WHEAT (*Triticum aestivum* 'Lemhi')
Stripe rust; *Puccinia striiformis* f. sp. *tritici*

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

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 'Lemhi' spring wheat 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 when wheat 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 and the second timing on 10 Jun when there was no sign of rust. The third fungicide application timing at boot stage was done on 27 Jun when stripe rust severity ranged from 1 to 5%. A 601C backpack sprayer was used with a CO_2 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, 9 Jul, 20 Jul, and 26 Jul or 1 day before and 12, 23, and 29 days after the third fungicide application timing, respectively. Plots were harvested on 10 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 significantly prevented rust development by 9 Jul compared with the non-treated control. Differences in stripe rust severity between the fungicide and non-treated control treatments remained significant 23 days after the third fungicide application timing for all treatments except the treatments of Topguard at 7 and 14 fl oz/A at late jointing stage. Relative AUDPC values of all treatments were significantly less than the non-treated control, and were significantly different among some of the treatments. The two treatments of Evito T, together with the treatments of Quilt, Quilt Xcel, Tilt, and Quadris, were in the best ranking group for controlling stripe rust. Of the 15 fungicide treatments, 9 significantly increased grain test weight. All fungicide treatments significantly increased grain yield by 25.3% from 14 fl oz/A Topguard at late jointing stage to 60.0% from Quilt Xcel.

Cultivar, treatment, rate/A, and timing of application[x]	Stripe rust severity (%)[z]					Test weight[y] (lb/bu)	Yield[y]	
	26 Jun Early heading	9 Jul Late flowering	20 Jul Late milk	26 Jul Soft dough	Relative AUDPC[w]		Mean (bu/A)	Increase (%)
Non-treated control	3.5 abc[v]	57.5 a	100.0 a	100.0 a	100.0 a	59.0 de	35.87 g	0.0
Topguard 1.04SC 7 fl oz/A (late jointing-10 Jun) ……	1.0 efg	22.5 b	95.0 abc	100.0 a	74.3 b	59.1 d	47.5 def	32.5
Topguard 1.04SC 10 fl oz/A (late jointing-10 Jun) ……	0.5 g	17.5 bc	92.5 bc	100.0 a	69.8 bc	58.4 e	45.3 ef	26.2
Topguard 1.04SC 14 fl oz/A (late jointing-10 Jun) ……	0.5 g	25.0 b	97.5 ab	100.0 a	76.9 b	59.1 d	45.0 f	25.3
Topguard 1.04SC 7 fl oz/A (boot-27 Jun) …….	2.5 bcdef	5.0 de	25.0 d	42.5 b	22.4 d	59.9 abc	47.9 cdef	33.6
Topguard 1.04SC 10 fl oz/A (boot-27 Jun)….....	2.8 bcde	2.0 e	8.8 efg	20.0 cd	9.5 e	60.1 a	52.6 abcd	46.6
Topguard 1.04SC 14 fl oz/A (boot-27 Jun) …….	3.3 abcd	3.0 e	10.3 e	16.3 cde	10.4 e	59.7 abc	51.2 abcde	42.9
Topguard 1.04SC 7 fl oz/A (late jointing-10 Jun) + Topguard 1.04SC 7 fl oz/A (boot-27 Jun) …….	1.0 efg	2.0 e	10.3 e	27.5 c	10.8 e	59.8 cd	51.0 abcdef	42.2
Evito 4.00FL 2 fl oz/A + NIS (late jointing-10 Jun)…….	0.5 g	12.5 cd	90.0 c	100.0 a	65.4 c	59.5 bcd	45.5 ef	26.9
Evito 4.00FL 1 fl oz/A + NIS (early jointing-1 Jun) + Evito 4.00FL 2 fl oz/A + NIS (late jointing-10 Jun)	0.8 fg	25.0 b	92.5 bc	95.0 a	73.9 b	59.4.cd	50.2 bcdef	40.1
Evito 4.00FL 2 fl oz/A + Tebuconazole 3.60FL 4 fl oz/A (boot-27 Jun)…….	2.0 cdefg	3.0 e	3.0 fgh	5.5 ef	5.9 e	59.8 abc	52.3 abcd	45.7
Evito 4.00FL 2 fl oz/A + Tebuconazole 3.60FL 5 fl oz/A (boot-27 Jun)…….	4.0 ab	2.8 e	3.0 fgh	3.3 f	5.1 e	60.1 ab	52.2 abcd	45.5

Quilt 1.66SC 14 fl oz/A + COC (boot-27 Jun)……...	3.3 abcd	1.0 e	1.0 h	12.5 def	4.3 e	60.2 a	56.4 ab	57.2
Quilt Xcel 2.20SC 10.5 fl oz/A + COC (boot-27 Jun)...	1.5 defg	0.5 e	2.0 gh	11.3 def	3.6 e	59.8 abc	57.0 a	59.0
Tilt 3.60EC 4 fl oz/A + COC (boot-27 Jun) ……	5.0 a	7.8 de	2.0 h	15.0 de	10.1 e	59.8 abc	53.8 abc	50.1
Quadris 2.08FL 6.2 fl oz/A + COC (boot-27 Jun)……...	2.3 bcdefg	1.3 e	10.0 ef	21.3 cd	9.6 e	60.1 a	50.4 bcdef	40.4
LSD ($P \leq 0.05$) ……...	1.8	8.7	7.1	11.3	7.4	0.6	6.2	

[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, =∑[rust severity (i) + rust severity (i+1)]/2*days. Relative AUDPC was calculat ed 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.