Vegetable Crop Update

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

No. 15 – July 15, 2018

In This Issue

Calendar of Events

July 10-12, 2018 – Farm Technology Days, Sternweis & Weber's Farms, Marshfield, WI
July 19, 2018 – UW-Hancock Agricultural Research Station Field Day, Hancock, WI
July 26, 2018 – UWEX Langlade County Field Day & Potato Virus Y Detection Training Workshop, Antigo, WI
August 2, 2018 – UW-Rhinelander Field Day, Rhinelander Agricultural Research Station, WI
November 27-29, 2018 – Processing Crops Conference & MWFPA Annual Convention, Wisconsin Dells, WI
January 15-17, 2019 – Wisconsin Agribusiness Classic, Alliant Energy Center, Madison, WI
January 27-29, 2019 – Wisconsin Fresh Fruit & Vegetable Conference, Kalahari Conference Center, Wisconsin Dells, WI
February 5-7, 2019 – UWEX & WPVGA Grower Education Conference, Stevens Point, WI

Amanda J. Gevens, Associate Professor & Extension Vegetable Plant Pathologist, Interim Co-Director of Wisconsin Seed Potato Certification Program, UW-Madison, Dept. of Plant Pathology, 608-890-3072 (office), Email: gevens@wisc.edu. Webpage: www.plantpath.wisc.edu/wivegdis/

Current P-Day (Early Blight) and Severity Value (Late Blight) Accumulations (R.V. James, UW-Plant Pathology/R.V. James Designs, S.A. Jordan, & J. Hammel, UW-Plant Pathology): 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 yet 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." www.plantpath.wisc.edu/wivegdis/contents_pages/pday_sevval_2018.html
Asterisks indicate values generated from weather data sourced from NOAA (link below to interactive tool for accessing site specific DSVs). https://agweather.cals.wisc.edu/vdifn/maps

Location	Planting Date	50% Emergence	Disease Severity Value	P-Day	Date of DSV/P-Day Generation
Antigo	Early 5/12	5/28	38*	>131	7/14
	Mid 5/25	6/7	30*	>131	7/14
	Late 6/9	6/22	17*	131	7/14
Grand Marsh	Early 5/1	5/15	160	448	7/14
	Mid 5/15	5/28	153	370	7/14
	Late 6/1	6/12	133	261	7/14
Hancock	Early 5/2	5/16	45*	429	7/14
	Mid 5/17	5/30	40*	340	7/14
	Late 6/1	6/14	31*	226	7/14
Plover	Early 5/7	5/18	39	434	7/14
	Mid 5/20	6/1	28	342	7/14
	Late 6/2	6/15	24	231	7/14

WI Potato Disease Risk Updates: Nearly all planting of potato have surpassed 18 DSVs and I recommend that they should be routinely receiving preventative fungicide applications to limit initial late blight infection. **No reports of late blight in Wisconsin at this time**. In Antigo area, the DSV accumulation is still under threshold for the latest plantings.

PDay values have surpassed the 300 threshold for Grand Marsh, Hancock, and Plover for most plantings; Antigo PDays have been accumulated only since June 27 and are at 131. Given that there have been observations of early blight in lower canopies of some varieties in the Antigo area, I would presume that earlier plantings have values at or over 300. This threshold indicates a time at which the early blight pathogen is active and initial infection of *Alternaria solani* can be limited by preventative fungicides. Many farms have already made several fungicide applications for late blight prevention and depending upon the fungicide selection, this treatment may be doubling to manage early blight. PDay of 300 thresholds typically align with row closure and so the timing of an initial fungicide spray just prior to PDay 300 can help to access lower canopies for improved delivery of contact fungicides.

Early symptoms of early blight and possibly brown spot are now evident in lower canopies in southern Wisconsin. Pressure is beginning to increase in our Hancock Ag. Research Station early blight fungicide trials (planted first week in May). I have observed both early blight and brown spot – with more substantial yellowing around early blight lesions than typical (picture on left from 'Snowden' white mold fungicide trial 7/12/18).

