Vegetable Crop Update

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

No. 12 – July 8, 2017

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Calendar of Events

July 20, 2017 – UW-Hancock ARS Field Day, Hancock, WI
July 27, 2017 – UWEX Langlade County Airport Research Station Field Day, Antigo, WI
August 4, 2017 – UW-Lelah Starks Elite Foundation Seed Potato Farm Field Day, Rhinelander, WI (10AM to Noon Lunch to Follow)
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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Utility of copper applications to hail-damaged potato and vegetable crops: For producers managing vegetable fields with damage to crops as a result of intense storms on the night of July 6th, applications of copper-containing fungicides can aid in healing of plant wounds and protecting against bacterial infection. Treatment with copper will not control bacterial disease that originates from a seedborne or systemic source, but can limit new infections on healthy plants.

As summarized in previous newsletters, field control of potato blackleg is challenging. Copper containing fungicide such as Kocide can provide some control of aerial stem rot, and can aid in managing bacterial infection after the crop has suffered hail damage. However, note that results of these approaches have had varied success throughout the U.S. Work by Dr. Dennis Johnson of Washington State University (published in 2011 Plant Disease), indicated that famoxadone + cymoxanil (Tanos) plus mancozeb tank-mix alternated with mancozeb + copper hydroxide (ie: Kocide) was an effective chemical tool in reducing aerial stem rot in potato. Copper hydroxide applications alone did not have as effective of control as combinations of Tanos, copper hydroxide, and mancozeb. Irrigation management was also a key factor in reducing aerial stem rot. As Tanos is alos an excellent late blight and early blight control material, its use at this time offers an appropriate and effective program for control of several diseases.

Current P-Day (Early Blight) and Severity Value (Late Blight) Accumulations (R.V. James, UW-Plant Pathology/R.V. James Designs): A P-Day value of ≥ 300 indicates the threshold for early blight risk and triggers preventative fungicide application. 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	P-Day Cumulative	Disease Severity Value	Date of DSV Generation	Increase in DSV from 6/27
Antigo	Early 5/3	5/25	>104*	**40***	7/6	(from 6/29) 7
	Mid 5/15	6/1	>104*	**36***	7/6	7
	Late 6/1	6/15	52	**26***	7/6	7
Grand Marsh	Early 4/10	5/15	**353**	**47**	7/7	15
	Mid 5/1	5/22	**346**	**45**	7/7	15
	Late 5/17	6/1	283	**37**	7/7	15
Hancock	Early 4/15	5/18	**351**	**35**	7/7	9
	Mid 5/5	5/30	288	**25**	7/7	9
	Late 5/20	6/5	250	**25**	7/7	9
Plover	Early 4/20	5/20	**354**	**37**	7/7	9
	Mid 5/8	5/25	**329**	**26**	7/7	9
	Late 5/25	6/8	233	**25**	7/7	9

Summary: Disease Severity Values (DSVs) and Late Blight Blitecast: All potatoes are at 50% emergence or greater. **All locations have reached threshold and should be considered for preventive fungicide application to manage the risk of late blight.** *We are again having problems with weather station components – batteries and modems are causing data drops. We are making replacements and working through these concerns. In the meantime, I am using DSV data generated through our UW Vegetable Disease and Insect Forecasting web tool (http://agweather.cals.wisc.edu/vdifn/maps) to provide information for the Antigo location. The weather data which generates these values are from NOAA rather than in-potato-field stations; the values have been comparable this season prior to the station failure. Note that the site also now has insect phenological data available for several pests. Recall the maximum number of DSVs that one day can accumulate is 4. Once thresholds of 18 DSVs have been met, routine, protection of susceptible tomato and potato crops is recommended. Wisconsin commercial conventional fungicides for potato late blight control can be found at:
http://www.plantpath.wisc.edu/wivegdis/pdf/2017/May%2022,%202017.pdf

P-Days indicating early blight risk have exceeded threshold for several locations: Grand Marsh (early and mid-planted), Hancock (early), Plover (early and mid-planted). Over the next week it is likely that all locations, with the exception of Antigo will exceed the threshold of 300. Recall the threshold is 300 P-Days. Most commercial fields in central and southern WI are now showing symptoms of early blight and/or brown spot in the lower plant canopies. A number of fungicides are highly effective in limiting early blight and brown spot.

