

Control of stripe rust of winter wheat with foliar fungicides, 2006.

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 'PS 279' wheat was seeded in rows spaced 14 in. apart at 60 lb/A with an experimental drill planter on 11 Oct 05. 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 18 May 06 when wheat plants were at stem elongation stage. Fungicides were applied in 16 gal water/A on different dates and stages depending upon the treatments. The first applications of Quilt, Tilt, and Headline and the one-time early application of Quilt were done on 18 May at stem elongation stage and together with herbicide when stripe rust was absent. Sprays were applied when wind was 3.5 mph and temperature was about 76 °F. The one-time applications of Tilt, Quadris, Topguard, Stratego, and Quilt and the second application of Quilt were done on 25 May when plants were at early boot stage. Sprays were applied when wind was 2.7 mph and temperature was 57.8 °F. The second applications of Tilt and Headline were done on 2 Jun when plants were at heading stage. Sprays were applied when wind was 2.7 mph and temperature was 72.6 °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 75.5 to 80.9 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 18 May just before herbicide and the earliest fungicide application; 25 May when most one-time treatment of fungicides was applied; 19 Jun or 25 days after the most one-time fungicide application at flowering stage; 28 Jun or 34 days after the most one-time fungicide application at milk stage; and 10 Jul or 46 days after the most one-time fungicide application at soft dough stage. 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 five 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.

Stripe rust severity in non-treated control plots was 0, 1, 95, 100, and 100% on 18 May, 25 May, 19 Jun, 28 Jun, and 10 Jul, respectively. All fungicide treatments significantly reduced stripe rust severity 25 days after application. On 28 Jun or 41 days after the application of Quilt at a half rate (7 fl oz/A) at time of applying herbicide, stripe rust developed to the similar level as the non-treated control. On 10 Jul or 46 days after fungicide application, plots sprayed with Topguard, Startego, and the half rate early application of Quilt had rust severity of 85 – 100% , which were not significantly different from the non-treated control (100%). All other treatments had 3.3 – 72.5% severities, which were significantly lower than that of the non-treated control. Relative AUDPC values of all fungicide treatments were significantly lower than the non-treated control (100%), but varied significantly (1.2 to 67.8%) because of differences in the duration of efficacy and timing, rate, and number of applications. All treatments significantly increased grain test weight, except for the half rate of Quilt that was applied at herbicide application. All treatments increased grain yield ranging from 13.2 to 42.5% compared to the non-treated control. The yield improvement could be valued at from \$29 to \$94/A depending upon the treatment. Stripe rust damage was low and the yield response to fungicide treatments also was relatively low in 2006 compared to the similar tests in 2005 because stripe rust started much later and developed much slower in 2006 than in 2005.

Treatment, rate/A, and timing of application ^z	Stripe rust severity (%) ^y						Test weight (lb/bu)	Yield ^w	
	18 May Stem elongation	25 May Early boot	19 June Flowering	28 June Milk	10 July Soft dough	Relative AUDPC ^x		Mean (bu/A)	Increase (%)
Tilt 4 fl oz (early boot-25 May)	0	0.8 a ^v	2.0 c	10.0 cd	72.5 b	17.9 de	61.1 ab	83.2 a	42.5
Quadris 6 fl oz (early boot-25 May)	0	1.0 a	2.3 c	15.0 c	30.0 cd	11.9 def	60.7 b	82.8 a	41.8
Quilt 7 fl oz (stem elongation-18 May) + Quilt 13.5 fl oz (early boot-25 May)	0	0.0 b	0.0 c	1.8 e	3.25 e	1.2 g	61.3 ab	82.8 a	41.7
Topguard 14 fl oz (early boot-25 May)	0	1.0 a	3.3 c	27.5 b	100.0 a	29.3 c	60.8 ab	82.2 a	40.7
Tilt 2 fl oz (stem elongation-18 May) + Tilt 2.0 fl oz (heading-2 June)	0	0.8 a	1.0 c	3.3 de	22.5 d	6.0 fg	61.6 a	82.0 a	40.3
Headline 4 fl oz (stem elongation-18 May) + Headline 4 fl oz (heading-2 June)	0	0.3 b	0.3 c	2.3 de	47.50 c	9.7 ef	61.2 ab	81.4 a	39.4
Stratego 10 fl oz (flag leaf-25 May)	0	0.8 a	0.5 c	6.3 de	85.0 ab	18.2 d	61.3 ab	80.0 a	37.0
Quilt 14 fl oz (early boot-25 May)	0	1.0 a	3.0 c	10.0 cd	67.5 b	17.6 de	61.0 ab	77.7 a	33.0
Quilt 7 fl oz (stem elongation-18 May)	0	1.0 a	37.5 b	92.5 a	100.0 a	67.8 b	59.7 c	66.1 b	13.2
Non-treated control	0	1.0 a	95.0 a	100.0 a	100.0 a	100.0 a	58.9 c	58.4 b	0.0
LSD ($P \leq 0.05$)	0	0.5	11.3	7.9	17.61	8.2	0.8	11.3	

^z Crop Oil Concentrate (COC) at 1% v/v was applied in all treatments.

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

^x 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.

^w Yield (lb/A) based on 3-5% moisture and test weight (lb/bu) measured for each plot.

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