UMass Extension

Vegetable Notes

For Vegetable Farmers in Massachusetts since 1975

Volume 27, Number 5 May 7, 2015

In this issue:

Crop Conditions

Prime spring planting weather is here throughout the state. Growers are catching up as the late, cold spring has transformed into summer-like heat. Beets planted 2 weeks ago were just popping this week due to the cold weather that held them back. Subsoiling is mostly complete now, and fields are being prepared for planting; in some places plastic is laid and transplants are going into them. The first successions of sweet corn, cabbage, beets, onions, leeks and carrots are in the ground, and germination rates are faster now that soils have warmed. However, with heat, sun and little rainfall, soils are also very dry in some places. Irrigation systems were put to work this week on asparagus and newly planted seeds and transplants. Greenhouses that were bursting are beginning to empty out as cool season transplants go out, and preparations for the earliest frost-sensitive transplants are underway. Greenhouse peppers and tomatoes are sizing up.

One grower's retrofitted spray nozzles for making drench applications on brassica and allium transplants affected by root maggots.

Fields planted with rye in September of last year are developing more biomass and doing well, however, several reports indicate that vetch did not survive the winter well. Some growers have seeded a spring cover crop such as oat and field pea, to make up for poor survival of winter covers, and some are trying the mustard 'Caliente' as an early season cover crop for suppression of soil pathogens and nematodes. Scout now for cabbage and onion root maggots since adult flies were caught on yellow sticky cards, and eggs were found in a Hadley field on Monday (see article this issue for management tips). If you are growing spinach, chard or beets, check undersides of leaves for leafminer eggs, both in the greenhouse and in the field. Now is the time to make sure you are prepared for scouting and monitoring for pests throughout the season. Make sure your traps are in good shape and you have enough pheromone if you are trapping for pests like corn earworm or squash vine borer. See our new factsheet on phermone trapping and scouting tools and tips here! Another good way to be prepared is to make sure you are signed up for any relevant pest alerts for all the different crops that you grow!

New Aerial Cover Crop Initiative through NRCS-EQIP Program

EQIP sign-up is continuous but the next ranking cut-off date is May 15th, so be sure to call or visit your County NRCS office in the next week! The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) has announced a new initiative to improve soil health on Massachusetts vegetable and livestock farms through the pre-harvest aerial seeding of cover crops that will protect the soil during the winter. Conservation practices such as cover crop, conservation crop rotation and reduced tillage improve a soil's organic matter content, water holding capacity, and resilience to climate change. In spite of the positive effects of these practices, many crop and livestock farmers find it difficult to harvest the main season crop and have enough growing degree days left in the season to establish a cover crop. Aerial cover crop seeding approximately four weeks prior to corn harvest should allow ample time for cover crop establishment.

Funding for the practice is available through the Environmental Quality Incentives Program (EQIP), which provides financial and technical assistance to agricultural producers and forest land owners to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, reduced soil erosion and sedimentation or improved or created wildlife habitat. Farmers who apply for this special funding will be competing only among other farmers seeking to improve soil health.

May 15th is the next EQIP cut-off date. All eligible and complete EQIP applications -- for any conservation practice available under EQIP -- received by that date will be evaluated and ranked for available funding. Applications – for the aerial cover crop initiative and all other eligible conservation practices – are accepted on a continuous basis and considered for funding in set ranking periods. If you're a farmer or forest land owner and are interested in EQIP, you're encouraged to call or stop by your local NRCS field office. A planner will discuss with you your vision for your land, the conservation planning process, and how to apply for financial assistance. "If you operate a farm or manage forest land and want to make improvements to your land, we can help, but don't wait for the next program cut-off date to be announced," said Christine Clarke, State Conservationist for NRCS in Massachusetts. "Folks should be aware that the entire process can take six to 12 months from initial request to implementation of their project. So, ask us for assistance as soon as you've identified a natural resource concern on your land." USDA Service Center locations are listed on-line at http://offices.usda.gov or in the phone book under Federal Government, U.S. Department of Agriculture. General program information is available on the NRCS Massachusetts website at www.ma.nrcs.usda.gov.

