UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

Volume 26, Number 20 August 28, 2014

In this issue:

Crop conditions

More fields are being mowed, harrowed and put into cover crops for fall – or in some cases, no-till seeded to cover crops where growers have transitioned to reduced-till systems. The dry, sunny conditions of the past week have helped growers get in the bounty of peppers, tomatoes and eggplants as well as early winter squash and pumpkins. We are hearing from growers who managed to keep their tomatoes relatively disease free that the crop has been abundant and good quality. Similarly, several growers have said they are pleased with the size and quality of this season's onions. Many growers are struggling to catch up on the infrastructure they need to cure and store all of the crops that they have grown for their expanding fall and winter markets. For a quick reference see our chart on harvest and postharvest needs of storage crops. Fighting the seemingly intractable diseases – bacterial canker, *Phytophthora capsici*—is very discouraging especially when acres of crop are cut short, or totally lost. Sometimes a little tweaking of an old practice can make an unexpected difference in an old problem. One grower is using a flail mower to chop his sweet corn in an effort to reduce the farm-wide population of sap beetles that thrive and reproduce inside the husks of ears, which remain intact when a disk is used. Another moved her spring brassicas to a new, distant field so there were no brassicas on the home farm till late July – and she's finding that her large fall brassica crop on the home farm has been virtually free of the black rot and flea beetles that plagued the crop last year.

This farmer outgrew their greenhouse and is curing in the field

We hope you'll join us at Foppema's Farm next Wednesday, September 3 for a vegetable and fruit program with some practical ideas on steps to meet food safety guidelines. See details in the Upcoming Events section of this issue.

Pest alerts

Cucurbits: Cucurbit downy mildew was confirmed on cucumber in Hampshire Co., MA this week and on pumpkin in Franklin Co., MA last week. No CDM was found during scouting visits in Worcester and Middlesex Cos., MA. According to the CDM-IPM Pipe forecast, most of MA is at a moderate risk of infection and CDM specific fungicides should be applied now in rotation every 5-7 days. This disease can spread very quickly, causing defoliation. At this time, when fruit is nearing harvest, maintaining healthy foliage to protect fruit from sunscald is important. Some of the most effective oomycete-specific products that work on CDM include: Ranman, Presidio, Previcur Flex, Zampro, and Forum. Manzate and Bravo are multisite fungicides that make good tank mix partners for the previously listed materials to prevent development of resistance within the pathogen. Copper products are generally the most effective option for oomycete pathogens such as CDM and late blight on organic farms, but many of the newer varieties of pumpkins are very sensitive to phytotoxicity when copper is used. It is best to try copper on just a few plants, if you are unfamiliar with how a new variety will handle copper.

Cucurbit downy mildew on underside (left) and top (right) of leaf

A field infected with P.capsici has been harrowed

As pumpkin and winter squash fields are getting closer to harvest, growers are diagnosing disease problems to determine crop storage potential, future crop rotations, and choices for resistant cultivars in the future. Leaf and fruit blights reported on cucurbits by the UMass Diagnostic Lab this week include: powdery mildew, angular leaf spot, anthracnose, and alternaria leaf spot. The August 13th rainstorm brought up to 5 inches of rain to the western part of the state. Where rainfall was heavy and ***Phytophthora capsici*** is present, the disease is widespread, affecting about ½ of a field of butternut in Hampshire Co., MA. Growers should scout their cucurbit fields for this disease, especially low spots. Till under areas if the disease is present in only small sections of the field, but don't try to harvest from patches that are surrounded by infected fruit. Harvest as soon as the crop is ready. *P. capsici* can continue to appear on fruit and spread among fruits in storage. See article this issue for more tips on harvesting and curing winter squash and pumpkins.

Table 1. European corn borer (ECB), fall army worm (FAW), and corn earworm (CEW) trap captures for the week ending 8/28/14.