National Late Blight Updates: http://usablight.org No late blight was reported in this past week. Prior to that time, reports had come from PA on tomato & potato, NY on tomato, and FL on tomato and potato. The clonal lineages/strain types are not yet known for the PA reports. Prior to this, and the previously reported NY tomato late blight case, most cases reported to the usablight website in 2018 have been the US-23 pathogen genotype. US-23 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 such as mefenoxam. However, a potato sample from northeastern FL was sent to my lab earlier this spring and was the US-8 genotype. This information does pose some additional concern for management as US-8 cannot be managed with phenylamide fungicides as isolates are resistant to the fungicide.

A **list of registered fungicides for late blight in potato for Wisconsin** can be found in past Vegetable Crop Updates Newsletter #6 (May 20, 2018) and at link below:
http://www.plantpath.wisc.edu/wivegdis/pdf/2018/2018%20Potato%20Late%20Blight%20Fungicides.pdf

Further **information on fungicides** and other vegetable crop management inputs in the 2018 Commercial Vegetable Production in Wisconsin guide (A3422): http://learningstore.uwex.edu/Assets/pdfs/A3422.pdf

No downy mildew on cucurbits in our UW Hancock Agricultural Research Station sentinel plots on 7/12/18. The cucurbit downy mildew reporting and forecasting site http://cdm.ipmpipe.org/ indicated new confirmations of downy mildew in AL, NC, NJ, PA, and SC on various cucurbit crops during the past week. In 2018 so far, the site has documented confirmations of downy mildew in AL, DE, FL, GA, MD, NC, NJ, and SC on primarily cucumber, acorn squash, and cantaloupe. A map showing forecasted movement of the downy mildew pathogen from active sources of inoculum is provided, below, from 7/15/18. No risk of movement to WI at this time.

Risk prediction map for Day 2: Saturday, July 14

Moderate Risk to cucurbits in southeast AL, central and southern GA, far southern SC, and far northern FL. **Low Risk to cucurbits in west-central FL, central and eastern SC, southeast NC, and central PA.** Minimal Risk to cucurbits otherwise.

Forecaster: TK at NCSU for the Cucurbit IpmPIPE - 2018

Cucurbit powdery mildew (A.J. Gevens): It's that time of year again when powdery mildew is beginning to develop on more mature, lower leaves of cucurbit plants in southern and central Wisconsin. Symptoms/signs include white, talcum-like pathogen sporulation on all leaf surfaces and petioles (picture below with disease cycle). Early management of powdery mildew can greatly enhance your overall control, especially for long season cucurbit types such as pumpkins and winter squashes. Management not only leads to healthier foliage and better quality pumpkins, but also leads to stronger and healthier stems for enhanced marketability and shelf life post-harvest.

There are several newer fungicides that have activity against powdery mildew on cucurbits. In our Hancock ARS trials of the past several years, disease pressure has started in the middle of July and has been quite severe on a highly susceptible pumpkin cultivar 'Sorcerer'. As such, our 14-day calendar spray program was much less effective than our 7-day spray program. I recommend that once a powdery mildew spray program is initiated, applications should be made every 7-10 days, if weather is conducive to disease. Include a base protectant fungicide in each application to both broaden the spectrum of diseases controlled and to mitigate pathogen resistance development. Resistance to myclobutanil (Rally, Nova) in central Wisconsin powdery mildew pathogen populations.

