UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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CROP CONDITIONS

The welcome, widespread rains of the past few days may not have saved crops that were lost in August, but they were much needed by fall crops and those that are still in production. Cover crops will germinate well now. Cooler, drier air following the rains still provides good conditions for curing and harvesting of fall root crops, squash and pumpkins. Harvest of most summer crops continues, though many are slowing down or have been lost to disease, drought, or old age.

It was good to see puddles again, though I can no longer see standing water without thinking of Phytophthora! Fruit rots of pumpkins remain a concern till everything is out of the field, which won't be for another several weeks. There are many! If you have questions on fruit rots, visit the UMass vegetable program website, select crops, pumpkins, postharvest fruit rots for photographs and descriptions of how to recognize and prevent these fruit rots. (http://www.umassvegetable.org/soil_crop_pest_mgt/crops/pumpkin.html)Also, use the disease diagnostic lab, it's worth knowing what you are dealing with.

Downy mildew has caused late cucumber crops to go down, but is having less impact on squash and pumpkin crops. However, powdery mildew is bringing down the foliage in squash and pumpkin. Both diseases cause a similar scorch and dieback of leaves, but the powdery only shows white fuzzy growth on top and bottom of leaves, while downy mycelia on the underside of leaves is more angular, slightly brown or purplish, and lesions are initially yellow on the upper leaf.

This is the final weekly edition of Vegetable Notes for the season. We hope that the steady flow of articles and pest alerts has helped you deal with some of the many issues that challenge vegetables over the course of the season. We will shortly be sending a short survey to get your feedback on what you have found most useful. We'd appreciate your feedback – in fact, its essential to keep us on track!

Mark your calendar for the **New England Vegetable and Fruit Conference** that is coming up **December 11-13, 2007** in Manchester NH at the Expo Center of New Hamphsire. It happens only once every two years so don't miss it! As always, we will have at least four concurrent sessions both morning and afternoon for three days, along with a great trade show and farmer to farmer discussion groups on a range of hot topics. See your friends, make new contacts, and get up to date on everything that's happening in vegetables, berries, tree fruits, and a few other novel crops! Instead of a banquet this year we'll have a social mixer and awards ceremony on Wednesday from 6-7:30 that is open to everyone. Book your room early because the hotels fill up fast! Find more details at www.nevfc.org or look for a program book to come your way in October. For registration information call Jude Boucher 860-875-3331.

FALL WEED MANAGEMENT ADVICE

Weed management is still important at the end of the season. There are three main activities that need to be completed. They are: fall field scouting, preventing weed seed production, and controlling perennial weeds.

End of Year Weed Scouting

It is worthwhile to take the time to check fields for weed problems at this time of year. A quick scouting can identify problems that will be expensive to solve if they get out of control and can provide clues that will help in designing a weed management program for next year. Mapping weedy spots, and keeping some kind of permanent record of weed surveys, can help you evaluate your weed management over the years. Make a map of each field and fill in the following information:

How dense are the weeds? If weeds are very dense, they may be having an impact on yields. This is especially true if these weeds emerged early in the season. If weeds were actively growing during the period of greatest crop growth, consider changing the weed management program.

Which Weeds? Identifying weeds can help identify potential problems before they get out of hand, and can help you decide if you need to modify your weed control program. Weeds like yellow nutsedge, field bindweed, and quackgrass are spreading perennials, which have underground parts that enable them to spread throughout whole fields. Because these weeds can be very damaging, and are very difficult to control, they are worth "nipping in the bud". In addition, keep an eye out for annual weeds that are new to a field or are increasing in numbers. With current herbicide registrations, certain weeds can be very difficult to control in some or all of the crops in your rotation. Galinsoga, for example, is hard to control in cole crops, greens, peppers, and squash. Nightshades are difficult to control in tomatoes because they are in the same family as tomatoes. Grasses are hard to control in sweet corn.

What worked? It is also useful to look at the whole field and evaluate the effectiveness of your weed control efforts. If some weeds are generally escaping, identify them. They may point to weaknesses in your herbicide or cultivation program. If mostly grasses, or mostly broadleaves are escaping, it may require an adjustment of either the rates or the timing of grass or broadleaf herbicides. You may also find the New England Vegetable

Management Guide useful. This manual contains a chart listing the effectiveness of vegetable herbicides on most of the common weeds in New England. Use this guide to find an herbicide labeled for your crop that might give better control than the one which was used.

