Managing disease in no-till soya beans

While no-till offers sustainability and cost benefits, the crops are nevertheless susceptible to several diseases. Dr Rikus Kloppers, senior manager: crop services with Pannar Seed, discussed these threats and how to manage them at the No-Till Club's 2014 conference. Lloyd Phillips reports.

**ABOVE:** Controlling Sclerotinia stem rot in soya beans requires integrated measures. COURTESY OF RIKUS KLOPPERS

**BELOW:** It is precisely the lack of tillage that makes no-till soya bean crops vulnerable to certain diseases. COURTESY OF PANNAR SEED

However, the Baker publication also points out that “such conditions” also encourage predators. “To date, no pest or disease problems have proved to be insurmountable or untreatable in long-term no-tillage systems.”

Kloppers agrees. “It shouldn’t sound as if no-till doesn’t work because of the particular disease threats that it faces.”

**NEW ENVIRONMENTS, NEW THREATS**

Traditionally, most of South Africa’s soya bean production has been in the cooler, wetter eastern half of the country. These environmental conditions favour the development of certain soya bean diseases, says Kloppers. However, as soya bean production gradually spreads...
westwards across the warmer, drier parts of the country, new soya bean pests and disease challenges will emerge there as well.

Various soya bean diseases attack the plants at specific growth stages, requiring no-till soya bean farmers to use specific control strategies at these stages. For example, seed treatment can protect soya bean seedlings. Then, as the seedling develops through its V2 to V4 growth stages, the farmer must control weed competition chemically.

From the V4 to R6 growth stages, he needs the appropriate chemical treatment to manage disease as well as bollworm threats.

YIELD LOSS ELSEWHERE

South Africa is not unique in losing soya bean yield to disease. A study by Doug Jardine, an agricultural extension specialist with the Kansas State University, found that soya bean producers in the USA lost an average of 11.1% in yield to disease between 2004 and 2013. Average annual soya bean yield in the USA during that decade was 3,114 billion bushels (84.76 million tons).

Were it not for this 11.1% loss, the country's average annual soya bean yield would have been 3,459 billion bushels (94.15 million tons), approximately 345 million bushels (9.4 million tons) per year more.

KNOW YOUR DISEASES

This yield loss to disease shows how important it is for farmers, crop scientists, extension officers and other role-players to have the knowledge, tools and motivation to effectively manage disease risk in CT soya bean production, says Kloppers.

"Breeding for a higher yield is a slow process, with a yield improvement of 1% to 2% in a year. But disease can negate this in a single season. Role-players must know each important soya bean disease and how to correctly tackle it for maximum benefit," he explains.

Economically important diseases to watch out for are white mould; sudden death syndrome; charcoal rot; and soya bean rust.

WHITE MOULDF

Also known as sclerotinia stem rot (SSR), white mould is a major stem and root disease in South African no-till soya bean production. Exacerbating the problem is the fact that there is no clear-cut solution for managing it.

SSR is a complex disease that occurs in several different locations, varies in its extent and requires a range of treatments. This fungal pathogen has approximately 250 hosts. Its sclerotia can survive in soil for three to five years to develop into apothecia after the soil has been moist for 10 to 14 days. Ascospores produced by the apothecia are released into the air to colonise senescing soya bean flowers. The infection then spreads from the colonised flowers down the stem and produces oxalic acid that kills the stem.

Plants infected with SSR are visibly dead three weeks after initial infection. A rule of thumb is that a soya bean land infected with SSR will lose between 300kg/ha and 700kg/ha in harvested yield.

"Without any SSR-resistant soya bean varieties anywhere in the
world, there is no silver bullet for controlling this disease,” says Kloppers. “It requires integrated control. Soya bean seed must be free of sclerotia. Combine harvesters must be thoroughly washed between harvesting different soya bean lands, irrigation must be reduced when soya bean flowers are senescing, and weeds that act as host must be effectively managed.”

He adds that no-till soya bean farmers must use nitrogen carefully to avoid early canopy closure between the rows. This is because a closed canopy creates the ideal moist and cool micro-climate for apothecia to develop.

“To break the disease cycle in a land, rotate the soya bean crop with a grain crop such as maize for at least two consecutive seasons. Don’t plough a land – the deeper the sclerotia are buried in the soil, the longer they survive. This is why the SSR risk is lower in CT systems than in tillage systems.”

