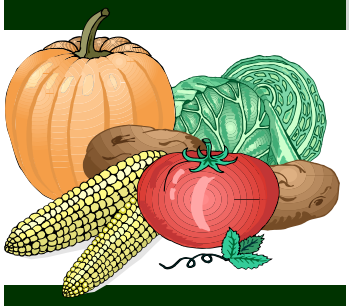

Veg Edge Weekly

Cornell University
Cooperative Extension
Cornell Vegetable Program

July 11, 2012 **Volume 8, Issue 16**

Beneficial Insects to Know and Love

by Abby Seaman, NYS IPM Program

Did you know that only about 1% of insect species are pests? The rest are either beneficial or just passing through your fields. That's why it's important to be able to accurately identify beneficials as well as pests, so you don't inadvertently wipe out a nice population of good guys that you've mistaken for bad guys. In this article I'll describe some of the most common natural enemies and what pests they can help control in the field. All are naturally occurring, and some can also be purchased from an insectary and released.

Lady beetles are a common and widely recognized predaceous insect. The adults are often red with black spots, but some species are black with red spots, and one common species has a black and yellow checkerboard pattern. Both the adult and larval stage are predators. They overwinter as adults, emerging in early spring to feed on the nectar and pollen of early flowering plants. Adult females lay clusters of cream, yellow, or orange eggs on plant leaves (Fig. 1), often near concentrations of prey. The black alligator-shaped larvae (Fig. 2) are less widely recognized that the adults, but are also predators on aphids, insect eggs, and newly hatched insects. Adult lady beetles may be purchased from insectaries and are most useful when released in a greenhouse situation.

Figure 1. Lady beetle eggs (left)

Figure 2. Lady beetle larva (below)

The common green **lacewing** is native to much of North America. The larvae are aggressive predators, feeding on aphids, insect eggs and small larvae. Green lacewing adults are not predators, instead feeding on nectar and aphid honeydew. Adult lacewings are about ½-1 inch long, with long antennae. Large, transparent wings are held upright over a fragile body (Fig. 3). Adults

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are active flyers, particularly during the evening and night. The small, oval, white to gray eggs are deposited on a stalk that holds them above the plant surface (Fig. 4). The larvae are pinkish brown and cream, and have alligator-like prominent pincher "jaws," which they use to suck the juice from prey (Fig. 5). They are very mobile and aggressive predators and grow from <1/16 to 1/4 inch long through three instars. Lacewings may be purchased in the egg or larval stages for release.

Figure 3. Lacewing adult (left)

Figure 4. Lacewing eggs (middle)

Figure 5. Lacewing larva eating aphid (below)

Predaceous bugs in the genus *Orius* are typically called **minute pirate bugs,** although that is the official common name for only one of these species. Adults are very small (1/16 inch) and black with white wing patches (Fig. 6). The females lay tiny white or clear eggs within plant tissue where they are rarely seen. The nymphs are yellow-orange and brown in color, teardrop-shaped and fast moving (Fig. 7). The minute pirate bug preys on thrips, all stages of spider mites, aphids, insect eggs, some small caterpillars, and small insects. Minute pirate bugs can be purchased for release.

Figure 6. Adult Orius sp.

Figure 7. Orius sp. nymph

Adult **hover flies**, also known as **syrphid flies**, resemble small bees or wasps and are usually seen on or near flowers (Fig. 8). They range in size from quite small to a little larger and narrower than houseflies. The female lays single, small, white, elongated eggs near or among aphid infestations. When the larvae hatch, they are typically small cylindrical, legless maggots, varying in color from cream to green to brown (Fig. 9), that feed on primarily on aphids, small caterpillars, and possibly thrips.

Figure 8. Adult Syrphid fly (left)

Figure 9. Syrphid fly larva feeding on aphids (below)

Several species of parasitic wasps attack aphids. **Aphid parasitoid** adults are very small, dark wasps with long antennae (Fig. 10). The female lays eggs inside aphid nymphs. One larva develops within each parasitized aphid. The larva either emerges to spin a cocoon under the dead aphid or pupates within the tanned and mummified aphid body (Fig. 11). Aphid parasitoids can be purchased for release, and can be especially useful in a greenhouse setting.

This is just a small sample of the many naturally-occurring beneficial insects helping prevent pest outbreaks. To learn about more, visit these online resources:
http://www.biocontrol.entomology.cornell.edu/
http://www.oardc.ohio-state.edu/ale/images/Natural_Enemies_1_page_handout.pdf ■

Figure 10. Aphid parasite wasp

Figure 11. Aphid mummies

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Figure 2: Joe Ogrodnick

Armyworm Adults Emerge from First Generation Infestations

Dan Olmstead and Tony Shelton, Cornell University

Common armyworm, *Psuedaletia unipuncta* (Haworth), is an annual spring migrant to the northeastern United States. In May and June of this year (2012), first generation larvae caused significant damage to pastureland, cereal crops, and early corn plantings across New York State. Heliothis traps baited with *Helicoverpa zea* pheromone lures at the Cornell University Agricultural Experiment Station captured adult males of *P. unipuncta* approximately 2-3 weeks before widespread reports of caterpillar damage began to appear. Beginning June 25 2012, traps again began capturing adult armyworm moths and an average of 4.1 per trap have been collected to date. In contrast, an average of 1 moth per trap was captured from the same sites prior to the first outbreak.