Strategizing potato early blight control in 2017: Early blight, caused by the fungus *Alternaria solani*, is a debris-borne pathogen, meaning it overwinters in infected potato tubers and plant parts remaining in fields after harvest. In the spring, spores (conidia) are produced on infected plant debris and dispersed by wind and rain splash and infect first fully expanded leaves near the soil. Generally, first foliar lesions are observed in early July and are characterized as dark brown to black and circular with distinctive target patterning within the lesion. Often, lesions are constrained by leaf veins giving the appearance of an angular edge. By late summer, early blight can be prevalent on senescing tissue and plants stressed from low nitrogen and from other pest pressures. Infected plants and tubers then harbor the pathogen for the following cropping season. Foliar symptoms are most common in Wisconsin, with tuber symptoms occurring infrequently, particularly when the foliar phase of the disease is well managed. Potato cultivars differ in susceptibility, but none are completely resistant to early blight. Very early maturing cultivars are often most susceptible; as such it's a good practice to avoid planting early and late cultivars in the same or adjacent fields. Early maturing infected plants may serve as an inoculum source for the late planting. Nitrogen management aids in control.

Currently, there are good fungicide options available for potato early blight control, but careful product selection and timing is essential to achieve control and maintain efficacy of site-specific fungicides. It is critical that fungicide modes of action are alternated to follow resistance management recommendations. Tank mixes of site-specific fungicides with broad-spectrum protectants such as chlorothalonil or mancozeb aid in resistance management as well as provide broader protection against a range of foliar pathogens. Good coverage, particularly on lower canopy and oldest leaves will enhance early season control – leading to overall reduction in in-field disease pressure throughout the season. The best timing for initial application of fungicides on early blight-susceptible potato varieties is just prior to row closure, for enhanced lower canopy coverage, or when P-Day (or potato physiological day) accumulation reaches 300. P-Day of 300 timing correlates with initial increase in early blight spore concentration. Effective conventional foliar fungicides currently registered for early blight control include Aftershock, Bravo (or Equus, Echo, etc.), Cabrio Plus, Dithane (or Manzate, Penncozeb, etc.), Elixir, Endura, Evito, Gem, Headline, Iprodione (or Meteor, Rovral etc.), Luna Tranquility, Polyram, Priaxor, Quadris (or Equation, Satori, etc.), Quadris Opti, Quadris Top, Quash, Reason, Revus Top, Scala, Super Tin, Tanos, Top MP, and Vertisan. Further details on registered fungicides for Wisconsin potatoes can be found in the University of Wisconsin Commercial Vegetable Production in Wisconsin Guide A3422, https://learningstore.uwex.edu/Assets/pdfs/A3422.pdf .

Presence of brown spot in Wisconsin: Brown spot, caused by another Alternaria species (*A. alternata*), is a foliar and tuber disease, very similar to early blight. The symptoms caused by the 2 diseases can be hard to discern, and both are considered to be causal agents of an early blight 'complex.' Brown spot lesions, like early blight, are dark brown to black, with target patterning, but tend to be smaller and darker in color. Brown spot typically appears first in the mid-canopy compared to early blight which is seen first on oldest, lower canopy leaves. The tuber phase of brown spot is called black pit, and like early blight, requires wounding for infection.The conditions that favor disease development is similar for both diseases. The brown spot pathogen (*A. alternata*) can become resistant to azoxystrobin much more readily and completely when compared to the early blight pathogen (*A. solani*) due to differences in genetic mutations.

Azoxystrobin resistance: The introduction of strobilurins, or QoI (quinone outside inhibitor) fungicides such as kresoxim methyl (Sovran), azoxystrobin (Quadris), pyraclostrobin (Headline), trifloxystrobin (Gem), famoxadone (component of Tanos), and fenamidone (Reason), offered a fungicide group with a broad spectrum of disease activity, reduced environmental impact, and reduced toxicity to mammals compared with other conventional materials for control of early blight on potato. Azoxystrobin and kresoxim-methyl were released commercially in the U.S. in the late 1990's and by 2001-2003, approximately 80% of the total Wisconsin potato acreage was treated with QoI fungicides (avg of 3

applications per year) alternated with chlorothalonil or mancozeb. Resistance to the QoI or strobilurin fungicides develops through mutations in the cytochrome b gene at 3 possible sites. The mutation of a particular pathogen isolate affects the type of resistance it will express. Isolates carrying a mutation at site G143A express high (complete) resistance. Isolates with mutations at sites F129L or G137R express moderate (partial) resistance.

