Vegetable Crop Update

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

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Calendar of Events

January 21-23, 2018 – Wisconsin Fresh Fruit & Vegetable Conference, Wisconsin Dells, WI
February 6-8, 2018 – UWEX & WPVGA Grower Education Conference, Stevens Point, WI

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Late blight from tomato in St. Croix and Polk Counties was US-8 genotype. In this past week we had some additional potato and tomato late blight sample submissions from counties previously reported. No reports from new counties, or of different genotypes from previously reported counties. The table below shows our late blight confirmations with pathogen genotype from the 2017 production season, to date.

County	Date Confirmed	Host Crop	Genotype
Waukesha	Jul 26	Tomato	US-23
Pierce	Aug 2	Tomato	US-23
Dane	Aug 7	Tomato	US-23
Portage	Aug 14	Potato	US-8
Waushara	Aug 16	Potato	US-8
Jefferson	Aug 16	Tomato	US-23
Iowa	Aug 21	Potato	US-23
Kenosha	Aug 23	Tomato	US-23
St. Croix	Sep 1	Tomato	US-8
Polk	Sep 1	Tomato	US-8

Wisconsin commercial conventional fungicides for potato late blight control can be found at link below, and at table at the end of this newsletter.
www.plantpath.wisc.edu/wivegdis/pdf/2017/Potato%20Late%20Blight%20Fungicides%202017.pdf

Across the nation this season, US-23 has predominated late blight outbreaks, with the exception of a US-8 detection in the state of Washington, and in our Portage, Waushara, St. Croix, and Polk Counties here in Wisconsin. Recall that the US-8 genotype was in central Wisconsin potatoes during 2013 and 2014, but has not been detected since that time in our state. US-8 tends to prefer potato hosts over tomato, is of the A2 mating type and is resistant to mefenoxam/metalaxyl fungicides (ie: Ridomil). US-23 is an A1 mating type, is aggressive on both potato and tomato and is generally sensitive to Ridomil fungicides.

New late blight confirmations from PA and VA this past week (as per usablight.org). Past confirmations have come from CT, FL, MA, MB, ME, MI, MN, NC, ND, NY, ON, PA, VA, WA, and WI.

Potato late blight symptoms are harder to identify in the field at this time given the senescence of the foliage and possibly advanced early blight infection. While it is hard to remove the 'background noise' of late season vine conditions to visualize late blight, the disease should continue to be scouted for as long as there is some green tissue remaining in the field. Identification of late blight in the crop at this stage is useful in considering your harvest and post-harvest management options. Pre-harvest checks for late blight in shallow tubers can further inform your management of a field. Wash tubers prior to checking for symptoms as early infections may be hard to see through even a thin layer of soil. (Tuber blight pics in Fig. 1). Late blight tuber infections may have occurred in field but may not necessary be symptomatic and visible at time of harvest.

Late season and post-harvest management of late blight: While most vines will die following the first kill treatment, lower stems may remain green especially in instances where potato vines were very hearty and green at time of vine kill. It is still important to continue to scout fields of this status and maintain fungicide programs on a 5 to 7-day schedule.

If late blight has been present in a field, be sure that vines are killed well prior to digging (waiting 2-3 weeks after last vine kill treatment). This will limit potential risk of active late blight pathogen coming in contact with tubers. Take care to limit damage to tubers through the harvest and post-harvest processes. While the late blight pathogen does not need wound sites, they are an easy and ready entry point for late blight and other pathogens.

