Vegetable Crop Update

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

UW Extension

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Calendar of Events

July 14, 2016 – UW-Rhinelander Agricultural Research Station Field Day
July 21, 2016 – UWEX Langlade County –Antigo Research Station Field Day
July 28, 2016 – UW-Hancock Agricultural Research Station Field Day
February 7-9, 2017 – UWEX/WPVGA Grower Ed. Conf., Stevens Point, WI

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Veg Pathology Webpage: http://www.plantpath.wisc.edu/wivegdis/.

National Late Blight Updates (www.usablight.org). On 5/25/16, there was a late blight (US-8) confirmation on potato from Kern Co. CA. This same county had an older report (from 4/28/16) of US-11 on potato. US-11 can infect both tomato and potato, is of the A1 mating type, and is resistant to Ridomil. US-8 can infect both potato and tomato, but favors potato, is of the A2 mating type and is also resistant to Ridomil. Earlier this season, there were a few cases confirmed in FL (tomato, potato, US-23), SC (tomato), and now posted, CA (potato, US-11). US-23 has predominated over the past few years in tomato and potato late blight epidemics across the U.S. As a reminder, US-23 is a genotype that can be controlled with mefenoxam/metalaxyl fungicides (ie: Ridomil Gold SL) and can infect both tomato and potato.

Early symptoms of late blight in potato ***(adapted largely from "Source of Late Blight Epidemics" written by Dr. Dennis Johnson, Dept. of Plant Pathology, Washington State University, printed in Potato Progress, a newsletter for the potato industry of ID, OR, and WA, Vol. 15(6), May 18, 2015),*** **http://www.potatogrower.com/uploads/6244.pdf**

Because we don't have long-standing, established, resident, soilborne populations of the late blight pathogen here in WI (or the U.S., overall) the pathogen, *Phytophthora infestans*, makes use of infected potato tubers to remain viable over the winter. Infected tubers can emerge and sporulate in the spring creating inoculum sources for the new crop in area fields. Late blight-infected tubers often rot during the winter months and fail to germinate, reducing their potential risk. However, a few successful infected tubers is all it takes to initiate inoculum production and an epidemic.

Inoculum can be introduced through infected volunteer potatoes, seed potatoes, or from infected cull piles (WI DATCP requires that all cull piles be destroyed by May 20). And, with new pathogen strains also infecting tomato, additional introductions of the pathogen could be made from non-potato and non-commercial sources. The role that each of these potential sources play in contributing to the start of epidemics can vary by year and location.

