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

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Calendar of Events:

July 7, 2022 – UW-Hancock Ag Research Station Field Day
July 8, 2022 – UW-Extension Langlade Co. Airport Ag Research Station Field Day
July 28, 2022 – UW-Rhinelander Field Day
November 29-December 1, 2022 – Midwest Food Producers Assoc. Processing Crops Conference, Kalahari Convention Center
February 7-9, 2023 – UW-Madison Div. of Extension & WPVGA Grower Education Conference & Industry Show, Stevens Point, WI

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/

Onion maggot 'peak' invades southern Wisconsin – (https://agweather.cals.wisc.edu/vdifn)

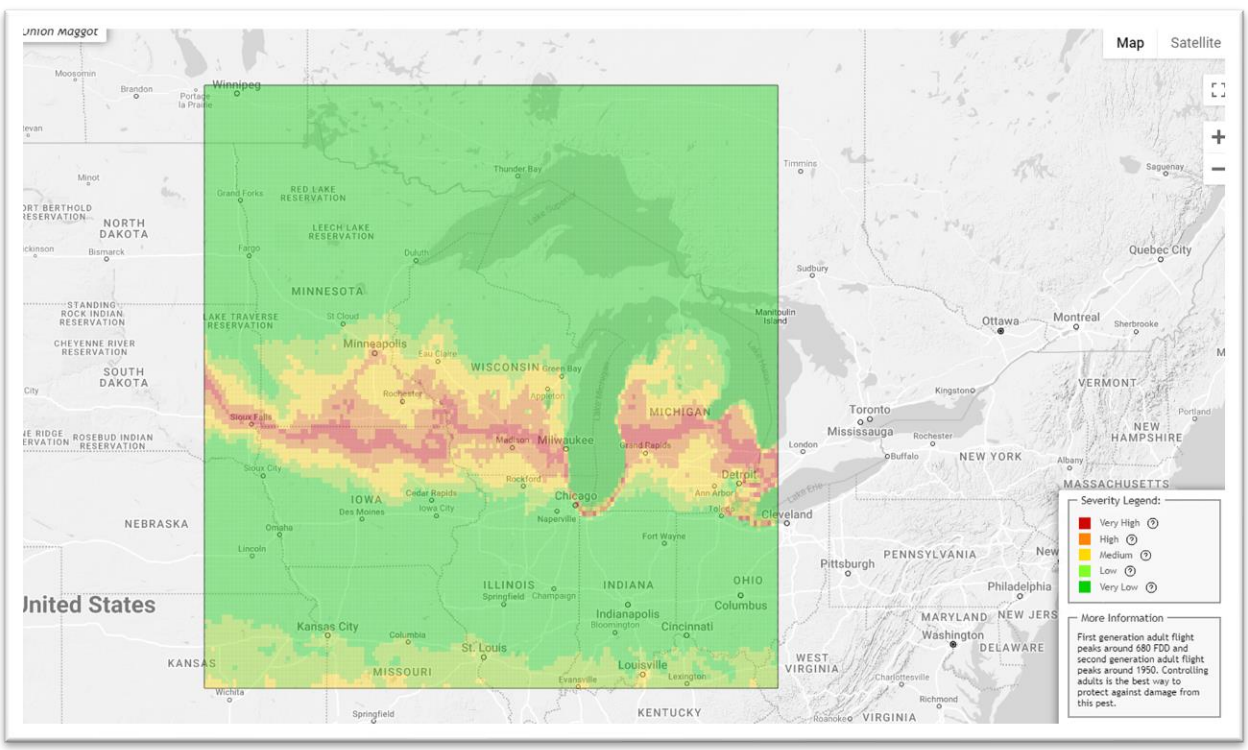

Figure 1. Peak flight activity for 1st generation of onion maggot in the upper Midwest. First generation peak (and subsequent risk) is illustrated across very southern Wisconsin. (Source: https://agweather.cals.wisc.edu/vdifn).

Using a base temperature of 39.2° F, peak flight for the first of three generations of onion maggot is now moving northward and occurs when 680FDD have been reached/surpassed (**Fig. 1**). Adult peaks are present across southern Wisconsin and planting of susceptible crops (e.g. onion, leek, shallot, chive) is advised in areas where 'high risk' is delimited. Directed seeded crops planted in the last 10-12 days which are just emerging are also quite vulnerable. Remember to avoid the incorporation of green manures at the times of the peak to lessen the infestation pressure. Consider covering recently seeded or transplanted crops with floating row covers as a barrier against adult onion maggot oviposition. Use production methods (raised beds, black plastic) that favor vigorous growth so that plants can compensate and outgrow moderate amounts of root injury. More information here.

