Wheat Disease Management and Diagnostics

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Contact information

- Website: http://amarillo.tamu.edu/
- http://amarillo.tamu.edu/programs/agrilife_programs/plant_pathology_extension/index.php
- Shortcut: http://sickcrops.tamu.edu/
- rdfrench@ag.tamu.edu
- 806-677-5600

TEXAS PLANT DIAGNOSTIC CLINIC

(Texas High Plains Plant Diagnostic Laboratory)

Texas AgriLife Research and Extension Center
6500 Amarillo Blvd. W
Amarillo, Texas 79106
http://plantdiagnostics.tamu.edu

Diagnostic Form

http://plantdiagnostics.tamu.edu

http://sickcrops.tamu.edu

Texas AgriLife Research & Extension Center at AMARILLO

Plant Pathology Extension

Dr. Ronald French

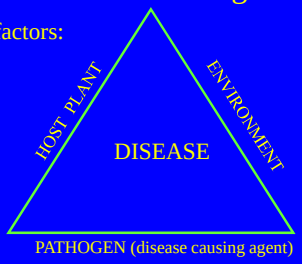
Welcome to **SICK CROPS**

- Citrus
- Corn
- Potato
- Sorghum
- Bean/Soybean
- Vegetables
- Wheat
- Other Crops
- Homeowner/Gardeners

- Contact Information
- Wheat Disease Fact Sheets
- Plant Diagnostic Form
- Texas Plant Diagnostic Clinic (THPPDL)

Disease triangle

- Three factors:



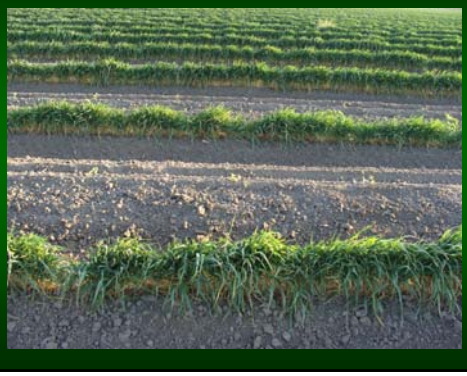
TEXAS A&M AGRILIFE EXTENSION

WHEAT DISEASES

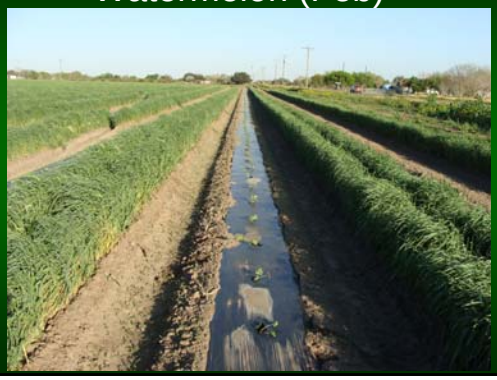
Wheat in LRGV?

Wheat in LRGV (February)

Wheat? (Feb)



Watermelon (Feb)

