UMass Extension
Vegetable Notes
For Vegetable Farmers in Massachusetts since 1975

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In this issue:

Zucchini is nearing harvest on a farm in Southeastern MA.

Crop conditions

May was a month of record breaking weather in much of New England. The Northeast Climate Center reports that it was the warmest May on record for monitoring sites in NY, VT, NH, CT, and PA, and also the driest May on record in Worcester, MA, with 15 other NECC weather stations reporting below-normal precipitation and some areas experiencing moderate drought by the end of the month. Meanwhile, Rhode Island reports cool temperatures, even down to 33F this week, and relatively normal (104%) precipitation. Despite the mostly warmer than usual temps, a few light frosts nipped tender foliage of early succession tomatoes under row covers. The rain that finally came earlier this week was much needed, but with such parched soil, some areas experienced runoff and soil erosion where hydrophobic soil could not absorb the moisture. Across MA, most farms received 2-2.5 inches of rain in that storm, which also brought cooler temperatures. Damage from root maggots and leafminers is reported to be severe across the state this season, so if you are struggling with these pests you are not alone. New pests observed this past week include European corn borer, onion thrips, striped cuke beetles, and Colorado potato beetles, among others, so it's time to start walking the fields and scouting for pests to take a preventive approach. Nonetheless, strawberry harvest is ramping up, greenhouse tomatoes are starting to ripen, and summer squash and zucchini are fast approaching maturity. Salad greens, spinach and chard, transplanted beets, and radishes are being harvested for sale at farm stands and markets across MA, and covers are coming off many crops.

After 26 years of service, Ruth Hazzard is retiring from the Vegetable Program this month. She is a dedicated and expert educator, a great friend to the farming community of New England, and she will be greatly missed. Please join us for a retirement party at the UMass Cold Spring Orchard on June 29th! See News and Events for more details. As we jump full swing into the season we will begin publishing Veg Notes weekly, and wanted to take this opportunity to thank those of you who donated to our Veg Notes Fundraising Campaign, and to our farm and corporate sponsors (see back page). We are grateful for your support. Here's to a great season!

Pest alerts

Vegetable scouting sheets can be found on the UMass Extension Vegetable Program website. When not given here, refer to the New England Vegetable Management Guide for scouting thresholds and treatment options.

Alliums: Onion thrips: Found while scouting in Chittenden Co., VT and Hampshire Co. and Bristol Co., MA, though populations were below threshold at all sites. Higher numbers of thrips were found in onions on bare ground compared to those on plastic. This means that thrips are active; so, time to get out and scout for this pest! Treat if thrips reach 1 per leaf. Onion maggot: We are now past peak flight, and yellow sticky cards in scouted fields are capturing <10 adult flies per card over 2 weeks. If adults were present in your field, eggs will be hatching now so start looking for signs of damage

Cabbage root maggot damage in Hampshire Co. MA, Photo: K. Campbell-Nelson

from larval feeding such as wilting.

Basil downy mildew has been found on mail order plants in CT and VA coming from a large, internet-based plant retailer. These plants are now "out of stock" and are no longer being distributed, however, inoculum may now be in your area.

Brassicas: Cabbage root maggot: Maggots are active throughout MA, and eggs and maggots are present in Washington Co., RI. While cabbage root maggot has been very active in most of MA, none were found in an untreated field in Plymouth Co., MA. Poor efficacy has been reported with Lorsban and Verimark, perhaps because dry weather prevented these materials from getting to the root zone where they are needed. The first generation of this pest is now complete and pupae are forming in some fields. **Flea beetle** is continuing to cause significant damage to establishing brassicas (even waxy leafed varieties) in Franklin Co., MA, Washington Co., RI and locations in ME. Treat if feeding is impacting marketable yields. **Imported cabbage worm**: Found above threshold in Plymouth Co., MA (over 40% infestation). This is an early emergence for this pest. Scout now.