-By Diane Baedeker Petit, Public Affairs Officer, NRCS-MA

About Degree Days

UMass Extension Vegetable and Fruit programs work with the Network for Environment and Weather Applications (NEWA), a web-based weather and pest reporting and forecasting system, to provide growers with ready access to useful weather and pest data. The NEWA website was developed by the New York State Integrated Pest Management program at Cornell University and relies on a network of on-the-ground weather monitoring stations around the Northeast region. NEWA generates forecasts and alerts for insect and disease pests of both fruits and vegetables.

For each weather station, you can choose a range of output reports. One of the most useful is basic growing degree day (GDD) accumulation -- by day, month and season -- at various base temperatures. There is also a 'forecast' option that will tell you expected GDD's for the next seven days. This can help you to predict emergence of pests.

Degree days (DD) are, essentially, a mathematical way to calculate the accumulation of heating units over time. (Cooling units, i.e. chilling hours, can also be calculated, though this is not currently programmed into NEWA.) A brief description of DDs is available from the University of Illinois at http://ipm.illinois.edu/degreedays/calculation.html

Because DDs are a way of expressing heating units, entomologists, plant pathologists, horticulturists, and agronomists have utilized DD calculations to model the development (phenology) of arthropod pests, plant diseases, plants, crops, and weeds. For instance, we know that the best fit for explaining the development of ascospores of the apple scab fungus is using degree days calculated with a low cutoff temperature of 32°F. We also know that codling moth development does not progress below 50°F. This is also the case for most plants, thus DDs calculated with a base temperature (or low cutoff) of 50°F are commonly referred to as growing degree days, or GDDs. Each organism has a specific base or cutoff temperature for development, and in general, the rate of growth or development increases with temperature; until it reaches a maximum when growth slows or stops.

NEWA serves many agricultural and horticultural commodities. Several crop, pest, and disease phenology models are programmed into NEWA. Some rely solely on DD tables, some display results directly (DD accumulations are not apparent to the user), and some provide DD ranges when IPM decisions and interventions are needed (hanging traps, spray timings, etc.)

Table 1. Degree Days (DD) calculated in NEWA at http://newa.cornell.edu/index.php?page=degree-days and the insect phenology and disease models for which they were developed.

Base Temperature	Insect Phenology Model or Disease Development Model
14.3°C	brown marmorated stink bug
40°F (4°C)	cabbage maggot
0°C	apple scab
40°F	onion maggot
43°F	obliquebanded leafroller, spotted tentiform leafminer
45°F	oriental fruit moth
47.14°F	grape berry moth
48°F	alfalfa weevil
50°F	growing degree days (GDD), codling moth, plum curculio, apple maggot
55°F	fire blight shoot blight symptom development

Implementation of these models is guided by research and extension faculty at Cornell University, as well as extension educators in Cornell Cooperative Extension. NEWA also provides a platform for stakeholder input to improve model performance and webpage results. For example, if you are looking at the "Results" pages generated by the Apple Insect Models on NEWA, those screens are generated by accumulating temperature data for the location of interest, generating a DD value (using Baskerville-Emin calculations, see below), and then comparing that total against a lookup table of DD ranges and corresponding text messages that are used to populate the Pest Status, Pest Development, and Pest Management boxes on the screen.

There are several formulas that can be used to calculate degree days. Historically in NEWA, the simple Max-Min formula is what has been used for DD calculations. This formula can readily be calculated by hand and was also included in many of the Cornell Pest Management Guidelines. The Baskerville-Emin (BE) formula uses a sine wave algorithm and results in more precise DD calculations. This formula was implemented in NEWA in ~2006.

We chose to place the simple DD formula choices at the top of the drop-down selection list on the NEWA Degree Day Data webpage (http://newa.cornell.edu/index.php?page=degree-days) to reduce confusion among our long-time NEWA users. Those base degree options that use the BE DD formula are noted as "BE" in the name. Different insect and disease models that use DD accumulations may be based on data using either the simple DD formula or the BE DD formula. Also, values given in newsletters and alerts that publish degree day data may vary based not only upon which formula was used to calculate these values, but also which calculators – two calculators crunching an involved equation may come up with two slightly different answers as software programs can differ slightly in the way they handle rounding of decimal places, etc., which can create some differences in the mathematical answer.

Max and Min temperatures are collected during a 'defined' 24-hour period. Another area that introduces variability in DD accumulations is how the 24-hour period is defined. For some systems, the 24-hour day begins at midnight, and for some it ends at midnight. That is, in some systems midnight is 0:00, in some it is 24:00. In NEWA, midnight marks the beginning of the day and is tabulated as 0:00 in the Hourly Data pages. NEWA's 24-hour period runs from 12:00 AM (= 0:00) until 11:59 PM.

