

MISSISSIPPI SOYBEAN PROMOTION BOARD

SUDDEN DEATH SYNDROME OF SOYBEAN

In a previous blog on this website, a link to a Nov. 2015 PMN article entitled “[First Report of Sudden Death Syndrome \(SDS\) of Soybean Caused by *Fusarium virguliforme* in Louisiana](#)” was provided. In this article, Louisiana State University scientists and specialists provide a detailed account of their confirmation of the first-reported presence of SDS in Louisiana soybeans.

[SDS has been increasing in Midsouth soybeans in recent years](#), and was a major yield-limiting disease in Missouri and Tennessee in 2014. Its now-confirmed presence in Louisiana indicates that this disease may become a major soybean pest in the more southern Midsouth states in coming years.

Details about this disease, pictures of soybean foliage and roots that show infection symptoms, and management practices for its avoidance and/or control can be found in the below linked articles. If/when this disease becomes a major pest in the lower Midsouth states, information in this White Paper and in the below articles should be consulted and used as a guide for its management.

[Sudden Death Syndrome of Soybean](#), by Westphal, Abney, Xing, and Shaner (APS)

[Sudden Death Syndrome](#) (NCSRP)

[Sudden Death Syndrome in Soybean](#), by Kelly (UTCrops News Blog)

[Sudden Death Syndrome](#), by Westphal, Xing, Abney, and Shaner (Purdue Extension)

[Sucker Punch SDS](#), by Unglesbee (Progressive Farmer)

A compilation of the major points in the above resources follows.

- SDS is a fungal disease that also occurs in a disease complex with soybean cyst nematode (SCN). When SDS occurs in the presence of SCN, disease symptoms occur earlier and are more severe. In fact, a soybean variety susceptible to both pathogens will be damaged more than by either pathogen alone. Thus, if both SCN and SDS are present in a field, a management strategy to control both pests is imperative.
- SDS is caused by the soil-borne fungus *Fusarium virguliforme*.
- The SDS pathogen survives between soybean crops as spores in crop residue and in the soil.
- The pathogen likely infects roots of soybean seedlings soon after planting, but SDS is not usually detectable on plant foliage until after beginning of flowering.
- The fungus produces toxins in the roots that are translocated to the leaves.
- Plants with advanced foliar symptoms of SDS will also display root symptoms since SDS causes root rot.
- SDS is diagnosed by symptoms on both leaves and roots of soybean.

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- High soil moisture increases the severity of the disease. The disease tends to be most severe on well-managed soybeans with a high yield potential as a result of irrigation.
- Fields that develop SDS likely will have the disease during subsequent years.
- No crop rotation appears to significantly reduce SDS. In particular, the common corn-soybean yearly rotation does not reduce the incidence and severity of SDS.
- The extent of yield loss due to SDS depends on the severity and timing of the disease expression. When the disease develops early in the season, flowers and young pods will abort. When the disease develops later, soybean plants will have fewer seeds per pod or smaller seeds.
- Varieties that are less susceptible to SDS are available, but no highly resistant varieties are available. Thus, it is critical that producers with SDS-infested fields determine the SDS-susceptibility level of chosen varieties to ensure that the most resistant varieties are grown on those fields. Click [here](#) for ratings from the University of Tennessee soybean variety trials.
- Foliar fungicides do not control the disease.
- Variety selection is the main management tool against SDS effect.

Bayer CropScience has developed [ILeVO](#) seed treatment (active ingredient fluopyram—Group 7 Fungicide) that can suppress early-season infection by *Fusarium virguliforme*. It was first available for use on crops in 2015.

[Results from research](#) conducted by Kansas State University scientists in 2013 and 2014 in fields with a long history of SDS show that using ILeVO seed treatment can alleviate the effects of SDS. To better understand and interpret the below results, realize that the ILeVO label states that the application rate for SDS control is 0.15–0.25 mg/seed, while the application rate for control of soilborne nematodes is 0.075–0.25 mg/seed.

Data in Table 1 indicate the following.