Location	ECB	FAW	CEW
Western, MA			
Amherst	3	-	-
South Deerfield	4	0	-
Sunderland	4	0	-
Hadley	0	0	0
Feeding Hills	2	0	0
Central & Eastern MA			
Spencer	7	0	0
Tyngsborough	2	2	0
Concord	1	1	0
Millis	0	2	-
Lancaster	0	0	0
Seekonk	0	10	-
NH			
Litchfield	0	1	4
Hollis	0	0	3
Mason	0	0	0
Burlington, VT	12	1	1

Solanaceous crops: Late blight has NOT been reported in tomato and potato in RI so far, but is in all other New England states. For a map of late blight reports and photos of symptoms, see usablight.org. Continue to apply protectant and targeted LB fungicides. Get spray recommendations tailored to your local weather conditions and fungicide program using the MA DSS website here. Tomato hornworm has been spotted in tomato fields in MA and VT, but not at damaging levels. Verticillium wilt in eggplant was seen in Washington Co., RI affecting 10-20% of the crop. If this disease is diagnosed in your field, rotate out of Solanaceous crops for 4 years. **Cyclamen mites** were identified on peppers and likely broad mites were causing russeting on eggplant, both in high tunnels.

Russeting on eggplant caused by mites

Brassicas: Imported cabbageworm (ICW), diamond back moth caterpillars (DBM) and cabbage loopers (CL) were all found during scouting visits in Worcester Co., MA this week. Only ICW and DBM were found in Chittenden Co., VT. Very few caterpillars of any kind were found on scouting visits in Washington Co., RI. Scout now in lettuce, spinach and celery for CL, as this pest also enjoys those crops. Also found this week were lady beetle eggs, adults and larvae, cocoons of *Cotesia rubecula* parasitizing ICW, and mummies of aphids parasitized by a beneficial wasp. Beneficial insects were providing significant control of brassica pests compared to last week. Treat plants between the start of heading and harvest if 20% or more of the plants are infested. The most critical time to scout and apply controls is just prior to head formation. Use a 10% to 15% threshold throughout the season for kale, collards and mustard. Dipel and Xentari are organic materials with good efficacy for these pests that are also easy on beneficial insects. Cross-striped cabbage worm (CSCW) was found in a field in Worcester Co., MA this week, along with ICW and CL, where it was causing heavy defoliation on collards. Spray if 5% of the plants are infested with CSCW. Use selective insecticides to preserve parasitic wasps. Both

cross-striped cabbage worm damage

Cross-striped cabbage worm (top) and imported cabbage worm

the brassica flea beetle and striped flea beetle were reported in a mixed brassica field in Chittenden Co., VT this week and **brassica flea beetle** damage was severe along a field edge in at least one cabbage field in Franklin Co., MA where it moved in from a spring cabbage crop. Very few flea beetles found on scouting visits in RI. There is no fixed economic threshold that applies to all crops, therefore, control if damage to cotyledons or seedlings is stunting growth, or if damage to greens will reduce marketability.

Sweet Corn: Corn earworm, European corn borer, and fall armyworm captures remain low and sprays can be extended to 7 days, or stopped altogether. Make a final scout of any pre-silk blocks to clean up ECB or FAW if infestation is > 15% . Most blocks are now in silk. Sales tend to slump around Labor Day, but often pick up again in September for growers who serve a clientele eager to savor the final weeks of tasty, fresh sweet corn.

Spotted Wing Drosophila: Track trap captures across MA here.

PUMPKIN AND WINTER SQUASH HARVEST AND STORAGE

Winter squash and pumpkin fruit that remain in the field face a daunting list of diseases, insects and weather events that could threaten fruit quality. Early harvest and careful storage is often preferable to leaving fruit in the field. This is especially true if you know that your pumpkins or squash are in fields that are infected with Phytophthora blight (*Phytophthora capsici*).

