Managing Winter Wheat Diseases

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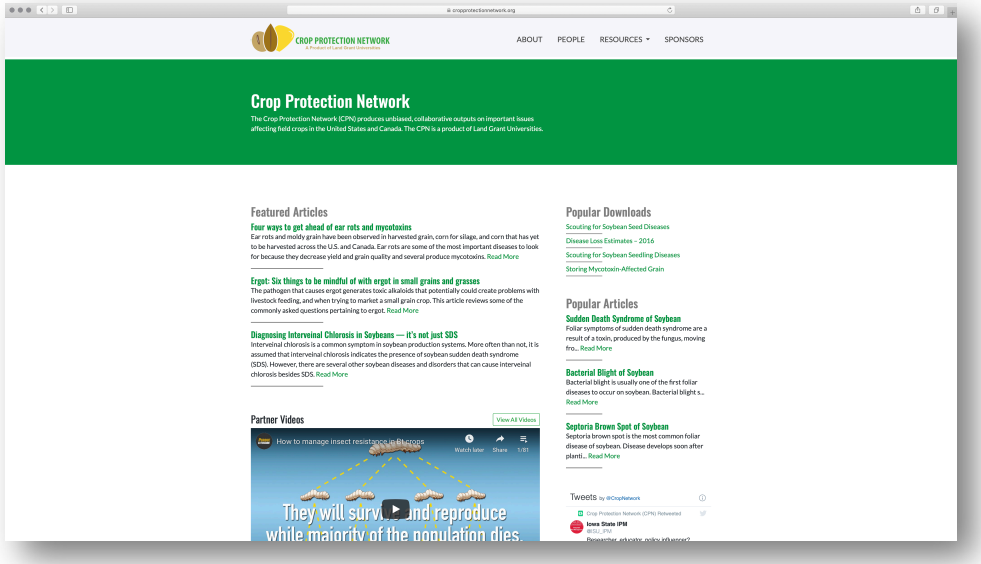
Electronic Resource Sites

http://badgercropdoc.com



http://cropprotectionnetwork.org

Top Wheat Diseases in Wisconsin (Last 5 years)

- Fusarium head blight (scab)
  - Caused by *Fusarium graminearum* and *F. culmorum*
- Stripe rust
  - Caused by *Puccinia striiformis* f. sp. *tritici* (*Pst*)
- Septoria leaf blotch
  - Caused by *Septoria tritici*
- Leaf rust
  - Caused by *Puccinia triticina*

