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Evaluation of Foliar Fungicides and Insecticides on Soybeans

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Abstract
Use of foliar fungicides and insecticides are an effective strategy for managing foliar diseases of soybean. There are many different fungicides and insecticides available for use currently in Iowa. Iowa State University personnel assessed the success of fungicides and insecticides across Iowa. This study was conducted at six research farm locations: Sutherland (NW), Kanawha (NC), Nashua (NE), Ames (central), Crawfordsville (SE), and Lewis (SW) (Figure 1).

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Introduction

Use of foliar fungicides and insecticides are an effective strategy for managing foliar diseases of soybean. There are many different fungicides and insecticides available for use currently in Iowa. Iowa State University personnel assessed the success of fungicides and insecticides across Iowa. This study was conducted at six research farm locations: Sutherland (NW), Kanawha (NC), Nashua (NE), Ames (central), Crawfordsville (SE), and Lewis (SW) (Figure 1).

Materials and Methods

The experimental design at each location was a randomized complete block with at least four replications. Details on variety and planting, application, and harvest dates are listed in Table 1. Fungicides and insecticides were applied at growth stage R3 (beginning pod) at all six locations. Disease was assessed when soybeans were at the R6 growth stage. Diseases found included Septoria brown spot, frogeye leaf spot, Cercospora leaf blight, and downy mildew. Only diseases that had more than 1 percent severity were analyzed. Soybean aphid populations were observed between R3 to R6 in order to time an IPM spray. Total seed weight per plot and moisture was measured, seed weight was adjusted to 13 percent, and yield was calculated.

Summary and Discussion

There was no difference in the amount of foliar disease between fungicide and insecticide treatments and the untreated control at the Lewis, Crawfordsville, Kanawha, and Nashua locations. There were foliar disease differences between the fungicide treatments and the untreated control at the Ames location (Table 5) and insecticide treatments and the untreated control at the Sutherland location (Table 2). The two most predominant diseases found were Septoria brown spot and frogeye leaf spot.

Septoria brown spot did not move into the upper canopy before R6 at any of the six locations, thus it likely had minimal impact on yield. The average severity in the untreated control in the lower canopy was less than 3.5 percent at all locations except Nashua (7.5%) and Ames (6.6%). At both of these locations, fungicides reduced brown spot severity in the lower canopy, but again, disease probably had minimal impact on yield.

Frogeye leaf spot was found in a few locations, but was greater than 1 percent severity in the untreated control at only the Ames location (4.9%). All fungicides significantly reduced frogeye severity (averaged 1.1%). As expected, insecticides alone did not have any effect on frogeye leaf spot severity (averaged 5.2% severity). There were no significant differences in disease control between fungicide products.

Soybean aphids averaged 320 aphids/plant at the Sutherland location, which exceeded the economic threshold of 250/plant. Aphids did not reach the threshold at any other location. At Sutherland, the IPM insecticide and insecticide + fungicide treatments were

applied at the R4 growth stage on August 3, which was 13 days after the R3 application. IPM treatments were not applied at the other five locations.

Seed moisture ranged from 8 to 11 percent depending on the location, but did not differ more than a few tenths of a percentage among treatments within any location.

Yield varied across locations ranging from 39.4 to 75.9 bushels/acre in the untreated control (Tables 2–7).

The results of this experiment illustrate the benefits of foliar fungicide and insecticide applications for the management of foliar diseases and insects. There were very small amounts of foliar disease across the state of Iowa in 2011 due to high heat and low rainfall amounts in July and August. Also, this was a moderate soybean aphid year across much of the state. At the four locations with very low insect populations and disease severity, there were no significant yield responses to either insecticides or fungicides. However, at the Ames location, fungicides reduced frogeye leaf spot in the upper canopy and the largest yield responses to fungicides were at this location (Table 5). Also, only one of the six locations (Sutherland) reached the threshold level to spray aphids and this was the only location where all insecticides had significant responses to insecticides (Table 2).

