



# Vegetable Crop Update

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

No. 14 – July 30, 2013

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P-Days for early blight management  
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Cucurbit downy mildew

## Calendar of Events

Aug 22 – UWEX-Langlade County Airport  
Research Station Field Day, Antigo, WI

**Vegetable Disease Update – Amanda J. Gevens, Assistant Professor & Extension Vegetable Plant Pathologist, UW-Madison, Dept. of Plant Pathology, 608-890-3072 (office), Email: [gevens@wisc.edu](mailto:gevens@wisc.edu). Vegetable Path Webpage: <http://www.plantpath.wisc.edu/wivegdis/>**

### Current P-Day (Early Blight) and Severity Value (Late Blight) Accumulations

P-Day of  $\geq 300$  indicates threshold for early blight risk and triggers preventative application of fungicide. DSV of  $\geq 18$  indicates threshold for late blight risk and triggers preventative application of fungicide. Red text in table below indicates threshold has been met. NA indicates that information is not yet available as emergence has yet to occur. [http://www.plantpath.wisc.edu/wivegdis/contents\\_pages/pday\\_sevval\\_2013.html](http://www.plantpath.wisc.edu/wivegdis/contents_pages/pday_sevval_2013.html)

Location	Planted	50% Emergence	P-Day Cumulative (increase from 7/29)	DSV Cumulative (increase from 7/29)	Calculation Date
Antigo Area	Early 5/13	6/4	394 (36)	41 (5)	7/29/13
	Mid 5/22	6/17	317 (36)	33 (5)	7/29/13
	Late 6/7	6/29	219 (36)	17 (5)	7/29/13
Grand Marsh Area	Early 4/15	5/10	517 (47)	169 (32)	7/29/13
	Mid 5/1	5/21	482 (47)	169 (32)	7/29/13
	Late 5/15	6/5	391 (47)	142 (32)	7/29/13
Hancock Area	Early 4/20	5/15	571 (53)	66 (8)	7/29/13
	Mid 5/5	5/23	509 (52)	64 (8)	7/29/13
	Late 5/15	6/5	427 (52)	42 (8)	7/29/13
Plover Area	Early 4/22	5/17	542 (48)	134 (19)	7/29/13
	Mid 5/7	5/30	462 (48)	110 (19)	7/29/13
	Late 5/24	6/5	420 (48)	101 (19)	7/29/13

**DSVs and Late Blight:** From in-potato-field weather stations here in Wisconsin, we have far exceeded initial threshold for Blitecast in all monitored locations with the exception of late planted fields in the Antigo area. Accumulations of DSVs were high in the Grand Marsh and Plover areas this past week due to cooler temperatures and moisture (32 and 19 respectively). I added some information in the above table to indicate increase in accumulated P-Days and DSVs from previous week. The accumulation of 32 in the Grand Marsh location indicates that nearly 5 DSVs accumulated in each day out of the possible maximum of 6 – very promotive weather for

late blight. A 5 to 7-day fungicide program is appropriate at this time given recent rain events and presence of pathogen. There has been limited spread from initial fields of detection.

The UW Vegetable Pathology site offers the Blitecast and Tomcast accumulations for foliar disease control from remotely sensed and forecasted weather data. Information is provided to help growers interpret the information offered for potato and carrot disease control. The link is entitled: “NEW: Blitecast & Tomcast estimates (from remotely sensed weather data), 2013” right in the center of the home page of: [www.plantpath.wisc.edu/wivegdis/](http://www.plantpath.wisc.edu/wivegdis/)

**Late blight status in WI and the U.S. Just last night and this morning, two new counties have confirmed reports of late blight here in WI: Dunn and Portage.** To summarize, to date, late blight was confirmed in Adams Co., WI on Jun 28 on potato (US-23); Juneau Co. on Jun 29 on potato (US-23); Sauk Co. on Jul 2 on tomato (US-23), Dunn Co. on Jul 29 on potato (US-23), and Portage Co. on Jul 29 on potato (US-not yet determined). **In the past week, NY and PA confirmed new reports of late blight on tomato.** To date this production year, late blight has been reported in in FL, KY, LA, MA, MD, ME, MI, NJ, NY, OH, PA, TN, WI, and WV. The website: <http://www.usablight.org/> indicates location of positive reports of late blight in the U.S. and provides further information on disease characteristics and management.

