

ALABAMA SOYBEAN PRODUCERS PROJECT REPORT – 2008

Title: Evaluation of Fungicides for Control of Asian Soybean Rust

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Objective: To evaluate fungicide applications and management for control of soybean rust and other foliar diseases at multiple locations in Alabama.

Results:

Several fungicide trials for the control of Asian soybean rust (ASR) were established at the Gulf Coast REC at Fairhope. Due to dry weather and the late appearance of ASR on soybeans in Alabama, only the Gulf Coast location experienced damaging levels of ASR or other fungus diseases in 2008 and alternate locations were not used.

At the Gulf Coast REC, DP 7870 RR soybeans were planted on 09 June for all ASR fungicide trials. Fungicides for all trials were applied in 18 gal/A of water using a Lee Spider high clearance sprayer with Turbodrop TDXL 10002 flat fan nozzles on 15-in. centers at 60 psi. Soybean foliar diseases were evaluated by rating disease severity at the R6 to R7 growth stage. Asian Soybean Rust leaf symptoms were initially observed in the trial in mid-September in the lower leaf canopy of untreated plots.

SSRP Trial

Fungicide treatments were applied as a foliar spray at R3 and again in 10 days for some treatments (R4-R5). Soybean foliar diseases were evaluated by rating severity of ASR and target spot in each plot regularly after rust developed. Plots were harvested on 19 November.

Rust severity was greater in the untreated control (13), Quadis (2), and Alto (6) as compared to all of the other fungicide treatments ($P \leq 0.10$). By 9 Oct, Topguard applied at R3 or R5 and Domark applied at R5 suppressed rust severity more than ($P \leq 0.10$) all other fungicide treatments. The Topguard treatment applied at R5 continued to suppress rust severity through 16 Oct. Defoliation ranged from 36.8 to 97.5% with the eight fungicide treatments reducing leaf senescence ($P \leq 0.10$) as compared to the control. Yields were affected by prolonged wet soil conditions during pod-fill, as well as green stems interfering with timely and efficient harvesting. Six fungicide treatments increased yields over the untreated control. Topguard (11), Domark (12) and Stratego (14) all applied at R3+10 and Domark (3), Folicur (7) and Stratego + Proline (8) applied at R3 produced greater ($P \leq 0.10$) yields than the control. All fungicide treatment yields averaged together indicate the use of a fungicide increased yields by 4.7 bu/A over the untreated control.

Table 1. Asian Soybean Rust Ratings and Soybean Yields for SSRP Fungicide Treatments at Gulf Coast REC, 2008

Treatment, rate/A	Growth stage	Soybean rust severity*			Defoliation		Soybean bu/A				
		1 Oct	9 Oct	16 Oct	16 Oct						
1. Headline 3.3 EC 6.0 fl oz.....		3.4	b**	5.9	bc	7.5	a	77.5	a-d	35.5	ab
2. Quadris 6 fl oz.....	R3	6.4	a	7.6	a	7.3	a	92.3	ab	29.0	bc
3. Domark 5 fl oz	R3	0.1	c	1.8	d	4.9	cd	69.0	b-e	39.7	a
4. Topguard 7.0 fl oz	R3	0.0	c	0.1	e	5.0	cd	36.8	f	36.5	ab
5. Punch 4 fl oz + Picoxystrobin 6 fl oz.....	R3	1.6	c	4.7	c	7.1	ab	58.5	c-f	33.7	bc
6. Alto 100 4.0 fl oz.....	R3	4.8	b	6.8	ab	6.6	abc	79.0	abc	31.1	bc
7. Folicur 4.0 fl oz.....	R3	1.1	c	5.1	c	6.3	abc	79.0	abc	39.5	a
8. Stratego 10 fl oz + Proline 1 fl oz....	R3	1.1	c	4.7	c	5.4	de	74.1	a-e	40.2	a
9. Quadris 6 fl oz + Alto 100 4.0 fl oz	R3 + R5	0.7	c	2.0	d	4.0	de	37.5	f	33.1	bc
10. Headline 3.3 EC 4.5 fl oz + Folicur 4 fl oz.....	R3 + R3+10	0.4	c	2.3	d	5.0	cd	53.0	def	35.4	ab
11. Topguard 7.0 fl oz.....	R3+10	0.2	c	0.1	e	2.7	e	51.5	ef	39.5	a
12. Domark 5 fl oz.....	R3+10	0.4	c	0.2	e	4.5	d	40.8	f	39.6	a
13. Untreated control		7.5	a	7.9	a	7.1	ab	97.5	a	31.5	bc
14. Stratego 10 fl oz.....	R3+10	1.2	c	3.1	d	5.3	cd	70.3	b-e	37.9	a
LSD ($P \leq 0.10$).....		1.5		1.5		1.6		51.5	ef	6.3	
CV		61.5		33.3		23.4		40.8	f	14.8	