Data is collected for NEWA's database at the top of the hour. Therefore, some NEWA weather stations may miss the true Max and true Min temperature for a given day, because it might have occurred at 2:16 PM. Hence, this adds another source of variability. Consequently, NEWA's new weather stations with the IP100 ethernet interface (described at http://newa.cornell.edu/index.php?page=get-weather-station) will be programmed to collect the true daily Max and Min values.

Daylight savings time can be problematic. Essentially, an hour is lost and then gained in the annual time continuum. NEWA uses the same methodology as the National Weather Service (NWS) for dealing with this 23-hour-long day and 25-hour-long day during the year.

The NWS has Weather Observer sites reporting daily Max and Min temperatures. These sites collect data, once per day, at specified times, which can affect DD value calculations. Consider the time when you look at the values from your Max-Min thermometer and then clear them. If you look at these first thing in the morning and invariably at 5:00 AM, then you are collecting a true 24-hour Max and Min temperature for the period 6:00 AM until 5:00 AM the following day. If you collect this data in the afternoon, the 24-hour period range would be different. Over time, climatologists have found that "afternoon" observations typically accumulate more DD's than "morning" ones.

The bottom line - when comparing DD data, keep in mind the sources of variability in DD accumulations. And don't sweat the discrepancies you find too much; like they say, "you can measure it with a micrometer, but what's the sense if you have to cut it out with a hatchet?" Nothing is more accurate than looking outside and seeing if you have green tip or counting the insects in your traps. We certainly don't expect an adult codling moth to pop out on the dot at 489 DD43 from Jan 1, or plum curculio to stop immigrating into the orchard at 308 DD50 from petal fall; there are simply too many sources of variability (e.g., in whose data one is using, how it was collected, in how representative a site, and at what point in time, etc.) to make this level of tracking practical.

NEWA provides theoretical predictions and forecasts. The theoretical models predicting pest development or disease risk use the weather data collected (or forecasted) from the weather station location. These results should not be substituted for actual observations of plant growth stage, pest presence, and disease occurrence determined through scouting or insect pheromone traps.

-adapted from article in 2011 by Juliet Carroll, Senior Extension Associate, NYS Integrated Pest Management Program, Cornell University, jec3@cornell.edu

TIME TO SCOUT FOR CABBAGE AND ONION MAGGOT FLIES

Onions and brassicas grow well in the cool spring conditions, and need an early start to reach maturity at the desired time. However, this makes them vulnerable to the spring flight of onion and cabbage maggots, which can stunt or kill young plants as a result of root feeding. These flies also do well in the cool spring, and become active at lower temperatures (40°F) than most insects (50 or 55°F). Being aware of when adult maggot flight occurs and being proactive with preventative control measures are key to getting the crop through the May flight period. **Flight of cabbage maggot has begun across the state; adults were found on yellow sticky traps and eggs have been observed in cabbage transplants in the CT Valley.**

Onset of Spring Flight. Cumulative growing degree days and indicator plants can be used to pin-point activity of onion maggot fly (*Delia antiqua*) and cabbage maggot fly (*Delia radicum*) in your area. Each is likely to be found on or near their host crop – alliums for onion maggot, and brassicas for cabbage maggot. A good biological indicator of cabbage maggot flight is blooming of the common roadside weed, yellow rocket or wintercress (*Barbarea vulgaris*); good photos can be found at the online UMass Weed Herbarium. Onion maggot emerges slight later than cabbage maggot, while seedcorn maggot is active earlier.

Table 1. Accumulated Growing Degree Days and % Emergence as of 5/6/15 for Cabbage and Onion Root Maggot. Values based on NEWA Maggot models.

