Cornell Cooperative Extension | Cornell Vegetable Program

VEGEdge

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Corn Earworm in High Tunnel Tomatoes

Judson Reid, Cornell Cooperative Extension, Cornell Vegetable Program

Corn Earworm, Tomato Fruitworm, Cotton Bollworm, Sorghum Headworm… all the same insect. Does it even know its own name? It doesn't matter, the thing is flat nasty.

Heavy infestations of this worm have been found in high tunnel tomatoes this week. Just like its many names, it has many host crops and many colors, which can make diagnosis difficult in crops aside from sweet corn. All larval variants of Corn Earworm (CEW) will have a mottled, brownish head, dark spots and hairs on their body. In tomatoes, the moth will lay eggs at the calyx (stem attachment), which will hatch in 2-10 days and then burrow into the fruit. CEW makes unsightly holes, drops excrement and is ugly in and of itself if discovered while making a salad, salsa or sandwich.

One way to prepare for CEW is to watch trap catch numbers in VegEdge. The CEW moth does not overwinter in New York, so pheromone traps are deployed throughout the State to monitor its annual arrival from the south, as well as increases in flights. There are very good recommendations on spray response to trap catches for sweet corn (See this week's sweet corn write-up by Elizabeth Buck, page 3). Trap catch recommendations have not been developed for tomatoes in New York, let alone high tunnels.

In most years high flights (trap catches) do not impact tomatoes. However, with the wide spread adoption of high tunnels,

There are many color variants of Corn Earworm. This individual is lighter colored, but has the characteristic light brown head and body hairs. CEW droppings have contaminated the fruit just beneath the stem attachment. *Photo by Judson Reid, CCE CVP*

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About VegEdge

VegEdge newsletter is exclusively for enrollees in the Cornell Vegetable Program, a Cornell Cooperative Extension partnership between Cornell University and CCE Associations in 14 counties.

The newsletter is a service to our enrollees and is intended for educational purposes, strengthening the relationship between our enrollees, the Cornell Vegetable Program team, and Cornell University.

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Help us serve you better by telling us what you think. Email us at *cce-cvp@cornell.edu* or write to us at Cornell Vegetable Program, 480 North Main Street, Canandaigua, NY 14424.

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The next issue of VegEdge newsletter will be produced on July 29, 2020.

Hooded Sprayers Reduce Particle Drift

Ali Nafchi, Cornell Cooperative Extension, Cornell Vegetable Program

Pesticides can contaminate our food supply and environment; therefore, scientists have always recommended reducing the pesticide usage. This reduction however, requires drastic changes in pesticide formulations and/or application methods. Precision Ag technologies such as; Site-Specific Management (SSM) and Variable Rate Application (VRA) can help to optimize as well as minimizing of the inputs such as pesticides (yet to be adopted and accessible to all). On the other hand, management of drift from pesticide applications is important. With potential expansions of use of pesticides, due to pest resistance, concerns have been raised about the increased risk of pesticide drift, leading to damage to non-target crops. A variety of factors can affect the drift potential of a pesticide application, including nozzle selection, solution chemistry, and application equipment. The hooded sprayers conversely, can help to target specific areas and the spray hoods separated rows of crop canopy. With hooded sprayers, nonselective pesticides can be used allowing for herbicide application only where weeds are present or positioned in the row middles. The hooded sprayers can help to reduce the drift potential of the pesticide application and increase the spray coverage under the boom.

FOR MORE INFORMATION

YouTube-Redball-Hooded Sprayer Demonstration

YouTube-Weed treatment with camera control

YouTube - Hooded Sprayer

YouTube - Willmar Fabrication 915 Hooded Sprayer

Reducing Herbicide Particle Drift

Sensor-Controlled Hooded Sprayer for Row Crops

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tomatoes are now fruiting at times when corn in the flight path may not yet be in silk. This may influence local infestations of high tunnel tomatoes as they present an egg laying opportunity not yet available outside. In years when corn maturity is delayed, CEW flights are early and tunnel tomatoes are available, infestations could be severe. Are there management options?

Closing tunnels to exclude the pest is not practical, as this would increase relative humidity and temperature. There are spray options, although the highly sporadic nature of CEW infestations in tunnels also makes this questionable.

For high tunnels use we recommend spray materials that are not greenhouse prohibited, have shorter PHI's and not within the 3A group (pyrethroids). The 3A group can influence aphid outbreaks and is inconsistently effective due to overuse on CEW in corn.

Although Exirel (group 28) is labeled to control CEW in field grown tomatoes, for greenhouse tomatoes only Thrips and Whiteflies are listed as target pests (in NYS both the pest and crop must appear on the label for legal applications). Coragen (also group 28, 1 D PHI) does not include a greenhouse prohibition and does list CEW as a target pest on tomato crops.

Avaunt (group 22, 3 D PHI) does lists CEW within the tomato portion of the label and does not have a greenhouse prohibition.

Note that Radiant (group 5) while labeled for tomatoes, is prohibited from greenhouse (high tunnel) use.

Organic growers may consider using Dipel (group 11A, 0 D PHI) for smaller worms, although this material is also not considered consistently effective. Gemstar LC (0 D PHI) contains a virus that infects the digestive tract of CEW and is certified organic. Entrust (group 5), also organic.

Although it is satisfying to spray, CEW that have burrowed within tomato fruit are tough to kill. Removing infected fruit by hand may be more effective. The other challenge is predicting when and where CEW will infest tomatoes. In most years, corn silks will attract the attention of egg laying moths and preventative sprays on tomato are unnecessary.

Look for dots on the lower portion of the body and light hairs.

Once hidden inside the tomato, the pest is well protected from insecticide sprays.