Table 1. Accumulated Growing Degree Days (F): Jan 1 to Jun 2, 2015

Location	Base 50F (10C)
Pittsfield, MA	366.3
S. Deerfield, MA	441.3
Northboro, MA	459.1
Dracut, MA	438.9
Boston, MA	455.4
Sharon, MA	450.6
Seekonk, MA	431
Burlington, VT	467.4
Middletown, RI	366.3

Corn: European corn borer: Based on the accumulated growing degree days (Table 1), European Corn Borer (ECB) has emerged, and egg laying has begun in some locations. **Where egg laying has begun, it is time to release *Trichogramma ostriniae* for biological control!** Timing is key for effectiveness; once eggs are hatched it's too late! Both the New York (EII) and Iowa (Z1) strains are now being captured. Adult moths have been captured in three locations in MA and NH (Table 4); trapping locations in VT and RI will begin reporting on ECB flight next week. For growers using row cover, track peak flight to determine when it is safe to remove them. Scout emerging tassels for the presence of ECB larvae by inspecting the tassels of 50 to 100 plants, in groups of 5 to 20 plants, throughout the field. Treat if more than 15% of the plants have one or more larvae present. If you have early corn in silk now, this corn will attract the most egg-laying, but treatment decisions should not be based on scouting. ECB will lay eggs at the base of the ear and emerging larvae will bore directly into ears. Therefore, if you have silk now and GDDs indicate that ECB is laying eggs (~450 GDD), one or two insecticide applications can be effective for controlling ECB on this advanced corn. Egg hatch is predicted to occur at 550 GDD.

Table 2. European Corn Borer trap captures. Week of 5/26-6/2/15.

Location	Weekly ECB reported
Western MA	
Hadley	5
South Deerfield	5
Whately	9
New Hampshire	
Litchfield	9
Hollis	0
Mason	0

Cucurbits: Striped cucumber beetle: Cucumber beetles were reported above threshold of 1 beetle per 2 plants in a high tunnel in Hampshire Co., MA, and in a field in Washington Co., RI. One striped cucumber beetle observed in Bristol Co., MA. See more information in article this issue. **Squash vine borer** flight is expected in parts of MA and NH; time to put out heliothis traps in summer squash, zucchini, or pumpkin fields to monitor this pest on your farm.

Spinach crown mite damage. Photo: A. Radin

Solanaceous: Colorado potato beetle:
Adults, eggs and small larvae were observed in Washington Co., RI this week, where they were above threshold: 56% of observed plants had adult CPB, 60% of plants had egg masses, and 26% had small larvae. However, a scout in Plymouth Co., MA did not find any CPB present in an untreated field. Thresholds are (per plant, or stalk once plants reach 12"): 0.5 Adult, 4 small larvae, or 1.5 large larvae. Keep an eye out for CPB as they emerge! **Botrytis gray mold** on greenhouse tomatoes was reported in Washington Co., RI this week, after rains and cooler temperatures. The tomatoes were spaced very close, with two leaders. Removing lower leaves up to the first fruit cluster is recommended to increase airflow.**Spinach crown mites:** Identified in field spinach in Washington Co., RI causing pinched leaves and deformed crowns. Control recom-

mendations include fallow periods until soil organic matter decomposes, crop rotation, and chemical control using bifenthrin and pyrethrin. Chemicals must be applied before damage appears; efficacy is not well documented.

Spinach leafminer damage.

Multiple Crops: Leaf miner maggots, like cabbage root maggots in brassicas, have been reported to be causing a lot of damage this year in spinach, chard, and beets. Damage has been reported in the following counties: Hampshire and Bristol Cos., MA, Chittenden Co., VT and Washington Co., RI. Scouting in Plymouth Co., MA, we found maggots in leaves of greenhouse chard but no egg masses or maggots in the field. Largely, the damage from the first generation is done and treatment is not effective once maggots are inside the leaves, though materials with some translaminar activity (spinosad, spinetoram) may have some effect on larvae inside the leaf cuticle. Use of an adjuvant may improve coverage and control.

STRIPED CUCUMBER BEETLE: FOCUS ON EARLY CONTROL

Striped cucumber beetle adults spend the winter in plant debris in field edges and with the onset of warm days move rapidly into the crop. High tunnel and greenhouse cucumbers draw beetles first, followed by early field crops. Densities can be very high, especially in non-rotated fields or close to last year's cucurbit crops. Adult feeding on cotyledons and young leaves can cause stand reduction, delayed plant growth, and reduced yield. Eggs are laid in soil near the stem, and a hidden but important impact of SCB is the larval root feeding, which reduces plant vigor and yield. The striped cucumber beetle also vectors *Erwinia tracheiphila,* the causal agent of bacterial wilt, and this can be more damaging than direct feeding injury. Focus on early, effective control to avoid yield impacts and to protect pollinators.