Many factors will influence the probability of a second widespread armyworm outbreak. According to Elson Shields at Cornell, the same behavior that makes this insect an effective long-ranged migrant also kicks in for the 2nd generation and will likely lessen the potential for a second outbreak.

Armyworm moths are programmed to fly a distance before eggs are laid, so they will not be so concentrated as they were during the first generation when incoming migrants were concentrated in weather systems and dropped out in very high numbers over a relatively small area. In the 2nd generation they will be dispersed over a much wider habitat.

However, growers should be alert since pheromone trap catches are increasing and we are starting to see the 2nd generation. These moths, will lay eggs in coming days and weeks, but we are not sure where. Thus, it would be advisable to monitor all stages of field and sweet corn, cereal grains, forage and pasture for larvae. When preferred food sources become scarce, caterpillars will go to a variety of other vegetable crops or weedy plant species, but will avoid legumes such as alfalfa, beans and clover.

Reports have indicated that pyrethroid insecticides will provide good curative control but are short-lived. Additional reports have indicated that products containing flubendiamide and chlorantraniliprole provided good preventive control for fall armyworm (a related species) and are likely to be effective against common armyworm as well. These will last longer, but require additional time to become effective. A test we conducted this year indicated that Entrust, a product available to organic growers, provided good control. As always, check the labels before applying an insecticide. ■

Common armyworm.
Photo courtesy of Mike Stanyard, NWNY Team

WNY Sweet Corn Pheromone Trap Network Report, 7/10/12

Abby Seaman, NYS IPM Program

E race European corn borer catches increased slightly this week, indicating the beginning of a second generation flight that is much earlier than usual. Degree day accumulations also suggest that this is the beginning of the second generation flight. Z race ECB catches also increased at some locations. Corn earworm and fall armyworm catches remain low across the area, while western bean cutworm are being caught in more locations, and in increasing numbers, with 23 caught in Kennedy this week.

True armyworm are being caught in corn earworm traps last week and this week, indicating that a second generation of this pest is getting started. Above is information on armyworm biology and management from Dan Olmstead and Tony Shelton of Cornell. ■

WNY Pheromone Trap Catches: July 3, 2012

Location	ECB-E	ECB-Z	CEW	FAW	WBC
Baldwinsville (Onondaga)	10	0	2	0	0
Batavia (Genesee)	0	0	0	1	4
Bellona (Yates)	0	0	0	1	0
Eden (Erie)	NA	NA	NA	NA	NA
Farmington (Ontario)	4	0	0	1	0
Hamlin (Monroe)	1	4	0	0	8
LeRoy (Genesee)	0	6	0	0	5
Lockport (Niagara)	0	0	2	0	0
Olean (Cattaraugus)	0	0	0	0	2
Penn Yan (Yates)	4	1	0	0	0
Spencerport (Monroe)	0	0	3	0	0
Waterport (Orleans)	0	0	0	0	2
Williamson (Wayne)	0	1	0	0	4

ECB - European corn borer
CEW - corn earworm
FAW - fall armyworm
WBC - western bean cutworm
NA - not available

Potato Disease Management for 2012

Thomas Zitter, Cornell (edited by C. MacNeil, Cornell Vegetable Program)

Potatoes (fresh market, processing, and niche market) are widely grown in NYS. Disease control is important for yield, marketability and storage capabilities. Management strategies need to include the following:

1) Early blight (EB) (Fig. 1) occurs every season. In general, early and mid-season varieties are quite susceptible and may need earlier and more protection. "Target"-like roundish lesions are typical. Rotation away from Solanaceous crops can reduce the severity.

2) Use of disease-free seed tubers is critical to preventing the introduction of late blight (LB) *Phytophthora infestans* (Fig. 2) into the field. Once LB is introduced into an area, timely monitoring of weather conditions, choosing the most appropriate fungicides, and applying them in a timely manner are needed to optimize control.

3) Crop rotation is critical to reduce overwintering inoculum for black dot (BD) *Colletotrichum coccodes* (Fig. 3). A minimum 3 year rotation out of all Solanaceous crops is needed. Infection of leaves causes tiny, inconspicuous lesions. With stem infection the diseased surface tissue can be easily rubbed off. A timely foliar fungicide spray (mid-July to early August) can reduce the early dying, as well as reduce the number of spores which can wash down to the soil to cause tuber infection.

4) Tuber blemish diseases like black dot (BD) have assumed more importance now that washed tubers have become the marketing norm. Inoculum from BD stem infections can wash down to the soil to infect the tubers. Individual dots (microsclerotia) appear on the tuber surface (L), mostly in round discolored patches (M), but can develop into sunken lesions once in longer storage (R).

Figure 1. Early blight *Alternaria solani*

Figure 2. Late blight, on foliage (left) and on tubers (right).

Figure 3. Black dot on stem.