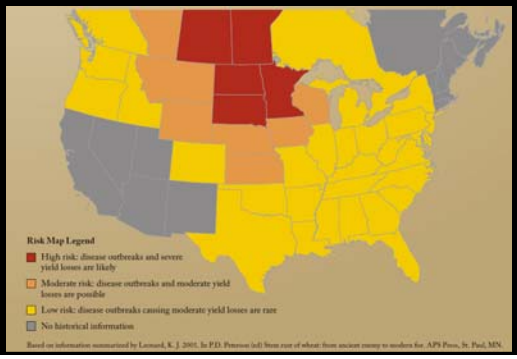


Stem Rust

February

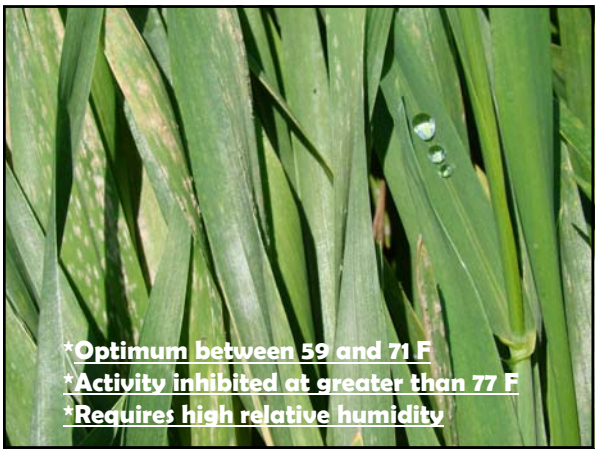
April

Estimated Yield Loss to Stem Rust



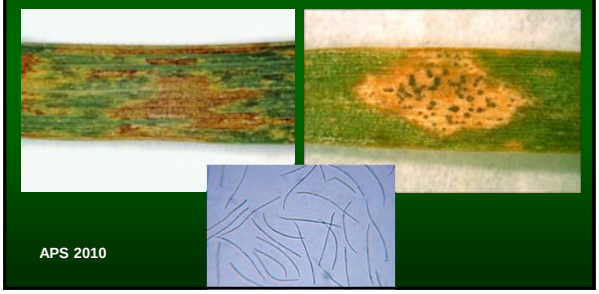
Foliar Diseases

Powdery Mildew



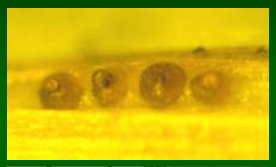
*Optimum between 59 and 71 F
*Activity inhibited at greater than 77 F
*Requires high relative humidity

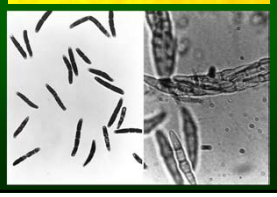
Septoria tritici (blotch)



APS 2010

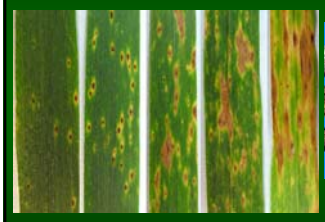
Stagonospora nodorum (blotch)

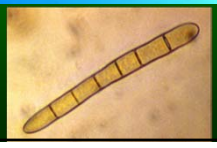




APS 2010

Pyrenephora tritici-repentis (causal agent of tan spot)





APS 2010

Stripe Rust (*Puccinia striiformis)*

More active in the mid 50s F to low 70s F. Fungus can survive at freezing temperatures.

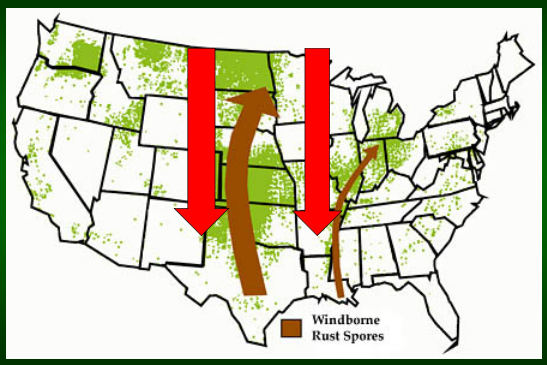
Stripe Rust (*Puccinia striiformis)*

Leaf Rust (*Puccinia triticina)*

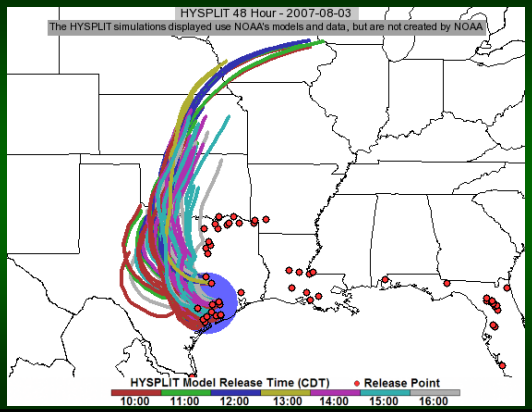
More active in the high 60s F to low 80s F. Fungus can survive at warmer temperatures.

