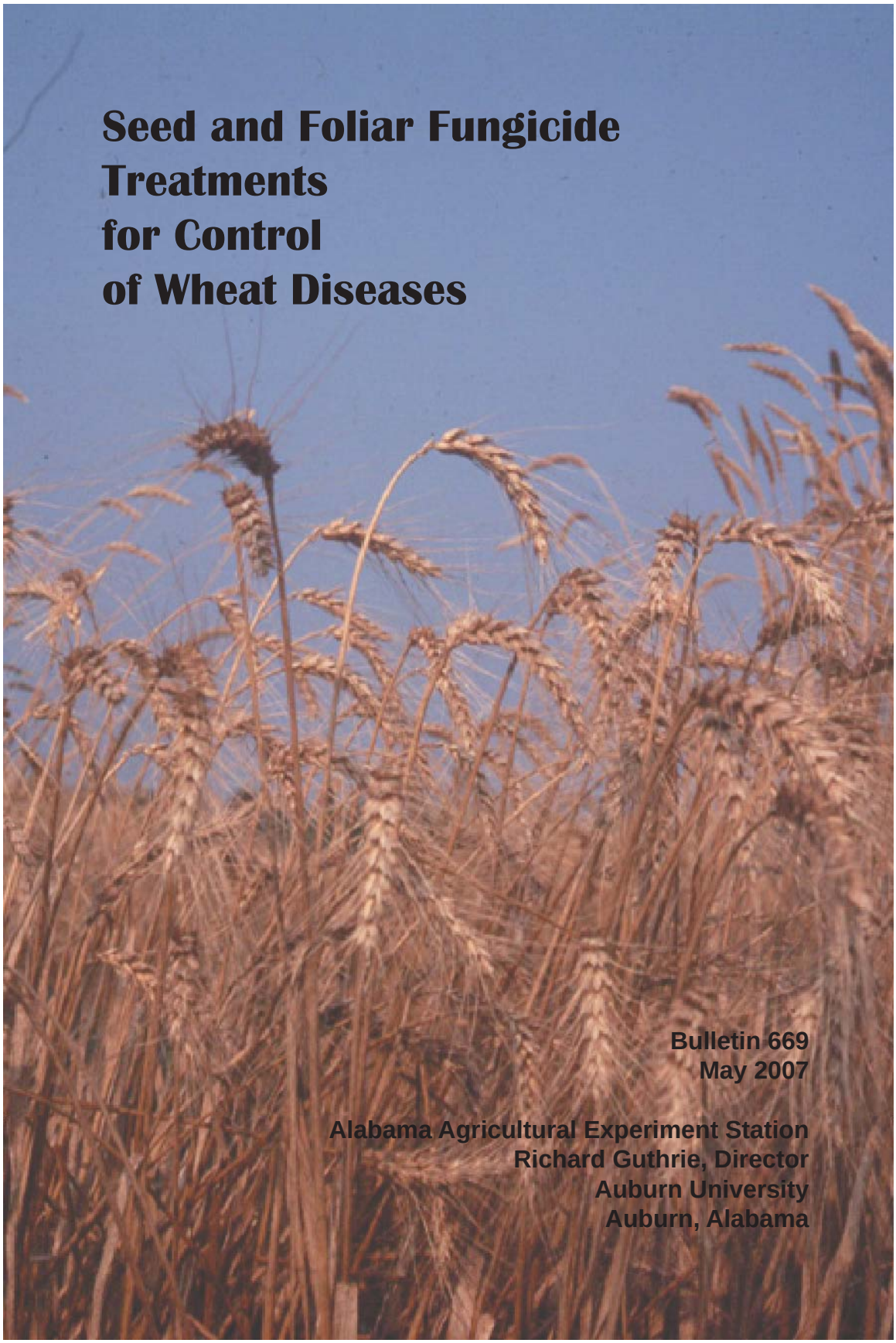
Seed and Foliar Fungicide Treatments for Control of Wheat Diseases



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INTRODUCTION

In Alabama, winter wheat is grown throughout the state. Wherever wheat is grown, foliar fungal diseases can limit grain yields. Rust diseases are particularly limiting to yield, and those that are commonly found on winter wheat in Alabama are leaf rust, caused by *Puccinia recondita* (also known as *P. triticina*), and stripe rust, caused by *P. striiformis.* Septoria leaf blotch, caused by *Septoria tritici,* is another fungal disease that frequently occurs in the state. In studies done in Arkansas, grain yield losses in winter wheat were as high as 30 percent and 60 percent due to leaf rust and Septoria leaf blotch, respectively (Milus, 1994).

Cultivar resistance has a major role in the amount of disease seen on wheat and on the level of grain loss due to disease. However, fungicides remain an option when cultivar resistance to diseases proves inadequate. This report summarizes fungicide trials on winter wheat in Alabama that have been conducted since autumn of 2003 (three growing seasons). Tests were conducted at the Tennessee Valley Research and Extension Center near Belle Mina (Limestone County), the Prattville Agricultural Research Unit (Autauga County), and the Gulf Coast Research and Extension Center near Fairhope (Baldwin County).

METHODS

The cultivars used in these tests—Pioneer 26R24 planted in 2003 and 2004 and Pioneer 26R12 planted in 2005—were used because of their availability and consistently good yields. In wheat variety trials (Glass et al. 2004), both varieties have been observed to have moderate susceptibility to leaf rust, stripe rust, and Septoria leaf blotch. Pioneer 26R24 has consistently yielded better than Pioneer 26R12.

Plots at Fairhope and Belle Mina were planted with both commercially and nontreated seed. Seed lots were treated with one of two systemic products each year: Dividend (32.8 percent difenoconazole, Syngenta), Baytan 30 (30 percent triadimenol, Bayer CropScience), or Gaucho XT (12.7 percent imidacloprid + 0.8 percent metalaxyl + 0.6 percent tebuconazole, Gustafson). Only nontreated seed was planted in plots at Prattville. Foliar fungicides were applied at all locations. Foliar applications included Headline (23.6 percent pyraclostrobin, BASF), Folicur (38.7 percent

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tebuconazole, Bayer Corp.), Stratego (11.4 percent propiconazole + 11.4 percent trifloxystrobin, Bayer Corp.), Tilt (41.8 percent propiconazole, Syngenta), Quadris (22.9 percent azoxystrobin, Syngenta), and Quilt (11.7 percent propiconazole + 7 percent azoxystrobin, Syngenta).