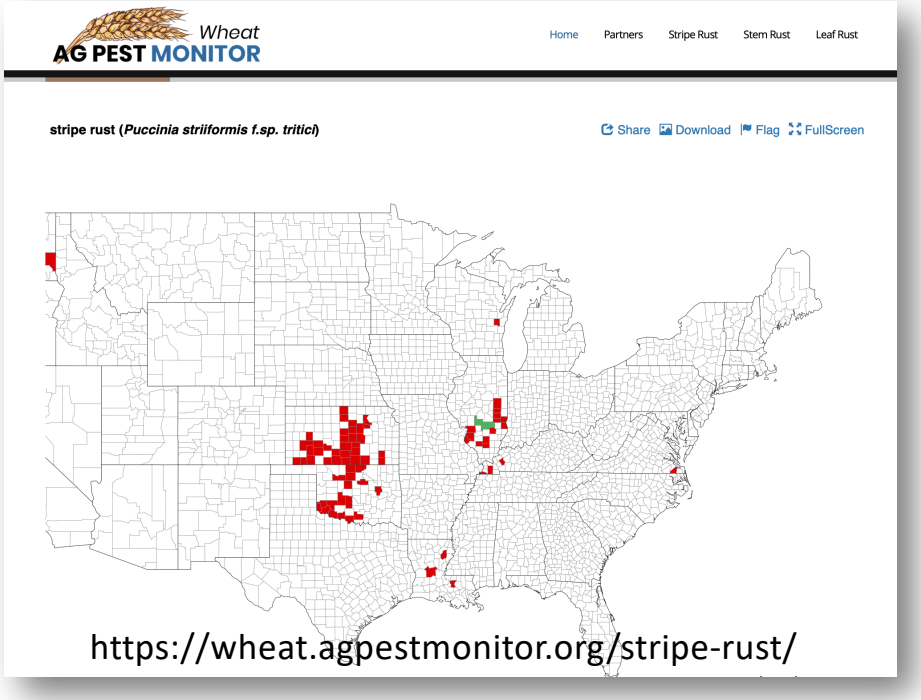
Septoria leaf blotch

Stripe rust

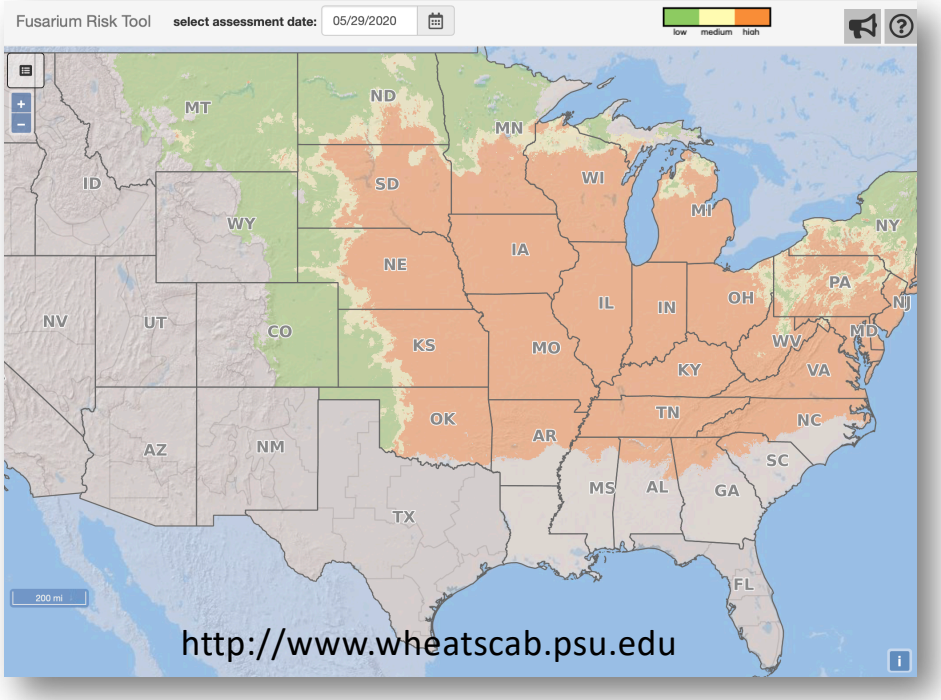
Leaf rust

Fusarium head blight

Other Resources to Track

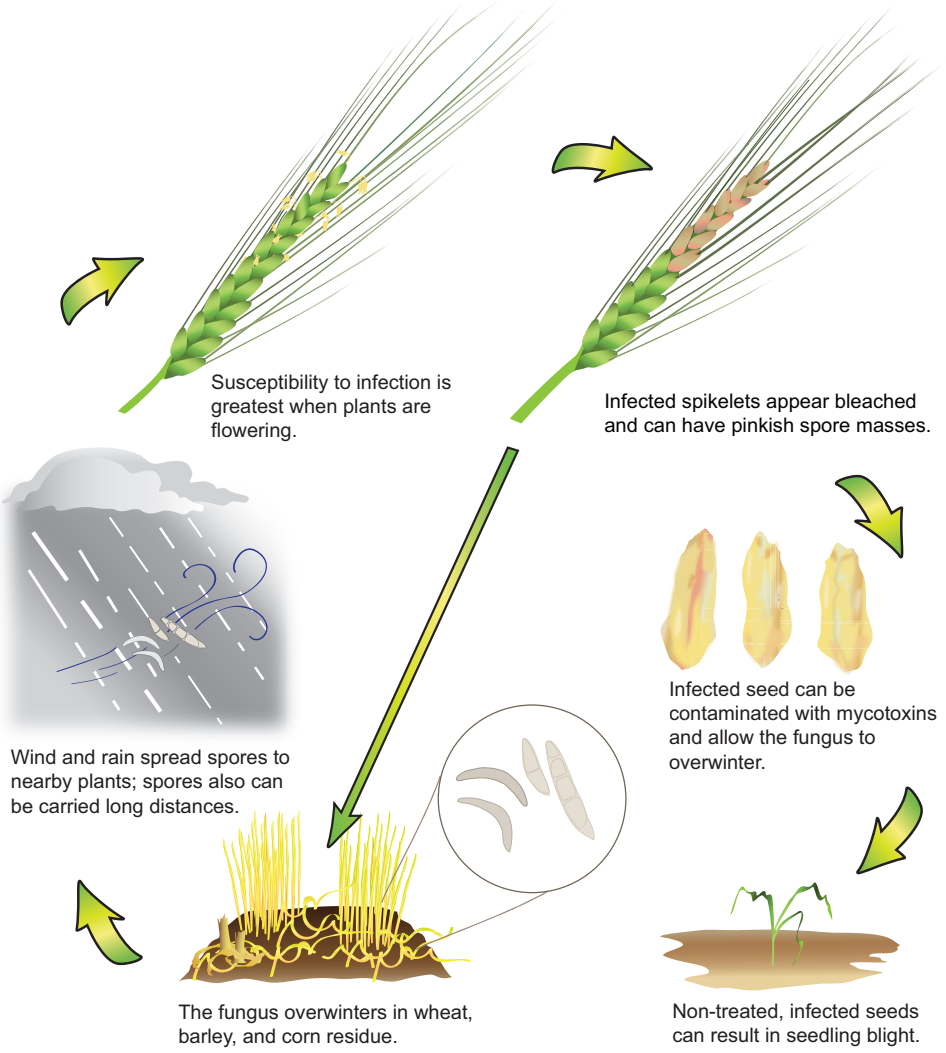


https://wheat.agpestmonitor.org/stripe-rust/



http://www.wheatscab.psu.edu

Fusarium head blight cycle



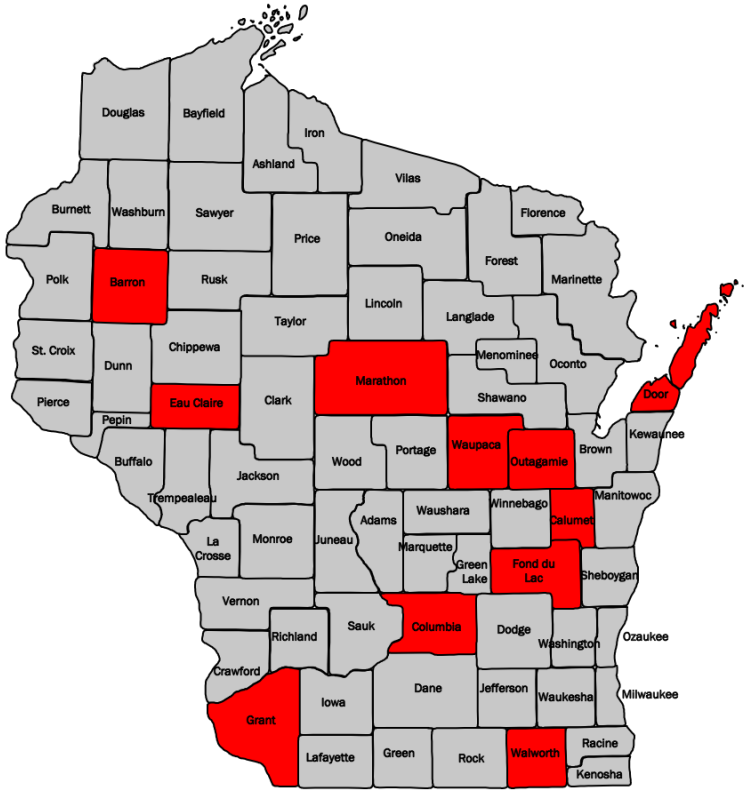
FDA Deoxynivalenol (DON;Vomitoxin) Guidelines

- 1 ppm for finished wheat products (e.g. flour, bran, germ, etc) to be consumed by humans
- 10 ppm for total feed ration for ruminating beef cattle over 4 months
- 5 ppm in the total ration for dairy cattle older than 4 months
- 5 ppm for swine as long as the grain products are not more than 20% of the feed ration
- 5 ppm for as long as the grain products are not more than 40% of the feed ration for all other animals

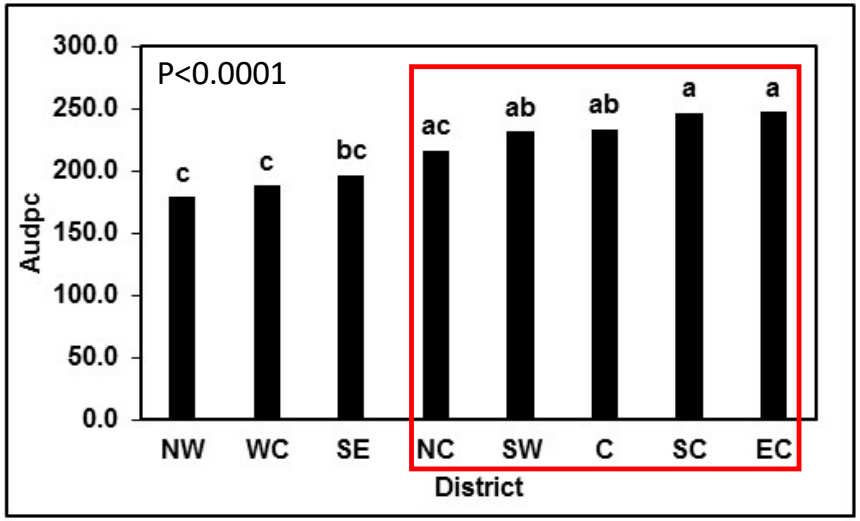
**In Wisconsin elevators typically start discounting (docking) grain at 2 ppm.