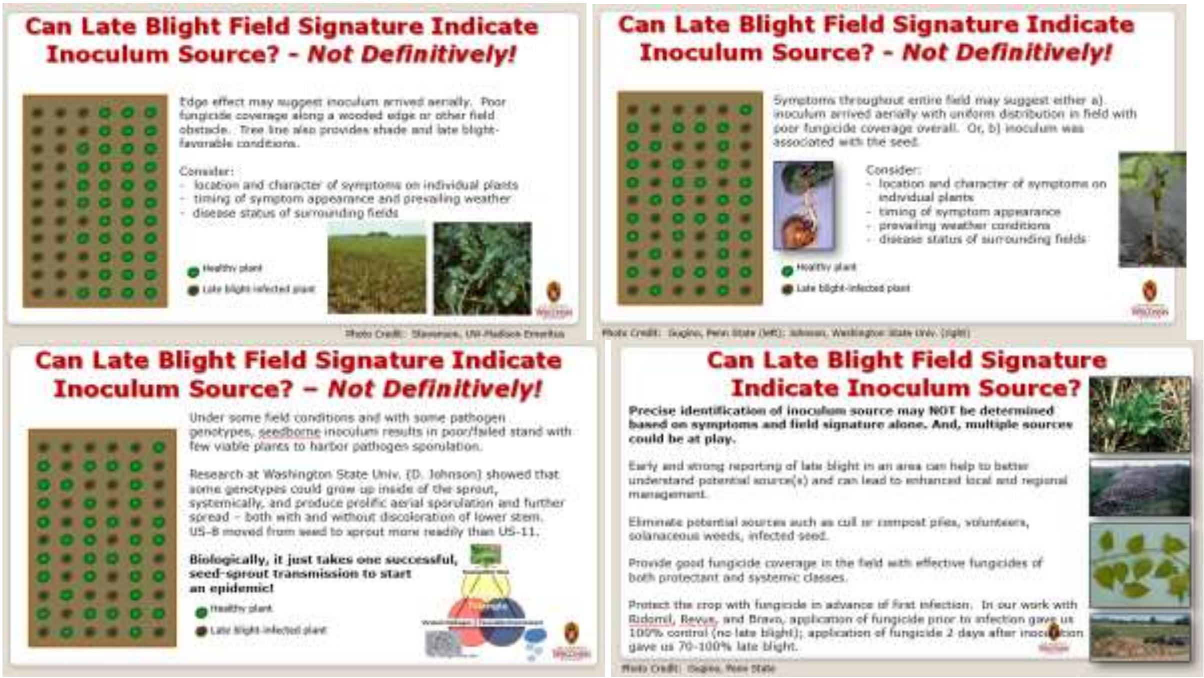
The movement of the pathogen from infected tubers to above-ground plant parts in the next season may occur during seed-tuber handling, cutting, and planting, or in the field. Be mindful that temperature and humidity within piles of cut seed tubers often favor sporulation, and sporangia have been observed on infected seed pieces within 19 hours of cutting. Sporangia are readily transmitted by direct contact from infected tubers or seed pieces to non-infected pieces. Tubers infected prior to planting may be more likely to produce viable shoots than those infected in the field near harvest because of less time for rot to develop before shoot emergence. Under experimental conditions, transmission occurred from tubers to shoots when tubers were inoculated in the spring before planting, but not when tubers were inoculated in the fall. Infection during seed-tuber cutting and handling increases the threat of late blight outbreaks on foliage in the field. Fungicide seed piece treatments can reduce transmission from infected seed tubers.

The mechanism by which *Phytophthora infestans* progresses from planted, infected seed tubers to plant foliage has been disputed in Plant Pathology. Years ago, it was thought that the pathogen spread by mycelial growth within infected seed tubers and advanced contiguously or followed growing shoots to produce lesions and sporangia on above-ground stems (under relatively dry conditions). However, this thought was challenged when this could not be duplicated by researchers. We now know that a moist environment plays a key role in the expression of transmission of the pathogen from infected seed to shoots (Figure 1, below). Continuous lesions are not always observed on the below-ground stem between the infected seed piece and the resultant lesion on the above-ground stem. No brown/dead tissue or reddish brown streaking may be observed on below-ground stems when the pathogen is transmitted by mycelia growth within the internal tissues (under low moisture conditions). Figures 1-3, below, show additional specific symptoms of late blight arising from seed-borne sources of inoculum.

What is most notable about a field planted to infected seed is that the emergence is typically low due to reduced stand from failed seed pieces (pre-emergence blighting of shoots). In experiments conducted in OR and WA, transmission from artificially infected seed pieces to emerging shoots was only 1.9-3.8%, depending upon the cultivar. However, in western WA under higher humidity conditions, up to 25% of plants resulted in infection from inoculated seed pieces, and, transmission of the pathogen was greater with US-8 than with US-11 strains.

Transmission of late blight from seed to shoots is favored by a moist environment. In field experiments conducted in the Pacific Northwestern U.S., transmission to emerged shoots did not occur from inoculated seed until shortly after a rainy period following row closure. The transmission rate from infected seed tuber to foliage does not need to be very high for late blight to develop given the explosive polycyclic capabilities of *P. infestans* and the large amount of seed potatoes planted in a major production region. Interestingly, as many as 300,000 sporangia can be produced from a single lesion demonstrating the explosive reproductive capabilities of the pathogen.

In sum, symptoms alone, may not provide enough information regarding source of pathogen inoculum. Below, I’ve shared a few of my summary slides of typical symptoms and field signatures to be mindful of as you are making field observations in potato this season. Knowledge of the source of the late blight pathogen is important information for mitigation further spread and for future decision making – however – answers are not easily come by given the nature of this pathogen.