Generally, standard production practices were followed, with fungicides applied both as seed treatment and to foliage for evaluation. Growth stages used for fungicide application timing are referring to the Feekes' scale, and usually limited to GS 8 (flag leaf just visible), GS 9 (flag leaf fully expanded), and GS 10.5 (ear clear of leaf sheath). As much as possible, each of the seed treatments was evaluated in combination with each of the foliar-applied fungicides. Each test consisted of a randomized complete block of treatment combinations, with four replications. In tests with seed and foliar treatments, data were analyzed as a factorial; in other words, a combined effect due to an interaction of seed treatment with foliar treatment was statistically evaluated.

Diseases were rated at each location during the spring of each year and included leaf rust, stripe rust, and Septoria leaf blotch. In all cases, diseases were rated on a scale from 0 (no disease) to 10 (leaves are dead apparently due to infection). Disease ratings for leaf rust and Septoria leaf blotch were made on the flag leaf prior to the soft dough stage (GS 11.2). Yields for each plot were measured at harvest and 1,000 kernel weights were obtained. Data were subjected to analysis of variance, and differences between treatment means are distinguished using Fisher's protected least significant difference using $P \leq 0.05$.

RESULTS AND DISCUSSION

Plant hardiness zones across Alabama vary from zone 7a in the north to 8b in the south. These zones reflect the average minimum temperatures—0 to 5 degrees F for the northern counties in the state to 15 to 20 degrees F for the southernmost counties. Actual temperatures and rainfall amounts recorded for test locations during the wheat growing seasons are presented in the tables. In general, temperatures are about 10 degrees cooler in northern counties than in southern counties.

Since the wheat plant is adapted to relatively dry and cool climates, one would expect lower grain yields from trials in southern locations than from trials in northern locations. However, this was not a clear trend in every year of these trials. In 2004, yields from Prattville and Belle Mina tests were between 70 and 73 bushels per acre; while at Fairhope, yields were closer to 60 bushels per acre. A similar trend was seen in 2006, when yields at Prattville, at 95 bushels per acre, were twice the yields from Fairhope tests (37 bushels per acre). However, in 2005, yields from all three locations averaged between 40 and 45 bushels per acre.

In two years of studies in Belle Mina, located in north Alabama, leaf rust and Septoria blotch were observed at low levels. Stripe rust was noted at low levels in 2005. Seed treatment provided some reduction of leaf rust in two study sites in 2004, but did not affect Septoria in that year or other diseases in 2005. Foliar fungicides tended to reduce leaf rust in 2004 and stripe rust in 2005, but had no effect on Septoria blotch in either year. There was no apparent effect on leaf rust with fungicide use in 2005, but this was probably because there was barely any leaf rust in that year. In both

study years at Belle Mina, there were no consistent effects on yields due to either seed treatment or foliar-applied fungicides.

In the central part of the state, in Prattville, disease levels varied among years. In 2004, only Septoria leaf blotch was noted at low levels, while in 2005, this disease was noted at moderate levels in nontreated plots. Low levels of stripe rust were also observed in 2005. Unlike at Fairhope, leaf rust was noted only in nontreated plots in 2006, along with Septoria blotch at low levels. Foliar fungicides had no effect on Septoria levels in 2004, but yields were consistently improved by about 5 bushels per acre compared to nontreated plots. In 2005 and 2006, most or all of the treatments provided reductions in rust and Septoria levels. However, yield increases were only seen in 2005, and these averaged 8.7 bushels per acre over all treatments, compared to no fungicide. Thousand kernel weight was also improved by about 5 percent in 2005 with foliar fungicides.

Disease levels were highest in the southern location of these studies, and at Fairhope, foliar fungicides were consistently effective in reducing levels of leaf rust and Septoria leaf blotch by 50 percent or more. The foliar fungicide-treated plots also had higher yields—from up to 8 percent increased yield in 2004 to more than 30 percent increased yield in 2005. These yield increases were 3.2 bushels per acre (2004) to 10.8 bushels per acre (2005) greater than in plots without foliar fungicide. Tilt, Stratego, and Folicur are estimated to cost about $10 per acre. Thus, when wheat is selling for more than $3.12 per bushel, there appears to be an advantage to applying these fungicides in the southern part of Alabama.

Where comparisons were possible, foliar fungicides applied at GS 9 (flag leaf wholly visible) provided better disease control than those made at GS 8 (flag leaf beginning to emerge). This was noted in studies done at Fairhope and at Prattville. However, application timing did not appear to differentially affect yields.

At Fairhope, disease pressure was substantially greater than at other locations. Higher temperatures are known to favor leaf rust and Septoria leaf blotch, which develop most rapidly when temperatures are between 60 and 72 degrees F. Stripe rust does better at cooler temperatures (50 to 60 degrees F), and was not observed at Fairhope during the three years covered by this report. While each of these diseases needs moisture, such as rainfall or dew, in order to develop, moisture is rarely limiting during winter wheat growth in Alabama. Temperatures that favor stripe rust tend to occur throughout the wheat growing season across Alabama; however, this disease does not occur every year. This may be because the pathogen is not moving from other states into Alabama during winter wheat growth. Temperatures that favor leaf rust and Septoria might occur as early as February in central Alabama and would prevail in March and April around Montgomery and north.