Since the pumpkin market lasts from Labor Day to Halloween, pumpkins may need to be held for several weeks before they can be marketed. When is it best to bring them in, and when to leave them in the field? If the vines are in good condition, the foliage can protect the fruit from sunscald. If foliage is going down from powdery mildew or downy mildew, this may help with ripening and make harvesting easier, but also increases the risk of sunscald or injury to pumpkin handles. There can be extra work involved in bringing fruit in early, especially for growers who normally have pick-your-own harvest. However, we recommend that growers harvest as soon as crops are mature and store under proper conditions, if it is feasible. If you need to hold fruit in the field for pick-your-own or any other reason, using a protectant fungicide (e.g. chlorothalonil) can help protect from black rot, and some of the other fruit rots. Scout for insects feeding on the fruit and handles, which may include squash bug nymphs or adults and striped cucumber beetle, and control them if damage is evident. See the New England Vegetable Management Guide for treatment recommendations.

Butternut ready to be harvested

What about pumpkin stems, i.e. handles? In some cases, it's the handle that sells the pumpkin. Pumpkins may not be marketable if the handle is broken off or dried up. Ideally, if the timing is right, pumpkins would be cut from the vine one to two weeks prior to marketing. However, if they are harvested now they may sit much longer before being sold. The discussion of how early to cut handles is an old one with many different opinions. One view is that it is advisable to cut the handles from the vine to save them from advancing powdery mildew and reduce shrinkage. Whether or not handles shrink and shrivel after cutting is affected by plant stress, genetics (variety), moisture and temperature conditions, and disease. There are many diseases that can affect handles, including Powdery mildew, Plectosporium, Fusarium, Black Rot, and Alternaria. Again, proper curing and storage conditions are key.

Ideally, pumpkins should be harvested when fully mature, with a deep orange color and hardened rind. Similarly, winter squash should be harvested when mature, as indicated by corking of the stem, loss of rind surface sheen or gloss, groundspot yellowing, and die-back of the tendril nearest to the fruit. As long as pumpkins have started to turn color, they will ripen off the vine if held under the proper conditions. While not ideal, this may be preferable to leaving them in the field if conditions are not favorable. If necessary, pumpkins can be ripened in a well-ventilated barn or greenhouse. The best temperatures for ripening are 80-85 degrees Fahrenheit with a relative humidity of 80-85%. Night temperatures should not drop below the sixties. These are the same conditions as those used for curing. A period of curing is often recommended for squash or pumpkin showing non-hardened skin or surface damage. However, research on this subject has produced variable results, and shows that curing squash is not consistently beneficial when the squash shows no damage or is well matured. The curing period is typically about 10 days. During this process the fruit skin hardens, wounds heal,

and immature fruit ripens – all of which prolongs the storage life.

Take care to avoid subjecting squash or pumpkin to chilling injury. Chilling hours accumulate when squash or pumpkin is exposed to temperatures below 50°F in the field or in storage. Injury increases as temperature decreases and/or length of chilling time increases.

Storage life depends on the condition of the crop when it comes in and your ability to provide careful handling and a proper storage environment. All fruit placed in storage should be free of disease, decay, insects, and unhealed wounds. When harvesting squash and pumpkins, it is important to handle the fruit with care to avoid bruising or cutting the skin. Despite their tough appearance, squash and pumpkin fruit are easily damaged. The rind is the fruit's only source of protection. Once that rind is bruised or punctured, decay organisms will invade and quickly break it down. Place fruit gently in containers and move bins on pallets. Use gloves to protect both the fruit and the workers. Removal of the stem from squash (butternut, Hubbard, etc.) will also decrease the amount of fruit spoilage because the stems frequently puncture adjacent fruit, facilitating infection. These fruits need a period of curing to heal the stem scar, which can be done in windrows in the field if weather is favorable.

Growers often plan to store winter squash until January, February or March. Select fruit that are free from disease and haven't been subject to much chilling (below 50°F). Chilling injury is of particular concern with squash intended for storage because it increases the likelihood of breakdown. If squash has been exposed to chilling injury it should be marketed first and not selected for long-term storage. Remove squash from the field if temperatures are likely to drop below fifty degrees for any length of time. Be sure that storage areas have the capacity to maintain temperatures above 50 F throughout the storage space.