Location	Accumulated GDD (40° F)	Cabbage Maggot Emergence[y]	Onion Maggot Flight Peak[z]
South Deerfield, MA	309	8%	< 1st Peak
Ashfield, MA	281	0	< 1st Peak
Waltham, MA	357	24%	< 1st Peak
Seekonk, MA	381	31%	< 1st Peak
Middletown, RI	336	17%	< 1st Peak
Burlington, VT	319	12%	< 1st Peak

Adult emergence from overwintering pupa:
[y] Cabbage Root Maggot 1st emergence = 288 GDD, 25% = 366 GDD, 50% (Peak) = 452 GDD, 95% = 687 GDD
[z] Onion Root Maggot 50% emergence (Peak) = 700 GDD

The NEWA website, http://newa.cornell.

edu/, has onion and cabbage maggot models and will output both current and forecast growing degree days (GDD) for whatever weather station you select. Find cabbage or onion maggot under 'pest forecast' and select a station near your farm. The report indicates daily and cumulative GDD using the base temperature 40°F. **For example, South Deerfield reached the threshold for first emergence (288 GDD, base 40°F) on Tuesday May 5; because of the hot weather this week, by Wednesday we have reached 8% emergence (309 GDD)!** Progress of spring emergence is very similar, and even farther along, in other parts of the state. Peak flight occurs around 450 GDD. Onion maggot reaches peak flight later, at 700 GDD (base 40°F) (see Table 1).

First generation peak flight (50% emergence) of key maggot fly pests (GDD in Fahrenheit, Base T = 40°F)

Seedcorn	Onion	Cabbage
360	700	452

Life cycle and damage. These maggot flies spend the winter as small brown pupae in the soil. Adults emerge in spring and can travel up to a mile in search of host plants. Both maggot flies are rather delicate, hump-backed gray-brown flies, about 5-7 mm long. Eggs are laid on host crops, in soil at the base of the stem. Cool, moist soil conditions favor survival of the eggs, and soil temperatures that exceed 95°F in the top 2-3 inches will kill them. Larvae feed on roots and can completely destroy the root system. The first sign of a problem is wilting of the plant on sunny days and yellowing or purpling of outer leaves. Later, plants collapse, wilt down, and die. On inspection of the root area you may find the legless white maggots feeding, or the small brown, oblong pupae. In Brassica root crops such as turnips, radishes and daikon, maggot feeding tunnels on or in the root render it unmarketable.

Damage can be stunting, wilting, discoloration or plant death.

In onions, newly hatched larvae crawl behind the leaf sheath and enter the bulb, and feed on the roots, stem, and developing bulb. Feeding damage also encourages entry of soft rot pathogens.

Monitoring for adults. Yellow sticky card traps (3" x 5") attract adult flies and can be deployed in or slightly above the canopy (see photo). Check and change cards every 3-5 days. See pheromone article for sources.

Larvae feed on roots and hypocotyl

Cabbage root maggot fly on sticky card.

Monitoring for eggs. If you have transplants hardening off in a cold frame or outdoors, flies may find them and lay eggs in the flats. Flies have even been known to lay eggs in greenhouses. To check for eggs in the field or in flats, look for the 1/8-inch long, torpedo-shaped white eggs that are laid along the stem, or in and on the soil near the stem of young transplants. A pencil point or knife helps stir the soil to look for them. Field scout by checking 25 plants, in groups of 2-5 plants, scattered around the field. If you find an average of 1 egg/stem or more, significant crop damage is likely. Eggs may be more abundant in wetter areas of the field. Egg numbers may build up rapidly after the first eggs are seen. Scout successive plantings.

Insecticides: Direct application of insecticides to the root zone is considered the most effective means for controlling maggot damage. Cyantranilprole (Verimark for soil application, Exirel for foliar), a new active ingredient in the diamide class of chemistry, received federal registration in 2014 and is registered in Massachusetts. For other New England states, please check with your state registration agency (see New England Vegetable

Management Guide, Pesticide Safety and Use section for list of state contacts). Verimark is registered for cabbage maggot in brassicas, though is not registered on Alliums. The treatment options are broad including application to transplants in the tray or in transplant water, in-furrow spray, hill drench, or banded spray. Applications should target the root zone, for root uptake and systemic movement through the plant. REI is 4 hours. Consult the label for more details.

Verimark showed positive results in trials on cabbage root maggot that were led by Susan Scheufele of the UMass Vegetable Program in 2014. See the November 13, 2014 issue for a research report. These trials are being repeated for a second year in 2015. Treatments include an additional material, spinosad, applied as a tray or soil drench or in combination of tray followed by soil drench. Given positive results in 2014, we are working with the manufacturer to seek a 2(ee) supplemental label for use of spinoad (Entrust) and spinetoram (Radiant) as a soil or tray drench against cabbage maggot. Currently, these are registered for cole crops and aliums, but only foliar applications are registered, and cabbage and onion maggot are not listed on the label. Contact Susan Scheufele, 413 577-3976, sscheufele@umext.umass.edu if you would like more information.

