

Control of stripe rust of winter wheat with foliar fungicides, 2007.

The study was conducted in a field with Palous silt loam under natural infection of stripe rust near Pullman, WA. Urea (46-0-0) was applied at 60 lb/A at the time of cultivation. Susceptible wheat cultivars 'Hatton' and 'PS 279' were seeded in rows spaced 14 in. apart at 60 lb/A with an experimental drill planter on 16 Oct 06. Harmony Extra 0.33 oz plus Buctril 0.75 pt/A with Agridex crop oil concentrate (COC) at 1% of spray volume was applied on 27 Apr 07 when wheat plants were at tillering stage. Fungicides were applied in 16 gal water/A on different dates and stages depending upon the treatments. The first applications of Topguard for the two-application treatments were done on 6 Jun at early heading stage when stripe rust was 10-20% on PS 279 and 20-30% on Hatton. Sprays were applied when wind was 1.9 mph and temperature was about 57 °F. The one-time applications of Headline, Tilt, Quilt, Stratego, Topguard, and Quadris were done on 12 Jun when plants were at late heading stage. Sprays were applied when wind was 1.8 mph and temperature was about 58 °F. The second applications of Topguard for the two-application treatments were done on 20 Jun when plants were at flowering stage. Sprays were applied when wind was 1.9 mph and temperature was about 72 °F. A 601C backpack sprayer from R & D Sprayers Inc. was used with a C3470 regulator and a 2.5 lb CO₂ cylinder. The spray boom had four nozzles 19 in apart, but three were used because of the width of the plots. The spray pressure was 18 psi. A randomized block design was used with four replications for each treatment. Plots, ranging from 79.6 to 85.4 sq ft., were individually measured at the time of harvest and individual plots areas were used to calculate yields. Stripe rust severity (percentage of diseased foliage) was assessed in each plot on 6 Jun just before the first fungicide application and 27 Jun (flowering), 5 Jul (milk), and 13 Jul (soft dough) or 7, 15, and 23 days after the last fungicide spray, respectively. Plots were harvested on 11 Aug when kernels were naturally dry, and test weight of kernels was measured for each plot. Area under disease progress curve (AUDPC) was calculated for each plot using the four sets of severity data. Relative AUDPC was calculated as percent of the non-treated control. Rust severity, relative AUDPC, test weight, and yield data were subjected to analysis of variance and means were separated by Fisher's protected LSD test.

Mean stripe rust severity in non-treated control plots of Hatton was 23.8, 100, 100, and 100% on 6 Jun, 27 Jun, 5 Jul, and 13 Jul, respectively; and that of PS 279 was 15, 100, 100, and 100% on these dates, respectively. All fungicide treatments significantly reduced stripe rust severity 7 days after the last application. Differences in stripe rust severity between the fungicide treatments and non-treated control remained significant thereafter, except for PS 279 plots sprayed with Headline that had a mean of 87.5% rust. Relative AUDPC values of all fungicide treatments were significantly lower than the non-treated control (100%), but varied significantly (11.9 to 41.9% on Hatton and 7.2-22.0% on PS 279) because of differences in the duration of efficacy and timing, rate, and number of applications. Only the treatment with Tilt significantly increased grain test weight of Hatton and only treatments of Tilt and two- application of Topguard at the rate of 14 fl oz/A increased grain test weight of PS 279. All treatments significantly increased grain yield, ranging from 38.9 to 59.8% on Hatton and from 58.5 to 111.8% on PS 279, compared to the non-treated control. The yield increase by fungicide applications could be valued at from \$136 to \$306/A depending upon the cultivar and treatment.

