

Interaction Between Seed Treatment and Variety on Sudden Death Syndrome Symptoms and Soybean Yield

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Summary

Sudden Death Syndrome (SDS) is a soybean disease that perennially limits yields in the Kansas River Valley (KRV). The presence of soybean cyst nematode (SCN) and saturated soils has been implicated in contributing to the severity of the disease. Selecting varieties with some degree of tolerance to SDS has been the primary cultural practice to reduce yield loss to SDS. Another tool to reduce yield loss to SDS has been made available to growers with the release of ILeVO seed treatment from Bayer CropScience (Research Triangle Park, NC). The potential benefit of ILeVO on varieties with different levels of tolerance to SDS was examined in a study conducted at the Kansas River Valley Experiment Field in 2015. Five different soybean varieties that varied in tolerance to SDS were planted, with and without the ILeVO seed treatment. The study was irrigated as required for production. The SDS severity was less than previous years, with the most severely infested plots at just a little more than 20% of the leaf area expressing symptoms of SDS by the R6 growth stage. Treatments with ILeVO reduced the severity of SDS more and the yield increase was greater, up to 6 bu/a with varieties more susceptible to SDS.

Introduction

The fungus *Fusarium virguliforme*, which infects plants through the roots, primarily before they start to flower, causes soybean SDS. Foliar symptoms generally begin to show up as interveinal chlorosis and necrosis in the leaves at growth stage R3, after the seed has started to develop in the pods.

An interaction between SDS and SCN has been reported, and SCN is prevalent in the soils of the Kansas River Valley. Saturated soils have also been implicated as contributing to the development of SDS. Depending on how early the symptoms begin to be visible and the symptoms' severity, yield losses can be very significant. In severe cases, plants in which the symptoms begin early (i.e., before seed development stage) can fail to produce any seed.

SDS has been a perennial problem in the Kansas River Valley, causing severe yield reductions in soybean to the point that the crop cannot be profitably produced in some fields. Crop rotations and tillage have had little effect on reducing the severity of the disease and reducing the subsequent yield loss. No soybean varieties are totally resistant

to the fungus, but some varieties have varying degrees of tolerance that can reduce yield losses. Irrigating soybean at the wrong time also could increase the severity of SDS, further complicating the production in the Kansas River Valley, where irrigation is often necessary to produce a profitable crop.

ILeVO seed treatment is another tool to increase soybean productivity in fields infested with SDS that was made available to growers for the first time in 2015. This seed treatment has been shown to decrease severity of foliar symptoms of SDS and increase yields in previous work conducted at KRV.

This study was to compare the interaction between varieties with varying degrees of tolerance to SDS and the ILeVO seed treatment. It is not known if the response to ILeVO seed treatments is consistent across all varieties or relates to the severity of the disease within each variety.

Procedures

Soybean were planted into a field with a history of SDS at the Rossville Unit of the Kansas River Valley Experiment Field in 2015. Bayer applied seed treatments to soybean varieties with varying levels of tolerance to SDS. The treatments included ILeVO in combination with other seed treatment products, and a check with the other products alone. The soybean were planted May 4 at 140,000 seeds/a into 10- × 30-ft plots, with four replications in a randomized complete block design. The soil was Eudora silt loam, and the previous crop was corn. Rainfall was greater than normal, receiving 10.28 in., May; 6.89 in., June; 8.81 in., July; and 3.28 in., August. A single irrigation of 0.7 in. occurred on August 31. Preemergent herbicide applied at planting was Authority Maxx (FMC Corporation Agricultural Products Group, Philadelphia, PA) (5 oz), Dual II Magnum (Syngenta Crop Protection, LLC, Greensboro, NC) (1.5 pt), and Liberty (Bayer) (32 oz). Postemergent herbicide was Roundup PowerMax (Monsanto Company)(22 oz), Outlook (BASF Corporation, Research Triangle Park, NC) (32 oz). Foliar symptoms of SDS were rated weekly starting August 6, when the soybean were at the R4 (pods full length) to R6 (full seed) growth stages on Sept. 1. Ratings were based on incidence and severity of the symptoms. An area under the disease progress curve (AUDPC), a unitless number describing the development of defoliation effects over time, was derived by plotting periodic measurements of disease over time and integrating the area under the disease curve. The plots were harvested October 7, 2015.

Results

As the susceptibility of varieties to SDS increased, the positive yield response to the ILeVO seed treatment increased (Table 1). The varieties with the greatest difference in disease rating due to the seed treatment had the greatest yield response. While there was very little SDS in the more tolerant varieties this year, this shows there is a distinct yield advantage to the seed treatment in the more susceptible varieties. It would be expected that in years that are more favorable for SDS, and more tolerant varieties develop more symptoms of SDS, the yield increase due to the seed treatment would be greater in those varieties.

Sudden Death Syndrome was not as severe as observed in previous years. The variety most susceptible to SDS in this study had just over 20% of the leaf area with symptoms of SDS at R6, and AUDPC just over 500 (Table 1). This is much lower than previous years, which had 80 to 90% of the leaf area with symptoms at R6 and AUDPC over 800 on susceptible varieties. The more tolerant varieties had very little SDS, and as a result had a yield response of about 1 bu/a. The more susceptible varieties had significant yield responses to the ILeVO seed treatment with yield increases up to 5.7 bu/a (Table 1).

It is not clear why SDS was not as severe as in the past. Generally, saturated soils, especially prior to bloom, have been associated with increased severity of SDS. Perhaps the prolonged saturation of the soil affected the survival of the fungus in the soil or its ability to infect the roots, or the role of SCN in the SDS infection process was reduced. This study shows that even with low levels of SDS symptoms, the ILeVO seed treatment can show a yield response.

Table 1. Influence of seed treatment for Sudden Death Syndrome on yield of soybean varieties with ranges of tolerance to SDS, Kansas River Valley Exp. Field, 2015

Variety	Yield		Yield advantage with ILeVO	SDS severity (pct leaf area @R6)		SDS severity (AUDPC)	
	Without ILeVO ¹	With ILeVO		Without ILeVO	With ILeVO	Without ILeVO	With ILeVO
	----- bu/a -----						
A	67.7	69.5	1.8	1.2	1.2	17	13
B	58.0	58.6	0.6	2.3	2.3	56	34
C	57.1	59.2	1.9	4.7	1.2	45	16
D	60.7	64.5	3.8	20.0	11.2	518	102
E	55.4	61.1	5.7	21.1	4.7	345	94
LSD 0.10	4.2			8.1		94	

¹ Bayer CropScience (Research Triangle Park, NC).