

Impact of Fungicide Application Timing and Soybean Row Spacing on Spray Canopy Penetration and Grain Yield

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Introduction: Asian soybean rust (*Phakopsora pachyrhizi*) causes widespread and severe yield loss. Application of a foliar fungicide is the best available method to prevent loss. Adequate foliar spray coverage is essential for disease control. Row spacing in soybeans may affect the spray coverage. This study examines the effect of row spacing and fungicide application timing on spray coverage and yield.

Objectives :

- To quantify the impact of crop row spacing and spray application timing on spray canopy coverage
- To quantify the impact of fungicide application timing on crop yield and crop injury caused by sprayer wheels

Image 1.



Materials and Methods: The experimental design was a randomized complete block with three replications. The main plot factors were crop row spacing (7.5, 15, and 30 inches) and spray application timing (unsprayed or applications at growth stage R1, R3, R5, R3+R5, or R1+R3+R5). The experiment was conducted at three locations in Indiana and utilized field-scale application equipment. Data presented in this poster are from the SEPAC location only. Soybean (94B13) was planted no-till at the state recommended population for each row spacing. Plots were sprayed with Quilt fungicide at each application time using an Apache applicator fitted with TeeJet TJ60-11006 spray tips spaced at 15-in., at 20 gallons/acre. Plots measured 45 by 300 ft. Syngenta water sensitive spray cards measuring 2 x 3 inches were mounted on wooden standards to quantify spray canopy coverage at 12-in. height increments throughout the soybean canopy (Image 1). Three spray canopy coverage sub-samples were collected from each height. After spraying, the cards were collected, scanned, and then analyzed for percent spray canopy coverage using Assess image analysis software. Frog-eye leaf spot severity was visually assessed on 14 Aug. At physiological maturity plots were combined with a John Deere 9400 combine and 915 grain head. Yield was recorded using an Ag Leader yield monitor which was calibrated with a weigh wagon. Two passes for yield were made per plot. One pass contained no wheel tracks and one contained both wheel tracks. Statistical analysis was conducted utilizing SAS.

Table 1. Effect of fungicide application timing on spray coverage at 12-in height intervals in the soybean canopy.

Height in canopy (in.)	Growth stage at application		
	R1	R3	R5
	-----Spray coverage (%)-----		
0	8.5	2.0	1.1
12	62.4	2.5	1.0
24	90.9	21.0	4.4
35	-	59.6	49.9
47	-	-	70.4
LSD (0.05)	9.8	3.3	4.1

Table 2. Effect of row spacing and sprayer wheel track damage on soybean yield in 2005 at the SEPAC research station, Butlerville IN.

Row spacing (inches)	Non wheel track	Wheel track	Non wheel vs. wheel
	-----Yield(bu/ac)-----		P-Value
7.5	70.2	64.6	P < 0.0001
15	70.5	66.0	P < 0.0001
30	65.6	64.1	P ≥ 0.05
LSD (0.05)	2.3	2.3	-

Table 3. Effect of fungicide application timing and sprayer wheel track damage on soybean yield in 2005 at the SEPAC research station, Butlerville IN.

Timing	Non wheel track	Wheel track	Non wheel vs. wheel
	-----Yield (bu/ac)-----		P-value
R1	67.9	65.8	P ≥ 0.05
R3	70.5	65.5	P < 0.0001
R5	68.0	63.1	P < 0.0001
R3+R5	69.8	63.1	P < 0.0001
R1+R3+R5	69.0	65.4	P < 0.005
Control	67.4	66.9	P ≥ 0.61
LSD (0.05)	3.3	3.3	-

Results:

- Crop row spacing had no effect on spray canopy coverage at any application timing.
- Fungicide application timing did not affect frog eye leaf spot severity. Mean severity was 7.1%.
- Spray canopy coverage diminished with greater depth in the canopy at each spray timing (Table 1)
- Grain yield was 7% greater in the 7.5 and 15-inch row spacings than in the 30-inch row spacing in the non wheel track area (Table 2)
- Yield was similar among row spacings in the wheel track area (Table 2)
- Grain yield did not differ between wheel track and non-wheel track areas at R1; however, it differed between the wheel track and non-wheel track areas at the R3 (7.0%), R5 (7.2%), R3+R5 (9.6%), and R1+R3+R5 (5.2%) application timings. (Table 3)

Conclusions:

- Row spacing did not affect spray canopy coverage
- Wheel traffic after R1 soybean will decrease grain yield; however additional yield loss will not occur with multiple trips in the same wheel tracks