If corn is not yet in silk, CEW will readily enter high tunnels to lay eggs in ripening tomatoes. *Photos by Judson Reid, CCE CVP*

Controlling Corn Earworm in Sweet Corn, Part 1: Why Is It so Hard & How to Improve?

Elizabeth Buck, Cornell Cooperative Extension, Cornell Vegetable Program

Corn earworm is not a straightforward pest to manage in sweet corn. Sure, there's many times when the pest can be well controlled. But when a farm's typical practices aren't effective, corn earworm management becomes a frustrating piece of work. Fickle corn earworm control is the result of many complex and interacting factors, which underly the difficulty in developing a season-long spray program. **The overarching goal is to create an economically reasonable spray program that exposes each corn earworm generation to a different chemistry, doesn't rely too heavily on pyrethroids, and adequately protects your plantings from silk emergence to silk dry down.**

IMPORTANT BIOLOGICAL FACTS RELATED TO CONTROL

Corn earworm is a mostly a migratory pest in NY. **Multiple waves of corn earworms travel to NY on weather fronts**, typically starting in late June. Adults tend to live 1-2 weeks and during that time females l**ay eggs directly onto green silks. Field scouting for eggs is impractical** because the eggs cannot be seen without a hand lens. Eggs hatch in 2-10 days, depending on temperature, then larvae move down the silk into the ears. Corn earworm **generations take about 1 month to mature, though hot weather can shorten the time** to 3 weeks. We expect 1 to 2 generations to arise from the migrating corn earworm each year. **Pressure usually peaks in early September**. Corn earworm is known to overwinter in areas of Erie and Onondaga Counties and may overwinter elsewhere in Western NY during mild winters. **Overwintering populations could exacerbate pyrethroid resistance issues**.

RESISTANCE CHALLENGES

Pyrethroids (Group 3A) are inexpensive insecticides commonly used to treat

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corn earworm. As each successive generation of corn earworm matures and travels north it is exposed to pyrethroids. Because of all that selection pressure, **corn earworms have varying tolerances to pyrethroids by the time they reach NY**. That's why **pyrethroids provide inconsistent control**, sometimes working well and other times failing to provide any meaningful protection. **Pyrethroids can be used, but you must carefully evaluate how effectively they are working to detect whether you have acquired a resistant population of corn earworm**. If one pyrethroid fails, it is doubtful that other pyrethroids will perform better. Examples of pyrethroids include bifenthrin (Ethos), permethrin (Perm-up, Eight), zeta-cypermethrin (Mustang Maxx), and lambda-cyhalothrin (Warrior).

Similarly, **corn earworm is resistant to most Bt proteins**. Bt sprays are not recommended in any setting. Among Bt traited **genetically engineered varieties**, only those carrying the **Vip3a protein** trait provide consistently high levels of corn earworm control.

DIFFICULTIES OF ROTATION

Each generation of corn earworm should be exposed to a different class of chemistry. Actually implementing a chemical rotation is not straightforward. **Pyrethroids** are the most common group registered for corn earworm control and require spray licenses. The inexpensiveness of pyrethroids disincentivizes rotation to other materials. **Group 1A** materials (ie Lannate, Sevin) are harsh. **Group 28** containing materials (ie Coragen) perform well on larvae but require spray licenses. **Group 5** materials (Blackhawk, Radiant, Entrust) work very well on larvae but do not treat adults. **Viruses** that attack corn earworm (GemStar, Helicovex) work best under lower pest pressure. Pre-mixes of materials from different groups (ie Besiege, Group 3A + 28) make it hard to create a true chemical rotation.

EFFECT OF PRESSURE

The more moths = more eggs = higher the worm pressure. Even with extremely effective (ie 98%) control of corn earworms, expect to find worms in ears when the moth population is very high, as occurred in 2018. **At low pressure, less effective materials may be able to keep the number of wormy ears below your market tolerance**. When pressure rises, those same materials may fail and necessitate rotation to more reliable chemistries.

MANAGING GENERATIONS, OR PLANTINGS, OR CALENDARS?

The time to complete a generation is temperature dependent and can vary from 3 weeks when it is consistently hot to over 4 weeks in cool weather. To complicate things, the multiple arrival waves of corn earworm can create overlapping stages and generations on the farm. **Switching between two spray materials based solely on the calendar is also unlikely to do a good job at exposing each generation to new chemistries.**

Managing spray rotations to give each planting one application of a rotational chemistry isn't practical either. Corn will be in green silk for 10-14 days. During the main season this means that several plantings will need to be treated on any given date and will likely receive the same chemistry.

PULLING IT ALL TOGETHER

Corn only needs to be protected from corn earworm while the crop has green silk. Once corn earworm arrives, any given planting will **usually take 2-4 sprays to achieve complete corn earworm coverage**. Generally speaking, the earliest plantings will need fewer sprays because of lower pressure. Late plantings typically require the most frequent sprays with the best materials and are at higher risk of decreased pyrethroid efficacy due to season-long, generational exposure. Consider using Vip3a traited genetically engineered varieties for late plantings. **From July on it is wise to rotate away from a pyrethroid at for at least two consecutive applications per month and to not use the same rotational partner two months in a row.**

The sweet corn **trap counts can be used to time applications** (see the Sweet Corn Trap Network Report each week in VegEdge). Counting growing degree days from time of moth catches doesn't work well for corn earworm because there is near constant adult pressure from July through September as more waves arrive and generations develop locally. While the trap network is an excellent resource, conditions in your field may not reflect the counts, especially if you are far from a trapping location. **You can easily set up your own corn earworm trap. Checking the trap takes 5-10 minutes a week**. The heliothis net traps cost about $100 and last for 3-5 years, depending on how well you take care of them. A season's worth of lures cost less than $20. Over the life a trap, that works out to an annual cost of $40-55, which could easily be offset by reduced inputs or higher quality product. Contact a CCE Fresh Market Vegetable Specialist or the NYS IPM Center for further information and training resources related to having a trap.

