Cornell University Cooperative Extension

Eastern NY Commercial Horticulture Program

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Vegetable News

In this issue of Vegetable News:

Watch for Cabbage Maggot Flies

Chuck Bornt, ENYCHP

Cabbage Maggot Rearing It's Ugly Head! The dry start to April allowed a lot of early brassicas to get in the ground and has also allowed cabbage maggot flies a lot of time to lay their eggs. I've gotten reports from my colleagues in the southern region of our territory that evidence of cabbage maggots is all to evident! If you see plants that have suddenly wilted, pull up the plant and cut the stem open to see if there are maggots (see figure 1) either inside the stem or in the soil close to where you pulled the plant out of.

Taking a look back at the growing degree model that we have to predict when the adult maggots will appear, many of those southern locations have already seen over 50 % of the adult flies emerge and in the Capital District region, about May 3 we saw 50% emergence. However in the north country, it looks like we've got about 100 growing degree days left before we see 50% emergence. Why is this important? Because using a growing degree day model to predict when the flies will emerge will help us time our sprays or other control measures. The trigger for us to really gear up for controlling them is when 50% of the adults have emerged. If you are interested in knowing the percentage of emergence in your location, go to the Network for Environment and Weather Applications (NEWA) at www.http://newa.cornell.edu/ and choose Pest Forecast on the top menu. From there select "Cabbage Maggot" and choose a weather station that is closest to your location to determine the status of cabbage maggot.

The model is based on the cumulative growing degree days and Table 1 gives you the approximate emergence based on these degree days.

So what does all of this mean? You should be scouting and treating plantings and successive planting now until the threat is over after most of the adults have emerged and the soil temperatures warm up. For more information on the life cycle and control options, I've included an edited article from our retired colleague Ruth Hazzard from the University of Massachusetts. It was found in the UMASS Vegetable Notes, Volume 26, No. 5 and edited by Chuck Bornt:

Cabbage Maggot Degree-Day Model
(accumulations are in °F)

Cabbage Maggot Stages (Model by: J.L. Jyoiti and A.M. Shelton)	
Stage	**Accumulated Base 40 Degree-Days**
1st Emergence	288 +/- 15
25 percent	366 +/- 5
50 percent	452 +/- 14
75 percent	547 +/- 66
95 percent	697 +/- 14
Overwintering generation	809 +/- 3

Generation	**Accumulated Base 40 Degree-Days for Peak (50%) Emergence**
First	1261 +/- 59
Second	2176 +/- 38
Third	3014 +/- 6

Life cycle and damage: Eggs are laid on host crops, in soil at the base of the stem. Cool, moist soil conditions favor survival of eggs and maggots. Yellow rocket blooms at about the same time that cabbage maggot flight occurs. Small, white cabbage maggot eggs are laid in soil at the base of young transplants 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

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Figure 1: Cabbage maggots feeding on cabbage stems: maggots are legless, tapered and white in color, and are usually less than 1/3 inch in length. *Photo courtesy of Michigan State Univ.*

feeding tunnels on or in the root render it unmarketable.

Insecticides: Direct application of insecticides to the root zone is considered the most effective means for controlling maggot damage. Two organophosphate insecticides, chlorpyrifos (eg Lorsban 4E, 75 WG, or 15G) and diazinon (Diazinon AG500) are registered for this use. 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.

Editor's note: Coragen (chlorantraniliprole) is a fairly new insecticide labeled in NYS and received a 2(ee) label for cabbage maggot. However, trials done by Dan Gilrein, Cornell Entomologist on Long Island have found that Coragen is not nearly as effective on cabbage maggot as Lorsban and is still recommending that Lorsban be used. If you do decide to use Coragen, it should be applied at a rate of 5.0 fluid ounces per acre as a water transplant treatment at planting in a minimum of 2.0 fluid ounces of solution per transplant. For the best results, the product needs to be taken directly up by the roots so it needs to be either put directly into the planting furrow or in the plugs—DO NOT use it as a post-plant drench as it will not be as effective! Do not apply more than 15.4 fluid ounces of chlorantraniliprole containing products per acre per crop. Growers should have a copy of the 2(ee) label and the full Coragen label in their possession when applying this product. For a copy of the 2(ee) label, contact Chuck Bornt at 518-859-6213 or cdb13@cornell.edu.

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. 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 (50°F, or 10°C). 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, in drip irrigation, or a combination of pre-plant and post-plant applications. Post-plant treatments are likely to be needed if maggot flight begins >1 week after transplanting. Rates of 100,000 to 125,000 infective juveniles per transplant have been shown to be needed to achieve reduction in damage. Nematodes need a moist soil environment and insect host to survive.

