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. 8 – July 7, 2024

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- Potato and vegetable disease forecasting updates – thresholds met for late blight and early blight treatments
- Cucurbit downy mildew
- Tomato bacterial spot
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Calendar of Events:

July 11, 2024 – UW Agricultural Research Station Potato Field Day, Hancock, WI
July 18, 2024 – UW Langlade County Extension & WI Seed Potato Certification Program – Ag Research Station Field Day, Antigo, WI
July 31, 2024 – UW-Madison Rhinelander Agricultural Research Station Potato Breeding Farm Field Day, Rhinelander, WI (contact Becky Eddy)
December 3-5, 2024 – Midwest Food Producers Assoc. Processing Crops Conference, Kalahari Convention Center
January 13-14, 2025 – Wisconsin Agribusiness Classic, Alliant Energy Center, Madison, WI
February 4-6, 2025 – UW-Madison Div. of Extension & WPVGA Grower Education Conference & Industry Show, Stevens Point, WI

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Current P-Day (Early Blight) and Disease Severity Value (Late Blight) Accumulations will be posted at our website and available in the weekly newsletters. Thanks to Ben Bradford, UW-Madison Entomology for supporting this effort and providing a summary reference table: https://agweather.cals.wisc.edu/thermal-models/potato. 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. Data from the modeling source: https://agweather.cals.wisc.edu/vdifn are used to generate these risk values in the table below. I've estimated early, mid-, and late planting dates by region based on communications with stakeholders. These are intended to help in determining optimum times for preventative fungicide applications to limit early and late blight in Wisconsin.

	Planting Date		50% Emergence Date	Disease Severity Values (DSVs) *through 7/6/2024*	Potato Physiological Days (P-Days) *through 7/6/2024*
Spring Green	**Early**	Apr 3	May 9	**31**	**473**
	Mid	Apr 17	May 12	**31**	**456**
	Late	May 10	May 25	**26**	**354**
Arlington	**Early**	Apr 5	May 10	15	**466**
	Mid	Apr 20	May 15	15	**435**
	Late	May 12	May 25	13	**356**

Grand Marsh	**Early**	Apr 5	May 10	**27**	**449**
	Mid	Apr 20	May 15	**27**	**420**
	Late	May 12	May 25	**20**	**347**
Hancock	**Early**	Apr 10	May 17	**33**	**401**
	Mid	Apr 22	May 21	**31**	**371**
	Late	May 14	June 2	**26**	291
Plover	**Early**	Apr 14	May 18	**27**	**397**
	Mid	Apr 24	May 22	**23**	**365**
	Late	May 19	June 7	**19**	250
Antigo	**Early**	May 1	May 24	**23**	**322**
	Mid	May 15	June 1	**23**	280
	Late	June 1	June 15	**18**	181
Rhinelander	**Early**	May 7	May 25	12	**311**
	Mid	May 18	June 8	11	217
	Late	June 2	June 16	11	168

Late blight of potato/tomato. Late blight diagnostics are available at no cost to WI growers and gardeners. Dr. Brian Hudelson of our UW Plant Disease Diagnostic Clinic and Dr. Amanda Gevens of UW-Potato & Vegetable Pathology can offer confirmation of the pathogen. Dr. Gevens will also offer strain typing of the pathogen. The usablight.org website (https://usablight.org/map/) indicates no reports of late blight from the US so far in 2024. Please keep in mind that the site is not comprehensive. Outside of this site, I'm aware of a Florida late blight sample from potato (March 2024) and a NY tomato late blight sample (from greenhouse in early May) with the confirmed genotype of US-23. This genotype is generally still responsive to phenylamide fungicides meaning that Ridomil and Metastar fungicides (mefenoxam and metalaxyl) can still effectively control late blight caused by this type.

We accumulated 4-10 Blitecast Disease Severity Values over the past week in WI. **Most WI locations and potato plantings are above the threshold for late blight disease severity values and should receive preventative fungicide application to reduce the risk of disease.** Rhinelander and Arlington are still below threshold, but will likely reach this treatment threshold within the week.