Figure 4. Individual dots (microsclerotia) appear on the tuber surface (left), mostly in round discolored patches (middle), but can develop into sunken lesions once in longer storage (right).

If you choose to use foliar fungicides, then spray preventatively as determined by scouting [and disease forecast programs, such as Blitecast or the LB Decision Support System for LB]. For LB also follow the tracking maps at USAblight.org and spray preventatively.

The table on the next page provides a listing of fungicides for conventional and organic use. To prevent resistance from developing, follow the label to avoid making sequential applications before alternating to a fungicide with a different Mode of Action (MOA). Additional Potato Disease Resources at: http://vegetablemdonline.ppath.cornell.edu/NewsArticles/NewsList.htm ■

Partial Listing of Foliar Conventional, Organic (OMRI) and Home Garden Potato Fungicides for Selected Diseases
Prepared by T. A. Zitter, Dept of Plant Path & Plant-Microbe Biology, Cornell University, Ithaca, NY. JULY 2012; edited by C. MacNeil, CVP

Fungicide Information					Foliar Applications										
Fungicides if UNDERLINED, are registered in NYS. * = Restricted for use by certified applicator. OLP = other label products are available. See OMRI: http://vegetablemdonline.ppath.cornell.edu/NewsArticles/OMRI%20Product%20List%20June%202012.pdf for list of all registered products.					Leak-*Pythium*	Pink Rot-*P.erythroseptica*	Black dot on foliage	Black dot on tubers	Late blight on foliage	Late blight on tubers	Early Blight-*A. solani*	Brown spot-*A. alternata*	Gray Mold-*B. cinerea*	White Mold-*S. sclerotiorum*	Comments below are to assist in the appropriate use of these products. Read the label for rates, uses and specific diseases.
Trade Names	MOA	*Common Name*	Activity	REI (hrs)											Comments
Protectants, Contact only; Conventional and Organic															
C Bravo WS or OLP	M5	*chlorothalonil*	C	12			G		G	P	G		G		Alone or TM partner.
C Dithane DF or OLP	M3	*mancozeb*	C	24					G	P	G				Alone or TM partner.
C Polyram 80DF	M3	*metiram*	C	24					F	P	G				Alone or TM partner.
C Agri-Tin* SuperTin*	30	*triphenyltin hydroxide*	C	48					F		G				Alone/TM; Su CPB; *Restricted
C Ranman	21	*cyazofamid*	C	12					G	G					TM for EB control.
C Gavel 75DF*	22+M3	*zoxamide + mancozeb*	C	48					G	G	G				*Restricted.
O Champ WG or OLP	M1	*copper hydroxide*	C	24					F-G	P	G				7 other OMRI coppers registered.
H Bonide Copper	M1	*basic copper sulfate*	C	12					F-G	P	G				Other coppers exist.
H Bonide Fung-onil	M1	*chlorothalonil*	C	4					G		G		G		other chlorothalonils exist.
Translaminar (upper to underside of leaf); Conventional only															
C Quadris Opti	11+M5	*azoxystrobin + chlorothalonil*	TL	12			E	G	F	P	G				EB *Resistance resolved by TM*
C Quadris Top	11+3	*azoxystrobin + difenoconazole*	TL	12			E	G	F	P	G	G			EB *Resistance resolved by TM*
C Cabrio Plus	11+M3	*pyraclostrobin + metiram*	TL	24			G	G	F	P	G			Su	EB *Resistance resolved by TM*
C Revus Top	40+3	*mandipropamid + difenoconazole*	TL	12			G	G	F	F	G	G			Quite broad spectrum
Systemic, Locally Systemic (leaf base to tip), or Contact; Conventional only															
C Curzate, TM	27+?	*cymoxanil + pro-tectant required*	Sy	12					F-G	P					Needs mod. temps, active growth for effectiveness LB
C Presidio*, TM	43+?	*fluopicolide + protectant*	C	12					E	E	G				TM requirement; *Restricted
C Previcur Flex*, TM	28	*propamocarb + protectant*	Sy	12					G	Su	G				Other diseases- TM; *Restricted
C Quash	3	*metconazole*	LS	12			G	G			G	G	Su	G	TM for LB control
C Ridomil Gold Bravo or OLP	4+M5	*mefenoxam + chlorothalonil*	Sy	48	F	F	F		G	G	G		G		Only LB control for US22$^{P\&T}$, US23$^{P\&T}$, US24^{P}.

TM = tank mix

Mode of Action (MOA):
If M = multisite

Activity:
Sys = systemic
LS = local systemic
C = contact

Rating:
P = poor
F = fair
G = good
Su = suppression

MOA: http://www.nysaes.cals.cornell.edu/recommends/2frameset.html. Go to Chemicals, Fungicides.
Pesticide details: http://vegetablemdonline.ppath.cornell.edu/NewsArticles/Potato_LabRates_Roster.pdf or see the label.

CROPS Tidbits & Insights

According to the USDA Drought Monitoring service, western NY is suffering from abnormally dry conditions which categorize the region as being in a drought. No surprise there if you have been out there moving irrigation lines for weeks now but now it is official. Believe it or not we are only in the "Abnormally Dry" segment while many of our vegetable growing neighboring states are in worst stages. Central and Eastern NY have caught more rain and are faring a little better.

