

Evaluation of Fungicides and Fungicide Timing for the Management of *Phakopsora pachyrhizi* in Paraguay and Zimbabwe



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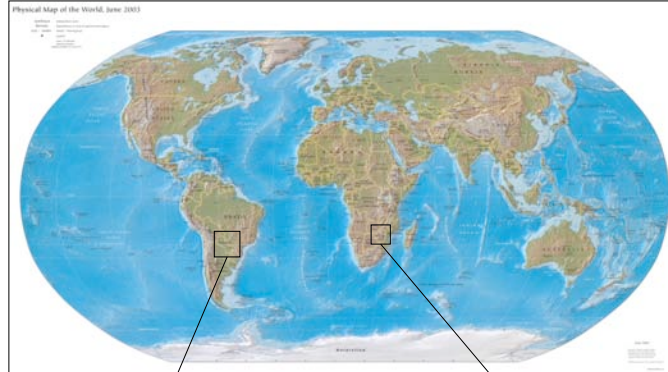
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Introduction:

Timing of fungicide applications is a critical component in managing soybean rust, if used effectively, may reduce the number of applications needed for economic benefit. The objective of these experiments was to evaluate the effect of different timings of fungicide applications on soybean rust severity and yield. Trials were conducted in three locations in Paraguay in growers' fields (Bella Vista, Capitán Meza, and Pirapo) and in Harare, Zimbabwe at the Rattray Arnold Research Station.

Materials and Methods:

- A representative variety was planted at each location in the 2005-2006 growing season
- Treatments in each field included applications with: triazole (Folicur), strobilurin (Headline), or triazole-strobilurin combinations (Quilt or Headline + Folicur)
- Fungicides were applied at either (i) growth stage (GS) R1, (ii) GS R3, (iii) GS R5, (iv) GS R1 and R3, (v) GS R3 and R5, (vi) GS R1, R3, and R5, or (vii) untreated control
- Fungicides were applied with a backpack sprayer with 15 gpa of water as the target application volume
- Yields were taken from the center two rows of the four row plot and adjusted to 13% moisture



Results:

Bella Vista, Paraguay: Rust was first detected at GS R4. All treatments had significantly less soybean rust than the untreated control, but only 6 of the 23 treatments had higher yield than the untreated control. In general there was not much difference between timings of fungicides.

Capitan Meza, Paraguay: Rust was first detected at GS R2. There was significantly less soybean rust than the untreated control for 16 of the 23 treatments, and 17 of the 23 treatments had higher yield than the untreated control. Treatments with a single application at GS R5 had the lowest yields, but there was little differences in rust severity.

Pirapo, Paraguay: Rust was first detected at GS R2. All treatments had significantly less soybean rust than the untreated control and 19 of the 23 treatments had higher yield than the untreated control. Treatments with fungicides applied at only GS R5 had the lowest yield and most severe rust while treatments applied at GS R1 and multiple applications had higher yields.

Harare, Zimbabwe: Rust was first detected at GS R2. There was significantly less soybean rust for 16 of the 23 treatments and 15 of the 23 treatments had higher yield than the untreated control. In general treatments with multiple applications of fungicides had lower rust severity and higher yields.

Conclusions:

- In general fungicides Headline and Folicur were more effective for the control of soybean rust than Quilt
- In general rust severity was lower and yields were higher when more than one application of fungicide was used
- The best time to apply fungicides depended on when the field was infected with soybean rust
- For more detailed information contact Tristan Mueller at tmueller@uiuc.edu