Many fields have been receiving more rainfall than ideal and it can make for challenges entering fields for spraying when using ground equipment. When timing fungicide applications, keep in mind that roughly 50% of fungicide residues are typically washed off with 1 inch of rain; ~100% of residues are washed off with 2+ inches of rain. Applications made before rain require some dry time for optimization. Depending upon the fungicide, some labels indicate 30 min to 2 hours; some simply state that they must dry prior to rain for efficacy.

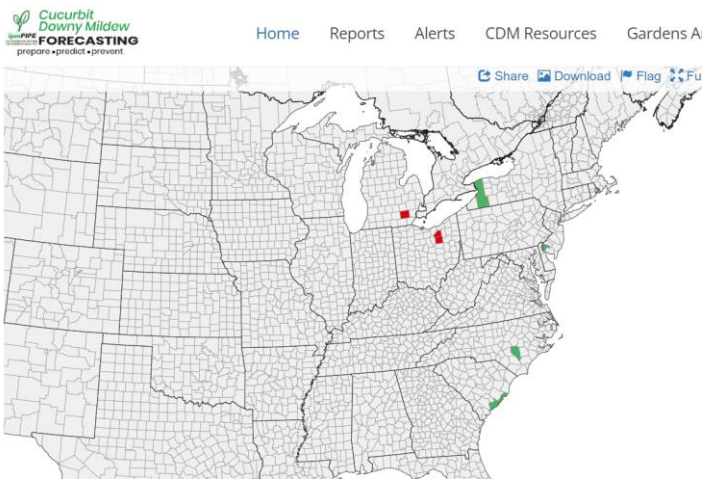
An updated listing of fungicides for WI potato late blight management for 2024 can be found at the link below. Base protectants such as chlorothalonil and mancozeb offer broad-spectrum control of fungal and oomycete (water mold – like late blight) pathogens. https://vegpath.plantpath.wisc.edu/wp-content/uploads/sites/210/2022/07/2024-Potato-Late-Blight-Fungicides.pdf

Early blight of potato. Plover and southward, areas of production have reached the threshold for the application of foliar fungicides to limit early blight. P-Day values will continue to amass (up to ~10 per day) and develop conditions optimum for early blight disease caused by *Alternaria solani*.

Earliest inoculum typically comes from within a field and from nearby fields. Once established, early blight continues to create new infections due to its polycyclic nature – meaning spores create foliar infection and the resulting lesion on the plant can then produce new spores for ongoing new infections in the field and beyond. Early season management of early blight in potato can mitigate the disease for the rest of the season. https://vegpath.plantpath.wisc.edu/diseases/potato-early-blight/

Fungicides can provide good control of early blight in vegetables when applied early on in infection. Multiple applications of fungicide are often necessary to sustain disease management to time of harvest due to the typically high abundance of inoculum and susceptibility of most common cultivars. For Wisconsin-specific fungicide information, refer to the Commercial Vegetable Production in Wisconsin (A3422), a guide available through the UW Extension Learning Store website which is annually updated. https://learningstore.extension.wisc.edu/products/commercial-vegetable-production-in-wisconsin Or, for home garden fungicide recommendations, see Home Vegetable Garden Fungicides (D0062), a fact sheet available through the UW Plant Disease Diagnostic Clinic website. Always follow label directions carefully.

Cucurbit Downy Mildew: On July 2, 2024, Michigan confirmed downy mildew on organic cucumber in Washtenaw County. This is in the southeastern corner of the state of MI. Medina and Wayne Counties in Ohio also reported cucumber downy mildew over this past week. To date, downy mildew spores (all Clade 2 – cucumber strain type) have been found in air sampling traps in four counties of Michigan (Bay, Muskegon, Monroe and Saginaw). No field disease confirmations were made in Wisconsin. Previously in this growing season, the disease was confirmed in: NJ, NC and SC.