Pumpkins and winter squash should be stored in a cool, dry, well-ventilated storage area. Ideal temperatures are between 55° and 60° F with relative humidity of 50 - 70%. High relative humidity provides a favorable environment for fungal and bacterial decay organisms. Lower humidity can cause dehydration and weight loss. Higher temperatures increase respiration and can cause weight loss. Temperatures lower than 50° F cause chilling injury. In a greenhouse, temperature can be managed with ventilation on sunny days; heaters will be needed for storage into November and beyond. Fruit temperature should be kept as close to the temperature of the air as possible to avoid condensation, which can lead to rot. Under ideal conditions, disease-free pumpkins should have a storage life of 8-12 weeks and butternut squash up to three or four months. Even if it is difficult to provide the ideal conditions, storage in a shady, dry location, with fruit off the ground or the floor, is preferable to leaving fruit out in the field.

As you plan for storage and marketing, keep in mind that the market for pumpkins seems to get earlier every year. Fall decorative displays include pumpkins, and those displays begin showing up as Labor Day approaches. One of the best solutions to early-maturing pumpkins may be finding an early market.

-by R. Hazzard, UMass Extension

FALL DISEASES OF BRASSICAS

Fall, with its cooler temperatures and shorter days, is the time when fall brassica crops tend to look terrific—broccoli is at its best, flea beetles seem to evaporate (though they can still be found in some fields in mid September) as they depart the field for overwintering sites in the border, and caterpillars grow more slowly so that, as long as you don't ignore them completely, they are easy to control. However, it's worth keeping a close eye on these crops, as fall is also the time when diseases of brassicas can quickly take off and reduce yield and quality, especially in leafy greens and storage crops. There are a few major diseases of brassicas which share much in common—they can all be seed-borne; they can survive in crop residues in soil for about two years; they are spread by wind, splashing water and insects like flea beetles; and they are favored by moist conditions. This means that the following preventive, cultural practices will go a long way in reducing the impacts of all a the diseases described below:

Start with disease free seedlings. All of these diseases are commonly introduced on infested **seed**. Talk to your supplier to be sure the seed has been tested or, better yet, **hot water treat** your seed to eradicate bacteria, fungi, and oomycetes that may be present. Avoid overwatering and encourage air flow through greenhouses. Monitor transplants in the **greenhouse** and remove any symptomatic plants.

Plant into a clean field. **Rotate** out of brassicas (including **weeds** like shepherd's purse, wild radish, field pennycress, etc.) for 2-4 years. Any amount of rotation you can do will help and the further the better, as these diseases can be dispersed by wind and insect feeding. Chopping and burying infested **residue** quickly after harvest will shorten the period of time the organisms persist in the soil. For example, avoid leaving diseased Brussels sprouts stalks standing in the field through the winter; mowing them is better than nothing if you can't disk them in. Manage **cull piles** well so that they do not become sources of inoculum.

Reduce leaf wetness. All of these diseases require moisture to grow and spread. Increase **plant spacing** so plants will dry off more quickly and so the pathogens can't easily spread from plant to plant. If overhead irrigation is necessary, or when **watering** in the greenhouse, water on a sunny day when leaves will dry quickly.

Control insects and remove weeds. Flea beetles can move fungal spores and bacteria from plant to plant and field to field. A study showed that spores of *Alternaria brassicicola* occur on their bodies, in their mouths, and in their feces, and that **flea beetles** actually concentrate alternaria spores in there mouthparts when they clean their antennae. The insects move from plant to plant, basically injecting spores and bacteria into wounds they create through their feeding. Reducing flea beetle pressure will also reduce the spread of diseases through the field. Similarly, cruciferous **weeds** can harbor diseases and act as bridges between fields and between seasons. Weeds also crowd the crop, increasing moisture and leaf wetness in the row making the environment around the plant more conducive to disease.