Where are the weeds? Weeds in the rows or planting holes are much more damaging to crop yields than between-row weeds. Weeds in rows may be an indication that cultivation equipment needs adjustment, or cultivation needs to be done earlier.

Preventing Weed Seed Production

Annual weeds produce incredible amounts of seeds. Annual grasses normally produce 3000 to 5000 seeds per plant, small seeded annual weeds such as pigweed and lambsquarters can produce 100,000 to 250,000 seeds per plant, and larger-seeded broadleaf weeds such as velvetleaf and smartweed can produce 5,000 or more seeds per plant. Perennial weeds can also produce seeds or other reproductive structures. For example, one yellow nutsedge plant can produce 2000 tubers. Perennial weed management is covered below.

Once fields are harvested, they should be tilled or disked as soon as possible to prevent seeds from maturing. Be especially concerned with weeds that are new to a field or are in abundant supply. If time is short, one alternative is to mow the weeds. This will remove the primary seed stalk but will also encourage lateral branching. Eventually, however, these branches will produce seeds and must be destroyed.

Perennial weed management

The best time to control perennial weeds is in the Fall. All perennial weeds have storage structures (tap roots, tubers, or rhizomes) below ground that enable these plants to survive the winter and regenerate themselves the following year. Fall tillage of perennial weeds will kill top growth and fragment the storage organs but will not kill the weed. Frequent tillage will, over a long period of time, control perennial weeds but, in most cases, this is not practical.

Perhaps the best control technique for perennial weeds is an application of glyphosate (Roundup) before the plant goes dormant. Perennial broadleaf weeds such as bindweed or dandelion should be sprayed while they are still actively growing which is usually before a hard frost. Perennial grasses, such as quackgrass, can be sprayed as late as mid-November. Use 10 to 20 gallons of water per acre when spraying Roundup. Two quarts of the herbicide will provide much better control in 10 gallons of water per acre than in 40 gallons of water per acre. Spraying on a mild afternoon following a cold or cool morning is best, to encourage translocation of the herbicide to the below-ground storage structures. Disking or tilling two weeks after application will also improve control of the weeds.

Many growers fight perennial weeds such as quackgrass in corn fields year after year because their primary goal in the Fall is to plant a cover crop. This is usually followed by a Spring application of Roundup which provides top kill but does not kill the whole weed. Applying Roundup at the proper time is the only way to achieve good control. Delaying the seeding of a cover crop may be a necessary evil in the fight against perennial weeds.

In conclusion remember to scout and map your fields, prevent weed seed production, and apply Roundup at the right time to control perennial weeds.

--Rich Bonanno, UMass Extension Weed Specialist

BRASSICAS: FALL INSECTS AND DISEASES

Fall with cooler temperatures and shorter days is the time when fall Brassica crops tend to look terrific. Fall is the easiest time to grow high quality broccoli. Flea beetles seem to evaporate (though they can still be found in some fields as of mid September this year), as they depart the field for overwintering sites in the border. Caterpillars grow slowly, so that as long as you don't ignore them completely, they are easy to control. However, its worth keeping a close eye on these crops, especially by looking underneath the leaves. As usual, that is where you will be able to notice problems early, and avoid having them sneak up on you.

Alternaria Leaf Spot (ALS) seems to be widespread this season. Desptie the long dry spell, it seems to have been encouraged by the heavy dews that kept leaves wet for long periods. At least three species of Alternaria can cause serious losses in cruciferous crops. It occurs on many Brassica crops, including Brassica oleracea types (eg broccoli, cabbage, collard) and Brassica rapa types (eg, bok choi, tatsoi, komatsuna) (see photos). These pathogens may be seed-borne, both as spores on the seed surface and as mycelium within the seed. However, the major source of inoculum is crop debris in soil.

Symptoms of ALS are circular, small, dark spots with concentric rings (target spots) on the upper surface of leaf. Older leaves

are more susceptible to infection. When humidity is high, lesions can be covered with a sooty black mass of spores. The pathogen sporulates abundantly on foliar lesions and centers may fall out to give a 'shot-hole' appearance. Lesions can grow together leading to large necrotic areas and early leaf drop. Symptoms on cauliflower and broccoli heads begin as browning at the margins of individual flowers. ALS requires leaf wetness for 16 hours to initiate infection and at least 12 hours of continuous humidity at >90% RH to develop. Note that if ALS does not have the required amount of leaf wetness, it will appear as tiny black "sooty"

dots (not as the characteristic target-spot lesions).