SPRING Spore Dispersal

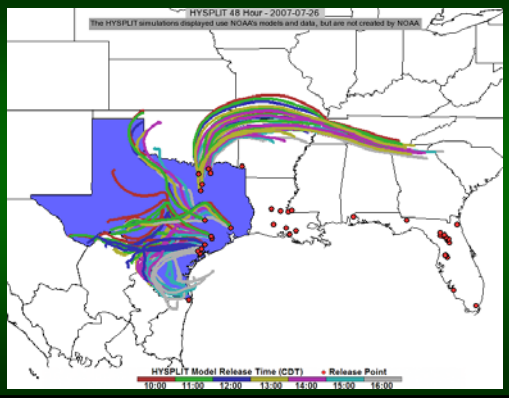
FALL Spore Dispersal



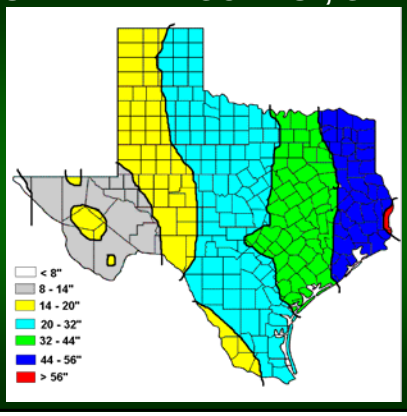
WHERE IT'S GOING:



WHERE IT'S GOING:



TEXAS RAINFALL: GO EAST, GET WET



Isakeit

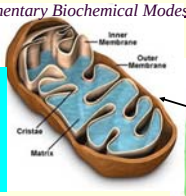
Fungicide Application

Product	Company	Rate/Acre	Diseases Controlled	Application Timing
Headline (pyraclostrobin)	BASF	**6-9 fl.oz./A**	Leaf rust, Stripe rust, Powdery mildew	**Apply after flag leaf emergence, no later than flowering (Feekes 10.5)**
PropiMax EC (propiconazole)	Dow AgroSciences	**4 fl.oz./A**	Leaf rust, Stripe rust, Powdery mildew	**Highest yields usually when applied to emerging flag leaf (no later than Feekes 8)**
Quilt (azoxystrobin + propiconazole)	Syngenta	**14 fl.oz./A**	Leaf rust, Stripe rust, Powdery mildew	**Applied until full head emergence (Feekes 10.5)**
Quadris (azoxystrobin)	Syngenta	**4-12 fl.oz./A**	Leaf rust, Stripe rust, Powdery mildew	**Applied from jointing (Feekes 6) up to late head emergence (Feekes 10.5)**
Stratego (trifloxystrobin + propiconazole)	Bayer CropScience	**10 fl.oz./A**	Leaf rust, Stripe rust, Powdery mildew	**Applied until full head emergence (Feekes 10.5).**
Tilt (propiconazole)	Syngenta	**4 fl. oz./A**	Leaf rust, Stripe rust, Powdery mildew	**Applied until full head emergence (Feekes 10.5)**

Product	Company	Rate/ per	Some Diseases Controlled	Pre-harvest interval (PHI) in days	Application Timing
Headline (pyraclostrobin)	BASF	6-9 fl. oz./A	Leaf rust, Stripe rust, Powdery mildew	48	Applied until full head emergence (Feekes 10.5)
Folicur 3.6F SC (tebuconazole)	Bayer CropScience	4.0 to 8 fl.oz. / A	Leaf rust, Stripe rust, Septoria/stagonospora and S. nodorum blotch	3 Weeks (21 days) Grazing (14 days)	Apply from full flag leaf emergence to early head emergence.
Headline (pyraclostrobin)	BASF	6-9 fl.oz./A	Leaf rust, Stripe rust, Powdery mildew	14 (day)	Apply no later than beginning of flowering (Feekes 10.5.)
PropiMax EC (propiconazole)	Dow AgroSciences	4 fl.oz./A	Leaf rust, Stripe rust, Powdery mildew	48	Until ligule of flag leaf has emerged (Feekes 8)
Prosaro 421 SC (prothioconazole + tebuconazole)	Bayer CropScience	6.5 to 8.2 fl. oz / A	Leaf Rust, Stem rust, Septoria leaf and glume blotch, tan spot	Do not apply 30 days til harvest	Until mid flowering when 75-100% wheat heads fully emerged and 50% of heads on main stem in flower (Feekes 10.5.2)
Quadris (azoxystrobin)	Syngenta	4-12 fl.oz / A	Leaf rust, Stripe rust, Powdery mildew	45	Applied from jointing (Feekes 6) up to late head emergence (Feekes 10.5)
Quilt (azoxystrobin + propiconazole)	Syngenta	14 fl.oz./A	Leaf rust, Stripe rust, Powdery mildew	45	Applied until full head emergence (Feekes 10.5)
Stratego (trifloxystrobin + propiconazole)	Bayer CropScience	10 fl.oz./A	Leaf rust, Stripe rust, Powdery mildew	35	Do not apply after Feekes 8 (the ligule of flag leaf emerged)
Tilt (propiconazole)	Syngenta	4 fl. oz./A	Leaf rust, Stripe rust, Powdery mildew	48	Applied until full head emergence (Feekes 10.5)
Twinline (pyraclostrobin + metconazole)	BASF	7-9 fl. oz./A	Rust, Stripe rust, Powdery mildew, Septoria leaf and glume blotch	30	Apply no later than the beginning of flowering (Feekes 10.5, Zadoks 5. 59)

