Vegetable Crop Update

A newsletter for commercial potato and vegetable growers prepared by the University of Wisconsin-Madison vegetable research and extension specialists

Extension
UNIVERSITY OF WISCONSIN-MADISON

No. 9 – July 16, 2023

In This Issue:

- Potato and tomato early blight and late blight disease updates
- Cucurbit downy mildew updates
- Cucurbit powdery mildew updates
- Potato Virus Y updates and management, Two-spotted spider mites, Caterpillar pests

Calendar of Events:

July 20, 2023 – WI Seed Potato Certification Program & WI Potato Coalition Early Generation Seed Potato Field Day, Lelah Starks Seed Potato Farm, Rhinelander, WI (*this Thursday!)*
November 28-30, 2023 – Midwest Food Producers Assoc. Processing Crops Conference, Kalahari Convention Center
January 9-11, 2024 – Wisconsin Agribusiness Classic, Alliant Energy Center, Madison, WI
January 21-23, 2024 – Wisconsin Fresh Fruit and Vegetable Growers Conference, Kalahari Resort, Wisconsin Dells, WI
January 25-26, 2024 – Organic Vegetable Production Conference, UW Madison Division of Extension (Online)
February 2-3, 2024 – Organic Vegetable Production Conference, UW Madison Division of Extension, Alliant Energy Center, Madison, WI
February 6-8, 2024 – UW-Madison Div. of Extension & WPVGA Grower Education Conference & Industry Show, Stevens Point, WI

Amanda Gevens, Chair, Professor & Extension Vegetable Pathologist, UW-Madison, Dept. of Plant Pathology, 608-575-3029, Email: gevens@wisc.edu, Lab Website: https://vegpath.plantpath.wisc.edu/

Early blight of potato/tomato. Accumulations of P-days (recall these are influenced by heat) ramped up this past week and on average we saw roughly 60 P-days across the state of Wisconsin. In all locations with the exception of Antigo (later plantings) and Rhinelander, all potato fields have reached/surpassed threshold and should receive (and continue to receive) preventative fungicide applications for early blight management. Hotter days generate roughly 10 P-days per day if you are looking ahead to likely accumulations and planned preventative fungicide applications.

Late blight of potato/tomato. Accumulations of Blitecast DSVs have been low this past week, ranging from 0 to 5 added DSVs statewide. The usablight.org website (https://usablight.org/map/) indicates no reports of late blight in potato or tomato from across the US in 2023. This website continues to provide a very useful mechanism for tracking this potentially destructive crop disease, but it's not comprehensive. Fungicides for management of late blight in tomato and potato crops are provided: https://learningstore.extension.wisc.edu/products/commercial-vegetable-production-in-wisconsin

Current P-Day (Early Blight) and Disease Severity Value (Late Blight) Accumulations. Many thanks to Ben Bradford, UW-Madison Entomology; Stephen Jordan, UW-Madison Plant Pathology; and our grower collaborator weather station hosts for supporting this disease management effort again in 2023. A Potato Physiological Day or P-Day value of ≥300 indicates the threshold for early blight risk and triggers preventative fungicide application. A Disease Severity Value or DSV of ≥18 indicates the threshold for late blight risk and triggers preventative fungicide application. Red text in table indicates threshold has been met or surpassed. TBD indicates that data are To Be Determined as time progresses. Weather data used in these calculations is from weather stations that are placed in potato fields in each of the four locations, as available. Data from an alternative modeling source: https://agweather.cals.wisc.edu/vdifn will be used to supplement as needed for missing data points and for