ALS can cause economical loss in storage if infection spreads into the upper frame leaves or head due to additional trim loss, the production of ethylene, and invasion by secondary fungi and bacteria. Fungicides are most effective if applied before disease gets established. Bravo, Amistar, Quadris and Maneb are control options.

Because inoculum carries over in crop residue, crop debris should be destroyed as soon as possible after harvest and a minimum 3- year rotation out of crucifers should be used. For rotation to be effective, cruciferous weeds need to be controlled during the rotational period. Buy seed from a reputable source or treat with hot water to eliminate Alternaria from seed. Eliminate cull piles. Avoid overhead irrigation during head development.

Powdery mildew of Brassicas. This disease is unusual in the US, but is reported to occur regularly in England, southern Ontario, among other locations, especially on rutabagas and turnips. Two occurrences, both from eastern Massachusetts, have come to our attention this week – one on collard, one on Lacinato and red Russian kale. Brussels sprouts, kale, Chinese cabbage, collards, broccoli, mustard and cauliflower are also reported to be hosts. Just as you would expect, the symptoms are white talcum-like growth on the upper leaf surface, starting as circular patches and expanding to cover the leaf. Leaves become pale green to yellow or tan, or if severely infected, curl and die. The plant is rarely killed, but growth can be stunted or defoliated, and of course is the leaves are sold, the disease would render them unmarketable. Note that this is a different species of powdery mildew than those that infect cucurbits, or tomato, or various ornamental crops.

Conditions that favor this disease seem to be low relative humidity with cool temperatures, water stress of the crop, and the availability of a thin film of moisture in which spores can germinate. The white powdery growth includes mycelium and spores (conidia), which can be dispersed quite long distances by wind. Spores overwinter "with difficulty"; however, survival of the fungus is better when live plant material carries over through the winter, which enables the fungus to produce new spores in the spring. It seems possible that one reason that we are seeing some occurrence of this disease is the milder winter last year, which allowed survival of brassicas, and also that more growers are overwintering Brassica plants through protection with row covers. If you see this in fall, don't ovewinter those Brassicas!

Fungicides which are labeled for fungal diseases of Brassicas, especially those which also work against powdery mildew in other crops, should provide control of the disease. Apply at first indication of disease. Put crop residue under as soon as possible after harvest, control Brassica weeds which could also harbor the disease.

Downy mildew of crucifers. This disease, caused by the fungus *Peronospora parasitca*, should not be confused with downy mildew of cucurbits (caused by *Pseudoperonosproa cubensis*), which is related but does not infect brassica crops. Downy mildews tend to be specific to a certain plant family or even species within a plant family. They are in the same group of fungi (Oomycetes or 'water molds') that cause late blight of potato and tomato and blue mold of tobacco.

Downy mildew is an important disease of broccoli, collards, kale, cabbage, cauliflower and Brussels sprouts. It can also infect rutabaga, turnip and radish. It is encouraged by cool, moist conditions (from rain, heavy dew or fog), which are more typical in late August, September and October in our region. Infection can occur at any stage of growth. Severe infections can kill seedlings, but stem, leaf and flower/head infections can cause crop injury and loss at later stages.

The most distinctive symptom is grayish white, fluffy growth on the undersides of leaves. Irregular, angular yellow to brown spots develop on both top and bottom of the leaf. 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. Secondary infection with soft rot bacteria (always smelly!) may follow the downy mildew. In cabbage, systemic invasion of the stem may occur after infection of the lower leaves. The fungus may then invade the head leaves and sporulate after the cabbage has been stored.

The fungus survives from season to season as thick-walled resting spores, called Oospores. These sexual spores can survive in the soil for extended periods and produce sporangia when conditions are moist and cool, especially at night. Disease development is favored by abundant moisture on leaves provided by dew, drizzling rain, or heavy fog. Sporulation, germination, and reinfection can occur in four to five days. The fungus may also survive in a latent state within systemically infected plants. Oospores and mycelium can be carried in and upon seed. Sporangia are carried on air currents and on wind-blown rain and when conditions are right, will germinate on leaves and produce new infections.

