

WINTER WHEAT (*Triticum aestivum* “Caledonia”)

Fusarium head blight; *Fusarium graminearum*
Stagonospora leaf and glume blotch; *Stagonospora nodorum*
Wheat rust; *Puccinia triticina*

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Evaluation of foliar fungicides treatments for control of winter wheat foliar diseases at Clarksville, MI, 2007.

Seeds of Caledonia wheat, treated with Thiram, were planted (24 seeds/row ft) on 15 Oct 06 in Capac loam soil at the Michigan State University, Clarksville Research Farm, MI. Prior to planting, the field was chisel plowed and 175 lb/A of ammonium nitrate was broadcast and soil incorporated with a disk. The design was a randomized block with four replicate blocks. Each plot consisted of 20 rows, 30 ft long with 7 in. between rows. Additional nitrogen was applied on 27 Mar 06 as 175 lb of ammonium nitrate. Plots were adjacent to a trial (300 x 40 ft) that was inoculated by broadcasting *F. graminearum* colonized corn kernels (0.12 oz/sq ft) over the plot surface on 18 May. Fungicides were applied as sprays in 25 gal water/A with a CO₂-pressurized R&D back pack spray boom with a constant boom pressure of 40 psi and 15 in. between six twin tip XR11003VS nozzles with one nozzle angled forward and one angled backward. Fungicides were applied on 25 Apr (GS 4-5), 9 May (GS 8-9), 25 May (GS 10.5) or 29 May (GS 10.5.1). Plots were assessed for Fusarium head blight (FHB) on 29 Jun by determining the percentage of spikelets affected per head on 20 heads at 4 locations in each plot. Severity was calculated as the average percentage of affected spikelets per head and incidence was calculated as the percentage of heads with disease. Plots were assessed for wheat rust (percentage of flag leaf affected), Stagonospora leaf and glume blotch and green leaf area remaining on 29 Jun by determining the percentage of leaf area affected on 20 plants at 5 locations. Plots were harvested on 9 Jul with a Massey Harrison plot combine. Yield (bu/A) was determined from harvested grain adjusted to 15.0% moisture. Test weight and 1000 grain weight were measured with a Steinlite SL95 NTEP Moisture Meter and Count-A-Pak® Model 77, respectively. The concentration of deoxynivalenol (DON) in the grain was determined by the regional diagnostic laboratory for DON analysis at the University of Minnesota. Meteorological variables were measured with a Campbell weather station located at the farm. Maximum, minimum and average daily air temperature (°F) were 87.4, 45.2 and 66.8 and 0-d with maximum temperature >90°F (May); 91.0, 40.2 and 68.5 and 2-d with maximum temperature >90°F (Jun); 95.3, 44.3 and 69.3 and 5-d with maximum temperature >90°F (Jul). Maximum, minimum and average relative humidity (%) was 97.9, 23.2 and 60.7 (May); 97.7, 23.1 and 65.9 (Jun); 97.6, 25.2 and 65.6 (Jul). Maximum, minimum and average daily soil temperature (°F) were 77.8, 53.1 and 66.5 (May); 89.2, 54.6 and 74.0 (Jun); 94.5, 59.8 and 76.7 (Jul). Maximum, minimum and average soil moisture (% of field capacity) was 21.3, 16.9 and 18.6 (May); 33.1, 16.1 and 24.0 (Jun); 16.1, 11.5 and 12.8 (Jul). Precipitation was 0.90 in. (May), 1.96 in. (Jun), 1.35 in. (Jul).

Relatively dry conditions during flowering and grain development did not favor Fusarium head blight development in spite of moderately cool temperatures during and 1 wk following anthesis. Fusarium head blight developed in the trial; however, most treatments did not reduce incidence in comparison with the untreated control except Stratego applied at (GS 4-5) or at (GS 8-9), LEM 17 200EC 16.8 fl oz (GS8-9), Prosaro 421SC 6.5 fl oz + Stratego 250EC 5 fl oz + Induce 280XL 0.125%, Absolute 500SC 5 fl oz and Prosaro 421SC 6.5 fl oz + Induce 280XL 0.125% (GS 10.5.1). All treatments reduced severity and the severity index in comparison to the untreated control. Wheat rust was evident but only developed to 5.8% in the untreated control. All treatments significantly reduced the severity of wheat rust in comparison to the untreated control. Stagonospora also developed and by Feekes 11.1 the non-treated control had 12.5% of the foliage affected. All treatments with 2.7 to 3.9% Stagonospora leaf and glume blotch were significantly different from the untreated control. By harvest the grain was minimally affected by *Fusarium* resulting in zero DON levels and good yields and test weights. Based on analysis of variance, no treatments were significantly different in terms of yield, test weight, 1000 grain weight or DON levels. No phytotoxicity was observed in any of the treatments.

