

# Effect of Foliar Fungicides at R3 Growth Stage on Soybean Disease and Yield

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### Introduction

The foliar, stem, and root diseases of soybeans are significant components of yield loss in soybean fields. Use of fungicides is one of the options in management of soybean diseases. According to USDA-NASS, fungicide use in soybean has increased from <1 percent in 2002 to 11 percent of soybean planted acres in 2012 in 20 soybean producing states (Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, North Carolina, North Dakota, Ohio, South Dakota, Tennessee, Virginia, and Wisconsin). The objectives of these trials were to test efficacy of various foliar fungicides sprayed at R3 growth stage on disease control and yield response during 2012 and 2013 growing seasons.

### Materials and Methods

Trials were set in a randomized complete block design with four replications each with 10 ft wide (four 30-in. rows) × 45.5-ft long plots at the ISU Northeast Research and Demonstration Farm, Nashua, Iowa. Trials assessed the efficacy of various fungicides sprayed at R3 growth stage (beginning pod development) for disease control and yield response during two cropping seasons (Tables 1 and 2).

*Field operations.* Trials in 2012 were no-till planted on May 17 with Asgrow Brand AG24-31. In 2013, they were planted on June 17 in a conventional tillage system (fall chisel plow,

spring field cultivate) with NK Brand S20-Y2. Both were planted at 188.8k plants/acre in 30-in. row spacing with a Kinze 3000 planter. Fungicides were sprayed at R3-growth stage using CO<sub>2</sub> backpack (10-ft hand boom/XR8003 tips) as per the treatment details provided by the companies (Tables 1 and 2). To maintain weed-free (including glyphosate resistant water hemp) plots, pre- or post-emergence herbicides (Outlook, Zidua, Roundup WeatherMax and Fusion) were sprayed at recommended rates. Excellent weed control was obtained. To control spider mites, Lorsban insecticide (1.5 pint/Ac) was used in 2012, and in 2013 soybean aphids were controlled with Warrior II insecticide (1.96 oz/ac). Plots were harvested using a John Deere 4420 combine with Shivvers grain moisture meter and Avery-Weigh Tronix weigh scale indicator. Yields were measured in bushels/acre converted to 13 percent grain moisture.

*Fungicides.* Two Triazole products (Proline and Tilt), three Strobilurins (Gem, Headline, and Quadris), and three mixtures of active ingredients of Strobilurin and Triazole (QuiltXcel, StrategoYLD, and Priaxor) were tested.

*Evaluation for diseases and data analysis.* Pre- and post-fungicide spray disease ratings were recorded weekly from one week before application through one week before the harvest. However, only mean final percent disease severity and incidence are presented in Tables 1 and 2. Sudden death syndrome (SDS) and white mold (WM) incidences in each plot were based on infected plants/total plant × 100 and the severity was based on percent plant damaged by the disease(s). Data was analyzed using SAS.

### Results and Discussion

Diseases observed during the 2012 growing season were bacterial leaf blight (BLB), frogeye leaf spot (FE), SDS, WM, and soybean vein necrosis (SVN) (Table 1), and in 2013 only the WM (Table 2). Severity of BLB and FE was <1 percent and that of SVN was 5 percent in all treatments. Due to dry weather in 2012 and late planting in 2013, WM and SDS incidence and severities were low. No significant ( $P<0.05$ ) effect of fungicides on SDS occurred, but a few treatments showed significant effect ( $P<0.05$ ) for WM incidence and percent defoliation over unsprayed control (Table 1). Although most fungicide treatments yielded more than the unsprayed control, no significant ( $P<0.05$ ) yield differences were noted when comparing sprayed versus the unsprayed control treatment (Table 1). The average yield advantage across fungicide

sprayed treatments was two bushels/acre over unsprayed control (range -3.3 to 6.3 bu/ac) (Table 1). In 2013, WM incidences were higher than in 2012 season, but fungicide sprays had no significant reduction in WM, as well as no significant increase in yield ( $P<0.05$ ). However, the average of all the fungicide treatments was 2.2 bushels/acre yield more than the unsprayed control (range 0.9 to 3.8 bu/ac) (Table 2).