Two organophosphate (Group B) insecticides, Chlorpyrifos (eg Lorsban 4E, 75 WG, or 15G) and diazinon (Diazinon AG500) are still registered. Check label for specific crops allowed and other restrictions including options for soil drench in direct seeded and transplanted crops, or transplant drench. Target the seed furrow or the base of the plants after transplanting, and use at least 100 to 200 gallons of water per acre to help the insecticide penetrate to the root zone.

An organic product that may have repellent effects is Ecotrol G, a plant based-granular with several aromatic oils that is applied to the furrow. This is exempt from pesticide registration, so does not have an EPA number or official label.

Floating row covers provide an effective barrier against this pest. Place the cover as soon as the transplants are set - especially when you know that flies are active! Do not use where the same crop family -- brassicas or onions -- were grown last year, as flies left in soil could emerge under the cover. Replace cover after weeding operations. As soil temperatures rise, first flight ends and crops grow large, covers can be safely removed.

Cultural practices and natural controls. Crop rotation contributes to keeping populations low; greater distances are more effective. Fall tillage to bury crop residues and to expose over-wintering pupae is also important. Bury, compost, or haul away onion culls—do not simply pile them somewhere on the farm. In a vigorous brassica crop, cultivation that brings soil up around the stem may help encourage formation of adventitious roots from the stem, which can help compensate for root loss even if maggots are present. Conditions that favor vigorous growth will enable the plant to compensate and outgrow moderate amounts of root injury.

Avoiding damage by later planting. The first flight and egg-laying period is generally most intense in the first half of May, depending on accumulated growing degree days – thus, it will vary with the season and location. After the first flight is over, and as soils heat up, fewer eggs are laid and those that are laid are less likely to survive. Planting from late-May into June is generally safer than the first half of May.

Natural enemies. Soil-dwelling beetles, including ground beetles (carabids) and staphylinid beetles, feed on onion and cabbage maggot eggs as well as larvae and pupae and can cause high levels of mortality. One staphylinid species, *Aleochara bilineata*, also parasitizes maggot larvae and has been shown to respond to chemicals given off by plants that suffer maggot damage. Because these soil-inhabiting beetles are susceptible to insecticides, broadcast soil insecticide treatments should be avoided. Other natural enemies including parasitic wasps and predatory mites. Naturally-occurring fungal diseases occasionally will reduce onion maggot numbers, particularly when flies are abundant and relative humidity is high. During a fungal epidemic dead, diseased flies, can be seen clinging to the highest parts of plants along field edges.

Nematodes for biological control. Soil application of the entomopathogenic nematodes, *Steinernema feltiae*, has shown efficacy against cabbage maggot in trials even at low soil temperatures of 50 F, or 10 C). It is not widely field tested in the Northeast. As with other biocontrols, success depends on proper conditions for survival of the organism that is being released, and proper timing to match the life stages of the predator and the pest. Apply in the morning or evening when it is cool, irrigate to keep the soil moist, and wash nematodes into the soil or apply in the trench to avoid more than 30 minutes of exposure to sunlight. Apply by suspending nematodes (infective juveniles) in water and treating transplants prior to setting in the field (as a spray or soaking drench), or in transplant water used in the water wheel transplanter, as a drench after transplanting, or through trickle irrigation. A combination of pre-plant and post-plant applications may be needed. Post-plant treatments are likely to be needed if maggot flight begins >1 week after transplanting. Rates of at least 100,000 to 125,000 infective juveniles per transplant are needed to achieve reduction in damage. Nematodes need a continuously moist soil environment to survive.

--R Hazzard. References: Network for Environment and Weather Applications (NEWA); Univ of Wisconsin Degree Day Calculator (http://www.soils.wisc.edu/asigServlets/asos/SelectDailyGridDD.jsp*); Ontario Ministry of Agriculture, Food and Rural Affairs online fact sheet ; University of Minnesota Veg Edge, Schroeder et al 1996, Journal of Economic Entomology 89:1109-1115; Chen et al, 2003, BioControl 48: 713–724; IPM Labs, Lockwood, NY. Updated May 10, 2013*

STOP THE ROT! CULTURAL PRACTICES REDUCE BACTERIAL BULB DECAY IN ONIONS

The following article is based on work done in 2009-10 by Christine Hoepting, Kathryn Klotzbach, and Judson Reid from the Cornell Cooperative Extension Vegetable Program and Beth Gugino from Pennsylvania State University Dept. of Plant Pathology. See http://cvp.cce.cornell.edu/submission.php?id=51 for the full report with tables and [Managing Bacterial Diseases in Onions]() from Penn State University for more on the results of this and other research.