Chemical control. There are many effective pesticides to control these diseases, please see the New England Vegetable Management Guide for chemical recommendations. Copper products and plant defense activators like Actigard or Regalia are the best choices for managing black rot. Avoid using excessive pressure when spraying for black rot as this can very efficiently spread the bacteria throughout the planting and can cause abrasions and wounds through which the bacteria can enter the plant—use only enough pressure to get good coverage. OMRI approved fungicides have not shown good efficacy for other diseases but many copper products, plant defense activators like Regalia, and other biopesticides are labeled for downy mildew, black rot, and alternaria—check labels.

Black Rot is one of the most devastating diseases of brassica crops, and can result in high losses of yield and quality.

The bacterium, *Xanthomonas campestris* pv. *campestris*, plugs the water-conducting tissue of the plant with xanthan, a mucilaginous sugar causing chlorosis (yellowing) and wilt of tissue. Seedlings are commonly affected but symptoms can appear at any growth stage or an infected plant may appear symptomless. The most common and characteristic symptom is a yellow, V-shaped lesion that extend from the leaf margin toward the base of the leaf, caused by bacteria entering through guttation droplets that form at the hydathodes. Lesions can also occur mid-leaf, as darkened dead patches of tissue between the veins, where wounding from insect feeding, hail, or mechanical injury has occurred. The pathogen may move into the plant vasculature and infected veins turn black as they are plugged with xanthan, and the normal flow of water and nutrients is impeded. Blackened veins may also appear in root crops like rutabagas even though foliar symptoms may not be present. On heading crops, infection may spread into the leaves of the head and is often followed by invasion by soft-rotting organisms.

Black rot is commonly transmitted by seed, and a seed lot with as little as 0.03% infected seed can cause an epidemic. The bacteria can persist in infected plant debris for up to two years, but can only survive for 40-60 days in the soil in the absence of host tissue. Disease development is favored by warm, wet weather and is spread within the field by splashing water, wind, equipment, workers, and by insects such as through flea beetle feeding. *X. campestris* pv. *campestris* can be spread long distances or introduced into new areas by infested seeds and transplants.

Alternaria leaf spot is a fungal disease that affects all cultivated brassicas, causing small black spots that grow into large

lesions with characteristic concentric rings on leaves, stems and heads. The disease can be caused by several fungi in the genus *Alternaria*, but the most damaging species in the production of vegetable brassicas are *A. brassicae* and *A. brassicicola*. Disease development is favored by cool temperatures and long periods of leaf wetness or high relative humidity, and Alternaria leaf spot can be a limiting factor in the production of vegetable and seed crops in regions where these conditions are common. Infection can cause reduction in crop quality and yield through damage to seeds, seedlings, leaves, and heads, and can also spread during

storage of vegetable crops like cabbage. Brussels sprouts can be rendered unmarketable by numerous small spots on the buds. Brown, sunken spots on heads of broccoli and cauliflower can make those crops unmarketable. The disease can spread in storage so management is especially important for cabbage and other storage crops. Inspect these crops for early symptoms before storing. In recent years, as a wider range of brassica crops and a longer growing season through season extension have led to increased brassica production in New England, this disease has become more severe and is causing more losses, especially in fall crops.

The initial symptoms of Alternaria leaf spot are small black dots surrounded by chlorotic haloes. As the disease progresses lesions expand into characteristic, dark brown to black circular leaf spots with target-like concentric rings. The centers of lesions often turn brown and crack or fall out, giving the leaf spots a shot-hole appearance. Individual spots coalesce into large necrotic areas and leaf drop can occur. Lesions can occur on petioles, stems, flowers, flower pedicels, and seed pods. Pod infection causes distortion, premature shattering, and shriveled, diseased seed that germinate poorly.