Planting a lower plant population at a wider row spacing also reduces the SSR risk. Your yield is still likely to be higher than that of a crop infected by SSR, he notes. A biological fungal control agent, Conidiobolus con-iosa, is being developed to attack SSR by parasitizing the sclerotia and killing them.

Finally, there is chemical control. Fungicidal chemicals will never eradicate SSR, but can help to reduce the disease to a manageable level for a while.

SUDDEN DEATH
Sudden death syndrome (SDS) is a new soya bean disease. Already common in the USA, it recently found its way into South Africa and is currently mainly confined to Mpumalanga.

SDS is caused by the fungal pathogen Fusarium virgiliforme and gives rise to interveinal chlorosis and necrosis on the leaves. It can affect an entire soya bean field, but usually occurs as scattered areas of infection.

“Typical symptoms of SDS are leaf loss, while the stems remain green and the leaf petioles remain attached,” explains Kloppers. “SDS infection also leaves blue masses of conidia on the surface of the plant’s root system.”

Plant pathologists are unsure how far SDS has spread in South Africa and have asked farmers to urgently report suspected cases to them.

In the meantime, options for managing SDS locally include sourcing any available SDS-resistant soya bean varieties, preventing extended cool and wet conditions from developing in soya bean lands, rotating soya beans with at least two consecutive years of a grain crop, and treating seed against fungal pathogens. Unfortunately, explains Kloppers, no seed treatment that prevents SDS has yet been registered, but this option is being investigated.

Leaf-applied fungicides cannot control the disease as the plant is already infected at an early stage of its development.

In the USA, SDS has been found to be associated with soya bean cyst nematode (SCN), and using appropriate nematicides against SCN appears to reduce SDS infection there. SCN has not yet been found in South Africa, though.

CHARCOAL ROT
Charcoal rot (Macrophomina phaseolina) is potentially one of the most important diseases of soya beans in South Africa, warns Kloppers.

“It typically emerges when soya bean plants are stressed for moisture at grain drying time. It isn’t new to our country, but it has the potential to dramatically increase its impact as commercial soya
bean production extends into the drier central and western parts.” As charcoal rot also infects maize, sorghum, sunflower and dry beans, none of these major summer crops can be rotated with soybean to break its cycle in a land. Its inoculum can survive in the soil for many years, particularly in crop residue left on the surface in CT production systems.

**SOYA BEAN RUST**

Soya bean rust was first discovered in South Africa at the turn of the century and initially caused a major scare among local CT and conventional tillage soybean farmers. But farmers’ rapid and effective response to varieties, and rotating soybean beans with crops not susceptible to charcoal rot.

**FARMERS WHO SUSPECT THAT THEIR CROP HAS FROGSEYE LEAF SPOT SHOULD IMMEDIATELY NOTIFY THE LOCAL PLANT PATHOLOGIST**

Symptoms of charcoal rot include yellow-brown leaves that remain attached to the plant stem, early death of infected plants, and gray discoloration of stems and roots. Managing charcoal rot in soybean requires an integrated approach that includes reducing the plant population, promoting soil moisture conservation (this is where CT is valuable), matching seeding rates to soil water availability, planting tolerant soybean bean this fungal disease has resulted in it being far less of a problem than initially anticipated.

“Farmers in areas prone to rust quickly learnt how to manage it,” says Kloppers. “It's no longer a big issue, provided appropriate management continues. However, a soybean farmer should not confuse soybean rust symptoms with those of downy mildew. The latter is the first to become visible in the season. Farmers sometimes confuse it with rust, panic, and end up applying fungicide prematurely.

“As soybean rust can be found in the west in a wet season, soybean farmers who have not yet experienced it should familiarise themselves with its symptoms and management strategies.”

**'ONLY A MATTER OF TIME'**

Finally, Kloppers warns no-till soybean producers that although the fungal disease frogeye leaf spot (Cercospora sojina) has not yet been found in South Africa, it is only a matter of time before it appears.

Farmers who suspect frogeye leaf spot in their soybean beans should immediately notify their local plant pathologist.

A final piece of advice from Kloppers to no-till soybean farmers is to use only registered, proven controls to combat diseases in their crops.

“There are snake oil products out there that farmers may want to try. I urge them not to. It could end up costing them far more than if they had used the correct, registered products,” he says.

*Phone Dr Rikus Kloppers on 033 413 9500 or email him at rikus.kloppers@pannar.co.za. Visit www.pannar.com.*

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3 OCTOBER 2014 | farmer's weekly | 63