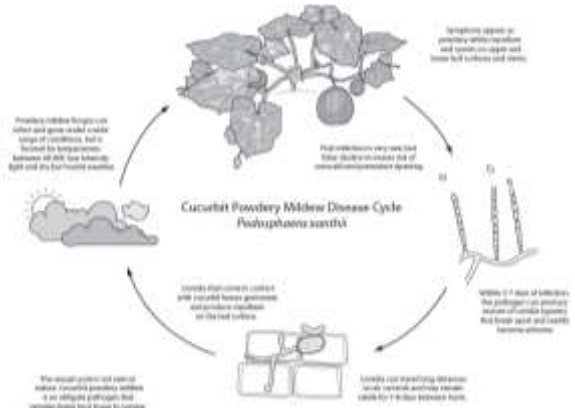
Torino (cyflufenamid, FRAC Group U6, Gowan), **Quintec** (quinoxyfen, FRAC Group 13, Dow, not registered for summer squash and cucumbers, but is for all full season cucurbits such as pumpkins, melons, gourds, winter squash), and **Vivando** (metrafenone, FRAC Group U8, BASF) are most effective in controlling powdery mildew on cucurbits in trials from several states. In our Hancock ARS trials, Quintec routines outperforms all other treatments. I have included a table with our 2014 results with Quintec, below. We have not yet tested Torino and Vivando.

Luna Experience (fluopyram + tebuconazole, FRAC Group 7+3, Bayer), **Topguard** (flutriafol, FRAC Group 3, Cheminova), and **sulfur** (M2, many formulations and registrants) provide good control of powdery mildew.

Fair control of cucurbit powdery mildew can be expected with the following fungicides based on trial data from several states. In some cases, efficacy has dropped from the past due to development of pathogen resistance to the fungicide active ingredient. **Quadris Opti** (azoxystrobin+chlorothalonil, FRAC 11+M5, Syngenta), **Quadris Top** (azoxystrobin+difenoconazole, FRAC 11+3, Syngenta), **chlorothalonil** (M5, many formulations and registrants), **Switch** (cyprodinil+fludioxonil, FRAC 9+12, Syngenta), **Inspire Super** (difenoconazole+cyprodinil, FRAC 3+9, Syngenta), **Luna Sensation** (fluopyram+trifloxystrobin, FRAC 7+11, Bayer), **Fontelis** (penthiopyrad, FRAC 7, DuPont), **Viathon** (tebuconazole+potassium phosphite, FRAC 3+33, Helena), **Pristine** (boscalid+pyraclostrobin, FRAC 7+11, BASF), **Monsoon** (tebuconazole, many others, FRAC 3, Loveland and many others), and **Procure** (triflumizole, FRAC 3, Chemtura).

Generally, mancozeb and copper formulations are poor in controlling powdery mildew on cucurbits. Due to resistance in many states, Rally (myclobutainl), Sovran (kresoxim methyl) and Topsin (thiophanate methyl) are not recommended. I have not trialed Sovran or Topsin specifically in Wisconsin, but since our powdery mildew typically moves in from more southern locations which do experience this fungicide resistance, I do not recommend these treatments for powdery mildew control. We have documented resistance to Rally in central Wisconsin over the past several years.

For organic producers, sulfur, copper, horticultural oils (such as JMS Stylet Oil), potassium bicarbonate, and biologicals (Actinovate, Double Nickel, Regalia, Serenade Opti, and Sonata) can be used to aid in powdery mildew management. In our experience at the Hancock ARS, weekly applications of this group of materials is essential for maintaining disease control.



Treatment and rate/A	Application Timing[z]	Plot Yield (lb)	Handle Rating (%)[y]	RAUDPC[x]
Untreated Control	1-3	172.5	40.6ab	0.51g
JMS Stylet Oil 5.0 qt/100 gal water	1-3	151.3	42.3ab	0.36c-e
Microthiol Disperss 80DF 4.0 lb	1-3	160.4	53.8ab	0.30b
Rally 40WSP 5.0 oz	1-3	163.7	46.2ab	0.44f
Bravo WeatherStik 720SC 2.0 pt	1-3	163.4	51.1ab	0.30b
Bravo WeatherStik 720SC 2.0 pt	1,3	151.7	40.4ab	0.31bc
Bravo WeatherStik 720SC 2.0 pt	1,3			
Quadris 2.08SC 15.5 fl oz	2	169.7	61.0b	0.33bc
Quintec 2.08SC 6.0 fl oz	1,3			
Microthiol Disperss 80DF 4.0 lb	2	203.2	90.1c	0.22a
Kocide 3000 DF 0.75 lb	1-3	195.0	36.4a	0.39ef
Kocide 3000 DF 0.75 lb	1,3			
Microthiol Disperss 80DF 4.0 lb	2	186.3	39.5a	0.38d-f

[z]Fungicide application dates: 1=23 July, 2 = 6 August, 3= 20 August.
[y]Column numbers followed by the same letter are not significantly different at $P=0.05$ as determined by Fisher's Least Significant Difference (LSD) test.
[x]RAUDPC= Relative Area Under the Disease Progress Curve.

