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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- Potato Virus Y Potato Demonstration Trial and Workshop – July 8 Antigo Airport
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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

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In our research trials planted at the Hancock Ag Station on April 28th, Agata and Colomba (plants within the box in picture 1), as well as Snowden have achieved >85% emergence this week, and some of the plants were already about 2'' tall (picture 2). Caribou Russet just emerged out of the soil, other varieties such as Plover Russet, Lakeview Russet, Reveille Russet are cracking the soil. There is apparent varietal difference regarding early season plant growth (Figure 1).

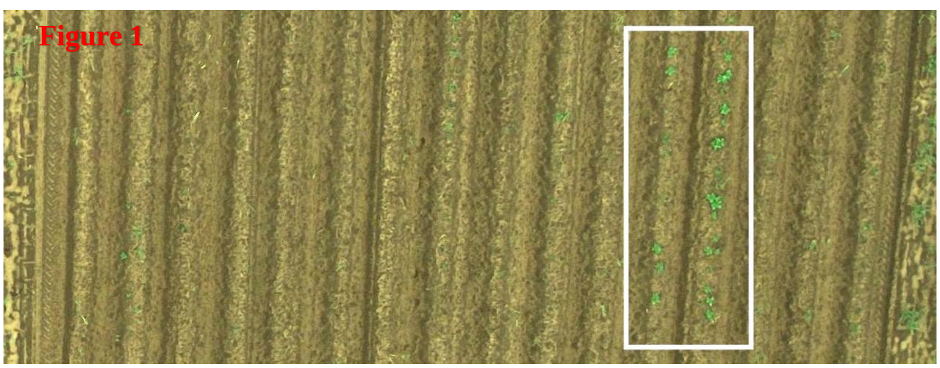


Figure 1


Figure 2

This week was the first week that my team collected aerial images using an UAV carrying a multispectral sensor.

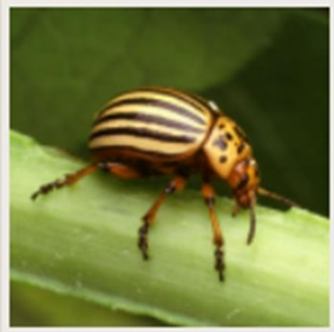
My postdoc Alfadhl Alkhaled and my PhD student Trevor Crosby are our pilots who flew the UAV (picture on the left). We are still developing our protocols about height of the flight, effects of cloudy and windy conditions, GPS positioning, imaging stitching and preprocessing, etc. This week we flew 150 feet high over our research field that's about 50 feet wide and 500 feet long (about 0.6 acres), and we found that this is a little too high because we covered a lot of other space. We will continue to work on finding the optimal height for different sizes of plots. Those images will be analyzed to extract spectral signals so we can calculate vegetation indices such as NDVI, a standard way to measure healthy vegetation, NDRE, which gives better insight into permanent or later stage crops since it's able to measure further down into the canopy, TCARI/OSAVI, which is sensitive to chlorophyll and nitrogen content of the plants and resistant to variations in leaf area/soil background. We will then develop machine learning models to predict potato petiole nitrate-N or final yield using those vegetation indices.

In addition, this season we will collaborate with two farms, each of which has applied different N fertilizer rates in a field. The field is about 100 acres, so we will need to figure out the best height to cover the large-scale production fields. Battery life of the UAV might be a concern to keep in mind. We aim at developing reliable algorithms that can help growers to monitor their plant N status or understand their yield potential by flying the UAV and generating whole-field maps with petiole nitrate-N or final yield values.