Flea beetles. – (https://vegento.russell.wisc.edu/pests/flea-beetles/). Flea beetles are now appearing as early-season pests, and these are commonly found on all members of the cole crop group (kale, brussels sprouts, cabbage, etc), but can also attack spinach, beets, and early planted eggplant. There are several different species of flea beetles that pose problems early in the season when they are considered occasional pests. Crucifer flea beetle attacks cole crops and mustards while the eggplant flea beetle is commonly associated with eggplant. Similarly, the potato flea beetle most often attacks potato, but can be found at low levels on other nightshade plants (pepper, tomato, solanaceous weeds). Common Wisconsin flea beetles include the cruicfer, eggplant, horseradish, pale-striped, potato, spinach, and striped varieties (**Table 1**). Chemical control options are recommended when flea beetle populations exceed established threshold levels, particularly early in the season (A3422, Commercial Vegetable Production).

Table 1. Common Wisconsin flea beatles

Common name	Scientific name	Description	Host plants
Crucifer flea beetle	*Phyllotreta cruciferae*	greenish or bluish-black; 1/16" to 1/8"	cabbage and other crucifers including horseradish
Eggplant flea beetle	*Epitrix fuscula*	black; 1/16"	eggplant
Horseradish flea beetle	*Phyllotreta armoraciae*	black with yellow stripes; 1/8"	horseradish and other mustards
Pale-striped flea beetle	*Systena blanda*	dark brown with 2 broad white stripes down its back; 1/6"	potatoes, tomato, eggplant, pepper
Potato flea beetle	*Epitrix cucumeris*	dull black; 1/16"	potatoes, tomato, eggplant, pepper
Spinach flea beetle	*Disonycha xanthomeles*	greenish-black with a yellow thorax; 1/5"	spinach and beets
Striped flea beetle	*Phyllotreta striolata*	black with 2 crooked yellow strips running down its back; 1/12"	cabbage

Care should be taken however, not to disrupt early populations of natural enemies that are also emerging at this time and trying to establish in the local landscape. The synthetic pyrethroids comprise the majority of options at this time, as well as pyrethrum (e.g. Pyganic, Azera, etc) for organics. Floating row covers can prevent adults from feeding on leaves and laying eggs on the crop. If used, row covers should be set up just before the crop emerges. Water deters adult flea beetles, and any watering should be done in mid-day. Since flea beetles overwinter near fields, planting after adults have emerged or rotating crops can help minimize flea beetle damage.

Imported cabbageworm – (https://vegento.russell.wisc.edu/pests/caterpillar-pests-of-cole-crops/). Imported cabbageworms (also known as cabbage whites or small whites), cabbage loopers and diamondback moths are the three most significant caterpillar pests of Wisconsin cole crops, with the imported cabbage worm being the most significant. Emergence of overwintered adults is now underway (**Fig. 3**) throughout much of central Wisconsin, and adult populations will continue to develop throughout the remainder of the state over the coming week. Imported cabbageworm adults, commonly referred to as the white cabbage butterfly, are white butterflies with black markings on the wing tips (**Fig. 2**). 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.

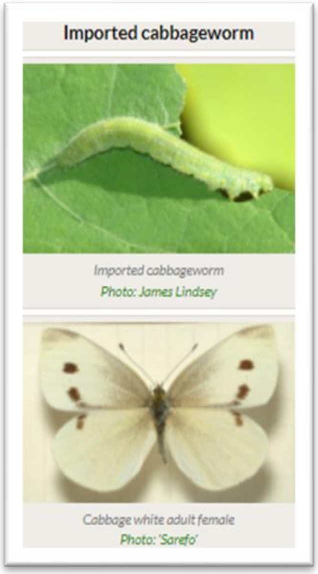

Figure 2 (on left). Adult and larva of Imported cabbageworm.

Imported cabbageworms overwinter as pupa on plant debris and usually produce 3-6 generations in a season. Adult butterflies have been emerging in southern and central Wisconsin and will begin laying single, small, yellow-orange eggs on any plant part that is above ground. Second generation butterflies emerge mid-July and larvae develop almost entirely on cultivated cole crops. The second generation usually causes the most damage.

