A 2017 Hop Disease Status and Research Update

Hop Production for the Wisconsin Craft Brew Industry 8th Annual Seminar

February 25, 2017



Michelle Marks, Graduate Research Assistant Department of Plant Pathology University of Wisconsin-Madison





Outline

- What was out there in 2016?
- "New" disease concerns
 - Powdery mildew
 - Fusarium tip blight
- Research updates
 - Spike emergence timing
 - Winter soil temperatures and influence on disease
 - Ridomil resistance

What was out there in 2016?

County	March	April	May	June	July	August
Dodge	First buds (March 21 st)	Downy (April 22 st)	Downy	Downy, Leafhoppers	Leafhoppers	
Dane	First buds (March 22 nd)	Downy (mid/late April)	Downy, Japanese beetles	Downy, Leafhoppers	Downy (minimal), Fusarium, Leafhoppers	Fusarium
Pepin		First buds (obs. April 13 th but likely earlier) Downy (April 20 th)	Downy	Downy, Leafhoppers		
Marathon	First buds (March 28 th)	Downy (April 27 th) – verified w/PCR			Leafhoppers	Spider mites, Powdery mildew

Early Season Spike Counts



On average, an 89.7% reduction in the number of spikes after spring prune

2016 Downy Mildew Disease Incidence



Powdery Mildew Confirmed

- Anecdotal reports before 2016, but never confirmed through the UW Plant Disease Diagnostic Clinic or the Vegetable Pathology Lab
- Sample collected August 10 in Marathon County
- Variety 'Challenger'











Powdery Mildew Management

• Early season

- Crowning or,
- Completely removing green tissue during spring prune
- Fungicide application to base of plants before hill closure (ground not visible through shoots)
- Periodic removal of basal growth (similar to downy management)
 - Especially just before flowering
- Chemical control be careful around burring
- Avoid excessive nitrogen/water applications

Fusarium Cone Tip Blight

- Caused by several *Fusarium* species
- Symptoms may be limited to necrosis of the cone tip, or larger areas
- Little is known about disease cycle, epidemiology
 - Some suggestion that high humidity during cone development may be a factor
 - *Fusarium* can survive in plant debris so good sanitation may help
 - Very opportunistic pathogen \rightarrow keep plants healthy!
- Specific control measures have not been developed
- Many diseases may cause cone necrosis and are difficult to distinguish: get tested!

Research Updates

Spike Emergence Timing

- Accurately predicting spike emergence useful for scouting, initiating management efforts
- Older PNW models have indicated spike emergence at ~111 growing degree-days
- Anecdotal observations by growers suggest lack of congruency here

Interesting since we wouldn't expect differences

 Collecting weather data + spike observations to model this here What happens when we manipulate soil temperatures?

- Does the timing of shoot emergence change?
- Does the timing of spike emergence change?
 - Is disease severity effected (as reflected by number of spikes)?

Experiment in progress this Winter 2016/2017

Experimental Setup

- Two yard locations
 - Pepin & Dodge counties
- Nugget variety
 - Similar ages, disease status
- Two treatments + control
 - Control = natural snowfall, no disturbance
 - Snow removal = ground kept bare
 - Soil is colder than control
 - Mulch = ground covered by straw bale
 - Soil is warmer (more insulated) than control
- 5 blocks in each yard

In the spring...

- Buried temperature probes will verify temperature differences between treatments
- In each plot, count total number of healthy and diseased shoots & recording the timing of each
- If colder winter soil temperatures inhibit disease, I expect to see fewer diseases spikes in snow removal plots relative to the control

Why test for resistance?

- Mefenoxam (active ingredient of Ridomil) known to be very effective against downy mildew & there is interest in use of this product
 - Single-site mode of action however = high risk for resistance development
- Insensitivity to mefenoxam is known to occur in the Pacific Northwest
- Some planting material in WI sourced from PNW → potential to introduce insensitive strains of pathogen
 - It's also possible that insensitive isolates occur naturally
- Need to know the status here to estimate product efficacy

Mefenoxam (Ridomil) Resistance Assay

- 9 total isolates analyzed in 2015 of 19 collections
 - One location, one time point
 - All rated as Sensitive
- 26 isolates analyzed in 2016 of 38 collections
 - 5 locations in 4 counties
 - Multiple time points over the season
 - 12 (46%) isolates tested Resistant
 - 14 (54%) isolates tested Sensitive

Mefenoxam (Ridomil) Resistance Assay Results (2016)

Making Mefenoxam (or Metalaxyl) Work for Us

- Can provide excellent, 2-way (up to new growth/down to roots), long-lasting control
- Best applied in the early season
 45 day pre-harvest interval
- Resistance management will be important
 - Foliar sprays should be accompanied by a copper fungicide
 - Do not exceed usage amounts specified on label (consider combined total of drench and foliar applications)
 - Should be part of a diverse fungicide program

Thank You!

Questions?

Michelle Marks memarks2@wisc.edu

Thanks to the WI Specialty Crop Block Grant Program for funding portions of this work.