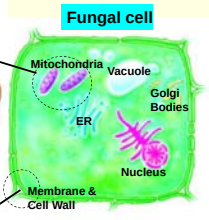
Foliar Fungicides- Strobilurin + Triazole:

Two Complimentary Biochemical Modes of Action

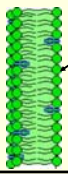


Strobilurin
Inhibits electron transfer in cytochrome bc1 complex of mitochondria. Therefore, disrupts energy production by the fungus.
Good preventative action!

Fungal cell



Triazole
Inhibits sterol biosynthesis. Sterols are important components of the cell membrane.
Good post-infection activity!



..... also beneficial for resistance management

Courtesy Syngenta (modified)

Potential Loss of Yield (%) from Stripe Rust based on Growth Stage of Wheat and Host Susceptibility. **Z**=Zadoks Decimal Growth Scale **F**=Feekes Growth Stage

Start of Epidemic (Epiphytotic)	Percentage Loss in Crop based on Host Susceptibility			
	S(2)	MS(4)	MR(6)	R(8)
First Node (Z31; F6)	85	75	55	25
Flag leaf (Z39; F9)	75	45	15	5
Mid-boot (Z45; F10)	65	25	7	2
First awns visible; First Spikelet of Inflorescence Barely Visible (Z49; between F10-10.1)	50	10	3	1
Mid-heading, half of inflorescence emerged (Z55; F10.3)	40	5	2	0
Mid-flowering; Anthesis half way (Z65; 10.52)	12	2	1	0

S=Susceptible MS=Moderately Susceptible MR= Moderately Resistant R=Resistant
Source: Gordon Murray, NSW DPI, Wagga Wagga, New South Wales, Australia.

RUST THRESHOLD: Disease Management for Leaf Rust

Approximate percent loss of yield caused by leaf rust at combinations of leaf rust severity and growth stage of wheat.

	Severity (%) of leaf rust on the flag leaf				
	10	25	40	65	100
Growth stage	----------Yield Loss (%)----------				
FLOWERING	10	15	20	30	35
Milk	2	5	8	14	20
Soft dough	1	3	4	7	10
Hard dough	1	1	1	3	5

TEXAS: Stripe Rust Threshold Study to determine potential economic thresholds -2008)

- TAM 111: Leaf rust (S), Stripe Rust (R)
- TAM 112: Leaf Rust (S), Stripe Rust (S)
- TAM 304: Leaf Rust (R), Stripe Rust (mod. S)
- Fannin: Leaf Rust (R), Stripe Rust (R)