Cuke beetles in squash blossom.

Crop rotation, transplants, and floating row cover are cultural controls that help reduce the impact of cucumber beetles. Row covers provide growth benefit and insect protection, but need to be removed when flowering begins.

Perimeter trap cropping has been shown to reduce or eliminate main crop sprays while providing effective control of beetles. Plant 1 or 2 rows of Blue Hubbard, buttercup squash or another *Cucurbita maxima* variety in an unbroken perimeter around the field. Always use 2 rows near woods or last year's fields, and space plants no wider than the between-row spacing that is used in the main crop between-row spacing. These perimeter crops will concentrate incoming beetles in the border because they are generally more attractive to beetles than winter squash, summer squash and pumpkin, which are *Cucurbita moschata* or *Cucurbita pepo* types. Note that some specialty pumpkin varieties are *Cucurbita maxima* types and very attractive to beetles. Do not use a crop that is highly susceptible to bacterial wilt (e.g. Turks' Turban) in the border. Beetles should be killed in the border, either by applying foliar insecticide when beetles first arrive or using a systemic insecticide at planting. Scout both borders and main crop to assess beetle numbers. Repeat perimeter-sprays if needed to prevent influx into the main crop, and spray the main field if thresholds are exceeded. Attractive crop types that are planted in rows within the main field also work as trap crops that draw beetles as they move around within the field. These trap crops can be selectively sprayed.

Thresholds and foliar controls. Cucurbit plants at the cotyledon and 1-2 leaf stage are more susceptible to infection with bacterial wilt than older plants. Thus, it is especially important to keep beetle numbers low before the 5-leaf stage. Scout frequently (at least twice per week up to emergence, and for two weeks after) and treat after beetles colonize the field. Scout at least 25 plants to monitor the number of beetles and damage. The economic threshold depends on the crop. To prevent bacterial wilt in highly susceptible crops such as cucumber, muskmelons, summer squash, and zucchini, we recommend that beetles should not be allowed to exceed one beetle for every 2 plants. Less wilt-susceptible crops (butternut, watermelon, most pumpkins) will tolerate 1 or two beetles per plant without yield losses. Spray within 24 hours after the threshold is reached. Proper timing is key.

Conventional foliar insecticides. There are a number of broad spectrum conventional insecticides which can be used for

foliar control, including carbamates, pyrethroids, and neonicotinoids. All are highly toxic to bees and should only be used before bloom. Avoid using neonicotinoid sprays (Actara (thiamethoxam) or Assail 30SG (acetameprid)) if systemics in the same class were used (see below) See the New England Vegetable Management Guide for more details.

Systemic insecticides. Two neonicotinoid products, imidacloprid (multiple trade names) and thiamethoxam (Platinum) are registered for use in cucurbits as an in-furrow, banded, drench, or drip irrigation application to the seed/seedling root zone during or after planting/transplanting operations. Note specific application methods and rates on label. Commercially-applied seed treatments (eg thiamethoxam, Farmore) are also available for early season control.

Organic insecticides. Kaolin clay (Surround WP), pyrethrin (Pyganic Crop Spray 5.0 EC), and Azera (mixture of pyrethrin and azadiractin) are labeled for SCB in cucurbits and can be tank mixed with an additive effect. Surround should be applied before beetles arrive because it acts as a repellent and protectant and is not a contact poison. With direct-seeded crops, apply as soon as seedlings emerge if beetles are active. Transplants can be sprayed before setting out in the field. As with other insecticides, it must be re-applied after heavy rain and on new growth. Pyganic provides a short term knockdown with no residual effect. Spinosad (Entrust) is labeled for the cucurbit crop group, though not for SCB.