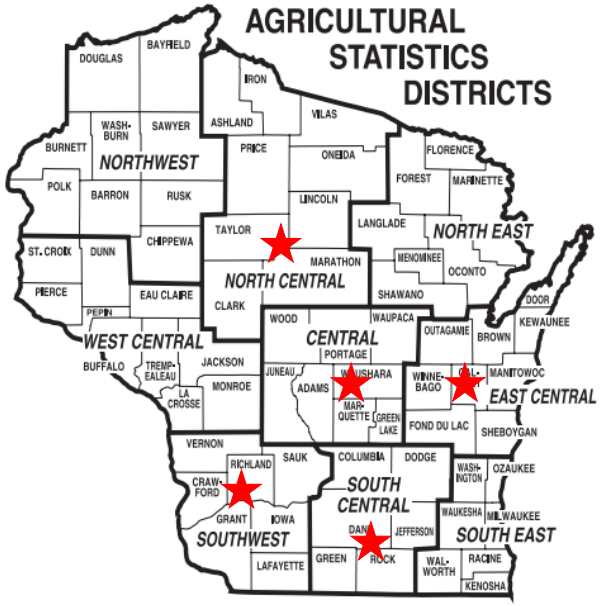
Multiple Chemotypes Can be found in Agronomic Landscapes – An example from Wheat

- 2016 Samples
  - Among 195 wheat head samples collected in 2016 in Wisconsin, 145 *Fusarium* spp. were positively chemotyped as 3ADON or 15ADON
  - 90% were of the 15ADON chemotype and 10% of isolates were 3ADON
- 2017 Samples
  - 185 samples were collected and 120 of them were chemotyped
  - 92% of the isolates were identified as 15ADON chemotype and 8% the 3ADON chemotype



Aggressiveness (AUDPC) by Cropping District



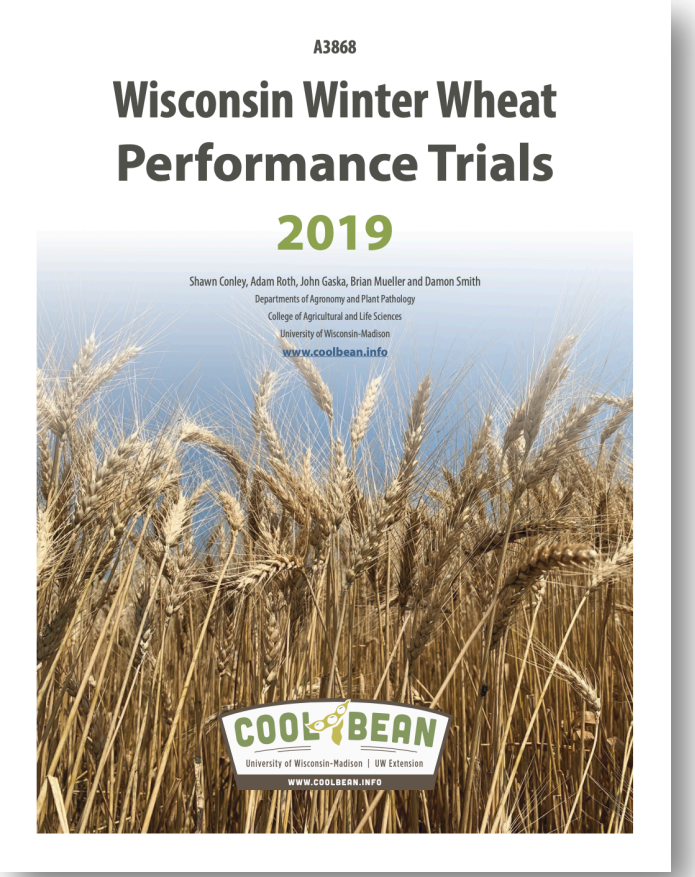


https://www.nass.usda.gov/Statistics_by_State/Wisconsin/index.php

Management of FHB

- Rotation
  - Rotation with soybeans is preferred
  - Avoid rotation behind corn, if possible
- Resistant Varieties
  - No complete resistance – partial only
  - Type 1 Resistance – Resistance to initial infection
    - -Pursuing this type of resistance has been elusive
  - Type 2 Resistance – Resistance to spread within the spike
    - -Most breeding emphasis has been here
    - -*Fhb1* first gene associated with this resistance
- Fungicide application
  - Product choice important
    - -DMI fungicides (Prosaro or Caramba) have been staples
    - -DMI plus SDHI (Miravis Ace) is the new product on the scene
    - -Strobilurin fungicides (ex. Headline) can make FHB worse
  - Timing of application important
    - -Anthesis (Feekes 10.5.1)applications have been the standard
    - -More recently applications 5-7 days after anthesis show excellent reductions in DON
    - -Applications can be made too early (ex. When the head is still in the boot)
    - -All product effective against FHB also effective against stripe rust

Variety Trials Are Key to Making a Decision on What to Plant



A3868

Wisconsin Winter Wheat Performance Trials

2019

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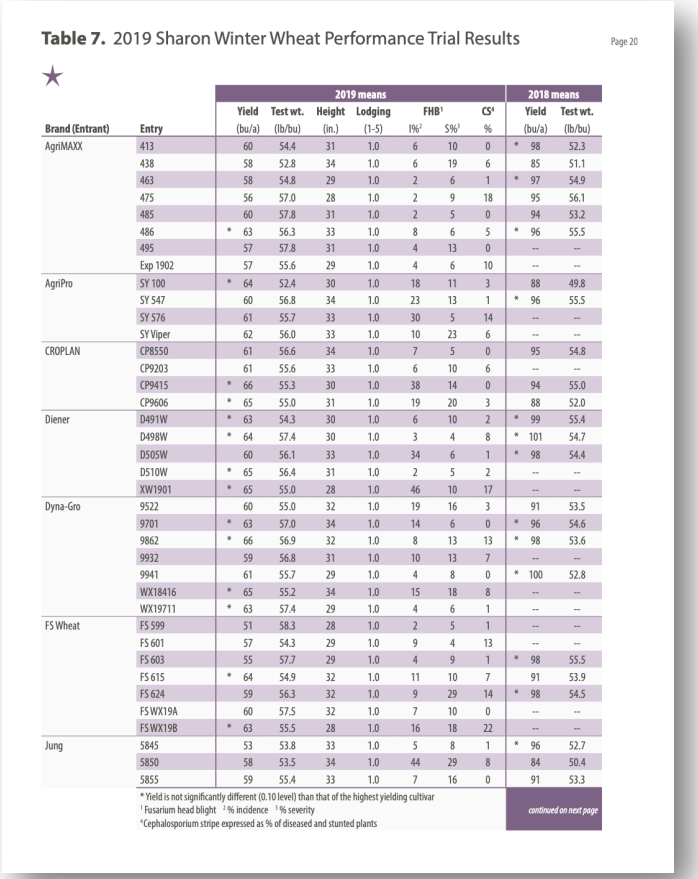