With the recent presence of the late blight pathogen in Wisconsin, and the uncertainty of disease-favorable weather conditions in 2016, it is critical that all growers of tomatoes and potatoes be on alert and prepared for late blight control. Key components of late blight control in potato are:

1) Destroy all potato cull piles (May 20 deadline by DATCP).
2) Manage potato volunteers in all fields - volunteers pose great risk for late blight introduction.
3) Use disease free seed from a reputable certified source.
4) If there is a risk of disease associated with seed, use seed treatment or in-furrow application of effective late blight controlling fungicides (seed treatment is best – mancozeb or Curzate).
5) Irrigate conservatively prior to tuber initiation. Whenever possible time irrigation so that you do not have lengthy leaf wetness periods, esp. through evening and nighttime.
6) Apply only proven effective fungicides for control of late blight when disease forecast tool indicates environmental risk and stay on a fungicide spray program (Blitecast DSVs reach 18 for initial threshold); reports of the disease in your area trumps Blitecast prompting for preventive fungicide applications.
    a. For conventional systems, a current list of registered late blight-specific materials can be found in the Commercial Vegetable Production in Wisconsin A3422 publication (further information below)
    b. For organic systems, copper-containing fungicides have been long-standing effective materials for preventing late blight in susceptible crops. Some newer organic fungicides are also available with promising late blight control (ie: EF400).
7) Scout regularly and thoroughly for disease in all potato fields, with special focus on areas that may be shaded, may receive more irrigation water, or may be receiving less adequate fungicide coverage for various reasons.

8) Re - apply effective fungicides for disease control on a 7 day schedule (recommendation adjusts to a 5 day schedule when late blight is in the area and weather favors disease; recommendation adjusts to a 10 day schedule when late blight is not found in area and weather is hot and very dry).

9) If late blight is identified in a field, have a mitigation plan in place for specific site. Depending on days to vine kill, environmental conditions, and extent of infection –plan may vary from complete crop destruction to early vine kill with continued maintenance fungicide sprays. Mitigation plan should limit disease spread within field and from field – to - field.

Figure 1. Sporulation (white downy growth) on stem above soil surface resulting from transmission of *Phytophthora infestans* from an infected seed piece (Photo Courtesy: Dr. Dennis Johnson, Washington State University).

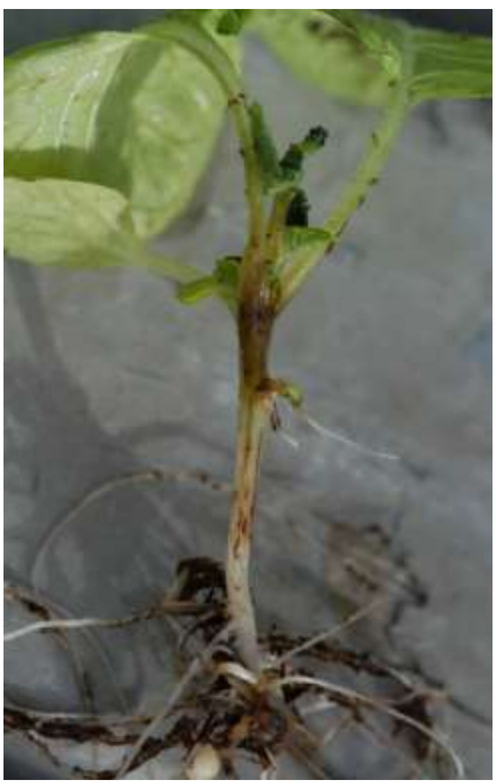


Figure 2. Streaking of reddish brown tissue on the below-ground stem where *Phytophthora infestans* moved internally in the below-ground stem from an infected seed piece to near the soil line and then formed a symptomatic lesion during a moist period. (Photo Courtesy: Dr. Dennis Johnson, Washington State University).

Figure 3. Late blight lesion on above-ground stem arisen from an infected seed piece planted in the field. (Photo Courtesy: Dr. Dennis Johnson, Washington State University).