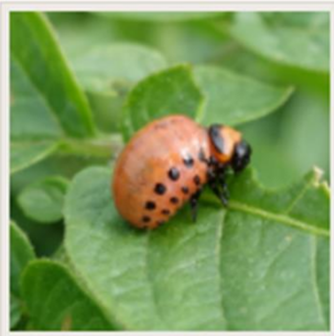
Vegetable Insect Update – Russell L. Groves, Professor and Department Chair, UW-Madison, Department of Entomology, 608-262-3229 (office), (608) 698-2434 (cell), e-mail rgroves@wisc.edu

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

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 have begun to colonize field edges in portions of southern and central Wisconsin this past week (**Fig. 1**). Early detection of infestation is especially critical in deploying many of the reduced-risk, active ingredients we have for control. Visual search patterns for CPB should be twofold early in the growing season. First, quickly scan plants and surrounding soil for the presence of live adults. Often adult beetles will drop from small plants to the soil as a defensive tactic, typically observing the area surrounding plants will help for early detection. Second, carefully examine lower leaf surfaces of plants for clusters of bright yellow-orange, waxy eggs. Note the number of adults and egg masses in for a given number of plants. This number will help to track the overall trajectory of pest infestation. Additionally, focus early season scouting on border rows that are adjacent to either previous solanaceous crops or unmanaged non-crop areas. These have the greatest probability for early infestation by adult CPB and greater densities egg masses.



Colorado potato beetle adult
Photo: Scott Bauer



Late-instar Colorado potato beetle larva
Photo: Ben Bradford

Figure 1. Adult and larva (later instar) of the Colorado potato beetle.

Many chemical pest management practices are timed to calendar dates. But insect development is directly related to temperature: cool weather slows growth, warm weather accelerates it. So unless the weather of a given year is that of the "normal" year, recommended treatment dates may not coincide with the most vulnerable life stage of an insect pest. Using a degree-day based, temperature dependent system incorporating daily high and low temperatures instead of calendar dates will help to anticipate pest outbreaks. This system converts daily average temperatures into degree days. A degree day is a unit of measure for each degree above a base temperature (52°F for CPB). To use this approach, begin keeping track of the temperature when you find the first egg mass (or use an online degree-day calculator like the [Vegetable Disease and Insect Forecasting Network](https://agweather.cals.wisc.edu/vdifn)). This site maintains a running total of the numbers of degree days to chart insect development. In **Table 1**, we identify the number of degree days needed for each stage of Colorado potato beetle development. The smaller dialogue box in the lower right corner of the VDIFN output also illustrates these important DD milestones (**Fig. 2**). As a reminder, a user is able to 'click on' any cell on the VDIFN map to obtain location-specific estimates of accumulated degree

Table 1. Rate of beetle development using degree days
See VDIFN (base: 52°F; max: none; biofix: 1st eggs)

Life stage	Degree days	Accumulated degree days	Treatment
Egg	120	120	Not susceptible - do not treat
First instar	65	185	Most effective time to apply Btt
Second instar	55	240	Most effective time to apply conventional insecticides
Third instar	60	300	Most effective time to apply conventional insecticides
Fourth instar	100	400	Most effective time to apply conventional insecticides
Pupae	275	675	Not susceptible - do not treat

