



**Project Identification**

**Project Title:** *Sclerotinia* Risk Assessment Tools for Spray Decision Support in Canola

**Project Number:** ADOPT 20200526

**Producer Group Sponsoring the Project:** Northeast Agriculture Research Foundation

**Project Location(s):** SW 30-45-14 W2, SW 16-45-14 W, and NE 1-41-21 W2

**Project start and end dates (month & year):** April 2021 to February 2022

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## **Objectives and Rationale:**

**Project objectives:** To demonstrate the various tools for assessing *Sclerotinia* stem rot risk in canola; and to assess their value in supporting producers with the decision to spray fungicide for *Sclerotinia* stem rot management

**Project Rationale:** *Sclerotinia* stem rot is a disease that impacts canola production by reducing seed yields (del Rio et al. 2007). *Sclerotinia* stem rot has been identified as the most destructive disease of canola in Western Canada (Canola Council of Canada). Fungicide applications have been found to suppress and/or control *sclerotinia* infections in canola, however many variables contribute to risk and intensity of *sclerotinia* infection (del Rio et al. 2007) Some important variables that may affect *sclerotinia* risk are rainfall and moisture conditions during and leading up to crop flowering, cultivar resistance, field history, and canopy density. Yield losses can be variable and depend on the impact of infection on seed filling for every infected plant (Canola Council of Canada). Fungal growth within the canola plant stem can also cause weakened stems, which increases crop lodging risk (Canola Council of Canada). Therefore, yield losses may be attributed to many factors as a result of *sclerotinia* infection, such as premature ripening, less and fewer seeds from shattering losses or impacts during grain fill, and loss of seed due to smaller seed size during combining (Canola Council of Canada).

To assess *sclerotinia* risk in canola crops, and whether a fungicide application is warranted, many tools and methods have been developed. A *Sclerotinia* stem rot checklist has been developed by the Canola Council of Canada, which uses crop rotation, disease history, and rainfall information during and prior to flowering to determine the risk for apothecia development. The checklist is available on the Canola Council of Canada website. The Canola Decision Support Tool (CanolaDST.ca) is another tool for determining *sclerotinia* risk. This tool combines in field management and history along with weather forecasting to determine *sclerotinia* risk for each canola field. There are also several methods that include actual detection of *sclerotinia* in the crop to determine the risk of infection including spore detection and canola petal sampling. 20/20 Seed labs has created a Spornado Sampler that is placed in the field during early to mid flower of the canola crop and collects ascospores to determine the spore load in that crop. The spore load is used to determine risk of *sclerotinia* development in-crop. Lastly, labs such as Quantum Genetix and Discovery Seed labs offer petal testing kits for *sclerotinia*, which allows the presence of ascospores to be detected in already infected petals, to determine the risk of infection. All of the tools combined or used simultaneously provide many options for producers to determine the risk of *sclerotinia* infection in their crop, and whether the risk is high enough to warrant a fungicide application to minimize potential yield losses.

## **Works Cited**

Canola Council of Canada. 2022. Canola Encyclopedia. [Online]

del Rio, L.E., Bradley, C.A., Henson, R.A., Endres, G.J., Hanson, B.K., McKay, K., Halvorson, M., Porter, P.M., Le Gare, D.G., and Lamey, H.A. 2007. Impact of *Sclerotinia* stem rot on yield of canola. *Plant Dis.* 91:191-194.

## Methodology and Results

### **Methodology**

The project was implemented on-farm in co-operation with producers in the Melfort, SK area. A total of three fields were used to collect data, all of which were operated under different management. Each field was approximately 160 acres and the field locations were over a relatively wide spread. Two of the three field locations were near Tisdale, SK (SW 30-45-14 W2, SW 16-45-14 W) and one field location was near St.Brieux, SK (NE 1-41-21 W2). Producers were asked to leave an unsprayed strip in their field if they chose to apply fungicide. An unsprayed strip was to be utilized for disease ratings at 60% seed colour change.

Data collection consisted of collecting and submitted samples for the 20/20 Seed Labs Spornado sampler, Discovery Seed Labs Sclerotinia test and Quantum Genetix Sclerotinia test using kits and procedures provided by each lab. Field information and history was also collected from each participating producer and was used for the Sclerotinia stem rot checklist and the Canola Decision Support tool to determine *sclerotinia* risk. Lastly, disease ratings were completed when the crop was at 60% seed colour change to determine actual *sclerotinia* infection in crop. Specific methodology for each assessment method is described below.