Using foliar fungicides and insecticides is an effective way to prevent yield losses to foliar diseases and insect pests. Also, only applying pesticides when needed can reduce overall production costs and preserve product efficacy for when severe outbreaks do occur.

Table 1. Variety, planting date, application date, and harvest date for six fungicide and insecticide trials.

	Variety	Planting date	Application date	Disease assessment date	Harvest date
Sutherland	Pioneer 92M32	May 17	July 21	August 23	October 10
Kanawha	Legend 2279	May 10	July 25	August 25	September 29
Nashua	Pioneer 92Y51	May 18	August 4	August 24	October 6
Ames	Asgrow 2531	May 19	August 1	August 30	October 7
Crawfordsville	Pioneer 93Y40	May 12	August 1	August 23	October 6
Lewis	Pioneer 93M11	May 17	August 1	August 23	October 5

Table 2. Treatments and rates of products evaluated for management of foliar disease and yield response at Sutherland, IA in 2011.

Treatment	Rate (oz/ac)	Septoria brown spot severity (%)[b]	Moisture (%)	Yield (bu/A)
Untreated control	---	1.1	8.6	49.9
Stratego YLD	4	1.0	8.7	50.6
Priaxor	4	1.1	8.8*	53.0*
Domark	5	0.7	8.6	49.2
Leverage[a]	3.67	0.5*	8.6	60.5*
Fastac	3.2	0.7	8.6	59.9*
Asana	4	0.7	8.7	56.2*
Leverage[c]	3.67	1.0	8.8*	62.0*
Stratego YLD + Leverage[a]	4 + 3.67	0.5*[v]	8.8*	61.2*[v]
Priaxor + Fastac	4 + 3.2	0.5*[v]	8.8*	59.1*[v]
Domark + Asana	5 + 4	0.8	8.8*	56.5*[v]
Stratego YLD + Leverage[c]	4 + 3.67	0.6*	8.7	61.8*
Overall LSD (0.05)	---	0.5	0.2	1.9
CV (%)	---	43.8	1.5	2.3

[a]Applied with COC one percent v/v.
[b]Septoria brown spot severity was estimated from 20 leaves in the lower canopy.
[c]IPM, sprayed R4 (8/3) when aphids reached 320/plant.
*Significantly different from untreated control.
[v]Significantly different from fungicide alone equivalent.

Table 3. Treatments and rates of products evaluated for management of foliar disease and yield response at Kanawha, IA in 2011.

Treatment	Rate (oz/ac)	Septoria brown spot severity (%)[b]	Moisture (%)	Yield (bu/A)
Untreated control[c]	---	3.0	10.8	39.4
Stratego YLD	4	0.9*	10.9	44.0
Priaxor	4	1.2*	10.9	39.6
Domark	5	1.6*	10.8	40.6
Leverage[a]	3.67	2.4	10.9	40.4
Fastac	3.2	2.2	10.8	38.8
Belay	4	1.6*	10.9	41.9
Stratego YLD + Leverage[a]	4 + 3.67	0.9*	10.9	41.3
Priaxor + Fastac	4 + 3.2	1.3*	10.8	39.3
Domark + Belay	5 + 4	1.7*	10.9	38.8
Overall LSD (0.05)	---	1.2	NS	NS
CV (%)	---	45.7	0.7	13.6

[a]Applied with COC one percent v/v.
[b]Septoria brown spot severity was estimated from ten leaves in the lower canopy.
[c]Aphid threshold never met, IPM treatments acted as controls.
*Significantly different from untreated control.
NS = not statistically significant.

Table 4. Treatments and rates of products evaluated for management of foliar disease and yield response at Nashua, IA in 2011.