Figure 1. Compared to the standard plant spacing, narrow plant spacing with fewer rows per bed controlled bacterial bulb rot by 53 to 66%. New Holland, PA: July 20, 2010.

Narrow Plant Spacing 32 inch2: 4" x 3 rows | *Standard Plant Spacing 36 inch2: 6" x 4 rows*

Narrow plant spacing reduced bacterial bulb decay by 53 to 64%. Do you know how easy this is? A simple modification to adjust your planting configuration is all it would take to drastically reduce losses from bacterial bulb decay. Our studies showed that when plant spacing was reduced from 6 or 8 inches to 4 inches with 3 or 4 rows per 3-foot plastic mulch bed (row spacing: 4 rows = 6 inch; 3 rows = 8 inch), this provided 53 to 64% control of bacterial bulb decay at harvest. Marketable yield also increased by 1.4 to 2.4 times, representing an increased net economic return of $43 to $258 per 100 feet of bed, due to increased weight of marketable jumbo-sized bulbs. We learned that wide plant spacing produces big bushy plants with more leaves, thicker necks, delayed maturity and bigger bulbs. Unfortunately, it was these bigger bulbs that rotted! By narrowing plant spacing, we got fewer colossal-sized bulbs, which was more than made up for by having significantly more healthy jumbo-sized bulbs for market.

Alternatives to black plastic reduced bacterial bulb decay by 59 to 75%. This is also a very simple modification for small-scale growers producing onions on plastic mulch, which could go a very long way towards reducing bacterial bulb decay. Our studies showed that reflective silver mulch, biodegradable black plastic and bare ground had 1.8 to 2.8 times higher marketable yield than black plastic. Reflective silver and biodegradable black plastics had 3.7 and 3.6 times higher jumbo weight, respectively, which resulted in an increased net return of $96 to $215 per 100 feet of bed compared to black plastic. All of the alternatives to black plastic had significantly lower soil temperatures compared to the black plastic; we suspect that the higher temperatures of the black plastic are more favorable for development of bacterial diseases.

Bacterial bulb decay can be a serious problem in onion production. Small-scale diversified fresh market growers who grow onions intensively are frequently challenged by yield losses due to bacterial diseases, which greatly compromise profitability. Bulbs with bacterial decay are not marketable, although sometimes they are sold unknowingly, since an infected internal scale may be undetectable if outer scales remain firm. Losses to bacterial bulb decay have increased steadily over the past decade, where onions are grown intensively on plastic mulch. It has become common for the incidence of bacterial bulb decay to be 35 to over 50% in parts of both PA and NY. In 2008 in PA, 34 growers lost a total of $140,000 to bacterial bulb decay. In NY, large scale onion producers report annual losses of 20 to 30% due to bacterial bulb decay.

Figure 2. Compared to black plastic, reflective silver mulch controlled bacterial bulb decay at harvest by 53%. New Holland, PA: July 20, 2010.

It is very important to note that this simple technique of reducing plant spacing was equally effective at reducing bacterial bulb rot associated with different bacterial pathogens. In New York, Sour Skin caused by *Burholderia cepacia*, is the most common cause of bacterial bulb decay, although *Pantoea ananatis* and *Enterobacter cloacae* have also been identified, and several others are likely part of the complex. In Pennsylvania, the most frequently isolated bacterial pathogens include soft rot pathogens, *Pseudomonas marginalis and Pectobacterium caratovora*; and center rot pathogens, *Pantoea ananatis* and *P. agglomerans*; *Xanthomonas axonopodis and Pseudomonas viridiflava*.

Figure 3. Left and Middle – above-ground symptoms of bacterial diseases of onions showing yellowing, bleaching and wilting of inner leaves. Right – bacterial bulb decay (pathogen not identified).