TENNESSEE VALLEY REC, BELLE MINA, ALABAMA, 2003–2005 TESTS

Cultural Practices and Weather Observations

All tests were planted with conventional tillage with a seeding rate of 90 pounds per acre, following a fallow summer period. Each plot was planted with 14

7-inch rows in a Decatur silt loam soil. Postplant fertilizer was applied by hand at the prejoint stage. Each test consisted of a randomized complete block of foliar treatments, each with one of two commercially applied seed treatments or nontreated seed and was replicated four times. There was no irrigation. Insecticides were applied to control cereal leaf beetles. No test was planted for 2006. Details on agronomic practices and weather information are presented in Tables 1 and 2.

TABLE 1. CULTURAL PRACTICES, TVREC

	2004	2005
Cultural information		
Wheat variety	Pioneer 26R24	Pioneer 26R24
Planting date	10/22/2003	11/18/2004
Soil analysis	P - high	P - high
	K - high	K - high
pH	6.0	6.0
Organic matter	< 1%	< 1%
Preplant	20 lb/A N (34-0-0)	100 lb/A (0-46-0, 0-0-60)
	11/12/03	11/8/04
		20 lb/A (34-0-0), 11/8/04
Postplant	60 lb/A N (34-0-0), 2/23/04	70 lb/A N - 2/18/05
Plot size	treated 10 X 15 ft	treated 10 X 20 ft
	harvested 5 X 15 ft	harvested 5 X 20 ft
Insecticide application	Tracer (3 oz/a) 4/30/04, 5/7/04	Tracer (3 oz/a), 5/6/05
Application of experimental products		
Feekes' stage 8	4/1/04	4/6/05
Feekes' stage 9	4/7/04	4/15/05
Feekes' stage 10.5	4/19/04	
Harvest date	7/9/04	6/22/05

TABLE 2. WEATHER OBSERVATIONS, TVREC, BELLE MINA, LIMESTONE COUNTY

	2003–2004			2004–2005		
	Total rainfall	Average daily temperature (F)		Total rainfall	Average daily temperature (F)	
	in	min	max	in	min	max
December	3.3	28.9	52.5	9.03	29.5	53.5
January	3.2	28.1	51.3	3.77	35.1	56.7
February	7.4	31.7	50.7	4.69	35.7	57.6
March	5.4	42.4	69.4	3.60	37.6	61.3
April	4.4	46.6	71.8	5.39	46.3	73.2

Tennessee Valley, Details and Data on 2003–2004 Tests

Two separate plot areas were used for tests in the 2003-2004 growing season. In both areas, nontreated seed was planted for comparisons to Dividend- and Baytan-treated seed. Foliar-applied fungicides differed between the plot areas (see Tables 3 and 4).

In both plot areas, the diseases leaf rust and Septoria blotch were observed at low severity. Effects of seed-applied fungicides on disease or yield were not influenced by the effects of foliar-applied fungicide on the levels of disease or yield. Results for each plot area follow.

Test 1. Stand counts in plots planted with seed treated with Baytan 30 were significantly lower than in plots planted to seed treated with Dividend Extreme or with nontreated seed (Table 3). Even though disease intensity was low, leaf rust was decreased with either seed treatment; Septoria blotch levels were not affected by seed treatment. Although not statistically different, yields were lowest from those plots planted to Baytan-treated seed.

Most foliar treatments reduced disease, especially as observed on the later rating date (Table 3). Stratego applied at 10 fluid ounces at GS 8 reduced leaf rust more than when applied at 8 fluid ounces at GS 9. Although not a statistically significant effect, most foliar fungicides improved yield. The exception was with the lower rate of Stratego applied at GS 9. Kernel weight tended to be improved with any fungicide application.

TABLE 3. TEST 1, SEED AND FOLIAR TREATMENTS AND THEIR EFFECT ON WHEAT DISEASES, TVREC, 2003–2004

	Stand counts[1]	Leaf rust[2] (5/14/04)	Septoria leaf blotch[2] (5/6/04)	(5/14/04)	Bushels per acre	1000 kernel wt (oz)
Seed treatment (formulation/A)						
Nontreated	37.1	0.26	0.20	0.63	73.3	1.21
Dividend Extreme 0.96 FS (15)	35.6	0.12	0.23	0.65	72.3	1.22
Baytan 30 (62)	27.6	0.14	0.23	0.58	69.5	1.22
LSD (p=0.05)	***2.6***	***0.11***	***0.09***	***0.13***	***3.8***	***0.02***
	Applic stage [3]	Leaf rust[2] (5/14/04)	Septoria leaf blotch[2] (5/6/04)	(5/14/04)	Bushels per acre	1000 kernel wt (oz)
Foliar treatment (formulation/A)						
Nontreated control		0.22	0.23	0.73	71.8	1.11
Stratego 250EC (10 fl oz)	8	0.11	0.30	0.58	72.6	1.22
Stratego 250EC (8 fl oz)	9	0.13	0.21	0.55	68.8	1.22
Tilt 3.6 EC (4 fl oz)	9	0.19	0.21	0.60	72.4	1.21
Quadris 2.08 (6.5 fl oz)	9	0.21	0.16	0.66	73.0	1.22
LSD (p=0.05)		***0.15***	***0.11***	***0.17***	***5.0***	***0.02***

[1]Plants per 3 feet of row.

[2] Rating based on a 0-10 scale: 0 = no disease, 10 = severe disease.

[3]Application stages: Feekes' stage 8 = appearance of flag leaf; stage 9 = flag leaf fully expanded.

Test 2. As with Test 1, stand counts in plots planted with seed treated with Baytan 30 were significantly lower than in plots planted to seed treated with Dividend Extreme or with nontreated seed (Table 4). Even though disease intensity was low, leaf rust was decreased with either seed treatment. In this test, unlike Test 1, Septoria blotch levels were lower with seed treatment. Yields were also lower with seed treatment than from plots planted to nontreated seed.

The foliar fungicides tested on this area did not consistently provide reduction in either leaf rust or Septoria blotch (Table 4). However, yield quantity tended to be greater with foliar fungicide treatment, compared to the nontreated control.

