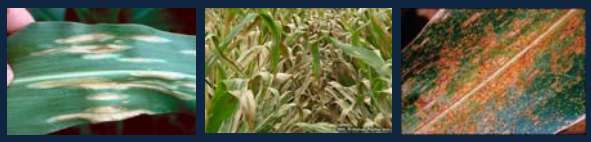
Updates in Sweet Corn Disease Management



Amanda Gevens
Extension Plant Pathologist
University of Wisconsin-Madison

MWFPA Conference– November 28, 2012 , 10:00-10:20 AM

Common rust (*Puccinia sorghi*) Disease Characteristics

Favored by cool (59-63°F), wet conditions

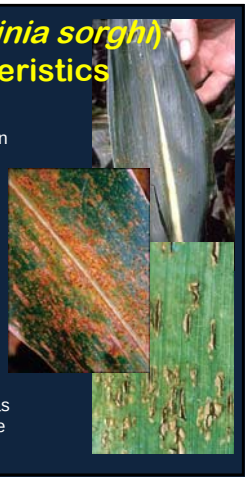
Mid-late season disease concern – but has been arriving earlier in recent years (at times May/June)

Rust pustules can form on leaf upper and lower surfaces (orange urediniospores and black teliospores)

Spores can germinate in 1-6 hours and in 1-2 days spots seen on the foliage

Generation time from 5-16 days

Oxalis spp. weeds (yellow wood sorrel) serve as alternate hosts but their role in the disease cycle is not well understood



Common Rust Control

Early plantings can generally escape late season disease pressure

Cultivar resistance – partial (general) and Rp resistance (are complementary)
- -partial resistance means fewer pustules
- -Rp resistance means hypersensitive or flecking response with few spores
- -many Rp resistance genes specific to pathogen strains – current breeding efforts to stack or compound Rps

Use of resistance results in reduction in necessary fungicide applications

Common rust (*Puccinia sorghi*) Fungicides

Broad spectrum protectants – little to no risk for fungicide resistance - no new registrations

chlorothalonil: Initiate (Loveland), Equus (MANA), Bravo, Chloronil (Syngenta), Echo (Sipcam), Chlorothalonil (Arysta)

mancozeb: Penncozeb (UPI), Manzate (DuPont), Dithane (Dow)

Common rust (*Puccinia sorghi*) Fungicides (single a.i.)

azoxystrobin: Quadris(Syngenta)

pyraclostrobin: Headline (BASF)

propiconazole: Propimax, Propiconazole (Dow), Bumper (MANA), Fitness (Loveland), Propicure (Direct), Topaz (Winfield), Tilt (Syngenta)

tebuconazole: Folicur (Bayer), Onset (Winfield), Orius (MANA), Monsoon (Loveland), Toledo (Rotam), Tebusha (Sharda), Tebustar (Albaugh), Tebuzol (UPI), Orius (MANA), Raxil (Bayer)

fluoxastrobin: Evito (Arysta LifeScience), Aftershock (Loveland)

No new a.i.s – but many new tebuconazole and propiconazole generics in 2012

Common rust (*Puccinia sorghi*) Fungicides (pre-mixes with 2 a.i.s)

propiconazole (3) & trifloxystrobin (11): Stratego, Strateo YLD (Bayer)

propiconazole (3) & azoxystrobin (11): Avaris* (Helena), Quilt Xcel, Quilt (Syngenta)

metconazole (3) & pyraclostrobin (11): Headline Amp* (BASF)

fluxapyroxad (7) & pyraclostrobin (11): Priaxor* (BASF)

***indicates new registration in 2012**

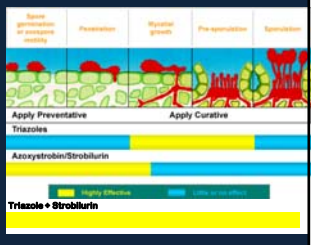
Why premixes with 2 a.i.s?