How does plant spacing work to reduce bacterial bulb rot? We don't know for sure, but suspect that narrow plant spacing produces plants that are less suitable hosts for bacterial diseases to establish, develop and spread. Our studies showed that wider plant spacing produces larger plants with more leaves, thicker necks and delayed maturity. Large bushy plants are more conducive to holding water in the leaf axils, which can favor bacteria entering the plant. Thick necks take longer to dry and remain succulent and green for a longer time, which provides ideal conditions for bacterial diseases to spread from the leaves into the bulb. Delayed maturity interferes with proper lodging and curing of the neck and bulbs, allowing for increased risk for bacterial infections in the leaves to spread into the bulbs. Meanwhile, the smaller plants with thinner, tighter necks that mature earlier in narrow plant spacing configurations are less conducive to bacterial bulb decay.

Our results from small-scale production suggest that bacterial bulb decay decreases when planting density is higher than 36 inch^2 per bulb, and continues to decrease as planting density increases. This could explain why we often see higher incidence of bacterial bulb decay in transplanted onions than we do in direct seeded onions of the same variety. For example, direct seeded onions planted at 7 seeds per foot with 15 inch row spacing have a planting density of 26 inch^2 per bulb, which is 2.3 times denser than transplanted onions that are planted at 3 plants per foot with the same row spacing (60 inch^2 per bulb).

Our data, collected from Interlaken, NY in 2010, suggests that row spacing is a very important factor related to rot: when we increased row spacing from 6 inches (4 rows per bed) to 8 inches (3 rows per bed), incidence of bacterial bulb decay at harvest increased 2 to 4 fold for each plant spacing (4", 6" and 8"). Therefore, in direct seeded onions, onions planted with 12 inch row spacing (= 21 inch^2 per bulb) might have less bacterial rot than onions grown with 15 inch row spacing (= 26 inch^2 per bulb). Another unknown is whether row type (single vs. double) effects bacterial bulb decay.

Our results from small-scale production suggest that reducing planting density to 36 inch^2 per bulb or less greatly reduces incidence of bacterial bulb decay at harvest. Therefore, with respect to large-scale production of onions from transplants, our data suggests that by decreasing row spacing from 15 inches (= 60 inch^2 per bulb with 4 inch plant spacing) to 8 to 6 inches, and adjusting plant spacing to achieve a planting density of 36 inch^2 per bulb or less (e.g. 6 inch row spacing with 5 or 6 inch plant spacing = 30 to 30 inch^2 per bulb), growers could control 50% or more of bacterial bulb rot. It would be very interesting to see whether bulb size could still be met with these different planting configurations. We also do not know the effect that the number of plants per hole (1 vs. 2 vs. 3) has on incidence of bacterial diseases.

How does mulch type reduce bacterial bulb decay? Growers' standard black plastic absorbs sunlight, thus increasing soil temperature, which in turn, promotes early crop development of onions. However, during the heat of June and July, the warmer soil temperatures provided by the black plastic may actually be creating a more favorable environment for bacterial diseases to develop and spread. In contrast, reflective silver mulch keeps soil temperatures cooler, and black biodegradable mulch provides early season added heat, which gives way to cooler soil temperatures as it degrades during the heat of summer. The lower temperatures provided by these alternative mulches could be the difference between optimum and below optimum temperatures for bacteria to grow. Similarly, soil temperatures of bare ground would be cooler than under black plastic, but extra effort would be required to provide effective weed control.

Ultimately, an integrated approach is needed to manage bacterial disease of onions. We are not telling you that all you have to do is reduce your plant spacing and bacterial diseases will be a thing of the past. Ultimately, managing bacterial diseases of onions will involve an integrated approach for both small and large scale producers.

Funding for these projects was provided by NESARE Partnership and NE IPM Partnership grants.

- adapted from Christine Hoepting, Kathryn Klotzbach, Judson Reid and Beth Gugino - Cornell Cooperative Extension Vegetable Program Dept. of Plant Pathology, Pennsylvania State University

News

Biological control of ECB with *Trichogramma ostriniae*: PLACE YOUR ORDER NOW!

Releasing *Trichogramma ostriniae*, the tiny wasp that parasitizes the eggs of European corn borer, can reduce or eliminate the need for pesticide sprays to control this pest. To ensure that you will be able to receive *Trichogramma* this year you must call IPM labs as soon as possible or when you plant your first succession of sweet corn. The wasps are custom-reared based on pre-orders, so let IPM labs know your needs well in advance. When placing your order, have the number of acres you wish to release in and the size and number of plantings you have for early corn. *Trichogramma* can also be ordered for later-season releases to control second generation ECB in sweet corn and fruiting bell peppers. *Trichogramma ostriniae* can be ordered from IPM Laboratories; Locke, New York; 315-497-2063,ipminfo@ipmlabs.com.