Reducing risk to pollinators: The New England Vegetable Management Guide describes many steps that growers can take to protect honeybees and native pollinators when using insecticides. The issue of neonicotinoids, in particular, has received a great deal of attention in recent years. This is a group of insecticides that have a chemical structure very similar to nicotine. They have been widely used in agriculture because they are effective against a wide range of insects, have lower mammalian toxicity compared to older classes of insecticides, and because they can be absorbed by roots and moved through the entire plant. This trait allows for applications to be made to soil or on seeds, with less exposure to humans and to natural enemies of insect pests. Neonicotinoids are highly toxic to bees, and label requirements prohibit use on blooming crops or where there are blooming weeds or borders. Additional concern about impact on bees arises because research has shown that detectable, low concentrations of neonicontinoids can move into pollen or nectar. These are present at sublethal concentrations, but may affect the foraging behavior of bees or suppress their immune system. The long-term or colony effects are difficult to assess in the field, because bees from each colony travel long distances and forage in many different habitats and types of plants. In cucurbits, both native bees (e.g. squash bees and bumblebees) and honeybees visit flowers to gather both pollen and nectar, and are essential to crop pollination. Research in cucurbits has shown that sublethal concentrations may be found in pollen or nectar. Higher levels were found after foliar applied treatments and chemigated insecticides were applied through drip irrigation during flowering. Lower levels were detected in treatment regimes that involved a single application at planting via seed treatment, drench applied to transplants trays, or transplant water treatment. Thus growers should avoid high rates and multiple applications, especially through trickle irrigation as the crop approaches flowering.

Beekeepers in Europe and North American have faced some difficult problems in the last 10 years, including a parasite of bees called the Varroa mite and Colony Collapse Disorder—a disorder in which bees disappear over a short period of time. Extensive research on Colony Collapse Disorder suggests that the most important causes of this syndrome are a combination of several bee diseases with other stresses. At this time, insecticide use is not considered to be a direct cause of Colony Collapse Disorder.

-R Hazzard. Sources include Protecting Pollinators in the Yard and Garden, David Smitley, Professor of Entomology, Michigan State University, April 3, 2014 and G. Dively & A. Kamel, Insecticide Residues in Pollen and Nectar of a Cucurbit Crop and Their Potential Exposure to Pollinators, J. or Agr. And food Chemistry. 2012.

NITROGEN MANAGEMENT WITH A PRE-SIDEDRESS SOIL NITROGEN TEST

Sandy soils low in organic matter can leach nitrogen quickly with spring rains. On the other hand, fields high in organic matter, in particular slowly decomposing organic matter may tie up nitrogen to aid in the decomposition of residual plant material in newly plowed fields with high amounts of sod or a cover crop and may be competing with your vegetable crops for nitrogen they need in these early stages of growth. In a dry spring such as this one, pre-plant fertilizers may not have been taken up by plants, and may still be present in the soil unless fields have been irrigated. Routine soil tests are not good predictors of nitrogen (N) availability because plant available N fluctuates greatly throughout the season. Perhaps you have already considered this possibility and taken a Pre-sidress Nitrogen Test (PSNT) to determine whether or

not your crop should receive any additional nitrogen to improve growth. Many vegetable crops rapidly take up nitrogen in the middle stages of their growth, and a PSNT can tell you if you have enough nitrogen available. Consult Table 1 for suggested crop stages on when to take a PSNT sample. Sampling instructions can be found at the UMass Soil Testing Lab website: https://soiltest.umass.edu/sites/soiltest.umass.edu/files/forms/soil/PSNT_030314.pdf. The UMass Soil Testing Lab is currently backed up, so plan ahead and get your PSNT in ahead of when you need to sidedress, or use the table as a guide to determine sidedressing needs if you did not apply all of your N up front.

Table 1. Suggested times for soil sampling vegetable crops to conduct PSNT and Sidedress Nitrogen needs of crops

Crop	Soil sampling time for PSNT	Sidedress N in Lbs/A[y]
Sweet corn	When plants are 6-10" tall	**60-90**
Cabbage Cauliflower Broccoli Brusselsprouts	2 weeks after transplanting	cabbage, broccoli, brusselsprouts: **60** cauliflower: **30**
Celery	2 weeks after transplanting. Sample again in 3-4 weeks later.	**40** twice 3-4 weeks apart
Lettuce Endive Escarole	2 weeks after transplanting or after thinning (2-4 leaves)	**30-50**
Beets	After thinning (2-4 leaves)	**30**
Pumpkin Winter Squash Cucumber Muskmelon	Before vines are 6" long	pumpkin and winter squash: **40-50** cucumber and melon: **40**
Spinach	2- 4 leaves. Sample again after first cutting.	**30**
Potato	Before plants are 6" tall	**40-60**[z]
Pepper Tomato Eggplant	3-4 weeks after planting. Sample again 3-4 weeks later.	pepper: **50**, and **40** later at fruit set tomato: **30** twice 3-4 weeks apart eggplant: **30-50**

[y] If soils have 0-25 ppm nitrate, apply the full sidedress amount recommended by the New England Vegetable Management Guide. For crops other than sweet corn, at 25-30 ppm nitrate you can cut the sidedress rate in half. Above 30 ppm no additional N is needed and could hurt yields.