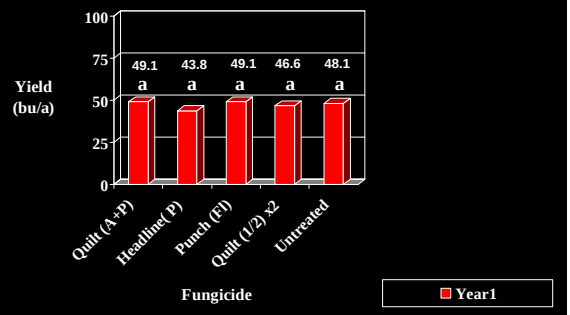
S=Susceptible, R=resistant

Sprayed ~ Feekes 10.5 (Fully headed) for all treatments

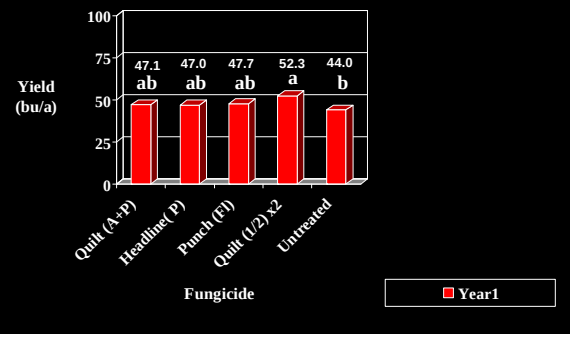
Split application of Quilt- Feekes 10.5 & 10.51 (mid flowering)

NO RUST AT TIME OF SPRAY

TAM 111: Leaf rust (S), Stripe rust (R)

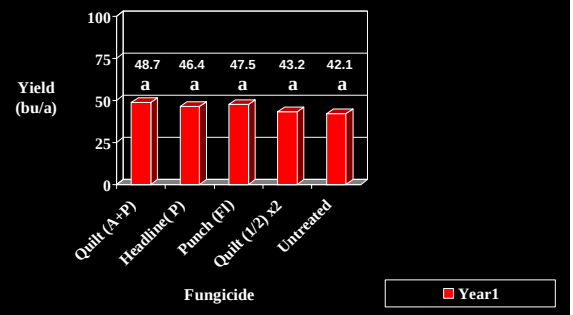


TAM 112: Leaf rust (S), Stripe rust (S)

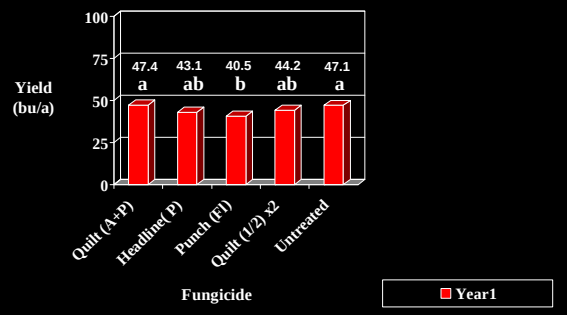


Fusarium foot (crown) rot?

TAM 304: Leaf rust (R), Stripe rust (mod. S)



Fannin: Leaf rust (R), Stripe rust (R)

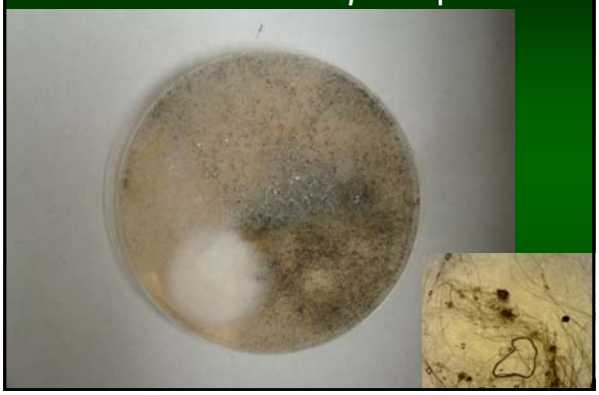


Seedborne (Seedling) Diseases

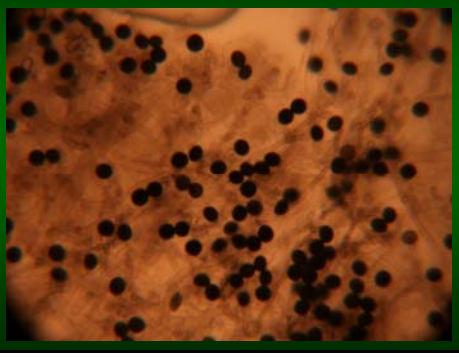
Seedborne/Seedling Diseases

- Most seedborne diseases are fungal.
- Most seed treatment ingredients are fungicides.
- Manage seedborne smuts and bunts.
- Improve stand establishment.
- Potential for Increased tillering with better root health.
- Root rot suppression
- Manage fall season foliar diseases.