NYS Vegetable IPM Coordinator Abby Seaman adjusts a heliothis net trap next to a sweet corn field. *Photo by J. Kikkert, CVP*

NY Sweet Corn Trap Network Report, 7/21/2020

Marion Zuefle, NYS IPM Program; from http://sweetcorn.nysipm.cornell.edu

Statewide, thirty-three sites reported this week. Nine of the sites had European corn borer (ECB)-E and four sites had ECB-Z. Sixteen sites reported corn earworm (CEW) with fourteen high enough to be on a 4, 5 or 6 day spray interval (see table at bottom of post). Fall armyworm (FAW) moths were caught at eight sites and Western bean cutworm (WBC) was caught at twenty-four sites. The hybrid ECB moth was not caught at any of the five reporting sites.

Western bean cutworm numbers really increased this week and will most likely peak over the next 2 weeks. Be sure to scout your pretassel corn for egg masses. And to determine estimated WBC flight completion refer to the lookup table using the base 38°F column.

NEWA Western Bean Cutworm Flight Emergence Lookup Table

	Hanson method (2015)[1,2]	
Est. Flight Completion	**Base 3.3°C**	**Base 38°F**
1%	1230	2200
5%	1320	2390
10%	1365	2460
15%	1390	2540
20%	1415	2585
25% (scout for egg masses)	1430	2615
30%	1450	2655
40%	1475	2690
50%	1500	2735
60%	1530	2800
70%	1560	2845
80%	1600	2919
90%	1660	3030
100%	2110	3825

[1] **Hanson, A.A., R.D. Moon, R.J. Wright, T.E. Hunt, and W.D. Hutchinson. 2015.** Degree-Day Prediction Models for the Flight Phenology of Western Bean Cutworm (Lepidoptera: Noctuidae) Assessed with the Concordance Correlation Coefficient. J. Econ. Entomol. 108:1728-1738. DOI: 10.1093/jee/tov110

[2] Model uses lower and upper thresholds of 3.3°C (38°F) and 23.9°C (75°F), respectively

WNY Pheromone Trap Catches: July 21, 2020

Location	ECB-E	ECB-Z	ECB Hybrid	CEW	FAW	WBC	DD to Date
Batavia (Genesee)	0	0	NA	0	0	43	2438
Bellona (Yates)	0	0	0	3	4	7	2448
Brockport (Monroe)	0	0	0	0	0	0	2526
Eden (Erie)	0	0	NA	6	8	1	2443
Farmington (Ontario)	0	0	0	0	0	1	2515
Geneva (Ontario)	2	0	0	0	0	1	2455
Hamlin (Monroe)	1	0	NA	2	0	0	2426
Kennedy (Chautauqua)	NA	NA	NA	NA	NA	NA	2309
Leroy (Genesee)	6	5	NA	7	2	0	2418
Lyndonville (Orleans)	0	0	NA	3	0	8	2362
Oswego (Oswego)	0	0	NA	0	0	8	2213
Panama (Chautauqua)	1	1	NA	1	0	2	2159
Penn Yan (Yates)	NA	NA	NA	NA	NA	NA	2366
Portville (Cattaraugus)	0	0	NA	0	0	6	2135
Ransomville (Niagara)	0	0	NA	1	0	0	2456
Seneca Castle (Ontario)	11	3	0	5	4	5	2399
Williamson (Wayne)	0	0	NA	0	0	0	2256

ECB: European Corn Borer; CEW: Corn Earworm; FAW: Fall Armyworm; WBC: Western Bean Cutworm; NA: not available; DD: Degree Day (mod. base 50F) accumulation

Average Corn Earworm Catch			
Per Day	**Per Five Days**	**Per Week**	**Days Between Sprays**
<0.2	<1.0	<1.4	No spray (for CEW)
0.2-0.5	1.0-2.5	1.4-3.5	6 days
0.5-1.0	2.5-5.0	3.5-7.0	5 days
1-13	5-65	7-91	4 days
over 13	over 65	over 91	3 days

Add one day to the recommended spray interval if daily maximum temperatures are less than 80F for the previous 2-3 days.

Western Bean Cutworm Report - Numbers are Increasing

Margie Lund, Cornell Cooperative Extension, Cornell Vegetable Program

Western Bean Cutworm (WBC) traps were set up adjacent to dry bean fields across the western NY region around the first of July, and have been monitored over the past three weeks. This week, we saw an increase in WBC at all locations, but none have yet reached a cumulative 50 moths per trap. Historically, peak flight for WBC is in the last week of July to first week of August. Both the trap reports and scouting corn in fields near dry beans can help determine the risk. Growers should scout adjacent corn fields when cumulative WBC have reached >50 moths per trap. Dry bean pod scouting should begin 7 to 10 days after peak emergence, regardless of cumulative WBC trap catch, and especially where WBC has been found in bean pods/seeds in recent years. This scouting should continue for three weeks.

See last week's issue of VegEdge, page 4, for scouting guidelines.

Western bean cutworm (WBC) trap set date and WBC adult numbers by date for each dry bean trap location.