Confirmed reports of cucumber downy mildew this past week in Ohio and Michigan. US counties with reports of cucurbit downy mildew during the past 7 days. Green counties indicate a former report of the disease greater than 7 days ago. From: https://cdm.ipmpipe.org/

Management information can be sourced here: https://vegpath.plantpath.wisc.edu/2022/07/03/update-10-july-3-2022/

Tomato bacterial spot *(Michelle Marks, former graduate student UW-Madison Plant Pathology & Dr. Brian Hudelson of our UW Plant Disease Diagnostic Clinic).* Bacterial spot of tomato is a potentially devastating disease that, in severe cases, can lead to unmarketable fruit and even plant death. Bacterial spot can occur wherever tomatoes are grown, but is found most frequently in warm, wet climates, as well as in greenhouses. The disease is often an issue in Wisconsin especially during periods of frequent

rainfall as we've recently experienced. https://hort.extension.wisc.edu/articles/bacterial-spot-of-tomato/#:~:text=Bacterial%20spot%20appears%20on%20leaves,leaf%20loss%20can%20also%20occur

Sunken, scabby bacterial spot lesions on ripening tomato fruit. (Photo courtesy of Mary Ann Hansen, Virginia Polytechnic Institute and State University)

What does bacterial spot look like? Bacterial spot can affect all above ground parts of a tomato plant, including the leaves, stems, and fruit. Bacterial spot appears on leaves as small (less than ⅛ inch), sometimes water-soaked (i.e., wet-looking) circular areas. Spots may initially be yellow-green, but darken to brownish-red as they age. When the disease is severe, extensive leaf yellowing and leaf loss can also occur. On green fruit, spots are typically small, raised and blister-like, and may have a yellowish halo. As fruit mature, the spots enlarge (reaching a maximum size of ¼ inch) and turn brown, scabby and rough. Mature spots may be raised, or sunken with raised edges

Bacterial spot symptoms can be easily confused with symptoms of another tomato disease called bacterial speck. For more information on this disease, see University of Wisconsin Garden Facts XHT1250. https://hort.extension.wisc.edu/articles/bacterial-speck-of-tomato/#:~:text=As%20the%20spots%20age%2C%20a,may%20cause%20similar%20leaf%20symptoms

Where does bacterial spot come from? Bacterial spot of tomato is caused by *Xanthomonas vesicatoria, X. euvesicatoria, X. gardneri,* and *X. perforans*. These bacterial pathogens can be introduced into a garden on contaminated seed and transplants, which may or may not show symptoms. Natural materials like wooden stakes could also harbor bacterial inoculum. The pathogens enter plants through natural openings (e.g., stomates), as well as through wounds. Disease development is favored by warm (75° to 86°F), wet weather. Wind-driven rain can contribute to more severe disease as the pathogens are splashed and spread to healthy leaves and fruit. Bacterial spot pathogens can survive well in tomato debris, but they survive very poorly in soil when not associated with debris.

How do I save plants with bacterial spot? A plant with bacterial spot cannot be cured. Remove symptomatic plants from the field or greenhouse to prevent the spread of bacteria to healthy plants. Burn, bury or hot compost the affected plants and do not eat symptomatic fruit. Although bacterial spot pathogens are not human pathogens, the fruit blemishes that they cause can provide entry points for human pathogens that could cause illness.

On tomato leaves, bacterial spot leads to small, angular (i.e., straight-edged) spots with yellow haloes. (Photo courtesy of Michelle Grabowski, University of Minnesota Extension)