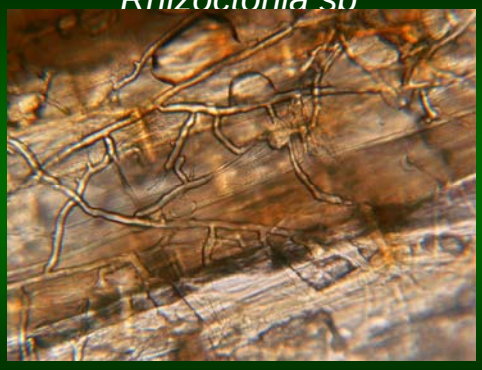
Wheat: *Rhizopus* sp.



Wheat: *Nigrospora* sp.



Rhizoctonia sp.

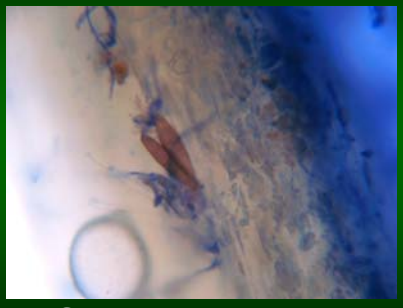


Rhizoctonia root rot

Pythium spp.

Pythium root rot ?

Cochliobolus sativus
(*Bipolaris sorokiniana)*



Common root rot

Loose Smut (*Ustilago tritici*)


Stinking Smut (Common bunt)

Sooty Mold

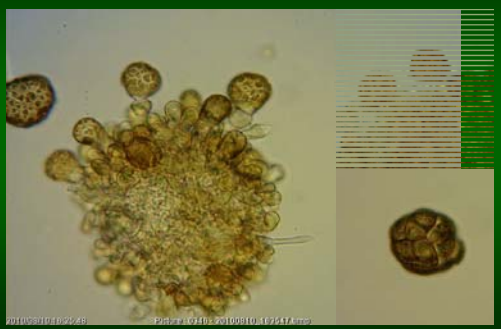
***Alternaria* spp. , *Cladosporium* spp. , *Epicoccum* spp. *Sporobolomyces* spp. , *Stemphylium* spp., and others.**

Black point (Kernel smudge)

Alternaria spp., *Nigrospora* spp., *Fusarium spp., Rhizopus spp.*

Alternaria sp.

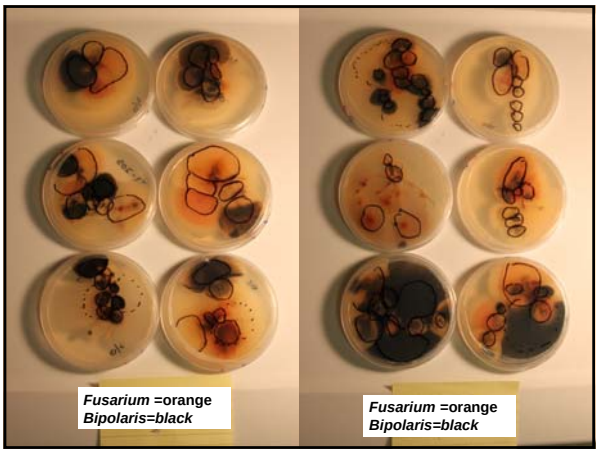
Epicoccum sp.

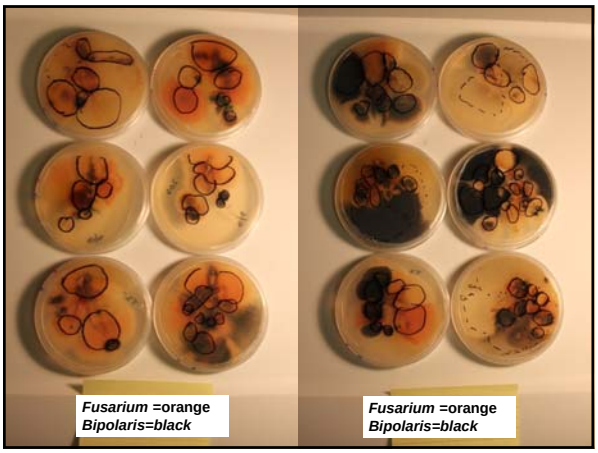


Fusarium seed scab (Fusarium graminearum/Giberella zeae)