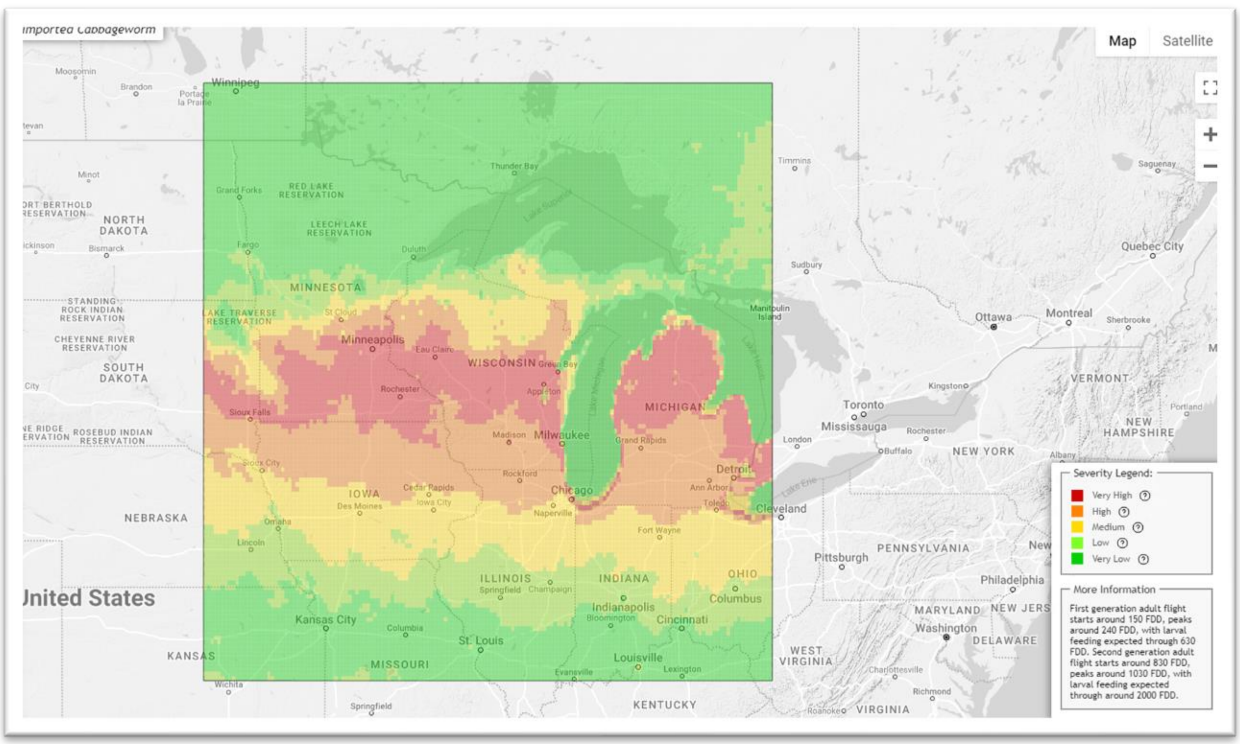

Figure 3. Peak flight activity for 1st generation of imported cabbageworm in the upper Midwest. First generation peak (and subsequent risk) is illustrated across central and southern Wisconsin. (Source: https://agweather.cals.wisc.edu/vdifn).

Colorado potato beetle (CPB) – (https://vegento.russell.wisc.edu/pests/colorado-potato-beetle/). Check for CPB adults now after potato plants have emerged and during hilling operations. Emerging adults are colonizing fields now in southern and central Wisconsin this past week (**Fig. 4**). Appearance of the very first egg masses is predicted for very southern Wisconsin. Some of our producers in the very southern part of the state, may be thinking about initial perimeter spray applications of the insect growth regulator, novaluron (Rimon® 0.83EC), and initiating treatment in the next 10 days. The initial application of Rimon can be successful in two ways, i) making recently laid eggs non-viable after adult females ingest the product, and ii) by limiting egg maturation and hatch if egg masses are contacted by the application (requires good coverage).

Adult CPB are easy to spot and have vivid-yellow shells with ten black running the length of their shell. Female adults are extremely fecund and can lay between 300 and 800 eggs. Egg masses are bright yellow to orange in typically found in clusters of ten to thirty eggs on the undersides of leaves. Larvae hatch from the eggs in 4-9 days depending upon ambient air temperature. Each immature life stage (stadia) between molts is called an instar, totaling 4 instars. First instar larvae are blackish-brown in color and very small, approximately the size of a pinhead. Once hatched first instar larvae prefer to feed upon newly expanded foliage at the crown of the plant. Because of their small size feeding damage is minimal. Second instar larvae assume a deep crimson coloring, leaf consumption increases two-fold from first instars. Third and fourth instars have bright red abdomens with black head capsules and legs. The last two larval instars consume increasingly more foliage and result in the majority of economic damage to solanaceous crops.