New 'Focus on Potato' Webcast Helps Users Minimize Spread of Blackleg (shared from Plant Management Network): Blackleg, caused by strains of soft rot bacteria known as Dickyea, has traditionally had little impact on North American potato production, but it now appears to be on the move throughout Europe and could increasingly threaten growers in the Eastern United States. The Plant Management Network (PMN) has released a new presentation entitled "Dickeya: A Scottish, UK, and European Perspective" (link below) http://www.plantmanagementnetwork.org/edcenter/seminars/Potato/Dickeya/ to provide growers and crop consultants with an overview of the history of the disease in Europe and an introduction to *Dickeya solani*, a new aggressive pathogen strain contributing to the increase in incidence and spread of blackleg.

The webcast, developed by Gerry Saddler, Deputy Head of Science & Advice Scottish Agriculture with the Scottish Government, details their country's potato production practices and explains why they have adopted a national zero-tolerance approach to the presence of *Dickeya* strains. The presentation discusses in detail:

- Causes of blackleg and symptoms exhibited by different strains
- Conditions that encourage infection and common transmission methods
- Inspection and testing practices employed in Scotland
- Effective control measures to limit spread

The 40-minute presentation will remain open access through July 31 in the *Focus on Potato* webcast resource.

The Plant Management Network is a nonprofit publisher of applied, science-based resources that help enhance the health, management, and production of agricultural and horticultural crops. Partnering with over 80 universities, nonprofits, and agribusinesses, PMN provides materials covering a wide range of crops and contemporary issues through the online PMN Education Center.

Cucurbit Downy Mildew Updates (http://cdm.ipmpipe.org/). On 5/24/16, there was a new report of cucurbit downy mildew from northern FL (Marion Co.). Prior to that time, there have been several detections of cucurbit downy mildew in the southern U.S.: FL, GA, and TX.

Wisconsin Hop Update, by Michelle Marks, Graduate Research Assistant, & Amanda Gevens, Potato & Vegetable Pathology Lab, UW-Madison. E-mail: memarks2@wisc.edu.

As May comes to a close, the hop growing season is well underway. Training is complete for most yards that I have visited. However, some varieties that were pruned later weren't quite tall enough for training at the time of last scouting visit. With the recent hot and sunny weather, significant plant growth is expected.

The completion of training marks a shifting of gears from early season yard management to mid-season management. Downy mildew disease pressure was very high in many yards this spring, thanks to extended periods of cool and wet conditions. Early disease control efforts focused on reducing initial pathogen inoculum. As described in earlier UWEX Veg Crop Updates Newsletters, disease initiates in the spring as systemically infected shoots, termed 'basal spikes', emerge. Under favorable environmental conditions, the pathogen sporulates on leaf undersides and spores spread to healthy foliage via wind and rainsplash. *Physical removal of basal spikes, prevention of sporulation, and the protection of healthy plant material are the cornerstones of disease management in the early season.*

While downy mildew in the Pacific Northwestern U.S. is primarily a spring disease, here in Wisconsin, significant infection events and sporulation can occur season long, though these events are tempered by periods of hot and dry weather. Disease data collected over the past two years has indicated that pressure can remain high from late May through mid-June as long as favorable cool and wet conditions persist. Pathogen sporulation and infection is greatly inhibited by high temperatures. Actively sporulating downy mildew was nearly impossible to find during recent field visits following approximately a week of temperatures in the high 70s to mid-80s with no or limited rainfall. Basal spikes, identified by their characteristic symptomology of stunting, chlorosis, and downward-cupped leaves, were still readily found, despite lacking sporulation. Should the weather return to a cool and wet pattern, these spikes will very likely exhibit sporulation once again. These infected shoots have been observed emerging throughout the growing season with other 'suckers' but can be obscured in dense foliage at the base of plants; be sure to maintain scouting efforts season-long.

Mid-season downy mildew management is focused on reducing the spread of pathogen spores onto the healthy tissue of the climbing bines. Should climbing shoots become infected, they will cease to grow, fall off the string, and ultimately die. At this time of year, the pathogen is most commonly found in the basal foliage of the hop plants, where moisture can persist most easily. Thorough removal of this growth either mechanically or chemically (once the bines have developed sufficient woody material) both removes infected material and increases airflow, discouraging further infection. Stripping green material from the lower 2-3 feet of the growing bines also improves airflow and further aids in the prevention of pathogen movement into the upper canopy. It should be noted that any potential yield impacts in response to these practices have not been evaluated here in Wisconsin.