[z] Potatoes also need 50-125lbs/A Potassium depending on soil test results.

Adapted from: Rutgers Cooperative Extension Bulletin by J. Heckman, "Soil Nitrate Testing as a Guide to Nitrogen Management for Vegetable Crops" and The New England Vegetable Management Guide.

Having received your PSNT test results, you are now left with questions about how much N to apply and in what form.

Interpreting PSNT results: The PSNT measures the current level of nitrate-N in the soil to predict the amount of N available for the remaining period of crop growth. The test helps growers avoid the use of excess nitrogen fertilizers, thus eliminating potential run-off and providing higher returns to labor and fertilizer investment. Broadcast and preplant nitrogen applications can be reduced or avoided entirely if nitrogen is supplied to plants at key periods of growth. The PSNT is useful in soils that are high in organic matter or have had a cover crop or manure turned under before planting, since microbes will be mineralizing organic nitrogen for use by plants throughout the season. If the PSNT level is low, additional N would be expected to increase yields and if the test levels are high, additional N would not increase yields. This test has been used successfully with corn, potatoes, peppers, cucurbits and some brassicas to predict sidedressing needs.

Research conducted by the Universities of Massachusetts and Connecticut indicates that an appropriate threshold for most vegetable crops is 30 ppm nitrate-N (NO_3-N) and 25ppm for sweet corn. Above this level, sidedressing or topdressing supplemental N would be of no value and may even decrease yields. As a tool, the PSNT should be used along with a grower's experience and knowl-

edge of their fields. For example, a field high in organic matter will continue to release nitrogen for crop growth throughout the season. Research indicates that for each 1% organic matter, we can expect 20 to 40 lb of N per acre per year to be mineralized when conditions are favorable. Reduce sidedressing amounts to reflect the nitrogen credit coming from organic matter. Interpretation of PSNT results should be made with regard to weather conditions such as recent leaching rains that reduce available N, or high soil temperatures that increase mineralization and therefore available N. Weather conditions should also be considered before making N applications to avoid runoff, leaching and volatilization.

How much should I sidedress based on PSNT results? If soils have 0-25 ppm nitrate, apply the full sidedress amount recommended by the New England Vegetable Management Guide for most vegetable crops except for sweetcorn. For the same crops, at 25-30 ppm nitrate you can cut the sidedress rate in half. Above 30 ppm no additional N is needed and could hurt yields. Consult Table 1 for sidedress rates of specific crops.

What form of nitrogen should I use? Nitrogen is available in a number of forms; consult pages 37-38 of the Nutrient Management Guide for New England Vegetable Production for nitrogen options for organic and non-organic growers. Common sources of fertilizer N include urea, ammonium nitrate, monoammonium phosphate, diammonium phosphate, calcium nitrate and potassium nitrate. Sulphur-coated urea is a material which releases N more slowly over a period of several weeks. In the soil, urea is converted by hydrolysis to ammonium, which in turn is converted through nitrification to nitrate. This process slightly acidifies soil as hydrogen is released from ammonium (NH_4) as it converts to Nitrate (NO_3). In warm soils these reactions usually happen fairly quickly if soil pH is over 6.0 and soil moisture and aeration are adequate. For organic growers options include: manure, meals and emulsions, or animal byproducts such as dried blood and feather meal. Not all of these forms are readily available to the crop, and selecting rapidly available forms of nitrogen may be preferable for sidedressing. Nitrate is the predominant form of N taken up by most plants, but any of these fertilizers can be used because they will be converted to nitrate eventually. Many growers use calcium nitrate and sometimes potassium nitrate for topdressing or sidedressing N on crops subject to calcium related disorders. When a slow release form of urea is used, only a small amount of ammonium is present at a given time and is unlikely to cause a problem with calcium nutrition, but N may not be available quickly enough to meet the demands of a rapidly growing crop.