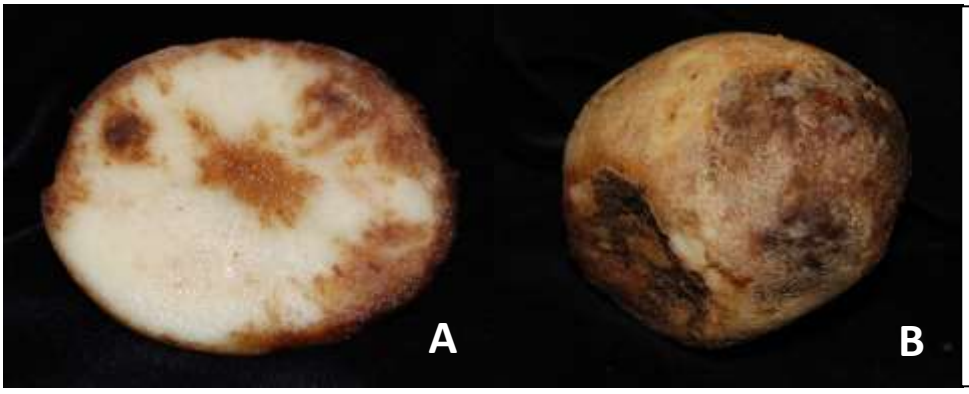

Figure 1. Symptoms of late blight infected potato tubers. Note brown, corky internal tissue (A) and sunken, dark external symptoms (B).

Recommendations for late-season potato late blight disease management should include the following:

1) Continue to scout fields regularly. Scouting should be concentrated in low-lying areas, field edges along creeks or ponds, near the center of center-pivot irrigation structures, and in areas that are shaded and protected from wind. Any areas where it is difficult to apply fungicides should be carefully scouted.
2) Avoid excess irrigation and nitrogen. If foliage is infected with late blight, spores can be washed down through the soil and infect tubers. Green vines can continue to be infected and produce spores even at harvest. Additionally, green and vigorous vines are hard to kill and skin may not be well-set at digging resulting in higher risk of post-harvest infection by late blight and other diseases.
3) Allow 2-3 weeks between complete vine kill and harvest. Fungicide applications should be continued until harvest. When foliage dies, spores of the late blight pathogen that remain on

the foliage also die. This practice will prevent infection of tubers during harvest and development of late blight in storage. In some WI fields, even multiple desiccation treatments may not completely kill vines. In this case, the continuation of fungicide use to protect tubers is critical.

4) Do not produce cull piles of late blight infected tubers. Such piles are a significant source of spores and centers of large piles may not experience freezing/killing winter temperatures which serve to kill tuber tissue and the pathogen. Culls should be spread on fields not intended for potato production the following year in time that they will freeze completely and be destroyed during the winter. Potato culls can also be destroyed in some other way such as chopping, burial, burning or feeding to livestock.

5) Keep tubers dry in storage. Air temperature and humidity should be managed so as to avoid producing condensation on tubers. Avoid or limit long term storage of tubers from fields in which late blight was detected. Temperatures ≤45°F limit activity of the late blight pathogen, but are not ideal for curing during pre-conditioning. Condensation and warmer temperatures can promote spore production of the late blight pathogen in storage. Application of fungicides such as phosphorous acids (ie: Phostrol) on tubers entering storage can limit progress and spread of late blight. Carrier volume of fungicides should be no more than 0.5 gal water/ton of tubers.

The decision to make fungicide applications to potato tubers post-harvest is not trivial. The addition of water to the pile, even in small volumes necessary for effectively carrying fungicides, may create an environmental favorable to disease under certain conditions. Typically, post-harvest fungicides are applied in ≤0.5 gal water/ton (2000 lb) of potatoes. At this spray volume, an evenly emitted liquid will leave tubers appearing slightly dampened. If tubers appear slick or shiny with wetness, the spray volume is likely greater than 0.5 gal/ton or the emitter may not be properly functioning.

Under some circumstances, for instance when tubers come out of the field in excellent condition and field history includes little to no disease concern, additional tuber dampness may be unacceptable and seen as a bin risk that outweighs any fungicidal benefit. In other circumstances, tubers may come out looking rough or with harvest damage, and field history includes pink rot or late blight. A scenario such as this may benefit from a post-harvest fungicide and resulting dampness should be mitigated by appropriate ventilation and temperature control.