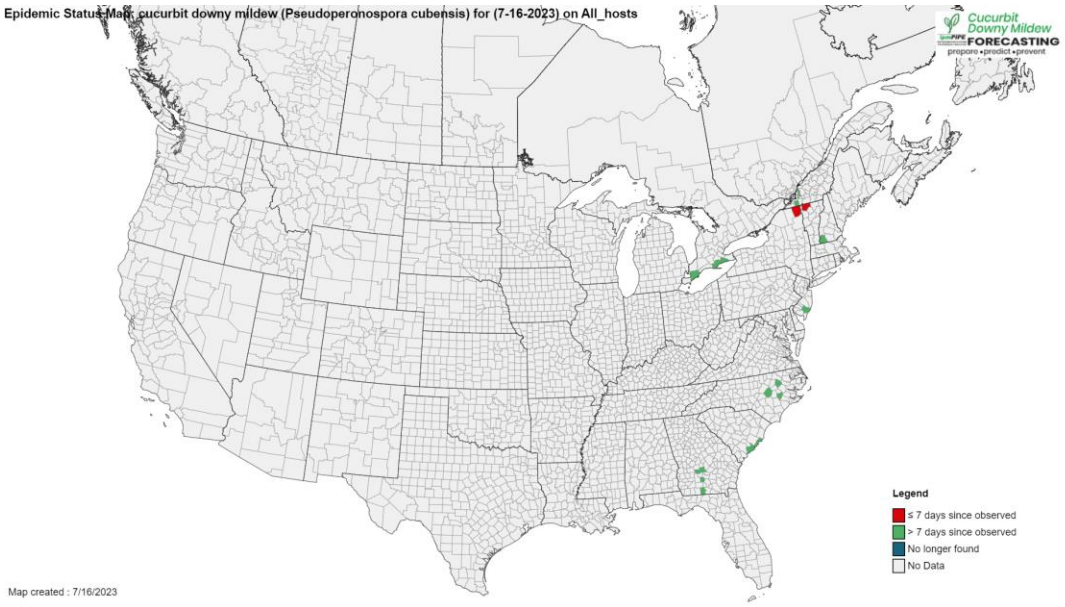
additional locations (indicated with *). Data are available in graphical and raw formats for multiple locations at: https://vegpath.plantpath.wisc.edu/dsv/.

	Planting Date		50% Emergence Date	Disease Severity Values (DSVs) *through 7/15/2023*	Potato Physiological Days (P-Days) *through 7/15/2023*
Spring Green*	**Early**	Apr 3	May 9	6	**517**
	Mid	Apr 17	May 12	6	**496**
	Late	May 10	May 23	6	**427**
Arlington*	**Early**	Apr 5	May 10	6	**518**
	Mid	Apr 20	May 15	6	**481**
	Late	May12	May 25	6	**421**
Grand Marsh	**Early**	Apr 5	May 10	4	**488**
	Mid	Apr 20	May 15	4	**454**
	Late	May 12	May 25	4	**402**
Hancock	**Early**	Apr 10	May 17	5	**453**
	Mid	Apr 22	May 19	5	**448**
	Late	May 14	May 28	5	**398**
Plover	**Early**	Apr 14	May 19	7	**441**
	Mid	Apr 24	May 20	7	**436**
	Late	May 19	May 29	7	**387**
Antigo	**Early**	May 1	May 28	5	**374**
	Mid	May 15	June 3	5	**329**
	Late	June 7	June 23	5	191
Rhinelander*	**Early**	May 7	June 1	2	**340**
	Mid	May 18	June 5	2	**305**
	Late	June 9	June 24	2	182

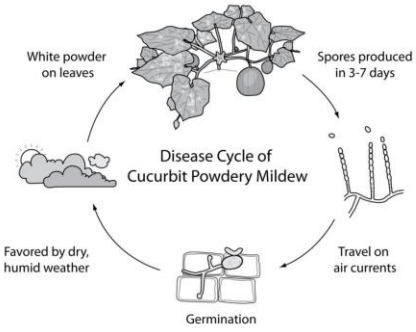
In addition to the potato field weather stations, we have the UW Vegetable Disease and Insect Forecasting Network tool to explore P-Days and DSVs across the state (https://agweather.cals.wisc.edu/vdifn). This tool utilizes NOAA weather data (stations are not situated within potato fields). In using this tool, be sure to enter your model selections and parameters, then hit the blue submit button at the bottom of the parameter boxes. Once thresholds are met for risk of early blight and/or late blight, fungicides are recommended for optimum disease control. Fungicide details can be found in the 2023 Commercial Vegetable Production in Wisconsin Guide, Extension Document A3422, linked here: https://learningstore.extension.wisc.edu/products/commercial-vegetable-production-in-wisconsin