Alternaria species overwinter primarily in diseased crop debris. Lignin-rich stalk tissues can persist in the soil for over two years, and the fungi can remain active on that tissue as long as it is present. Disease development is favored by temperatures of 60-78° F and 12 hours of relative humidity of 90% or more. The main means of introduction into new areas is on infested seed. However, spread from one infected crop into nearby crops occurs easily once the disease is established on a farm. The fungi sporulate profusely and are spread throughout fields by wind, splashing water, equipment, and workers.

In 2009, a Brussels sprout variety trial was conducted by the UMass Vegetable IPM Program. Seven varieties were evaluated—Vancouver, Franklin, Nautica, Diablo, Dimitri, Roodnerf and Oliver. Among these varieties, Oliver and Franklin showed significantly more disease damage than the other cultivars. There are many fungicides with efficacy against Alternaria leaf spot including Quadris, Endura, and Bravo among others—please see the New England Vegetable Management Guide for recommendations. Research on the efficacy of biological fungicides (eg. Serenade, Sonata, and Actinovate, etc.) to control Alternaria in cabbage is ongoing at the UMass Research Farm, look for those results over the winter.

Downy mildew caused by the fungus *Hyaloperonospora parasitca*, is an important disease of broccoli, collards, kale, cabbage, cauliflower and Brussels sprouts, as well as root crops such as rutabaga, turnip and radish. There are many downy mildews, seemingly every crop has one, but they are all unique and very host specific—if you have cucurbit downy mildew you don't need to worry about it infecting your brassicas, or the other way around. Disease development is favored by cool, moist conditions caused by rain, heavy dew, or fog. Infection can occur at any stage of growth. On seedlings, slighty yellow patches appear before whole leaves and cotyledons turn yellow and drop. Early infections can also be symptomless until seedlings are transplanted to the field and conditions become favorable. Irregular, angular yellow to brown spots develop on both the top and bottom of the leaf and a characteristic grayish-white, fluffy growth on the undersides of leaves appears. In the floral parts of broccoli or cauliflower, dark brown areas develop internally in curds or floral buds of the head. Stems and stalks of the flower head may be darkened or have black streaks, and this may be the first sign of infection in broccoli. In cabbage, internal darkening and purplish spots appear in the inner layers of the head or move upward in the head from stem infections. The disease can spread in storage and infected plants are susceptible to secondary infection with soft rot bacteria, resulting in a stinky puddle of rotten cabbage.

Unlike other downy mildews that blow in from afar each year, *Hyaloperonospora parasitica* can survive from season to season as thick-walled resting spores, called oospores, in the soil or crop debris. These sexual spores can survive in the soil for extended periods and produce sporangia when conditions are moist and cool, especially at night. Other sources of initial inoculum are infested seeds, or cruciferous weed hosts. Disease development is favored by abundant moisture on leaves provided by dew, drizzling rain, or heavy fog, and by temperatures of 50-60°F. Sporulation, germination, and reinfection can occur in four to five days. Sporangia (secondary, asexual spores) are spread throughout the field by wind, splashing rain, and by feeding insects. This disease commonly infects plants early on but shows no symptoms until environmental conditions become favorable and suddenly all the plants begin to show symptoms later in the season. Resistant or tolerant varieties of broccoli have been developed; our sources list Marathon and Arcadia among these.

Blackleg (*Phoma lingam*) causes a leaf spot and a stem canker on many cruciferous crops, especially cauliflower, broccoli, and turnip. Rutabaga, radish, and mustard cultivars are only slightly susceptible. This disease can spread rapidly within a field. Initial symptoms are small lesions on stems at cotyledon stage which elongate, turn brown with a black to purplish border, and become sunken. The lesion extends up and down the stem, the stem becomes girdled and blackened,

with many fruiting bodies (pycnidia) embedded in the tissue. Lesions may extend below the soil and attack roots. Diseased plants often wilt, lodge, and die. On root crops, symptoms occur in the form of cankers on the fleshy roots and a dry rot may appear in storage.