Cultivar, treatment, rate/A, and timing of application ^x	Stripe rust severity (%) ^z				Relative AUDPC ^w	Test weight ^y (lb/bu)	Yield ^y	
	6 Jun Early boot	27 Jun Flowering	5 Jul Milk	13 Jul Soft dough			Mean (bu/A)	Increase (%)
Hatton								
Non-treated control	23.8 a ^v	100.0 a	100.0 a	100.0 a	100.0 a	63.4 bc	43.9 c	0.0
Topguard 1.04SC 7 fl oz/A (early heading-6 June) + Topguard 1.04 lb/gal SC 7 fl oz/A (flowering-20 June)	25.0 a	6.5 cd	0.0 c	22.5 bc	18.5 cd	67.6 ab	63.2 ab	44.0
Topguard 1.04SC 10 fl oz/A (early heading-6 June) + Topguard 1.04 lb/gal SC 10 fl oz/A (flowering-20 June)	23.8 a	1.3 d	0.0 c	0.0 c	12.6 d	65.7 abc	66.3 ab	51.1
Topguard 1.04SC 14 fl oz/A (early heading-6 June) + Topguard 1.04 lb/gal SC 14 fl oz/A (flowering-20 June)	23.8 a	0.0 d	0.0 c	0.0 c	11.9 d	66.2 abc	70.4 a	60.5
Headline 2.08F 4 fl oz/A (late heading - 12 June)	23.8 a	42.5 b	42.0 b	45.0 b	41.9 b	64.1 abc	60.9 b	38.9
Tilt 3.6EC 4 fl oz/A (late heading - 12 June)	23.8 a	1.3 d	0.0 c	0.0 c	12.6 d	68.9 a	67.6 ab	54.0
Quilt 1.67SE 14 fl oz/A (late heading - 12 June).....	25.0 a	0.0 d	0.0 c	0.0 c	12.5 d	63.1 bc	70.1 a	59.8
Stratego 2.08EC 10 fl oz (late heading-12 June)	23.8 a	0.0 d	0.0 c	0.0 c	11.9 d	66.2 abc	68.3 a	55.5
Topguard 1.04 lb/gal SC 14 fl	26.3 a	14.0 c	0.0 c	0.0 c	21.5 c	65.7 abc	65.6 ab	49.4

oz/A (late heading-12 June)...									
Quadris 2.08 SC 6 fl oz/A (late heading - 12 June)	25.0 a	12.8 c	0.0 c	0.0 c	20.1 cd	61.2 c	68.6 a	56.3	
LSD ($P \leq 0.05$)	6.1	11.1	1.0	31.4	8.4	5.2	7.3		
PS 279									
Non-treated control	15.0 a	100.0 a	100.0 a	100.0 a	100.0 a	58.5 c	34.2 e	0.0	
Topguard 1.04 lb/gal SC 7 fl oz/A (early heading-6 June) + Topguard 1.04 lb/gal SC 7 fl oz/A (flowering-20 June)	13.8 a	0.0 c	0.0 c	0.0 c	7.2 c	60.3 bc	70.8 a	106.9	
Topguard 1.04 lb/gal SC 10 fl oz/A (early heading-6 June) + Topguard 1.04 lb/gal SC 10 fl oz/A (flowering-20 June)	17.5 a	0.0 c	0.0 c	0.0 c	9.2 c	61.4 bc	71.4 a	108.6	
Topguard 1.04 lb/gal SC 14 fl oz/A (early heading-6 June) + Topguard 1.04 lb/gal SC 14 fl oz/A (flowering-20 June)	15.0 a	0.0 c	0.0 c	0.0 c	7.9 c	65.2 a	72.5 a	111.8	
Headline F 500 4 fl oz/A (late heading - 12 June)	16.3 a	4.0 b	11.3 c	87.5 a	22.0 b	59.7 bc	54.3 d	58.5	
Tilt 3.6 EC 4 fl oz/A (late heading - 12 June)	16.3 a	0.0 c	0.0 b	17.5 b	10.2 c	63.0 ab	59.8 cd	74.7	
Quilt 200 SE 14 fl oz/A (late heading - 12 June).....	16.3 a	0.0 c	0.0 c	0.0 c	8.5 c	61.0 bc	69.5 ab	103.0	
Stratego 250 EC 10 fl oz (late heading-12 June)	15.0 a	0.0 c	0.0 c	0.0 c	7.9 c	59.9 bc	62.6 bc	82.9	
Topguard 1.04 lb/gal SC 14 fl oz/A (late heading-12 June)..	15.0 a	2.5 bc	0.0 c	0.0 c	9.4 c	61.2 bc	55.0 cd	60.6	
Quadris 2.08 SC 6 fl oz/A (late heading - 12 June)	15.0 a	3.8 bc	0.0 c	0.0 c	10.2 c	60.5 bc	58.2 cd	70.1	
LSD ($P \leq 0.05$)	6.2	3.8	6.0	16.2	4.6	3.7	7.9		

^z Stripe rust severity was recorded as percentage of leaf area with disease.

^y Test weight (lb/bu) and yield (lb/A) based on 3-5% moisture measured for each plot.

^x Crop Oil Concentrate (COC) at 1% v/v was applied in treatments of Headline, Tilt, Quilt, Stratego, and Quadris..

^w AUDPC is area under disease progress curve, = $\sum[\text{rust severity (i)} + \text{rust severity (i+1)}]/2 * \text{days}$. Relative AUDPC was calculated for each treatment as the percent of the AUDPC (as 100%) of the non-treated control.

^v Column numbers followed by the same letter are not significantly different at $P = 0.05$ as determined by LSD test.