

WHAT HIDDEN THREATS ARE AFFECTING YOUR YIELD?



PHYTOPHTHORA

The #1 disease that suppresses soybean yields.

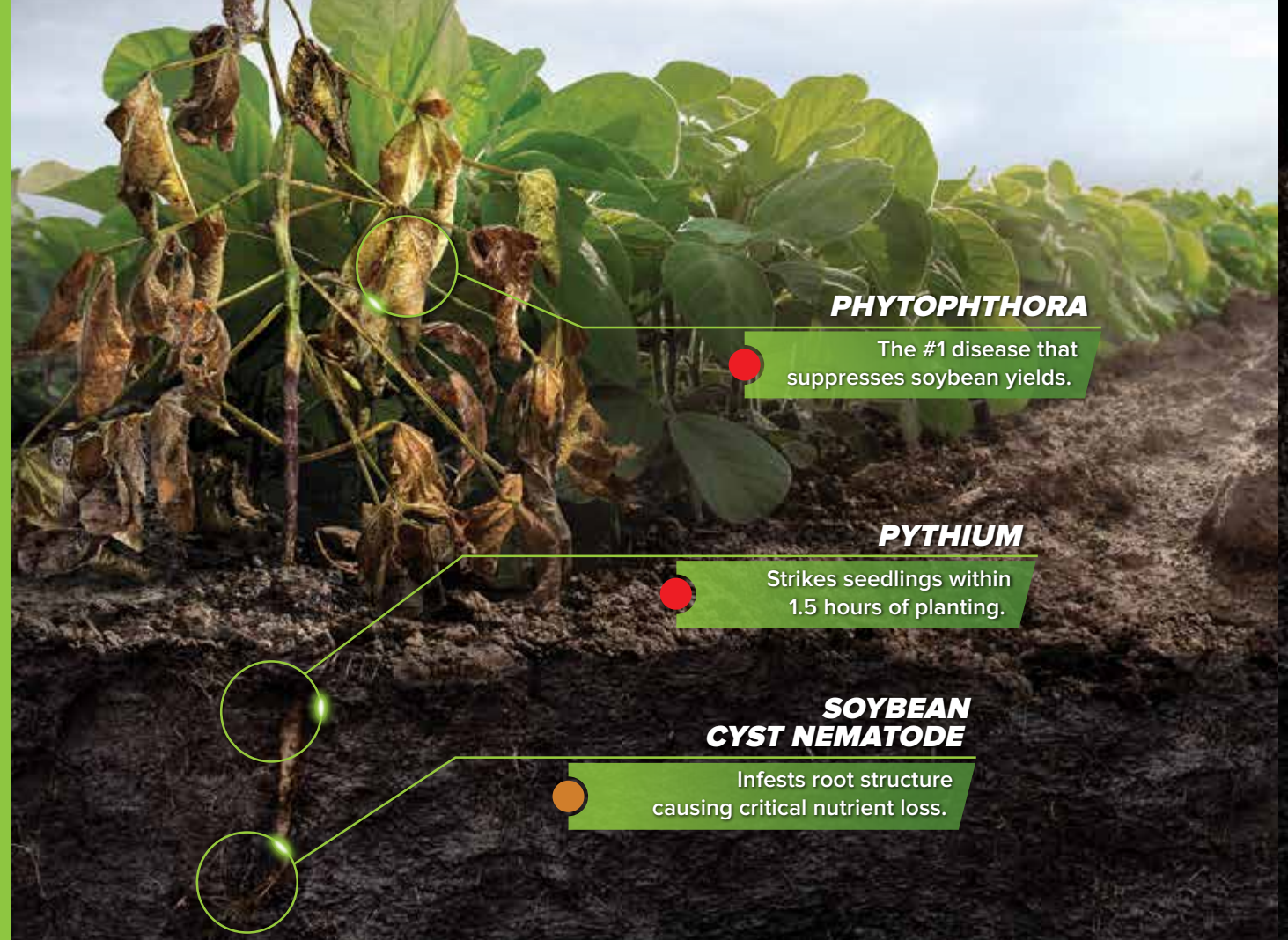
PYTHIUM

Strikes seedlings within 1.5 hours of planting.