Table 7. 2019 Sharon Winter Wheat Performance Trial Results

★

		2019 means							2018 means	
Brand (Entrant)	Entry	Yield (bu/a)	Test wt. (lb/bu)	Height (in.)	Lodging (1-5)	FHB[1] I%[2]	FHB[1] S%[3]	CS[4] %	Yield (bu/a)	Test wt. (lb/bu)
AgriMAXX	413	60	54.4	31	1.0	6	10	0	* 98	52.3
	438	58	52.8	34	1.0	6	19	6	85	51.1
	463	58	54.8	29	1.0	2	6	1	* 97	54.9
	475	56	57.0	28	1.0	2	9	18	95	56.1
	485	60	57.8	31	1.0	2	5	0	94	53.2
	486	* 63	56.3	33	1.0	8	6	5	* 96	55.5
	495	57	57.8	31	1.0	4	13	0	--	--
	Exp 1902	57	55.6	29	1.0	4	6	10	--	--
AgriPro	SY 100	* 64	52.4	30	1.0	18	11	3	88	49.8
	SY 547	60	56.8	34	1.0	23	13	1	* 96	55.5
	SY 576	61	55.7	33	1.0	30	5	14	--	--
	SY Viper	62	56.0	33	1.0	10	23	6	--	--
CROPLAN	CP8550	61	56.6	34	1.0	7	5	0	95	54.8
	CP9203	61	55.6	33	1.0	6	10	6	--	--
	CP9415	* 66	55.3	30	1.0	38	14	0	94	55.0
	CP9606	* 65	55.0	31	1.0	19	20	3	88	52.0
Diener	D491W	* 63	54.3	30	1.0	6	10	2	* 99	55.4
	D498W	* 64	57.4	30	1.0	3	4	8	* 101	54.7
	D505W	60	56.1	33	1.0	34	6	1	* 98	54.4
	D510W	* 65	56.4	31	1.0	2	5	2	--	--
	XW1901	* 65	55.0	28	1.0	46	10	17	--	--
Dyna-Gro	9522	60	55.0	32	1.0	19	16	3	91	53.5
	9701	* 63	57.0	34	1.0	14	6	0	* 96	54.6
	9862	* 66	56.9	32	1.0	8	13	13	* 98	53.6
	9932	59	56.8	31	1.0	10	13	7	--	--
	9941	61	55.7	29	1.0	4	8	0	* 100	52.8
	WX18416	* 65	55.2	34	1.0	15	18	8	--	--
	WX19711	* 63	57.4	29	1.0	4	6	1	--	--
FS Wheat	FS 599	51	58.3	28	1.0	2	5	1	--	--
	FS 601	57	54.3	29	1.0	9	4	13	--	--
	FS 603	55	57.7	29	1.0	4	9	1	* 98	55.5
	FS 615	* 64	54.9	32	1.0	11	10	7	91	53.9
	FS 624	59	56.3	32	1.0	9	29	14	* 98	54.5
	FS WX19A	60	57.5	32	1.0	7	10	0	--	--
	FS WX19B	* 63	55.5	28	1.0	16	18	22	--	--
Jung	5845	53	53.8	33	1.0	5	8	1	* 96	52.7
	5850	58	53.5	34	1.0	44	29	8	84	50.4
	5855	59	55.4	33	1.0	7	16	0	91	53.3

* Yield is not significantly different (0.10 level) than that of the highest yielding cultivar
[1] Fusarium head blight [2] % incidence [3] % severity
[4] Cephalosporium stripe expressed as % of diseased and stunted plants

