

Evaluation of foliar fungicides for control of stripe rust on spring wheat in 2020.

The study was conducted in a field with Palouse silt loam soil near Pullman, WA. Stripe rust susceptible 'Avocet S' spring wheat was seeded in rows spaced 14-in. apart at 60 lb/A (99% germination rate) with a drill planter on 27 Apr 20. Urea fertilizer (46-0-0) was applied at the rate of 100 lb/A at the time of planting and at the same rate on 2 Jun when plants at the early jointing stage (Feekes 4). Herbicides (Huskie, 15 fl oz/A, Axial XL, 16.4 fl oz/A, and M-90, 10.4 fl oz/A) were applied to the entire field to control weeds on 4 Jun when wheat plants were at the early jointing stage (Feekes 4). Before the first fungicide application, the field was divided into individual plots of 4.5-ft (4 rows) in width and 15.8 to 16.9-ft in length by eliminating plants between plots by spraying herbicide (Glystar, 88.7 ml/gal plus M-90 0.25% v/v). Fungicides were applied in 16 gal water/A on different dates and stages depending upon the treatment. The first fungicide application timing at the jointing stage (Feekes 5-6) was made on 18 Jun when stripe rust was just appearing (2% severity) in all plots. The second application timing at the heading stage (Feekes 10.2) was conducted on 2 Jul when stripe rust was 10% severity in unsprayed plots. A 601C backpack sprayer was used with a CO₂-pressurized spray boom at 18 psi having three operating 0.25-in. nozzles spaced 19-in. apart. A randomized complete block design was used with four replications. Disease severity (percentage of diseased foliage per whole plot) was assessed for each plot on 17 Jun, 1 Jul, 15 Jul, and 22 Jul or 1 day before and 13, 27, and 34 days after the first fungicide application timing, respectively. Plots were harvested on 25 Aug when kernels had 13 to 15% kernel moisture, 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 (rAUDPC) was calculated as percent of the non-treated check. Rust severity, rAUDPC, test weight, and yield data were subjected to analysis of variance, and means were separated by Fisher's protected LSD test.

Stripe rust from natural infection was observed as 2% severity in all plots on 17 Jun 20, one day before the first fungicide application, and reached a mean of 97.5% severity at the milk stage in the non-treated check plots by 22 Jul. The rAUDPC values of all fungicide treatments were significantly less than the non-treated check. All 15 treatments with applications at both Feekes 5-6 and Feekes 10.2 provided equally better control of stripe rust than the four treatments (Topguard EQ 7.0 fl oz/A, Lucento 5.5 fl oz/A, Quilt Xcel 14.0 fl oz/A, and Tilt 4.0 fl oz/A) with only one application at Feekes 10.2. All treatments had higher test weight than the non-treated check. All treatments produced yield higher than the non-treated check, and treatments with two applications generally produced higher yields than those with only one application at Feekes 10.2. The significant yield responses ranged from 34.4 bu/A (68.4%) by the treatment of Topguard EQ 7.0 fl oz/A at Feekes 10.2 to 51.0 bu/A (101.4%) by the treatment of Proline 5.0 fl oz/A at Feekes 5-6 followed by Proline 5.0 fl oz/A at Feekes 10.2.