Source: UMASS Vegetable Notes, Volume 26, No. 5: Ruth 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.

Spinach Crown Mite

Amy Ivy, ENYCHP

If the center and new growth of your late winter or early spring high tunnel spinach is puckered and distorted, you may have spinach crown mite. It has been seen sporadically in high tunnels for a few years now and we are interested in understanding how widespread this problem is, so please contact Amy Ivy if you suspect you have this pest. It is more common during the cooler temperatures of spring and fall and in soils with high organic matter content.

Below is some information from Ann Hazelrigg of the UVM Plant Diagnostic Clinic in a newsletter dated 3/13/12. https://www.uvm.edu/vtvegandberry/newsletter/3-13-12.pdf

"Crown mites in overwintered spinach are tiny, almost transparent mites with prominent long hairs. They are soil and leaf dwelling. Above ground, they live deep in the crown of the spinach plant. Crown mite eggs are transparent and spherical and are laid in the innermost parts of the plant. Immatures are similar to adults except smaller in size. They can damage germinating seeds, seedlings and older plants. The mites feed mainly on the new, expanding leaves at the center of the plant. As the plants get larger and grow more rapidly, damage may be less. The damage I saw in the clinic due to these mites included stunting of the plants and off color, looking almost like a nutrient deficiency. With a hand lens, and pulling apart the crown you should be able to see these clear/whitish mites that are much more bulbous or rounded than 2 spotted spider mites. Also, these mites have long hairs or setae visible with a hand lens.

Typical feeding injury by spinach crown mites. Photo credit: Amy Ivy

A magnified spinach crown mite, notice the long hairs on the abdomen. Photo credit Joan Allen,

Damage by these mites is usually associated with soils high in organic matter and cool wet conditions. They will build up if repeated cropping occurs all winter. Destroy crop residues as soon as you are finished harvesting and try to break the cycle by not immediately replanting to the same crop.

For more info:

http://www.ipm.ucdavis.edu/PMG/GARDEN/VEGES/PESTS/spbulbmites.html

Greenhouse ALERT! Broad Mites in Ornamentals can Infest your Veg Transplants

Teresa Rusinek, ENYCHP

Over the past weeks several educators have seen broad mite infestations in New Guinea Impatiens (NGI). There are many growers out there who grow both ornamentals and vegetable transplants in the same greenhouses. Though this is not advised because of the potential of diseases and insects (and mites in this case!) jumping over from one crop to the other, it is often a necessity because of space limitations and heating efficiency. If you have or had NGIs in your greenhouse operation, keep an eye out for broad mite damage. Because the mites are so small, it is difficult to detect them before damage shows up. Keep an eye on new growth for symptoms of twisting, hardening and distortion or bronzing of lower leaf surfaces. These mites actually have a broad host range in ornamentals, but it's NGI that we've been seeing them on this season and the past few years! The concern in vegetable production is that we've been seeing an increase in broad mites on peppers late in the season (read Crystal's article below from last year). There is a good chance that the mites could have moved off the ornamentals onto the peppers while in the greenhouse. If you suspect this may be the case you may want to treat the peppers with a miticide before you transplant. Just

Broad mite damage on New Guinea Impatiens, Image: Teresa Rusinek

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make sure the miticide is labeled for use in greenhouse and on veg transplants.

The Semi-Russetted Bell Peppers

What a shock to find your whole high tunnel crop of peppers looking like the ones below. They are really something to see, as a vegetable specialist, but this is a lost crop. The culprit is **Broad Mite,** a nearly microscopic (less than .2mm) mite which is an occasional pest of ornamentals, peppers, and tomatoes. Dr. Nault, our entomologist at Cornell, indicates that these mites do not overwinter. As this grower has a greenhouse with both ornamentals and vegetable transplants the infestation may have been present for a long time and become a serious problem towards the end of the season. Note that Cyclamen mite damage looks very similar on peppers and that Cyclamen mite does overwinter in our region and may infest subsequent crops in the field or high tunnel/greenhouse. One way to distinguish between broad mites and cyclamen mites is to examine their eggs with a 20 X lens. Cyclamen mite eggs are smooth, elliptical and about 1/2 the size of the adult female. Broad mite eggs are elliptical but are covered by small whitish bumps that look like rows of diamonds. *–CLS*

Broad mite eggs (in the yellow circle) and adults (below circle) Image: Ohio State

Image: Crystal Stewart

Value Added Producer Grants Available

Jesse Strzok, ENYCHP

Have you thought about diversifying and adding value-added products to your business? The USDA's Value Added Producer Grants (VAPG) program is designed to subsidize producers entering the processing or marketing of bio-based value-added products and will be awarded through a national competition. Priority may be given to beginning, socially-disadvantaged, small- to medium-sized farms (structured as a family farm or farm (or ranch) cooperative), or are proposing "mid-tier value chain."