Cucurbit Downy Mildew. The Cucurbit Downy Mildew forecasting webpage (https://cdm.ipmpipe.org/) is not forecasting the movement of the pathogen, but the group is offering reporting of findings of cucurbit downy mildew from the US. Dr. Mary Hausbeck reported the interception of cucurbit downy mildew spores in an air/spore trap in Monroe, Berrien, and Allegan counties in Michigan last week. Through molecular biological testing, Dr. Hausbeck and her laboratory at Michigan State University characterized the pathogen as the Clade 2 type of the cucurbit downy mildew pathogen which tells us that this type is likely to infect cucumber and melon crops. In past years, when SW MI had cucurbit downy mildew in production fields, WI did see some movement of the disease into southeastern WI. For this reason, I am being vigilant in tracking reports of the disease in southern Michigan. To date, there have been no reports of the disease developing in cucumber fields in MI or WI. If reports arise, we should be considering preventative treatment of cucumber and melon crops here in southeastern Wisconsin.

The disease has been confirmed on cucumber in Ontario and Quebec, Canada, GA, NC, NJ, NY, SC, and VT. These data suggest that there are both strain types of the pathogen active along the east coast. We should be watchful of all cucurbit crops. In past recent years, we have predominantly seen the cucumber strain types impacting cucurbits in Wisconsin.



Cucurbit Powdery Mildew: Cucurbits have been showing signs of powdery mildew in central Wisconsin over the past week. This disease is typically caused by the fungal pathogen *Podosphaera xanthii* and we see it appear on most susceptible cucurbits first in mid to late July of most years. While some cucurbits can tolerate powdery mildew infection, if the disease onsets early and on a highly susceptible variety, control may be necessary. There are several fungicides with effective control of powdery mildew (list provided below from the A3422 Commercial production guide for vegetables in Wisconsin). However, cucurbit powdery mildew pathogen populations in Wisconsin have resistance to the strobilurin fungicides which include azoxystrobin, pyraclostrobin, and trifloxystrobin. In our past field trials, Quintec (quinoxyfen) was most effective in alternation and tank-mixed with chlorothalonil. For multi-pick cucurbits, it's important to have a look at the allowable days to harvest. The images below show typical powdery mildew signs (talcum-like white spore production on foliage) and the disease cycle of powdery mildew on cucurbits.