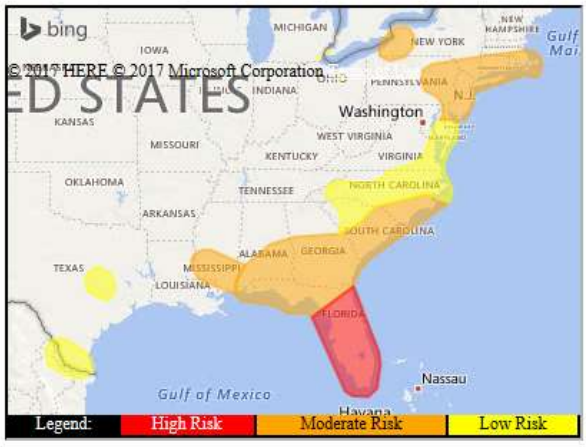
Recently registered fungicides for potato early blight control: Luna Tranquility (Bayer CropScience), a pre-mix of fluopyram and pyrimethanil, is currently registered for use on potato in the U.S. Fluopyram is a new fungicide in the carboxamide or FRAC Group 7 category and pyrimethanil is in the anilino pyrimidine (AP) or FRAC Group 9 category. In our trials at the Hancock Agricultural Research Station in WI, we had excellent results with programs including Luna Tranquility in 2010 for control of early blight control. The Luna Tranquility label includes suppressive activity for potato on white mold, black dot, and Rhizoctonia. Velum Prime (fluopyram), while not on the list at the start of this early blight article because it is an in-furrow treatment targeting nematode control, has provided apparent systemic long lasting control of early blight and white mold in the early season. Over the past 3 years we have been trialing fluopyram applied in-furrow at Hancock Ag Research Station on 'Russet Burbank' and it consistently has held early blight at bay until early August. Quash (Valent USA Corp), metconazole, received a supplemental label for use on potato in the U.S. Metconazole is a Demethylation inhibitor (DMI) or in the FRAC Group 3 category. In our Hancock trial, we had similar early blight control with Quash and Luna Tranquility in 2011. The Quash label includes activity on white mold, black dot, and Rhizoctonia. Quadris pre-mixes (Syngenta Crop Protection), Quadris Top (azoxystrobin+difenoconazole) and Quadris Opti (azoxystrobin+chlorothalonil) are now registered and have activity on early blight and black dot on potato. Both contain azoxystrobin a Quinone outside inhibitor (QoI) or in the FRAC Group 11 category. Early blight control performance was similar with Quadris Top, Quash, and Luna Tranquility in 2011. Vertisan (DuPont Crop Protection), penthiopyrad, recently received registration on potato. Penthiopyrad is a new fungicide in the carboxamide or FRAC Group 7 category. In our Hancock trial, we had similar early blight control with Quash, Luna Tranquility, Quadris Top, and Vertisan in 2011. Most recently registered are BASF's new fungicides, Xemium (Group 7 carboxamide) and Priaxor (Xemium+pyraclostrobin a QoI strobilurin). Both fungicides have performed well in our Hancock potato early blight trials and have activity against black dot, Rhizoctonia, and white mold. With the registration of new fungicides for potato early blight, we have additional tools with which to appropriately and effectively alternate modes of action for both enhanced disease control and management of fungicide resistance. Keep in mind that several of the new fungicides contain a carboxamide (Group 7). Endura (boscalid) is also a carboxamide and is currently widely used in Wisconsin for early blight control.

National Late Blight Updates: **http://usablight.org** is a useful resource for the detection and characterization of late blight on tomato and potato crops from the U.S. No new reports of late blight this past week. Already this year, late blight has been confirmed on potato and/or tomato in FL, NC, and VA, as reported on the usablight.org website. In all reported cases, the pathogen genotype was US-23. This has been the predominant genotype in Wisconsin, and across the U.S., in recent years. US-23 can still generally be managed well with use of phenylamide fungicides.

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 AL, MS, NC, NJ, PA, and SC. Prior confirmations were from AL, DE, FL, GA, MD, MI, NC, NJ, OH, ON (Canada), SC, and TX on a variety of cucurbits. The counties highlighted in red on map (below) have had disease reports within this past week; green counties indicate locations of confirmed disease this season, but greater than 7 days ago. No risk of movement of the disease to WI based on the current forecast (see risk map below).

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

Risk prediction map for Day 2: Saturday, July 8



HIGH Risk for cucurbits on the FL peninsula. Moderate Risk in southern MS, southern AL, the FL panhandle, central and southern GA, central and eastern SC, southeast NC, western NY, eastern PA, northern DE, NJ, southeast NY, Long Island, CT, RI, and southeast MA. Low Risk for cucurbits in southern DE, eastern MD, southeast VA, NC except the southeast , western SC, and parts of deep south and east-central TX. Minimal Risk to cucurbits elsewhere.