Dry Bean Location	Trap Set	7/7/20	7/14/20	7/21/20	Cumulative WBC
Avoca Hill (Steuben Co.)	7/1/2020	0	0	23	23
Avoca Valley (Steuben Co.)	7/1/2020	1	0	6	7
Caledonia S (Livingston Co.)	6/30/2020	0	0	6	6
Caledonia SW (Livingston Co.)	6/30/2020	0	0	8	8
Geneva (Ontario Co.)	6/30/2020	0	2	13	15
Riga (Monroe Co.)	6/30/2020	0	1	24	25
Stafford (Genesee Co.)	6/30/2020	1	1	18	20
Wayland (Steuben Co.)	7/1/2020	0	2	4	6

Project funded by the NYS Dry Bean Endowment

Garlic Harvest Season Once Again

Robert Hadad, Cornell Cooperative Extension, Cornell Vegetable Program

As the wheat comes off, garlic harvest is about ready to go. Weather condition have been tough on garlic this cycle. Winter's lack of snow cover, mild conditions, and frost-heaving spring freezes have taken a toll on this crop. Stand-loss going into the spring was higher than average for some farms. Wet cold conditions slowed growth. Hot and dry days have stressed plants probably reducing overall bulb size. We didn't see too much in the way of insect damage generally speaking but wireworm and thrips did plague a few fields. Eriophyid mites may be a problem for bulb in storage.

Below is an article recently posted in UMass Extension's Vegetable Notes newsletter published 7/9/20. It is a compilation of sections from other articles mainly written by Dr. Ruth Hazard of UMass and Cornell Cooperative Extension's Crystal Stewart-Cortens from the ENY Commercial Horticulture Program. It is a great summary on harvest, curing, and storage practices.

GARLIC HARVEST, CURING & STORAGE

Harvest

Many farmers are beginning to harvest garlic, a big task that usually occurs around mid-late July. Timing the harvest can be tricky—heads should be left in the ground as long as possible to attain maximum bulb size (which doubles in the last stage of growth), but not so long that the cloves begin to separate, as overripe bulbs sell and store poorly. Harvest when leaves begin to turn yellow, but when about 60% are still green. Crystal Stewart-Courtens, Cornell Extension Vegetable Specialist, recommends checking bulbs by cutting through the head sideways to see how well developed the cloves are. Cloves should fill the wrappers - if they seem a little loose, the garlic has a little ways to grow, see photos. A little of the outermost wrapper may have started to discolor at this point. Harvest before the bulbs pop, which can happen relatively quickly, especially in a wet year. Remember that it is better to harvest too early than too late. Ms. Stewart-Courtens advises that plants should be pulled when there are a minimum of three leaves left that have not begun to brown at the tips. Use hand tools to loosen soil under the bulbs or a mechanical harvester to undercut the bed. Pulling bulbs out when they are tight in the ground can open wounds at the stem-bulb junction and allow for fungal infections. Fresh bulbs bruise easily and these wounds can also encourage infection. Don't knock off dirt by banging bulbs against boots, shovels, or buckets— shake or rub gently, and leave the rest to dry out during curing.

Curing

If short on curing space, tops can be cut in the field, with a sickle bar mower or by hand, down to 1.5 to 6 inches long. Cornell trials indicated that disease incidence does not increase when trimming garlic down at this stage, though leaving tops on can facilitate hanging.

Curing is important for successful bulb storage and finding the ideal conditions for curing can be a challenge. Curing in the field runs the risk of sunscald, while curing in poorly ventilated barns can result in yield loss from disease. Good airflow around the bulbs is critical. Avoid high temperatures (generally above 90°F) and bright sunlight. Ms. Stewart-Courtens notes that garlic will dry well at 110°F but at about 120°F waxy breakdown, a physiological disorder, starts to occur, so be sure to monitor temperatures in the drying area. Rapid curing can be achieved by placing trimmed bulbs roots up on 1" wire mesh in a hoophouse covered with a shade cloth, and with the sides and ends open. A well-ventilated barn will also work, but be sure that bulbs are hung with adequate air circulation or on open racks up off the floor.

Curing takes 10-14 days and is complete when the outer skins are dry and crispy, the neck is constricted, and the center of the cut stem is hard.

Storing Bulbs

After curing, garlic can be kept in good condition for 1 to 2 months at ambient temperatures of 68 to 86°F under low relative humidity (< 75% RH). However, under these conditions, bulbs will eventually become soft, spongy and shriveled due to water loss. For long-term storage, garlic is best maintained at temperatures of 30 to 32°F with low RH (60 to 70%). Good airflow throughout storage containers is necessary to prevent any moisture accumulation. Under these conditions, well-cured garlic can be stored for 6-7 months. Storage at higher temperatures (60°F) may be adequate for the short term, but it is important to select a place with low relative humidity and good air flow. As with onions, relative humidity needs to be lower than for most vegetables because high humidity causes root and mold growth; on the other hand, if it is too dry the bulbs will dry out.

Storing Seed

Garlic bulbs that are to be used as seed for fall planting of next years' crop should be stored at 50°F and at relative humidity of 65-70%. Garlic cloves break dormancy most rapidly between 40 to 50°F, hence prolonged storage at this temperature range should be avoided. Storage of planting stock at temperatures below 40°F results in rough bulbs, side-shoot sprouting (witch's-brooms) and early maturity, while storage above 65°F results in delayed sprouting and late maturity.

Management of White Mold in Beans

Julie Kikkert and Margie Lund, Cornell Cooperative Extension, Cornell Vegetable Program, and Sarah Pethybridge, Cornell University

Akin to a flush of germinating weeds after a rain, resting structures of the fungus that cause white mold in beans (*Sclerotinia sclerotiorum*) will likely germinate as rain (or irrigation) and cooler temperatures arrive as the bean growing season continues. These resting structures, called sclerotia, are hardened masses of the fungus which can survive for long periods of time in the soil. If you have ever had a crop with white mold in a field, it is likely there are sclerotia buried in the ground that may come to the surface with tillage or planting equipment. Under conducive environmental conditions, sclerotia at or near the soil surface form fruiting structures called apothecia. Although these tan, cup-shaped structures may sometimes be observed beneath the bean canopy, most people will never see them as they are very small, blend in with the soil, and often appear for only short periods of time. Mature apothecia release ascospores into the air, which are transported by wind and infect dying flowers leading to white mold.

