

**Control of stripe rust of winter wheat with foliar fungicides, 2012.**

The study was conducted in a field with Palouse silt loam under natural infection of stripe rust near Pullman, WA. Fertilizer (Osmocota 14-14-14) was applied at 60 lb/A at the time of cultivation on 25 Oct 11. Susceptible 'PS 279' winter wheat was seeded in rows spaced 14 in. apart at 60 lb/A (99% germination rate) with a drill planter on 26 Oct 11. Huskie, 15 fl oz/A, plus Axial, 80 ml/A, and M-90, 140 ml/A, were applied on 30 May when wheat plants were at early jointing stage. Before the first fungicide application the field was divided into individual plots of 4.4 ft (4 rows) in width and 14.8-17.0 ft in length by eliminating plants between plots with a rototiller. Fungicides were applied in 16 gal water/A on different dates and stages depending upon the treatment. The first fungicide application timing at jointing stage was done on 3 Jun when stripe rust was 1-5% severity in the field. The second application was done at boot stage on 15 Jun when stripe rust in the non-treated plots reached 20-30% severity. The third was done at heading stage on 25 Jun when stripe rust in the non-treated plots reached 90% severity. A 601C backpack sprayer was used with a CO<sub>2</sub>-pressurized spray boom at 18 psi having three operating ¼ in. nozzles spaced 19 in. apart. A randomized block design was used with four replications. Disease severity (percentage of diseased foliage per whole plot) was assessed from each plot on 3 Jun, 18 Jun, 25 Jun, 6 Jul (data not shown), and 13 Jul or on the day of fungicide application and 15, 22, 33, and 40 days after the first fungicide application timing, respectively. Plots were harvested on 16 Aug when kernels had 3-5% kernel moisture and test weight of kernels was measured. 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.

The first fungicide was applied as stripe rust began to develop; the disease reached 100% severity about one month after the first application. All fungicide treatments significantly reduced rust severity compared to the non-treated control at boot stage, except ProSaro and Tilt when applied at boot stage. However, these two treatments reduced disease severity thereafter. The Relative AUDPC values of all treatments were significantly less than the non-treated control, and there were significant differences among the treatments. All treatments with two applications of fungicides provided better control of stripe rust than did the treatments with only one. Among the treatments with only one application, Quilt Xcel (10.5 fl oz/A), X4602 (2.86 oz/A), Twinline (9.0 fl oz/A), and X4604 (13.7 oz/A) provided better control than ProSaro (both at 5.0 and 6.5 fl oz/A), Tilt (4.0 fl oz/A), and X4604 (5.5 oz/A). All treatments significantly increased test weight compared to the non-treated control. Treatments of Tilt (4 fl oz/A at jointing stage) followed by Quilt (14.0 fl oz/A at heading stage), Quilt (14.0 fl oz/A) followed by Quilt (14.0 fl oz/A), Quilt (14.0 fl oz/A) followed by Quilt Xcel (14.0 fl oz/A), Alto (4 fl oz/A) followed by Quilt (14.0 fl oz/A), and Alto (4 fl oz/A) followed by Quilt Xcel (14.0 fl oz/A) had highest test weight. Compared to the non-treated control, all treatments significantly increased yield. The increases ranged from 18.3 bu/A (46.7%) in the treatment of Tilt (4.0 fl oz/A at boot stage) to 43.7 bu/A (111.5%) in the treatment of Tilt (4 fl oz/A at jointing stage) followed by Quilt Xcel (14.0 fl oz/A at heading stage).