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As of 7/12, at Hancock Ag Research Station for potatoes planted in the first and second week of May, Silverton and Hodag are still in the full bloom stage, Russet Burbank, Russet Norkotah and Lamoka are in their late bloom stage, and Snowden and Red Norland have already done flowering. Max and average tuber size of those varieties are shown below:

Variety	Max tuber length/diameter	Average tuber length/diameter
Russet Burbank	3.5''	2.5''
Russet Norkotah	4.5''	2.5''
Silverton	3''	1.5''
Lamoka	3.5''	2''
Snowden	2.5''	2''
Red Norland	3''	2''

Russet Burbank

Russet Norkotah

Silverton

Lamoka

Snowden

Red Norland

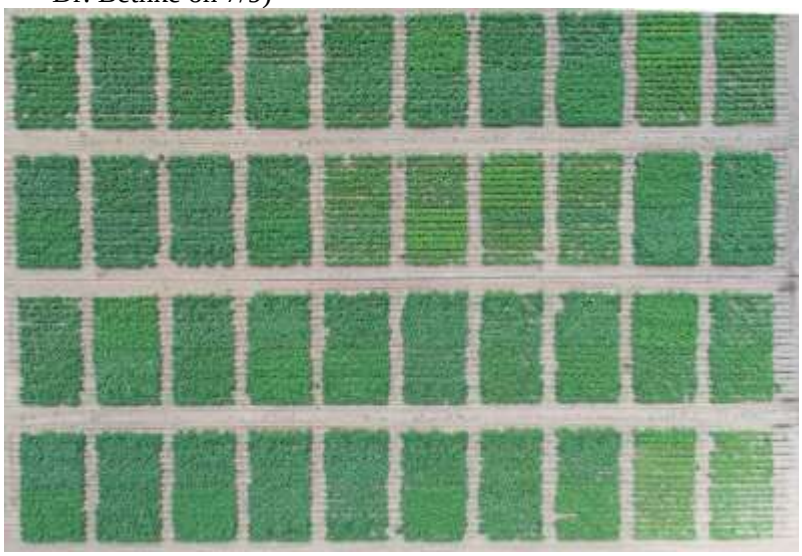
Due to the fast growing of the plants and the hot weather without any precipitation, we increased our irrigation amount to 0.6'' every other day (previously we were doing half inch every other day). We hope that this amount together with the forecasted rainfall will make the available soil moisture catch up fast. We are planning on keeping this irrigation amount and frequency throughout the peak bulking stage. Before we made the change, our tensiometer probes (figures below) showed that the moisture level of the top 8'' soil in the hill was consistently very low (readings between 45 and 85) even after irrigation. Typically for potatoes on sandy soils, readings between 40 and 50 on the tensiometer indicate necessity of starting irrigation, and readings higher than 70 indicate that the plants are water stressed. Tensiometers can measure soil water tension, which means how hard a soil is pulling on soil water and is negatively related with available soil moisture. Therefore high readings on the tensiometer mean low available soil moisture.