FIGHT PYTHIUM AND PHYTOPHTHORA

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POWERFUL SOYBEAN PROTECTION ONE COMPLETE SOLUTION



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SOYBEAN CYST NEMATODE

Infests root structure causing critical nutrient loss.



Fight Pythium, Phytophthora and Soybean Cyst Nematode with a combination defense.

Aveo™ EZ Nematicide is a powerful defense against Soybean Cyst Nematode and works in tandem with INTEGO® SUITE Soybeans to provide complete protection from hidden, quick-spreading diseases that can threaten yield. **Find out more at soybeanprotection.com.**

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Getting to the Root of the Matter

A Hidden Threat

A clean soybean field is something that brings pride to many farmers. Doing everything to keep those rows neat by reducing weed and pest pressure helps ensure a strong harvest. However, even in the cleanest fields, there can be threats to yield below the surface that attack the roots of the plant. With tight margins and commodity prices remaining low, it's important to identify and address these hidden threats to get the most out of each acre.

Farmers today are using better technologies to improve soybean production and quality. Protecting the plant from unseen threats like Soybean Cyst Nematode (SCN), *Pythium* and *Phytophthora* requires a management plan that can help turn yield potential into yield results.

GET TO THE ROOT OF THE MATTER

SOYBEAN CYST NEMATODE

Infests root structure causing critical nutrient loss.



STOP SOYBEAN CYST NEMATODE



Soybean Cyst Nematode

Soybean Cyst Nematode (SCN) is present in soybean fields across 30 states and causes about \$1.5 billion in economic loss to U.S. soybean farmers annually. This microscopic roundworm is virtually invisible to the naked eye and attacks soybean roots, reducing the plant's ability to utilize nutrients.

SCN females form cysts after completing their life cycle, and these cysts contain eggs. When eggs hatch, the worm-shaped juveniles immediately seek to enter plant roots and begin feeding.

"After penetrating the soybean roots, juveniles move through the root until they contact vascular tissue in the center of the root," said Professor of Plant Pathology Greg Tylka, Iowa State University Extension. "There, they stop and start to feed. The nematode injects secretions that modify soybean root cells. This turns them into specialized feeding cells for the nematode."

SCN can go through three to five generations per season, each able to damage root systems. Affected plants cannot use nutrients and water efficiently, resulting in stunted plants with chlorotic foliage, nodule reduction and fewer nitrogen-fixing bacteria (see Figure 1).

SCN can be hard to detect. If there are low SCN populations, aboveground symptoms may not be present and crops may appear normal. As SCN numbers increase, plants may begin to show physical symptoms and yield impact will increase.