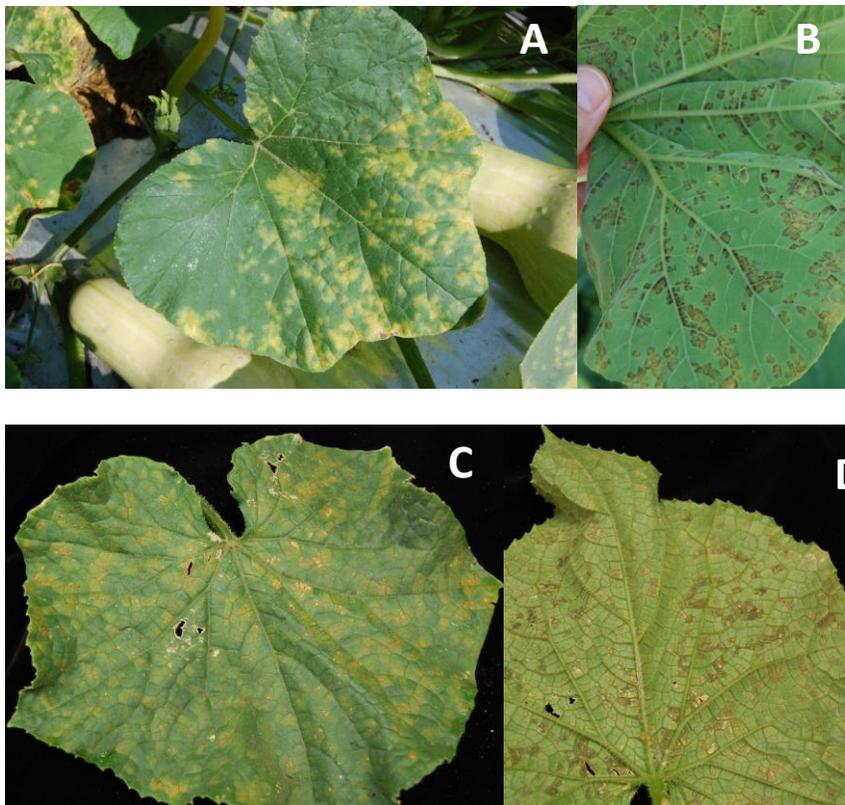
***P-Days and Early blight:*** P-Days have reached/surpassed the threshold of 300 in all but late plantings in the Antigo area. Fungicide applications for the management of early blight are recommended at this time for all but mid and late planted fields in the Antigo area. Because of the dual risk of late and early blight, consider management options that control against both diseases. Symptoms of early blight are advancing in lower and mid-plant canopies throughout most of Wisconsin.

***Tomatoes in high tunnels:*** Several diseases have been observed on tomatoes grown in high tunnels or similar season extension systems this past week. Leaf mold caused by the fungus *Fulvia fulva* is very active at this time. Symptoms include yellowing of discrete patches to entire leaves accompanied by signs of pathogen sporulation on leaf undersides. The leaf mold pathogen prolifically produces gray to dark brown spores on leaf undersides. Management of leaf mold includes cultural measures to reduce humidity especially in the lower plant canopies – staking, pruning of lateral lower branches, rolling up high tunnel sides orienting plant rows to allow moving of air down, mitigating sharp temperature shifts in morning/night hours, irrigation from below or drip tape, and ensuring adequate plant spacing to allow for air movement. We are currently investigating the tolerance of common tomato cultivars to leaf mold in development of an economic threshold for management. However, if symptoms are worsening and moving up the plant and affecting new growth and flower set, the use of fungicides may be necessary to protect the crop. Remember that not all fungicides registered for use in open field production are registered in the greenhouse or high tunnel. Mancozeb and copper-containing fungicides can prevent new leaf mold infections and have some registrations in the greenhouse/high tunnel. Refer to fungicide labels to ensure use allowance. Early blight has also been noted in several high tunnels this past week. Lesions are dark brown to black in color and contain diagnostic target spot rings. Lesions on tomato typically begin on lower leaves and can move upward in the plant canopy as conditions continue to favor the pathogen (warm and moist). New infections can be limited, see above comments on cultural and chemical management of leaf mold.



Tomato leaf mold caused by the fungus *Fulvia fulva*. Photos courtesy of Texas A&M/AgriLife Sciences. Severely infected leaves can completely turn yellow with undersides covered in spores.

**Cucurbit Downy Mildew:** has not been identified in Wisconsin at this time in commercial fields, home gardens, or our sentinel monitoring plots. **In the past week, many states reported cucurbit downy mildew on multiple hosts including AL, CT, DE, KY, MD, MI, NC, NY, OH, PA, and VA.** In summary this year, AL, DE, FL, GA, MD, MI, NC, NJ, NY, OH, PA, SC, TX, VA, and Ontario Canada have reported cucurbit downy mildew across multiple cucurbit hosts. I will be keeping tabs on disease reports in the region and will provide updates in this newsletter. No forecasted risk of movement of spores from states reporting detects to Wisconsin at this time. The website: <http://cdm.ipmpipe.org/> offers up to date reports of cucurbit downy mildew and disease forecasting information.