- ILeVO applied to seed at 0.075 mg/seed (lowest labeled rate for nematode control) along with Poncho/VOTiVO (insecticide/nematicide seed treatment) resulted in a yield that was greater than that from the Pancho/VOTiVO alone treatment. Thus, a lower-than-labeled rate of ILeVO added to Poncho/VOTiVO increased yield.
- ILeVO applied to seed at 0.075 mg/seed along with Poncho/VOTiVO resulted in a yield that was similar to that from applying ILeVO at the 0.15 mg/seed (lowest labeled rate for SDS control).
- SDS severity in response to ILeVO followed the same pattern as yield response.

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Table 1. Influence of ILeVO seed treatment for SDS on yield of SDS-resistant soybean variety Stine 43RE02 (MG 4.3) at the Kansas River Valley Expt. Field–Rossville, 2014.

Seed treatment*	Yield <i>bu/acre</i>	SDS severity <i>% leaf area at R6</i>
Poncho/VOTiVO check	47.4	52
ILeVO (0.15 mg/seed) + Poncho/VOTiVO	59.6	16
ILeVO (0.075 mg/seed) + Poncho/VOTiVO	57.0	31
Gaucho 600 check	54.0	25
ILeVO (0.15 mg/seed) + Gaucho 600	57.2	16
ILeVO (0.075 mg/seed) + Gaucho 600	57.1	7
LSD (0.05)	3.7	22.9

*ILeVO: 0.15 mg/seed is lowest label rate for SDS; 0.075 mg/seed is lowest label rate for soilborne nematodes.

*Poncho (clothianidin)/VOTiVO (*Bacillus firmus*—a biological seed treatment that provides early-season protection against certain nematode species) is a combination insecticide/nematicide seed treatment.

*Gaucho 600 (imidacloprid) is an insecticide seed treatment.

Click [here](#) for source by Adee, Jardine, Schapaugh, and Todd.

Data in Table 2 indicate the following.

- Adding ILeVO at the lowest (0.15 mg/seed) and highest (0.25 mg/seed) labeled rates for SDS control resulted in significant yield increases in soybean varieties with three levels of SDS resistance/susceptibility. However, using the highest vs. lowest rate increased yield significantly only in the susceptible variety.
- SDS severity in response to ILeVO in the varieties with the three levels of resistance/susceptibility followed the same pattern as yield response.

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Table 2. Influence of soybean variety and seed treatment on SDS at the Kansas River Valley Expt. Field–Rossville, 2013.

Seed treatment*	Soybean varieties					
	Most resistant	Moderately resistant	Susceptible	Most resistant	Moderately resistant	Susceptible
	<i>Yield (bu/acre)</i>			<i>SDS severity (% leaf area at R6)</i>		
None	28.6	29.2	21.3	18	44	63
ILeVO (0.25 mg/seed)	41.6	39.7	37.4	4	28	45
ILeVO (0.15 mg/seed)	42.9	41.0	26.2	5	28	72
LSD (0.05)	8.3			17.4		

*ILeVO rates: 0.15 - 0.25 mg/seed label rate for SDS.

Click [here](#) for source by Adee, Jardine, Schapaugh, and Todd.

Since ILeVO is a relatively new product, results from research with it are limited. It is likely that not all instances of using ILeVO will result in the magnitude of yield increases seen in the above Kansas studies. Therefore, it is recommended that soybean producers accurately calculate their SDS risk and potential losses because adding this seed treatment component will likely cost an additional \$11 to \$13 per acre.

Iowa State University researchers (Zhang, A. Singh, Mueller, and A.K. Singh) conducted [studies](#) to identify genes and marker-assisted selection approaches that can be used by breeders

to develop soybean lines with resistance to SDS. The end result of this endeavor is to provide plant breeders the tools to identify the genetic basis for host plant resistance to SDS in soybean so that resistant varieties can be developed and released. Details of this research are published in an article entitled “Genome-wide association and epistasis studies unravel the genetic architecture of sudden death syndrome resistance in soybean” in *The Plant Journal* (2015) **84**, 1124-1136.

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