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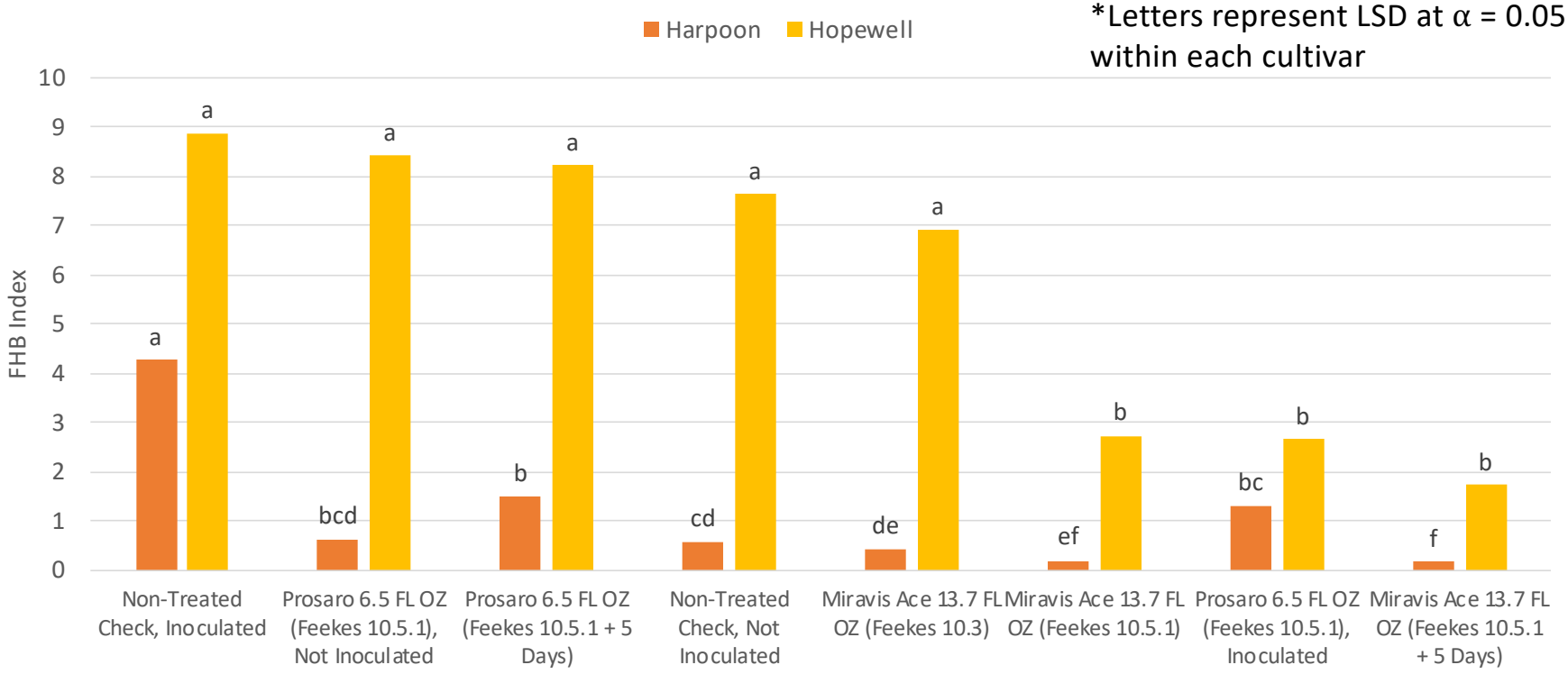
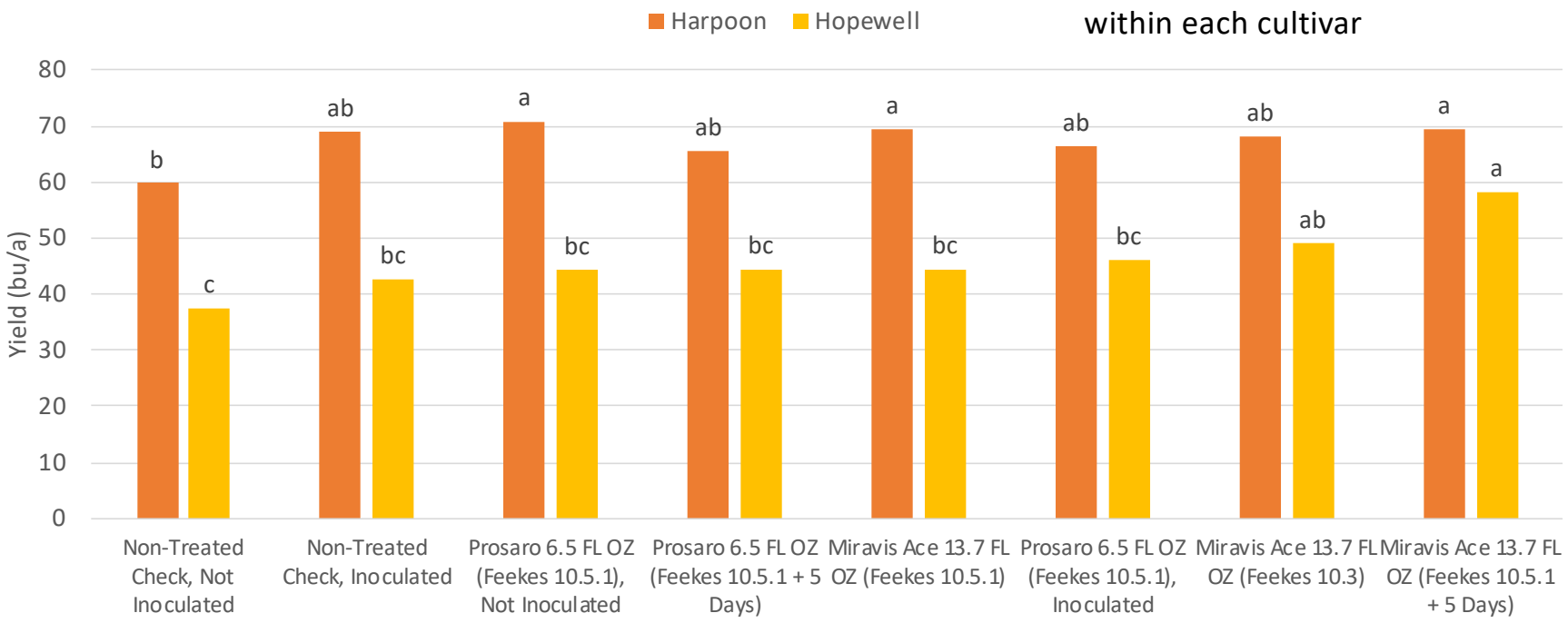
Integrated Management is Key - Combining Resistance with Fungicide Application