Phoma lingam is a fungus which can survive for up to four years in seed and three years in infected crop debris. Plants can become infected at the seedling stage or at any stage in the field. The initial source is probably infected seed. The disease spreads by spores which are exuded from pycnidia in long coils and are splashed to nearby plants to initiate new infections. The disease is favored by wet conditions, though it may get an early start on seedlings in the greenhouse and cause problems even in dry, sandy fields. The disease has become less important in brassica crops because of successful disease management strategies in seed production. Once present on the farm, management should focus on avoiding spread of the disease by rogueing out affect plants and reducing soil moisture.

-by S. B. Scheufele and M. B. Dicklow, UMass Extension

THE SOIL LAB IS MOVING!

After 23 years, the UMass Soil and Plant Tissue Testing Lab is leaving West Experiment Station! While we love this old building with all its character and charm, we are looking forward to our newly renovated space in the basement of Paige Laboratory. The move is scheduled for September 15, 2014.

The lab will be closed on Monday, September 15, 2014. Orders sent to the old address will automatically be forwarded to the new lab. Please be aware that turnaround time may be delayed by this transition, however, we will do our best to minimize the disruption. We thank you in advance for your patience and understanding.

NEW Soil Lab Address:

UMass Soil and Plant Tissue Testing Lab
203 Paige Laboratory
161 Holdsworth Way
Amherst, MA 01003
Phone: (413) 545-2311
e-mail: soiltest@umass.edu
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Fall soil testing

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

In many cases, fields are not uniform. There are many reasons for this including: uneven topography, wet and dry areas, different soil types and areas with varying previous crop and fertilizing practices. In such cases, the field should be subdivided and composite samples tested for each section.

Soils should be tested for organic matter content every two or three years. Be sure to request this as it is not part of the standard test. A standard soil test costs $15; with organic matter it costs $20.

Submitting soil samples

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

A fall nitrate test or "report card nitrate test" as some university labs call it, indicates how closely crop nitrogen (N) uptake has been matched with nitrogen supply for the season. High (> 20 ppm) or excessive soil nitrate content in the fall indicates that too much N fertilizer was applied in the prior season, and a fall cover crop would be beneficial to conserve this remaining N for the following season. Use the Pre-Sidedress Nitrogen Test form to submit a Nitrate test soil sample.

A standard soil test that includes other macro- and micronutrients can help you make the best choice to fit a particular crop to a given soil nutrient profile for the following season. When submitting your soil sample for testing, include the crop code on the form for the crop to be grown in that field the following year. Haven't prepared your crop rotation plans yet? You may ask for recommendations of up to 3 different crops without extra charge. Use this form for Vegetable and Fruit Crop Soil Submissions.

Sheet compost

Interpreting Results and choosing amendments

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

Soil pH: The lab report will recommend the amount of lime to apply based on the buffer pH, exchangeable acidity and the crop(s) to be grown. Lime can be applied any time, but fall is preferred to allow several months to raise the pH. Split applications (half in the Fall and half in the Spring) may also be used effectively.

Compost may be applied as matured compost (usually in the spring) or as underaged compost (preferably in the fall). Sheet composting is the process of applying undercomposted ingredients directly to the soil and incorporating. High carbon to nitrogen ratios in this process can hinder the rate of decomposition and bits of undercomposted materials can interfere with seeding. Undercomposted materials also harbor disease and weed seeds! If this method is used for adding soil nutrients and organic matter, it is best done in the late summer or fall. In this case, a soil test should be conducted in the Spring to better determine nutrient availability for crops. Matured compost applications are usually made in the Spring, and in this case, testing may happen in the fall in order to estimate plant available nutrients for next year's crop and help determine future compost application rates.

