

Control of stripe rust of spring wheat with foliar fungicides, 2012.

The experiment 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 19 Apr. Susceptible 'Lemhi' spring wheat was seeded in rows spaced 14 in. apart at 60 lb/A (99% germination rate) with a drill planter on 19 Apr. Huskie 15 fl oz plus Axial 80 ml and M-90 140 ml/A was applied on 3 Jun 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 15.6-18.1 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 15 Jun when stripe rust was 1-3% severity in the field and the second at boot stage on 25 Jun when stripe rust in the non-treated plots reached 10-20% severity. A 601C backpack sprayer was used with a CO₂ 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 on whole plot) was assessed from each plot on 15 Jun, 27 Jun, 5 Jul, 13 Jul (data not shown), and 23 Jul or on the same day and 10, 22, 28, and 38 days after the first fungicide application, respectively. Plots were harvested on 16 Sep 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 with the first application on 15 Jun significantly reduced rust severity when data were recorded on 27 Jun, compared to the non-treated control at boot stage. The Relative AUDPC values of all treatments were significantly less than the non-treated control and were significantly different among some of the treatments. With few exceptions, the treatments with two applications provided better control of stripe rust than the treatments with one application, and the treatment of one early application at jointing stage resulted in better control than those of one late application at boot stage. All treatments significantly increased test weight compared to the non-treated control. All treatments significantly increased grain yield. Among all treatment, Alto 4 fl oz/A (jointing-15 Jun) followed by Quilt 14.0 fl oz/A (boot-25 Jun) had the highest yield, which was 22.5 bu/A (55.4%) more than the non-treated control, whereas ProSaro 5.0 fl oz/A (boot-25 Jun) produced the lowest yield, which was 6 bu/A (14.8%) more than the non-treated control.

Treatment and rate/A ^z	Days after first application ^y	Stripe rust severity (%) ^x				Relative AUDPC ^w	Test weight ^v (lb/bu)	Yield ^v Mean (bu/A)
		15 Jun Jointing	27 Jun Boot	5 Jul Flower.	23 Jul Dough			
Non-treated control	Not applicable	1.8 a ^u	21.3 a	87.5 a	100.0 a	100.0 a	57.8 i	40.6 l
Tilt 3.60E 4 fl oz	0							
Quilt 1.66SE 14.0 fl oz.....	10	1.8 a	5.0 g	5.0 h	5.0 j	8.0 jk	59.3 a-d	57.2 a-f
Tilt 3.60E 4 fl oz	0							
Quilt Xcel 1.66SE 14.0 fl oz...	10	1.8 a	5.0 g	5.0 h	5.0 j	8.0 jk	59.1 a-e	59.1 a-c
Quilt 1.66SE 14.0 fl oz	0							
Quilt 1.66SE 14.0 fl oz.....	10	1.5 a	5.5 g	5.5 h	7.5 h-j	9.0 jk	59.3 a-d	55.7 b-g
Quilt 1.66SE 14.0 fl oz	0							
Quilt Xcel 1.66SE 14.0 fl oz...	10	1.5 a	2.0 g	2.0 h	5.0 j	4.8 k	58.9 b-h	61.3 ab
Alto 4 fl oz	0							
Quilt 1.66SE 14.0 fl oz.....	10	1.5 a	5.0 g	5.0 h	5.0 j	8.0 jk	59.0 a-g	63.1 a
Alto 4 fl oz	0							
Quilt Xcel 1.66SE 14.0 fl oz...	10	1.3 a	5.5 g	5.5 h	6.3 ij	9.0 jk	59.1 a-f	58.4 a-d
Tilt 3.06E 4 fl oz.....	0	1.3 a	4.3 g	6.3 gh	25.0 b	16.3 hi	58.4 h	55.8 b-g
Quilt 1.66SE 7.0 fl oz.....	0	1.3 a	4.3 g	6.3 gh	25.0 b	16.8 g-i	58.6 f-h	57.7 a-e
Quilt Xcel 1.66SE 7.0 fl oz.....	0	1.5 a	4.3 g	6.3 gh	17.5 c-f	13.8 ij	58.6 e-h	54.2 c-i
Stratego YLD 4.0 fl oz.....	10	1.8 a	16.3 b-e	17.5 b-d	22.5 bc	27.0 bc	58.8 c-h	51.4 e-j
Absolute 500SC 5.0 fl oz.....	10	1.0 a	13.8 d-f	15.0 c-e	21.3 b-d	24.8 b-e	59.0 a-f	54.1 c-i
ProSaro 421SC 5.0 fl oz.....	10	1.8 a	16.3 b-e	18.8 bc	21.3 b-d	27.8 b	59.0 a-f	46.6 g-j
ProSaro 421SC 6.5 fl oz.....	10	1.0 a	18.8 a-c	16.3 b-d	17.5 c-f	25.5 b-e	59.0 a-g	50.5 f-j
Quilt Xcel 1.66SE 14.0 fl oz.....	10	1.3 a	16.3 b-e	17.5 b-d	17.5 c-f	24.8 b-e	59.1 a-e	48.3 h-k
Twinline 210EC 9.0 fl oz.....	10	1.5 a	13.8 d-f	16.3 b-d	13.8 e-h	21.3 c-h	59.1 a-e	47.2 i-l
Twinline 210EC 6.0 fl oz	0							
Twinline 210EC 9.0 fl oz.....	10	1.0 a	11.3 f	10.0 fg	10.0 g-j	15.5 hi	58.8 c-h	57.9 a-e
Twinline 210EC 7.0 fl oz	10	1.3 a	12.5 ef	16.3 b-d	17.5 c-f	22.8 b-g	59.1 a-f	51.6 d-j
Quilt 1.66SE 14.0 fl oz.....	10	1.3 a	13.8 d-f	15.0 e-d	15.0 d-g	21.0 c-h	58.8 d-h	55.1 b-g
Quilt Xcel 2.2SE 10.5 fl oz.....	10	1.3 a	15.0 c-f	11.3 ef	11.3 f-j	18.5 f-i	59.2 a-d	53.8 c-i
X4602 45WG 2.86 oz (wtpr).....	10	1.5 a	13.8 d-f	13.8 d-f	13.8 e-g	20.5 d-h	59.1 a-e	50.6 f-j