WHAT IS THE RISK FOR WHITE MOLD INFECTION?

In regions where it has been hot and dry for the past few weeks, non-irrigated beans were at pretty low risk for infection. However, the risk for later planted beans is much higher, so make sure to consider the following when deciding to treat beans with a fungicide:

1. **Soil Moisture.** For germination of sclerotia to occur, the soil must be cool (40 to 60°F) and moist for 7 to 10 days prior to bean flowering. Often the soil under the canopy remains cool and moist throughout the day compared to bare ground.
2. **Crop Stage.** Ascospores only infect dying flowers. Growth of the fungus may subsequently spread from the flowers to pods and foliage.
3. **Environmental Conditions.** Infection requires extended periods (40 hours) of high humidity or foliage wetness and temperatures less than 85°F. The period when morning dews are common is usually high risk.
4. **Canopy Density.** In recent multivariate data analysis of risk factors, canopy density (i.e. ground cover) was the single most important variable. Dense plant canopies and other factors that reduce air flow increase the risk of white mold. Fields with trees around the borders, valleys where humidity and fog persist also carry more risk.
5. **Field History.** If susceptible vegetables, dry beans, soybeans, sunflowers, etc. have been grown in the field and had white mold, then it is likely that inoculum is present in sufficient quantity to cause disease. Sclerotia can survive for many years in the soil. It only takes one germinating sclerotia per row meter of beans to cause disease resulting in economic loss. Rotation with non-host crops such as grains and corn for 4 to 5 years is recommended.

MANAGEMENT OPTIONS FOR SNAP BEANS AND DRY BEANS

If you've decided that field history and environmental conditions warrant a fungicide application, there are several labeled products (see the 2020 Cornell Vegetable Guidelines). The sprays need to be applied to protect the flowers and timing is critical as no products will cure an infection after it has started.

Snap beans

1 open flower/plant in 10% of the plants; a second application may be considered at 100% bloom (this may happen within a day or two in some varieties in warm weather). Our recent research has focused on the products Endura, Topsin 4.5 FL, and Omega 500F. Each of these products is highly efficacious when applied at optimal timing and there was no significant difference in the disease control between the products. In further teasing out the optimal application timings, our research has shown that the optimal timing of Topsin 4.5 FL is at 10% bloom, and that this product is not effective when applied at 100% bloom. Furthermore, there is no benefit to a second application. Conversely, disease control with Omega 500F was not related to timing (10% or 100% bloom) and there was no benefit from a second application even when applied at 100% bloom. For growers who were not able to put on a spray at 10%, then Omega 500F would be the choice product to use. Timing of the other possible fungicides was not tested. Results of these studies can be found in the Proceedings of the 2017 Empire State Producers Expo at http://www.hort.cornell.edu/expo/2017proceedings.php.

Dry Beans

1 open flower/plant in 10% of the plants; a second application may be considered 10 to 14 days later. Endura, Topsin 4.5 FL, and Omega 500F have also shown good efficacy in dry beans. Like snap beans, fungicide application shows highest results when applied at early bloom stages (plants are between 10-50% bloom and small pods are present). Omega 500F has shown best results when applied to fields without dense canopy cover. In the case of a dense canopy, Topsin 4.5 FL or Endura should be considered. A first application of Topsin 4.5 FL followed by a second application of Endura has also shown effective control of white mold in dry beans.

OPTIONS FOR ORGANIC BEANS

Strategies include good crop rotation, manipulation of plant densities to improve air flow, maintaining good weed control, and selection of varieties that have a more open canopy. We have conducted extensive testing of OMRI listed products in our trials at Geneva. To date, the most efficacious and reliable product from year to year is Double Nickel (Bacillus amyloliquefaciens strain D747). Both the LC and 55 formulations are equally effective. While labeled at the rate of 1 to 2 quart/acre, there was no benefit of the higher rate, and thus 1 quart/acre is recommended. We continue to test additional products, including those under development and expect new registrations of efficacious products in the future. ●

CROP INSIGHTS

GENERAL
The weather trend has reversed and we've been lucky to receive ample rain across most of the region in the past week or two. All this moisture has helped refill farm ponds but it has also kicked off disease cycles. Many bacterial diseases are particularly favored in wet warm weather. - EB

BEETS
Harvest of the processing crop is scheduled to begin soon. Recent rains have helped move this crop along. However, in dense canopies there is a higher risk for leaf spot diseases. Cercospora (CLS) is becoming more prevalent, so be on the lookout. The forecast for CLS for our region is low to moderate for the remainder of this week. - JK

CARROTS
The crop is growing better with recent rain. Keep scouting for leaf diseases and leaf hoppers. - JK

COLE CROPS
Saw my first case of alternaria of the summer yesterday on a stressed and struggling portion of a cabbage planting. Scout your fields, especially if you have broccoli and cauliflower and have a plan in place to protect your plantings. Harvested plantings should be thoroughly destroyed to discourage population growth of swede midge, especially on organic farms. - EB

CUCURBITS
Downy Mildew (DM) is on the rise in our region! Be sure to scout and adjust spray programs to include DM active fungicides. Cucumbers and cantaloupes are the most susceptible, but all vine crops can be infected. - JR

Seeing an explosion of **bacterial disease in cucurbits**, with suspected Xanthomonas infections on butternut, patty pan, yellow squash, zucchini, and melons across the region. ManKocide is slightly better than copper alone against Xanthomonas. Angular leaf spot (Pseudomonas) bacterial infections may also be present and can be treated with copper. Some **alternaria** starting on cantaloupes. Seeing a little target spot on greenhouse cukes, though downy mildew is a larger concern. **Bacterial wilt** is taking out plantings of cukes, summer squash/zucchini, and even jack-o'lanterns where cucumber beetle protection was lax early in the season. Also seeing higher populations and reports of **squash vine borer** this summer. - EB

DRY BEANS
Green cloverworms have been found feeding in some dry bean fields this week. Dry beans can tolerate 25-30% defoliation by green cloverworms, so it is unlikely that chemical management will be needed in most cases. However, if defoliation is high, Baythroid XL can be applied to manage large green cloverworm numbers. Green cloverworms can be identified through their looping walking behavior (inchworm-like walk), green in color with one or two white stripes down each side and three prolegs mid-body, and wiggle movement when disturbed.