*Disease severity: 1= no rust; 2 < 2.5%, 3 = 2.5 - 5%, 4 = 5 - 10%, 5 = 10 - 15%, 6 = 15- 25%, 7 = 25 - 35%, 8 = 35 - 67%, 9 = 67- 100%.

**Means within columns followed by different letters are significantly different according to Fisher's LSD ($P \leq 0.10$).

Tebuzol-Topsin-Domark trial

Fungicide treatments were applied as a foliar spray at R3 only to evaluate preventive and curative effects. Soybean foliar diseases were evaluated by rating severity of ASR and target spot in each plot regularly after rust developed. Plots were harvested on 19 November.

Rust severity was greater in the untreated control (Treatment 1), Tebuzol (2), and KFD-21-03 (4) as compared to all of the other fungicide treatments ($P \leq 0.10$). By 9 Oct, rust incidence in the control was 25-35% severity, which was higher than all the fungicide treatments. Topguard (7) and Domark applied at 4 and 5 fl oz/A (8 and 9) further suppressed rust severity to less than 2.5% incidence which was less disease than ($P \leq 0.10$) all other fungicide treatments. The Topguard and Domark treatments continued to suppress rust through the last rating on Oct. 16 as compared to Tebuzol (2), Topsin M (3), KFD-21-03(4), Topsin M+Tebuzol (5) and Headline (6). Defoliation was also reduced in the Topguard (7) Domark (8 and 9) and the Topsin M+Tebuzol combination (5) as compared to all other treatments and the control. Yields were affected by prolonged wet soil conditions during pod-fill, as well as green stems interfering with timely and efficient harvesting. All fungicide treatments produced similar yields with an average increase of 2.7 bu/A over the control.

Table 2. Asian Soybean Rust Ratings and Soybean Yields for Tebuzol-Topsin-Domark Fungicide Treatments at Gulf Coast REC, 2008

Treatment, rate, and timing				Rust severity*				Defoliation 16 Oct	Yield bu/A
				16 Sep	1 Oct	9 Oct	16 Oct		
1	Untreated check		R3	0.10 a**	5.4 a	7.28 a	8.0 a	90.3 a	31.1 a
2	Tebuzol	4 fl oz/A	R3	0.00 b	3.4 a	4.80 b	7.5 ab	82.8 ab	33.4 a
3	Topsin M	16 fl oz/A	R3	0.00 b	1.4 b	4.45 b	7.4 ab	61.8 c	34.7 a
4	KFD-21-03	20 fl oz/A	R3	0.00 b	4.4 a	4.39 b	6.8 ab	73.0 abc	32.5 a
5	Topsin M Tebuzol	16 fl oz/A 4 fl oz/A	R3 R3	0.00 b	0.4 b	2.80 b	6.4 b	35.0 d	34.9 a
6	Headline	6 fl oz/A	R3	0.03 b	0.4 b	3.72 b	7.1 ab	63.9 bc	33.5 a
7	Topguard	7 fl oz/A	R3	0.00 b	0.0 b	0.13 c	0.7 d	19.3 d	34.6 a
8	Domark	4 fl oz/A	R3	0.00 b	0.1 b	0.48 c	2.0 c	28.0 d	34.4 a
9	Domark	5 fl oz/A	R3	0.00 b	0.0 b	0.00 c	1.3 cd	28.5 d	32.7 a
LSD ≤ 0.10				0.04	1.906	2.078	1.154	18.97	4.8
CV				234.66	76.54	54.69	18.06	29.01	11.74