X4602 45WG 5.0 oz (wtpr).....	10	1.0 a	15.0 c-f	13.8 d-f	12.5 f-i	19.5 f-i	59.1 a-e	52.0 d-j
X4602 45WG 6.0 oz (wtpr).....	10	2.0 a	18.8 a-c	20.0 b	12.5 f-i	24.5 b-f	59.4 a	52.9 c-i
X4602 45WG 7.0 oz (wtpr).....	10	1.5 a	13.8 d-f	15.0 c-e	13.8 e-g	20.8 d-g	59.4 ab	52.0 d-j
X4604 200EC 5.5 oz (wtpr).....	10	1.5 a	16.3 b-e	16.3 b-d	16.3 c-g	24.0 b-f	59.0 a-g	49.7 g-j
X4604 200EC 9.0 oz (wtpr).....	10	1.3 a	12.5 ef	13.8 d-f	15.0 d-g	20.3 d-g	59.0 a-g	51.8 d-j
X4604 200EC 12.0 oz (wtpr).....	10	1.8 a	15.0 c-f	17.5 b-d	17.5 c-f	24.8 b-e	59.2 a-d	50.0 g-j
X4604 200EC 13.7 oz (wtpr).....	10	1.5 a	17.5 a-d	20.0 b	16.3 c-g	26.3 b-d	59.3 a-d	53.8 c-i
Quadris 2.08SC 5.5 fl oz.....	10	1.5 a	16.3 b-e	15.0 c-e	16.3 c-g	23.3 b-f	58.8 d-g	49.1 g-j
Tilt 3.6EC 4.0 fl oz.....	10	1.8 a	12.5 ef	13.8 d-e	16.3 c-g	21.0 c-g	59.3 a-c	48.0 i-k
LSD ($P \leq 0.05$)		1.0	4.8	4.4	7.3	6.2	0.5	6.9

^z 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); Tilt 3.60E 4.0 fl oz, Quilt 1.66SE 7.0 fl oz/A, and Quilt Xcel 1.66SE 7.0 fl oz applied once in the first application (15 Jun); Quilt 1.66SE 14.0 fl oz, Quadris 2.08SC 5.5 fl oz, and Tilt 3.6EC 4.0 fl oz applied once 10 days (25 Jun) after the first application. Induce 90S 0.125% v/v was mixed with fungicide in treatments of Stratego YLD 4.0 fl oz, Absolute 500SC 5.0 fl oz, 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 10 days (25 Jun) after the first application. Coc 1.0% v/v was mixed with fungicide in the remaining treatments.

^y The first application was done on 15 Jun when wheat plants were at jointing stage.

^x Stripe rust severity was recorded as percentage of whole plot leaf area with disease.

^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 Test weight (lb/bu) and yield (lb/A) based on 3-5% kernel moisture.

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