ADVANCES IN SCLEROTINIA DETECTION

Battle River Implements

AGRONOMY UPDATE

September 2016

Hello Again Everyone,

As we progress through harvest and struggle with the annual question of when to swath (or spray) our canola, I am sure many of you are noticing a lot of sclerotinia when you scout your canola fields. In a year like this when we have heavy canopies, high rainfall and high humidity, it is relatively easy to suspect that you are at risk for infection, and most people decided the correct decision was to apply a fungicide. Even a cursory look at the canola fields right now tells you this was the right decision to make this year.

But what about all those years where the decision is not so clear-cut? In many years, the conditions are not quite so favourable for the onset of disease, or the stand is not quite as heavy as you would like; and you are left wondering whether or not to spend the money on a fungicide. A producer near Fort Saskatchewan once told me that spraying for sclerotinia in canola was something that only paid off about once every 4 years, but the times it did pay off covered the expenses of all the other years. In other words, he looked at it as an expense he could not afford to be without – kind of like hail insurance.

But what about all those years where the decision is not so clear-cut?

And, what if we had a reliable detection system that would allow us to accurately assess the risk in every year and every type of climatic conditions? If we could know what the levels of infection would be before we saw the visible results of the infection?

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This type of detection system is closer to reality than you probably realize and the technology being used to develop it may surprise you. A "made in Alberta" solution to sclerotinia detection and measurement is currently being developed using nanotechnology. For those who need a refresher, nanotechnology deals with the manipulation of matter on an atomic or molecular level, and is generally used to describe small machines or tools that are less than 100 nanometers in size. Just so you have a reference for the sizes we are talking about, one piece of paper is about 100,000 nanometers thick!

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Dr. Susie (Xiujie) Li, Senior Research Scientist for the Alberta Innovates Technology Futures has been working on using a nano-antibody based sensor to detect sclerotinia spores in the field. She presented her findings at the Alberta Canola Council's Science-O-Rama seminar held in Edmonton in early May. "Nanobots" carrying antibodies that react in the presence of sclerotinia spores are being used for the purpose. The nano particles and antibodies are mounted on a chip which is placed in a spore trap in the canola field. The nano particles then communicate with a bio-sensor in the field. Using this antibody and nano technology, Dr. Li has determined that as few as 5 spores captured in the spore trap can trigger a response. Once detected, the presence of spores and their number can be transmitted directly from the bio-sensor to a smartphone. Once a certain spore level is reached, your phone will receive a message advising you that spraying a fungicide is recommended.

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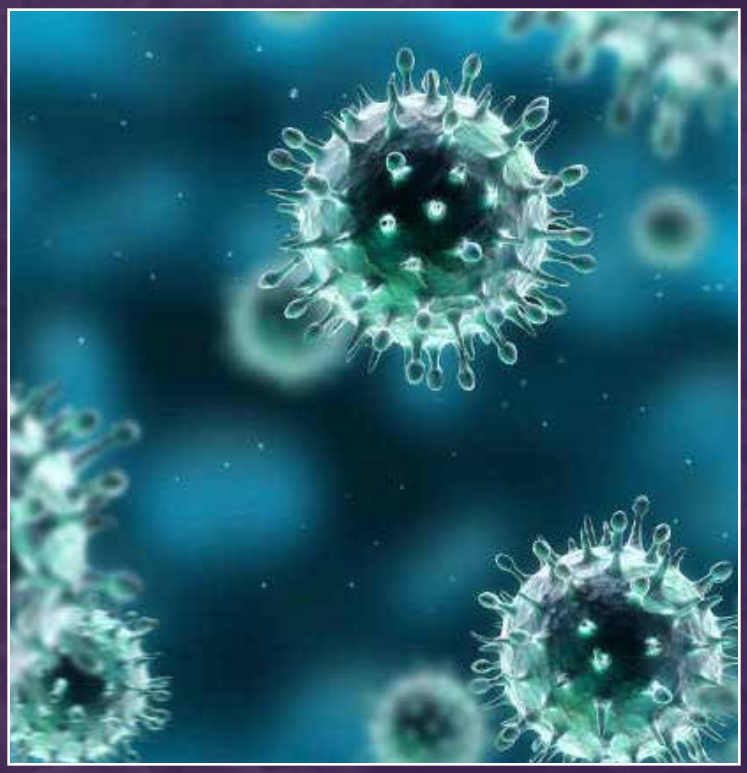

We already know what spore levels are necessary to cause infection, so with an accurate measuring device it should be possible in the future to monitor spore levels through the

flowering period. This will allow us to not only decide whether or not spraying is necessary, but possibly help us optimize the timing of spraying by spore levels rather than depending solely on bloom stage of the crop. It would also provide invaluable information on whether or not a second fungicide application is necessary – something that many people wrestled with this year.

There are still a few things that need to be figured out before this technology is commercialized, but they are mostly logistical issues – we already know the technology itself is sound. It is now a matter of calibrating the system under field conditions to ensure we get the maximum benefit. What we still need to determine are things such as the most efficient spore trap design that will give us an accurate representation of the spore population (4 different models have been tested so far) and how many bio sensors are needed per field; also where should they be placed in the field to be sure we are getting an accurate picture of infection levels. And finally, they are still looking at methods that will connect the biosensor and spore collector in a practical and economical manner. Tying them in to remote weather stations such as John Deere's Field Connect System, which can already be communicated with a computer through MyJohnDeere.com or on your smart phone through the Field Connect app, is likely one of the options that Dr Li's team will be looking at in the future. Mounting these bio-sensors with weather stations will also provide valuable information on what specific environmental conditions are required for spore populations to increase in any given year. This may allow modelling of anticipated spore levels in other fields that may have weather stations, but not bio-sensors.

While there may still be lots of work to do before this product comes to market, I hope it is merely the first of many applications of nanotechnology that will allow us to manage our crops more effectively and economically.

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