ONIONS
Direct seeded fields are solidly bulbing with 8-9 leaves and 1" bulbs. Early-maturing transplants have lodged completely and harvest will begin this week. Movement of Botrytis leaf blight (BLB) and onion thrips has been variable. Stemphylium leaf blight (SLB) is at the very beginning of moving from its back seat position as a secondary pathogen to the front seat as a primary pathogen. As a secondary pathogen, SLB casually invades necrotic leaf tissue including leaf tips, outer leaves and injured portions of leaves (weather or herbicide injury). It is characterized by tan colonization or "dirty"-appearing leaf tips/outer-leaf necrotic tissue and not well-defined lesions. As a primary pathogen, SLB becomes more "showy" with target spot lesions on necrotic tissue that progress from tan to black and purplish-red in color. The most progressed stage of SLB is when target spot lesions occur on green tissue and leaf dieback becomes excessive. Growers have been taking advantage of the secondary nature of SLB throughout July by using as much Bravo as possible and then saving most of their SLB sprays (FRAC 3 and 7) for August when SLB ramps up and becomes primary. In transplants and early-maturing direct seeded crops, it will not be a problem to finish the season with no more than 3 apps per FRAC 3 and only 1 FRAC 7 (Luna product), but crops in the ground longer will take a bit more strategic planning, and likely use of additional FRAC group(s), for proper fungicide resistance management. See June 24, July 1 and 15 issues of VegEdge, and Cornell "cheat sheets" on the Cornell Vegetable Program website for more information. Growers should also consider a protectant for downy mildew at this time, such a mancozeb.

Generally, fields have experienced a 1 to 2 week "ride with the momentum of Movento" and now thrips pressure is approaching the spray threshold for the next insecticide in sequence. Also, some growers have successfully cleaned up high populations of thrips along field edges with a border/edge spray of Radiant 8-10 fl oz/A. This is an effective strategy to manage thrips with reduced insecticide use, because it avoids treating an entire field that is generally below the spray threshold.

Thrips pressure & logical insecticide choice:
0.6 to 1.0 thrips/leaf – Agri-Mek SC 3.5 fl oz/A or EC formulation (e.g. Reaper) 14-16 fl oz/A
1.0 to 2.0 thrips/leaf – Minecto Pro 7-10 fl oz/A
>2.0 thrips/leaf – Radiant 8-10 fl oz/A

- Note, that all of these insecticides should be applied with a penetrating nonionic surfactant such as Dyne-Amic or Weatherguard.
- Agri-Mek and Minecto Pro have 30-day pre-harvest intervals, which is why they are positioned middle in rotation sequence instead of last when the PHI may exceed actual days to harvest.
- Agri-Mek may be tank mixed with Warrior for an extra "kick" against thrips. We have experienced mixed results in the field regarding the benefit of this tank mix.
- Brace for significant influxes of thrips coming out of early-maturing fields as they are pulled and harvested. Neighboring field borders may benefit from edge/border sprays, or Minecto Pro/Radiant may be selected over Agri-Mek for a more potent defense.

continued on next page

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- See Cornell "Quick" Guidelines for Onion Thrips Spray Decisions on the CVP website, and article in July 8 issue of VegEdge. - CH

Bacterial rot and some stemphylium is starting in fresh market, upland sweets as they mature. Both of these diseases should be taken seriously. Removing bulbs showing foliar collapse due to rot will help mitigate stemphylium by removing highly susceptible tissue. - EB

PEAS

Harvest of the processing crop is ongoing and will wrap up at the end of this month. While stands of peas were very good starting out the season, the heat and drought took a toll on yields despite some fields being irrigated. Slugs were not a big issue during the drought period. Pressure from aphids was higher than usual this year, but most of the fields were not sprayed. Fields in the southern tier that are being harvested this week are yielding well, as that area has had more frequent rain. - JK

PEPPERS

Continue to monitor soil moisture to prevent Blossom End Rot. - JR

Aphids and thrips are present in many fields. However, in each case beneficials have moved in with a week or two and have kept the pest populations in check. Aphid pressure should be monitored since they can quickly multiply. Tarnished plant bugs are feeding in many pepper plantings. Heavier pressure can occur where pigweed is poorly controlled. Seeing more bacterial spot infections in this weather. - EB

POTATOES

Colorado potato beetles (CPB) are now laying a second generation of eggs in potatoes. Some small-medium larvae are also being seen in fields. Potatoes should be scouted (25 plants checked per field) to check for CPB numbers across the field. Chemical treatment should be considered if the following CPB numbers are observed: >23 adults/25 plants, >200 small larvae/25 plants, >68 large larvae/25 plants.