In summary: Nitrogen is easily leached from the soil. If this happens, money is wasted and ground water may be contaminated. Nitrogen applications should be timed to meet crop demands. Large pre-plant broadcast N applications should be avoided. A PSNT should be used to determine the need, if any, for additional N during the growing season. If needed, additional N can be applied by topdressing, sidedressing or injection into a trickle irrigation system.

- K. Campbell-Nelson, UMass Vegetable Extension with thanks to J. Howell, UMass Extension and Joseph R. Heckman, Ph.D., Extension Specialist in Soil Fertility, Rutgers

WATCH FOR THRIPS IN ONION

Onion thrips (*Thrips tabaci*) are being observed in onions across New England and although numbers are generally low, this is a good time to begin regular scouting for this pest. Hot and dry conditions favor rapid buildup of this pest, thus an end to our generally cool weather could allow numbers to build to damaging levels. This is the most important insect pest of onions, and onions are their preferred host crop.

The host range of onion thrips is wide, including many vegetable families, field crops such as alfalfa, wheat, oat and tobacco, weeds including amaranth, goldenrod, ragweed and sunflower, and ornamentals such as roses. Cabbage may be infested at any time in the season, but the most common thrips damage in brassicas in New England occurs later in the season on fall transplants. Succulent peas are sensitive to thrips feeding damage, and onion thrips can also cause damage in greenhouse tomato and cucumber.

Onion thrips are small, but can be seen with the naked eye, and appear as slender, yellow or briwn flecks moving across leaf at growing tip.

Identification and life cycle. Onion thrips are tiny, slender insects that range in color from translucent to yellow to brown and are only 1/16” in length.

They spend the winter as adults in crop remnants, alfalfa, wheat, greenhouses and weeds along the border of crop fields. Early spring reproduction can occur in field crops, especially wheat, before movement into onion. Adults insert eggs singly into plant tissue, adults and nymphs feed on leaves, and pupation occurs in the soil near the plant. Development time (base temperature of 52.7°F) is 140 GDD for egg, 180 GDD for larva (2 instars), and a total of 323 GDD for each generation. At summer temperatures, a generation can be completed in 2-3 weeks. Thrips have rasping mouth parts which they use to tear open plant cells to feed on plant juices.

Damage. In onions, damage is caused by adults and nymphs piercing cells and removing cell contents along leaf blades. Symptoms are irregular, blotchy whitening of the leaves (known as 'blast'), and if feeding is heavy, leaf curling or twisting and overall stunting of plant growth can occur. The result is reduced bulb size and lower overall yields, or if severe enough, plant death. Feeding that occurs during bulb formation and rapid bulb expansion has the most effect on yield. Scallions are particularly sensitive because the whole plant is marketed. In addition to direct injury, thrips also vector the iris yellow spot virus which affects many allium crops, and allow entry of bacterial and fungal pathogens such as purple blotch (*Alternaria porri*).

Monitoring. Scout plants along field margins where infestations build early, as well as checking across the field. Scout weekly to determine if populations are increasing. Look closely between the leaf blades, especially in the center of the plant around the growing tip, to find the light yellow nymphs or darker adults. Though tiny, you can see the slender, yellow nymphs moving about on the leaf when the leaves are parted. Count number per plant and note number of leaves per plant to determine if thresholds are reached. The number that constitutes an economic threshold varies with the stage of plant growth, efficacy of insecticide to be used, water availability, and health of the plants. A widely used threshold is 1-3 thrips per leaf or 30 per mature plant.

Cultural practices can reduce thrips numbers by delaying or inhibiting their establishment in the crop, or by reducing survival. These include:

-Incorporate or remove crop residue at the end of the season.

-Rotate into fields where no alliums or brassicas were grown for the past 2 years.

- Avoid planting onions or cabbage near alfalfa, wheat or clover; thrips may migrate to onions when these crops reach maturity or are cut and harvested.

- Avoid importing plants or sets from other farms or regions, or using last year's onions for sets.

- Maintain sanitation and scout regularly in the greenhouse to avoid thrips on transplants.

- Use straw mulch, which has been shown to slow population buildup.

-Alternate onion rows with carrot rows, which has been shown to reduce thrips in onion

-Use reflective plastic mulch.

-Provide adequate water for onion growth: onions need consistent, adequate moisture, and dry soil conditions worsen the effects of feeding damage.