*Disease severity: 1= no rust; 2 < 2.5%, 3 = 2.5 - 5%, 4 = 5 - 10%, 5 = 10 - 15%, 6 = 15- 25%, 7 = 25 - 35%, 8 = 35 - 67%, 9 = 67- 100%.

**Means within columns followed by different letters are significantly different according to Fisher's LSD ($P \leq 0.10$).

Triazole timing trial

Fungicide treatments were applied as a foliar spray at either R2 or R4 to evaluate preventive and curative effects of several triazole fungicides. Soybean foliar diseases were evaluated by rating severity of ASR and target spot in each plot regularly after rust developed. Plots were harvested on 10 November. All fungicides reduced rust severity and defoliation compared to the check, however they did not increase yield in 2008.

Table 3. Asian Soybean Rust Ratings and Soybean Yields for Triazole Timing Fungicide Treatments at Gulf Coast REC, 2008

Treatment, rate, and timing	Rust severity*				Defoliation	Yield
	16 Sep	1 Oct	9 Oct	16 Oct	16 Oct	bu/A
1 Topguard 7 fl oz/A R2	0.0 b**	0.0 b	1.6 cde	5.2 bc	73.0 bc	38.4 a
2 Topguard 7 fl oz/A R4	0.0 b	0.2 b	1.2 cde	2.9 def	36.8 ef	38.3 a
3 Domark 5 fl oz/A R2	0.0 b	0.0 b	0.1 e	0.9 f	41.3 ef	37.1 a
4 Domark 5 fl oz/A R4	0.0 b	0.1 b	0.5 de	1.8 ef	31.8 f	37.3 a
5 Folicur 4 fl oz/A R2	0.0 b	0.2 b	3.3 b	7.6 a	82.3 b	37.4 a
6 Folicur 4 fl oz/A R4	0.0 b	0.0 b	1.3 cde	3.4 cde	36.8 ef	38.6 a
7 Alto 4 fl oz/A R2	0.0 b	0.0 b	2.3 bc	5.6 b	63.3 cd	35.5 a
8 Alto 4 fl oz/A R4	0.1 b	0.0 b	1.8 bcd	2.7 def	45.0 ef	36.2 a
9 Proline 3 fl oz/A R2	0.1 b	0.1 b	2.6 bc	4.1 bcd	48.5 de	36.1 a
10 Proline 3 fl oz/A R2	0.1 b	0.3 b	1.4 cde	4.0 bcd	52.0 de	36.2 a
11 Untreated check	0.6 a	5.8 a	7.9 a	8.0 a	97.0 a	34.2 a
LSD \leq 0.10	0.2	0.7	1.4	1.9	14.7	4.5
CV	251.7	92.5	46.6	38.0	22.2	10.2

*Disease severity: 1 = no rust; 2 < 2.5%, 3 = 2.5 - 5%, 4 = 5 - 10%, 5 = 10 - 15%, 6 = 15- 25%, 7 = 25 - 35%, 8 = 35 - 67%, 9 = 67- 100%.

**Means within columns followed by different letters are significantly different according to Fisher's LSD ($P \leq 0.10$).

Similar results were noted with several trials with new materials at Fairhope, Weights of 100-seed samples were correlated with yield in all trials, indicating that the primary effect of ASR was leaf damage and loss that lessened seed fill.

