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1-1-2015

Evaluation of Application Rates of Fungicides on Soybean Diseases and Yield

Shrishal Navi
Iowa State University, ssnavi@iastate.edu

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Abstract

The foliar, stem, and root diseases of soybean are significant components of yield loss in soybean fields. Objectives of this study were to test fungicides against foliar diseases and white mold.

Keywords

Plant Pathology and Microbiology

Disciplines

Agricultural Science | Agriculture | Agronomy and Crop Sciences | Natural Resources and Conservation

Evaluation of Application Rates of Fungicides on Soybean Diseases and Yield

RFR-A14103

Shrishail Navi, associate scientist
Department of Plant Pathology and
Microbiology

Introduction

The foliar, stem, and root diseases of soybean are significant components of yield loss in soybean fields. Objectives of this study were to test fungicides against foliar diseases and white mold.

Material and Methods

Trials were set up in a randomized complete block design (RCBD) with four replications each with 10 ft wide (four 30-in. rows) × 45.5 ft long plots at the ISU Northeast Research Farm, Nashua, Iowa. Trials assessed the application rates of fungicides sprayed either alone or mixture of two for disease control and yield response during the 2012 and 2014 cropping seasons (Tables 1 and 2).

Field operations. The trial in 2012 was no-till (in corn for 2011) planted with Pioneer 92Y11RR on May 19. In 2014, the trial was a conventional tillage system (in corn for 2013, fall chisel plowed and spring cultivated) planted with Kruger K2-2402 RR on May 23 at 188.8k plants/acre in 30-in. row spacing with Kinze 3000 planter. Pre- and post-emergence weeds were controlled using Fusion (5 oz/ac) and Roundup WeatherMax® (22 oz/ac) in 2012 and Outlook (21 oz/ac) and Roundup PowerMax® (26 oz/ac) at 20 GPA in 2014. To protect research plots from aphids, Warrior II insecticide (1.96 oz/ac) was sprayed. Fungicides were sprayed at R1 (beginning bloom) and R3 (beginning pod) growth stages using CO_2 backpack (10 ft hand boom with XR8003 tips) as per the treatment

details provided by the company (Tables 1 and 2). Plots were harvested using a John Deere 4420 combine with Shivvers grain moisture meter and Avery-Weigh Tronix weigh scale indicator, and yields were measured in bushels/acre converted to 13 percent grain moisture.

Fungicides. Three triazole products (Proline, Topsin-M, and Domark), one each of strobilurin (Aproach), premix of active ingredients of strobilurin and triazole (Priaxor), and other strobilurin or triazole (Endura) 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 harvest. However, only mean final percent disease ratings are presented in Tables 1 and 2. Phytophthora root rot (*Phytophthora sojae*) and sudden death syndrome (*Fusarium virguliforme*) incidences in each plot was based on infected plants/total plants × 100 and the severity was based on percent plant damaged by the disease(s). Data was analyzed using SAS 9.4.

Results and Discussion

Diseases observed in 2012 were bacterial leaf blight (trace), frogeye leaf spot (1-2% severity), phytophthora root rot, and soybean vein necrosis (SVN). Incidence of SVN was 50-60 percent with 10-15 percent severity in all the treatments including unsprayed control. Diseases observed in 2014 were bacterial leaf blight (5% severity), Cercospora leaf blight (5% severity), Phytophthora root rot, and sudden death syndrome. Interestingly, frogeye leaf spot and SVN were not observed in 2014. Fungicide sprays had no significant ($P < 0.05$)

impact on diseases observed and yields over the unsprayed controls in both the years (Tables 1 and 2). However, there was significant (P < 0.05) yield penalty in plots that received Cobra spray in 2014 (Table 2) compared with 2012 (Table 1).

Although most of the soybeans treated with fungicide yielded more than the control, no significant (P < 0.05) yield differences were observed in sprayed vs. the unsprayed control (Table 1). The average across fungicide sprayed treatments was 0.42 bushels/acre advantage over unsprayed control (range -1.45

to 2.25 bu/ac) in 2012 (Table 1). In 2014, the average across fungicides sprayed treatments was -0.55 bushels/acre disadvantage over unsprayed control (range -3.32 to 0.36 bu/ac). Also, there was no significant yield advantage with more than one spray or mixture of two fungicides (Table 2).

Table 1. Effect of application rates of foliar fungicides on Phytophthora root rot and yields during 2012.[1]

Products tested[2]	Application Rate (oz/ac)	Time	Phytophthora root rot[3] Incidence %	Severity %	Yield bu/ac
Endura + HSOC/Blend	8	R1	1.3a	40a	64.3a
Endura + HSOC/Blend	6	R1	1.0a	40a	63.6a
Proline + NIS	4.3	R1	0.3a	20a	63.2a
Endura + Endura	8 + 8	R1+14daps	1.8a	40a	62.9a
Endura + HSOC/Blend	4	R1	0.8a	40a	62.9a
Endura + HSOC/Blend	2	R1	1.5a	40a	62.5a
Unsprayed control	-	-	2.8a	20a	62.1a
Cobra + COC	6	R1	1.5a	20a	61.8a
Aproach	6	R1	0.5a	20a	61.7a
Topsin M 4.5L	20	R1	0.0a	0a	61.2a
Domark + NIS	5	R1	1.8a	40a	60.6a

[1]Means with the same letter are not significantly different ($P < 0.05$).
[2]COC = Herbimax crop oil concentrate from UAP - Loveland Industries at 0.125 gal/ac, HSOC/blend = High surfactant oil concentrates, NIS = non-ionic surfactant Activator 90 from Loveland Industries at 0.25% v/v.
[3]Values are average of four replications, Incidence % = infected plants/total plant × 100. Severity % = percent of infected plant damaged by the disease (and is not per plot).

Table 2. Effect of application rates of foliar fungicides on Phytophthora root rot, sudden death syndrome, and yields during 2014.[1]

Products tested[2]	Application Rate (oz/ac)	Time	Phytophthora root rot[3] Incidence %	Severity %	Phyto-toxicity %	Sudden death syndrome[3] Incidence %	Severity %	Yield bu/ac
Endura + Priaxor + NIS	4 + 4	R1	0.34a	100a	0b	1.21a	50.0a	53.6a
Aproach + NIS	9	R1	0.29a	100a	0b	1.48a	60.0a	53.6a
Endura + Priaxor +NIS	6 + 4	R1&R3	0.36a	100a	0b	0.66a	62.5a	53.4a
Endura + NIS	8	R1	0.37a	75a	0b	1.47a	41.3a	53.4a
Unsprayed control	-	-	0.32a	100a	0b	0.52a	47.5a	53.3a
Endura + NIS	6	R1	0.24a	75a	0b	0.75a	55.0a	52.6ba
Aproach + NIS	9 & 6	R1&R3	0.37a	100a	0b	1.25a	35.0a	52.4ba
Cobra + COC	6	R1	0.41a	100a	46.3a	0.74a	55.0a	50.0b

[1]Means with the same letter are not significantly different ($P < 0.05$).
[2]COC = Herbimax crop oil concentrate from UAP - Loveland Industries at 0.125 gal/acre, NIS= non-ionic surfactant Preference® adjuvant from WinField at 0.25% v/v.
[3]Values are average of four replications. Incidence % = infected plants/total plant × 100. Severity % = percent of infected plant damaged by the disease (and is not per plot).