### **Results**

#### Spornado (20/20 seed labs):

Spornado Samplers were used as a diagnostic tool for *sclerotinia* spore detection in each of the 3 canola fields used in this demonstration. Spornado's were provided by 20/20 Seed Labs and 1 sampler was used per field. Each Spornado was placed in an open area within each field, away from windbreaks, trees, or buildings. Two cassette's were used per field, where the first cassette was put in the Spornado at 10-20% flower and the second cassette was put in at 30-40% flower. Each cassette was to be left out for 2 to 4 days before removing and submitting to 20/20 Seed Labs for detection of *sclerotinia* spores. The dates during which each cassette was placed in the Spornado and then removed for each location was included in Table 5 of the Appendices. All cassette's at all locations and all timings were reported as having no detection of *sclerotinia* spores.

#### Q-protect Kit (Quantum Genetix)

Q-protect kit's were provided by Quantum Genetix for detection of *sclerotinia* infected petals during flowering of the canola crop. Petal collections were completed at 5 sites throughout each field. Within each of the 5 sites, 8 plants were randomly selected and three petals per plant (lower, middle, and top of the plant) were collected and placed in a single vial. Forceps were used to collect each petal and were sanitized with an alcohol wipe in-between plants. Petal testing was completed at 20-30% flower and again around 40-50% flower. The 5-sites were marked, so each collection was completed in a similar area at the different crop stages. Results are reported based on the percentage of vials (8 total per site) that contained petals that were infected with *sclerotinia*. For example, a 12.5% result indicates that of the 8 plants sampled per site, 1 plant tested positive for *sclerotinia* detection. All sites and all collection timings indicated a low risk for infection of *sclerotinia* (Table 1). At two of the three sites, the percentage of infected petals was unchanged from the 1<sup>st</sup> collection to the 2<sup>nd</sup> collection. At one site, the percentage of infected petals was reduced at the 2<sup>nd</sup> collection as compared to the 1<sup>st</sup>, which was likely

attributed to random variability. The hot and dry conditions in 2021 at all locations was likely a large contributing factor to the low percentage of infected canola petals at all sites and timings.

**Table 1.** Petal collection results for *Sclerotinia* spore detection using Q-protect kits from Quantum Genetix in *Sclerotinia* Risk Assessment Tools for Spray Decision Support in Canola at Melfort, SK 2021.

SW 30-45-14-W2 (near Tisdale, SK)						
Site	1	2	3	4	5	Overall
Infection (20-30% flower)	12.5	12.5	12.5	0	12.5	10
Infection (40-50% flower)	0	0	0	0	0	0
SW 16-45-14-W2 (near Tisdale, SK)						
Site	1	2	3	4	5	Overall
Infection (20-30% flower)	0	0	0	12.5	0	2.5
Infection (40-50% flower)	12.5	0	0	0	0	2.5
NE 1-41-21-W2 (near Tisdale, SK)						
Site	1	2	3	4	5	Overall
Infection (20-30% flower)	12.5	0	0	12.5	0	5
Infection (40-50% flower)	0	0	0	12.5	12.5	5

<sup>2</sup>Low Risk= 10-20%, Moderate Risk=20-40%, High Risk=40-100%

#### Discovery Seed Labs Petal Test

Petal testing kits were provided by Discovery Seed labs as another *sclerotinia* assessment tool at each location. Petal sampling was completed at 8 different sites within each field. Each site was approximately 50 paces apart. Within each site 16 petals were collected, with 2 petals placed in each of the 8 vials. Forceps were used to collect the petals and were disinfected with an alcohol wipe in between each petal collection. The 8 locations were marked at the first collection timing of 20-30% flower, so the second collection timing at 40-50% flower could be repeated in a similar location. The number of vials with infected petals out of the 8 vials per site was reported as a percentage and used to determine *sclerotinia* risk. Discovery seed labs uses a predictor model, which accounts for the number of canola petals infected with *sclerotinia*, crop density, and weather patterns during flowering to determine the probable % of diseased plants in the crop and the probable % yield loss. Of all petal collections, only one timing at one site resulted in petals with *sclerotinia* infection. Based on the low amount of petals infected at this collection, the crop density, and weather patterns, this location demonstrated a 0-20% probability of diseased plants in the crop and a 0-10% probability of yield loss.

**Table 2.** Petal collection results for *Sclerotinia* spore detection using kits from Discovery Seed Labs in *Sclerotinia* Risk Assessment Tools for Spray Decision Support in Canola at Melfort, SK 2021.

