



Courtesy of Jason Bond, Southern Illinois University

- 1 Watch for foliar symptoms**
(Foliar symptoms appear early as well as late in the season.)
- 2 Split stems to determine if SDS or BSR**
(If the center of stem is brown it is BSR. If white, it is SDS.)
- 3 Dig roots to determine if SDS or BSR**
(Look for blue colored structures, indicative of Fusarium.)
- 4 SDS symptoms appear earlier than BSR**

For soybean growers, the one advantage of sudden death syndrome (SDS) is that it causes foliar symptoms," says Jason Bond, plant pathologist at Southern Illinois University. "So unlike soybean cyst nematode (SCN), at least you can see there's a problem."

Symptoms of SDS include interveinal necrosis and chlorosis (brown or yellow spots on leaves), and sudden leaf drop with petiole retention.

"Unfortunately, SDS looks very similar to brown stem rot (BSR)," says Dean Malvick, University of Minnesota Extension pathologist.

"Differentiating between SDS and BSR can be a challenge," says Shawn Conley, Extension soybean specialist at the University of Wisconsin (UW). "Just because you live in Wisconsin doesn't mean it's BSR, and just because you live in Illinois or southern Iowa doesn't mean it's SDS."

Split stems, dig roots

Conley says if you're not sure whether it's BSR or SDS, "The first thing to do is split some stems. If the center of the stem is brown it's BSR. If it's white it's SDS."

Conley's colleague, UW Plant Pathologist Paul Esker, advises growers to dig out a few roots and look for a blue coloration on the roots. "That blue hue from SDS is distinctive," he says.

Why the blue color? Because the fungus that causes SDS, *Fusarium virguliforme*, is blue.

SDS symptoms appear early

"We expect to see SDS symptoms earlier than BSR symptoms, which generally appear in the late reproductive stages," Esker says. "If you see foliar symptoms in the late flowering to early reproduction stage, you may be looking at SDS."

But here's where it gets tricky. "Depending on the timing of the initial foliar symptoms, we're wondering if it might be both SDS and BSR," Esker explains. "In Wisconsin fields with a history of SDS, students are checking to see if we can detect both BSR and SDS fungal pathogens."

SDS and BSR

In greenhouse studies, Esker has been coinoculating soybean plants with SDS and BSR. "We think there's interaction occurring," he continues. "We see symptom expression and disease severity earlier."

Malvick says there are plenty of Minnesota fields infected with both BSR and SDS. "We have confirmed in Minnesota fields that a single plant can be infected by both SDS and BSR."

If you see SDS, test for SCN

Because of the association between SCN and SDS, "If you're seeing SDS symptoms, make sure you get those fields tested for cyst," Esker adds.

According to Iowa State University Plant Pathologist Leonor Leandro, "We know the interaction between SDS and SCN exists. We just don't understand the mechanisms behind it."

Clean corn harvest

Research shows that corn is a good crop for harboring the SDS pathogen, especially corn kernels. This is consistent with producers' observations that severe outbreaks of SDS can occur after a few years of continuous corn. A clean corn harvest may help reduce the risk of SDS, while a high amount of harvest loss increases your risk of SDS the next time you plant soybeans.



Brown stem rot infected stems will appear chocolate brown in the center (left). The center of SDS infected plants will be white (right).



SDS infected roots may have a blue hue because of the presence of blue colored fungal masses.

"The SDS fungus may be taking advantage of wounds on the roots caused by SCN," suggests Leandro. But the fungus also can affect the plant on its own, so it may be a plant response. "Perhaps SCN infection triggers a reduction in the plant's resistance, which allows the SDS fungus to grow faster, colonize roots better and produce more toxins," she continues.

Leandro's team is also studying whether the feeding sites of the nematode facilitate fungal infection. "Feeding near the vascular system might help the fungus to penetrate the xylem," she says. "Roots have natural barriers to pathogen invasion that may be disrupted by the nematode feeding. We know nematodes feed more outside the root vascular cylinder in wetter soils. In dry soils, they feed more inside the vascular cylinder of the root."



Courtesy of National Corn Growers Association