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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In This Issue

Late blight national updates
Integrated late blight management webinar link
Cucurbit downy mildew – heads up for unique symptoms on non-cucumber cucurbits in 2016
Linex 4L herbicide registration updates

Calendar of Events

July 21, 2016 – UW-Hancock Agricultural Research Station Field Day

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

National Late Blight Updates. While no new detections of late blight have been made in the past week. This season, however, has had several cases confirmed in Florida (tomato and potato, US-23) and South Carolina (tomato). 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); this type can infect both tomato and potato.

Integrated Late Blight Management. I recently provided a webinar on late blight management for the American Phytopathological Society Crop Protection and Management Collection - Plant Management Network - Focus on Potato. This is an online information resource which collects informational webinars that are peer reviewed. This late blight webinar is available for free download until July 31, 2016. A summary of the webinar content is provided below the link.

http://www.plantmanagementnetwork.org/edcenter/seminars/potato/LateBlightManagement/

Summary: Late blight is a potentially destructive disease of potato and tomato crops worldwide. While the disease has been studied by many for over a century, changes within the *Phytophthora infestans* pathogen population have required further in depth investigation for management. From 2009 to the current, a group of newly identified genotypes/clonal lineages/strains of the pathogen were identified, with US-23 becoming most predominant in both tomato and potato production areas of the continental U.S. This presentation will offer new information on the characterization of US-23 and other newer clonal lineages as it pertains to pathogen persistence and management. Further, a process for integrated late blight management, established for Wisconsin, will be shared to aid practitioners in understanding critical concepts of the pathogen and fungicides to enhance overall disease management.

Cucurbit Downy Mildew caused by the "water mold" plant pathogen *Pseudoperonospora cubensis* has become more prevalent in the Great Lakes region and throughout the U.S. over the past 10 years. Growers of cucurbits (cucumber, squash, melon, pumpkin) in WI may recall rare occurrences of late season downy mildew over the previous four decades. However, changes in the pathogen population have resulted in differences in cucurbit host preference, timing of disease arrival, and reaction of the downy mildew pathogen to some current fungicides.

While downy mildew does not cause direct fruit infection on cucurbits, the pathogen can rapidly defoliate plants leaving fruit at risk for sunscald and secondary infection. Foliar symptoms include pale green to yellow angular (squared off within veins) lesions on leaf surfaces with corresponding and distinctive fuzzy brown growth on leaf undersides. The fuzzy growth is the pathogen producing thousands of new sporangia, or spores, which can become airborne and further spread the pathogen within field and beyond at a rate of approximately 6 miles per day. Early infections can be tricky to identify, as they may mimic a nitrogen deficiency, angular leaf spot, or even virus symptoms.

The pathogen is an obligate parasite, requiring living cucurbit plants to remain viable. Disease is especially favored by warm temperatures (65-85°F) and wet field conditions. The pathogen cannot overwinter in the soil on its own, as production of persistent soilborne spores (oospores) have not been found here in Wisconsin.

Since 2005, the Great Lakes region has typically seen cucumber as the first and primary cucurbit crop infected with downy mildew with symptoms detected as early as mid-June. In the last few years, pumpkin, butternut squash, cantaloupe, watermelon, and yellow summer squash were also infected in several states, but symptoms were not detected until later in the summer and symptoms were, in many cases, harder to diagnose on these "non-cucumber" cucurbits. Symptoms on cucumber include pale green to yellow angular lesions on leaf surfaces. The angularity results from the lesion being limited by the vein structure of the leaf. On leaf undersides, masses of gray to black spores may be evident in places where the leaf surface was discolored. Downy mildew on cucumber can progress very rapidly from early symptoms of pale green to dead leaf tissue within about 7-10 days if the weather is ideal.

On other cucurbit hosts, the disease can also be very crop destructive in a short amount of time. However, symptoms can be much trickier to confirm and growers may attribute the rapid vine decline to some other factor such as drought stress, spider mite damage, nutrient deficiency, phytotoxicity, heat damage, or frost damage depending upon the prevailing condition.
On cantaloupe and watermelon, downy mildew lesions often remain relatively small and do not appear as clearly vein limited as on cucumber. Yellow haloes often surround brown lesions and leaf undersides may not clearly show large masses of pathogen sporulation. On acorn squash, symptoms can be much more general with larger masses of blighted or dead tissue on leaves without unique defined lesions. Butternut squash lesions look more consistent with cucumbers with well-defined and vein-limited lesions on leaf surfaces and spore masses on leaf undersides.