Disease control in pumpkin and squash *(continued)*

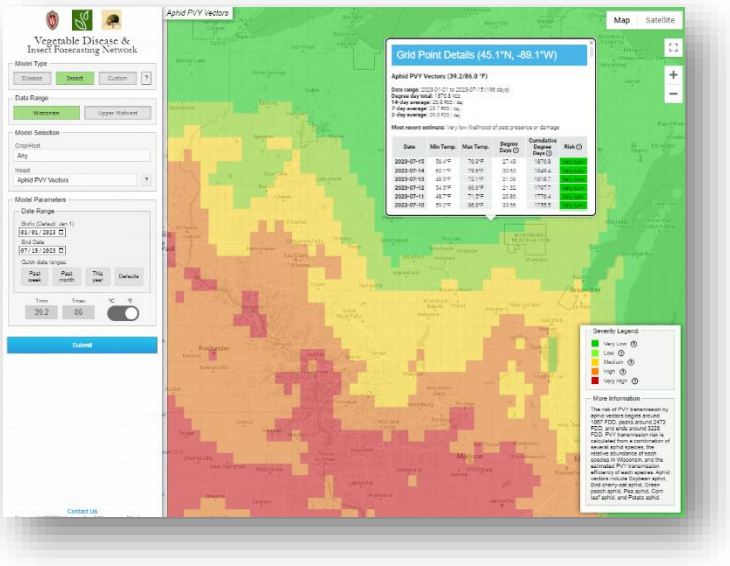
Disease	Active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
Powdery mildew	azoxystrobin	11.0–15.5 fl oz Aframe, AzoxyStar, Equation, Quadris Flowable, Satori	1	Equation, Quadris, Cabrio, and Flint belong to the Group 11 (strobilurin) category of fungicides. Quadris Opti contains a combination of Groups 11 and M5 fungicides. Do not exceed 1 application of any of these products before alternating with a fungicide having a different mode of action. Do not exceed 4 applications of strobilurin fungicides per year. Do not exceed 64.0 oz/a Cabrio, 8.0 oz/a Flint, 1.92 qt/a Quadris or Equation, or 2 gal/a Quadris Opti per season. Do not tank mix Cabrio, Flint, Quadris, Equation, or Quadris Opti with additives or adjuvants.
	azoxystrobin + chlorothalonil	3.2 pt Quadris Opti	1	
	pyraclostrobin	12.0–16.0 oz Cabrio EG	0	
	trifloxystrobin	1.5–2.0 oz Flint	0	
	boscalid + pyraclostrobin	12.5–18.5 oz Pristine WDG	0	Pristine belongs to Group 7 and Group 11 (strobilurin) fungicide categories. Do not exceed 2 sequential applications before alternating to a labeled fungicide with a different mode of action. Do not exceed 4 applications of Pristine or other Group 7 or 11 fungicides per season. Limit of 74.0 oz/a per season.
	clarified hydrophobic extract of neem oil	0.5–1.0% Trilogy in 25–100 gal water *or* 2.0 pt in at least 5 gal water	0	Do not apply more than 2 gal of Trilogy/a. OMRI-approved.
	cyflufenamid	3.4 oz Torino	0	Do not make more than 2 applications per year. Do not apply more than once every 7 days. Do not exceed total of 6.8 oz/a product per year.
	cyprodinil + fludioxonil	11.0–14.0 oz Switch 62.5WG	1	Do not apply more than 56.0 oz/a Switch per season. After 2 applications, alternate with a fungicide with a different mode of action for 2 applications.
	difenoconazole + benzovindiflupyr	10.5–13.5 fl oz Aprovia Top	0	Do not apply to greenhouse peppers. Do not apply more than 53.6 oz per year.
	fluopyram	6.5–6.84 fl oz Velum Prime	0	Also labeled for nematode suppression. Do not apply more than 13.7 fl oz of Velum Prime per acre per year. Fluopyram usage should be considered as total of soil and foliar applications (no more than 0.446 lb fluopyram).
	fluopyram + tebuconazole	6.0–17.0 fl oz Luna Experience	7	A mild yellowing on leaf margins is sometimes noted following application.
	fluopyram + trifloxystrobin	4.0–7.6 fl oz Luna Sensation	0	Do not apply more than 27.1 fl oz/a per season.
	flutriafol	10.0–14.0 fl oz Topguard	0	Follow resistance management guidelines.
	kresoxim-methyl	3.2–4.8 oz Sovran	0	Do not exceed 19.2 oz/a per season. Consult label for comments on adjuvant usage.
	metrafenone	15.4 fl oz Vivando	0	Make no more than 3 applications per year.
	myclobutanil	2.5–5.0 oz Rally 40WSP	0	Do not exceed 1.5 lb/a product (0.6 lb ai/a) per year. Observe a 30-day plantback interval between the last application and planting new crops. (Formerly Nova.) Resistance has been noted in WI.
	neem oil	0.5–1.0% Trilogy in 25–100 gal water	0	Has fungicide and miticide benefits. Organic (OMRI) approved.

Powdery mildew *(cont.)*	penthiopyrad	12.0–16.0 fl oz Fontelis	1	For disease control in greenhouse cucurbits, use at a rate range of 0.375–0.5 fl oz per gallon of spray per 1,360 sq ft. These rates equal field rates of 12.0–16.0 fl oz/a. Make no more than 2 sequential applications before switching to a fungicide with a different mode of action. Do not apply more than 67.0 fl oz/a per year.
	potassium bicarbonate	2.5–5.0 lb Kaligreen	1	Use higher rates when disease pressure is high. Apply at first sign of disease for best results.
	quinoxyfen	4.0–6.0 fl oz Quintec	3	Do not apply more than 32.0 fl oz Quintec per calendar year. Under certain environmental conditions, Quintec may cause leaf spotting or chlorosis. If symptoms occur after applying Quintec, discontinue use.
	sulfur	various, depending on product and formulation	0	Do not apply to sensitive crops. Do not apply during hot weather. Do not use within 2 weeks of an oil treatment. Consult with processor prior to use.
	tebuconazole	4.0–6.0 fl oz Folicur 3.6 F, Monsoon, Onset 3.6L, Orius 3.6F, Tebusha 3.6FL, TebuStar 3.6L, Tebuzol 3.6F, Toledo	7	Do not exceed 24.0 fl oz/a per season.
	thiophanate methyl	0.5 lb Topsin M 70W, Topsin M WSB 10.0 fl oz Topsin 4.5FL 0.2–0.4 lb Thiophanate methyl WDG	0 0	Apply when disease first appears and repeat if needed every 7–14 days.
	triflumizole	4.0–8.0 oz Procure 50WS 4.0–8.0 fl oz Procure 480 SC	0	Do not exceed 40.0 oz/a of Procure 50WS or 40.0 fl oz/a of Procure 480 SC per season. See product label for plantback restrictions for leafy vegetables (30 days), root vegetables (60 days), and all other crops (1 yr).