- Heavy rain or overhead irrigation can lower populations (but may increase risk of foliar disease).

- Use selective insecticides to conserve minute pirate and insidious flower bugs, which are the most effective predators, as well as other natural enemies.

Chemical Control: Thrips move from the protected growing tip up the leaves during the evening, so that's the best time to spray. Use moderate to high pressure, 100 gal water/A, and appropriate nozzle spacing to achieve the best possible coverage. Wetting agents or spreader-stickers are strongly recommended so that insecticides don't quickly wash off the waxy foliage. If repeat applications are needed, use a 7 to 10 day spray interval. Use a shorter interval in hot weather. Rotate between insecticide groups after 2 applications to help prevent resistance. Note that products labeled for thrips control are not exactly the same for onions and brassicas and dry bulb onions and fresh eating onions are often labeled differently. Always read the label carefully before applying any pesticide.

Conventional: neonicotinoids eg. Assail, Admire Pro (Group 4A); pyrethroids eg. Ammo 2.5EC, Delta Gold 1.5EC, Proaxis, Warrior, Mustang, and generic equivalents (Group 3A); spinosyn eg. Radiant (Group 5); carbamates eg. Lannate (Group 1A); cyantraniliprole eg. Exirel (Group 28); malathion (Group 1B); sodium tetraborohydrate decahydrate eg. Prev-AM (Group 25); pyriproxyfen eg. Esteem 0.86 EC (Group 7D); spirotetramat eg. Movento (Group 23).

OMRI-listed: *Chromobacterium subtsugae* eg. Grandevo; kaolin clay eg. Surround WP, pyrethrin eg. Pyganic 5.0 EC; petroleum oil eg. Suffoil X; spinosyn eg. Entrust SC (Group 5).

For detailed information on current chemical control recommendations, please see the 2014-2015 New England Vegetable Management Guide.

-UMass Extension Vegetable Program

DMI FUNGICIDES

The DMI (Demethylation Inhibitor) fungicides travel by several names. They are also sometimes referred to as SI or SBI (Sterol Biosynthesis Inhibitor) Class 1 fungicides. Triazoles are DMIs, but not all DMIs are triazoles. Regardless of name, the DMIs belong to FRAC group 3, the largest of the fungicide classes. The first product in this class, triadimefon (Bayleton), was produced by Bayer in 1973. Since then, this class has expanded to include 26 active ingredients.

The active ingredients in the DMI class may have slightly different mechanisms, but all of them work by inhibiting an enzyme necessary for the synthesis of ergosterol, a major component of cell membranes in fungi. Without ergosterol, fungi begin to display abnormal growth and soon die.

The DMIs have a broad range of activity and can be useful in the control of many different fungal diseases, in particular powdery mildews, rusts, and leaf spots. They are best used as a preventive or early infection treatment. The triazoles have no effect on spore germination or infection, but will inhibit fungal growth inside the plant and prevent spore formation, thereby preventing disease spread.

DMI fungicides penetrate the leaf cuticle and are taken up into the xylem. They travel via the xylem throughout the leaf, but are not necessarily transported from leaf to leaf, and so are considered to be locally systemic. Adequate spray coverage is therefore essential. The residual period is about 14 days, but since the fungicide may not travel far within the plant, any new growth that appears after an application will be unprotected. DMIs do not enter the phloem and so are not translocated into plant roots.

The single site activity of the DMIs puts them at risk for resistance development. Resistance has been documented in several pathogens, including those that cause sugar beet leaf spot, cucurbit powdery mildew, and apple scab. Resistance is quantitative, meaning that strains of a fungal species can have high, moderate, or low sensitivity to DMIs. Strains with different sensitivities may be present in the same population. The susceptibility of a population may also depend on the product and the rate used. Scouting is important. If it appears that low rates do not control a disease, a higher rate may be effective. If the higher rate is ineffective, a product with a different active ingredient may be effective. It may take some experimentation for a grower to learn what works best in his or her own fields.

It should be noted that DMIs can interfere with gibberellin synthesis in some plants and thereby have a growth regulation effect, resulting in shorter internodes and smaller leaves.

General guidelines to prevent resistance development:

Best used as a protectant: never use as a curative treatment. If disease is already active in the crop, use of these fungicides greatly increases the chance of resistance development.