CABBAGE & COLE CROPS

Worm pressure has increased over the past week, especially cabbage looper, which has gotten big in some fields – see relative efficacy of insecticides for worm control table on page 7 of this issue. **Reminder – the stop use date for Thionex 3EC & 50W (a.i. endosulfan) in cole crops is July 31, 2012.**

DRY BEANS

Potato leafhopper populations remain high on crops in the region so check your fields regularly, especially if Cruiser was not used on your seed, and especially if hay or roadsides are mowed nearby. Some beans were burned by post-emergence herbicide sprays last week, even when no oil or nitrogen were used. Young, emerging leaves were also burned just by the high temps and wind last week. Spraying at 85+ degrees F is risky, as is spraying when beans are under heat or drought stress. If you must spray on a hot day to control the weeds before they get too big then do so just as soon as it's light enough to see in the morning. Stop spraying well before temps get hot. We're beginning to catch a few Western bean cutworm moths in the traps but there's no cause for concern at this point.

GREENS

Heat stress is causing some types of greens (lettuce, chard, mustards) to have a bitter flavor. Frequent waterings (almost daily) are needed rather than less frequent heavy waterings to reduce water stress. Another factor affecting flavor is slow growth. Applying nutrients at least once a week to keep the plants actively growing is essential. Running fertilizer through a drip line can go a long way with keeping lettuce and other greens sweet tasting.

ONIONS

In line with the early theme for the 2012 growing season, the first onions of the season were harvested (although on the green side) last week in Elba! The crop is dry, but still holding up very nicely as growers continue to irrigate. Several direct seeded fields are in the midst of Movento sprays and this insecticide is doing a fantastic job of keeping onion thrips under control – see last week's issue of VEW for thrips insecticide reminders. New research results show that Warrior could have a fit in the 2012 onion thrips insecticide lineup – see article, page 10. Humid weather and dewfall at night allow leaf diseases to develop in spite of hot and windy daytime conditions. This week tip burn and outer leaf dieback started to show up. his is generally normal after bulbing begins as the plants are pulling nutrients out of the leaves into the bulb. It is also a sign that plants are under stress, and it can be a fine line distinguishing between normal and stressed. At any rate, this makes plants more prone to Purple Blotch, which usually shows up in early to mid-July. **At this time, all transplanted and direct seeded fields should be sprayed with fungicides for Purple Blotch** – see article, page 9.

POTATOES

More and more fields are flowering and filling the rows. Potato leafhopper populations remain high on crops in the region so check your fields regularly, especially if a systemic insecticide was not used at planting/on seed, and especially if hay or roadsides are mowed nearby. With this period of hot, dry weather also watch for two spotted spider mites, which occasionally cause yellowing circles in field areas near dusty farm lanes. Marcy, Nordonna and E11-45 are particularly susceptible. Check leaf undersides with a hand lens for the tiny red spotted mites and their fine webs. Don't wait to treat! For the threshold and controls go to http://www.nysaes.cals.cornell.edu/recommends/24frameset.html Insects, then Spider Mites.

Colorado potato beetle (CPB) summer adults will be emerging soon. They often emerge in large numbers after a rain (or irrigation) that was preceded by a dry period. Repeating Brian Nault's, Cornell, message in the March *Veg Edge* article: Do not use neonicotinoid insecticides (imidacloprid or thiamethoxam) against summer adults if you used one of them at planting/on seed. Foliar neonicotinoid-containing insecticides include: Admire Pro, Actara, Couraze, Impulse, Nuprid, Pasada, Prey, Montana, Leverage and Endigo ZC. To slow down the development of CPB insecticide resistance, or to manage resistance that has already developed, insecticide classes should be rotated, meaning that insecticides with the same mode of action should not be applied to two different CPB generations in the same season. If you used a neonicotinoid at planting then alternatives in a different class include: Coragen, Voliam Xpress, Radiant, Black Hawk or Agri-Mek. Note: The latter three are more effective against larvae than adults. Do not apply insecticides below labeled rates as this may increase risk resistance. See also the 6/13 *Veg Edge Weekly* article on Potato Pests for a chart of the newer potato insecticides and what pests they control.

(info from Zsofia Szendrei, Michigan State University Extension News, 7/9)

PROCESSING CROPS

Peas - Yields continue to decline due to heat and drought. Growers are irrigating where possible.

Snap beans - Harvest is beginning for Seneca Foods this week. Heat and drought continue to be the biggest challenge at this time. Beans are at all stages of development as late plantings are still going in as well. Beans being irrigated will be at greater risk for disease.

Sweet corn - Second generation armyworm is predicted in the coming weeks. It is advisable to monitor sweet corn during this period (see article by Shelton and Olmstead in this issue, page 3).

CROPS Tidbits & Insights

SWEET CORN

Dry conditions have begun to stunt some non-irrigated plantings. Pollen becomes less viable when temperatures move up into the high 80's and 90'sF. Maturity quickens with extreme/prolong heat and dryness so what we see is that the interval between succession plantings shortens.