Vegetable Insect Update – Russell L. Groves, Professor and Department Chair, UW-Madison, Department of Entomology, 608-262-3229 (office), (608) 698-2434 (cell), e-mail rgroves@wisc.edu

Vegetable Entomology Webpage: https://vegento.russell.wisc.edu/

Potato virus Y (PVY) – (https://vegento.russell.wisc.edu/pests/plant-pathogens/).



A screen shot from VDIFN (July 15, 2023) map focusing upon Antigo, WI. Risk of aphid activity and potential PVY transmission is expected to exceed the estimated 1967 FDD on July 19. Peak risk for transmission is rapidly moving across Wisconsin and the map included indicates an estimated 29 FDD accumulated each day.

The application of foliar insecticides in the growing season to potato has almost no effect on preventing PVY inoculation of plants by non-potato colonizing aphid species that are migrating into and transmitting the virus through susceptible potato. At-plant, systemic insecticides can, however, help to reduce populations of potato-colonizing species, and this can provide some relief from virus spread in the current season. Consult your scouting reports and ensure that no potato colonizing species are present (green peach aphid, potato aphid, buckthorn aphid).

Colonizing species of aphids: (https://blogs.cornell.edu/potatovirus/pvy/aphid-vectors-of-pvy/)

Buckthorn aphid (*Aphis nasturtii*)
Description: Small-sized insects. Body color of apterous yellow to greenish **Distribution:** Worldwide, except Australasia.
Host biology: Highly polyphagous and feeds on herbaceous plants that belong to 28 different families in summer, and overwinters as an egg on buckthorn, *Rhamnus cathartica*.
Photo credit*:* David Voegtlin, University of Illinois

Green peach aphid (*Myzus persicae*) - *Most efficient PVY vector.*
Description: Body color varies from yellow to all shades of green, to pink, red, or black with a dorsal black patch at the base of abdomen.
Distribution: Worldwide, present in all areas of North America.
Host biology: Able to feed on many plant species. Exhibits host alternation, overwintering on woody (*Prunus* spp.) and infesting hundreds of plant species (including potato) in summer.
Photo credit: David Voegtlin, University of Illinois

Potato aphid (*Macrosiphum euphorbiae*)
Description: Large insects with pear-shaped bodies and distinct red eyes. Body color varies from solid pink to green and pink mottled to light green.
Distribution: Native of North America, worldwide except India.
Host biology: Potato aphid attacks over 200 plant species including vegetable and ornamental crops, as well as weeds. **Photo credit:** David Voegtlin, University of Illinois

Two-spotted spider mites – (https://vegento.russell.wisc.edu/pests/).

Two-spotted spider mites (TSSM) are small arthropods which are more related to spiders, ticks, daddy-longlegs and scorpions. The TSSM has a worldwide distribution and can infest 100's of plant species including vegetables, fruits and ornamentals. Vegetables that are often affected include cucumbers, snap beans, lettuce, peas, potatoes and tomatoes. Populations can increase rapidly since each female mite produces up to 20 eggs per day, and the resulting immature stages will develop to reproductive adults in as few as 5-8 days during hot, dry weather.

Forecast temperatures combined with ongoing local drought conditions in many portions of Wisconsin, predispose susceptible crops to infestation. Scouting agencies revealed the first sign of infestation by TSSM in early July and populations continue to progress. Drought stressed crops help to create ideal conditions for TSSM increase. Early symptoms of infestation include a chlorotic, stippled appearance on the leaves, as feeding mites remove leaf cell contents, including the chlorophyll that gives leaves their green color. Without the chlorophyll, those empty cells appear whitish or bronze. Heavily infested leaves turn completely pale, dry up, and fall off. Maintaining the nutritional (fertility) and hydraulic (water) health of plants is key to lessen the success of TSSM populations.