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**Table 1. Effect of foliar fungicides application at R3 growth stage on soybean diseases, defoliation and yield response during 2012, Nashua, IA.<sup>1</sup>**

Products tested	Application rate/ac	Sudden death syndrome (%)		White mold (%)		Defoliation (%)	Yield bu/ac
		Inc	Sev	Inc	Sev		
Priaxor + NIS <sup>2</sup>	4 oz + 0.25% v/v	0.00 a	0.0a	0.00 b	0 a	12.5 bc	69.8 a
Headline SC+NIS	5.3 oz + 0.25% v/v	0.16 a	17.5 a	0.00 b	0 a	15.0 bc	69.1 ba
Gem 500 SC+NIS	3 oz + 0.25% v/v	0.34 a	20.0 a	0.00 b	0 a	12.5 bc	67.6 bac
Quadris + NIS	6 oz + 0.25% v/v	0.39 a	17.5 a	0.00 b	0 a	22.5 ba	66.6 bac
BAS700 04+NIS	2.2 oz + 0.25% v/v	0.18 a	7.5 a	0.01 b	20 a	10.0 c	66.0 bac
Stratego YLD + NIS	4 oz + 0.25% v/v	0.43 a	17.5 a	0.04 ba	30 a	15.0 bc	64.2 bac
Tilt 3.6E +NIS	3 oz + 0.25% v/v	0.24 a	12.5 a	0.00 b	0 a	18.0 bc	63.9 bac
Unsprayed control	0	0.00 a	0.0 a	0.08 a	35 a	30.0 a	63.5 bac
Quilt Xcel + NIS	10.5 oz + 0.25% v/v	0.03 a	7.5 a	0.01 b	20 a	17.5 bc	62.0 bc
Proline	1.05 oz + 0.25%						
480SC+NIS	v/v	0.22 a	8.8 a	0.00 b	0 a	20.0 bac	60.2 c

<sup>1</sup>Means with the same letter are not significantly different (P<0.05). Values are mean of four replications.

<sup>2</sup>NIS=non-ion surfactant Activator 90 from Loveland Industries. Inc=incidence, Sev=severity. Note: Application rate of Proline was lower in this trial than in 2013.

**Table 2. Effect of foliar fungicides application at R3 growth stage on soybean diseases, defoliation and yield response during 2013, Nashua, IA.<sup>1</sup>**

Products tested	Application rate/ac	White mold incidence (%)		Yield bu/ac
		Inc	Sev	
Headline SC + NIS <sup>2</sup>	5.3 oz + 0.25% v/v	1.08 a		62.7 a
Proline 480 SC + NIS	4 oz + 0.25% v/v	0.49 b		62.6 a
Priaxor + NIS	4 fl oz + 0.25% v/v	0.41 b		61.7 a
Gem 500 SC + NIS	3 oz + 0.25% v/v	0.46 b		61.3 a
Quadris + NIS	6 oz + 0.25% v/v	0.35 b		61.1 a
Stratego YLD + NIS	4 oz + 0.25% v/v	0.64 ba		60.6 a
Quilt Xcel + NIS	10.5 oz + 0.25% v/v	0.25 b		60.3 a
BAS 700 04 + NIS	2.2 oz + 0.25% v/v	0.52 b		60.0 a
Tilt 3.6E + NIS	3 oz + 0.25% v/v	0.71b a		59.8 a
Unsprayed control		0.59b a		58.9 a

<sup>1</sup>Means with the same letter are not significantly different (P<0.05). Values are mean of four replications.

<sup>2</sup>NIS=non-ion surfactant Activator 90 from Loveland Industries. Note: Application rate of Proline was higher in this trial than in 2012.