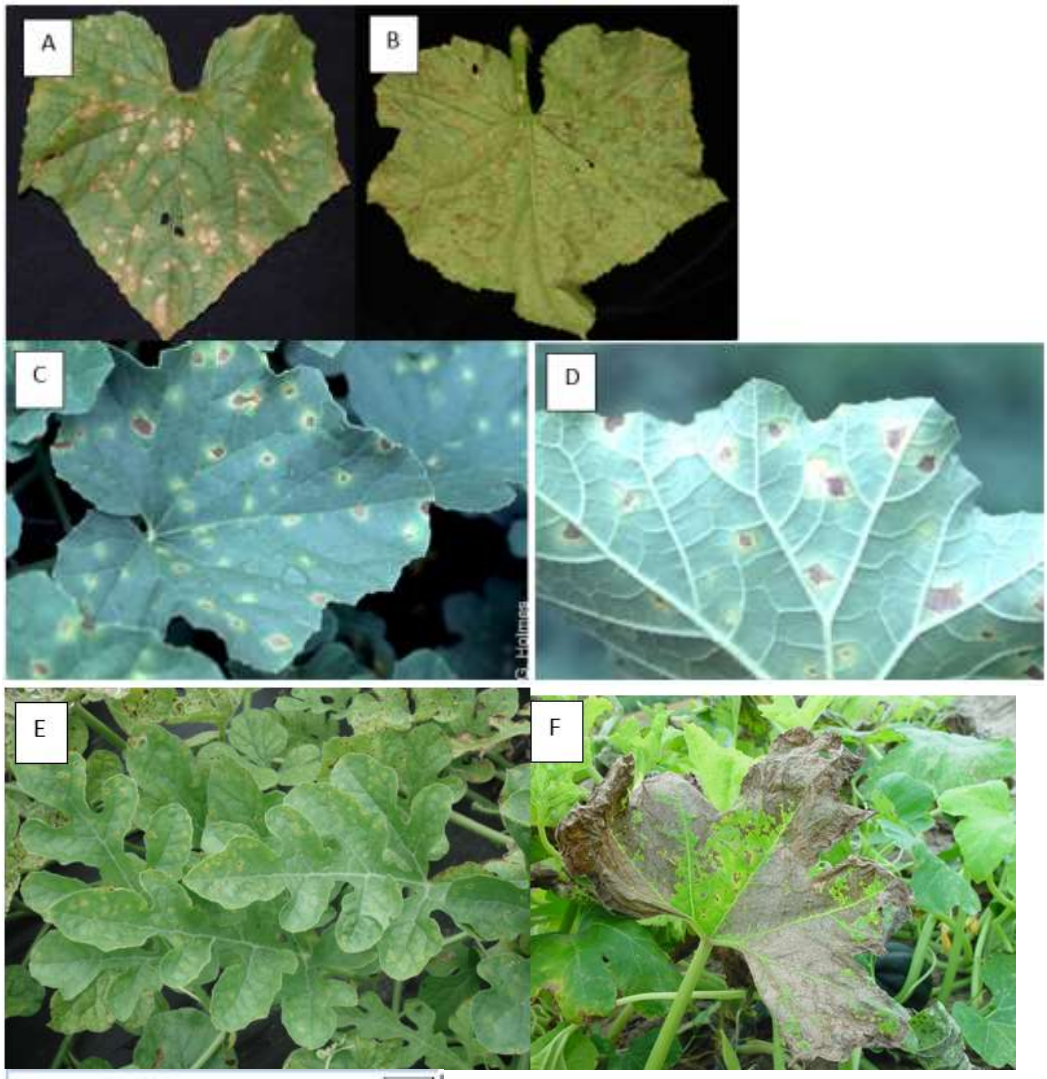
Cucurbit crops in Wisconsin have historically not needed routine application of fungicides for downy mildew control. For approximately 40 years, varietal resistance in commercial cucumber and some melon varieties, conferred by the recessive *dm1* downy mildew resistance gene, was effective in controlling disease. Pumpkin, squash, and watermelon crops were without this resistance and would sporadically become infected with downy mildew late in the production season. It had been standard recommendation that pumpkins in northern states were to be planted and harvested early to avoid risk of downy mildew because the pathogen could make its way north on late season air currents. The strain(s) of the downy mildew

pathogen that have recently made their way to the Great Lakes region are not adequately controlled by *dm1* resistance that held up for decades. And, arrival of the pathogen seems to be more variable in time.

