Identification and Management of Wheat Diseases

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Fungal Diseases of Wheat in the PNW

	Common name	Pathogen
✓	Stripe rust	*Puccinia striiformis*
✓	Eyespot	*Oculimacula yallundae, O. acuformis*
	Cephalosporium stripe	*Cephalosporium gramineum*
	Rhizoctonia root rot	*Rhizoctonia solani, R. oryzae*
	Fusarium foot rot	*Fusarium culmorum, F. pseudograminearum*
✓	Fusarium head blight (FHB)	*Fusarium graminearum and others*
	Pythium seed/root rot	*Pythium spp.*
	Snow molds	*Typhula ishikariensis, Microdochium nivale*
	Stem rust	*Puccinia graminis*

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Virus, Bacteria, & Nematode Diseases of Wheat in the PNW

Common name	Pathogen
Root lesion nematode	*Pratylenchus penetrans, P. neglectus*
Wheat streak mosaic	*Wheat streak mosaic virus*
Cereal cyst nematode	*Heterodera avenae, H. filipjevi*
✓ Soilborne wheat mosaic	*Soilborne wheat mosaic virus*
Barley yellow dwarf	*Barley yellow dwarf virus, Cereal yellow dwarf virus*
Black chaff, aka Bacterial leaf streak	*Xanthomonas translucens* pv. *undulosa*

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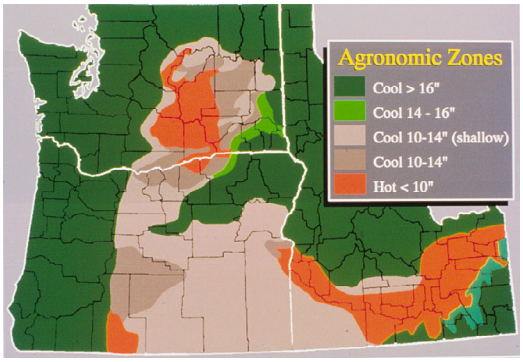
PNW Agronomic Production Zones



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Distribution of Diseases by Rainfall

Disease	Rainfall zone			
	8-12"	12-18"	>18"	Irrig.
Stripe rust				
Eyespot				
Cephalosporium stripe				
Rhizoctonia root rot				
Fusarium crown rot				
Fusarium head blight				
Snow molds				
Soilborne wheat mosaic				
Wheat streak mosaic				

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Management Considerations

Disease	Cultural practices	Variety selection	Chemical control
Stripe rust	+	+	+
Eyespot	+	+	+
Ceph. stripe	+	+	-
Rhizoctonia root rot	+	-	-
Fusarium crown rot	+	-	-
Fusarium head blight (FHB)	+	-	+
Nematodes (lesion/cyst)	+	-/+	-
Pythium root rot	+	-	+
Snow molds	+	+	-
Soilborne wheat mosaic	-	+	-
Wheat streak mosaic	+	-	-

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Cultural Management Practices

Disease	Seeding date	Residue mgt	Green bridge	Fertility	Crop rotation	Soil pH
Stripe rust	+	-	+	+	-	-
Eyespot	+	+/-	-	-	-	-
Ceph. stripe	+	+/-	-	-	+	+
Rhizoctonia	+/-	+	+	-	-	-
Fusarium	+	-	-	+	-	-
FHB	-	+	-	-	+	-
Nematodes (lesion/cyst)	-	-	+/-	-	+	-
Pythium	+	+	+	-	-	-
Snow molds	+	-	-	-	-	-
SBWM	+	-	-	-	-	-
WSMV	+	-	-	-	-	-

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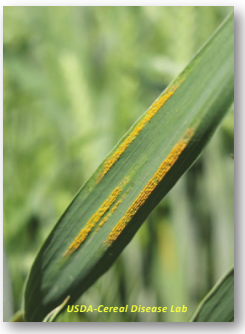
Stripe Rust



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Stripe Rust

Courtesy X. Chen

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Factors Affecting Stripe Rust

Temps of 50-64°F w/6 hrs of dew
- cool temps most important for infection
- disease development up to ~90°F