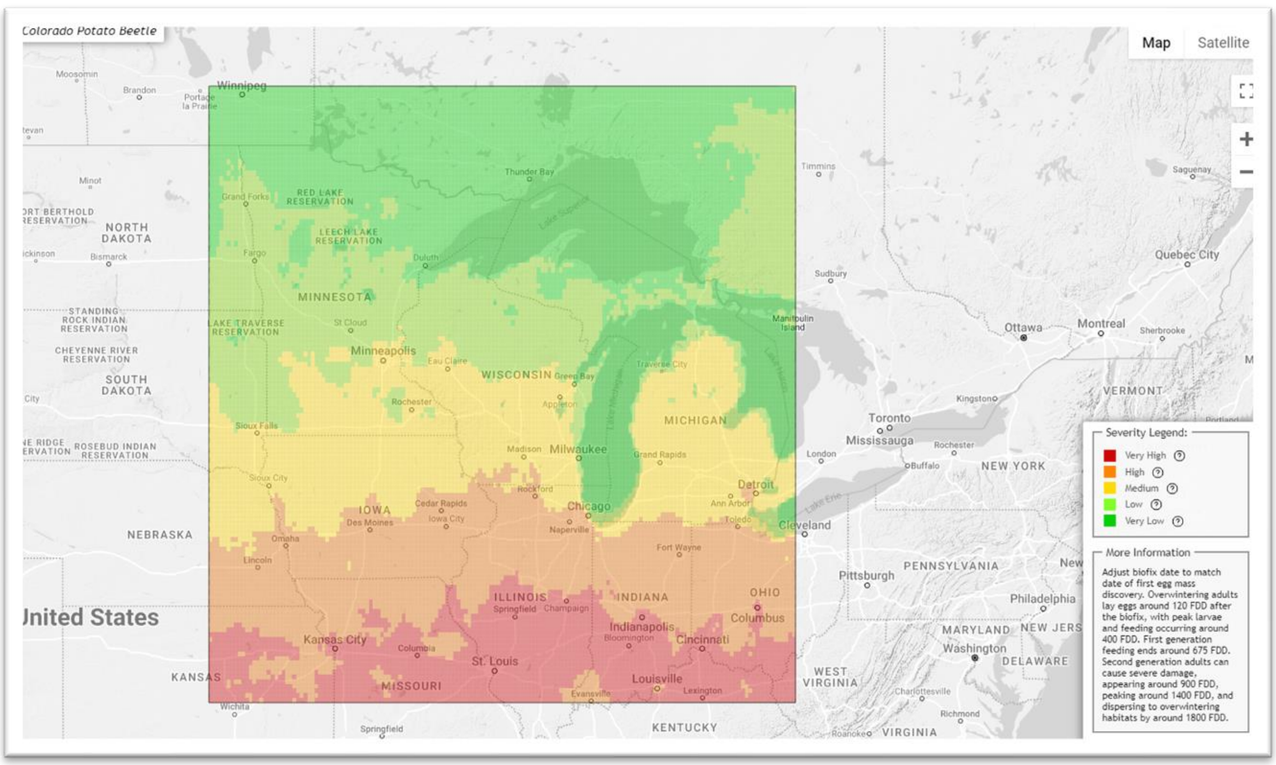


Figure 2. Peak emergence activity for 1st generation of Colorado potato beetle in the upper Midwest. First generation emergence (and subsequent risk) is illustrated across central and southern Wisconsin. (Source: https://agweather.cals.wisc.edu/vdifn).

Potato leafhopper (PLH). In Wisconsin, the potato leafhopper can be a serious annual pest of snap beans, hops, clover, alfalfa and potatoes. Damage caused by leafhoppers includes stunted plants, brown leaves and reduced plant vigor. Both adults and nymphs feed by inserting their mouth parts into the plant's vascular tissue and extracting sap. Damage results when the insect injects saliva containing toxic substances and creates physical damage during feeding, plugging the vascular tissue and permanently reducing the plant's photosynthetic efficiency.

The first signs of leafhopper feeding are the leaf veins turning pale and the leaf curling. Continued feeding results in a characteristic triangular yellowing or browning of the leaf tip known as "hopperburn". As symptoms develop, lesions spread backward and inward from the margin, eventually destroying the entire leaf. Plants become stunted and yellow leaves curl upward. Injury develops most rapidly during hot, dry weather. More damage is attributed to the nymphs than the adults. Leafhopper damage may take weeks before symptoms begin to show and it is typically older leaves that display the "hopperburn" symptomology. Yield loss generally occurs before symptoms are readily seen. Though plants may show little evidence of hopperburn, yield losses can be substantial.

When to scout for potato leafhopper																		
	April			May			June			July			August			September		
	early	mid	late	early	mid	late	early	mid	late	Early	Mid	Late	Early	Mid	Late	Early	Mid	Late
Potatoes																		
Beans																		

Snap beans and potatoes should be scouted regularly for PLH activity. Leafhoppers tend to migrate into other crops in early summer after alfalfa is cut. This is a key time to watch for early migrants in vegetable plantings. With snap beans, the greatest amount of injury caused by PLH occurs during the seedling stage.