Strobilurins (11) can stop spore germination and host penetration, little control effect once fungus has invaded plant tissues, limited systemic movement (translaminar)

Triazoles (3) have some curative activity, limiting infection once established in plant tissues, systemic movement into new growth

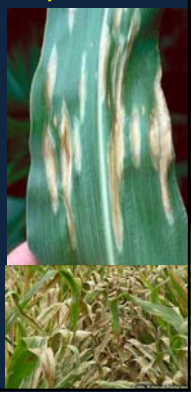
SDHI (succinate dehydrogenase inhibitors) (7) have some systemic activity

Some evidence of synergy with mixes of strobilurins and triazoles



Northern Corn Leaf Blight (*Exserohilum turcicum*)

- Spring disease – likes cooler temp (64-80°F)
- Host resistance has reduced impact of NCLB
- Early symptoms - yellow spots on lower foliage that expand to form tan dead areas about 4-6 in long and half an inch wide
- Does not infect ears - may produce lesions on husks
- If disease is severe before silking, yield losses may occur, but later initiation of the disease produces little yield loss
- Large amounts of spores can form in humid weather, during which time fungicide applications are recommended



Northern Corn Leaf Blight Fungicides - single a.i.s

azoxystrobin: Quadris (Syngenta)

pyraclostrobin: Headline (BASF)

propiconazole: Propimax, Propiconazole (Dow), Bumper (MANA), Fitness (Loveland), Propicure (Direct), Topaz (Winfield), Tilt (Syngenta)

tebuconazole: Folicur (Bayer), Onset (Winfield), Orius (MANA), Monsoon (Loveland), Toledo (Rotam), Tebusha (Sharda), Tebustar (Albaugh), Tebuzol (UPI), Orius (MANA), Raxil (Bayer)

fluoxastrobin: Evito (Arysta LifeScience), Aftershock (Loveland)

No new a.i.s – but many new tebuconazole and propiconazole generics in 2012

Northern Corn Leaf Blight Fungicides – premixes, 2 a.i.s

propiconazole (3) & trifloxystrobin (11): Stratego, Strateo YLD (Bayer)

propiconazole (3) & azoxystrobin (11): Avaris* (Helena), Quilt Xcel, Quilt (Syngenta)

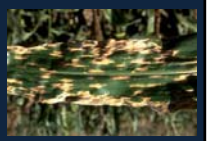
metconazole (3) & pyraclostrobin (11): Headline Amp* (BASF)

fluxapyroxad (7) & pyraclostrobin (11): Priaxor* (BASF)

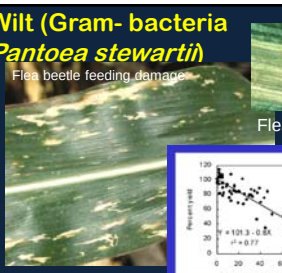
***indicates new registration in 2012**

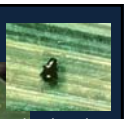
Southern Corn Leaf Blight (*Bipolaris maydis*)

- May occur with NCLB, but has smaller lesions which are lighter in color and angular
- Limited by cooler temperatures
- Disease is favored by warm, moist conditions
- Fungus survives in crop debris from season to season
- Generally less severe than NCLB unless weather conditions are very favorable for disease development and the variety is susceptible
- Can be controlled with fungicides listed for NCLB, if necessary



Stewart's Wilt (Gram- bacteria *Erwinia/Pantoea stewartii*)





Consider Sevens-Boewe Forecast to predict overwintering risk of vector
Cultivar resistance
Seed-applied insecticides
No fungicide or bacteriacide solutions

Summary – Use of Protectant Fungicides

- Mancozeb and chlorothalonil for NCLB, SCLB, and rust
- Mancozeb may be applied up to 7 days before harvest and the restricted entry interval (REI) is 24 hours (crop max 18lb a.i./A)
- Chlorothalonil may be applied up to 14 days before harvest and the REI is 12 hours

Fungicides – Propiconazole (3)

Bumper, Tilt, Propimax

- For NCLB, SCLB, and Rust
- Locally systemic – can slow down disease development after infection
- More expensive than mancozeb – so it is often a choice when disease conditions are most favorable
- May be applied up to 14 days before harvest and the REI is 12 hours
- Crop maximum of 0.45 lb/a.i./A

Fungicides – Azoxystrobin (11)

Quadris

- For NCLB, SCLB, and Rust
- Will slow down disease following infection and has greater efficacy than protectants
- May be applied up to seven days before harvest and REI is 4 hours
- Crop max of 2.0 lb/a.i./A
- Rotate chemistry to avoid resistance development
- Rates differ for rust vs. other foliar diseases

