered and can be adjusted to apply up to 10,000 psi of down pressure to terminate a cover crop. The Monosem planter had to be built with it's own gas-piston down pressure system to counteract the pressure created by the rollers in front. He did not change his fertilizer practices, and has mounted a $100 pump to fill his fertilizer tanks, which are above the planter, to fertigate at planting. Mike sprayed some Acuron herbicide (a combination of four active ingredients: atrazine (10.93%), bicyclopyrone (0.65%), mesotrione (2.6%), and S-metolachlor (23.4%) plus the safener benoxacor) to manage thistle. He sidedressed the corn by hand at knee height as he always does. He says the stand of corn came out perfectly and he couldn't have hoped for a better first try with no-till. **Lessons learned:** The equipment is heavy (about 6,000 lbs)! A tractor with about 90 horse-power is needed to handle this equipment, and Mike wished he had better down pressure adjusted on the seeder—he had seed left on the surface in some places. Mike will experiment with adding tillage radish to his cover crop mix this fall for better weed control in the spring. He will also try winter wheat instead of rye because it is slower to mature in the spring and, when rolled, will better match the planting dates for his later season sweet corn successions.

*The Dawn ZRX rollers in front of the blue Monosem planter. Note that the planter has 2 different closing wheels to handle residue better (one smooth and one toothed) Photo: B. Schultz*

**Trevor Hardy, Brookdale Fruit Farm, Hollis, NH**

- 3 years growing reduced-till and no-till tomato, broccoli and cabbage
- Equipment used: Checci-Magli Unitrium Transplanter ($17,500), Jayco Weedwipe ($1,800)

As an irrigation and farm supply salesman, Trevor has seen an increased demand for reduced and no-till supplies from his clientele, so he started experimenting with it himself. Trevor uses the Checci-Magli transplanter (photo front cover), which can also be used as a water wheel transplanter in conventionally tilled systems. The Checci-Magli conserves water while transplanting, as it only deposits water with a plant, rather than trickling along. The planter also comes with it's own tool set mounted to the rig! This planter works best with small seedlings (128-cell trays or smaller), as the furrow is narrow and anything bigger has a harder time getting planted deep enough in the soil. Starting with smaller plants means that a little more care is needed in the field, and row cover may be needed to push the crop along. Trevor used a Jayco Weedwipe this season in between rows to safely apply herbicide between the rows without killing the crop. **Lessons learned:** The soil needs to be moist, or the planter needs more weight in order to plant efficiently. Otherwise, transplants may be left on the surface, as there is not enough pressure to penetrate the soil. Planting into a cover crop other than rye may be easier because rye creates such as dense root mat.

*Jayco Weedwipe: This newer weed-wipe works better that previous models which picked up a lot of soil along the way, causing the glypho-sate to be de-activated before it was able to kill the weeds. Photo: B. Schultz*

**Skip Paul, Wishing Stone Farm, Little Compton, RI**

- 3 years practicing reduced tillage in sweet corn and brassicas
- Equipment used: Roller-crimper, InterSeeder ($16,000)

Skip has been experimenting with rolling and crimping cover crops before planting his cash crop for several years now. He first became interested in working on organic no-till, but isn't sure that is entirely possible, so he is trying it with some conventional herbicides like Gramoxone (paraquat). Lessons Learned: He borrowed a roller-crimper from the University of Rohde Island, and rolled a cover crop of rye in the first year before the milk stage; it popped back up again. The next year, he waited until the rye was well into the milk stage to roll, but again, 10-15% of the cover crop popped back up again. Then, clover grew up through the rye and caused problems with his cash crop. So, Skip decided to try a different strategy and applied for a Conservation


*Skip Paul's InterSeeder. Photo: B. Schultz*

Innovation Grant through NRCS to purchase an InterSeeder which is a high clearance grain drill allowing him to plant cover crop seed between rows of crops during the growing season to maintain ground cover and reduce erosion. The InterSeeder allows the grower to remove drop shoes to accommodate different row widths. Skip will use the InterSeeder at 34" spacing for fall brassicas, but the equipment can be adjusted to different row spacing. The InterSeeder will put three to four rows of cover crop seed between single rows of brassicas. The goal is to establish substantial cover crops between cash crop rows from August through October. Skip is excited to work with this new tool and experiment with timing.

*-- K. Campbell-Nelson, UMass Vegetable Program and Annalisa Flynn, UMass Vegetable Program and Stockbridge School of Agriculture*

## NEWS RELEASE: REMINDER TO REPORT CROP DAMAGES PROMPTLY

Producers covered by a Federal Crop Insurance Policy are reminded to monitor their crops for insurable damage throughout the growing and harvesting season. If you notice damage contact your crop insurance agent within 72 hours of discovery, 15 days before harvesting begins and within 15 days after harvesting is completed on the insurance unit. Two other important reminders:

- Direct marketed crops must have a yield appraisal before they are harvested, if loss is anticipated.
- Do not destroy crop evidence that is needed to support your claim without clear direction, in writing, from the insurance adjuster.

Producers having coverage under the Noninsured Crop Disaster Assistance Program (NAP) administered by the USDA - Farm Service Agency have similar loss reporting requirements. NAP producers should contact the FSA Office that serves their farming operation to report losses.

*UMass Extension works in partnership with the USDA Risk Management Agency (RMA) and various agricultural organizations to educate and inform Massachusetts producers about Federal Crop Insurance and Risk Management Programs. For more information, please visit www.rma.usda.gov or contact UMass Extension Risk Management Specialists Paul Russell at pmrrussell@umext.umass.edu or Tom Smiarowski at tsmiarowski@umext.umass.edu or check out our website:* https://ag.umass.edu/risk-management

## EVENTS

**Northeast Greenhouse Conference and Expo - Basic Production Skills Session**

The Basic Production Skills session at the NEGC will feature four presentations on the fundamentals of greenhouse production. These presentations are appropriate for new growers or experienced growers interested in learning training topics.

- 9:00 am - Controlling Height: Chemical, cultural and environmental approaches, Christopher J. Currey, Iowa State University
- 10:30 am - The art and science of watering, Rosa Raudales, University of Connecticut
- 1:30 pm - Managing the greenhouse environment: Light, temperature, carbon dioxide, and humidity, Christopher J. Currey, Iowa State University
- 2:30 pm - Nutrient management: Fertilizers and substrates, Ryan Dickson, University of New Hampshire

**When:** Wednesday, November 7, 2018

**Where:** Boxboro Regency Hotel, 242 Adams Pl., Boxborough, MA 01719

**Registration:** https://www.negreenhouse.org/registration.html

## THANK YOU TO OUR SPONSORS:

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

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