

The Most Comprehensive Survey of Soybean Foliar Diseases in Manitoba

Frogeye leaf spot and bacterial pustule were identified for the first time in Manitoba in 2016 using molecular analyses.

EACH YEAR, A range of foliar diseases are present in soybean crops across Manitoba. Timely and accurate assessment of these pathogens is important to determine the impact on production and what type of management is appropriate.

Traditional disease surveillance has relied on approaches that only validate the presence of known foliar diseases. This suggests a need for tools and techniques that identify any emerging diseases.

The objectives of this study were to: 1) identify and assess the prevalence of known and emerging soybean foliar diseases, 2) evaluate the incidence of co-infections to characterize pathogens that may act synergistically and 3) quantify

genetic diversity among strains/races of pathogens.

Soybean fields were surveyed for foliar diseases in 2016 (81 fields) and 2017 (67 fields), in collaboration with MPSG and Manitoba Agriculture. At least five leaves showing foliar disease-like symptoms were collected per field at the V3 and R6 stages.

Each leaf was preserved in a special solvent and brought back to the lab for next-generation sequencing (NGS). NGS is a relatively new and powerful disease diagnostic tool that can identify both new and existing diseases in Manitoba. This generated DNA sequence data for pathogen strains specific to Manitoba, which was used to develop molecular diagnostic

tools for seven of the most common foliar diseases. These diagnostics will improve the accuracy of disease identification in future surveys at a minimal cost.

Two diseases were identified for the first time in Manitoba, including frogeye leaf spot (*Cercospora sojina*) and bacterial pustule (*Xanthomonas spp.*). Residual diseases were also identified, meaning pathogens present in the previous year's crop were still active in soybeans grown the following year. This generated important knowledge for crop rotation planning.

This project helped detect pathogens that are new to a region and those not yet on the radar of agronomists. Along the way, it also validated visual disease diagnoses made in the field. While most of these foliar diseases are not considered economically relevant, prevalence (% of total fields infected) and incidence (% of plants infected within a field) should be monitored over time and managed accordingly.

Photos and descriptions of all diseased leaves were compiled and made available at manitobapulse.ca.

Table 1. Foliar pathogens identified by molecular analyses at early (V3) and late (R6) survey timings in the western, central and eastern regions of Manitoba (2016–2017).

		Western				Central				Eastern			
		2016		2017		2016		2017		2016		2017	
Type	Pathogen	V3	R6	V3	R6	V3	R6	V3	R6	V3	R6	V3	R6
Fungi	Leaf spot (<i>Alternaria spp.</i>)												
	Leaf blight (<i>Cercospora kikuchii</i>)												
	Frogeye leaf spot (<i>Cercospora sojina</i>)												
	Anthraxnose (<i>Colletotrichum spp.</i>)												
	Ascochyta blight (<i>Didymella pinodes</i>)												
	Leaf spot (<i>Drechslera spp.</i>)												
	Downy mildew (<i>Peronospora manshurica</i>)												
	Leaf blight (<i>Pleospora herbareum</i>)												
	Brown spot (<i>Septoria glycines</i>)												
Bacteria	Bacterial blight (<i>Pseudomonas syringae</i>)												
	Bacterial pustule (<i>Xanthomonas spp.</i>)												
Virus	Necrotic spots (<i>Tobacco necrosis virus</i>)												
	Alfalfa mosaic (<i>Alfalfa mosaic virus</i>)												
	Viral infection (<i>Bean yellow mosaic virus</i>)												

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DURATION 2 years