Also I am providing some updates on my program's collaborations with fellow researchers on potato irrigation and fertility management:

1. Dr. Ankur Desai's group with UW-Madison Atmospheric Sciences has installed a flux tower, a high-tech equipment that can record real-time ET from a small area (300 feet in diameter), on a commercial potato field. The equipment has started to collect ET data on a half-hourly basis since June 30th. We are in the process of comparing this dataset with the daily ET data provided by UWEX Ag Weather website;

2. This week I worked with Dr. Jingyi Huang with UW-Madison Soil Science to measure soil Electrical Conductivity (EC), which reflects the soil moisture status, before and after an irrigation event on our irrigation trial (figure below). We are trying to understand the change of soil moisture level at different soil depths before and after irrigation and how over- and deficit irrigation can influence this process;

3. My group has been collecting weekly petiole, leaflet, and whole vine samples from our N trial subjected to five N rates over the last three weeks, and Dr. Paul Bethke with UW-Madison Horticulture/USDA-ARS flew a UAV over our field every time we took the plant tissue samples. We are investigating the possibility of incorporating remote sensing into in-season potato N management. Just for fun, can you tell which plots received 0 in-season N here? (picture taken by Dr. Bethke on 7/9)



Considering irrigation for vegetable crops (Yi Wang): ET during these hot days can be between 0.2 and 0.3'' per day. I would say 95°F will more likely result in 0.25-0.3'' and 85°F will possibly lead to about 0.2''. But air temp is not the only factor to determine ET, it's also related to humidity, wind speed, solar radiation, etc.

Most vegetables require at least 1'' of water per week during the growing season, so per acre will require about 27,000 gallons. This amount will soak down to about 8 inches in the soil. Watering to a depth of 5 to 6 inches encourages the growth of deeper roots. Avoid quick, shallow watering, which encourages shallow root growth. Shallow roots are more susceptible to damage by sun and heat. Early morning is a good time to irrigate. Morning water prepares plants for the stress of midday heat and allows them to grow uninterrupted.

For specific vegetables:
Beans: during pollination, flowering, and pod development. Blossoms may drop and pods may fail to enlarge if watering is inadequate; 1 gallon per week per foot of row (to measure the number of gallons use

a drip emitter and timer).

Cantaloupe: during flowering, fruit set, and fruit development. Keep the soil evenly moist throughout the season; 1 1/2 gallons per plant per week or 18 inches per season.

Corn: corn requires consistent, even watering; water is critical during silking, tasseling, and ear development. Water when tassels on small cobs begin to shrivel and 10 days before cobs are picked. Water stress can cause tassels to shed pollen before silks on ears are ready for pollination; lack of pollination may result in missing row of kernels and reduced yields.

Cucumbers: even, consistent watering during bud development, flowering, fruit development; 1 1/2 gallons per plant per week or 25 inches per season.

Eggplants: even, consistent watering from flowering through harvest; 1 1/2 gallons per plant per week or 18 inches per season.

Peppers: even, consistent watering from planting to fruit set and enlargement; 1 pint per plant a week when young, increasing to 1 1/2 gallons per plant a week or 18 in per season.

Squash: even, consistent watering during bud development, flowering, fruit development; 1 1/2 gallons per plant per week or 18 inches per season.

Tomato: consistent, even watering is critical during flowering, fruit set, and fruit enlargement; 2 1/2 gallons per plant each week or 24 inches per season. More water may be needed for non-mulched plants. Older late-maturing varieties may require less water near harvest.

Langlade County Agriculture Research Station Field Day

Agenda from Steve Zimmerman UWEX Langlade County

Langlade County Airport, Antigo, WI (intersection of Highways 64 and 52)
Thursday, 26 July 2018 – 1:00 pm

- Scab Variety Trial - Felix Navarro, Hancock Ag Research Station
- Wisconsin Potato Variety Trial - Felix Navarro, HARS
- RPE Research Trials, Mike Copas, RPE
- Potato Herbicide Update, Daniel Heider, UW-IPM Program
- Disease Updates for Potatoes – Amanda Gevens, UW-Plant Pathology
- Insect/Aphid Updates for Potatoes – Russell Groves, UW-Entomology
- Oat Variety Trial – Lucia Gutierrez, UW-Agronomy
- Research Updates on Irrigation and Fertility Trials - Yi Wang, UW-Horticulture

Food and refreshments provided by Insight FS of Antigo at the Antigo City Park East Shelter following the tour. All are welcome!
For more information, contact Steve Zimmerman at (715) 627-6236; or email: stephen.zimmerman@ces.uwex.edu