Strobiluron Effects Trials:

Three trials investigated strobiluron fungicide application to soybeans at different growth stages on greening effects and yields. Trials were conducted in north and central AL at the Tennessee Valley RREC (TVRREC), Sand Mountain RREC (SMRREC), and the EV Smith Field Crops Unit (EVS). Headline @ 9 fl. oz/A, Quadris @ 9 fl. oz/A or Stratego @ 10 fl. oz/A were applied at R2 with and without applications at R5. A tank mix of Gramoxone Inteon® 2L (paraquat) @ 1 pt/A plus sodium chlorate @ 3 lb a.i. /A was applied (if needed) to all plots at pod maturity, after rating for greening effects. At harvest, yield and harvest moisture data was recorded. Seed samples were also analyzed for foreign matter content and 100-seed weights.

A. At the Tennessee Valley Regional Research and Educational Center (TVRREC), DeltaKing 5068 RR soybean seed was planted on 07 May in a Decatur silt loam, and managed according to Extension recommendations. Plots were 4 * 30-inch rows, 30 feet long, in Randomized Complete Blocks with four replications. The three fungicides were applied in a factorial design at

either the R2 growth stage (full bloom) on 03 July, or the R2 + R5 (beginning seed fill) growth stage on 25 July. Fungicides were applied in 20 gal/A of water using a backpack CO2 sprayer equipped with TeeJet 8002VS flat fan nozzles on 19-in. centers at 60 psi. Per resistance management guidelines, a triazole fungicide (Folicur @ 3 fl. oz/A) was added to the second strobiluron spray of Headline and Quadris (Stratego is a premix containing a strobiluron and a triazole).

The trial was rated at pod maturity, with ratings at approximately 60% brown pods on 02 October. The center two rows of each plot were harvested with a plot combine on 22 October and weighed, with samples dried and analyzed for seed weights. (Table 4.)

Retention of green leaves was increased by all fungicide applications, with R2 +R5 > R2 alone with no interactions between treatments and timing. Yields were not affected by strobiluron fungicide applications, while 100-seed weights were slightly increased by both Headline applications, as well as Quadris at R2 only.

Table 4. Yields of strobiluron treated soybeans with application timing, TVRREC 2008

Treatment	Timing	Greening*	Yield	100-seed
		03 Oct	Bu/A	Grams
Headline @ 9 oz/A	R2 only	5.8	51.4	16.67
Headline @ 9 oz/A	R2 + R5	5.5	48.7	16.68
Quadris @ 9 oz/A	R2 only	6.3	54.1	16.46
Quadris @ 9 oz/A	R2 + R5	6.0	56.9	16.20
Stratego @ 10 oz/A	R2	6.5	54.6	15.94
Stratego @ 10 oz/A	R2 + R5	5.8	54.1	16.18
Untreated check		7.8	48.6	15.58
	<i>LSD (0.10)</i>	<i>0.72</i>	<i>8.46</i>	<i>0.801</i>

* Greening rating – 1 = lush green, 10 = brown and dry

B. At the Sand Mountain Regional Research and Educational Center (SMRREC) Dyna-Gro 3443nRR soybean seed was planted on 02 May in a Wynville sandy loam using strip-tillage, and managed according to Extension recommendations. Plots were 4 * 36-inch rows, 25 feet long, in Randomized Complete Blocks with four replications. The three fungicides were applied in a factorial design at either the R2 growth stage (full bloom) on 26 June, or the R2 + R5 (beginning seed fill) growth stage on 17 July. Fungicides were applied in 20 gal/A of water using a backpack CO2 sprayer equipped with TeeJet 8002VS flat fan nozzles on 19-in. centers at 55 psi. Per resistance management guidelines, a triazole fungicide (Folicur @ 3 fl. oz/A) was added to the second strobiluron spray of Headline and Quadris (Stratego is a premix containing a strobiluron and a triazole).

The trial was rated at pod maturity, with ratings on 17 and 26 September. The center two rows of each plot were harvested with a plot combine on 30 September, weighed, with samples dried and analyzed for seed weights. (Table 5).