Table 1: Results from all locations

Treatment (rate) @ growth stage	Bella Vista, Paraguay		C. Meza, Paraguay		Pirapo, Paraguay		Harare, Zimbabwe	
	Rust Severity Relative to Untreated Control	Yield (bu/A)	Rust Severity Relative to Untreated Control	Yield (bu/A)	Rust Severity Relative to Untreated Control	Yield (bu/A)	Rust Severity Relative to Untreated Control	Yield (bu/A)
Headline (9.2 oz/A) @ R1	60% bcd	40.1 ef	65% bodef	26.0 abcde	44% g	23.4 defg	100% a	49.1 fgh
Headline (9.2 oz/A) @ R3	4% e	48.2 bcde	78% abc	23.8 defghi	76% c	16.0 k	96% a	50.8 efgh
Headline (9.2 oz/A) @ R5	64% bcd	43.3 def	78% abc	22.7 efgh	89% b	10.1 l	16% ef	55.8 abcde
Folicur (4 oz/A) @ R1	45% d	42.8 def	38% ghi	24.2 cdefg	33% h	24.9 bcde	66% bc	51.6 defg
Folicur (4 oz/A) @ R3	14% e	46.2 cdef	54% defghi	25.2 abcdef	73% cd	18.0 jk	84% abc	49.6 efgh
Folicur (4 oz/A) @ R5	15% e	46.6 cdef	86% ab	20.8 gh	90% b	11.2 l	92% abc	46.7 gh
Folicur (4 oz/A) @ R1 and R3	11% e	44.0 def	35% hi	27.7 abcd	25% hij	24.3 cdef	34% de	53.5 cdefg
Folicur (4 oz/A) @ R3 and R5	4% e	51.2 abcd	76% bcd	25.6 bcdef	66% def	18.5 jkl	17% ef	54.0 bcdefg
Folicur (4 oz/A) @ R1, R3 and R5	1% e	45.3 cdef	41% ghi	26.1 abcde	18% jkl	27.0 abcd	0% f	64.6 a
Quilt (14 oz/A) @ R1	79% b	45.5 cdef	51% efghi	24.8 cdefg	45% g	22.0 efgh	93% ab	47.3 fgh
Quilt (14 oz/A) @ R3	66% e	46.5 cdef	81% abc	24.5 cdefg	68% cd	19.1 hij	100% a	47.7 fgh
Quilt (14 oz/A) @ R5	60% bc	44.4 cdef	59% cdefg	21.8 fgh	90% b	9.9 i	62% cd	53.3 cdefg
Quilt (14 oz/A) @ R1 and R3	51% cd	42.9 def	41% ghi	25.9 abcdef	31% hi	25.5 abcd	95% ab	49.9 efgh
Quilt (14 oz/A) @ R3 and R5	56% cd	45.2 cdef	86% ab	23.8 defghi	64% ef	19.0 hijk	24% ef	60.7 abc
Quilt (14 oz/A) @ R1, R3 and R5	58% cd	47.6 cdef	32% hi	28.2 abc	22% ijk	25.0 bcd	23% ef	60.0 abcd
Folicur (3 oz/A) + Headline (6 oz/A) @ R1	79% b	39.6 f	81% abc	24.6 cdefg	65% def	21.4 fghi	31% e	59.9 abcd
Folicur (3 oz/A) + Headline (6 oz/A) @ R3	11% e	46.8 cdef	76% bcd	19.7 h	89% b	11.4 i	17% ef	47.8 fgh
Folicur (3 oz/A) + Headline (6 oz/A) @ R5	5% e	50.5 abcd	43% fghi	20.9 a	13% i	28.2 a	0% f	62.8 ab
Folicur (3 oz/A) + Headline (6 oz/A) @ R1 and R3	0% e	58.7 a	73% bcde	28.3 abc	58% f	20.5 ghij	0% f	60.1 abcd
Folicur (3 oz/A) + Headline (6 oz/A) @ R3 and R5	3% e	51.2 abcd	30% i	27.9 abcd	16% kl	27.3 ab	34% de	63.3 a
Headline (9.2 oz/A) @ R1, Folicur (4 oz/A) @ R3	8% e	52.8 abc	70% bcde	25.2 bcdef	65% def	20.7 ghij	0% f	60.3 abcd
Headline (9.2 oz/A) @ R3, Folicur (4 oz/A) @ R5	8% e	47.0 cdef	32% hi	29.1 ab	13% i	25.8 abcd	35% de	58.0 abcde
Folicur (4 oz/A) @ R1, Headline (9.2 oz/A) @ R3	0% e	56.5 ab	84% ab	26.6 abcde	63% ef	23.5 defg	0% f	59.9 abcd
Folicur (4 oz/A) @ R3, Headline (9.2 oz/A) @ R5	—	40.8 ef	a	19.9 h	a	9.9 i	a	42.4 h
Untreated control	—	—	—	—	—	—	—	—
Mean	33%	46.8	62%	25.1	55%	20.1	47%	54.6
LSD 0.05	19%	8.6	23%	4.2	9%	3.0	30%	8.8

Table 2: Final soybean rust severity and yield means for all locations and fungicides

Timing (Growth Stage)	Bella Vista, Paraguay ¹		C. Meza, Paraguay ¹		Pirapo, Paraguay ¹		Harare, Zimbabwe ²	
	Rust Severity	Yield (bu/A)	Rust Severity	Yield (bu/A)	Rust Severity	Yield (bu/A)	Rust Severity	Yield (bu/A)
Untreated	7.3	40.8	3.1	19.9	9.0	9.9	100	42.4
R1	4.4	44	1.4	25.8	3.3	23.8	70.4	52
R3	3.0	45.1	2.3	24.5	6.3	18.6	77.7	52
R5	2.8	45.3	2.3	21.3	8.0	10.7	46.6	50.9
R1 and R3	1.1	47.1	1.1	28.1	1.8	26.2	39.5	56
R3 and R5	1.0	52.9	2.4	25.9	5.7	20.4	0	59
R1, R3, and R5	0.1	45.3	1.3	26.1	1.6	27.0	8.1	64.6
Average	2.4	46.8	1.9	25.1	4.9	20.1	46.5	54.6

¹ratings on a 0 to 9 scale with 0 equals no rust and 9 equals very severe rust for the final rust rating
²rating on a percent severity scale (0 to 100%) for the final rust rating

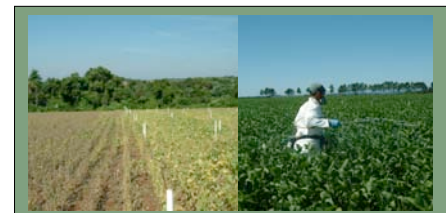


Figure 1: Fungicide trial in Paraguay