Insecticidal and miticidal soaps and botanical oils can be effective solutions for organic producers when paired with conservation biological control strategies to limit developing populations. Conventional producers often rely upon a set of abamectin (Agri-Mek), bifenazate (Acramite), bifenthrin (Brigade), dimethoate or fenpyroximate (Portal) applications spaced 5-7 days apart to control feeding stages.

Caterpillar pests (sweet corn, dry beans, tomatoes, peppers, snap beans) – (https://vegento.russell.wisc.edu/pests/corn-earworm/). Pest Survey specialists at Wisconsin Department of Agriculture, Trade and Consumer Protection (WI DATCP) collect and manage data on plant pests that threaten agricultural production (Wisconsin Home Pest Survey). This very important program focuses on surveillance and early detection of economically significant pests, including insects relevant to Wisconsin agriculture. Data is collected through field-based sampling and from networks of cooperators across Wisconsin. Species-specific

pheromone trapping is conducted for relevant pests in the state, and special reference should be paid to counts obtained for both corn earworm and true armyworm over the next 1-2 weeks in many portions of the state, with special emphasis to the southern half where trapping is concentrated.

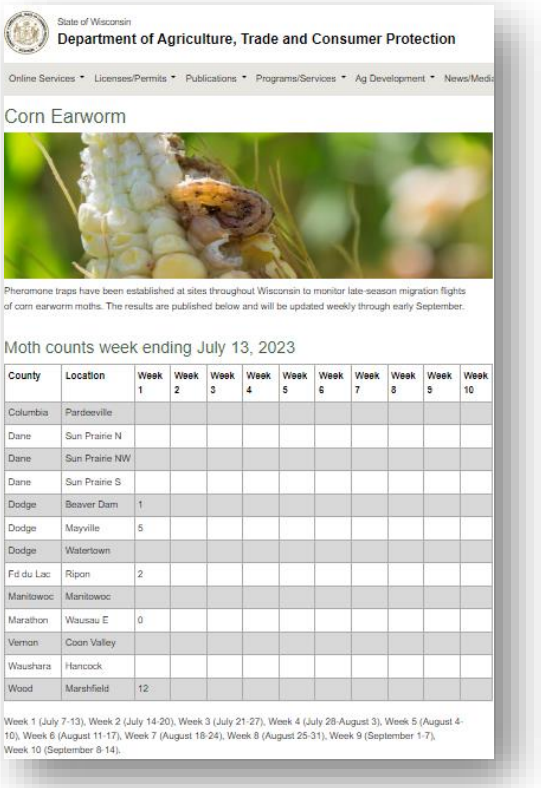
The best technique for monitoring earworms is through the use of pheromone traps. These traps use a special scent to attract male moths. Knowing when moths are present helps to determine when to treat fields. Weekly pheromone trap captures of adult corn earworm (*Helicoverpa zea*) are available through the Wisconsin Home Pest Survey and this past week (ending July 13) represents initial counts for the state.

For producers interested to have very site-specific data for their field locations, it is best to place a trap 4 to 6 feet above the ground on the south or west side of fields when corn is in the green silk stage. Pheromones should be changed every 2 weeks with the unused lures kept frozen until needed. Hercon pheromone lures (as only one example) have been very effective at attracting earworm moths. For accurate counts, be sure to remove used lures from the trap area.

Another technique for monitoring earworms uses a black light to lure night-flying insects. Data from statewide blacklight traps are also available through the Wisconsin Home Pest Survey, and these are However, black light traps are more expensive, less effective, and more difficult than pheromone traps to monitor. Counts in blacklight traps are consistently lower than those in pheromone traps in adjacent fields.

Pheromone trap catches of 5 to 10 moths or blacklight trap captures of 3 to 5 moths per night for three consecutive nights indicate that moths are probably laying enough eggs to warrant treatment of fields that are in the vulnerable stage between brush and silk browning to add precision to your scouting, check silks for the small, spherical corn earworm eggs before beginning a spray program.

