THE CYCLE OF PULSE PATHOLOGY

Keeping the upper hand on pulse crop diseases requires constant vigilance. If it's not one thing, it's another. As soon as a chronic issue like powdery mildew is solved, an obscure and virulent pathogen (*Aphanomyces*) suddenly rises to prominence.

Once scientists understand the prevalence and nature of a disease, they can study how to manage it through means such as plant breeding and agronomy. Once that disease can be managed, there's little time to rest. New disease threats will emerge in due course.

The research work of AAFC Plant Pathologist Dr. Syama Chatterton illustrates this cyclical nature. She recently concluded a study on faba beans, is continuing work on root rot and white mould and is starting a new project on field management of *Aphanomyces*.

Here's a summary.

CHOCOLATE SPOT IN FABA BEANS

Chocolate spot hasn't been a major issue in Alberta faba beans, but it's a problem virtually everywhere else the crop is grown. For the past five years, Chatterton has studied the incidence of chocolate spot in faba beans in Alberta.

A key finding was that the *Stemphylium* and *Alternaria* species of chocolate spot were more commonly found than the *Botrytis* species that predominate in other countries. Chatterton has now passed the baton to colleagues at the University of Saskatchewan to continue the work on *Stemphylium* and *Alternaria*. The idea is that when chocolate spot becomes more of a problem, the framework of a defence will already be in place.

"It's important for producers to know what's coming as far as diseases, especially for a new crop like faba beans," Chatterton said. "Early monitoring of potential disease problems, and an understanding of environmental conditions that drive disease, will help avoid unexpected surprises."

BREEDING AND PHYSIOLOGY OF ROOT ROT

As a causal agent of root rot, A*phanomyces* has been a focus for Chatterton since 2013. Meanwhile, the *Fusarium* pathogen of root rot hasn't gone away. In 2021, Chatterton will continue this project, with several objectives and funding from the Canadian Agricultural Partnership AgriScience Program.

First, to identify pea lines with partial resistance to *Fusarium* root rot pathogens, with the longer-term goal of breeding pea cultivars with stacked resistance to both *Fusarium* and *Aphanomyces* root rot.

Second, to find indicators of resistance by looking for certain plant genes that may be turned on or off during infection by *Aphanomyces* or *Fusarium*. This could advance the screening process for breeding.

Third, to examine field-based solutions, such as intercropping or rotation of pea with root rot-resistant pulse crops (faba bean, chickpea, soybean). Chatterton also wants a better idea of how long an infected field should remain out of peas before pathogen levels are reduced.

"I've been really encouraged by the intercropping results, as that may be a way of gaining back some pea yield in fields impacted by root rot," said Chatterton. "Furthermore, at some of our rotation sites (Redvers and Lacombe) we saw a recovery of pea yields in a shorter interval between pea crops than expected, but not at other sites where intervals are very long. This means there are more threads to pull at to unravel what site-specific characteristics might lead to faster decay of pathogen inoculum."

SPORE TRAPS FOR WHITE MOULD

Chatterton is nearing the end of a four-year project studying the key bean diseases of white mould and bacterial blight, with the goal of adding management options and reducing risk.

She wants to provide better tools for bean growers to decide whether a fungicide application is necessary. Strategies being examined with funding from the Canadian Agricultural Partnership AgriScience Program include using spore counts and weather modelling as predictive tools for white mould.

As Chatterton explained, most fields surveyed had a relatively low incidence (<20%) of white mould. On the few fields that left check strips, fungicides did not appear to influence disease levels. At the same time, a handful of fields were heavily infected (50% to 100% incidence), highlighting the sporadic and localized development of white mould and the difficulty in predicting disease risk.

Still, the work goes on.

"I think it's very exciting that these new technologies of spore samplers coupled with rapid quantitative diagnostics can provide better insight into infectious periods," Chatterton said. "What I envision for Alberta is a multi-pathogen, multi-crop disease forecasting network based on aerial spore quantification."

Disease management continues to be a major focus of research funded by Alberta Pulse Growers.

USING CALCIUM-BASED PRODUCTS TO MANAGE *APHANOMYCES*

The arrival of *Aphanomyces* root rot at significant scale in 2013 put Chatterton at the starting point of the pulse disease research cycle. Over seven years and several projects, she studied its nature and distribution, and investigated agronomic and breeding methods to manage it.

Now Chatterton is looking to develop the agronomic toolbox for *Aphanomyces* even further. Between 2021 and 2024, she'll evaluate different types of calcium-based products (limestone, hydrated lime, calcium sulfate) at varying rates to determine whether these will reduce *Aphanomyces* root rot and improve yield at infested sites. Chatterton will also investigate whether new products such as seed treatments or other soil amendments have the potential to suppress *Aphanomyces* root rot.

Greenhouse studies have suggested that these methods hold promise. Will they work in the field? That's the big question.

"My goal is to perform non-biased field testing of these products to provide evidence-based advice on root rot suppression or management," Chatterton said. "I'm really optimistic that with all of the complementary research projects on the horizon for the pea root rot complex, we're building good foundational practices for root rot management."