Tank mix with fungicides of a different class, or use combination products. It is best to combine a DMI with a protectant (Frac Codes M 1-11) fungicide; that is, one that prevents spore germination and/ or infection.

Avoid repeated use of the same product to minimize the risk of resistance development.

Fine to medium droplet size (200-300µm) is generally best for application of fungicides.

Chemical controls should always be combined with physical, cultural, mechanical, and genetic management options.

Always adhere to label instructions: the label is the law.

Some products containing DMI fungicides labeled for use on vegetable crops in Massachusetts:

DMI Active Ingredient	Trade Name	Other Active Ingredient in Product (FRAC group)
difenoconazole	Inspire	none
	Quadris Top	azoxystrobin (11)
	Inspire Super, Inspire Plus	cyprodinil (9)
	Revus Top	mandipropamid (40)
myclobutanil	Rally, Nova	none
propiconazole	Tilt, Propimax	none
	Quilt	azoxystrobin (11)
triflumizole	Procure	none
tebuconazole	Luna Experience	fluopyram (7)

Source: New England Vegetable Management Guide (http://nevegetable.org)

-Angela Madeiras, UMass Extension

Ruth Hazzard, Vegetable Specialist of 26 years to retire

Invitation to an Open House Reception for Ruth Hazzard

To celebrate her retirement from UMass Extension

Monday June 29, 2015, 4-7 PM

UMass Cold Spring Orchard Research and Education Center, 391 Sabin St, Belchertown MA 01007

Hosted by her friends and colleagues at UMass Extension and the Stock-

Events

Managing Weeds and Cover Crops

When: Tuesday, June 9, 2015 from 5:00pm to 7:00pm

Where: Picadilly Farm, 264 South Parrish Road, Winchester, NH 03470

Join Jenny and Bruce Wooster of Picadilly Farm for a discussion on managing weeds and the implements they use for cultivating 20+ acres of organic vegetables. They will also demonstrate the use of a roller crimper on cover crops.

RSVP at http://nofanh.org/nofa-event/managing-weeds-and-cover-crops/ or by calling 603-224-5022.

Also on-hand will be:

- Carl Majewski and George Hamilton (UNH Cooperative Extension) to talk about the importance of cover crops and the potential for using cover crops in no-till vegetable production
- Andy Pressman (National Center for Appropriate Technology) to address cultivation strategies in organic vegetable systems;
- Amanda Littleton (Cheshire County Conservation District) to share information on equipment rental, including the roller crimper.

Farm Food Safety for Post-Harvest Handling and Small-Scale, Low-Cost Facility Design

When: Wednesday, June 17, 2015 from 2pm to 6pm

Where: Red Fire Farm, 184 Meadow Road, Montague MA 01351

Join Cornell Vegetable Program's Robert Hadad to learn how to design, build, and operate a small-scale, DIY post-harvest handling system! This great workshop will focus on the trifecta of good washing and handling—food safety, maintaining high quality and efficiency, and affordability for new and small growers.

To register, go to: https://www.surveymonkey.com/s/umassproducesafety

Contact Amanda Kinchla at amanda.kinchla@foodsci.umass.edu or 413.545.1017 for more info.

2015 NOFA Summer Conference

When: Friday, August 14 to Sunday, August 16, 2015

Where: UMass Amherst Campus

This year's main conference features 144 individual sessions with 27 different topic areas. Workshops address organic farming, gardening, land care, draft animals, homesteading, sustainability, nutrition, food politics, activism, and more. The theme for this year's Conference is "Healing the Climate, Healing Ourselves: Regeneration through Microbiology".

This year's conference will include sessions with UMass personnel:

- Amanda Brown, Director of the UMass Student Farm; Tour of the UMass Ag Learning Center
- Lisa McKeag, Extension Vegetable Program; Pest Scouting in the Field at Simple Gifts Farm
- Susan Scheufele, Extension Vegetable Program; Integrated Pest Management in Brassicas

Sponsors

We are very grateful to all those who contributed to our Veg Notes sponsorship campaign! Thanks to your support we raised $9,000 this year! A special thanks goes to Laura and Charlie Tangerini's CSA shareholders. We're also very grateful to our farmer and corporate sponsors listed below.

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Vegetable Notes. Ruth Hazzard, Katie Campbell-Nelson, Lisa McKeag, Susan Scheufele, co-editors.