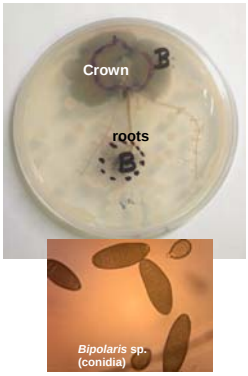
Common seed treatment fungicides labeled for use on winter wheat

Trade Name Company	Common Chemical name	% Active Ingredient	Rate	Additional label Information
Dividend XL RTA Syngenta	difenoconazole mefenoxam	3.21% 0.27%	2.5 fl oz per 100lb of seed OR 5.0 fl oz per 100lb of seed OR 10.0 fl oz per 100lb of seed	**Disease control**: The 1.0 fl oz rate of D Dividend XL RTA are for control of com Dividend XL RTA and the 2.0 fl oz rate common bunt, dwarf bunt, flag smut, se rots, *Fusarium* seed scab and *Pythium* common root rot and *Rhizoctonia* root r
Dividend Extreme Syngenta	difenoconazole mefenoxam	7.73% 1.87%	1.0 fl oz per 100lb of seed OR 2.0 fl oz per 100lb of seed OR 4.0 fl oz per 100lb of seed	The 10.0 fl oz rate of Dividend XL RTA for control of common blunt, dwarf bunt general seed rots, *Fusarium* seed scab season control of common root rot, *Fus* and *Rhizoctonia* root rot as well as fall s *Septoria* leaf blotch. Green wheat forage may not be grazed Apply Dividend Extreme as water-base seed treatment equipment. Dividend XL treatment, using standard mechanical s
Cruiser 5FS Syngenta	thiamethoxam	47.6%	1.0 fl oz. / 100 lb. of seed	**Insect control:** Early season protection (including Bird cherry-oat, English grain Wireworms and Hessian fly. While the grub control in wheat, limited field tests

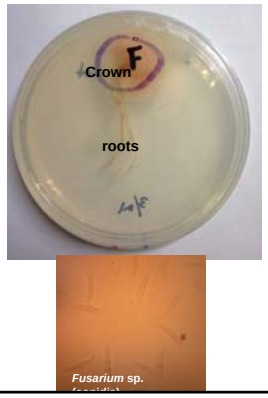




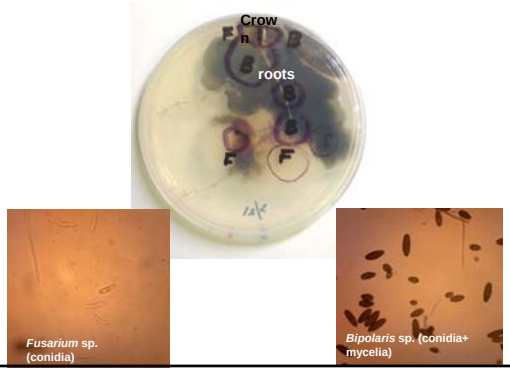
Sample 2014-00XX



Sample 2014-00XX



Sample 2014-00XX



Snap Beans

Conclusions

- Fungi are present in soil, seed, roots, foliar tissue, and heads.
- Fungal pathogens will vary with location, so management practices, including fungicide seed treatments, need to be adjusted to what is present in a field.
- Further studies (field, in vitro) will attempt to determine which chemistries work better against a certain fungal population or isolates of a specific fungus.