Treatment and rate	Incidence ^z (%)	FHB		Wheat rust ^y (%)	Stagonospora ^x (%)	Green Leaf Area
		Severity ^z (%)	Severity index ^z (%)			
LEM 17 200EC 9.6 fl oz (B) ^w	64.2a-e ^v	6.2b	4.2bcd	1.0cd	2.6b-e	41.3a
LEM 17 200EC 16.8 fl oz (B).....	50.8de	2.8b	1.4d	1.5bcd	1.6cde	43.8a
LEM 17 200EC 9.6 fl oz + YT 669 2.08SC 4 fl oz + Induce 280XL 0.125% (B).....	75.0a-d	4.8b	3.5bcd	1.7bcd	3.4b-e	36.7ab
LEM 17 200EC 9.6 fl oz + Punch 3.3EC 3 fl oz (B)...	55.0b-e	4.1b	2.3bcd	0.8d	1.8b-e	46.3a
Punch 3.3EC 4 fl oz (B).....	67.5a-e	5.0b	3.4bcd	1.6bcd	5.3bcd	25.0ab
Punch 3.3EC 3 fl oz + YT 669 2.08SC 4 fl oz + Induce 280XL 0.125% (B).....	67.5a-e	6.3b	4.4bcd	1.4bcd	3.8b-e	28.8ab
Kocide 3000 46.1DF 0.75 lb (A).....	80.0abc	8.5b	7.2bc	2.8b	3.6b-e	38.8ab
Punch 3.3EC 4 fl oz (D).....	62.5a-e	4.7b	3.1bcd	0.9d	1.8b-e	32.5ab
Quadris 2.08SC 11 fl oz (C).....	90.0a	8.3b	7.8b	1.4bcd	5.4bc	30.0ab
Tilt 4SC 4 fl oz (C).....	73.3a-d	5.4b	4.0bcd	2.2bcd	5.9b	35.0ab
Quilt 200SC 14 fl oz (C).....	62.5a-e	8.0b	5.4bcd	0.9d	1.7cde	37.9ab
Stratego 250EC 5 fl oz (A).....	52.5cde	2.5b	1.7cd	0.6d	0.9e	45.8a
Stratego 250EC 5 fl oz (B).....	44.2e	2.1b	0.9d	1.2bcd	1.2de	45.8a
Prosaro 421SC 6.5 fl oz + Stratego 250EC 5 fl oz + Induce 280XL 0.125% (D).....	47.5de	3.3b	1.7cd	0.6d	1.7cde	49.2a
Absolute 500SC 5 fl oz (D).....	51.7cde	5.0b	2.8bcd	1.7bcd	3.5b-e	33.8ab
Prosaro 421SC 6.5 fl oz + Induce 280XL 0.125% (D).....	47.5de	2.7b	1.5cd	0.8d	1.0e	40.0ab
Absolute 500SC 1.5 fl oz + Prosaro 421SC 6.5 fl oz + Induce 280XL 0.125% (D).....	61.7a-e	5.5b	3.5bcd	0.8d	1.8b-e	32.9ab
Untreated.....	83.3ab	17.5a	14.5a	5.8a	12.5a	14.2b

Treatment and rate	Yield bu/A	Test weight lb/bu	1000 grain weight (oz)	DON ^t ppm
LEM 17 200EC 9.6 fl oz (B).....	68.6	57.1	1.28	0
LEM 17 200EC 16.8 fl oz (B).....	67.5	58.2	1.29	0.1
LEM 17 200EC 9.6 fl oz + YT 669 2.08SC 4 fl oz + Induce 280XL 0.125% (B).....	67.3	57.8	1.27	0.1
LEM 17 200EC 9.6 fl oz + Punch 3.3EC 3 fl oz (B)...	70.1	57.2	1.31	0.1
Punch 3.3EC 4 fl oz (B).....	64.5	57.9	1.33	0.1
Punch 3.3EC 3 fl oz + YT 669 2.08SC 4 fl oz + Induce 280XL 0.125% (B).....	65.8	57.6	1.29	0
Kocide 3000 46.1DF 0.75 lb (A).....	71.2	58.5	1.36	0.1
Punch 3.3EC 4 fl oz (D).....	71.3	57.3	1.33	0.1
Quadris 2.08SC 11 fl oz (C).....	64.2	58.5	1.34	0.1
Tilt 4SC 4 fl oz (C).....	58.0	58.7	1.32	0.1
Quilt 200SC 14 fl oz (C).....	64.3	57.9	1.37	0.1
Stratego 250EC 5 fl oz (A).....	73.2	57.6	1.37	0.1
Stratego 250EC 5 fl oz (B).....	56.9	57.2	1.31	0
Prosaro 421SC 6.5 fl oz + Stratego 250EC 5 fl oz + Induce 280XL 0.125% (D).....	67.9	58.4	1.31	0
Absolute 500SC 5 fl oz (D).....	61.4	58.1	1.35	0
Prosaro 421SC 6.5 fl oz + Induce 280XL 0.125% (D).....	70.1	58.4	1.33	0.1
Absolute 500SC 1.5 fl oz + Prosaro 421SC 6.5 fl oz + Induce 280XL 0.125% (D).....	63.9	58.2	1.34	0.1
Untreated.....	61.1	57.1	1.32	0.1
Tukey's HSD (P=0.05)	26.15	2.38	0.254	0.17

^z Mean Fusarium head blight incidence (FHB), severity and index = (FHB incidence * FHB severity)/10 on four sub-samples of 20 heads of wheat per plot on 9 Jul (267 days after planting at Feekes 11.1).

^y Wheat leaf rust caused by *Puccinia triticina*; percent severity on flag leaf on 9 Jul (267 days after planting at Feekes 11.1).

^x Stagonospora leaf and glume blotch caused by *Stagonospora nodorum* percent severity over whole plant on 9 Jul (267 days after planting at Feekes 11.1).

^w Fungicides were applied on 25 Apr (A), 9 May (B), 25 May (C) or 29 May (D) at beginning of erect growth (jointing), 50% flag leaf emergence, heads fully emerged and early-flowering growth stages corresponding to Feekes' growth stage (GS) 4 – 5, 8 – 9, 10.5 and 10.5.1, respectively.

^v Values followed by the same letter are not significantly different at P = 0.05 (Tukey Multiple Comparison).

^t DON = deoxynivalenol level (ppm) measured at University of Minnesota.