

Control of stripe rust of spring barley with foliar fungicides, 2009.

The study was conducted in a field with Palouse silt loam near Pullman, WA. Urea (46-0-0) was applied at 60 lb/A at the time of cultivation. Susceptible 'Morex' spring barley was seeded in rows spaced 14 in. apart at 60 lb/A (99% germination rate) with a drill planter on 30 Apr 09. 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 1 Jun 09 when barley plants were at early jointing stage. Before the first fungicide application, the field was divided into individual plots of 5 ft (4 rows) in width and 16.6-18.0 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 was done on 1 Jun when there was no sign of rust. To create adequate stripe rust, sporulating seedlings of susceptible 'Steptoe' barley that had been inoculated with a mixture of barley stripe rust races collected from the same location in 2008 and grown in a greenhouse were transplanted into the field on 5 Jun. The second fungicide application timing at late jointing was done on 10 Jun when 1% stripe rust was observed in some plots. The third fungicide application timing at boot stage was done on 27 Jun when stripe rust severity ranged from 0 to 50%. 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 26 Jun just before the third fungicide application timing and 9 Jul, 20 Jul, and 26 Jul or 12, 23, and 29 days after the third fungicide application, 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 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.

All fungicide treatments applied at the late jointing stage on 10 Jun significantly prevented rust development when recorded on 26 Jun. Twelve days after the third fungicide application timing, rust severities were significantly less than that of the non-treated control in all fungicide treated plots, and the severity differences remained significant 29 days after the third fungicide application timing for the treatments of 14 fl oz/A Topguard at late jointing stage, 5 fl oz/A Evito T, Quilt, Quilt Xcel, Tilt, and Quadris. Relative AUDPC values of all treatments were significantly less than that of the non-treated control except the treatments of 7 and 10 fl oz/A Topguard at boot stage. Of the 15 fungicide treatments, six (the two-application treatment of Topguard, the two-application treatment of Evito, Quilt, Quilt Xcel, Tilt, and Quadris) significantly increased both grain test weight and yield; and two (Topguard at 10 fl oz/A and late jointing stage and Evito at 2 fl oz/A) increased grain yield.

Cultivar, treatment, rate/A, and timing of application ^x	Stripe rust severity (%) ^z				Relative AUDPC ^w	Test weight ^y (lb/bu)	Yield ^y	
	26 Jun Early heading	9 Jul Late flowering	20 Jul Late milk	26 Jul Soft dough			Mean (lb/A)	Increase (%)
Non-treated control	30.0 a ^v	51.3 a	90.0 a	100.0 a	100.0 a	49.9 fg	3045.8 f	0.0
Topguard 1.04SC 7 fl oz/A (late jointing-10 Jun)	6.5 cd	21.3 cde	75.0 ab	100.0 a	66.3 cd	50.6 defg	3586.5 cdef	17.8
Topguard 1.04SC 10 fl oz/A (late jointing-10 Jun)	4.0 cd	17.5 def	70.0 abc	100.0 a	60.7 d	50.2 efg	3670.5 abcde	20.5
Topguard 1.04SC 14 fl oz/A (late jointing-10 Jun)	7.3 cd	13.8 efg	60.0 bcd	82.5 b	52.1 d	50.7 cdefg	3598.8 bcdef	18.2
Topguard 1.04SC 7 fl oz/A (boot-27 Jun)	30.0 a	37.5 b	77.5 ab	97.5 ab	85.7 ab	49.7 g	3396.5 def	11.5
Topguard 1.04SC 10 fl oz/A (boot-27 Jun).....	30.0 a	33.8 bc	85.0 a	100.0 a	87.1 ab	50.2 fg	3234.3 ef	6.2
Topguard 1.04SC 14 fl oz/A (boot-27 Jun)	28.8 a	32.5 bc	70.0 abc	97.5 ab	78.6 bc	50.7 bcdefg	3224.0 ef	5.9
Topguard 1.04SC 7 fl oz/A (late jointing-10 Jun) + Topguard 1.04SC 7 fl oz/A (boot-27 Jun)	13.8 bc	27.5 bcd	60.0 bcd	100.0 a	66.0 cd	51.3 abcde	3591.5 cdef	17.9
Evito 4.00FL 2 fl oz/A + NIS (late jointing-10 Jun).....	0.0 d	0.8 g	22.5 fg	97.5 ab	26.5 e	50.9 abcdef	4167.5 abc	36.8
Evito 4.00FL 1 fl oz/A + NIS (early jointing-1 Jun) + Evito 4.00FL 2 fl oz/A + NIS (late jointing-10 Jun)...	0.0 d	1.0 g	26.3 ef	95.0 ab	27.9 e	51.5 abcd	4176.5 ab	37.1
Evito 4.00FL 2 fl oz/A + Tebuconazole 3.60FL 4 fl oz/A (boot-27 Jun).....	21.3 ab	28.8 bcd	50.0 cd	95.0 ab	64.1 cd	50.7 bcdefg	3742.5 abcde	22.9

Evito 4.00FL 2 fl oz/A + Tebuconazole 3.60FL 5 fl oz/A (boot-27 Jun).....	26.3 a	30.0 bcd	47.5 de	51.3 c	58.4 d	50.6 cdefg	3527.8 def	15.8
Quilt 1.66SC 14 fl oz/A + COC (boot-27 Jun).....	28.8 a	4.3 fg	1.3 g	2.3 d	13.7 e	51.7 ab	4205.0 a	38.1
Quilt Xcel 2.20SC 10.5 fl oz/A + COC (boot-27 Jun)..	25.0 a	2.0 g	1.3 g	2.8 d	11.0 e	51.8 a	3687.3 abcde	21.1
Tilt 3.60EC 4 fl oz/A + COC (boot-27 Jun).....	22.5 ab	11.3 efg	6.5 fg	13.8 d	20.3 e	51.3 abcd	3699.3 abcde	21.5
Quadris 2.08FL 6.2 fl oz/A + COC (boot-27 Jun).....	30.0 a	4.5 fg	2.0 g	1.0 d	14.4 e	51.7 abc	3879.5 abcd	27.4
LSD ($P \leq 0.05$)	11.0	13.3	21.9	16.1	17.6	1.1	581.6	

^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.