This week, over half of the stations have exceeded the threshold of 30 Blight Units (BU) through the forecast period, including Arkport, Baldwinsville, Ceres, Elba, Fairville, Farmington, Fulton, Lyndonville, Medina, Niagara Falls, Penn Yan, Rochester, Versailles, and Wellsville. A BU of 30+ indicates the need to spray for late blight. All stations have surpassed the threshold of 15 Fungicide Units through the forecast period, signaling the decline of fungicide residue and suggesting the need for additional fungicide sprays. The chart assumes use of a susceptible potato variety, and an application of chlorothalonil. Because weather conditions can vary depending on topography and altitude, the recent disease information and disease forecasts will be most accurate very close to the weather station used. For locations that are not close to a weather station, forecast information should only be used as a general indication of how favorable weather has been for late blight. Forecast BUs are subject to changes as the weather forecast changes, so check forecasting tools regularly to see if disease forecasts have changed. Information for other weather stations can be found on NEWA's website. On a national level, late blight was reported on tomato in North Carolina this week, adding to past reports in FL and AL. No late blight has yet to be reported in NYS. - ML and JG

New Late Blight Risk Chart, 7/21/20

Location	Blight Units[1] 7/15-7/21	Blight Units[2] 7/22-7/24	Location	Blight Units[1] 7/15-7/21	Blight Units[2] 7/22-7/24
Albion	7	15	Hammondsport	0	18
Arkport	11	20	Knowlesville	12	13
Baldwinsville	16	19	Lyndonville	11	20
Bergen	7	17	Medina	13	19
Buffalo	10	17	Niagara Falls	20	20
Burt	1	17	Penn Yan	24	19
Ceres	32	21	Rochester	18	16
Elba	12	21	Sodus	NA	NA
Fairville	12	18	Versailles	21	20
Farmington	22	16	Wellsville	31	20
Fulton	31	17	Williamson	7	18
Geneva	5	16			

[1] Past week Simcast Blight Units (BU)
[2] Three-day predicted Simcast Blight Units (BU)

SNAP BEANS

Diseases to be on the lookout for at this time are bacterial leaf spot and Pythium crown rot, both of which often develop after rainstorms. Pythium has dry, reddish brown to black streaks on the crowns and lower stems that cause the plants to wilt and die (see left photo). The risk of white mold is highest where canopies are closed and in fields with a history of white mold. White mold can be distinguished from Pythium by the mounds of white, cottony mycelium and wet, brown to black streaks on the stems (see right photo). See the general white mold article on page 7. - JK

Pythium crown rot on beans (left). White mold on bean stems (right). *Photos: J. Kikkert, CVP*

SWEET CORN

Sap beetles are starting to show up. Small populations may not be a bother but if there are larger numbers then damage to the silks is possible. This will then affect ear tip quality. More on this pest next week. - RH

Sap beetles are small, slightly elongated insects seen on sweet corn damaging silks. *Photo: Cornell U. Pests of the Northeast*

TOMATOES

See cover article on Corn Earworm (CEW) in high tunnels. CEW moths will lay eggs in field plantings of tomatoes. There are more spray options on outdoor than indoor tomatoes. These sprays may help with the lingering Western Flower Thrips populations we've found in tomatoes this week. - JR

Early blight and septoria have been kicked off by splashing with all these heavy rains. - EB

Foliar Leaf Sampling in Small Fruits – Late July Through Early August is the Target Time

Laura McDermott, Cornell Cooperative Extension, ENY Commercial Horticulture Program

[With harvest season in full swing for raspberries, blueberries and currants/gooseberries, the main issue is staying on top of SWD sprays. Late strawberries are still being renovated. The other significant berry activity is leaf/tissue sampling, which should happen in the next few weeks. It's easy to miss in the crush of harvest, but leaf sampling is an important step in understanding and managing berry nutrition. If you haven't taken a soil sample in a few years, it's never a bad idea to send some soil in for evaluation as well - it can really help direct appropriate actions to take. ed. E. Kibbe, CCE Harvest NY]

One of the best ways to monitor small fruit nutritional status is to do regular foliar testing. This allows growers to monitor performance over many seasons, and to provide individualized fertilizer programs where necessary. Soil tests provide a baseline, but the foliar tests are the 'dietary plan'.

Timing is everything. Late July to mid-August allows most of the fruit plants to finish their spring growth, but it's before the plant starts to move nutrients to the roots and crown in preparation for dormancy. Make sure also to gather a representative sample. The leaves should be distributed from plants throughout the field. If there is a problem area it would be great to do a broad field test – and then a targeted sample from leaves gathered from low vigor plants.

Wash dirt and spray residue off collected tissue using distilled water if possible. Blot off excess water, place tissue in a paper bag, allow tissue to air dry and then send to: Agro-One, 730 Warren Rd., Ithaca, NY 14850. Visit the Dairy One website, Plant Tissue Analysis (https://dairyone.com) for more information about this process, plus the correct forms and testing kits to include with submission. The cost is approximately $27 per sample.

Strawberries: Collect a minimum of 30 trifoliate leaves that are fully expanded after renovation in July or August. Day Neutral strawberries can be sampled at any time, but you should note the stage of bearing for them. Also, use a lab that can definitely give me results for this atypical crop.

Raspberries: For floricane varieties, collect 30 of the newest fully expanded trifoliate leaves from primocanes in early August. For fall raspberries (primocane varieties), sampling timing maybe a little tricky; and it is good to have soil analysis that is not less than two years old to compliment the leaf analysis. For example – foliar analysis in an early fruiting year showed low Potassium; soil levels were adequate. Probable explanation – fruit acting as a sink for foliar potassium.

Blueberries: Collect 30-50 newly expanded leaves from well-exposed branches in late July or early August. Blueberries often have 2 flushes of growth during season. Leaves for analysis should be fully expanded new growth from 1st flush, not second. Foliar analysis in new blueberry plantings may be beneficial but sometimes produce rather erratic results. This is attributed to the need for 4-5 years to pass after planting for plants to settle down and juvenile growth spurts to be over. Age usually calculated from when plants go in the ground; transplant age not necessarily included in calculation in this respect (i.e. 3 year old transplants, planted 3 years probably still in juvenile growth spurt.)

Currants and Gooseberries: Collect 30-50 newly expanded leaves from well-exposed branches in late July.

The Heat is On!