Fall infection
- susceptible plants in fall

Winter survival
- temperatures during Dec-Feb

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Stripe Rust Outlook – December 2024

What we know now:

- Rust developed later in the 2024 season and was followed by average precip in fall
- typical planting & emergence + Fall weather = average risk for rust establishment
  - ➔ Still very early
- December & January temperatures will determine rust survival into 2025
  - ➔ Expect Dr. Chen's 1st forecast in January

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Stripe Rust Control Options

Cultural
- Green bridge (volunteer) management
- Avoid very early planting
- Avoid excessive irrigation (furrow better than sprinkler)

Plant disease resistant varieties
- ➔ preferably those with HTAP resistance (1-4)

Monitor rust forecast, scout fields, spray fungicides when necessary
- ➔ Scout fields for rust, spray susceptible varieties (5-9) or when 1-5% of plants have active rust

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Stripe Rust Resistance - Winter Varieties 2024

Rating	Varieties
R (1,2)	Allegiant 3412, aMaze, AP Dynamic, AP Exceed, AP Iliad, AP Octane, AP Olympia, ARS Castella, ARS-Selbu 2.0, Bobtail, Bruehl, Cameo, Cara, HSG 124, Inspire, Jameson, Jasper, LCS Biancor, LCS Blackjack, LCS Drive, LCS Evina, LCS Hulk, LCS Jefe, LCS Kamiak, LCS Missile, LCS Rocket, LCS Scorpion AX, LCS Shark, LCS Shine, LCS Sonic, LCS Yeti, LCS Zoom, Nimbus, Nixon, Norwest 553, Norwest Duet, Norwest Tandem, OR2x2 CL+, Pritchett, Resilience CL+, Rollie, Rosalyn, Sockeye CL+, Stingray CL+, SY Assure, SY Banks, SY Clearstone CL2, SY Dayton, SY Ovation, SY Raptor, TMC M-Press, UI Bulldog, UI Frost, UI Presto CL+, WB1529, WB1545, WB1604, WB1621, WB1922, WB4311, WB4510CLP, WB4623CLP, Windust
MR (3,4)	Appleby CL+, AP Redeye, AP Venom, ARS Selbu, Canvas, Coda, Gemini, HSG 108, LCS Artdeco, LCS Eclipse AX, LCS Ghost, LCS Hydra AX, LCS Reaper AX, Kairos, Mela CL+, Millie, Otto, Sequoia, UI Bronze Jade, UI-WSU Huffman, WB1376CLP, WB1720
M (5)	AP503 CL2, Guardian, GS Bounty, LCS Aymeric, LCS Blackbird, LCS Helix AX, LCS Kraken AX, Mary, Piranha CL+, Puma, Purl, SY107, SY Command, SY Touchstone, UI Castle CL+, UI Sparrow, WB1783
MS (6,7)	AP700 CL, AP Legacy, ARS Crescent, Canvas, CPX66251, Curiosity CL+, Devote, Irv, Keldin, LCS Fusion AX, LCS Jet, Milestone, Scorpio, TMC M-Pire, UI Palouse CL+, WB1532
S (8,9)	Battle AX, Brawl CL Plus, CP7010, CP7909, Kivari AX, LCS Dagger AX, Snowmass 2.0, UI Magic CL+, VI Voodoo CL+, WB4303, WB4394, WB Rimrock, Whistler, XF4303
	Soft white, Hard red, Club, Hard White

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Stripe Rust Resistance - Spring Varieties 2024

Rating	Varieties
R (1,2)	Allegiant 6765, Alum, AP Octane, AP Renegade, AP Venom, Butch CL+, CP3055, CP3066, CP3099A, CP3119A, CPX39120, Dayn, Expresso, Glee, Hale, Hedge CL+, JD, Melba, Roger, Seahawk, SY Basalt, SY Gunsight, SY Teton, TMC2021, UI Cookie, WB6121, WB7202CLP, WB9623, WB9636, WB9662, WQL008, WQL195, YSC-605
MR (3,4)	Cabernet, Chet, CP3322, Diva, LCS Iron, Net CL+, Ryan, SY Coho, SY Selway, SY Steelhead, Tekoa, TMC Lochaven, UI Platinum, UI Stone, SY Saltese, WB6211CLP, WB9668, YSC-603
M (5)	AP Coachman, Buck Pronto, Bullseye, Jefferson, LCS Hammer AX, Louise, WB6341, Whit
MS (6,7)	AP Mondovi CL2, CP3915, Hollis, Jefferson HF, LCS Luna, Kelse, WB9303
S (8,9)	Allegiant 6633, Babe, CP3530, SY605 CL2, MT Carlson, MT Dutton, WB1035 CL+
	Soft white, Hard red, Club, Hard White, Durum