The 2017 A3422 Commercial Vegetable Production in Wisconsin guide is available for purchase through the UW Extension Learning Store website: https://learningstore.uwex.edu/Commercial-Vegetable-Production-in-Wisconsin2017-P540.aspx
A pdf of the document can be downloaded or is available at the following direct link: https://learningstore.uwex.edu/Assets/pdfs/A3422.pdf

Tomato and potato late blight samples can be submited free of charge to the UWEX Plant Disease Diagnostic Clinic (PDDC) or directly to my Potato & Vegetable Pathology program. We will confirm presence of late blight (or other diagnosis). If it is late blight, we will determine pathogen genotype, or strain type. PDDC in Russell Labs, Dr. Brian Hudelson, UW-Madison campus: https://pddc.wisc.edu/

Potato & Vegetable Pathology, Dr. Amanda Gevens: UW-Madison campus:
http://www.plantpath.wisc.edu/wivegdis/

Current DSV or Disease Severity Value (Late Blight) Accumulations A DSV of ≥ 18 indicates the threshold for late blight risk and triggers preventative fungicide application. Red text in table below indicates threshold has been met/surpassed. "-" indicates that information is not available. Blitecast and P-Day values for actual potato field weather from Grand Marsh, Hancock, Plover, and Antigo are now posted at the UW Veg Path website at the tab "P-Days and Severity Values."
http://www.plantpath.wisc.edu/wivegdis/contents_pages/weather_%20list_2017.html

Location	Planting Date	50% Emergence	Disease Severity Value*	Date of DSV Generation	Increase in DSV from 9/4
Antigo	Early 5/3	5/25	**116**	9/10	1
	Mid 5/15	6/1	**112**	9/10	1
	Late 6/1	6/15	**102**	9/10	1
Grand Marsh	Early 4/10	5/15	**141**	9/10	2
	Mid 5/1	5/22	**139**	9/10	2
	Late 5/17	6/1	**131**	9/10	2
Hancock	Early 4/15	5/18	**128**	9/10	3
	Mid 5/5	5/30	**118**	9/10	3
	Late 5/20	6/5	**118**	9/10	3
Plover	Early 4/20	5/20	**128**	9/10	0
	Mid 5/8	5/25	**117**	9/10	0
	Late 5/25	6/8	**116**	9/10	0

Summary: Disease Severity Values (DSVs) and Late Blight Blitecast: **Low accumulation of DSVs over the past 10 days; late blight hasn't been favored by prevailing WI weather.***For DSV updates, above, I have generated values through our UW Vegetable Disease and Insect Forecasting web tool (http://agweather.cals.wisc.edu/vdifn/maps) to provide. Wisconsin commercial conventional fungicides for potato late blight control can be found at:
www.plantpath.wisc.edu/wivegdis/pdf/2017/Potato%20Late%20Blight%20Fungicides%202017.pdf

National Cucurbit Downy Mildew Updates: **http://cdm.ipmpipe.org/** offers information on the detection and characterization of the cucurbit downy mildew pathogen from the U.S. (and often Canada). In this past week, confirmations of downy mildew have come from MI, OH, SC, VA, and AL. Prior confirmations of this year were from: AL, CT, DE, FL, GA, IN, KY, MA, MD, MI, MS, NC, NH, NJ, NY, OH, ON, PA, QC, SC, TX, VA, and WV on a variety of cucurbits. **There is no predicted risk of movement of the disease to WI based on the current forecast.**

Further details on use of fungicides in managing cucurbit downy mildew can be found at my previous newsletter #7 from June 3, 2017. Link below.
http://www.plantpath.wisc.edu/wivegdis/pdf/2017/June%203,%202017.doc.pdf