Cultural controls for downy mildew: Rotation out of brassicas for at least two years; removal of crop residues which contain Oospores (may not be practical!); adequate crop spacing to encourage drying of leaves. Control in the seed-bed is very important and includes the use of clean growing medium, good

drainage, and an avoidance of overhead irrigation. Resistant or tolerant varieties of broccoli have been developed; our sources list Marathon and Arcadia among these.

Fungicides for downy mildew include Prophyt, Alliette, Ridomil or Ridomil/Bravo. Preventive spraying of protectant foliar fungicides may be necessary if environmental conditions favor disease development.

Phoma leaf spot and stem canker (Blackleg) caused by *Phoma lingam* has been observed on broccoli in one field this year. Blackleg attacks 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. Though it is favored by wet conditions, it was widespread in a dry, sandy field. It may have spread on seedlings in the greenhouse.

Plants can become infected at the seedling stage or at any stage in the field. The initial source is probably infected seed. The disease has become less important in cruciferous crops because of successful disease management strategies in seed production. Once present on the farm, management should focus on avoiding spread of the disease, and rotating out of the infected field for four years to eliminate the inoculum. Rogue diseased plants from seedbeds. Improve soil drainage and air circulation. Control cruciferous weeds. Incorporate crop debris promptly after harvest to hasten decay. Avoid working in the fields when wet.

Symptoms of the pathogen start as slight 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 can survive for up to four years in seed and three years in infected crop debris. The pathogen infects seedlings, forms pycnidia, and produces abundant amounts of spores which exude from the pycnidia in long coils and are splashed to nearby plants to initiate new infections. The disease is favored by wet, rainy weather. Start with seed certified as disease-free or treat seeds with hot water.

Chemical recommendations: For organic growers: potassium bicarbonate (Armicarb 100): 2.5 to 5.0 lb/100 gal (0 dh, REI 4h).Start application at the first sign of disease and continue at 7-14 day intervals while conditions remain favorable for disease development.

Non-pathogenic disorders of broccoli: Brown bead, heat injury, hollow stem of Broccoli. As part of the Brassica project, we are working to gain a better understanding of these disorders. Each can be caused by a combination of factors – heat stress during head initiation, excessive water especially after a dry period, excessive nitrogen, rapid growth during head formation, deficiency of boron, and cultivar susceptibility. Heat injury is most often manifest as unevenness of the crown and uneven bud size on the head, as well as small head size. Brown bead appears as heads

approach maturity and is usually associated with rapid growth during periods of high temperature followed by abundant rainfall. Floral buds turn tan or brown and become easily detached. These may then become infected with soft rot bacteria, Erwinia species. Boron deficiency, which shows up as hollow stem of broccoli or cauliflower, brown discoloration of turnip or rutabaga roots, or internal discoloration of cauliflower, can be more severe if plants are water stressed or pH is greater than 7. Adequate supplies of soil organic matter, consistent and adequate water levels in the soil, and supplemental boron applied before planting if boron levels are low can all help in avoiding these problems.

Cabbage aphid. Cabbage aphids tend to build up in fall Brassicas, and we have observed small colonies starting up in our fall broccoli plots. These are gray-green aphids with a waxy coating that makes them appear whitish gray. Colonies tend to form in younger, upper leaves, in cabbage heads, between cauliflower curds, or in long-season Brassicas such as Brussels sprouts. Numbers tend to build in the fall. Winged aphids arrive, and produce colonies of wingless nymphs that also reproduce. Large colonies can stunt plants or cause curled leaves, and will contaminate harvested parts.

Biocontrols (predators and parasites, and a fungal pathogen) often keep colonies under control; however, if numbers are building, insecticides may be needed. University of Connecticut recommends a threshold of 10% infested plants in cabbage, broc-

coli, cauliflower and Brussels sprouts after heads or sprouts begin to form.

There is a range of chemistries available among insecticides labeled for this pest: including pyrethroids and organophosphates, neonicotinoids (Provado), pymetorzine (Fulfill), and insecticidal soap (MPede). Note plant back limitations or limits on which Brassicas are allowed. Always uses a spreader sticker to obtain better coverage and more insecticide persistence. Insecticidal soaps are capable of reducing cabbage aphid and are relatively easy on natural enemies. Soaps (eg MPede) are quite effective as long as the material contacts the pest at the time of application, but they have no residual activity once they have dried. Ensure good coverage of the undersides of leaves. Several applications may be needed.