Variety ratings courtesy of Dr. Xianming Chen, USDA-ARS

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Fungicides

Monitor forecasts and development of rust

Spray when necessary:

Spray when susceptible varieties (5-9) have 1 to 5% rust

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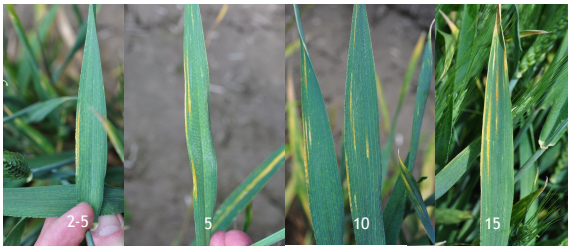
What Does 5% Rust Look Like?



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Rust Fungicides - WSU Wheat Academy 2024

Class	Active ingredient	Product	Rate/A, fl. oz	Stripe rust	Head scab[4]	Harvest Restriction
Strobilurin	Picoxystrobin 22.5%	Aproach SC	6.0 - 12.0	E[3]	NL	Feekes 10.5
	Pyraclostrobin 23.6%	Headline SC	6.0 - 9.0	E[3]	NL	Feekes 10.5
	Azoxystrobin 22.9%	Quadris 2.08 SC Multiple generics**	4.0 - 12.0	E	NL	Feekes 10.5.4
Triazole	Tebuconazole 38.7%	Folicur 3.6 F Multiple generics**	4.0	E	F	30 days
	Prothioconazole 41%	Proline 480 SC	5.0 - 5.7	VG	G	30 days
	Prothioconazole19% Tebuconazole 19%	Prosaro 421 SC	6.5 - 8.2	E	G	30 days
	Propiconazole 41.8%	Tilt 3.6 EC Multiple generics**	4.0	VG	P	Feekes 10.5.4
	Metconazole 10.91% Prothioconazole 18.19%	Sphaerex	4.0 – 7.3	E	G	30 days
	Tebuconazole 22.6% Trifloxystrobin 22.6%	Absolute Maxx SC	5.0	VG	NL	35 days
	Cyproconazole 7.17% Picoxystrobin 17.94%	Aproach Prima SC	3.4 - 6.8	E	NR	45 days
Mixed modes of action	Prothioconazole 16.0% Trifloxystrobin 13.7%	Delaro 325 SC	8.0	VG	NL	Feekes 10.5 35 days
	Pydiflumetofen 13.7% Propiconazole 11.4%	Miravis Ace SE	13.7	VG	G	Feekes 10.5.4
	Fluxapyroxad 2.8% Pyraclostrobin 18.7% Propiconazole 11.7%	Nexicor EC	7.0 - 13.0	E	NL	Feekes 10.5
	Fluxapyroxad 14.3% Pyraclostrobin 28.6% Prothioconazole 17.39%	Priaxor	4.0 - 8.0	VG	NL	Feekes 10.5
	Tebuconazole 8.7% Fluopyram 8.7%	Prosaro Pro SC	10.3-13.6	E	G	30 days
	Propiconazole 11.7% Azoxystrobin 13.5%	Quilt Xcel 2.2 SE Multiple generics**	10.5 - 14.0	E	NL	Feekes 10.5.4
	Prothioconazole 10.8% Trifloxystrobin 32.3%	Stratego YLD[6]	4.0	VG	NL	Feekes 10.5 35 days
	Benzovindiflupyr 2.9% Propiconazole 11.9%	Trivapro SE	9.4 - 13.7	E	NL	Feekes 10.5.4
	Azoxystrobin 10.5% Flutriafol 18.63%	Topguard EQ	4.0-7.0	E	NL	Feekes 10.5.4 30 days
	Azoxystrobin 25.30%					