Treatment	Rate (oz/ac)	Septoria brown spot severity (%)[b]	Moisture (%)	Yield (bu/A)
Untreated control	---	7.5	11.0	68.4
Stratego YLD	4	5.2*	11.1	67.9
Priaxor	4	4.7*	11.0	68.3
Domark	5	5.9*	10.9	67.9
Evito	2	5.7*	11.0	70.4
Leverage[a]	3.67	6.3	10.7	68.6
Fastac	3.2	5.8*	11.1	68.5
Belay	4	5.9*	11.0	69.2
Warrior II	1.92	6.1	10.8	68.1
Stratego YLD + Leverage[a]	4 + 3.67	5.3*	10.9	68.7
Priaxor + Fastac	4 + 3.2	5.2*	11.2	67.8
Domark + Belay	5 + 4	6.9	10.9	66.6
Warrior II + Headline	1.92 + 6	5.3*	10.9	68.0
Overall LSD (0.05)	---	1.6	NS	NS
CV (%)	---	18.8	2.9	5.0

[a]Applied with COC 1 percent v/v.
[b]Septoria brown spot severity was estimated from 20 leaves in the lower canopy.
*Significantly different from untreated control.
NS = not statistically significant.

Table 5. Treatments and rates of products evaluated for management of foliar disease and yield response at Ames, IA in 2011.

Treatment	Rate (oz/ac)	Frogeye leaf spot severity (%)[b]	Septoria brown spot severity (%)[b]	Moisture (%)	Yield (bu/A)
Untreated control	---	4.9	6.6	9.31	52.3
Stratego YLD	4	0.5*	5.4*	9.28	60.3*
Priaxor	4	1.2*	5.0*	9.29	62.3*
Domark	5	1.4*	5.4	9.30	63.2*
Leverage[a]	3.67	4.6	5.4	9.29	60.2*
Fastac	3.2	5.2	6.9	9.29	56.0
Belay	4	5.7	6.9	9.29	55.6
Stratego YLD + Leverage[a]	4 + 3.67	0.6*[o]	4.5*	9.34[vo]	65.2*
Priaxor + Fastac	4 + 3.2	0.8*[o]	4.6*[o]	9.34[o]	63.3*[o]
Domark + Belay	5 + 4	2.2*[o]	5.4[o]	9.29	60.3*
Overall LSD (0.05)	---	1.9	1.2	NS	5.8
CV (%)	---	55.0	17.1	0.38	7.6

[a]Applied with COC 1 percent v/v.
[b]Frogeye leaf spot severity was estimated from 20 leaves in the upper canopy from each plot; Septoria brown spot from 20 leaves in the lower canopy.
*Significantly different from untreated control.
[v]Significantly different from fungicide alone equivalent.
[o]Significantly different from insecticide alone equivalent.
NS = not statistically significant.

Table 6. Treatments and rates of products evaluated for management of foliar disease and yield response at Crawfordsville, IA in 2011.

Treatment	Rate (oz/ac)	Septoria brown spot severity (%)[b]	Moisture (%)	Yield (bu/A)
Untreated control[c]	---	3.4	6.7	63.0
Stratego YLD	4	3.3	6.8	62.5
Priaxor	4	3.6	6.7	67.8
Domark	5	3.7	6.7	65.2
Leverage[a]	3.67	4.0	6.7	66.6
Fastac	3.2	3.2	6.8	65.6
Belay	4	3.0	6.8	64.7
Stratego YLD + Leverage[a]	4 + 3.67	2.9	6.7	66.9
Priaxor + Fastac	4 + 3.2	2.4	7.0	71.0
Domark + Belay	5 + 4	4.1	6.8	65.0
LSD (0.05)	---	NS	NS	NS
CV (%)	---	43.2	3.1	6.1

[a]Applied with COC 1 percent v/v.
[b]Septoria brown spot severity was estimated from 10 leaves in the lower canopy.
[c]Aphid threshold never met, IPM treatments acted as controls.
NS = not statistically significant.

Table 7. Treatments and rates of products evaluated for management of foliar disease and yield response at Lewis, IA in 2011.