Treatment and rate/A <sup>z</sup>	Days after first application <sup>y</sup>	Stripe rust severity (%) <sup>x</sup>				Relative AUDPC <sup>w</sup>	Test weight <sup>v</sup> (lb/bu)	Yield <sup>v</sup> (bu/A)
		3 Jun Jointing	18 Jun Boot	25 Jun Heading	13 Jul Dough			
Non-treated control.....	Not applicable	2.0 ab <sup>u</sup>	33.8 a	90.0 a	100.0 a	100.0 a	57.3 i	39.2 h
Tilt 3.60E 4 fl oz	0							
Quilt 1.66SE 14.0 fl oz.....	22	2.0 ab	4.3 ef	4.3 h	8.8 fg	8.3 g	61.9 a	81.9 ab
Tilt 3.60E 4 fl oz	0							
Quilt Xcel 1.66SE 14.0 fl oz...	22	2.8 a	3.5 ef	4.3 h	8.8 fg	8.5 g	60.9 b-f	82.9 a
Quilt 1.66SE 14.0 fl oz	0							
Quilt 1.66SE 14.0 fl oz .....	22	2.0 a	2.0 f	2.8 h	8.8 fg	6.5 g	61.1 a-d	74.2 a-f
Quilt 1.66SE 14.0 fl oz	0							
Quilt Xcel 1.66SE 14.0 fl oz...	22	2.0 a	4.3 ef	2.0 h	7.5 fg	7.3 g	61.5 ab	80.5 a-d
Alto 4 fl oz	0							
Quilt 1.66SE 14.0 fl oz.....	22	2.0 a	5.0 ef	10.0 gh	11.3 fg	12.5 g	61.4 a-c	82.4 ab
Alto 4 fl oz	0							
Quilt Xcel 1.66SE 14.0 fl oz...	22	1.8 b	2.8 ef	10.0 gh	13.8 ef	11.8 g	61.4 a-c	76.1 a-e
ProSaro 421SC 5.0 fl oz.....	12	2.5 ab	31.3 a	45.0 bc	48.8 b	56.3 b	60.2 e-g	60.7 fg
ProSaro 421SC 6.5 fl oz.....	12	2.0 ab	26.3 ab	37.5 cd	47.5 b	50.5 bc	60.2 e-g	68.7 a-g
Quilt Xcel 1.66SE 14.0 fl oz.....	12	2.3 ab	21.3 bc	26.3 ef	30.0 cd	35.3 de	60.5 d-g	66.4 c-g
Twinline 210EC 9.0 fl oz.....	12	2.0 ab	11.3 de	20.0 f	26.3 d	26.5 ef	60.7 c-g	73.4 a-f
Twinline 210EC 6.0 fl oz	0							
Twinline 210EC 9.0 fl oz.....	12	2.3 ab	2.5 f	2.0 h	2.8 g	3.8 g	60.9 b-e	80.9 a-c
Quilt Xcel 2.2SE 10.5 fl oz.....	12	2.0 ab	11.3 de	17.5 fg	25.0 d	24.5 f	60.7 b-g	67.3 b-g
Tilt 3.6EC 4.0 fl oz .....	12	2.8 a	27.5 ab	18.8 fg	47.5 b	55.0 b	59.3 h	57.5 g
X4602 45WG 2.86 oz (wtpr).....	12	2.0 ab	13.8 cd	57.5 b	22.5 de	24.5 f	60.0 gh	70.7 a-g
X4602 45WG 7.0 oz (wtpr).....	12	2.3 ab	21.3 bc	22.5 f	31.3 dc	34.3 def	60.1 e-h	65.7 d-g

X4604 200EC 5.5 oz (wtpr).....	12	2.0 ab	22.5 b	32.5 de	36.3 c	40.5 cd	60.1 f-h	63.2 e-g
X4604 200EC 13.7 oz (wtpr) ....	12	2.3 ab	11.3 de	26.3 ef	23.8 d	27.5 ef	60.9 b-e	73.2 a-f
LSD ( $P \leq 0.05$ ) .....		0.9	8.6	9.1	8.8	10.2	0.8	15.1

<sup>z</sup> M-90 0.25% v/v was mixed with fungicide in all of the treatments with two applications (except Twinline with Induce 90S 0.125% v/v); Induce 90S 0.125% v/v was mixed with fungicide in treatments of Prosaro 421SC 5.0 fl oz, Prosaro 421SC 6.5 fl oz, Quilt Xcel 1.66SE 14.0 fl oz, and Twinline 210EC 9.0 fl oz applied once 12 days (15 Jun) after the first application; and Coc 1.0% v/v was mixed with fungicide in all remaining treatments.

<sup>y</sup> The first application was done on 3 Jun when wheat plants were at jointing stage.

<sup>x</sup> Stripe rust severity was recorded as percentage of whole plot leaf area with disease.

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

<sup>v</sup> Test weight (lb/bu) and yield (lb/A) based on 3-5% kernel moisture.

<sup>u</sup> Column numbers followed by the same letter are not significantly different at  $P = 0.05$  as determined by LSD test.