WSU Wheat Academy 2024

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Eyespot

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Eyespot Lodging

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Factors Affecting Eyespot

Autumn temperatures 40-50°F

Rainfall

Snow cover

➔December 2024 outlook:

- Similar to stripe rust: normal planting & emergence + average rainfall + mild temperatures = average risk for susceptible varieties
- Scout fields of susceptible varieties prior to jointing to determine severity

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Control of Eyespot

Cultural practices

➔seeding date

Resistant varieties

Foliar fungicides

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Eyespot Resistant Winter Varieties

- Cara
- Devote*
- Dyna-Gro Impact
- Inspire*
- Jasper
- LCS Blackjack
- LCS-Drive
- LCS Hulk*
- LCS-Jet
- Madsen
- M-press
- Nixon
- Norwest Tandem
- OR2X2
- Otto
- Piranha CL+*
- Pritchett
- Resilience CL+
- Rollie*
- Rosalyn
- Sockeye CL+*
- Stingray*
- SY Raptor
- SY Touchstone
- VI Bulldog
- VI Frost
- WB 1529
- WB 1604
- Windust*

Soft white, Hard red, Club
*based on molecular marker data

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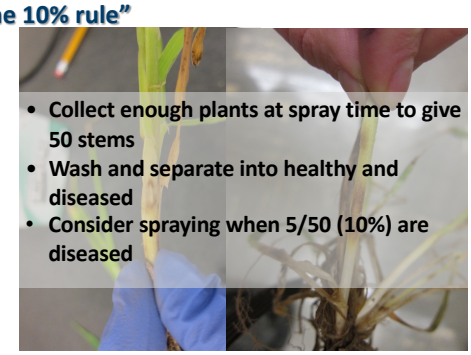
When to Spray?

"the 10% rule"



- Collect enough plants at spray time to give 50 stems
- Wash and separate into healthy and diseased
- Consider spraying when 5/50 (10%) are diseased

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Eyespot Fungicides

Active Ingredient	FRAC Group	Product	Rate/A, fl. oz	Application
propiconazole thiophanate-methyl	3 1*	Tilt 3.6EC** Topsin 4.5 FL**	4.0 10.0	Up to Feeke's GS 6
propiconazole azoxystrobin thiophanate-methyl	3 11 1*	Quilt Xcel 2.2 SE** Topsin 4.5 FL	14.0 10.0	Up to GS 6
cyproconazole thiophanate-methyl	3 1*	Alto 100 SL Topsin 4.5 FL	3.0-5.5 10	Up to GS 6
fluxapyroxad pyraclostrobin propiconazole	7 11 3	Nexicor EC	9.0-13.0	Up to GS 10.5
fluxapyroxad pyraclostrobin	7 11	Priaxor	6.0-8.0	Up to GS 10.5
pydiflumetofen propiconazole	7 3	Miravis Ace SE	13.7	2EE label

** generics available

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Soilborne Wheat Mosaic - SBWM

Originally detected in the Walla Walla region in 2007, but found in other locations in 2022 & 2023

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SBWM

Disease of fall-sown wheat only

Transmitted by soilborne fungus-like organism

➔ *acts like other soilborne diseases in terms of distribution within fields and spread*

Infection occurs in the fall and symptoms appear in early spring

- symptoms fade and plants appear to recover as temperature increases in spring

Damage remains and yield is reduced

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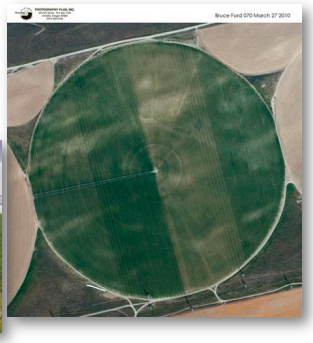
SBWM Variety Trial, Umatilla, OR 2011

Irrigated circle on sandy soil with severe SBWM symptoms in 2010



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SBWM – Management

Disease resistance – only practical option

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SBWMV Resistant Varieties

- ARS Pritchett
- Genesis
- Ladd
- LCS Shark
- ORCF-103
- ORCF-101
- Puma
- SY Dayton
- SY Ovation
- WB4303
- WB Junction
- Whetstone

Soft white, Hard red, Club

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Fusarium Head Blight

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Fusarium Head Blight or Scab = FHB

Courtesy J. Marshall

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Signs & Symptoms FHB

Courtesy J. Marshall

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Fusarium Head Blight

Why worry now?