TABLE 4. TEST 2, SEED AND FOLIAR TREATMENTS AND THEIR EFFECT ON WHEAT DISEASES, TVREC, 2003–2004

	Stand counts[1]	Leaf rust[2] (5/14/04)	Septoria leaf blotch[2] (5/6/04)	(5/14/04)	Bushels per acre	1000 kernel wt (oz)
Seed treatment (formulation/A)						
Nontreated	33.6	0.12	0.15	0.45	73.6	1.23
Dividend Extreme 0.96 FS (15)	34.0	0.07	0.12	0.00	69.8	1.24
Baytan 30 (62)	25.7	0.05	0.13	0.33	69.0	1.23
LSD (P=0.05)	***2.3***	***0.06***	***0.07***	***0.10***	***2.9***	***0.01***
	Applic stage [3]	Leaf rust[2] (5/14/04)	Septoria leaf blotch[2] (5/6/04)	(5/14/04)	Bushels per acre	1000 kernel wt (oz)
Foliar treatment (formulation/A)						
Nontreated control		0.03	0.16	0.39	68.3	1.23
Tilt 3.6 EC (4 fl oz)	8	0.11	0.18	0.33	72.3	1.24
Quadris 2.08 (6.5 fl oz)	8	0.26	0.19	0.37	69.2	1.24
Headline (9 fl oz)	9	0.03	0.09	0.32	70.6	1.23
Quilt (10.5 fl oz)	9	0.06	0.11	0.29	70.8	1.23
Quilt (14 fl oz)	9	0.06	0.12	0.39	73.8	1.23
Tilt 3.6 EC (4 fl oz) + Quadris 2.08 (6.5 fl oz)	10.5	0.03	0.07	0.15	70.5	1.24
LSD (P=0.05)		***0.09***	***0.10***	***0.16***	***4.4***	***0.02***

[1]Plants per 3 feet of row.
[2] Rating based on a 0-10 scale: 0 = no disease, 10 = severe disease.
[3]Application stages: Feekes' stage 8 = appearance of flag leaf; stage 9 = flag leaf fully expanded; stage 10.5 = ear clear of leaf sheath.

Tennessee Valley, Details and Data on 2004–2005 Tests

Onset of leaf rust and Septoria leaf blotch was later and intensity of these diseases was lower than seen in 2004. However, stripe rust was observed on wheat in 2005, and this disease is not seen annually (Table 5). Effects of seed-applied fungicides on disease or yield were not influenced by the effects of foliar-applied fungicide on the levels of disease or yield.

No differences in stand counts, levels of diseases, yield quantity, or seed weight due to kernel treatment were observed in this test (Table 5). Foliar fungicides, however, did reduce levels of both leaf and stripe rust and tended to increase kernel weight. Septoria blotch levels and yield quantity were not affected by the foliar fungicide evaluated in this test.

TABLE 5. SEED AND FOLIAR TREATMENTS AND THEIR EFFECT ON WHEAT DISEASES, TVREC, 2004–2005

	Stand counts[1]	Leaf rust[2]	Stripe rust[2]	Septoria leaf blotch[2]	Bushels per acre	1000 kernel wt (oz)
Seed treatment (g ai/100 kg))						
Nontreated	19.2	0.01	0.60	0.37	44.1	1.30
Dividend Extreme (15)	19.7	0.00	0.53	0.38	44.6	1.28
Gaucho XT (31)	19.8	0.01	0.60	0.37	45.1	1.29
LSD (P=0.05)	***2.2***	***0.02***	***0.25***	***0.13***	***2.1***	***0.05***
	Applic stage[3]	Leaf rust[2]	Stripe rust[2]	Septoria leaf blotch[2]	Bushels per acre	1000 kernel wt (oz)
Foliar treatment (formulation/A)						
Nontreated control		0.03	1.37	0.31	44.4	1.27
Stratego 250EC (10 fl oz)	8	0.00	1.25	0.33	43.9	1.29
Quilt (14 fl oz)	8	0.01	0.86	0.48	44.5	1.30
Folicur 3.6F(4 fl oz)[4]	9	0.01	0.08	0.42	44.0	1.28
Absolute (5 fl oz)	9	0.00	0.13	0.43	45.4	1.29
Quilt (11 fl oz)	9	0.02	0.41	0.26	45.9	1.31
Quilt (14 fl oz)	9	0.01	0.25	0.38	44.8	1.29
Tilt 3.6EC (4 fl oz)	9	0.00	0.25	0.39	44.0	1.29
LSD (P=0.05)		***0.03***	***0.40***	***0.21***	***2.1***	***0.05***

[1]Plants per 3 feet of row.
[2] Rating based on a 0-10 scale: 0 = no disease, 10 = severe disease. Ratings taken on 5/18/05.
[3]Application stages: Feekes' stage 8 = appearance of flag leaf; stage 9 = flag leaf fully expanded.
[4]Plus Induce-F surfactant (0.06% v/v).

PRATTVILLE ARU, PRATTVILLE, ALABAMA, 2003–2006 TESTS

Cultural Practices and Weather Observations

All tests were planted with conventional tillage with a seeding rate of 90 pounds per acre, following a fallow summer period. Each plot was planted with seven 7-inch rows in fine sandy loam. Postplant fertility was applied with a Gandy spreader at the prejoint stage. Each test consisted of a randomized complete block of foliar treatments on nontreated seed and was replicated four times. There was no irrigation, and no other pesticides were applied other than those listed. Details are presented in Tables 6 and 7.