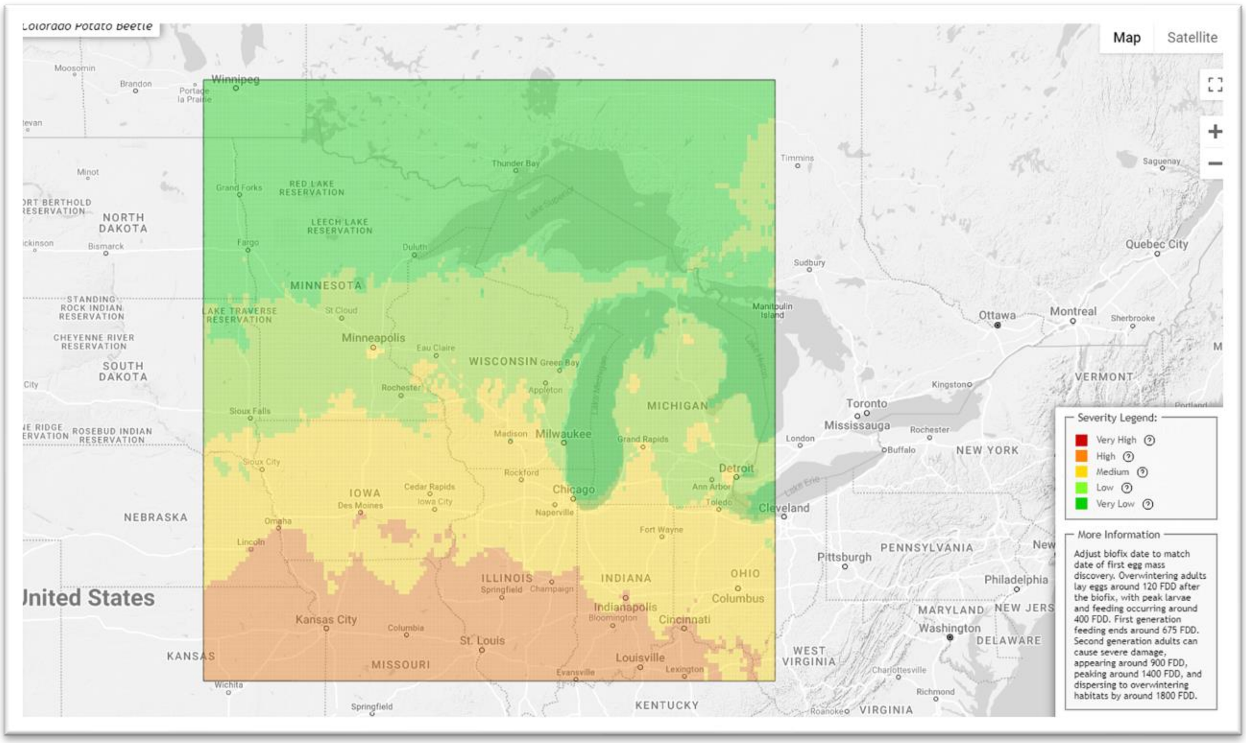

Figure 4. Peak emergence activity for 1st generation of Colorado potato beetle in the upper Midwest. First generation emergence (and subsequent risk) is illustrated across central and southern Wisconsin. (Source: https://agweather.cals.wisc.edu/vdifn).

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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 2022. 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 will come from weather stations that are placed in potato fields in each of the four locations, once available. Data from an alternative modeling source: https://agweather.cals.wisc.edu/vdifn will be used to supplement as needed for missing data points. We currently have our Grand Marsh, Hancock, and Plover weather stations up and running. We will add the Antigo station soon. Data are available in graphical and raw formats for each weather station at: https://vegpath.plantpath.wisc.edu/dsv/

Location	Planting Date		50% Emergence Date	Disease Severity Values (DSVs)	Potato Physiological Days (P-Days)
Grand Marsh	**Early**	Apr 5	May 10	1	79
	Mid	Apr 20	May 15	1	38
	Late	May 12	TBD	TBD	TBD
Hancock	**Early**	Apr 7	May 12	1	60
	Mid	Apr 22	May 17	1	22
	Late	May 14	TBD	TBD	TBD
Plover	**Early**	Apr 7	May 15	0	37
	Mid	Apr 24	May 20	0	7
	Late	May 18	TBD	TBD	TBD
Antigo	**Early**	May 1	TBD	TBD	TBD
	Mid	May 15	TBD	TBD	TBD
	Late	TBD	TBD	TBD	TBD