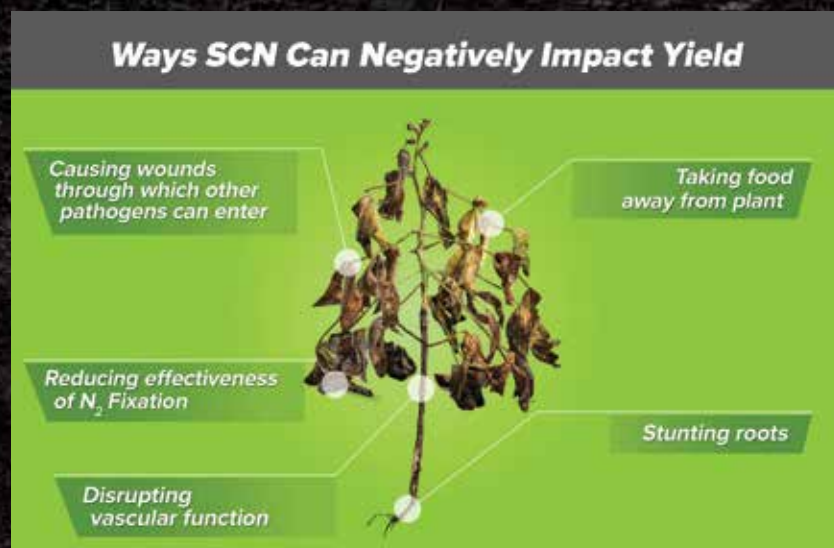


Figure 1

Lost Yields

Pythium, *Phytophthora* and SCN infestations can eat away at soybean yields and margins. SCN damage can reduce a would-be bumper crop significantly depending on the severity of infestation. As an example, a moderate infestation that reduced yields by 10 percent in a 50 bushel acre would translate to a 5 bushel loss. With soybean prices at \$9 to \$10 per bushel, that's \$40 to \$50 in lost revenue on one acre alone. That approaches \$5,000 lost per 100 acres of infested beans. And yield losses can go even higher.



"SCN can reduce the number of nodules formed by beneficial nitrogen-fixing bacteria that are necessary for optimum soybean growth," said Dr. Tylka. "Yield loss will increase as the infection of roots by SCN increases. Yield loss of 30 to 40 percent can occur even without aboveground visual symptoms."

Scouting For SCN: A Whole-Field Approach

With the threat of high yield loss, scouting for SCN is a must. Dr. Tylka notes that by using a shovel to uproot one plant, growers can often identify infested roots. The SCN adult female swells to a lemon shape as it matures and can be seen on roots.

"Carefully observing soybean roots for SCN females is a good way to check fields for infestations that have not yet been discovered," he said. "It also is an effective way to assess how well SCN-resistant soybean varieties are controlling nematode reproduction in fields known to be infested with SCN. There should not be many SCN females on the roots of a resistant variety if the variety is effectively controlling the nematode."

Soil Test in Fall or Winter

With the difficulty in visually determining SCN infestation and the little that can be done once plants are infested, pathologists recommend detailed soil testing. The University of Missouri (UM) Department of Plant Pathology says the best time to take soil

samples for SCN is when nematode levels are normally highest and easier to detect: in the fall, right after harvest or before soybeans are planted the following spring.

Soil should be collected over the entire field to obtain an accurate assessment. UM Plant Pathology says large fields should be subdivided into 10-acre sections. If possible, accumulate samples that represent the top 8 in. of soil in the crop row root zone. Using a shovel or soil probe, take from 10 to 20 subsamples per section in a zigzag pattern. When sampling is completed, blend subsamples and send a pint-size composite sample from each section to a nematode test laboratory.

Management: Getting Back on Solid Ground

A good management strategy is key to helping mitigate the hidden threats of SCN, *Pythium* and *Phytophthora*. Strategies include planting SCN-resistant varieties, crop rotation and using proven seed fungicide treatments and nematicides.

"The number of SCN in a field can be reduced through proper management, but it is impossible to eliminate SCN from your field once it has become established," Dr. Tylka said. "Growers should choose appropriate management practices in order to continue profitable soybean production."

Soybean Cyst Nematode (SCN) is present in soybean fields across 30 states and causes about \$1.5 billion in economic loss to U.S. soybean farmers annually.

SCN-resistant varieties can minimize reproduction, slow the build-up of SCN population densities in the soil and even produce profitable soybean yields in SCN-infested fields.

Dr. Tylka notes that SCN populations are developing the ability to reproduce on SCN-resistant varieties containing PI88788 resistance genes. "Yields of SCN-resistant varieties will continue to decrease as SCN populations adapt and develop higher reproduction on varieties with these genes," he said.

A good crop rotation goes a long way toward getting back on solid ground. Crops that are non-hosts to SCN are needed in a rotation to help keep the infestation from growing and may even help to decrease it. Good options include corn, sorghum, sunflower and alfalfa.



A common rotation of soybeans, corn, soybeans will help control SCN.

Along with a non-host rotation, Iowa State University plant pathologists say good growing conditions can help reduce stress and yield losses caused by SCN. Good soil fertility is needed to optimize plant growth and development.

Plant stress is also reduced with extensive weed control. Some weeds are hosts for SCN and can add to infestation problems. Effective disease and insect control help promote plant health and minimize damage caused by SCN.

