

28 May 2026

Curtin study finds soils can naturally suppress major crop diseases

Curtin University researchers have discovered some agricultural soils can naturally suppress one of Australia's most damaging broadacre crop diseases.

The research, published in the international journal *Applied Soil Ecology*, found some soils can inhibit infection and survival of *Sclerotinia sclerotiorum* — the fungus responsible for Sclerotinia stem rot, a disease that causes significant yield losses in broadacre crops such as canola and pulses.

Lead author [Dr Viet-Cuong Han](#), from [the Centre for Crop and Disease Management](#), said the study highlights the role of soil as a living biological system, rather than a passive growing medium.

"We identified a soil that naturally suppresses *Sclerotinia sclerotiorum* by preventing the fungus from infecting plants and by inhibiting germination of its survival structures in the soil," Dr Han said.

"In field conditions, by comparing a suppressive soil with a nearby disease-conducive soil, we found clear differences in microbial community structure. Suppressive soils were enriched with well-known naturally occurring biocontrol organisms, particularly bacteria from the genera *Bacillus* and *Streptomyces*.

"These microbes actively 'antagonise' the pathogen.

"This suppressive effect is driven by the soil microbiome — the community of microscopic organisms living in the soil — and under controlled and experimental conditions the effect can be expressed in soils that are normally conducive to disease, by inoculating the conducive soil with the microbiome from the suppressive soil."

Dr Han said the research showed that *Bacillus* bacteria are central to disease-suppressing soils, while both *Bacillus* and *Streptomyces* help stop fungal growth and reduce disease in lab and plant tests.

"The study also identified bacteria from Western Australian soils that had not previously been shown to fight *Sclerotinia sclerotiorum*, suggesting that disease-suppressing soils could be a source of native microbes that may be helpful to control crop disease," Dr Han said.

"We also found certain soil properties were linked to disease suppression, with less acidic soils and those with lower carbon-to-nitrogen levels better able to suppress the pathogen."

[Professor Sarita Bennett](#), co-author and Deputy Head of School Molecular and Life Sciences, said the findings have important implications for Australia's broadacre cropping industries.

"Sclerotinia stem rot is becoming increasingly prevalent in agricultural systems," Professor Bennett said.

"This research shows that soil microbial communities can play a crucial role in limiting disease prevalence, providing a foundation for microbiome informed approaches to crop protection."

Dr Han said the findings open the door to future disease management strategies that work with soil biology rather than relying solely on chemical control.

“Agronomic practices that support soil health — such as maintaining soil organic matter and minimising unnecessary disturbance — may help support microbial communities associated with natural disease suppression,” Dr Han said.

“Understanding which microbes are responsible, and how soil conditions influence them, brings us closer to managing disease through biology.

“Ultimately, this work supports the possible future use of soil microbes as indicators and tools for more sustainable management of Sclerotinia stem rot and other soil borne crop diseases.”

The paper, *‘Antagonistic microbiota drive soil suppressiveness against Sclerotinia sclerotiorum, a widespread soil borne fungal plant pathogen’*, is here: <https://doi.org/10.1016/j.apsoil.2025.106722>

The Centre for Crop and Disease Management is a national co-investment of the Grains Research and Development Corporation and Curtin University.

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Curtin is ranked in the top one per cent of universities worldwide and has achieved a QS Five Stars Plus rating, the highest available for a tertiary institution and one of only four to do so in Australia.

The University has built a reputation around innovation and an entrepreneurial spirit, being at the forefront of many high-profile research projects in geology, astronomy, biosciences, economics, mining and information technology. It is also recognised globally for its strong connections with industry, and for its commitment to preparing students for the jobs of the future.

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