SW 30-45-14-W2									
Site	1	2	3	4	5	6	7	8	Total
Infection (20-30% flower)	0	0	0	0	0	0	0	0	0
Infection (40-50% flower)	0	0	0	0	0	0	0	0	0
SW 16-45-14-W2									
Site	1	2	3	4	5	6	7	8	Total
Infection (20-30% flower)	0	0	0	0	0	0	0	0	0
Infection (40-50% flower)	6.5	0	6.5	13	13	13	13	-	8.4
NE 1-41-21-W2									

Site	1	2	3	4	5	6	7	8	Total
Infection (20-30% flower)	0	0	0	0	0	0	0	0	0
Infection (40-50% flower)	0	0	0	0	0	0	0	0	0

Canola Decision Support Tool (canoladst.ca)

The Canola Decision Support Tool is an online tool that producers can use to determine the risk of *sclerotinia* infection in their canola crop. The program requires answers to various crop management questions to determine the risk of *sclerotinia* development. Based on the inputs and crop conditions at all fields used in this demonstration the risk of *sclerotinia* infection was determined to be low (Table 3).

**Table 3.** Canola Decision Support Tool (canoladst.ca) crop and field management questions and answers to determine sclerotinia risk in *Sclerotinia* Risk Assessment Tools for Spray Decision Support in Canola at Melfort, SK 2021.

<u>Canola Decision Support Tool</u>			
	SW 30-45-14-W2	SW 16-45-14-W2	NE 1-41-21-W2
Variety (Early, Mid, Late Maturity)	Early	Mid	Mid
Varietal Resistance (Susceptible, Intermediate, Resistant)	Susceptible	Susceptible	Intermediate
Seeding date	May 21, 2021	May 27, 2021	May 27, 2021
Plant density (High, Normal, Low)	Normal	Normal	Normal
Disease incidence in last year's crop (High, Medium, Low)	Low	Low	Low
Preceding crop	CWRS Wheat	CWRS Wheat	Barley
No. of years with canola, other oilseed crops, and other host crops within past 6 years	2	3	3
Preceding tillage (No-till, Minimum, Conventional)	Minimum	No-till	No-till
Emergence Date	May 28, 2021	June 2, 2021	June 1, 2021
Fertilizer Regime	130-25-5-12 lbs/ac NPKS	128-38-0-38 lbs/ac NPKS (90lbs NH <sub>3</sub> in fall)	140-40-0-30 lbs/ac NPKS
Initial soil moisture (Low, Medium, High)	Medium	Medium	Medium
Clay/Silt/Sand	Clay	Clay	Clay
<b>Risk:</b>	Low	Low	Low

Sclerotinia stem rot checklist:

The *Sclerotinia* stem rot checklist is a checklist that was developed by the Canola Council of Canada, which combines crop management, disease history, and rainfall to determine the regional risk of apothecia development from total risk points. As determined by the *sclerotinia* stem rot checklist all fields used in this demonstration resulted in a low risk for apothecia development (Table 4).

**Table 4.** Sclerotinia stem rot checklist crop and field management questions and answers to determine sclerotinia risk in *Sclerotinia* Risk Assessment Tools for Spray Decision Support in Canola at Melfort, SK 2021.

<i>Sclerotinia stem rot checklist</i>			
	SW 30-45-14-W2	SW 16-45-14-W2	NE 1-41-21-W2
Number of years since last canola crop	2	2	2
Disease incidence of last host crop (None/low/moderate/high)	Low	Low	None
Crop density (Low/normal/high)	Low	Low	Normal
Rain in the last 2 weeks	20mm	25.4mm	10mm
Weather forecast (Low or High probability of rain)	Low	Low	Low
Regional risk for apothecia development	Low	Low	Low

**Disease Assessment:**

Disease assessments were completed when each canola field reached 40-60% seed colour change. A total of 20 plants from five different sites within the field were rated for the severity of *sclerotinia* infection on a 0-5 scale. The scale used was 0= no infection, 1= superficial lesions or small branch infected, 2= large branch infected, 3= main stem at least 50% girdled, 4= main stem girdled but plant produced good seed, and 5= main stem girdled with much reduced yield. A rating of 2 indicated 25% potential yield lost, 3 indicated 50%, 4 indicated 75%, and 5 indicated up to 100% potential yield affected. Of the three fields, one field (NE1-41-21-W2) had no plants with any indications of *sclerotinia* infection. The remaining two fields (SW 30-45-14-W2, SW 16-45-14-W2) had two plants in total that had a superficial lesion or small branch infected (a rating of 1). This resulted in an overall disease incidence of 0.02 for these two locations when averaged over the 20 plants rated at 5 different sites. The low incidence of *sclerotinia* infection in all three fields was not surprising, and supported the low risk that was indicated by all *sclerotinia* risk assessment tools used in the demonstration.