**Figure 2. Symptoms and signs of cucurbit downy mildew.** A. Yellow angular lesions on butternut squash. B. Dark brown pathogen sporulation on leaf underside of butternut squash. C. Yellow angular lesions on pickling cucumber. D. Dark brown pathogen sporulation on leaf underside of pickling cucumber.

Once identified in a region, cucurbit downy mildew should be carefully managed with effective fungicides. I have included fungicide recommendations for cucurbit downy mildew below – based on efficacy trials are commendations of Dr. Mary Hausbeck at Michigan State University.

<b>CUCUMBER</b>	
<b>Fungicides applied BEFORE disease 7 day interval</b>	<b>Fungicides applied AFTER disease 5 day interval</b>
Gavel 75WG (5 day phi)	Presidio 4FL (2 day phi)
Presidio 4FL (2 day phi)	Previcur Flex 6SC (2 day phi)
Previcur Flex 6SC (2 day phi)	Ranman 3.6SC (0 day phi)
Ranman 3.6SC (0 day phi)	Tanos* 50WG (3 day phi)
Tanos* 50WG (3 day phi)	
Zampro 4.4SC (0 day phi)	
Alternate products and mix with either: mancozeb (ie: Dithane) OR chlorothalonil (ie: Bravo)	Alternate products and mix with either: mancozeb (ie: Dithane) OR chlorothalonil (ie: Bravo)
Use of the highest labeled rate of products is recommended. *NOTE: Tanos did not provide adequate control of downy mildew when used alone on cucumbers during a 2011 MI field trial.	

<b>OTHER VINE CROPS such as pumpkin, winter squash, melon, gourds, zucchini</b>	
<b>Fungicides applied BEFORE disease 7-10 day interval</b>	<b>Fungicides applied AFTER disease 7 day interval</b>
Gavel 75WG (5 day phi)	Presidio 4FL (2 day phi)
Presidio 4FL (2 day phi)	Previcur Flex 6SC (2 day phi)
Previcur Flex 6SC (2 day phi)	Ranman 3.6SC (0 day phi)
Ranman 3.6SC (0 day phi)	Tanos* 50WG (3 day phi)
Tanos* 50WG (3 day phi)	
Zampro 4.4SC (0 day phi)	
Alternate products and mix with either: mancozeb (ie: Dithane) OR chlorothalonil (ie: Bravo)	Alternate products and mix with either: mancozeb (ie: Dithane) OR chlorothalonil (ie: Bravo)
Use of the highest labeled rate of products is recommended. *NOTE: Tanos did not provide adequate control of downy mildew when used alone on cucumbers during a 2011 MI field trial.	

Early detection and management of this disease is critical. If you suspect downy mildew, please contact your county agent, me, or submit a sample for confirmation.

The 2013 A3422 Commercial Vegetable Production in Wisconsin guide is available for purchase through the UW Extension Learning Store website: <http://learningstore.uwex.edu/Commercial-Vegetable-Production-in-Wisconsin2013-P540.aspx>

A pdf of the document can be downloaded or is available at the following direct link: <http://learningstore.uwex.edu/Assets/pdfs/A3422.pdf>



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

**UW Extension**

**Disease Supplement #5 – July 31, 2013**

**Vegetable Disease Update – Amanda J. Gevens, Assistant Professor & Extension Vegetable Plant Pathologist, UW-Madison, Dept. of Plant Pathology, 608-890-3072 (office), Email: [gevens@wisc.edu](mailto:gevens@wisc.edu). Vegetable Path Webpage: <http://www.plantpath.wisc.edu/wivegdis/>**

**Late blight update:** The Portage County potato late blight sample was determined by allozymes analysis to be of the **US-8 genotype**. This is significant for several reasons, 1) we have not identified US-8 in Wisconsin since the 1990s and it has not been common in the U.S. in recent years, 2) US-8 is resistant to mefenoxam/metalaxyl fungicides, 3) US-8 is of the A2 mating type and has the potential to sexually recombine with US-23 (an A1 and common in WI and the US this year) producing soilborne oospores when co-inoculated onto susceptible plants, and 4) identification of this second genotype suggests a second introduction of the late blight pathogen in Wisconsin. Table 1 below summarizes genotypes (and their characteristics) common in the US since the 1840s.

**Table 1.** Genotypes/clonal lineage, mating type, host, years found, and mefenoxam sensitivity of *Phytophthora infestans* in the U.S. since from 1840 to present.