2019 Integrated Management Trial



2019 Integrated Management Trial

*Letters represent LSD at α = 0.05 within each cultivar



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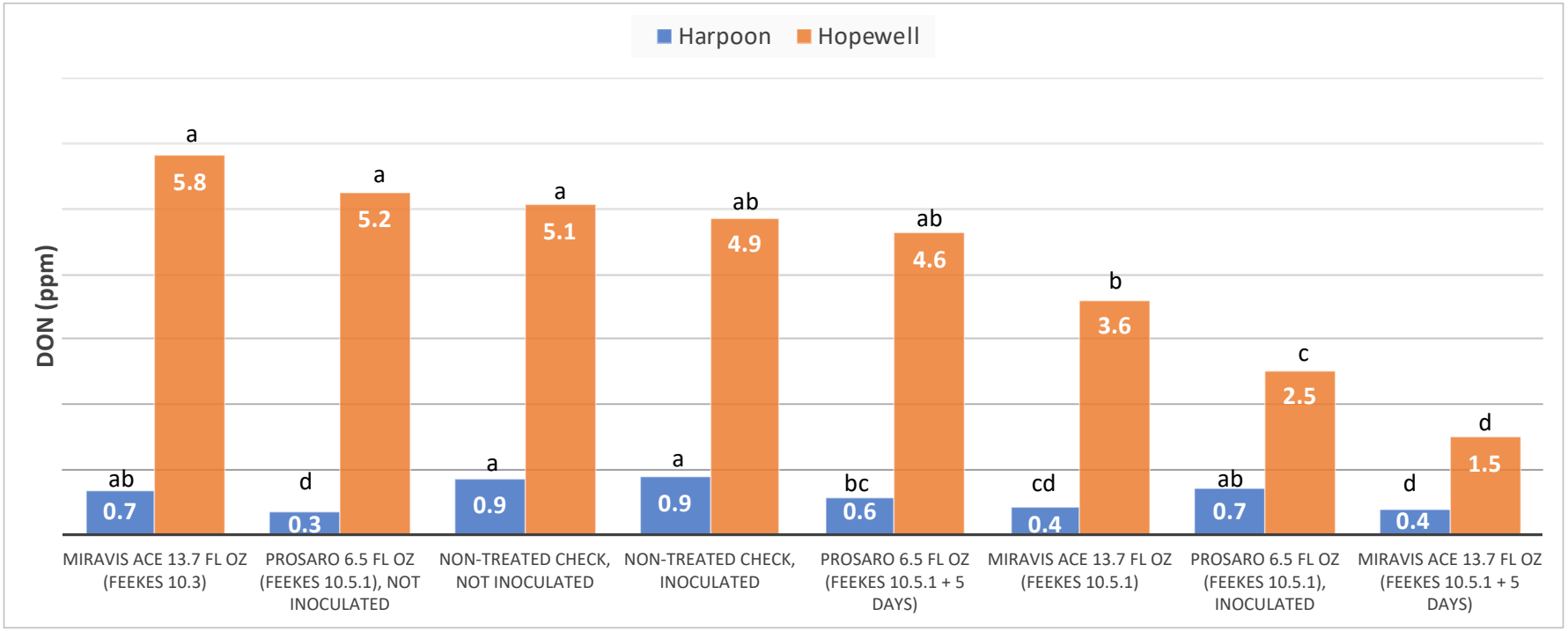
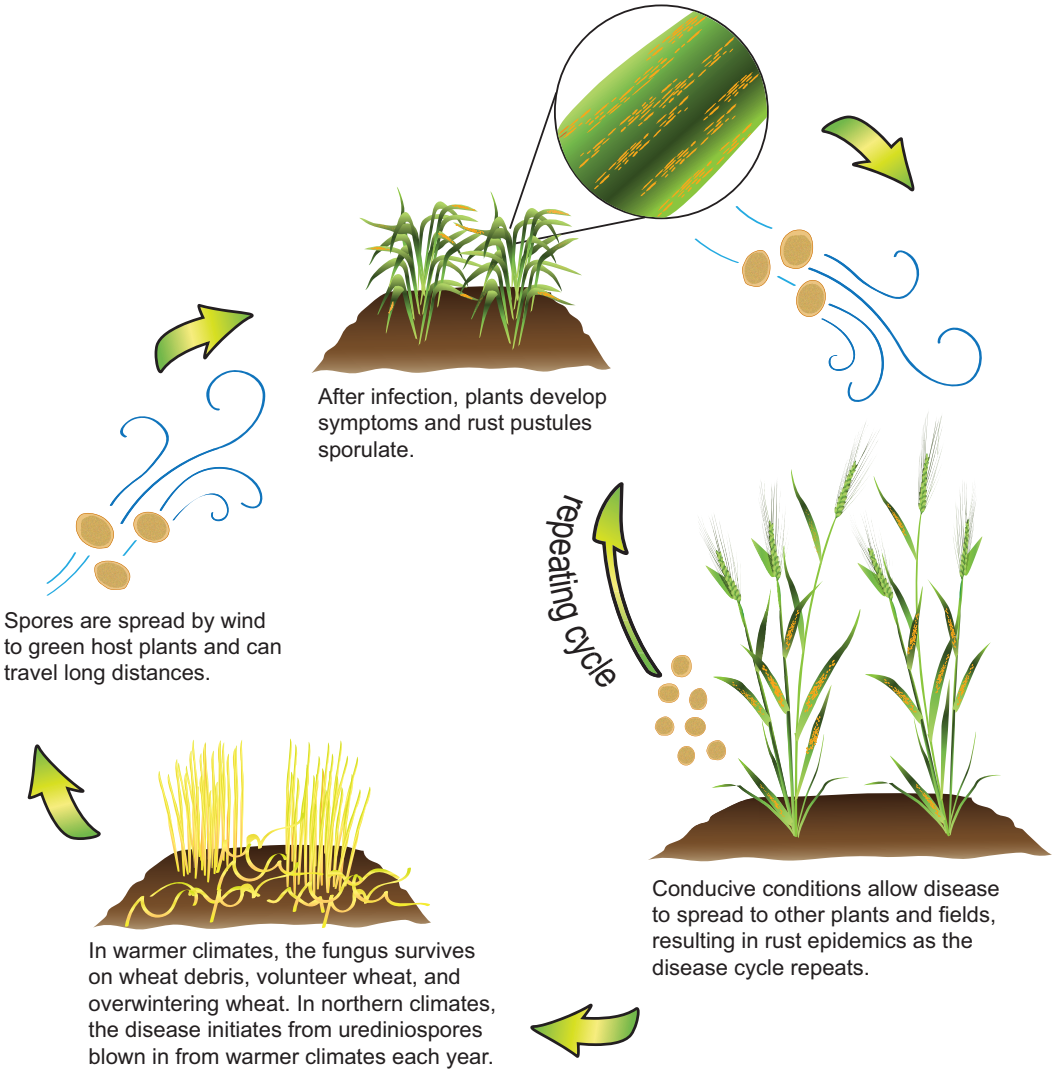
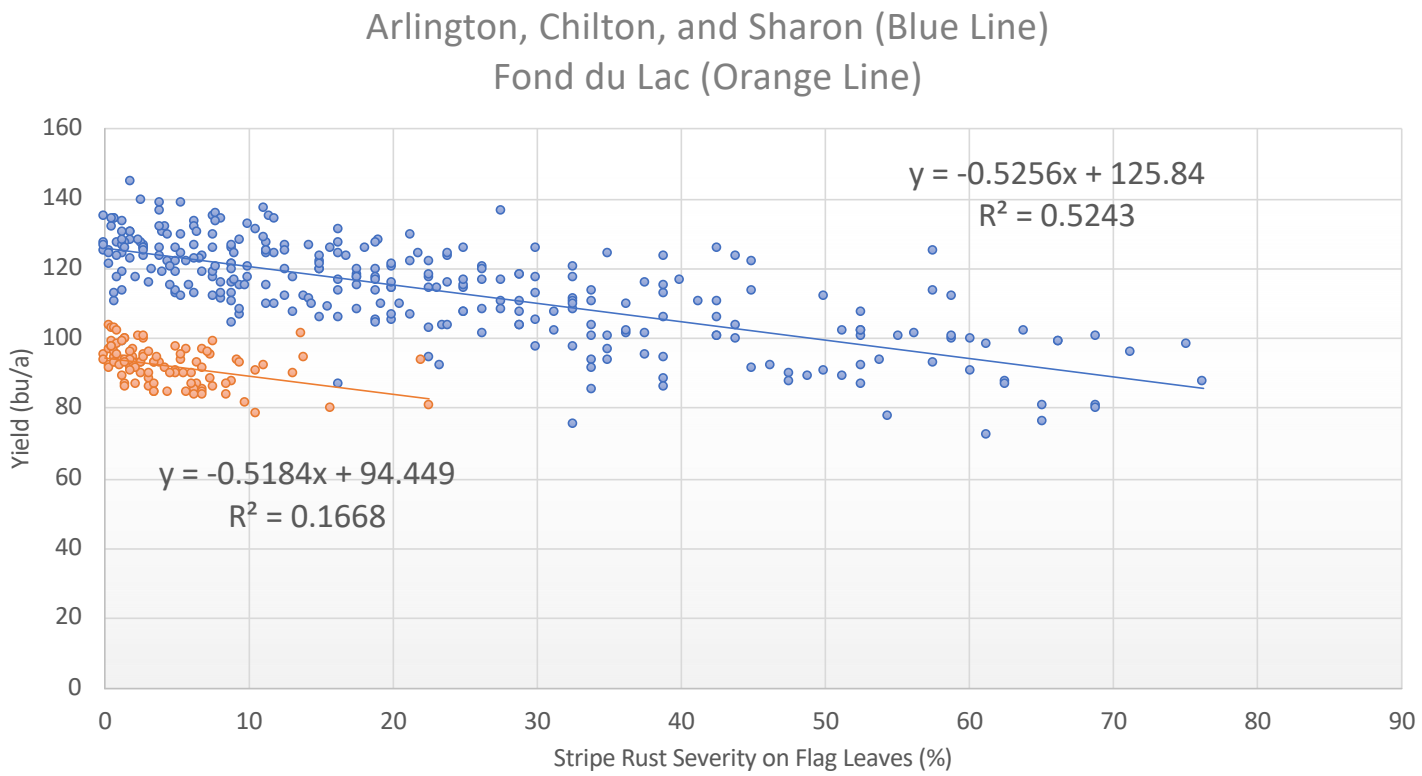