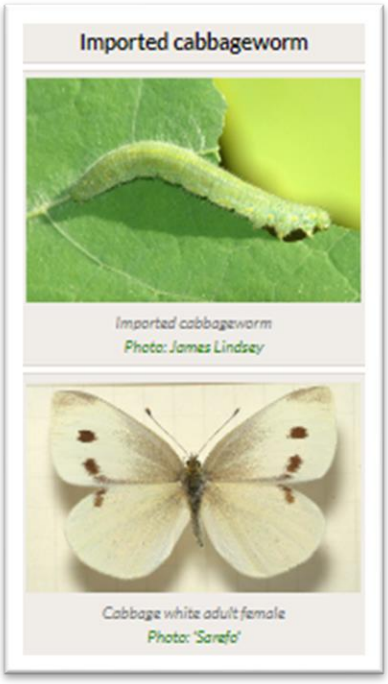
How can I prevent bacterial spot in the future? Plant pathogen-free seed or transplants to prevent the introduction of bacterial spot pathogens on contaminated seed or seedlings. If a clean seed source is not available or you suspect that your seed is contaminated, soak seeds in water at 122°F for 25 min. to kill the pathogens. To keep leaves dry and to prevent the spread of the pathogens, avoid overhead watering (e.g., with a wand or sprinkler) of established plants and instead use a drip-tape or soaker-hose. Also to prevent spread, DO NOT handle plants when they are wet (e.g., from dew) and routinely sterilize tools with either 10% bleach solution or (better) 70% alcohol (e.g., rubbing alcohol).

Where bacterial spot has been a recurring problem, consider using preventative applications of copper-based products registered for use on tomato, especially during warm, wet periods. Keep in mind however, that if used excessively or for prolonged periods, copper may no longer control the disease. Be sure to read and follow all label instructions of the product that you select to ensure that you use it in the safest and most effective manner possible. Burn, bury or hot compost tomato debris at the end of the season. Wait at least one year before planting tomatoes in a given location again, and remove and burn, bury or hot compost any volunteer tomatoes that come up in your field/garden.

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

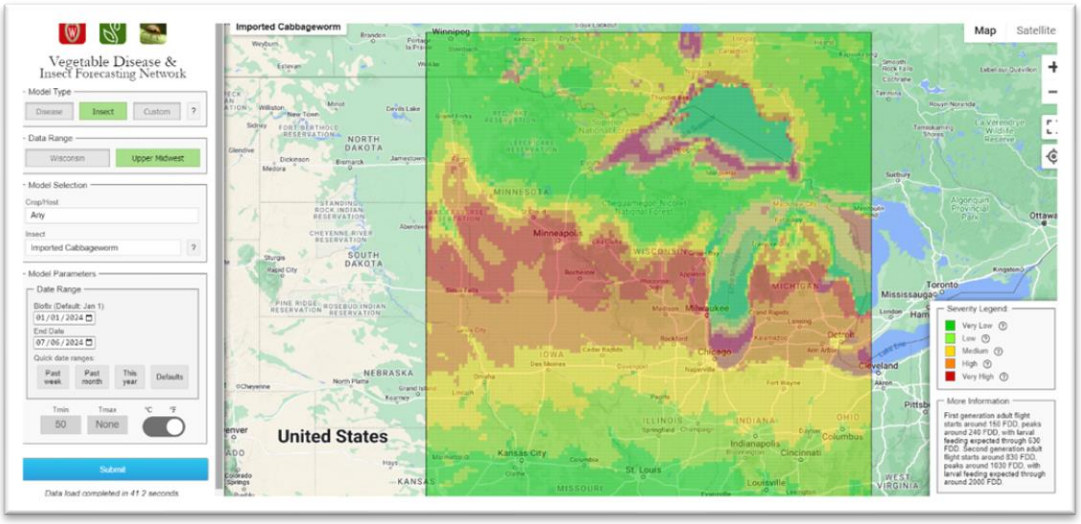
Vegetable Entomology Webpage: https://vegento.russell.wisc.edu/

Imported cabbageworm. (https://vegento.russell.wisc.edu/pests/caterpillar-pests-of-cole-crops/). Imported cabbageworm adults, commonly referred to as the white cabbage butterfly, are white butterflies with black markings on the wing tips. Female butterflies have 2 black dots on each fore wing; males, which are smaller, have 1 dot per wing. Eggs are yellow and conical, laid individually on the leaf surface and occasionally on the stem. An adult butterfly can lay 300 to 400 eggs in her lifetime. Larvae appear as velvety green worms up to 1 inch long with a faint yellow stripe running down the back. The caterpillar is commonly found along the veins of leaves and easily blends into the foliage.