Fungicide applications at R2 +R5 vs R2 alone or the untreated check increased retention of green leaves at both rating dates. Fungicide applications at R2 +R5 vs R2 alone or the untreated check

also increased yields (27.5 vs 25.6 bu/A) and 100-seed weights (13.4 vs 13.1 grams) with no significant interactions between treatments and application timing.

Table 5. Yields of strobiluron treated soybeans with application timing, SMRREC 2008

Treatment	Timing	Greening*		Yield Bu/A	100-seed Grams
		17 Sep	26 Sep		
Headline @ 9 oz/A	R2 only	8.8	9.3	26.6	13.19
Headline @ 9 oz/A	R2 + R5	7.5	7.8	26.7	13.96
Quadris @ 9 oz/A	R2 only	9.0	9.3	24.6	13.32
Quadris @ 9 oz/A	R2 + R5	8.5	8.8	28.4	13.34
Stratego @ 10 oz/A	R2	9.3	9.3	25.7	12.81
Stratego @ 10 oz/A	R2 + R5	8.5	8.8	27.5	13.04
Untreated check		9.5	9.8	25.6	12.73
	<i>LSD (0.10)</i>	<i>0.89</i>	<i>0.83</i>	<i>2.43</i>	<i>0.559</i>

* Greening rating – 1 = lush green, 10 = brown and dry

C. At the EV Smith Field Crops Unit (EVS) Pioneer 94M80 (RR) soybean seed was planted on 24 April @ 10 seed/ft in a Compass loamy sand, and managed according to Extension recommendations. Plots were 4 * 36-inch rows, 25 feet long, in a Randomized Complete Blocks with four replications. The three fungicides were applied in a factorial design at either the R2 growth stage (full bloom) on 23 June, or the R2 + R5 (beginning seed fill) growth stage on 15 July. Fungicides were applied in 18 gal/A of water using a Lee Spider high clearance sprayer with Turbodrop TDXL 10002 flat fan nozzles on 15-in. centers at 60 psi. Per resistance management guidelines, a triazole fungicide (Folicur @ 3 fl. oz/A) was added to the second strobiluron spray of Headline and Quadris (Stratego is a premix containing a strobiluron and a triazole).

The trial was rated at pod maturity, with ratings at approximately 60% brown pods and again just prior to harvest. The center two rows were harvested with a plot combine, weighed before and drying, and samples taken for seed weights. (Table 6)

Retention of green leaves was increased at the first rating by all fungicide applications compared to the check, with Quadris > Stratego (6.9 vs. 5.4) and R2 +R5 > R2 alone (6.8 vs. 5.8) with no interactions between treatments and timing. At the second rating, greening was again increased by fungicides: Headline and Quadris had greater greening than Stratego (5.6 and 5.4 vs. 4.0, respectively), with R2 +R5 > R2 alone (5.3 vs. 4.7) with no interactions.

Yields and 100-seed weights were not affected by strobiluron fungicide applications.

Table 6. Yields of strobiluron treated soybeans with application timing, EVS 2008

<u>Treatment</u>	<u>Timing</u>	<u>Greening*</u>		<u>Yield</u>	<u>100-seed</u>
		<u>03 Sep</u>	<u>08 Sep</u>	<u>Bu/A</u>	<u>Grams</u>
Headline @ 9 oz/A	R2 only	6.3	5.5	49.0	15.56
Headline @ 9 oz/A	R2 + R5	7.0	5.8	48.0	15.83
Quadris @ 9 oz/A	R2 only	6.3	4.8	49.4	15.50
Quadris @ 9 oz/A	R2 + R5	7.5	6.0	50.8	15.96
Stratego @ 10 oz/A	R2	5.0	3.8	53.0	15.40
Stratego @ 10 oz/A	R2 + R5	5.8	4.3	49.5	15.75
Untreated check		3.3	2.5	51.2	15.36
	<i>LSD (0.10)</i>	<i>1.2</i>	<i>1.0</i>	<i>4.1</i>	<i>0.67</i>

* Greening rating – 10 = lush green, 1 = brown and dry