Table 6. Cultural Practices, PARU, Autauga county

	2004	2005	2006
Cultural information			
Wheat variety	Pioneer 26R24	Pioneer 26R24	Pioneer 26R12
Planting date	11/12/2003	12/16/2004	11/30/2005
Soil analysis	P - medium	P - medium	P – medium
	K – high	K – high	K – high
pH	6.0	6.0	6.0
Organic matter	< 1%	< 1%	< 1%
Preplant	20 lb/A N- 11/14/03	20 lb/A N- 12/16/04	20 lb/A N- 11/30/05
Postplant	60 lb/A N – 3/1/04	60 lb/A N – 3/1/05	60 lb/A N – 2/15/06
Plot size	treated 5 X 19 ft	treated 5 X 15 ft	treated 5 X 15 ft
	harvested 5 ft X 19 ft	harvested 5 ft X 15 ft	harvested 5 ft X 15 ft
Application of experimental products			
Feekes' stage 8	3/26/04	4/16/05	4/3/06
Feekes' stage 9		4/19/05	4/6/06
Feekes' stage 10.5	4/7/04	5/4/05	4/10/06
Harvest date	6/22/04	6/21/05	6/6/06

Table 7. Weather Observations, PARU, Autauga County

	——2003–2004——			——2003–2004——			——2004–2005——		
	Total rainfall	Average daily temperature (F)		Total rainfall	Average daily temperature (F)		Total rainfall	Average daily temperature (F)	
	in	min	max	in	min	max	in	min	max
December	3.21	32.8	56.8	3.19	33.3	56.8	2.50	31.6	56.6
January	2.21	33.3	56.1	3.18	38.0	60.9	4.37	40.0	63.5
February	4.78	36.3	54.7	5.56	41.4	61.6	4.48	34.1	57.6
March	1.23	46.5	73.7	7.17	42.5	64.8	4.96	43.9	69.1
April	3.14	49.1	75.6	7.49	50.5	73.9	1.95	55.7	81.4

Prattville, Details and Data on 2003–2004 Tests

In this test, only foliar-applied fungicides were evaluated, and each of three products was applied at GS 8, GS 10.5, or as a split (half rate) application at GS 8 and GS 10.5. Overall, disease pressure was very low and Septoria leaf blotch was the only disease observed (Table 8). There were no significant reductions in Septoria leaf blotch by foliar fungicides. While yield was improved with all tested products, applications of Tilt and Quadris significantly increased yield over the nontreated control. There were no significant differences among disease ratings due to application times, but fungicide timings that included a GS 8 application had the highest yields.

TABLE 8. FOLIAR TREATMENTS AND THEIR EFFECT ON WHEAT DISEASES, PARU, 2003–2004

	—Septoria leaf blotch[1]— (4/20/04)	(5/2/04)	Bushels per acre	1000 kernel wt (oz)
Foliar treatment (formulation/A)				
Nontreated control	0.4	0.5	70.6	1.3
Tilt 3.6 EC (4 fl oz)	0.4	0.6	75.5	1.3
Premix Quilt (6 oz)	0.3	0.5	75.1	1.3
Stratego 250EC (10 fl oz)	0.3	0.4	73.6	1.3
FLSD (p=0.05)	***0.2***	***0.2***	***3.2***	***0.0***
Application[2]				
Nontreated control	0.4	0.5	70.6	1.3
Feekes' Stage 8	0.4	0.5	75.1	1.3
Feekes' Stage 10.5	0.5	0.5	73.2	1.3
Feekes' Stage 8+10.5	0.3	0.5	75.8	1.3
LSD (P = 0.05)	***0.2***	***0.2***	***3.2***	***0.03***

[1] Rating based on a 0-10 scale: 0 = no disease, 10 = severe disease. [2] Application stages: Feekes' stage 8 = appearance of flag leaf; stage 10.5 = ear clear of leaf

Prattville, Details and Data on 2004–2005 Tests

Onset of Septoria leaf blotch was earlier and incidence was higher than in 2004; no leaf rust was observed (Table 9). Stripe rust was observed at Prattville in 2005, and this disease is not seen annually. Stripe rust and Septoria blotch were both reduced by most of the foliar products compared to the nontreated control, but these reductions were not consistently statistically significant. Eight of the ten treatments significantly improved grain yield. While grain weight tended to be improved by all foliar applications, seven treatments significantly increased kernel weight.

TABLE 9. FOLIAR TREATMENTS AND THEIR EFFECT ON WHEAT DISEASES, PARU, 2004–2005

	Applic stage[1]	Stripe rust[2]	Septoria leaf blotch[2]	Bushels per acre	1000 kernel wt (oz)
Foliar treatment (formulation/A)					
Nontreated control		0.43	1.80	49.9	1.09
Tilt 3.6EC (4 fl oz)	8	0.08	1.20	58.3	1.13
Stratego 250EC (10 fl oz)	8	0.13	1.10	58.3	1.13
Stratego 250EC (8 fl oz)	9	0.28	1.50	59.1	1.13
Folicur 3.6F(4 fl oz)[3]	9	0.23	1.30	54.3	1.11
Headline (9 fl oz)[3]	9	0.48	1.43	60.4	1.13
Absolute (5 fl oz)	9	0.00	1.31	52.6	1.13
Quilt (11 fl oz)	9	0.20	1.50	59.1	1.14
Quilt (14 fl oz)	9	0.03	1.84	61.0	1.16
Tilt 3.6 EC (4 fl oz) / Quadris 2.08 (6 fl oz)[4]	8/10.5	0.63	1.25	64.0	1.16
LSD (P = 0.05)		***0.51***	***0.52***	***8.2***	***0.04***

[1]Application stages: Feekes' stage 8 = appearance of flag leaf; stage 9 = Flag leaf fully expanded; stage 10.5 = ear clear of leaf sheath. [2]Rating based on a 0-10 scale: 0 = no disease, 10 = severe disease. Ratings taken on 5/17/05. [3]Plus Induce –F surfactant (0.06% v/v). [4]Plus Crop Oil (1% v/v).

Prattville, Details and Data on 2005–2006 Tests

Onset of Septoria leaf blotch was later and incidence was lower than in 2005 (Table 10). Leaf rust, which had been observed at very low levels in the 2004–2005 season, was observed at slightly greater levels in 2006.

This test evaluated several fungicidal products applied once at GS 9 or as split applications, each at half rate, made at GS 8 and GS 10.5. All products, applied according to either strategy, reduced leaf rust intensity compared to the nontreated control plots. This trend was seen also with Septoria blotch; however, disease reduction was not statistically significant. There were no substantial differences in Septoria blotch levels when fungicides were applied once or in a split application; however, yield quantity tended to be slightly higher with single rather than split fungicide applications.