Treatment, rate/A	Growth stage ^y (Feekes)	Stripe rust severity (%) ^z				Relative AUDPC ^x	Test weight ^w (lb/bu)	Yield ^w (bu/A)
		17 Jun Jointing	1 Jul Heading	15 Jul Flower.	22 Jul Milk			
Non-treated	---	2.0 a ^v	10.0 a	91.3 a	97.5 a	100.0 a	56.9 d	50.3 g
Topguard EQ 4.29SC, 7.0 fl oz	10.2	2.0 a	6.3 b	18.8 b	17.5 c	24.8 b	59.9 a-c	84.7 f
Lucento 4.17SC, 5.5 fl oz	10.2	2.0 a	5.8 bc	15.0 c	22.5 b	22.8 b	59.5 a-c	84.8 f
Quilt Xcel 2.2SE, 14.0 fl oz ^u	10.2	2.0 a	4.5 c	4.5 d	8.8 d	10.7 d	60.0 a-c	90.2 ef
Trivapro 2.2SE, 13.7 fl oz fb Trivapro 2.2SE, 13.7 fl oz	5-6 fb 10.2	2.0 a	2.0 d	2.3 d	2.3 e	5.1 e	60.4 ab	90.6 d-f
Tilt 3.6EC, 4.0 fl oz ^u	10.2	2.0 a	5.0 bc	12.5 c	12.5 d	17.8 c	59.2 c	92.0 de
Tilt 3.6EC, 4.0 fl oz ^u fb Tilt 3.6EC, 4.0 fl oz ^u	5-6 fb 10.2	2.0 a	2.0 d	2.3 d	2.3 e	5.1 e	60.1 a-c	92.2 c-e
Trivapro 2.2SE, 9.4 fl oz ^u fb Trivapro 2.2SE, 13.7 fl oz ^u	5-6 fb 10.2	2.0 a	2.0 d	2.0 d	2.0 e	4.8 e	59.3 bc	92.8 c-e
Lucento 4.17SC, 5.5 fl oz fb ⁱ Lucento 4.17SC, 5.5 fl oz	5-6 fb 10.2	2.0 a	2.0 d	2.3 d	2.3 e	5.1 e	59.6 a-c	93.3 b-e
ADA 77906 – M, 24.7 fl oz fb ADA 77906 – M, 24.7 fl oz	5-6 fb 10.2	2.0 a	2.0 d	2.0 d	2.0 e	4.8 e	60.2 a-c	93.7 b-e
Lucento 4.17SC, 5.5 fl oz fb Topguard EQ 4.29SC, 7.0 fl oz	5-6 fb 10.2	2.0 a	2.0 d	2.3 d	2.3 e	5.1 e	60.4 ab	94.0 b-e
Tilt 3.6EC, 4.0 fl oz ^u fb QUILT XCEL 2.2SE, 14.0 fl oz ^u	5-6 fb 10.2	2.0 a	2.0 d	2.0 d	2.0 e	4.8 e	60.2 a-c	95.0 a-e
Topguard EQ 4.29SC, 7.0 fl oz fb Lucento 4.17SC, 5.5 fl oz	5-6 fb 10.2	2.0 a	2.0 d	2.0 d	2.0 e	4.8 e	59.9 a-c	95.3 a-e
Alto 100SL, 4.0 fl oz ^u fb Trivapro 2.2SE, 13.7 fl oz ^u	5-6 fb 10.2	2.0 a	2.0 d	2.0 d	2.0 e	4.8 e	60.4 a	96.9 a-e
Topguard EQ 4.29SC, 7.0 fl oz fb Topguard EQ 4.29SC, 7.0 fl oz	5-6 fb 10.2	2.0 a	2.0 d	2.0 d	2.0 e	4.8 e	60.3 a-c	96.9 a-e
ADA 77901, 9.5 fl oz fb ADA 77901, 9.5 fl oz	5-6 fb 10.2	2.0 a	2.0 d	2.0 d	2.0 e	4.8 e	60.3 a-c	97.0 a-e
Quilt Xcel 2.2SE, 14.0 fl oz fb Quilt Xcel 2.2SE, 14.0 fl oz	5-6 fb 10.2	2.0 a	2.0 d	2.0 d	2.0 e	4.8 e	60.0 a-c	97.4 a-d
ADA 77906 – H, 26.6 fl oz fb ADA 77906 – H, 26.6 fl oz	5-6 fb 10.2	2.0 a	2.0 d	2.0 d	2.0 e	4.8 e	60.5 a	99.2 a-c
ADA 77906 – L, 22.8 fl oz fb ADA 77906 – L, 22.8 fl oz	5-6 fb 10.2	2.0 a	2.0 d	2.0 d	2.0 e	4.8 e	60.5 a	100.0 ab
Proline 480SC, 5.0 fl oz fb Proline 480SC, 5.0 fl oz	5-6 fb 10.2	2.0 a	2.0 d	2.0 d	2.0 e	4.8 e	60.4 ab	101.3 a
CV	---	0.0	29.2	22.1	31.1	20.4	1.3	5.4
<i>p</i> -value	---	0.0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
LSD ($P \leq 0.05$)	---	0.0	1.3	2.7	4.2	3.6	1.1	7.0

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

^y The first application at Feekes 5-6 was done on 18 Jun when wheat plants were at the jointing stage; and the second application at Feekes 10.2 was done on 2 Jul when wheat plants were at the heading stage.

^x AUDPC is area under the 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.

^w Test weight (lb/bu) and yield (bu/A) based on 13 to 15% kernel moisture.

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

^u Non-ionic surfactant (NIS) M-90 was mixed with the fungicide at 0.25% v/v.

ⁱ fb, followed by.