Viruses and Vectors

Most common viruses

- ***Wheat streak mosaic virus* (WSMV)**
- ***Wheat Mosaic Virus-WMoV (aka High plains virus* -HPV)**
- ***Triticum mosaic virus* (TriMV)-2006**
- ***Barley yellow dwarf virus* (BYDV)**
- **Cereal yellow dwarf virus (CYDV)-Subgroup II**

Table 1. Susceptibility of selected plants to mite increase and to WSMV

Plants	Mite Increase	WSMV Susceptibility
Oat	None	Resistant
Barley	Poor	Resistant
Proso millet	Good	Susceptible
Rye	Poor	Resistant
Sorghum	Poor-Good	Immune
Corn	Poor-Fair	Susceptible
Jointed goatgrass	Fair-Good	Susceptible
Japanese chess	Fair	Susceptible
Cheat	Fair	Susceptible
Downy chess	Good	Susceptible
Sandbur	Good	Susceptible
Smooth crabgrass	Fair-Good	Susceptible
Crabgrass	None	Susceptible
Barnyard grass	Poor	Susceptible
Yellow foxtail	None-Poor	Immune
Green foxtail	Poor	Susceptible
W. wheatgrass	Fair	Immune
Buffalograss	None	Immune
Side oats grama	Poor	Immune
Smooth brome	Very Poor	Immune
Canada wild-rye	Poor-Fair	Susceptible
Johnsongrass	Poor-Good	Immune

Townsend et al. http://www.ca.uky.edu/entomology/entfacts/ef117.asp

Wheat Streak Mosaic: Severely infected plants desiccate and can die

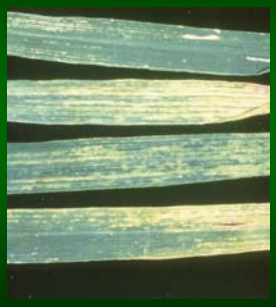
Triticum mosaic virus

- Wheat, others?
- Transmitted by Wheat curl mite
- Appearance can be confused with WSMV
- Unknown yield potential losses.

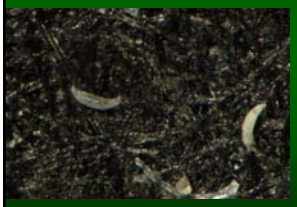
J. Price

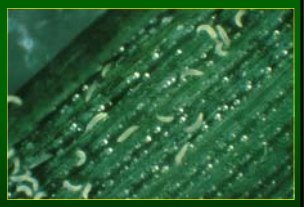
Wheat mosaic virus (aka High Plains Virus)

- Corn, wheat, barley, oats, and rye
- Transmitted by Wheat curl mite
- Symptoms- mosaic and streaking patterns, bright yellow streaks (wheat)
- Potential severe yield losses



Prevention is the Key: Managing the Wheat Curl Mite (*Aceria tosichella*)is the only option. Once the plant has the virus there is no cure.





J.Price/D.Henne

Wheat Curl Mite can be windblown

APS

102

Waco area

Waco area

Wichita Falls area

Barley Yellow Dwarf

APS

Barley Yellow Dwarf (virus) ans Cereal Yellow Dwarf (virus)

www.oznet.ksu.edu

Also on Oats, barley, corn, Triticale, and rice

Host range ~150 species in the family poaceae (grasses)

www.plantpath.wisc.edu

Over 20 species of aphids can transmit the virus

Management of WSMV, TriMV & WMoV(HPV)

Destroy the host for Wheat Curl Mite

Variety selection for WSMV (TAM 112 tolerance)

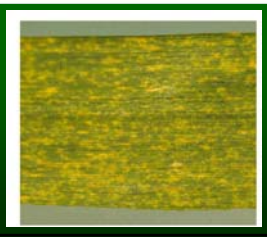
- will not hold-up to heavy pressure

Cultural practices

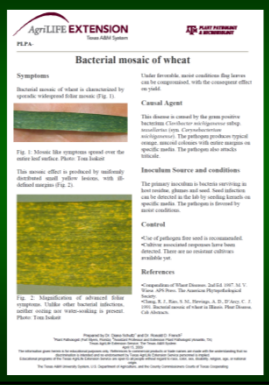
- Wheat curl mite can not live without a host

- Remove all volunteer wheat and weeds at least 21 days before planting wheat

Pathogen? Mosaic?



Pathogen? Mosaic?



Yes…but caused by a bacterium

Fact Sheets

Climbing the "Probability Ladder" for Foliar Disease Problems.

- Susceptible host
- Continuous crop
- No-till
- Planting Date
- Yield potential
- Irrigation
- Disease activity after flowering

THANK YOU !

For more information:

http://sickcrops.tamu.edu