TABLE 10. FOLIAR TREATMENTS AND THEIR EFFECT ON WHEAT DISEASES, PARU, 2005–2006

	Applic stage[1]	Leaf rust[2] (4/26/06)	(5/2/06)	Septoria leaf blotch[2] (4/26/06)	(5/2/06)	Bushels per acre	1000 kernel wt (oz)
Foliar treatment (formulation/A)							
Nontreated control		0.50	1.26	0.23	0.67	100.7	1.21
Tilt 3.6EC (4 fl oz)	9	0.00	0.00	0.20	0.43	93.6	1.16
Absolute (5 fl oz)	9	0.00	0.00	0.13	0.50	95.5	1.20
Stratego 250EC (8 fl oz)	9	0.00	0.00	0.10	0.35	93.6	1.17
Quilt (11 fl oz)	9	0.00	0.00	0.08	0.54	98.8	1.22
Headline (9 fl oz)	9	0.00	0.00	0.15	0.18	100.5	1.20
Stratego 250EC (4 fl oz) / Stratego 250EC (4 fl oz)	8 / 10.5	0.00	0.00	0.10	0.58	94.0	1.23
Quilt (5.5 fl oz) / Quilt (5.5 fl oz)	8 / 10.5	0.00	0.00	0.15	0.30	90.7	1.19
Headline (4.5 fl oz) / Headline (4.5 fl oz)	8 / 10.5	0.00	0.00	0.28	0.25	93.0	1.18
Tilt 3.6 EC (4 fl oz) / Quadris 2.08 (6 fl oz)	8 / 10.5	0.00	0.00	0.13	0.40	88.6	1.19
LSD (P = 0.05)		***0.22***	***0.06***	***0.20***	***0.32***	***8.0***	***0.05***

[1] Application stages: Feekes' stage 8 = appearance of flag leaf; stage 9 = flag leaf fully expanded; stage 10.5 = ear clear of leaf sheath. [2] Rating based on a 0-10 scale: 0 = no disease, 10 = severe disease.

GULF COAST REC, FAIRHOPE, ALABAMA, 2003–2006 TESTS

Cultural Practices and Weather Observations

All tests were planted with conventional tillage with a seeding rate of 90 pounds per acre, following a fallow summer period. Each plot was planted with 14 7-inch rows in fine sandy loam. Postplant fertilizer was applied with a Gandy spreader at the prejoint stage. There was no irrigation and no other pesticides were applied other than those listed. Additional details are presented in Tables 11 and 12.

Table 11. Cultural Practices, GCREC

	2004	2005	2006
Cultural information			
Wheat variety	Pioneer 26R24	Pioneer 26R24	Pioneer 26R12
Planting date	11/10/2003	11/18/2004	11/14/2005
Soil analysis	P - medium K - medium	P – medium K – medium	P – medium K – medium
pH	5.9	5.9	5.9
Organic matter	< 1%	< 1%	< 1%
Preplant	198 lb/A -10-20-20 + 10 lb/A Sulfur (20-40-40-10S) 9/30/03	187 lb/A -11-21-21 + 10 lb/A Sulfur (20-40-40-10S) 10/06/04	276 lb/A -7-21-21 + 10 lb/A Sulfur (20-40-40-10S), 9/9/05
Postplant	180 #/a Ammonium Nitrate (60-0-0), 2/20/04	210 #/a Ammonium Nitrate (70-0-0), 2/15/05	235 #/a Ammonium Nitrate (80-0-0), 2/17/06
Plot size	treated 5 X 11 ft harvested 5 ft X 11 ft	treated 5 X 15 ft harvested 5 ft X 11 ft	treated 10 X 15 ft harvested 5 ft X 11 ft
Application of experimental products			
Feekes' stage 8	3/17/04	3/29/05	3/27/06
Feekes' stage 9	3/23/04	4/5/05	4/10/06
Feekes' stage 10.5	3/29/04		
Harvest date	5/19/04	6/3/05	5/22/06

Table 12. Weather Observations, GCREC, Farihope, Baldwin County

	——2003–2004——			——2003–2004——			——2004–2005——		
	Total rainfall	Average daily temperature (F)		Total rainfall	Average daily temperature (F)		Total rainfall	Average daily temperature (F)	
	in	min	max	in	min	max	in	min	max
December	4.13	37.6	61.5	5.58	39.4	61.2	3.90	38.7	61.6
January	5.75	39.8	61.5	2.08	44.6	66.0	2.62	45.4	67.7
February	8.12	41.3	59.3	5.60	47.2	66.1	4.22	41.4	64.4
March	0.68	51.4	75.1	4.28	48.7	69.4	0.39	49.6	73.7
April	2.32	52.6	78.0	20.50	53.9	76.0	6.09	58.7	81.8

Gulf Coast, Details and Data on 2003–2004 Tests

Two separate plot areas were used for tests in the 2003-2004 growing season. In both areas, nontreated seed was planted for comparisons to Dividend- and Baytan-treated seed. Foliar-applied fungicides differed between the plot areas (see following tables).

In both plot areas, the diseases leaf rust and Septoria blotch were observed at low severity. Effects of seed-applied fungicides on disease or yield were not influenced by the effects of foliar-applied fungicide on the levels of disease or yield. Results for each plot area follow.

Test 1. Stand counts were lower in plots planted to Baytan-treated seed than in those planted to nontreated or Dividend-treated seed (Table 13). No other significant

effects on disease or yield were observed with fungicidal seed treatment. Leaf rust severity was significantly reduced, and grain yields and quality were improved, with each of the foliar fungicides compared to the nontreated control. Stratego application at Feekes' stage 9 (flag leaf complete) provided better control of leaf rust than when applied at GS 8, but there was no difference in the levels of Septoria blotch relative to application timing.