Fungicides – Pyraclostrobin (11)

Headline, Cabrio (on vegetables)

- For NCLB, SCLB, and Rust
- Will slow down disease following infection and has greater efficacy than protectants
- May be applied up to seven days before harvest and REI is 12 hours
- Crop max of 1.18 lb of a.i./A/season
- Rotate a.i. to manage resistance concerns

Fungicides – Tebuconazole (3)

Orius, Folicur, Tebuzol, Monsoon

- Labeled for NCLB, SCLB, Rust
- Many new generic formulations
- May be applied up to seven days before harvest and REI is 12 hours
- Crop max of 24 fl oz./A/season
- Rotate a.i. to manage resistance concerns

Fungicides – Pre-Mixes

propiconazole (3) & trifloxystrobin (11): Stratego, Strateo YLD (Bayer)

propiconazole (3) & azoxystrobin (11): Avaris (Helena), Quilt Xcel, Quilt (Syngenta)

metconazole (3) & pyraclostrobin (11): Headline Amp (BASF)

fluxapyroxad (7) & pyraclostrobin (11): Priaxor (BASF)

Rotate to manage resistance concerns

Consider: 1) you have 2 classes of fungicides going out in 1 spray, and 2) pathogens can become resistant to an entire class of fungicides (with variability) – so a pathogen population resistant to propiconazole may also be resistant to metconazole

Fungicide Concerns with Livestock

- Chlorothalonil and mancozeb are good protectant fungicides
- However, they cannot be used on crop for livestock feed (debris forage)
- Consult labels for all fungicides used on the crop if considering for use as feed
- Many of the reduced risk fungicides developed for specialty/horticultural crops with use on sweet corn do not comment on feed allowance or potential risks

Disease Management Overview

Cultural & Chemical Approaches

- Crop rotation (2-3 yrs)
- Plant seed treated with a fungicide
- Plant disease-resistant varieties
- Destroy old crop residues
- Follow good fertilization practices
- Limit soil compaction to promote root growth
- Use fungicides on susceptible varieties when disease is present and when environmental conditions favor disease
- **Are fungicides necessary in sweet corn production?**

Fungicide Efficacy Trials

Year	Location	Plantings	Treatments
2009	Arlington	Early (early May) Late (mid June)	12 12
	Hancock	Early (early May) Late (mid June)	12 12
2010	Arlington	Late (mid June)	10
	Hancock	Early (early May) Late (mid June)-failed	10 10

-All trials had 4 replications, one application at silking
-All trials on Rogers yellow super sweet corn hybrid 'Overland'

'Overland' Selection

Rogers sweet corn hybrid 'Overland' has :

High resistance to NCLB, Common Rust (Rp1-g), and Stewart's Wilt

Intermediate resistance to SCLB, and MDMV or Maize Dwarf Mosaic Virus

'Overland' was selected for trials because it is a common commercially grown hybrid

Fungicides Tested

#	Fungicide	Active Ingredient	Year	
			2009	2010
1	Untreated Control	NA	X	X
2	Stratego (Bayer) 10 oz	propiconazole + trifloxystrobin	X	X
3	USF0731 (Bayer) 5 oz (now Stratego Pro)	experimental	X	
4	Stratego + Folicur (Bayer) 10 oz + 6 oz	propiconazole + trifloxystrobin & tebuconazole	X	
5	LEM17 EC (DuPont)+ .25% NIS 10 oz	penthiopyrad		X
6	LEM17 EC + .25% NIS 12 oz	penthiopyrad	X	
7	LEM17 EC + .25% NIS 16 oz	penthiopyrad	X	
8	LEM17 EC + .25% NIS 20 oz	penthiopyrad		X
9	LEM17 EC + .25% NIS 24 oz	penthiopyrad	X	
10	YT699 (DuPont) + .25% NIS 6 oz	picoxystrobin	X	X
11	YT699 + .25% NIS 9 oz	picoxystrobin	X	
12	YT699 + .25% NIS 12 oz	picoxystrobin	X	X
13	Headline (BASF) + .25% NIS 6 oz	pyraclostrobin	X	X
14	Quilt (Syngenta) 14 oz	azoxystrobin + propiconazole	X	X
15	Q8X63 (DuPont) + .25% NIS 19.2 oz	experimental		X
16	Q8778 (DuPont) + .25% NIS 18 oz	experimental		X