Potato virus Y Demonstration Trials – 2022. As part of our July 8, 2022 – UW-Extension Langlade Co. Airport Ag Research Station Field Day, we will host another demonstration trial to illustrate how symptoms of PVY infection can vary among commonly grown potato cultivars in the Midwest. This demonstration trial is part of a USDA Specialty Crops Research Initiative funded project. In our Wisconsin plots, we plan to have two planting dates separated by 10-14 days. In discussion with inspectors from the Wisconsin Seed Potato Certification Program, the two plantings are necessary to provide field day participants the ability observe how potato cultivar influences the timing of symptom expression. Inspectors suggest there are discrete 'windows' of time when disease symptom expression is most obvious on certain varieties. A listing of cultivars and strains to be included in the evaluation is provided (**Fig. 3**).

A federally funded research and extension-based program focused on developing virus management strategies to produce a high-quality crop

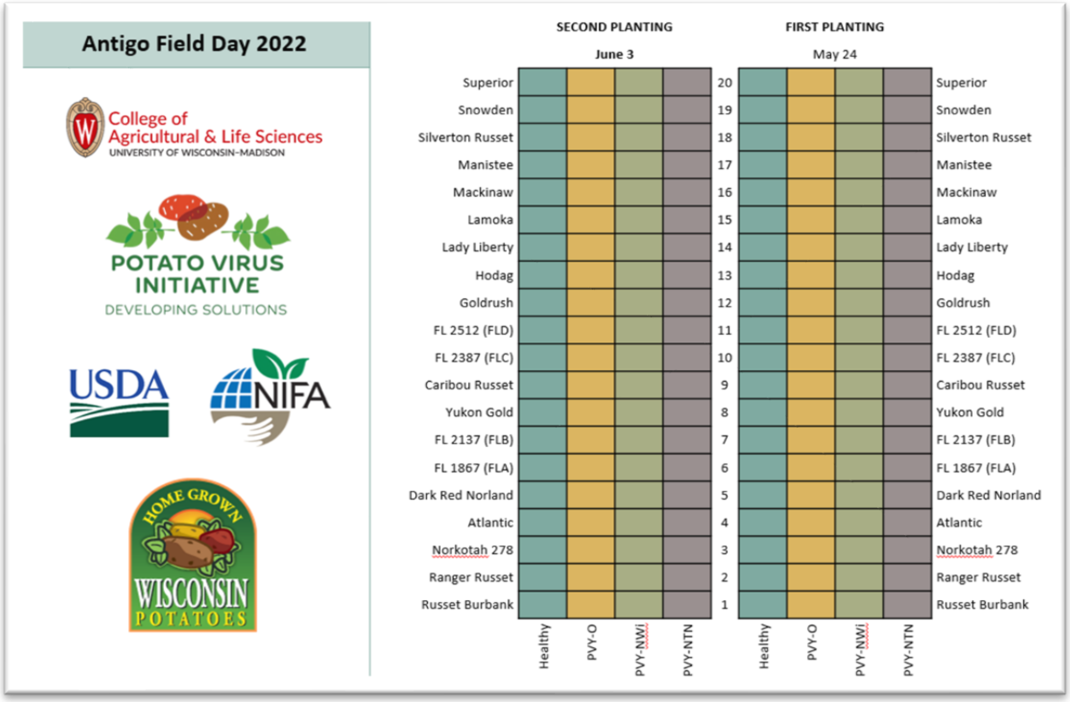


Figure 3. Planting arrangement of 20 commonly grown potato cultivars expressing seed-borne symptoms of infection with Potato virus Y at the Langlade County Airport and research site.

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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) 5/27/2022	Potato Physiological Days (P-Days) 5/27/2022
Grand Marsh	**Early**	Apr 5	May 10	1	117
	Mid	Apr 20	May 15	1	77
	Late	May 12	May 25	1	18
Hancock	**Early**	Apr 7	May 12	1	90

	Mid	Apr 22	May 17	1	56
	Late	May 14	May 26	0	11
Plover	**Early**	Apr 7	May 15	1	75
	Mid	Apr 24	May 20	1	741
	Late	May 18	May 27	0	4
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 (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 2022 Commercial Vegetable Production in Wisconsin Guide, Extension Document A3422, linked here: https://learningstore.extension.wisc.edu/products/commercial-vegetable-production-in-wisconsin

Onion Botrytis Leaf Spot/Leaf Blight. Ben Bradford, UW Entomology; Ariana Abbrescia, UW-Agroecology; Amanda Gevens, UW-Plant Pathology.