TABLE 13. TEST 1, SEED AND FOLIAR TREATMENTS AND THEIR EFFECT ON WHEAT DISEASES, GCREC, 2003–2004

	Stand counts[1]	Leaf rust[2]	Septoria leaf blotch[2]	Bushels per acre	1000 kernel wt (oz)
Seed treatment (fl oz/lb seed)					
Nontreated	24.7	1.0	0.7	59.0	1.1
Dividend Extreme .96 (2)	26.2	0.7	0.6	62.2	1.2
Baytan 30 (3)	21.2	1.0	0.7	61.5	1.2
FLSD (P=0.05)	***1.5***	***0.4***	***0.2***	***2.6***	***0***
	Applic stage[3]	Leaf rust[2]	Septoria leaf blotch[2]	Bushels per acre	1000 kernel wt (oz)
Foliar treatment (fl oz/A)					
Nontreated control		2.6	0.9	56.8	1.1
Stratego 250EC 10 fl oz	8	1.0	0.5	61.2	1.2
Stratego 250EC 10 fl oz	9	0.1	0.6	64.3	1.2
Tilt 3.6EC 4 fl oz	9	0.2	0.7	61.1	1.2
Quadris 2.08 6.5 fl oz	9	0.5	0.7	61.1	1.2
FLSD (P=0.05)		***0.5***	***0.2***	***3.4***	***0***

[1] Plants per 3 feet of row.
[2] Rating based on a 0-10 scale: 0 = no disease, 10 = severe disease. Ratings taken on 4/18/04.
[3] Application stages: Feekes' stage 8 = appearance of flag leaf; stage 9 = flag leaf fully expanded.

Test 2. As with Test 1, stand counts were higher in plots planted to nontreated and Dividend-treated seed compared to Baytan-treated seed (Table 14). Leaf rust tended to be reduced with seed treatments compared to nontreated seed, but this was not a statistically significant disease reduction. No differences were observed on Septoria blotch or yield due to fungicidal seed treatment. Each of the foliar fungicides reduced leaf rust and Septoria blotch compared to no foliar fungicide treatment. Tilt applied at GS 8 was less effective than all other fungicides evaluated. As with Test 1, lower leaf rust and Septoria blotch levels were observed when fungicides were applied at GS 9 rather than GS 8; however, the products applied at GS 9 did differ from products applied at GS 8. Grain yields were better with any of the foliar fungicides compared to no fungicides, but there were no statistically significant differences.

TABLE 14. TEST 2, SEED AND FOLIAR TREATMENTS AND THEIR EFFECT ON WHEAT DISEASES, GCREC, 2003–2004

	Stand counts[1]	Leaf rust[2]	Septoria leaf blotch[2]	Bushels per acre	1000 kernel wt (oz)
Seed treatment (fl oz/100 lb seed)					
Nontreated	28.8	1.4	1.0	58.5	1.1
Dividend Extreme (2)	28.9	1.2	1.0	56.4	1.1
Baytan 30 (3.4)	23.2	1.1	1.0	59.2	1.1
FLSD (p=0.05)	***1.5***	***0.4***	***0.5***	***3.7***	***0.04***
	Applic stage[3]	Leaf rust[2]	Septoria leaf blotch[2]	Bushels per acre	1000 kernel wt (oz)
Foliar treatment (formulation/A)					
Nontreated control		4.4	2.8	55.3	1.1
Tilt 3.6 EC (4 fl oz)	8	2.2	1.5	60.1	1.1
Quadris 2.08 (6.5 fl oz)	8	1.1	0.8	56.7	1.2
Tilt 3.6 EC (4 fl oz) / Quadris 2.08 (6.2 fl oz)	8 / 10.5	0.6	0.6	59.4	1.2
Premix Quilt (10.5 oz)	9	0.2	0.5	58.7	1.2
Premix Quilt (14 oz)	9	0.1	0.4	56.3	1.2
Headline (9 fl oz)	9	0.3	0.5	59.8	1.1
FLSD (p=0.05)		***0.6***	***0.7***	***5.7***	***0.05***

[1]Plants per 3 feet of row.

[2] Rating based on a 0-10 scale: 0 = no disease, 10 = severe disease. Rating taken on 4/18/04.

[3]Application stages: Feekes' stage 8 = appearance of flag leaf; stage 9 = flag leaf fully expanded; stage 10.5 = ear clear of leaf sheath.

Gulf Coast, Details and Data on 2004–2005 Tests

Onset, or the initial observation of leaf rust was earlier, and disease incidence was higher than in 2004. Onset and incidence of Septoria leaf blotch were similar to the disease in the preceding year. Effects of seed-applied fungicides on disease or yield were not influenced by the effects of foliar-applied fungicide on the levels of disease or yield (Table 15). Generally low yields were attained in this season, probably due to the excessive rain event (20 inches) of April 1 2005.

Stand counts were improved with nontreated and Dividend-treated seed compared to the Gaucho XT treatment, although this difference was not statistically significant. Seed treatments did not affect leaf rust or Septoria blotch levels, nor were yield differences noted due to these treatments.

Disease was reduced and yield was improved by each of the foliar treatments compared to the nontreated control. Tilt applied at GS 9 provided better control of leaf rust and Septoria blotch than when applied at GS 8. Best control of both diseases was achieved with applications of Absolute or Headline; Headline treatment also resulted in substantially improved yield quantity compared to all other foliar fungicide treatments.