- Not a new disease – 1st described in the U.S. in 1884
- Common and severe in some irrigated wheat fields in 2013
  - widespread but low intensity in southeastern WA dryland spring wheat
- Increased reports and samples of FHB in the past several years
- Concerns over vomitoxin-contaminated grain
  - ➔ Produce tricothecene mycotoxins = Deoxynivalenol (DON), aka vomitoxins

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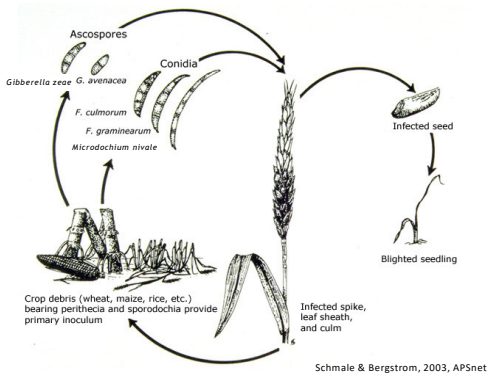
Disease Cycle of FHB



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Factors Affecting FHB

- Temps 59-86°F w/ >90% RH before, during, & after flowering
  - frequent rain showers or irrigation
- Reduced tillage that retains residue on soil surface
- Short rotations following previously infected crops, e.g. corn

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Controlling FHB

- Crop rotation to allow infested residue to decompose – avoid following corn
- Tillage to bury residue/enhance decomposition
- Healthy, treated seed
- Variety selection*
- Irrigation management
- Fungicides – foliar & seed treatment
- Harvest – higher fan speed

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FHB Control – Foliar Fungicides

Fungicide sprays may reduce infection at heading but may not reduce DON production

Use triazole fungicides: Caramba, Proline, Prosaro - all are rated good to very good

➔ *Timing of application is critical!*

Wheat: Feekes 10.51 – early flowering

Barley: Feekes 10.5 – full head emergence

Do not use strobilurin fungicides ➔ may increase DON contamination

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FHB Fungicides - 2023

Class	Active ingredient	Product	Rate/A, fl. oz	Stripe rust*	Head scab	Harvest Restriction
Strobilurin	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Triazole	Metconazole 8.6% Tebuconazole 38.7%	Caramba 0.75 SL Folicur 3.6 F**	10.0 - 17.0 4.0	E E	G F	30 days 30 days
	Prothioconazole 41%	Proline 480 SC	5.0 - 5.7	VG	G	30 days
	Prothioconazole19% Tebuconazole 19%	Prosaro 421 SC	6.5 - 8.2	E	G	30 days
	Propiconazole 41.8%	Tilt 3.6 EC**	4.0	VG	P	Feekes 10.5.4
	Metconazole 10.91% Prothioconazole 18.19%	Sphaerex	4.0 – 7.3	E	G	30 days
Mixed modes of action	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Pydiflumetofen 13.7% Propiconazole 11.4%	Miravis Ace SE	13.7	VG	G	Feekes 10.5.4
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Prothioconazole 17.39% Tebuconazole 8.7% Fluopyram 8.7%	Prosaro Pro SC	10.3-13.6	E	G	30 days
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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Plant Disease Diagnostic Lab

- Whole plants whenever possible
- Range of symptoms
- Include a healthy plant
- As many photos as needed
- Carefully packaged
- Kept cool until delivery (via mail or in person
- Delay = decay
- Fill-out submission form completely

WSU - Pullman Plant Pest Disease Clinic:
plant.clinic@wsu.edu
(509) 335-3292
Website: https://plantpath.wsu.edu/diagnostic-clinic/

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Questions?

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