With dry conditions, the possibility of two spotted spider mites feeding on leaves. Numbers can build up enough to cause injury. Sap beetles can also build up in the silks and become damaging.

VINE CROPS

Downy mildew (DM) has spread into Michigan in cucumbers. Reports have also confirmed DM in Lancaster County, PA on cucumbers. DM has been found on giant pumpkins and cantaloupe in NC. Preventative applications of products like Bravo are advised. Cool night temperatures bring overnight dews which can last long enough for spores to infect leaves.

Squash bugs have been busy laying eggs and young are now hatching. Feeding damage can be seen on the leaves of zucchini and summer squash. Several of the same products used for striped cucumber beetles also are affective for squash bugs.

Aphids can be a problem on squash. They do not overwhelm the plant with feeding damage but periodically they can carry a virus that can be very destructive. If you are not treating vines for striped cucumber beetles or squash bugs, then be extra vigilant for aphids.

Control of Worm Pests in Cole Crops

C. Hoepting, CVP: Following is a list of insecticides labeled for use on various cole crops with tentative efficacy ratings for control of imported cabbage worm (ICW), small and large cabbage looper (CL) and diamondback moth (DBM), which was put together by Cornell researchers in Long Island. Growers and other researchers may have somewhat different opinions and results vary according to rates, application method and frequency, location, etc. so selection of controls should not be made solely based on this chart. Not all materials are labeled for all crops or areas - check labels. For most cole crops, addition of a spreader-sticker is advised.

Relative Efficacy of Insecticides for Control of Worm Pests in Cole Crops

Material, Formulation & *Rate*	ICW	Sm CL	Lg CL	DBM[3]
Ryanodine receptor modulator (Group 28)				
Synapse WG *(3-5 fl oz)*	xxx	xxx	xxx	xx
Spinosyns (Group 5)				
Radiant SC *(5-10 fl oz)*	xxx	xxx	xxx	xx
Diamides (Group 28)				
Coragen *(3.5 – 5 fl oz)*	xxx	xxx	xxx	xxx
Voliam Xpress[9] (5-9 fl oz)	xxx	xxx	xxx	xxx
Indoxacarb (Group 22)				
Avaunt 30WG[6] *(0.15 – 0.22 lb)*	xxx	xxx	xxx	xxx
Avermectin (Group 6)				
Proclaim 5G *(2.4 – 4.8 oz)*	xxx	xxx	xx[2]	xxx
Pyrethroids (Group 3A)				
Warrior T 1CS *(1.92 – 3.2 fl oz)*	xxx	xxx	xx	x
Endigo ZC *(4 – 4.5 fl oz)*[8]	xxx	xxx	xx	x
Danitol 2.4 EC *(10.6 – 16 fl oz)*	xxx	xxx	xx	x
Brigade/Capture 2EC *(2.1 – 6.4 fl oz)*	xxx	xx	xx	x[2]
Pounce/Ambush *(0.05 – 0.2 lb ai)*	xxx	xx	x	x
Baythroid 2 (1.6 – 2.4 fl oz)	xxx	xx	x[2]	x
Ammo 2.5EC *(2.5 – 5 fl oz)*	xxx	xx[2]	x[2]	-
Mustang 1.5EW *(2.9 - 4.26 fl oz)*	xxx	xx[2]	x[2]	-
Asana XL 0.66EC *(5.8 – 9.6 fl oz)*	xxx	x[2]	x[2]	-
Hero (4-10.3 oz)	?[7]	?	?	?
Bts (Group 11)				
Bt kurstaki (see labels) (Biobit, Javelin, DiPel, Condor, Crymax)	xxx	xx[2]	x[2]	x[2]
Bt aizawai (see labels) (Xentari, Agree, Ketch)	xxx	x	x	xx[4]
OPs (Group 1B)				
Orthene/Address 75S/97 *(1.3 lb)*	xxx	xx	xx	x
Carbamates (Group 1A)				
Lannate LV 2.4L *(1.5 – 3 pt)*	xxx	x[2]	x[2]	x[2]
Larvin 3.2F *(16 – 40 fl oz)*	xxx	x[2]	x[2]	x[2]
Sevin 80 Solupak (1.25-2.5 fl oz)	x	-	-	x

xxx = most effective (usually good control expected); x = least effective (fair or poor control); - not labeled or not effective. Not all formulations listed. Rates in amount of formulated product unless otherwise indicated.

[1] 4.5 – 6 oz for CL; [2] higher rates needed; [3] Where insecticide resistance is not a problem better control of DBM with some materials may be expected; [4] *Bt aizawai* may provide better control of DBM where populations are resistant to *Bt kurstaki;* [5] some incidental control;
[6] Avaunt is not labeled for use on Long Island. [7] Has not been trialed in University studies.
[8] a premix of Warrior + Actara/Cruiser. [9] A premix of Coragen + Warrior. ■

Healthy Greenhouse Tomatoes: It's All Connected

J. Reid, CVP: When diagnosing a production issue in greenhouse tomatoes, the first problem we see may be the last in a chain of events. Plant health is connected to many factors such as humidity and fungi, but principally to management competence.