These grants may be ideal if you've done some groundwork (such as attending ENYCHP's Berry Processing Workshop this Spring which covered topics from home processing exemptions to commercial processing, food safety, and market evaluations) and are looking to get into value added products. An excellent resource is Cornell University's Northeast Center for Food Entrepreneurship (NECFE) located in Geneva (visit https://necfe.foodscience.cals.cornell.edu/).

A few quick facts about the USDA VAPG program:

Program funding: $44 million Maximum grant amount: $75,000 for planning grants; $250,000 for working capital grants Matching funds requirements: 50% of total project costs

Grant fund examples: Planning grant funds can be used for conducting feasibility studies to developing business plans. Working capital grant funds can be used for processing costs, marketing and advertising, and some inventory and salary expenses.

If you're interested and would like more information visit http://www.rd.usda.gov/programs-services/value-added-producer-grants. The USDA website provided has a toolkit for planning grants and working capital grants at the bottom of the page. Don't wait too long as application deadlines are fast approaching – June 24, 2016 (electronic) and July 1, 2016 (paper).

USDA United States Department of Agriculture Rural Development

FARM CREDIT 100 ESTABLISHED 1916

Farm Credit has cited 100 agriculture professionals as tops in the nation for their 'Fresh Perspective' and we are proud to say that eastern NY is home to 4 of the 6 NY honorees! Congratulations to all of the folks on the list and especially to the New York farmers among them including:

Levi Cahan, Whitehall, NY
Christine Fesko, Skaneateles, NY
Jim Hyland, New Paltz, NY
Dale Ila Riggs, Stephentown, NY
Nancy Robbins, Sackets Harbor, NY

Botrytis in Greenhouse Basil

Erik Kocho-Schellenberg, ENYCHP

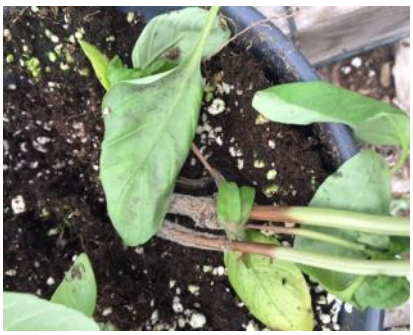
The first week of May was wet and cold. NEWA data for the week at Highland Hudson Valley Lab show a total of 2.52 inches of rain for the week with an average temperature of 50 degrees, and very low solar radiation intensity values. Prolonged periods of cool temperatures, low light levels, and high humidity form the perfect conditions for many plant diseases even inside protected greenhouses.

This week, the fungal disease often called gray mold (Botrytis cinerea) has caused some damage to greenhouse basil. It is important to know how to manage the climate in your greenhouse to get through these periods of bad weather and effectively combat Botrytis and other diseases.
The first line of defense against any disease in your greenhouse is sanitation. Regardless of what you are growing, keeping things clean is important. It is good practice to keep the ground clean, and ideally install permanent weed barrier and/or gravel. Concrete floors are another good but more expensive option. Make sure to keep hoses and irrigation equipment off the ground, where fungal spores and bacteria hide out. It is good practice to sanitize the greenhouse with ethanol or sodium hypochlorite at least once a season and/or after any disease epidemics. Cleaning and disinfecting regularly is key for economic success. Always buy clean potting soil and seed, and if you re-use pots and trays make sure to sanitize them between uses. Be careful not to let diseased plants into your greenhouses, and if you have a disease in a greenhouse make sure it is the last one you visit in the course of your day (1).

Next, make sure to optimize your temperature. For basil, and most other cold-sensitive plants, the night-time minimum temperature should be maintained at 65 degrees Fahrenheit. Remember that every degree Fahrenheit you turn up the heat, you incur an additional 3% heating cost. That goes the opposite way as well! Greenhouse heating is expensive, so paying attention to every energy-saving detail is well worth it. Relative humidity is also important. To prevent diseases, humidity should be controlled as a function of temperature as seen in the table below (2).