We recently added a new disease modeling tool to the Vegetable Disease and Insect Forecast Network website: https://agweather.cals.wisc.edu/vdifn . The descriptive information below is also available at our website: https://vegpath.plantpath.wisc.edu/resources/onion-botrytis/

Symptoms of Onion Botrytis Leaf Spot/Leaf Blight. Note the small, whitish, oval-shaped spots on the leaf surrounded by a light green or silver halo. Photo credit: Lindsey du Toit, Washington State University, via Bugwood.org

Onion Botrytis leaf blight/leaf spot is a fungal disease of alliums caused by *Botrytis squamosa*. Symptoms first appear as small whitish spots on the leaf. These spots are oval-shaped, and sometimes surrounded by a light green or silver halo that often appears water-soaked. Leaf tips will begin to dry and wither as the disease progresses, sometimes until the whole leaf dies back. Progressed infection can stunt bulb growth and reduce yield. Heavily infected fields often appear yellowish and blighted. Severe infection can stunt bulb growth and reduce yield.

Infection. Primary infection occurs from *B. squamosa* spores that overwinter in infected in-field plant debris, cull piles, stored bulbs, volunteer bulbs in-field, and in infected soil. Secondary infection can occur when conidia spores spread from moist, infected leaves. Favorable conditions for disease development include high relative humidity and rainfall, prolonged leaf wetness, and warm temperatures.

Disease Cycle. *Botrytis squamosa* overwinters as sclerotia in infected in-field plant debris, cull piles, stored bulbs, volunteer bulbs in the field, and infested soil. These sclerotia produce airborne conidia spores and ascospores (sexual spores) that travel to and infect onion leaves during periods of high moisture and low air movement. These same favorable conditions allow for secondary cycles of infection, where infected leaves produce more conidia, which spread to further infect the same leaf or others. Sclerotia are once again formed at the end of the season, and the disease cycle will continue the following season.

Disease Modeling. To view the predicted onion botrytis risk on any given day, visit the Vegetable Disease and Insect Forecasting Network (VDIFN) website. From the Disease tab, select the "Botrytis leaf blight" model. This BOTCAST model uses a cumulative disease severity index (CDSI) computed from gridded NOAA weather data to calculate the risk of onion botrytis development, which is displayed as a colored map overlay.

- Threshold 1: ($21 \leq$ CDSI < 31) Warning threshold of "no spray applied unless rain predicted or overhead irrigation applied"
- Threshold 2: high risk of rapid disease development, apply initial spray as soon as possible
- CDSI > 40: extremely elevated risk

The start point should be set to the date of crop emergence. Click any grid point in VDIFN to get more detailed weather and disease progression information for that location.

Cultural control. Cultural control strategies include scouting regularly to identify the presence of the disease early before it has had a chance to spread and cause significant damage. Disease spread can be limited by avoiding working in fields when plants are wet and disinfecting tools and machinery. The following practices can help mitigate the risk of this disease:

- Maintain proper spacing between plants
- Destroy cull piles
- Rogue volunteer plants
- Distance seed and commercial onion fields
- Destroy infested plant debris
- Rotate away from susceptible crops (Alliums) to reduce sclerotia in soil (3 years)

Chemical control. Use disease forecasting tools to properly time the most effective disease prevention sprays. For Wisconsin-specific fungicide information, refer to the Commercial Vegetable Production in Wisconsin (A3422), a guide available through the UW Extension Learning Store website. 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.

Additional References

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Adapted from UW Extension publication A3803, written by Karen Delahaut and Walt Stevenson in 2004.