Disease Evaluation

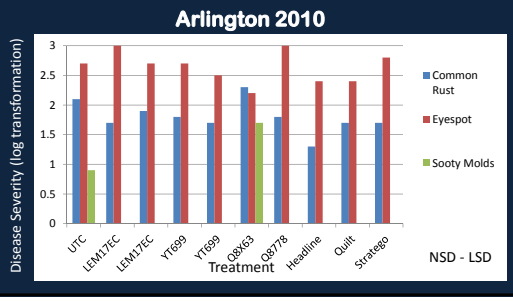
2009	2010
Common Rust *Puccinia sorghi*	**Common Rust** *Puccinia sorghi*
Eyespot *Aureobasidium zeae*	**Eyespot** *Aureobasidium zeae*
Northern Corn Leaf Blight *Exserohilum turcicum* formerly *Helminthosporium turcicum*	**Sooty molds** Cladosporium, Alternaria, and other secondary fungi
Holcus Blight *Pseudomonas syringae*	**Smut** *Ustilago maydis*
Smut *Ustilago maydis*	*Northern Corn Leaf Blight came in Sept after trial concluded*

Pre-spray: whole plants were evaluated for disease (incid and sev)
Post-spray: ear leaves were evaluated for disease (incid and sev)

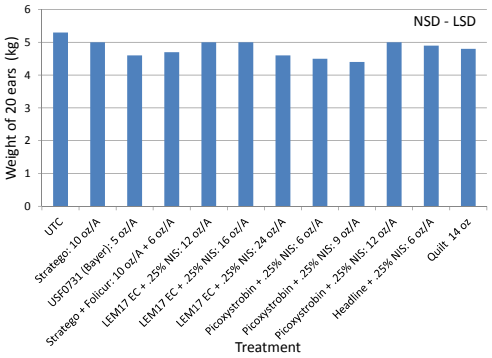
Disease Results

-In both years and locations, little disease seen in trials

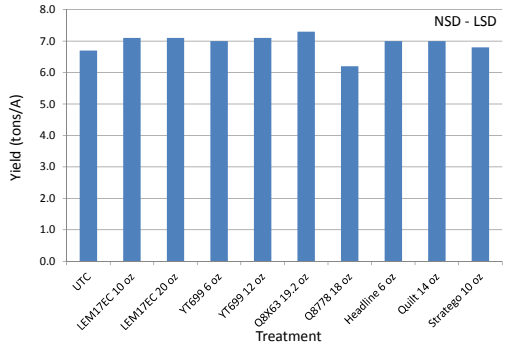
- No significant differences in disease across treatments



Sweet Corn Fungicide Trial - Yield Hancock, 2009



Sweet Corn Fungicide Trial – Yield Arlington, 2010



Does it pay to apply fungicides to sweet corn?

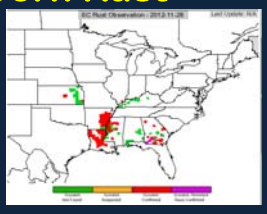
-Our WI trials with 'Overland' indicated a lack of significant disease control or yield increase with a single application of several different fungicide modes of action (triazoles, strobilurins, carboxamides) and combinations of fungicides at silking

-Disease-susceptible varieties may benefit from the application of preventative fungicides

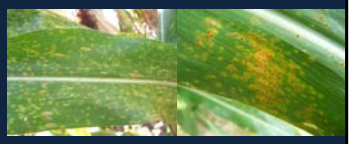
-Factors impacting economic benefit of fungicides in sweet corn include: susceptibility of corn hybrid, weather conditions, timing of fungicide application, and disease pressure

Southern Corn Rust

- *Puccinia polysora*
- Identification:
  - Orange to brown mass of spores
  - Erupt through upper leaf surface (key differentiating trait)
  - Often more clustered on the leaf surface
- Wind-dispersed from south
- Present in WI in recent years – but not in 2012



http://ipmpipe.org/sbr-bin/sbr/public.cgi?host=corn&pest=southern_corn_rust



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Thank you!