°F	Humidity
50°	83%
61°	89%
68°	91%
86°	95%

Dr. Neil Mattheson from Cornell University has been researching greenhouse heating and efficiency, and you can find plenty of energy-saving advice at the Cornell greenhouse program (3).
Getting the sanitation, temperature, and humidity right are the most important steps but even then Botrytis and other diseases will find a way in from time to time. Botrytis can most easily be identified by looking closely to observe the branching structures which hold the spores. Seen with the naked eye, they look like a gray-brown fuzz. On basil, stem infections will turn brown and can kill small and full size plants alike, as seen in the pictures below.



Management
If sanitation and environmental control are not enough, the following are labelled for use against Botrytis on basil in the greenhouse:
Bacillus subtilis (Companion)
Streptomyces lydicus (Actinovate SP, Mycostop Biofungicide)
Always apply fungicides appropriately as indicated on the label.
Another way of fighting Botrytis in sweet basil involves changing the N and Ca concentrations in liquid fertilizer. When climatic factors increase risk of Botrytis infection, one study showed that modifying the irrigation solution to contain half the normal N (3.6 mM) and twice the normal Ca (2.55 mM) significantly reduced B. cinerea sporulation without affecting basil yield.
Keep a lookout for Botrytis and other diseases on basil, and be familiar with all the signs and symptoms of diseases using Plant Disease Diagnostic Clinic fact sheet for Basil (5).

1. http://nysaes.cals.cornell.edu/administrative-resources/buildings-properties/trades/greenhouse/greenhouse-sanitation
2 Bartok J.W. 1990. *Lower Humidity Levels in Your Greenhouse.* Cooperative Extension System, University of Connecticut, Publication SEG 102.
3. http://www.greenhouse.cornell.edu/crops/factsheets/GreenhouseEnergyManagement.pdf
5. Sharabani, G., et al. 1999. *Epidemiology of Botryris cinerea in Sweet Basil and Implications for Disease Management*. Plant Disease. 1999 83:6, 554-560
6. http://onlinelibrary.wiley.com/doi/10.1111/j.1365-3059.2006.01388.x/pdf
7. http://plantclinic.cornell.edu/factsheets/basildiseases.pdf

ENYCHP Canada Bus Tour

Date: June 28th, 2016

Departure: 6:00am from Albany, NY

*Pick-up stops will be planned for Saratoga, Glens Falls & Plattsburgh as needed

Return: 9:00-9:30pm Arrive in back in Albany, NY

Cost: $75 (includes bus fare, Lunch and a light Dinner)

Stops: Sherrington, St. Clotilde & Napierville, Quebec

* All those attending must have a valid passport or enhanced drivers license

Please Contact Amy Ivy, with any questions: 518-561-7450, adi2@cornell edu

Registration and Payment due by Monday, May 23rd

contact: Abby Henderson: (518)746-2553, aef225@cornell.edu

2016 Weekly and Seasonal Weather Information

	Growing Degree Information Base 50° F			Rainfall Accumulations		
Site	2016 Weekly Total 5/3-5/9	2016 Season Total 3/1-5/9	2015 Season Total 3/1-5/9	2016 Weekly Rainfall (inches) 5/3-5/9	2016 Total Rainfall (inches) 3/1-5/9	2015 Total Rainfall (inches) 3/1-5/9
Albany	16.9	122.4	211.5	0.7	4.21	3.55
Castleton	Na	94.7[1]	204.3	Na	Na	3.13
Glens Falls	19.0	79.0	133.0	0.64	4.38	4.38
Griffiss	18.9	79.9	121.0	0.45	7.32	7.32
Guilderland	15.0	101.0	180.0	0.78	8.9	8.9
Highland	19.8	177.8	233.3	1.02	7.34	7.35
Hudson	17.8	138.7	218.3	1.05	7.17	7.17
Marlboro	11.6	146.2	205.8	1.0	5.26	5.27
Montgomery	16.5	148.5	206.0	0.79	5.24	5.24
Peru	19.3	52.4	145.0	0.13	4.29	4.29
Red Hook	21.2	136.4	202.4	0.71	4.02	4.02
Willsboro	21.4	53.0	128.0	0.36	4.12	4.14
N. Adams, MA	10.9	73.9	104.0	0.52	5.76	5.76

Every effort has been made to provide correct, complete and up-to-date pesticide recommendations. Nevertheless, changes in pesticide regulations occur constantly, and human errors are possible. These recommendations are not a substitute for pesticide labelling. Please read the label before applying any pesticide. .

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