Much of the well water used in New York for irrigation is high in pH and alkalinity. This has never created an issue, by my observation, for field production of tomatoes. Rain, crop rotation and tillage keep the soil in balance. However, in tunnels and greenhouses the high alkalinity of irrigation water can elevate the root zone pH and interfere with nutrient uptake. To prevent this acid is injected into the irrigation water. Sulfuric acid is the common choice. However, excess levels of sulfur in irrigation water are just as much a threat as high alkalinity, perhaps more so.

Recommendations for irrigation water levels of sulfur are generally between 50-70 ppm. An industry standard is to not exceed 2 ounces of 66% sulfuric acid per 100 gallons of irrigation water. However, for some water sources 2 ounces does not sufficiently reduce the pH and more acid goes into the water. There are other sources of sulfur in the system too. For example, magnesium sulfate (Epsom salts) are often applied to correct magnesium deficiency, or sulfate of potash is used as a potassium source. Fish fertilizers and fungicides may also add sulfur. Our target range for sulfur in leaf tissue is 0.30 - 0.60%, however, our lab results sometimes come back with excess levels (see chart below).

Excess sulfur can cause necrotic spots on foliage (Fig. 1). In previous seasons we have seen these symptoms exacerbated by varietal susceptibility and low-light conditions. These necrotic spots, in addition to reducing the photosynthetic capacity of the plant, create an infection point for the fungus *Botrytis cinerea*, or Gray Mold. As the fungus proliferates on the necrotic tissue, it can also infect fruit, often starting under the calyx where moisture gathers (Fig. 2).

Figure 1. Necrotic spots on foliage due to excess sulfur (above and below)
Photos: Judson Reid, Cornell Vegetable Program

N	P	K	Mg	Ca	S	B	Zn	Mn	Fe	Cu
3.17 %	0.46 %	3.38 %	0.73 %	4.31 %	1.87 %	113.0 ppm	21.0 ppm	69 ppm	165 ppm	9.0 ppm

NO_3-N:	ppm	Na:	%	Al:	ppm	Mo:	ppm	Ni:	ppm	Cl:	%

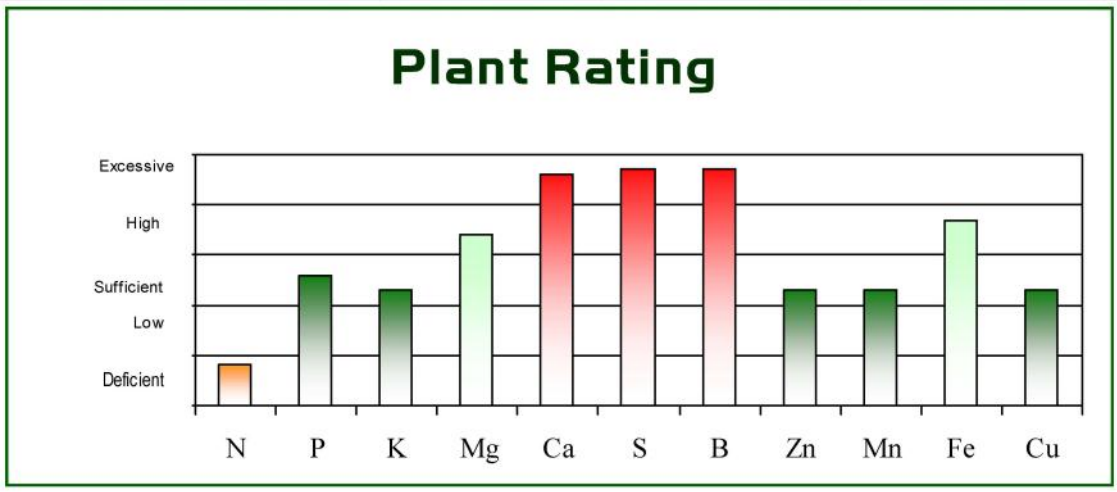

Figure 2. Gray mold on tunnel tomatoes.
Photo: Judson Reid, Cornell Vegetable Program

So we now find ourselves consulting a list of fungicides, concentrating on efficacy, use restrictions and pre-harvest intervals when the problem began with our irrigation water. This is the last (or present) challenge in a chain of events influenced by management competence. How do we sharpen this competence?

Gather as much data as possible.

- Soil test for all plant nutrients prior to planting.
- Water test for pH and alkalinity early in the season.
- Foliar test for tissue levels of sulfur and other nutrients throughout the season.

Be mindful of how our management decisions are interconnected.

- Consider the multiple sources of nutrients (such as sulfur) including water, fertilizers, acids and fungicides. Are there additive effects?
- Examine the potential implications of increasing shade or failure to ventilate.
- Is our variety selection based on what our neighbor grows, or is it matched to our own management style and production and marketing.

Implement changes in the system to prevent problems.

- Deficiencies are easier to correct than toxicities.
- Eliminate problems and move on, such as removing gray mold infected fruit to prevent further spore production.
- Focus on maximizing principle factors for tomato health aside from fertilizers: light, fresh air, water.