An increasing trend is the use of cover crops to build up soil nutrients and reduce soil and water erosion. Some growers have had success in using cover crops to manage SCN. But even though they can enhance soil fertility, Dr. Tylka said, "The usefulness of cover crops at reducing SCN numbers remains to be determined. The results published to date are inconsistent among years and among geographical locations."

Seed Protection

Seed protectants can help shield soybean seeds and seedlings from early disease, insect and nematode pressure. The fungicide protectants in INTEGO® SUITE Soybeans help guard young seedlings against *Pythium* and *Phytophthora*. By adding a nematicide such as new

Aveo™ EZ Nematicide to the INTEGO SUITE Soybeans base treatment, growers can protect their crop from SCN as well.

"INTEGO SUITE contains two fungicides, metalaxyl and ethaboxam, that have excellent activity against numerous species of *Pythium* and *Phytophthora*," said Plant Pathologist Alison Robertson of Iowa State University. "If seedbed conditions are poor, cool and wet, a seed treatment may protect early plant stands and negate the need for replanting."

A proven powerful defense against SCN is new Aveo EZ Nematicide. For convenience, it is available as a stand-alone product and can be added to any base seed treatment. Ease of mixing and quick-drying features help make it a reliable tool in managing destructive SCN.

"The low use rate of Aveo EZ makes it easy to add to INTEGO SUITE Soybeans for complete soybean protection," said Dair McDuffee, seed treatment specialist with Valent U.S.A. Additionally, this user-friendly system provides smooth flowability and a low use rate.

Seed protectants can help shield soybean seeds and seedlings from early disease, insect and nematode pressure.

Independent research shows how Aveo EZ added to INTEGO SUITE Soybeans provides excellent SCN control and helps produce high-yielding soybeans (see Figure 2).

To learn more about SCN, *Pythium* and *Phytophthora* control, or to contact your local Valent representative, visit <http://soybeanprotection.com>.

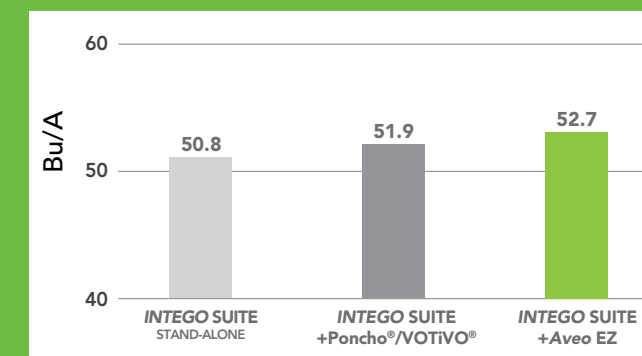


Figure 2



Pythium and Phytophthora

Pythium is a soilborne pathogen that is present in nearly all soybean fields and causes seedling rot and/or damping-off. There is a broad range of *Pythium* species, meaning the disease can be active at soil temperatures ranging from 32°F to 85°F. *Pythium* can infect within 1.5 hours of planting.¹

"*Pythium* is probably our No. 1 seedling pathogen, followed by *Fusarium*, then *Phytophthora* and *Rhizoctonia*," said Dr. Robertson.

"Based on research, one of the things we've learned is that *Pythium* is a lot more significant than we originally thought. Damage can be especially high during cool, wet springs, which favor infection of soybean seedlings by this pathogen."

Phytophthora thrives in wet conditions. It can inhibit nearly all phases of growth and damage seedlings and plants. This disease occurs most

commonly in heavy, wet clay soils with poor drainage and is often found in compacted areas of a field.

Phytophthora infection causes root rot and stem rot, leading to seedling decay and damping-off under warm, damp conditions. "This will likely lead to stunted plants, which are less vigorous and produce less pods and/or smaller seeds per pod and lower yields," said Dr. Robertson.

If severe enough, damage caused by *Phytophthora* can force growers to replant all or parts of fields, added costs that are likely not part of an already tight budget.

While symptoms of these diseases may be easy to spot, they are not necessarily easy to diagnose. Yellowing of leaves or weak stalks may mimic symptoms of herbicide damage or drought.

¹ Stanghellini ME and Hancock JG, 1971a