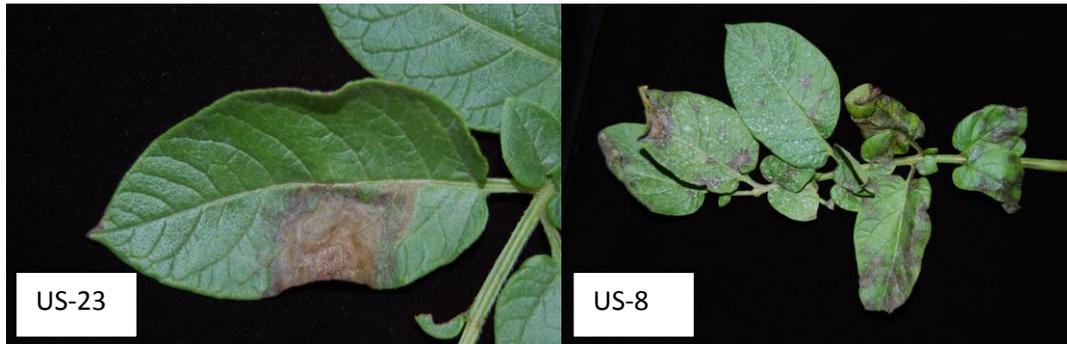
Clonal Lineage	Mating Type	Host (s)	Years Found	Mefenoxam Sensitivity
US-1	A1	potato	1840-present	sensitive
US-6	A1	potato/tomato*	1979-94	sensitive
US-7	A2	potato/tomato*	1992-95	resistant
<u>US-8</u>	<u>A2</u>	<u>potato*/tomato</u>	<u>1992-present</u>	<u>resistant</u>
US-11	A1	potato/tomato	1994-present	resistant
US-17	A1	tomato	1996	resistant
US-18	A2	tomato	1995-98	sensitive
US-22	A2	potato/tomato*	2009-present	sensitive
<u>US-23</u>	<u>A1</u>	<u>potato/tomato*</u>	<u>2010-present</u>	<u>sensitive</u>
US-24	A1	potato*/tomato	2010-present	resistant

\*= favored host if two hosts are shown

Fig. from Halterman & Gevens, *Phytophthora infestans* in the U.S., book chapter, *Phytophthora: A Global Perspective*, Edited by K. H. Lamour. CABI Plant Protection Series 2013.

In order to help better understand the epidemic at hand, **please submit samples to my lab** or work through your county agent and request that they send to me for genotyping. *Even if a sample has already been submitted from your county and determined to be US-23.* All we need to know is the county of sample origin. Identification of genotype at the county level would be very helpful in improving our understanding of this epidemic and potential future risks. Lab address is: Amanda Gevens, 1630 Linden Dr, Room 689, Plant Pathology Dept., University of Wisconsin, Madison, WI 53706. Please send infected leaves in a slightly inflated ziplock bag with no paper towel. Overnight shipping is best.

**Symptoms of late blight** looked a bit different with the US-8 genotype than with US-23 (see Figure 1 below). US-8 lesions were smaller but more numerous, dark brown to black in color, were present on leaves and petioles, and were not sporulating at time of collection. US-23 lesions were larger and few, brown to water-soaked or dark green in color, were present on leaves, and were sporulating at time of collection. While sporulation and lesion size can vary based on environmental conditions and fungicides, the symptomology appears to be unique between the genotypes and should be noted when scouting.



**Figure 1.** Late blight symptoms on potato foliage from US-23 *Phytophthora infestans* on left (from Dunn County) and US-8 *P. infestans* on right (from Portage County).

In summary **this production season, late blight has been confirmed in 5 Wisconsin counties**, details specified in Table 2 below.

**Table 2.** Characterization of late blight from Wisconsin in 2013.

<b>County</b>	<b>Host</b>	<b>Genotype</b>	<b>Date of Confirmation</b>
Adams	potato	US-23	28 Jun
Juneau	potato	US-23	29 Jun
Sauk	tomato	US-23	2 Jul
Dunn	potato	US-23	29 Jul
Portage	potato	US-8	29 Jul

**In the past week, NY and PA confirmed new reports of late blight on tomato.** To date this production year, late blight has been reported in in FL, KY, LA, MA, MD, ME, MI, NJ, NY, OH, PA, TN, WI, and WV. Most reports indicated US-23 clonal lineage. The website: <http://www.usablight.org/> indicates location of positive reports of late blight in the U.S. and provides further information on disease characteristics and management.

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**For further symptom and management information:**

**2013 WI organic tomato and potato late blight fungicides:**

<http://www.plantpath.wisc.edu/wivegdis/pdf/2013/Organic%20late%20blight%20control%202013.pdf>

**2013 WI commercial potato late blight fungicides:**

<http://www.plantpath.wisc.edu/wivegdis/pdf/2013/Potato%20Late%20Blight%20Fungicides%202013.pdf>