Steve Reiners, Cornell University, Cornell AgriTech

Although the last few weeks have brought much needed rain to New York, temperatures remain way above normal. These extreme temperatures can lead to lots of problems with vegetables.

Heat impacts vine crops like squash, melons, pumpkins and cucumbers both directly and indirectly. High temperatures lead to more male flowers at the expense of females. And it's the female flowers we need to get fruit. Plus, hot days keeps bees from foraging and pollinating. So even with female flowers, you may notice them fall off as bees failed to do their job.

Tomatoes are not immune to the heat either. Although we think of them as heat loving plants, they prefer more seasonable summer temperatures. Hot days over 90F and warm nights over 80F results in pollen sterility. Similar to squash, without viable pollen, you may notice flowers and pea-sized fruit fall off the plants.

The condition is temporary, and fruiting will return to normal when it cools down. But that might explain the lack of fruit you might see about six weeks from now. That's just about when the fruit that should be setting now would be ready for harvest. Peppers too have a similar problem with fruit and flower excision.

Snap bean flowers may also abort in the heat and result in split sets, which can reduce yields considerably.

The heat causes quality problems too. Cucumbers become more bitter due to a high level of cucurbitacin, a compound that occurs naturally in the fruit but usually at low levels. Stress of any kind tends to increase its level. Tomatoes and peppers will develop more blossom-end rot as drought stress reduces calcium uptake.

Sunscald is also a problem. Fruit exposed to temperatures greater than 95F can experience yellowing and browning while temperatures 5 to 10 degrees higher can cause necrosis and death of tissue. Maintain good foliage cover and fruit shading by managing diseases and optimizing soil fertility. Be careful when harvesting sensitive crops like peppers as broken branches expose previous hidden fruit.

Silk emergence and pollen shed timing in sweet corn can be uncoupled by heat. Heat and dry winds also reduce pollen germination and pollen tube development. This results in missing kernels and poor tip fill.

Hot, stagnant air masses may lead to ozone damage on crops. Common ozone symptoms are small, irregular, shaped spots that range in color from dark brown to black (stipple like) or light tan to white (fleck like). These spots are found only on the upper surface of the leaf.

Very young and old leaves are less susceptible to ozone while newly mature leaves are the most susceptible. With severe damage, symptoms may extend to the lower leaf surface. Flecks from insect feeding are usually spread uniformly over the leaf surface while ozone flecks are concentrated in specific areas, usually most pronounced at the leaf tip and along the margins.

The most sensitive crops include: Bean, Broccoli, Muskmelon, Squash, Onion, Potato, Radish, Spinach, Sweet Corn, Tomato. Intermediate crops include: Carrot, Endive, Parsley, Parsnip, and Turnip. Tolerant crops include: Beet, Cucumber, and Lettuce

The best thing you can do to reduce heat problems is to maintain your irrigation program. Dry soils make problems worse. To keep plants from wilting, water needs to move continuously from the soil into the roots and up through the leaves. The water is needed for photosynthesis which of course powers the plant. But it also cools the leaf as it evaporates.

If it's dry, the small pores on the leaves called stomata close. That stops water from evaporating from the leaves. This not only shuts down photosynthesis but causes leaves to heat up.

Weather Charts

John Gibbons, CCE Cornell Vegetable Program

WEEKLY WEATHER SUMMARY: 7/14/20 - 7/20/2020

	Rainfall (inch)		Temperature (°F)	
Location**	Week	Month July	Max	Min
Albion	1.28	3.07	88	61
Arkport	0.32	1.70	86	55
Bergen	2.02	4.20	90	58
Brocton	1.88	4.28	88	59
Buffalo*	1.10	2.78	89	64
Burt	0.33	0.83	89	58
Ceres	3.44	4.24	87	54
Elba	2.51	3.55	87	58
Fairville	1.29	2.24	90	58
Farmington	2.08	4.53	90	59
Fulton*	0.87	3.42	91	60
Geneva	1.21	2.69	89	60
Hammondsport	0.34	1.39	91	58
Hanover	1.61	2.66	88	57
Lodi	0.29	1.51	89	60
Niagara Falls*	0.51	1.42	87	60
Penn Yan*	0.11	2.41	93	62
Rochester*	1.77	5.13	90	61
Sodus	NA	NA	NA	NA
South Bristol	0.75	2.69	89	59
Varick	NA	NA	91	60
Versailles	1.14	1.94	87	57
Williamson	1.63	2.93	90	60

ACCUMULATED GROWING DEGREE DAYS (AGDD) BASE 50°F: APRIL 1 - JULY 20, 2020

Location**	2020	2019	2018
Albion	1356	1178	1431
Arkport	1157	1103	1463
Bergen	1320	1144	1344
Brocton	1298	1176	NA
Buffalo*	1365	1169	1504
Burt	1257	1050	1284
Ceres	1114	1161	1249
Elba	1275	1100	1353
Fairville	1284	1088	1291
Farmington	1309	1118	1339
Fulton*	1321	1076	1323
Geneva	1345	1184	1381
Hammondsport	1282	1133	1317
Hanover	1297	1172	1407
Lodi	1353	1215	1420
Niagara Falls*	1319	1122	1555
Penn Yan*	1389	1238	1446
Rochester*	1358	1271	1533
Sodus	NA	1064	1283
South Bristol	1286	1122	1332
Varick	1408	1252	1445
Versailles	1261	1165	1374
Williamson	1256	1045	1256

*Airport stations
** For other locations: http://newa.cornell.edu

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VEGEdge

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VegEdge is the highly regarded newsletter produced by the Cornell Vegetable Program. It provides readers with information on upcoming meetings, pesticide updates, pest management strategies, cultural practices, marketing ideas and research results from Cornell University and Cornell Cooperative Extension. VegEdge is produced every few weeks, with frequency increasing leading up to and during the growing season.

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