Practice this process throughout the season to create a steady process of monitoring and fine tuning, instead of intervention and correction. ■

Purple Blotch in Onions

C. Hoepting, CVP: In Elba, the first Purple Blotch (PB) lesions were detected a couple of weeks ago. This disease usually develops and spreads during July and August as plants mature. It also can get a foothold on plants that have herbicide injury from Buctril or Chateau, or from hail or other mechanical injury. In small-scale onion production on plastic, PB is fairly common and sometimes can be severe. Optimum conditions for PB are 77°F and high humidity. PB lesions can girdle onion leaves resulting in leaf dieback and in severe cases, onions can die standing up. When scouting, look for boat-shaped target-spot lesions about 0.5 to 1.0 inch in length. Lesions can be tanish or purplish, sometimes blackish in color (Fig 1 & 2). PB is closely related to secondary saphrophytic fungi (fungi that naturally break down dead tissue) and can be confused with lesions caused by these commonly occurring organisms in onions. With saprophytic fungi, the lesions occur only on necrotic tissue that is already dying. Two tell-tale signs that the pathogenic PB is present are: 1) tan or purple lesions occur on otherwise green tissue (Fig 1 & 2), and 2) lesions are purple, even if they are occurring on necrotic tissue. PB lesions occur on the oldest 2-3 leaves of the plant.

Figure 1. Characteristic boat-shaped target spot purple lesions of Purple Blotch on otherwise green leaf tissue.
Photo: Christy Hoepting, CVP

Figure 2. Less diagnostic tan-colored lesions of Purple Blotch on otherwise green leaf tissue.
Photo: Christy Hoepting, CVP

It is recommended to start spraying for PB when plants get 8-10 leaves and start bulbing, or at first sign of disease, whichever comes first. In the most recent Cornell fungicide trials (2006-2008), half rate of Scala (9 oz) + half rate of Bravo (1.5 pt) ranked best overall for PB control (and also for Botrytis leaf blight control). Scala 18 fl oz, Rovral and Switch ranked second best – see table in June 27 issue of VEW. Other fungicides that can be used to manage PB include Quadris Top, Pristine, Cabrio and Inspire Super. In 2012 fungicide trials, Quadris Top suppressed downy mildew (DM) and could perhaps be included in the rotation when cool temperatures are favorable for DM. Note, mancozeb and Bravo are weak on PB. Generally, fungicide sprays for PB need to be continued weekly for the rest of the season. ■

Late Blight Risk

C. MacNeil, CVP: Blitecast late blight (LB) severity value (SV) accumulations in the past week varied tremendously depending on rainfall and humidity. Accumulating 3 – 5 SVs in a week indicates moderate risk of LB development and the need for a 7 day fungicide spray schedule; 6+ indicates high risk and the need for a 5 day schedule. Be sure you have fungicide coverage as soon as a chance of rain, or pop-up thunderstorm, comes back into the forecast, or if fog forms in your area. *From Meg McGrath, Cornell, Long Island, 7/5*: LB continues to be a concern during hot, humid weather because the pathogen strains that have been present in more recent years tolerate high temperatures better than previous strains. Also, this pathogen can infect when humidity is at least 90%. It doesn't need rainfall.

Recent changes in how LB SVs are calculated has made the Blitecast system somewhat more accurate and conservative. Season total LB SVs have jumped in the accompanying table and on the NEWA website. Next week we hope to introduce you to Simcast blight units, which are even more accurate than LB SVs.

Late Blight Severity Values* 7/10/12

Location**	Week	Total	Location	Week	Total
Albion	2	24	Lafayette	7	76
Appleton	1	9	Lodi	0	10
Baldwinsville	1	20	Penn Yan***	1	55
Buffalo***	1	33	Ransomville	3	18
Ceres	5	39	Rochester***	3	43
Elba	5	28	Sodus	0	14
Farmington	2	31	Syracuse***	2	49
Gainesville	7	74	Versailles	NA	NA
Geneva	1	18	Williamson	1	25

** For more sites: http://newa.cornell.edu/ Crop Pages, Potato, Blitecast
*** Airports, with RH increased to estimate field conditions

Save the information from Tom Zitter, Cornell, in this issue, "Potato [foliar] Fungicide Ratings on Selected Diseases" (see the 6/27 *Veg Edge Weekly* regarding tomato diseases).

LB was first reported in central Maine in commercial potatoes and garden tomatoes, in CT tomatoes, and in New Brunswick, Canada, in the past week, and more fields are affected on Long Island. We are surrounded! ■

Resurrection of Warrior for Onion Thrips Control

C. Hoepting, CVP: In the 1990s, Warrior was practically a silver bullet for controlling onion thrips in onions. Unfortunately, Warrior was overused because it was cheap and there were few other effective alternatives for thrips control and this led to a Nationwide development of resistance to Warrior, including all major onion growing regions in New York**.** Warrior absolutely failed to control onion thrips in Brian Nault's on-farm insecticide trials from 2002 to 2008. Fortunately, with the recent registrations of Movento, Agri-Mek and Radiant, several growers in the state have been able to avoid the use of pyrethroids in onions for 3-4 years. The question is, **"**Are thrips populations still resistant to Warrior (and other pyrethroids)?"