Imported cabbageworms overwinter as chrysalae on plant debris and usually produce 3-6 generations in a season. Butterflies emerge in early May and begin laying single, small, yellow-orange eggs on any plant part that is above ground. The eggs hatch in about 5 days. The larvae develop on cruciferous weeds and cole crops that are planted early. The caterpillar feeds and develops for approximately 11 to 20 days before forming a pupa from which the adult butterfly emerges after 6 to 11 days. Second generation butterflies emerge mid-July and larvae develop entirely on cultivated cole crops. This generation causes the most damage.

Second generation adults are becoming abundant across southern and central Wisconsin and producers should pay attention to developing populations in the field. Scout fields weekly throughout the season for damage. Check plants carefully, even if no feeding damage is apparent, to look for eggs that will hatch into small caterpillars several days to a week later. Examine the lower leaves of the plant for the larvae of each pest. Although feeding damage and fecal material are signs of activity, it is better to rely on larvae counts to determine the level of infestation. Caterpillars cause varying amounts of



damage depending on the plant's maturity, so the need for treatment changes as the crop grows. The imported cabbageworm will feed on all ages of leaves but prefers the younger leaves. They feed along the edges of the leaves, leaving only thick veins behind.

Wisconsin Department of Agriculture Trade and Consumer Protection – (Wisconsin Home Pest Survey). Producers should continue to direct attention to the resources available through the WI DATCP's, Wisconsin Home Pest Survey. Pest Survey specialists at DATCP collect and manage data on plant pests that threaten agricultural production and pose trade barriers. This program focuses on surveillance and early detection of economically significant pests, including insects, diseases, mollusks, nematodes and weeds. Data is collected through field-based sampling and from networks of cooperators across Wisconsin. The program maintains long-term historical pest surveys, while continually adapting and developing new surveys in response to emerging threats. Much of the Pest Survey's work is carried out in cooperation with the U.S. Department of Agriculture Animal and Plant and Health Inspection Service and other partners, such as the University of Wisconsin, the Wisconsin Department of Natural Resources, and researchers nationwide.

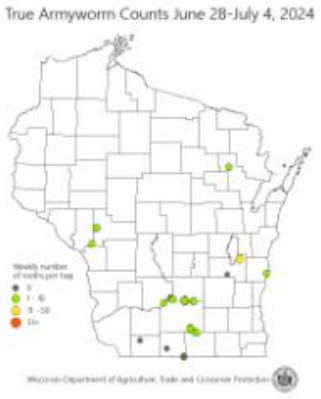
Pest Survey Program cooperators across the state maintain black light traps to monitor moth flights as an early warning of potential pest problems. Insect counts were just initiated in 2024 and the first reports were just released. Each week this report can be used to alert growers to the emergence, abundance, and seasonal occurrence of a variety of nocturnal agricultural pests. The results here represent first captures through the first week of July.

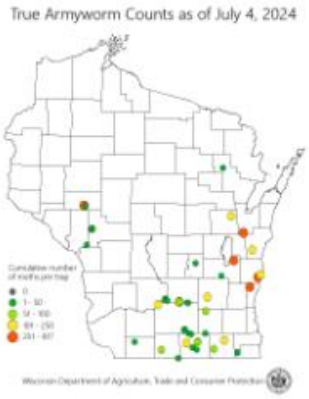
Week ending July 4, 2024

County	Location	Bcw	Cel	Cew	Dcw	Ecb	For	Scw	Taw	Vcw	Wbc
Columbia	Arlington	4	8	4	0	1	2	0	1	2	0
Dodge	Beaver Dam	1	7	0	0	0	5	1	11	0	0
Fond du Lac	Ripon	2	3	2	0	0	0	2	11	0	2
Grant	Prairie du Chien										
Marathon	Wausau E	1	3	0	0	0	1	0	5	0	0
Marathon	Wausau N	0	0	0	0	0	0	0	0	0	0
Walworth	East Troy	0	9	0	6	0	6	0	0	0	12
Wood	Marshfield	2	19	0	0	0	0	2	3	1	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.

