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Canola may soon be able to text you when it needs to be sprayed

Nano-biosensors are more accurate than checklists at determining when to spray for sclerotinia

by Jennifer Blair

An Alberta researcher has found a tiny way to solve a big problem for canola farmers — using nano-biosensors to detect sclerotinia stem rot in the field, eliminating the need for visual scouting.

“Sclerotinia stem rot is one of the most devastating diseases in canola farming, and scientists have worked very hard to try and find a way to forecast it,” said Susie Li, senior researcher at Alberta Innovates-Technology Futures. “Right now, we have a checklist — a set of questions you have to answer before you can make decisions to spray or not to spray.” But while the questions — about your crop rotation, incidence of disease in previous years, moisture levels in the canopy, and other factors — have been successful for crops such as peas, they’re “not always reliable” for canola.

That’s because sclerotinia spores can stay dormant in a field for years, and “sudden weather changes can cause infestations to occur unexpectedly,” Li said at the Farming Smarter conference last month. “If you were to ask me, my suggestion would be to flip a coin. You have a 50/50 chance either way.” While scouting for apothecia — fruiting bodies that look a little like mushrooms — can be “an excellent indicator of sclerotinia risk,” it is time consuming and more often than not, producers have no way of knowing how many spores are present or whether they’ve reached a level that can trigger the disease.

“Not finding them either means there’s low risk of sclerotinia, or you just didn’t find it. That doesn’t mean it’s not there,” said Li. “We can’t send a farmer into the field checking 24-7 for about six weeks to find this out, so we know we need to improve the forecasting technology.” Nano-biosensors Li’s solution is both high tech and simple: nano-biosensors placed in the field to detect spore levels before they become a problem. “A biosensor is an extremely small device capable of detecting and responding to physical stimuli,” said Li.

“The sensor will detect the spores, and if the number of spores reaches the level that you need to spray, it will convert the biosignal to an electronic signal and send it to your cellphone. “You don’t need to go to the field by using this device. You just stay in the comfort of your home until you find out if you need to spray or not.”

The biosensor has two parts — a container that collects the spores, and a small chip that contains a sclerotinia antibody, which attracts the sclerotinia spores. The antibody is a bit like a police checkstop, she said. If a sclerotinia spore tries to go through it, it gets caught, but other spores in the atmosphere carry on by it. The sensor then counts the number of spores — “it can detect as low as five spores,” — and once the count reaches a level that would trigger the disease, it sends a signal to a cellphone using Bluetooth technology.

So far, the biosensors have only been tested in a lab, using growth chambers and a small number of canola plants. The next step is taking the trial into the field next year to see how big of an area the $10 sensor can cover and what levels of spores might trigger the disease in a larger area. “After all this work, I hope we can have a device in the field to monitor sclerotinia stem rot for you and alert you whenever there’s a sclerotinia stem rot outbreak imminent,” said Li.