TABLE 15. SEED AND FOLIAR TREATMENTS AND THEIR EFFECT ON WHEAT DISEASES, GCREC, 2004–2005

	Stand counts[1]	Leaf rust[2]	Septoria leaf blotch[2]	Bushels per acre	1000 kernel wt (oz)
Seed treatment (fl oz/100 lb seed)					
Nontreated	40.0	2.1	1.0	39.7	1.1
Dividend (2)	40.1	2.0	0.9	39.8	1.1
Gaucho XT (3.4)	39.6	2.2	0.9	40.5	1.2
FLSD (P=0.05)	***1.5***	***0.6***	***0.4***	***1.5***	***0.0***

	Applic stage[3]	Leaf rust[2]	Septoria leaf blotch[2]	Bushels per acre	1000 kernel wt (oz)
Foliar treatment (rate/A)					
Nontreated control		3.9	2.8	30.5	1.0
Stratego 250EC (10 fl oz)	8	3.4	1.1	40.0	1.2
Tilt 3.6EC (4 fl oz)	8	2.8	0.7	41.1	1.2
Tilt 3.6EC (4 fl oz)	9	0.9	0.5	41.1	1.2
Absolute 500 SC (5 fl oz)	9	0.3	0.6	39.9	1.2
Headline (9 fl oz)	9	0.6	0.4	44.4	1.2
Quilt (11 fl oz)	9	2.2	0.8	41.3	1.2
Quilt (14 fl oz)	9	2.7	0.7	41.3	1.2
FLSD (P=0.05)		***0.6***	***0.4***	***2.4***	***0.0***

[1]Plants per 3 feet of row.
[2] Rating based on a 0-10 scale: 0 = no disease, 10 = severe disease. Rating taken on 4/28/05.
[3]Application stages: Feekes' stage 8 = appearance of flag leaf; stage 9 = flag leaf fully expanded.

Gulf Coast, Details and Data on 2005–2006 Tests

Onset of leaf rust and Septoria leaf blotch was later and incidence was lower than observed in 2005; yields were also lower than in the preceding year. Effects of seed-applied fungicides on disease or yield were not influenced by the effects of foliar-applied fungicide on the levels of disease or yield (Table 16).

Plots with nontreated seed had the highest stand counts, although differences between treatments were not statistically significant. Leaf rust levels were reduced by both seed treatments compared to no seed treatment. Septoria blotch, yield quantity, and kernel weight were not affected by seed treatment.

This test included both single applications and two half-rate applications of Stratego, Headline, and Quilt. Septoria blotch levels were very low in all plots and none of the foliar fungicide treatments affected these levels. Leaf rust was reduced and yields were improved by each of the tested foliar-applied treatments compared to the nontreated control. In general, the two half-rate applications did not improve disease control or yields compared to single applications of the fungicides.

TABLE 16. SEED AND FOLIAR TREATMENTS AND THEIR EFFECT ON WHEAT DISEASES, GCREC, 2005–2006

	Stand counts[1]	Leaf rust[2]	Septoria leaf blotch[2]	Bushels per acre	1000 kernel wt (oz)
Seed treatment (fl oz/100 lb seed)					
Nontreated	44.4	0.7	0.1	36.1	0.9
Dividend (2)	43.0	0.0	0.1	37.9	0.9
Gaucho XT (3.4)	43.5	0.1	0.1	38.0	1.0
FLSD (P=0.05)	***1.5***	***0.1***	***0.1***	***2.3***	***0.1***
	Applic stage[3]	Leaf rust[2]	Septoria leaf blotch[2]	Bushels per acre	1000 kernel wt (oz)
Foliar treatment (rate/A)					
Nontreated control		1.5	0.1	32.8	1.0
Tilt 3.6EC (4 fl oz)	8.0	0.7	0.1	36.6	1.0
Stratego 250EC (10 fl oz)	8.0	0.4	0.1	41.0	1.0
Headline (9 fl oz)	8.0	0.8	0.2	36.4	0.9
Quilt (11 fl oz)	8.0	0.7	0.1	35.6	0.7
Stratego 250EC (4 fl oz)	8,10.5	0.5	0.1	38.4	1.0
Headline (4.5 fl oz)	8,10.5	0.7	0.1	37.9	1.0
Quilt (5.5 fl oz)	8,10.5	0.3	0.0	39.8	1.0
FLSD (P=0.05)		***0.3***	***0.1***	***3.8***	***0.2***

[1]Plants per 3 feet of row.

[2] Rating based on a 0-10 scale: 0 = no disease, 10 = severe disease. Rating taken on 4/12/06.

[3]Application stages: Feekes' stage 8 = appearance of flag leaf; stage 10.5 = ear clear of leaf sheath.

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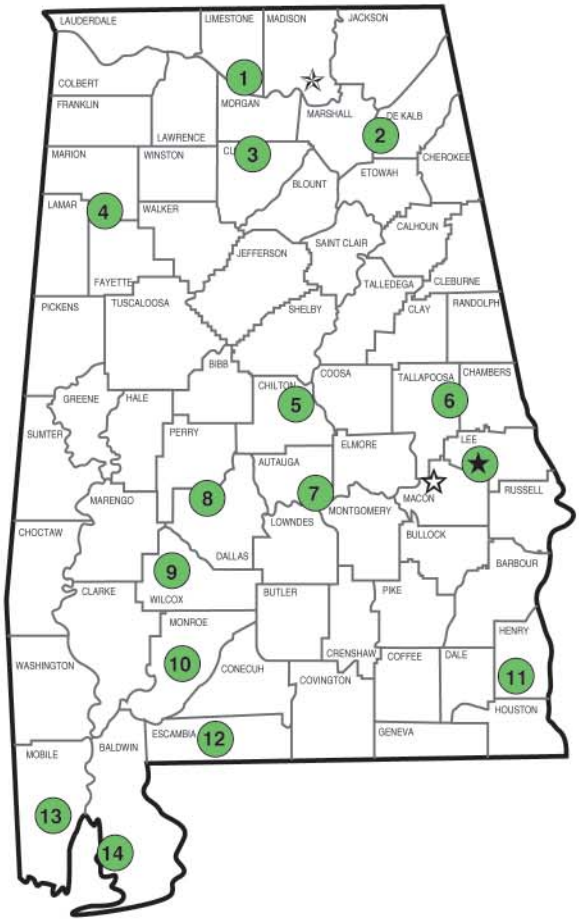

Research Unit Identification

★ Main Agricultural Experiment Station, Auburn.
⛤ Alabama A&M University.
☆ E. V. Smith Research Center, Shorter.

1. Tennessee Valley Research and Extension Center, Belle Mina.
2. Sand Mountain Research and Extension Center, Crossville.
3. North Alabama Horticulture Research Center, Cullman.
4. Upper Coastal Plain Agricultural Research Center, Winfield.
5. Chilton Research and Extension Center, Clanton.
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