Early black light captures do illustrate some increasing captures of true armyworm. The WI DATCP more accurately traps for potentially problematic populations of true armyworm using pheromone traps. A summary of these captures (through July 4) are illustrated. Armyworms are dark caterpillars measuring up to 2 inches long. They have a dark stripe running lengthwise on the side with a yellow stripe beneath. Dark and light stripes alternate along their back. Armyworms move up from grassy weeds within cornfields or





migrate into cornfields from small grain or forage fields. They may hide in soil crevices and beneath clods by day. At night, they chew corn leaves and weaken plants.

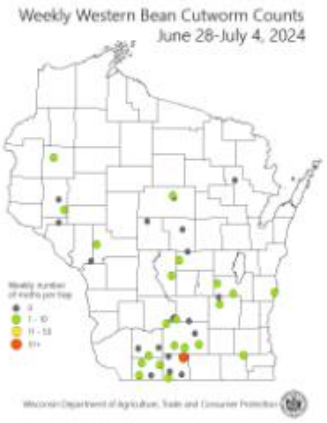
Corn earworm. (https://vegento.russell.wisc.edu/pests/corn-earworm/). The corn earworm can cause serious economic damage to fresh market and processing sweet corn and hybrid dent seed corn. Also known as the tomato fruit worm, the larvae feed on field corn, tomatoes, lettuce, peppers, and snap beans. Few corn earworms survive winter in Wisconsin. Instead, they overwinter as pupae buried in the soil in the Gulf States. In early spring, the pupae complete their development and emerge as moths in early May. Some of these moths migrate northward, flying at dusk or during warm, cloudy days.

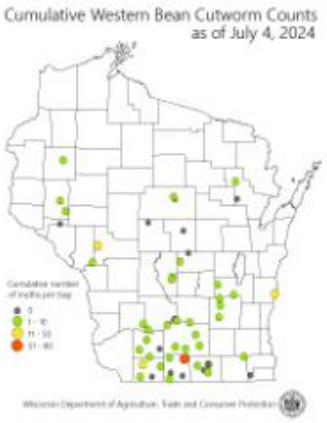
In the north, a few pupae survive Wisconsin winters to complete development in the spring. As a result, sweet corn growers may find some adult moths in traps in the early season. This overwintering generation will only pose a problem in early planted sweet corn. The more damaging migratory adults appear between mid-August and early September. Fresh market sweet corn is susceptible to early- and late-season damage.

The best technique for monitoring earworms is using pheromone traps. These traps use a special scent to attract male moths. Knowing when moths are present helps to determine when to treat fields. Place a trap 4 to 6 feet above the ground on the south or west side of fields 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 have been very effective at attracting earworm moths. For accurate counts, be sure to remove used lures from the trap area.

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.

Corn earworm trapping is just underway with the WI DATCP and first counts will be available in the coming weeks. Very few corn earworms were captured in the blacklight traps and risk of damage to early planted, silking sweet corn is quite low at this time.





Counts for **western bean cutworm** are also just underway and only the first 2-3 weeks of pheromone captures are illustrated by the Department. The first flights of this insect are now underway. Although not a widespread insect with consistent economic loss, it is a potential problem in some areas of the state.

Scouting for egg masses is the best predictor of damage. Egg laying can be clumped within a field. A minimum of 20 consecutive plants in 5 areas of a field should be monitored for eggs at intervals of 5-7 days. If sweet corn is pollinating or silking during scouting also inspect the tassel and silk for early instar larvae. In the Midwest, a lower threshold of 5% infested plants (eggs + larvae) has been adopted to account for the risk of ear molds. Western bean cutworm egg mass near/at hatch. Egg

masses turn from cream-colored to purple 24-48 hours before hatching. Newly hatched larvae consume their eggshell, so egg masses are most evident before or immediately after hatching.