Fungicides remain an important component of downy mildew disease control as we enter the mid-season. Keep an eye on the weather: spray programs can often be extended from 7-day to 10-day intervals in instances of hot and dry weather. You can find more information about recommended fungicides including a complete list of those registered in WI and a sample

program at the following link:
http://www.plantpath.wisc.edu/wivegdis/contents_pages/hops.html

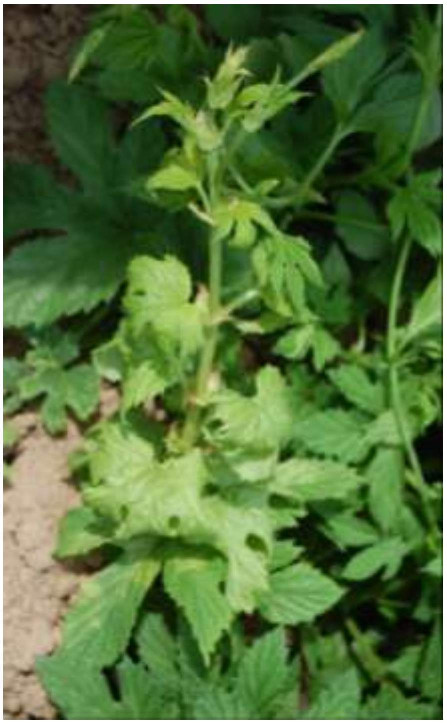
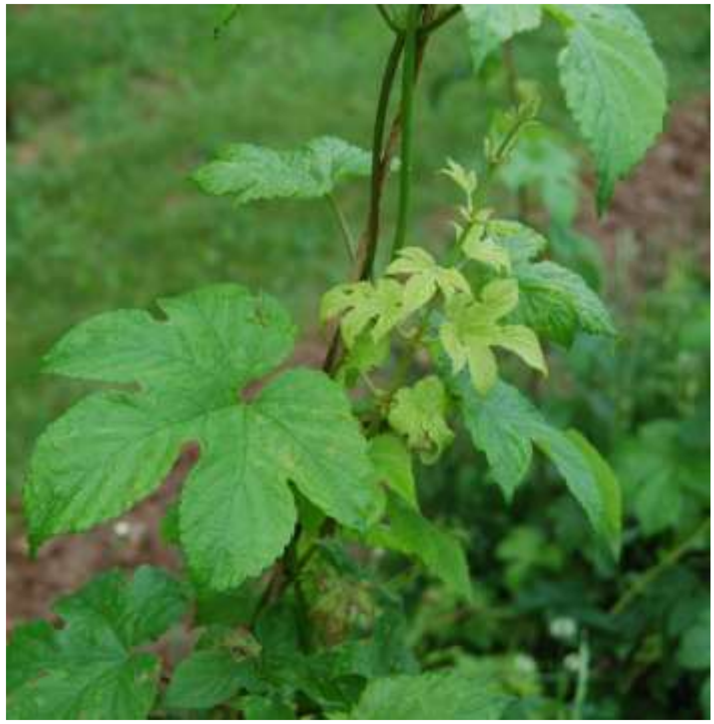



Image on the left. Photo from May 24. Shoot infected with downy mildew; note the yellowish appearance and downward-curling of the leaves. When flipped over, no sporulation was observed. **Image on the right.** Climbing bine that was infected with downy mildew, and has fallen away from the string. It will not grow further.

For further information on common diseases, insect and weed pest information, please consider the 2016 A3422 Commercial Vegetable Production in Wisconsin guide is available for purchase ($10) through the University of Wisconsin Extension Learning Store website:
http://learningstore.uwex.edu/Commercial-Vegetable-Production-in-Wisconsin2016-P540.aspx

A pdf of the document can be downloaded for free at the following direct link:
http://learningstore.uwex.edu/Assets/pdfs/A3422.pdf