Stripe Rust cycle



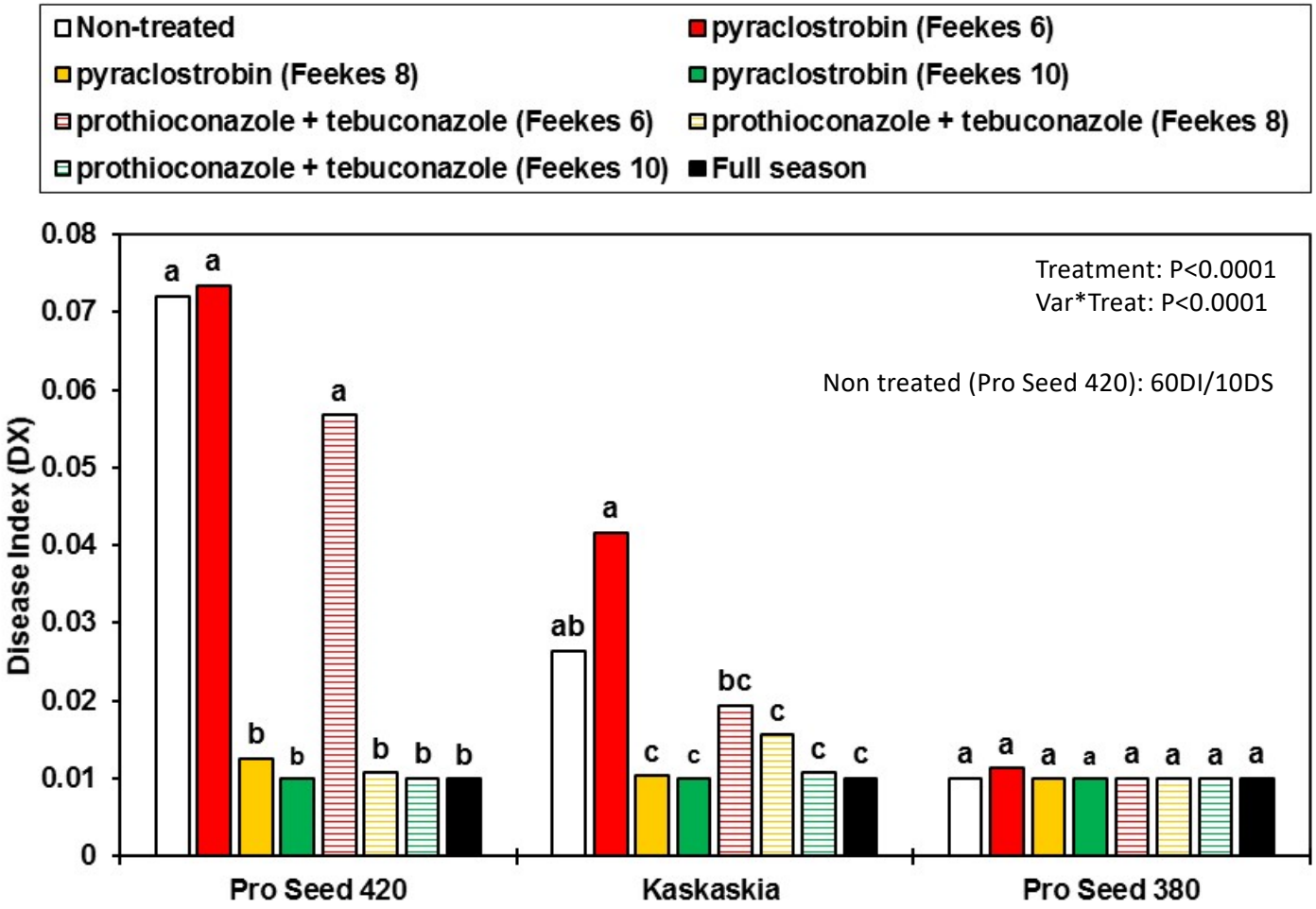
Yield Loss Due to Stripe Rust In 2016



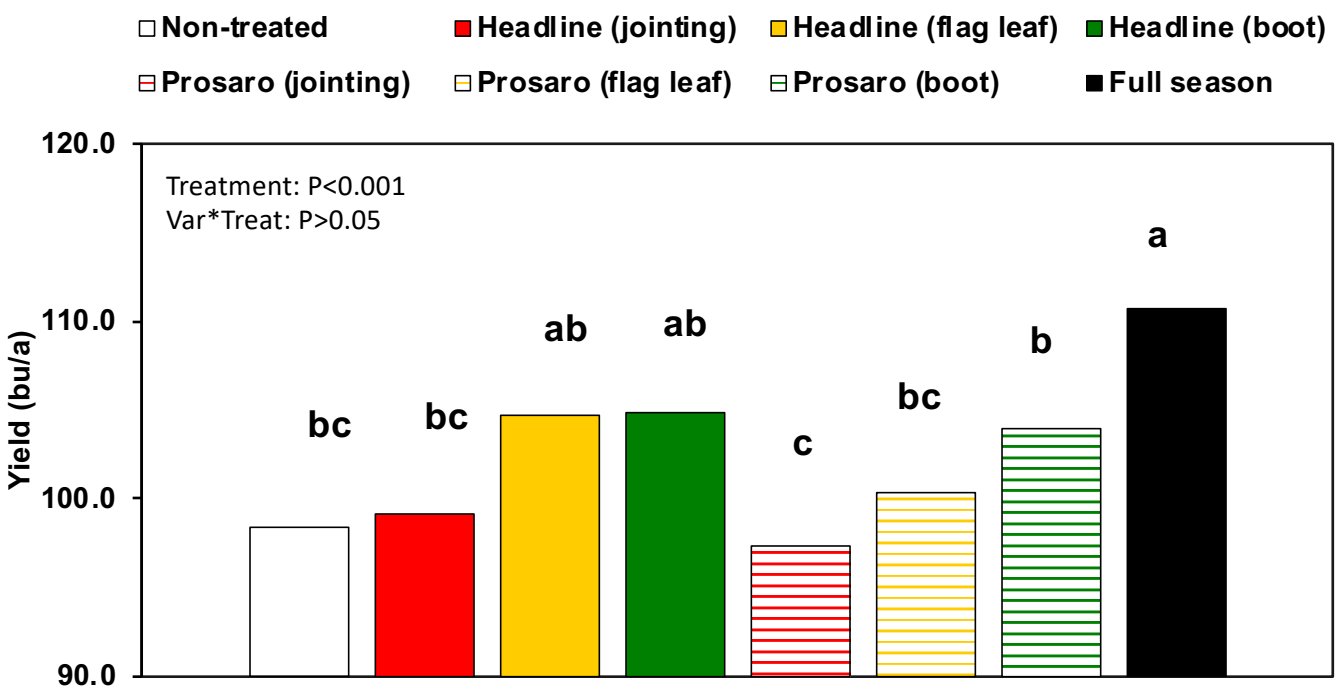
Integrated Management of Stripe Rust in Wisconsin