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. This tool utilizes NOAA weather data (stations are not situated within potato fields). In the hypothetical examples, below, I have used a potato emergence date of May 1 and selected a central WI location. Note that during our recent atypically hot days, we accumulated ~9 P-Days per day. 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 2022 Commercial Vegetable Production in Wisconsin Guide, Extension Document A3422, linked here: https://learningstore.extension.wisc.edu/products/commercial-vegetable-production-in-wisconsin

Potato early season disease considerations: Wet and cool soils common in early potato plantings can delay germination and emergence. Such conditions also promote activity of plant pathogens, such as *Rhizoctonia solani*, a potentially seed-, soil-, or debris-borne fungal pathogen which causes stem or stolon cankers resulting in reduced stands, stunted plants, and/or reduction in tuber number, size, or quality. With the range of temperature conditions in spring, hilling time can also impact Rhizoctonia and other seed and emerging plant disease risks.

Later in the season, **Rhizoctonia** can also cause black scurf on tubers. Cultural management approaches such as planting when soil temperatures are more consistently above 46°F, planting into well-drained soils, avoiding planting too deep, and avoiding hilling prior to adequate emergence can limit early season stem and stolon canker.

Several other seed-, soil-, and/or debris-borne diseases can also impact the potato crop as temperatures increase, including **Fusarium seed piece decay** caused by the fungus *Fusarium sambucinum*, **Silver scurf** caused by the fungus *Helminthosporium solani*, and **Late blight** caused by the oomycete *Phytophthora infestans*. While optimum temperatures for promoting each of these diseases vary, all require high soil moisture levels.

Fusarium, as a dry rotting pathogen which requires wounds for entry, can affect quality of seed potatoes in storage and lead to further disease concerns when potatoes are moved and warmed for planting. As a seed piece decay pathogen, Fusarium can affect seed immediately after cutting and through to sprouting. If initial and subsequent sprouts continue to be affected by Fusarium, the seed piece loses vigor and stand is reduced.

The **Silver scurf** pathogen is favored by warmer conditions and is recognized as a weak soil-borne and a stronger seed-borne pathogen. Typically, symptoms are not evident on tubers at harvest, but develop over time in storage. The longer the tubers remain in the ground after vine kill, the greater the risk for development silver scurf. Blemishes on tubers are restricted to the periderm. However, damage to the periderm causes increased water loss and shrink. The pathogen is not known to cause above ground plant symptoms.

Fungicide seed and ino-furrow treatments have a place in an integrated pest management plan which includes cultural practices such as planting certified seed, proper handling and sanitation of storage/cutting/curing facilities prior to planting, and cultivar resistance. In combination, IPM practices minimize economic losses to disease, minimize environmental effects, limit risk of pesticide residues in the food supply, limit development of fungicide-resistant pathogen strains, and limit development of pathogen strains which may overcome host disease resistance.

Several fungicides with effective control of multiple diseases are available with registration for application to seed pieces prior to planting listings can be found in our 2022 A3422 Commercial Vegetable Production Guide for Wisconsin. https://learningstore.extension.wisc.edu/products/commercial-vegetable-production-in-wisconsin . Always read and follow the pesticide label prior to use.

In special consideration of late blight control in potato, key components of management include:

- Destroy all potato cull piles (May 20 deadline by DATCP)
- Manage potato volunteers in all fields –*volunteers pose great risk for late blight introduction*
- Acquire disease free seed from a reputable certified source –*infected seed poses great risk for introduction*
- If there is a risk of disease associated with seed, consier seed treatment or in-furrow application of effective late blight controlling fungicides (seed treatment is best)
- Apply **only proven effective fungicides** for control of late blight when disease forecast tool indicates environmental risk and stay on a fungicide spray program (DSVs reach 18)
    0. For conventional systems, a current list of registered late blight-specific materials can be found in the Commercial Vegetable Production in Wisconsin A3422 publication
    1. For organic systems, copper-containing fungicides have been long-standing effective materials for preventing late blight in susceptible crops. Some newer organic fungicides are also available with promising late blight control
- Scout regularly and thoroughly for disease in all potato fields
- Re-apply effective fungicides for disease control on a 7 day schedule (recommendation adjusts to a 5 day schedule when late blight is in the area and weather favors disease; recommendation adjusts to a 10 day schedule when late blight is not found in area and weather is hot and very dry)
- If late blight is identified in a field, have a mitigation plan in place for specific site. Depending on days to vine kill, environmental conditions, and extent of infection – plan may vary from complete crop destruction to early vine kill with continued maintenance fungicide sprays. Mitigation plan should limit disease spread within field and from field-to-field.