Phytophthora in Cucurbits, Peppers, and Tomatoes: This summer has been especially bad for the development of Phytophthora crown and fruit rot in vegetable crops. This potentially aggressive disease, caused by the soilborne water mold *Phytophthora capsici*, can infect a broad range of crops including summer squash, zucchini, winter squash, pumpkins, melons, cucumbers, peppers, tomatoes, and eggplant. Reports of this pathogen have also been made on snap and lima beans in commercial fields in the Midwest and Mid-Atlantic regions of the U.S. in the past decade. Symptoms of Phytophthora include

water-soaking of lower stem or crown of a plant resulting in complete wilting of plants, and water-soaking on fruit often associated with white talcum-like pathogen sporulation on surfaces (see picture below of watermelon fruit). Breakdown of plant tissues by this pathogen can be rapid and can occur on fruit post-harvest.

To avoid Phytophthora, the following measures should be taken:

1) do not plant susceptible crops on fields with recent history of this disease
2) provide good drainage (raised beds are beneficial)
3) avoid planting in low-lying areas of fields
4) practice good irrigation management to avoid standing water and extended periods of leaf wetness
5) apply effective protectant fungicides when conditions favor infection in known infested fields

With wet weather, it is critical that growers of susceptible crops scout their vegetable fields for Phytophthora. Roguing of infected plants from the production field when disease is identified early can aid in limiting spread of disease. Do not allow infected fruit to sporulate and persist in production fields. Culls can continue to provide inoculum for remaining plants. Because Phytophthora is soilborne, soil from infested fields remaining on equipment should be removed prior to moving to a new or 'clean' field. Every effort should be made to avoid introducing this pathogen into non-infested fields.

Fungicides can be effective in managing Phytophthora when environmental conditions favor disease. The keys to making fungicides work best for you are:

1) select most effective fungicides with no known resistance in your field/area
2) make a thorough application particularly if fruit are to be protected and are beneath a dense foliar canopy
3) make frequent applications when conditions favor disease and crop growth is rapid

We have documented *Phytophthora capsici* resistance to the fungicide mefenoxam (active ingredient in Ridomil Gold, Ultra Flourish) in a few Wisconsin vegetable production fields during the past 6 years. However, there are still many fields in which the pathogen is very sensitive to Ridomil fungicides. This means that use of mefenoxam will likely control Phytophthora in that field. If your farm has no history of

Ridomil use, it is likely that the fungicide will be effective for disease control. Please contact me if you have questions on resistance or need assistance in determining this status.

Fungicides with activity against Phytophthora crown and fruit rot include: Ridomil (mefenoxam, *for fruiting vegetables not cucurbits*), Ranman (cyazofamid), Forum (dimethomorph), Tanos (fanoxadone + cymoxanil), Presidio (fluopicolide), Aliette (fosetyl-al), Revus (mandipropamid), Zampro (ametoctradin+dimethomorph), Gavel (zoxamide + mancozeb), and Orondis Ultra/Opti (oxathiapiprolin+either chlorothalonil or mandipropamid). Fungicides should be tank-mixed with multi-site protectant such as chlorothalonil (ie: Bravo) or mancozeb (ie: Dithane). Tank-mixes of Presidio (fluopicolide) or Revus (mandipropamid) with copper hydroxide (ie: Kocide) have also been effective in trials on picking cucumber in MI: http://www.veggies.msu.edu/Research/GLpickle2010.pdf

And, more recent information from Michigan on use of biopesticides as well as Revus and Presidio used in drip irrigation system for Phytophthora crown and fruit rot management in cucurbit crops: http://msue.anr.msu.edu/news/watch_for_phytophthora_on_vine_crops

If you have any questions on symptoms, control, or fungicide resistance, please contact your county agent, crop consultant, the diagnostic clinic, or myself at UW-Plant Pathology. For further information on any fungicides that may be mentioned in this newsletter, please see the 2017 Commercial Vegetable Production in Wisconsin Guide A3422. An online pdf can be found at the link below or a hard copy can be ordered through the UWEX Learning Store.
http://learningstore.uwex.edu/Assets/pdfs/A3422.pdf