

## MPSG ANNUAL EXTENSION REPORT

**PROJECT TITLE:** Frequency of Soybeans in Rotations - Exploring Root Rot and Foliar Pathogens

**PROJECT START DATE:** 1 June 2017

**PROJECT END DATE:** 31 May 2019

**DATE SUBMITTED:** 28 February 2018

### PART 1: PRINCIPAL RESEARCHER

#### PRINCIPAL

<b>NAME:</b>	Fouad Daayf
<b>POSITION:</b>	Professor & Department Head
<b>INSTITUTION:</b>	University of Manitoba
<b>EMAIL:</b>	Fouad.Daayf@umanitoba.ca
<b>PHONE:</b>	204-474-6096

### PART 2: EXECUTIVE SUMMARY

*Outline the project objectives, their relevancy to pulse and soybean farmers, and a summary of the project to date, including methods and preliminary results.*

Soybean is currently the 3rd most cultivated crop in Manitoba after canola and spring wheat with an acreage that exceeded 2.3 million acres in 2017 (Statistics Canada). This means that soybean is growing more frequently in crop rotations across Manitoba, which raises questions about potential risks of crop diseases and potential management measures. In fact, information about proper rotation regimes for soybeans under Manitoba conditions is rather scarce. Unfortunately, plant diseases, especially those caused by soilborne pathogens, usually flourish in absence of proper rotations. In 2013, a 4-year crop rotation project was established at three locations in Manitoba (Carman, St. Adolphe, Melita). In 2017 this experiment was in the soybean test crop phase, which represented a great opportunity to investigate best rotation practices for this crop and to better understand the impact of soybean frequency in the rotation on the crop's health. We compared four rotation regimes that included canola, corn, wheat, and soybean, as follows: 1. (soy-soy-soy-soy), 2. (corn-soy-corn-soy), 3. (canola-soy-canola-soy), 4. (wheat-canola-corn-soy). Among the tested treatments, root rots were the most prevalent and damaging disease in all three studied locations. The continuous soybean rotation had the highest root rot severity followed by the "canola/soybean" rotation. No significant difference was observed between the "corn/soybean" and "wheat/canola/corn/soybean" rotation regimes in terms of disease incidence. As a result, it seems that rotating soybean with wheat and corn will reduce the incidence and severity of root rots. More research is required to build proper management strategies.

### PART 3: PROJECT ACTIVITIES AND PRELIMINARY RESULTS

*Outline project activities, preliminary results, any deviations from the original project and communication activities. You may include graphs/tables/pictures in the Appendix.*

In 2013, a 4-year crop rotation project was established at three locations in Manitoba (Carman, St. Adolphe, Melita) to investigate best rotation practices for this crop. In 2017 this experiment was in the soybean test crop phase, which represented a great opportunity to also better understand the impact of soybean frequency in the rotation on the crop's health, especially in regard to diseases.

We compared four different rotation regimes that included canola, corn, wheat, and soybean, as follows:

- 1- Continuous soybeans (soy-soy-soy-soy).
- 2- Soybeans every second year (corn-soy-corn-soy).
- 3- Soybeans every second year (canola-soy-canola-soy).
- 4- Soybeans every fourth year (wheat-canola-corn-soy).

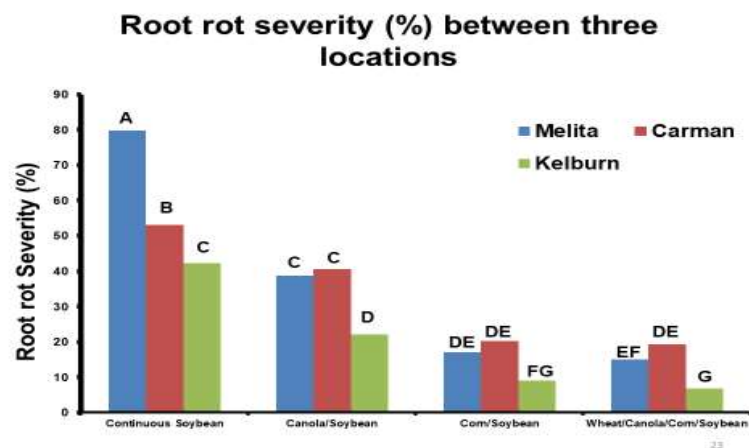
The main question we focused on was whether the frequency of soybean in the rotation increases the incidence/severity of any important diseases that usually reduce soybean yield.

The experiment was set up with a randomized complete block design with four replicates and each location had 16 replicates. Cultivar (DKC 24-10 RY) was planted in the three locations. Fields were visited during the different growing stages (V1 to R8). Ten plants were collected from each replicate for a total of 160 plants per visit. Then plants were transferred to Dr. Daayf's lab, Department of Plant Science, University of Manitoba, for further investigations. Each plant was examined for diseases on roots, stems and leaves. A Disease Severity index of the most damaging disease was calculated.

Among the tested treatments, root rots caused by *Fusarium* sp. were the most prevalent and damaging disease in all three studied locations with disease incidence reaching 100%, 50% and 100% in the Carman, St. Adolph and Melita tested plots, respectively. The continuous soybean rotation had the highest root rot severity followed by the "canola/soybean" rotation while the "corn/soybean" and "wheat/canola/corn/soybean" rotations had the lowest root rot severity, with no significant difference between these two rotations. The highest root rot severity (80%) was observed on soybean plants collected from "continuous soybean" rotation from Melita. The lowest root rot severity (6.8%) was observed on soybean plants collected from the (wheat/canola/corn/soybean) rotation from St. Adolph location.

In conclusion, root rots were the most prevalent and damaging disease in the three locations. Continuous soybean rotation had the highest root rot severity followed by "canola/soybean" rotation. It seems that rotating soybean with wheat and corn will reduce the incidence and severity of root rots. However, more research is required to better understand this interaction under Manitoba conditions and to build proper management strategies. Future work will include completing isolation and identification of collected samples, confirming the pathogenicity of the isolated species in the greenhouse, and improve a rapid diagnostic tool for the most important diseases of soybean in Manitoba.

## APPENDIX



**Fig. 1. Root rots severity (%) comparison between three experimental sites at Melita, Carman and St. Adolph MB.**



**Fig. 2 Seedlings' damping off**