Farmers Encouraged to call Boston Area Gleaners for Donation of Surplus Crops

Boston Area Gleaners is a 501(c)(3) non-profit organization dedicated to rescuing surplus farm crops for people in need. BAG delivers high quality, local produce to pantries and meal programs by working closely with local farmers, providing volunteer labor to harvest what would otherwise be plowed under or what was specifically planted for donation.

All volunteer groups are supervised by experienced staff and can be organized with minimal notice (1-2 days). BAG's current operating region is within a 1-hour driving distance from their Waltham office, and in this region, they currently work with over 40 farms to provide a healthy, fresh, local food source for community residents who otherwise may not be able to afford it.

As farmers are developing their crop plans for the season, they are encouraged to consider planting one extra row of crops such as cabbage, corn, potatoes, carrots, etc. As the season progresses, if they wish to donate it but do not have the ability to harvest it, they can call BAG to assist them with making the donation.

Please contact Matt Crawford, Lead Gleaning Coordinator, if interested; office: 781-894-3212, cell: 978-578-5647, email: coordinator@bostonareagleaners.org. To learn more about working with and donating to BAG, visit http://www.bostonareagleaners.org/farmers-click-here.html.

Boston Area Gleaners, Inc. is fully insured and provides accurate harvest records.

Presidio Fungicide Label Changes

Presidio has a new specimen label and a supplemental label for cucurbits. The supplemental label incorporates changes that were made to address resistance issues with cucurbit downy mildew; specifically, the label only allows a 4 fl oz/A use rate, no back-to-back applications, and a limit of 2 applications per season. You can access the labels at CDMS: http://www.cdms.net/labelsmsds/lmdefault.aspx

Endosulfan (Thionex, Drexel Endosulfan) Phase-out Reminder

Registration for Thionex, and other endosulfan products, was cancelled by the EPA, allowing for a phase-out period. Use on the remaining crops for which it has been labeled - sweet corn, peppers, potatoes, pumpkins, tomatoes, and winter squash - is not allowed after July 31, 2015.

Upcoming Events

Proven Biological Control Programs for Indoor and Outdoor Production of Ornamentals

When: June 18, 2015

Where: WB Young Bldg., UConn Storrs, CT

Come learn more about evaluating your biological control program, using biological controls in outdoor production areas and conservatories, and biocontrol of fungal and bacterial diseases.

Featured Speakers

Margery Daughtrey, Cornell University

Suzanne Wainwright-Evans, Buglady Consulting

Grant Jones, IPM Specialist, Longwood Gardens

Five Pesticide recertification credits have been approved.

Program and registration form

Sponsored by: UConn Extension and UMass Extension

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

This program will focus specifically on washing/packing facilities and low-tech & low-cost design for very small farms. Topics will also cover wash water sanitizer usage, sanitizer level monitoring, and other aspects of post-harvest handling using farm food safety good agricultural practices.

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.

UMass Agricultural Field Day

When: Wednesday, June 24, 2015 9:30am-4pm

Where: UMass Crop and Animal Research and Education Center, 91 North River Rd, S. Deerfield, MA 01373

The public is invited to come and take a guided tour through the farm to learn about current research projects at UMass. Professors and graduate students will be on hand to offer presentations on a variety of research topics. Closed-toed shoes are mandatory. Sunscreen and hats are recommended. There is no registration fee; however, pre-registration is strongly encouraged. Lunch will be provided.

Certified Crop Advisors will receive CEU credits: .5 credits for nutrient management and 2.5 credits for crop management.

Projects will include but are not limited to:

Cover Crops in Potato Production

Dual-Purpose Cover Crops for Fall Nutrient Capture and Additional Forage Production

Production of Quality Malt Barley in New England

Hardwood Biochar Amendment of Agricultural Soils

Growing Mustard as a Biofumigant Cover Crop

Evaluation of Reduced Risk Pesticides for Cabbage Root Maggot Control

Effect of Bee Disease on Hedgerow Plantings

Contact Kelly Kraemer at kkraemer@umass.edu or 413-545-5221 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

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