Cabbage root maggot can cause root injury in fall turnips and rutabagas. Timing of controls is more difficult than in spring crops, and root crops are more sensitive to injury since the root is marketed. The adult fliees are active in early September, but the precise flight period is not well known and not easy to detect. The only labeled chemical control is Lorsban, which may be directed to the base of the plant and has a 30 days to harvest interval. Non-chemical controls are in short supply. In 2005, two growers in the UMass Brassica Project evaluated row cover to exclude maggot flies from fall root crops and found the cover reduced yield (and enhanced aphids).

-R Hazzard, Bess Dicklow, A. Cavanagh, UMass Extension

ONIONS: HARVEST AND CURING TIPS FOR BEST QUALITY:

Editor's Note: the following article from CCE talks about the technology used by large-scale onion growers, but the crop needs are the same on small farms – except that growers often have to improvise to achieve the best conditions. A relative humidity sensor and maximum-minimum thermometer would be useful tools for growers aiming for good curing and long term storage of onions or other root crops.

Harvest Tips for Best Quality

1) Be sure onions are well dried and necks tight (i.e. the tissue does not slide when you roll your neck between your fingers) before harvesting/topping. Bacterial diseases and Botrytis Neck rot can move through green tissue into the bulbs. These diseases do not move in dry tissue.

2) Leave 2-3 inches of neck on the bulb. This increases the distance from the cut surface to the bulb for these pathogens to travel.

3) Minimize mechanical injury during harvesting by adjusting the chain speed to make sure the chain is always full. This will help reduce rolling and bumping of the bulbs. Reduce drops to 6" and pad sharp surfaces. Bruises provide direct entry points for diseases to get started.

4) Grade out damaged onions before putting them into storage. Damaged bulbs give off moisture, which is favorable for development of diseases in storage.

Curing Onions for Maximum Quality: Temperature

Quick curing can be done with outside air, which is heated to approximately 77ºF. Higher temperatures, up to 90ºF can be used if onions are of high quality with several layers of good skins. Higher temperatures are favorable for development of bacterial diseases. Black mold is more likely to develop when temperatures exceed 82ºF. A lower temperature, down to 68ºF should be used if onions are poorly skinned or if they have been touched by frost. Best skin color develops at 75-90ºF. **Relative humidity** - should not fall below 65% or exceed 80%. RH going into the boxes should ideally be 50%. **Airflow** - should be no less than 3 cubic feet per minute per cubic foot of product. Be aware that when bulb size is down, air circulation through the boxes is reduced (onions pack tighter with smaller air spaces in between). An empty bushel crate can be placed into the onion boxes while filling to increase air circulation. **Dryer Volume** - the wetter/greener the onions going into a dryer, the fewer should be put into it. Stack no more than 3 boxes away from the plenum. Check Conditions – RH and temperature of the air going into and out of the boxes should be monitored and adjustments made accordingly. Check air flow. Air will take the path of least resistance. Use a smoke test to show you where and how the air is moving.

--September 7, 2005 PestMinder 12.19 1, A publication of the Cornell Cooperative Extension Vegetable Program

Corn Report

Sweet corn harvest is almost completed in New England. Harvest will continue for another two weeks or so. Rust caused by the fungus, *Puccinia sorghi,* is still showing up in many late season corn fields this year (see last weeks article for more information about common rust of sweet corn). Insect pressure is down for the most part except for a few locations in the Connecticut Valley.

For sweet corn that you expect to pick in late September or October, spray schedules can be extended. European corn borer flight has ended in most places. In previous yearsd captures of either strain has increased which may indicate that a third flight has occured. Pepper growers should be able to stop any further ECB sprays now, if they have not already done so. Corn earworm is down but a 5 day schedule would be recommended where captures are over 7 moths per week. It is possible that any late seson storms will bring a new flush of corn earworm, which could be a concern especially for growers near the coast, who have corn that is still in fresh silk. Get rye cover down as soon as possible after harvest to take up nitrogen and store it for next year's crop.

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