

Control of stripe rust of winter wheat with foliar fungicides, 2009.

The study was conducted in a field with Palouse 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' winter wheat was seeded in rows spaced 14 in. apart at 60 lb/A (99% germination rate) with a drill planter on 23 Oct 08. 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 13 May 09 when wheat plants were at late tillering stage. Before the first fungicide application, the field was divided into individual plots of 5 ft (4 rows) in width and 16.8-18.0 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 treatments. The first fungicide application timing at early jointing stage was done on 22 May and the second at late jointing stage when there was no sign of rust. The third fungicide application timing at boot stage was done on 10 Jun when stripe rust of 1% severity was observed in some plots. A 601C backpack sprayer was used with a CO₂ pressurized spray boom at 18 psi having three operating 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 9 Jun, 17 Jun, 24 Jun, 1 Jul, and 14 Jul or 1 day early and 7, 14, 21, and 34 days after the third fungicide application timing, respectively. Plots were harvested on 5 Aug when kernels were naturally dry, 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.

All fungicide treatments significantly prevented rust development from 17 Jun through 1 Jul and nine of the treatments maintained rust severity levels significantly less than the non-treated control 34 days after the third fungicide application timing. Relative AUDPC values of all treatments were significantly less than the non-treated control, and were significantly different among some of the treatments. All treatments significantly increased grain test weight and yield. Yield increases ranged from 22.0% from the two-application treatment of Evito to 76.2% from Quadris.

Cultivar, treatment, rate/A, and timing of application ^x	Stripe rust severity (%) ^z					Relative AUDPC ^w	Test weight ^y (lb/bu)	Yield ^y	
	9 Jun Boot	17 Jun Headed	24 Jun Early flowering	1 Jul Late milk	14 Jul Dough			Mean (bu/A)	Increase (%)
Non-treated control ...	1.0 a ^v	40.0 a	92.5 a	100.0 a	100.0 a	100.0 a	57.5 f	53.5 f	0.0
Topguard 1.04SC 7 fl oz/A (late jointing-28 May)	0.5 abc	0.3 c	6.3 de	37.5 d	100.0 a	41.2 de	59.7 de	68.9 e	28.9
Topguard 1.04SC 10 fl oz/A (late jointing- 28 May)	0.3 bc	0.0 c	5.0 de	23.8 e	100.0 a	35.5 ef	60.0 cde	68.1 e	27.3
Topguard 1.04SC 14 fl oz/A (late jointing-28 May)	0.0 c	0.0 c	1.8 e	13.8 f	100.0 a	30.7 fg	60.8 c	85.4 bcd	59.6
Topguard 1.04SC 7 fl oz/A (boot-10 Jun)	0.8 ab	0.8 c	0.3 e	1.3 g	35.0 c	9.6 h	61.8 b	84.1 cd	57.2
Topguard 1.04SC 10 fl oz/A (boot-10 Jun).....	0.8 ab	0.8 c	0.0 e	0.5 g	18.8 d	5.2 hi	62.3 ab	84.6 cd	58.1
Topguard 1.04SC 14 fl oz/A (boot-10 Jun)	0.8 ab	0.8 c	0.0 e	0.0 g	12.5 d	3.5 i	62.5 ab	86.1 bcd	61.0
Topguard 1.04SC 7 fl oz/A (late jointing-28 May) + Topguard 1.04SC 7 fl oz/A (boot-10 Jun)	0.0 c	0.0 c	0.0 e	0.0 g	42.5 c	10.6 h	61.8 b	91.9 abc	71.8
Evito 4.00FL 2 fl oz/A + NIS (late jointing-28 May).....	0.8 ab	0.8 c	4.0 e	15.0 f	90.0 a	29.7 g	60.7 c	81.4 d	52.1
Evito 4.00FL 1 fl oz/A + NIS (early jointing-22 May) + Evito 4.00FL 2 fl oz/A + NIS (late jointing-28 May).....	0.8 ab	1.0 c	10.0 d	36.3 d	100.0 a	42.0 d	59.5 e	65.2 e	22.0

Evito 4.00FL 2 fl oz/A + Tebuconazole 3.60FL 4 fl oz/A (boot-10 Jun).....	1.0 a	3.0 c	30.0 c	67.5 c	72.5 b	53.2 c	60.5 cd	80.7 d	50.8
Evito 4.00FL 2 fl oz/A + Tebuconazole 3.60FL 5 fl oz/A (boot-10 Jun)	1.0 a	9.3 b	42.5 b	82.5 b	90.0 a	68.5 b	60.1 cde	71.9 e	34.4
Quilt 1.66SC 14 fl oz/A + COC (boot-10 Jun)...	0.0 c	0.0 c	0.0 e	0.0 g	0.0 e	0.0 i	62.7 a	93.1 ab	74.1
Quilt Xcel 2.20SC 10.5 fl oz/A + COC (boot-10 Jun).....	0.3 bc	0.3 c	0.0 e	0.0 g	0.0 e	0.1 i	62.7 a	87.6 abcd	63.8
Tilt 3.60EC 4 fl oz/A + COC (boot-10 Jun)	0.3 bc	0.3 c	0.0 e	0.0 g	0.5 e	0.2 i	62.8 a	92.7 ab	73.3
Quadris 2.08FL 6.2 fl oz/A + COC (boot-10 Jun).....	0.0 c	0.0 c	0.0 e	1.3 g	0.0 e	0.5 i	62.7 a	94.2 a	76.2
LSD ($P \leq 0.05$)	0.5	5.1	6.5	8.2	11.7	5.7	0.8	8.0	

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

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

^x Crop Oil Concentrate (COC) at 1% v/v was applied in treatments of Quilt, Quilt Xcel, Tilt, and Quadris. Non Ionic Surfactant (NIS) at 0.25% v/v was used in Evito+NIS treatments.

^w 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.

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