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

May 17 – UW-Hancock Storage Research Updates, 10AM-3:30PM
July 24 – UW-Hancock Ag Research Station, Field Day, 12:30-4:00PM
August 2 – UW-Langlade County Ag Res Station Field Day Antigo, 1:00PM

Vegetable Disease Update – Amanda J. Gevens, Vegetable Plant Pathologist, UW-Madison, Dept. of Plant Pathology, 608-890-3072 (office), Email: gevens@wisc.edu. Contributions by S.A. Jordan, Associate Researcher, UW-Plant Pathology, and K.M. Cleveland, Undergraduate Research Assistant, UW-Plant Pathology.

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

Strategizing potato early blight control in 2012: 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 at temperatures between 41 and 86°F. Conidia are then dispersed by wind and rain splash and infect first fully expanded leaves near the soil. Conidia germinate in presence of free water and may penetrate tissues directly or through stomata or wounds. 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 WI, 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 fungicides currently registered for early blight control include Bravo (or Equus, Echo, etc.), Curzate, Dithane (or Manzate, Penncozeb, etc.), Endura, Evito, Gem, Headline, Quadris, Reason, Revus Top, Scala, Super Tin, and Tanos. Further details on registered fungicides for WI potatoes can be found in the Univ. of WI Commercial Vegetable Production in WI Guide A3422, http://learningstore.uwex.edu/assets/pdfs/A3422.PDF.

Presence of brown spot in WI: Brown spot, caused by another Alternaria species (*A. alternata*), is a foliar and tuber disease, very similar to early blight. In Europe, the symptoms caused by the 2 diseases are so hard to discern, that 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 and includes high humidity and cool temperatures (~65°F).

While *A. alternata* has been identified in WI potato fields, its role in our early blight 'complex' and timing of its activity during the potato production season is unclear. Last year, we found *A. alternata* on potato foliage very late in the season. While the brown spot pathogen may be around all season long, we do not know if it may be more pronounced in late season 'early blight' epidemics. In this case, brown spot occurrence may be interpreted as loss of early blight control or fungicide resistance in the early blight pathogen population. 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.

We plan to continue our survey and fungicide resistance work on both early blight and brown spot to better understand the role of both pathogens in the early blight complex and the incidence of fungicide resistance in both species in WI.

Figure 1. Potato early blight symptoms. Individual lesion with distinctive targeting pattern and angular edge constrained by leaf vein (left). Typical appearance of early blight on potato foliage (right).

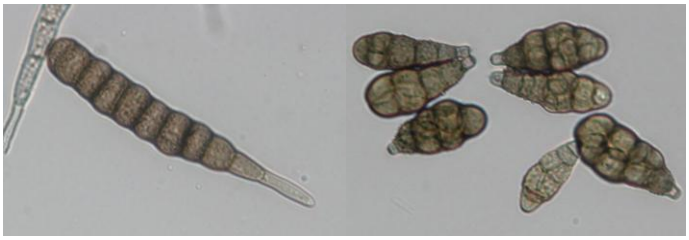

Figure 2. Spores (conidia) of *Alternaria solani* (left) and *A. alternata* (right). The conidia of *A. solani* are longer and produce a long "beak" that are not seen on the smaller, fatter conidia of *A. alternata.*

Azoxystrobin resistance in WI early blight?: The introduction of strobilurins, or QoI 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 fungicides 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 WI potato acreage was treated with QoI fungicides (~3 applications per year) alternated with chlorothalonil or mancozeb.

Isolates of *A. solani* with partial resistance to azoxystrobin were detected in WI in 2001-2003. We are currently characterizing the azoxystrobin resistance of isolates of *A. solani* and *A. alternata* from WI potatoes. Our assays, so far, indicate resistance to azoxystrobin in 'poison plate' spore assays of both Alternaria species. While we need to expand our survey over geography and time, our preliminary results imply that late season efficacy of azoxystrobin on early blight and brown spot in some northern WI fields may be limited.

New fungicide chemistries for potato early blight control: Luna Tranquility (Bayer), 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.

Quash (Valent), 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), 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, 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.

Yet to be 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 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 WI for early blight control.