In a trial just completed in Elba in an onion field where Warrior or other pyrethroids were not used for 4 years, Warrior + Induce controlled thrips as good as Agri-Mek + Induce**.** In this trial, Movento provided a bit better control than Warrior and Agri-Mek**.** Small-scale upland growers have also had success controlling thrips with Warrior. We still recommend starting the spray season with Movento and then finishing with the most effective material, Radiant, when pressure is highest. In between, growers have a few choices: Agri-Mek, Lannate **and** perhaps Warrior in some situations**.** Warrior could follow Movento in the sequence for onions that are less than 30 days from harvest (Agri-Mek has a 30 day pHI) and then Radiant could be used at the end of this sequence. Alternatively**,** Warrior could replace Lannate or be added in **the** sequence, depending on how many weeks are remaining until harvest. Since thrips populations have already developed resistance to pyrethroids once, resistance and difficulty in controlling the infestation will occur faster than before with resumed continuous exposure. When using Warrior for onion thrips: i) make the first application at 1 thrips per leaf; ii) use with a surfactant; iii) do not make more than two consecutive sprays before switching to another mode of action; and iv) if after 7 days, thrips numbers increase excessively, abandon the second application and switch to another chemical class. ■

Dates…

July 17 - Vegetable Weed Day, 8:00-11:30 am, H.C. Thompson Research Farm, Freeville, NY (10 miles northeast of Ithaca, Fall Creek Rd, Rt 366 extension). DEC and CCA credits have been requested. **Pre-registration deadline: July 13.** Registration $8. Contact Maxine Welcome, 607-255-5439; mw45@cornell.edu.

July 17 - Field Crop Weed Control, 2:00-5:00pm, Robert B. Musgrave Research Farm, Aurora, NY (Poplar Ridge Rd, connects 90 and 34B). Contact Maxine Welcome, 607-255-5439; mw45@cornell.edu.

August 2 – Annual Elba Muck Onion Twilight Meeting – more info to follow. Contact Christy Hoepting (cah59@cornell.edu; 585-721-6953).

August 10 - Tile Drainage Field Day 9:00 am - 2:00 pm, Lilyea Farms, 1320 Pre-Emption Rd, Penn Yan. Morning will cover benefits, economics and the how-to. Afternoon will be equipment demonstrations, both traditional and tile plow. Lunch provided. To register, call CCE Yates Co at 315-536-5123. *Brought to you by CCE Regional Ag Teams, Yates Co Soil & Water Conservation District. Financial support from Hudson Pipes and Himrod Farm Supply.*

Weather Charts

J. Gibbons, CVP:

Weekly Weather Summary: 7/03 - 7/09

Location	Rainfall (inch)		Temp (°F)	
	Week	Month July	Max	Min
Albion	0.09	0.09	92	55
Appleton, North	0.18	0.18	91	56
Baldwinsville	0.19	0.19	89	59
Buffalo*	0.14	0.14	94	62
Ceres	0.83	0.83	90	51
Elba	0.22	0.22	93	54
Farmington	0.21	0.21	90	58
Gainesville	0.09	0.16	89	56
Geneva	0.23	0.23	92	62
Lafayette	0.12	0.12	90	54
Lodi	0.25	0.25	96	58
Penn Yan*	0.33	0.35	92	58
Ransomville	0.56	0.56	93	55
Rochester*	0.07	0.07	93	59
Sodus	0.13	0.13	90	55
Syracuse*	0.22	0.22	94	60
Versailles	0.00	0.00	90	57
Williamson	0.13	0.13	90	61

Accumulated Growing Degree Days (AGDD)
Base 50°F: Jan. 1 — July 9, 2012

Location	2012	2011	2010
Albion	1254	1006	1165
Appleton, North	1115	763	985
Baldwinsville	1325	1205	NA
Buffalo	1396	1053	1168
Ceres	1085	996	NA
Elba	1283	943	1163
Farmington	1225	1024	1145
Gainesville	1219	1002	1097
Geneva	1326	1136	1244
Lafayette	1253	1079	1097
Lodi	1266	1163	1298
Penn Yan	1352	1150	1233
Ransomville	1243	986	1161
Rochester	1385	1084	1229
Sodus	1170	984	NA
Syracuse	1436	1291	1249
Versailles	1278	NA	NA
Williamson	1290	1014	1205

* Airport stations
** Data from other station/airport sites is at: http://newa.cornell.edu/ Weather Data, Daily Summary and Degree Days.

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Veg Edge Weekly is a seasonal weekly publication of the **Cornell Vegetable Program** providing information about crop development, pest activity and management, pesticide updates, local weather conditions, meetings and resources.

Veg Edge is published 28 times annually, monthly from October-May and weekly from May-September. If you have any questions about this publication, contact Julie Kikkert at 585-394-3977 x404 or jrk2@cornell.edu. **Visit the Cornell Vegetable Program website at http://cvp.cce.cornell.edu/ for information on our research, upcoming events and enrolling in our program.**

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