Currently, with mid-season risk of spore movement and lack of commercially available and durable varietal resistance in cucurbits, fungicide applications are essential for protection of yield and quality. The selection of fungicides, timing of application, and thoroughness of application are critical for effective disease control. Fungicides should be applied prior to or at first sign of infection to best control cucurbit downy mildew. Based on field research in multiple states including Michigan and North Carolina, effective fungicides for downy mildew control include zoxamide+mancozeb (Gavel 75WG), cyazofamid (Ranman 3.6SC), famoxadone+cymoxanil (Tanos 50WG), ametoctradin+dimethomorph (Zampro 4.4SC), and oxathiapiprolin (Orondis Opti, newly registered in 2015). It should be noted that this list omits propamocarb hydrochloride (Previcur Flex 6SC), fluopicolide (Presidio 4FL), mandipropamid (Revus), mefenoxam (Ridomil), and strobilurins (ie: Quadris, Cabrio) because significant resistance has been detected in the downy mildew pathogen populations in MI in recent years.

The effective control program for cucumber established at Michigan State University by Dr. Mary Hausbeck, which I recommend to producers in Wisconsin, specifies a 7-day spray interval of the previously listed materials tank-mixed with either mancozeb or chlorothalonil when initiated **before** downy mildew is found in the field. Fungicides should be alternated so as to manage the potential development of fungicide resistance. Sprays are tightened up to a 5-day interval when initiated **after** disease is found in the field. For cucurbits other than cucumber, the program above is modified to expand the spray intervals from 7 to 10-day **before** disease, and 7-day **after** disease is found in the field. Downy mildew can be well controlled in cucurbit crops with use of effective fungicides, however, this adds a significant increase to the cost of production and success is contingent upon careful attention to regional extension vegetable disease reports and careful field scouting to appropriately time fungicide application.

To aid in tracking cucurbit downy mildew in your county and beyond, the website: http://cdm.ipmpipe.org/ offers forecasting of the disease based on confirmed reports across the U.S. The ipmPIPE (or **i**ntegrated **p**est **m**anagement **P**est **I**nformation **P**latform for **E**xtension and Education) cucurbit downy mildew website provides a publicly accessible site for sharing of cucurbit downy mildew detections, as well as symptom descriptions and management recommendations by region. The site is maintained by researchers at North Carolina State University with collaboration from researchers across the U.S., including Wisconsin. With the multitude of tasks that growers have to manage in the field, office, and marketplace, I recommend use of the CDM ipmPIPE Alert System (link on left side bar of website) which sends you an email or text message when downy mildew is reported within a selected geographic radius around your farm. Also, be sure you are receiving this UWEX Vegetable Crop Update newsletter each week through the growing season for downy mildew status reports.



A. Mature downy mildew angular/necrotic lesions on cucumber leaf. Pathogen sporulation begins to shut down on leaf once necrosis sets in. Depending upon weather and use of fungicides, lesions can produce more spores and create new lesions.
B. Signs of downy mildew on cucumber leaf underside. Note dark brown, fuzzy pathogen sporulation in angular patches which correlate to yellowing on surface.
C. Downy mildew lesions on cantaloupe leaf. Note irregularly shaped and placed lesions on leafe surface with yellow halo surrounding brown lesion (Photo courtesy: G. Holmes).
D. Downy mildew lesions on cantaloupe leaf bottom (note limited spore mass). (Photo courtesy: G. Holmes).
E. Small, brown downy mildew lesions on watermelon leaves (Photo courtesy: G. Holmes).
F. Downy mildew infection on acorn squash foliage. Note non-specific lesions and no limitation of lesion by veins (Photo courtesy: G. Holmes).
G. Cucurbit downy mildew disease cycle.

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Linex 4L receives Special Local Need (24c) label for potatoes in Wisconsin.

The Wisconsin DATCP issued a Special Local Need (24c) label this week for Linex 4L on potatoes grown on coarse-textured, low organic matter soils. The label expires December 31, 2020. It can be accessed on the DATCP Special Registrations web site: http://datcp.wi.gov/uploads/Plants/pdf/SpecialUses.pdf.

While the Special Local Need label still contains significant soil type and organic matter restrictions that the regulatory agencies (WI DATCP and U.S. EPA) are requiring to protect groundwater, it does broaden use and consider groundwater depth compared to the main Linex 4L label that you would find on the product container.

In the intermediate term, we're assisting the registrant (TKI NovaSource) in their work to conduct new soil type and organic matter lab studies that could support a much broader use of linuron products. The data generated in these studies will address EPA concerns about potential for linuron to be a groundwater contaminant. We'll keep you updated on progress.

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