- 2016 and 2017
- Evaluating Fungicide Application Timing on 3 Winter Wheat Varieties
  - Fungicides
    - Prosaro
    - Headline
  - Fungicide Application Timings
    - Non-treated (Negative Control)
    - 1 app at Feekes 5 (Jointing)
    - 1 app at Feekes 8 (Emerging Flag leaf)
    - 1 app at Feekes 10 (Boot Stage)
    - Full-Season Fungicide Application (Positive Control)
  - Varieties
    - Pro Seed 420 (Susceptible)
    - Kaskaskia (Moderately Resistant)
    - Pro Seed 380 (Resistant)

Disease Index 2016



Yield In Stripe Rust Trials, 2016



What is the Return on Investment (ROI) for Intensive Wheat Management?

Intensive Wheat Management Trials (2016-2019)

*All treatments applied to 14 winter wheat varieties each year

Table 1. Management treatments at three levels.

	Management Treatments		
	Current	MidLevel	HighLevel
Base seed treatment	Same variety/treatment at all levels. See Table 2.		
Base herbicide (14-May)	Huskie 15 fl oz/a	Huskie 15 fl oz/a	Huskie 15 fl oz/a
Seeding rate (million seeds/a)	1.50	1.75	2.00
Nitrogen (lbs N/a) (5-Apr + 3-May)	55	55+30 split	110+30 split
Growth regulator @ F6 (16-May)			Palisade 12 fl oz/a
Micronutrients @ F9 (28-May)			Brandt Smart Quatro Plus (N,S,B,Mn,Mo,Zn) 32 fl oz/a EB Mix (N,S,B,Mn,Fe,Zn) 64 fl oz/a
Fungicide @ F9 (28-May)			Trivapro 13.7 fl oz/a
Micronutrients @ F10.5.1 (13-June)			TakeOff Phite MZ 32 fl oz/a
Fungicide @ F10.5.1 (13June)		Miravis Ace 13.7 fl oz/a	Miravis Ace 13.7 fl oz/a

Roth, M., Mourtzinis, S., Gaska, J., Mueller, B., Smith, D., and Conley, S. 20XX. Intensive management strategies for winter wheat in Wisconsin. Agronomy Journal. I*n preparation*.

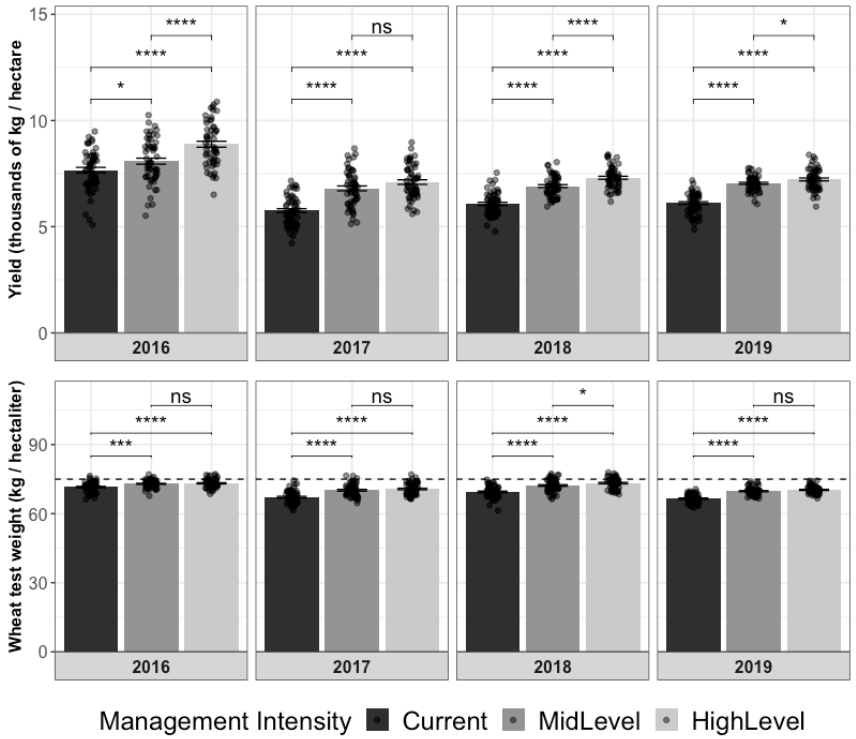
Intensive Wheat Management Trials (2016-2019)

Average Yields Across all Years, across varieties

Current: 95.2 bu/a
Mid-level: 107.2 bu/a
High-level: 113.4 bu/a

Average Yield Preservation all Years, across varieties

Current to mid = 12 bu / acre
Current to high = 18.2 bu / acre
mid to high = 6.2 bu / acre



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The "Take-Home"

- Watch your crop rotation – Try to plant what after soybean
- Choose a FHB-resistant variety that also has decent stripe rust resistance
- Feekes 5 applications of fungicide not needed in most years in Wisconsin
- In some years apply fungicides for stripe rust on susceptible cultivars around Feekes 8 (will also control Septoria if needed)
- Plan to apply an FHB fungicide application – especially on susceptible varieties
  - Shoot for Anthesis or up to 5-days after the start of anthesis for Prosaro and Caramba
  - Can go earlier (Feekes 10.5) up to 5-days after the start of anthesis for Miravis Ace
  - May need other tactics!
    - Rotate to broadleaf crops (soybean/alfalfa) where head scab is problematic
    - Rotating wheat after corn can increase risk of FHB
    - Watch the "Scab Alerts" – it isn't perfect, but can help make a decision (http://www.wheatscab.psu.edu)
    - Be sure to track Stripe Rust (https://wheat.agpestmonitor.org/stripe-rust/)

Questions?

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