Recent capture data in portions of southern Wisconsin do indicate elevated captures of the 1st full generation of corn earworm that have now developed in the state. With early silking sweet corn, it is important to scout the silking crop and apply insecticides on vulnerable silks when eggs hatch. The first application is the most critical and tank-mixes containing an ovicide (an egg killer) and synthetic pyrethroid are recommended. On sweet corn, treat every 3 to 4 days beginning when silks first appear and continuing until they brown. On hybrid dent seed corn, make 1 to 2 applications during this period. Discontinue treatments 10 days before harvesting fresh market sweet corn as additional sprays will not improve product quality.



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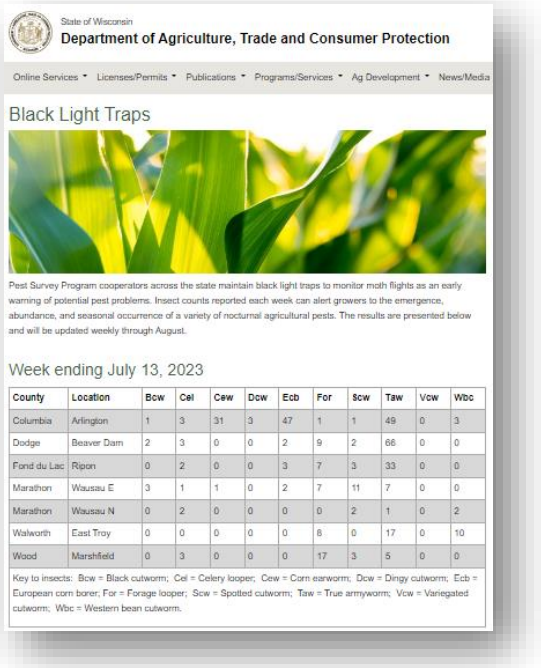
Corn Earworm

Pheromone traps have been established at sites throughout Wisconsin to monitor late-season migration flights of corn earworm moths. The results are published below and will be updated weekly through early September.

Moth counts week ending July 13, 2023

County	Location	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10
Columbia	Pardeeville										
Dane	Sun Prairie N										
Dane	Sun Prairie NW										
Dane	Sun Prairie S										
Dodge	Beaver Dam	1									
Dodge	Mayville	5									
Dodge	Watertown										
Fd du Lac	Ripon	2									
Manitowoc	Manitowoc										
Marathon	Wausau E	0									
Vernon	Coon Valley										
Waushara	Hancock										
Wood	Marshfield	12									

Week 1 (July 7-13), Week 2 (July 14-20), Week 3 (July 21-27), Week 4 (July 28-August 3), Week 5 (August 4-10), Week 6 (August 11-17), Week 7 (August 18-24), Week 8 (August 25-31), Week 9 (September 1-7), Week 10 (September 8-14).



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Black Light Traps

Pest Survey Program cooperators across the state maintain black light traps to monitor moth flights as an early warning of potential pest problems. Insect counts reported each week can alert growers to the emergence, abundance, and seasonal occurrence of a variety of nocturnal agricultural pests. The results are presented below and will be updated weekly through August.

Week ending July 13, 2023

County	Location	Bcw	Cel	Cew	Dcw	Ecb	For	Scw	Taw	Vcw	Wbc
Columbia	Arlington	1	3	31	3	47	1	1	49	0	3
Dodge	Beaver Dam	2	3	0	0	2	9	2	66	0	0
Fond du Lac	Ripon	0	2	0	0	3	7	3	33	0	0
Marathon	Wausau E	3	1	1	0	2	7	11	7	0	0
Marathon	Wausau N	0	2	0	0	0	0	2	1	0	2
Walworth	East Troy	0	0	0	0	0	8	0	17	0	10
Wood	Marshfield	0	3	0	0	0	17	3	5	0	0

Key to insects: Bcw = Black cutworm; Cel = Celery looper; Cew = Corn earworm; Dcw = Dingy cutworm; Ecb = European corn borer; For = Forage looper; Scw = Spotted cutworm; Taw = True armyworm; Vcw = Variegated cutworm; Wbc = Western bean cutworm.