Treatment	Rate (oz/ac)	Septoria brown spot severity (%)[b]	Moisture (%)	Yield (bu/A)
Untreated control[c]	---	1.7	9.3	75.9
Stratego YLD	4	2.4	9.4	77.5
Priaxor	4	1.3	9.0	75.0
Domark	5	1.4	9.1	75.4
Leverage[a]	3.67	2.4	8.9	79.5
Fastac	3.2	2.6	9.2	77.0
Belay	4	2.1	9.3	75.6
Stratego YLD + Leverage[a]	4 + 3.67	1.0	9.2	77.8
Priaxor + Fastac	4 + 3.2	1.2	8.8	77.3
Domark + Belay	5 + 4	1.5	9.2	76.5
LSD (0.05)	---	NS	NS	NS
CV (%)	---	66.3	6.1	4.5

[a]Applied with COC 1 percent v/v.
[b]Septoria brown spot severity was estimated from 10 leaves in the lower canopy.
[c]Aphid threshold never met, IPM treatments acted as controls.
NS = not statistically significant.

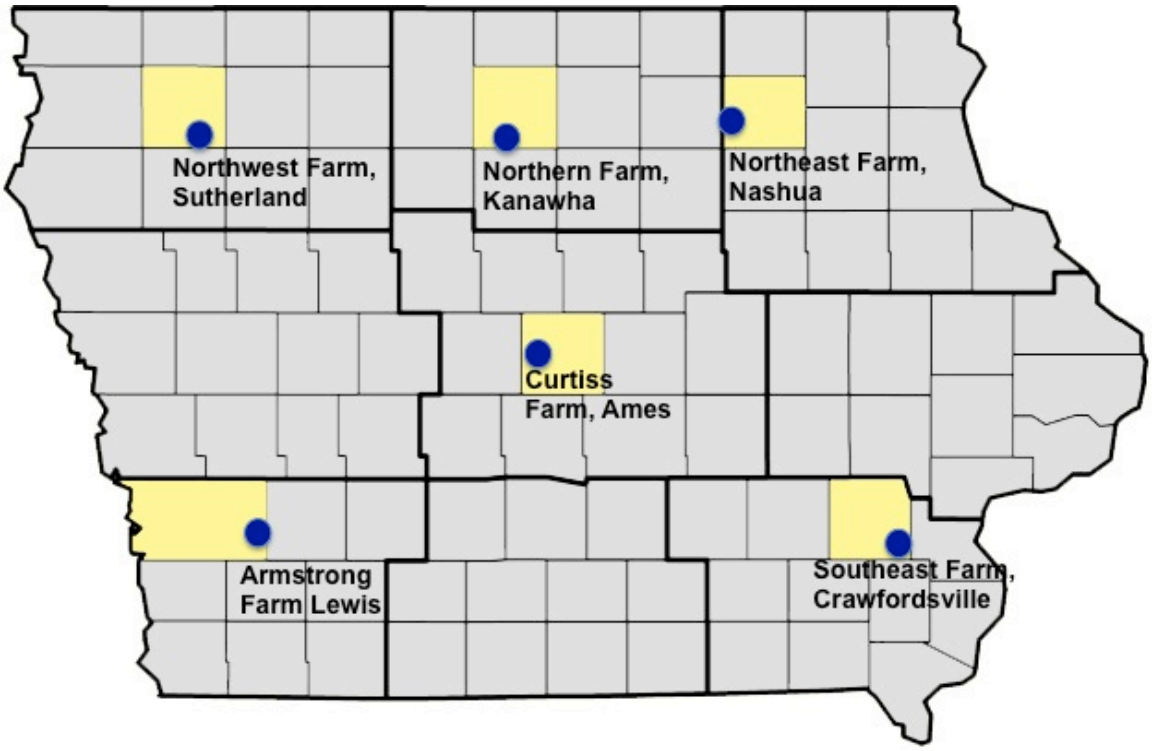

Figure 1. Iowa field locations for the 2011 soybean fungicide and insecticide study.