Manure is an excellent source of nutrients, however, as manure ages and decays, considerable nutrient loss occurs from leaching, surface runoff, or volatilization of ammonia into the atmosphere. Manure may also contain pathogens such as E. coli and salmonella. If manure is used, vegetables should not be harvested within 120 days of application. This is a requirement for organic production and a good practice for everyone. In most cases, manure should be applied in the fall or to a non-food rotation crop. Fall-applied manure should be incorporated immediately and a winter cover crop should be planted to protect N from leaching. Manure applications should be made in cold weather to reduce volatilization, but not to frozen ground as this increases surface runoff potential. In no-till systems, research has shown that manure can be effectively surface applied to a growing cover crop to reduce nutrient losses, but not to bare ground. In order to make accurate nutrient applications to best fit your crop needs, a manure analysis should be conducted. The University of Maine has a manure testing lab; here is their Manure Sample Submission Form. Be sure to submit your samples in a tightly sealed container!

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

- **Legume** cover crops provide up to 100 lb PAN/a. To maximize PAN contribution from legumes, kill the cover crop at bud stage in the spring.
- **Cereal** cover crops immobilize up to 50 lb PAN/a. To minimize PAN immobilization from cereals, kill the cover crop during the early stem elongation (jointing) growth stage.
- **Legume/cereal** cover crop mixtures provide a wide range of PAN contributions, depending on legume content. When cover crop dry matter is 75 percent from cereals + 25 percent from legumes, PAN is usually near zero.

Micronutrient application recommendations cannot be determined accurately by soil labs in New England because deficiencies in crops have not been widely measured in our soils. However, the soil test results do report the ranges found in all the soils that come through the lab so that you may compare where your soil falls in regards to other soils in New Eng-

land. For recommendations on specific micronutrients needed for crop growth, such as Boron, see the New England Vegetable Management Guide section on micronutrients. Preferred timing of micronutrient applications in the Fall vs. Spring has not been determined. Other Nutrient applications should be avoided until spring when a growing crop is best able to use the applied nutrients in water soluble form and avoid leaching, runoff, or volatilization.

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

-By Katie Campbell-Nelson, UMass Vegetable Extension, 2014

Vegetables:

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or

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UPCOMING EVENTS

UMass Extension Vegetable and Fruit Twilight Meeting: Food Safety, IPM and the Commonwealth Quality Program

When: September 3, 2014 4-7 pm

Where: Foppema's Farm, Northbridge, MA, 1605 Hill St, Northbridge, MA 01534

Join UMass Extension faculty and staff and the Foppema family to learn about how the farm is using food safety and IPM strategies in their vegetable, tree fruit and berry crops.

Foppema's Farm is a 75 acre fruit and vegetable farm located in Northbridge, Massachusetts. The farm is family owned and operated by the Ken Foppema family. Ken and Lisa and their four sons (along with a wonderful staff of employees) grow and sell produce from the farm out of a beautiful post and beam farmstand built in 1998. They sell wholesale and at farmers markets, and through pick-your-own, especially at nearby Keown Orchards which is now part of their farm.

The farm participates in the **Commonwealth Quality Certification Program** and they are taking steps to increase their implementation of the **food safety standards** as well as the **sustainability and IPM standards** that are part of this program. We will tour their wash room and packing area, and discuss specific steps that help to ensure food safety when **field packing greens**. Mike Botelho from the Mass Dept. of Ag Resources will talk about the Commonwealth Quality Program (CQP), its food safety standards, and the market access that can be gained through CQP. You'll see some of the CQP promotional materials, that can be customized to highlight aspects of your farm.

On the IPM side:

- Rich Bonanno, UMass Extension weed specialist, will discuss **weeds**: types of weeds, how they grow, how to identify them, and how to manage them on a very diverse farm like Foppema's.
- UMass Extension Fruit Program will tour the apple orchard and discuss **apple IPM** strategies.
- Ruth Hazzard, UMass Extension Vegetable specialist with Lisa McKeag, Extension Assistant and Ken Foppema will discuss how the Foppema's are using **IPM in onions** to solve a key disease problem.

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.