**Conclusions and Recommendations**

The 2021 season was much warmer and drier in the Melfort area, most notably during flowering of canola, which significantly impacted *sclerotinia* stem rot risk. All assessment tools and methods used in this demonstration indicated that the risk of *sclerotinia* infection was low due to many factors including, low amounts or no precipitation prior to and during flowering. The low risk of *sclerotinia* infection was further verified with disease ratings closer to crop maturity indicating a very low number of infected plants and/or no infected plants throughout each field. When infection did occur the degree of infection was very minimal (only a small lesion present). Due to the abnormally dry conditions during the 2021 season, using these assessment tools in a season with conditions that are more conducive to *sclerotinia* stem rot infection would be valuable to further evaluate these tools and methods for determining in-crop risk.

### Extension Activities

The results of this demonstration were shared by Christiane Catellier of IHARF at the virtual AgriARM Update on January 13, 2022. The results of this demonstration will also be shared on neag.ca

### Supporting Information

#### **Acknowledgements**

The Northeast Agriculture Research Foundation would like to express our gratitude to the Saskatchewan Ministry of Agriculture's ADOPT program for funding this demonstration and for providing signage. We would like to thank Jessica Slowski (formerly of NARF), Brianne McInnes, and David MacTaggart of NARF for coordinating the project protocol, data analysis and report writing for this project. Finally, NARF would like to thank Gayelene Dagenais, Caitlyn Hartman, and Carter Fettes for their hard work and dedication in completing this project.

## Abstract

### **Abstract/Summary**

*Sclerotinia* stem rot is the most destructive disease of canola in Western Canada (Canola Council of Canada). Many risk assessment tools and methods are available to determine the risk of infection in-crop and whether or not a fungicide application is warranted. To assess the efficacy of the tools that are available to producers in Saskatchewan a field scale demonstration was conducted near Melfort, SK in 2021 in collaboration with producers in the area. Three fields were selected, each consisting of approximately 160 acres, and each under different management. The tools used for *sclerotinia* assessment were 20/20 Seed Labs Spornado Sampler, and Quantum Genetix and Discovery Seed Labs petal testing kits to determine spore presence and the number of petals infected during crop flowering. Additionally, the *Sclerotinia* Stem Rot Checklist by the Canola Council of Canada and the Canola Decision Support Tool (CanolaDST.ca) were used to combine field management factors as well as environmental conditions to determine the potential for *sclerotinia* stem rot risk. Lastly, disease ratings were completed closer to crop maturity to determine the degree of infection closer to crop harvest. The 2021 season at Melfort was very hot and dry. These conditions in combination with field management factors resulted in the risk of *sclerotinia* infection being low for both the *Sclerotinia* stem rot checklist and the Canola Decision Support Tool (CanolaDST.ca). The Spornado Sampler from 20/20 seed labs used to collect *sclerotinia* spores during crop flowering resulted in no spores being detected in any of the producer canola fields. Petal testing from Quantum Genetix and Discovery Seed labs resulted in petal infection rates of 0-10%, which was indicative of low *sclerotinia* stem rot infection. Lastly, disease ratings which rated 20 plants in 5 spots throughout each field determined that the number of plants infected was very low with 0-2 plants having some degree of *sclerotinia* symptoms within the 100 plants that were rated per field. Overall, the risk of *sclerotinia* infection was very low due to very dry conditions in 2021, and thus repeating this demonstration under conditions that are more conducive to *sclerotinia* infection in canola would be ideal.

**Appendices:**

**Table 5.** Dates of operation for data collected for *Sclerotinia* Risk Assessment Tools for Spray Decision Support in Canola at Melfort, SK 2021.

	Near Tisdale, SK		Near Tisdale, SK		Near St. Brieux, SK	
Field Location	SW 30-45-14-W2		SW 16-45-14-W2		NE 1-41-21-W2	
Crop Stage	20-30% Flower	40-50% Flower	20-30% Flower	40-50% Flower	20-30% Flower	40-50% Flower
1 <sup>st</sup> petal collection	July 5		July 8		July 6	
2 <sup>nd</sup> petal collection		July 8		July 15		July 9
1 <sup>st</sup> cassette	July 5-8		July 8-13		July 6-9	
2 <sup>nd</sup> cassette		July 8-13		July 13-15		July 9-13
Disease Ratings	August 12		August 12		August 9	

**Finances**

**Budget Report**

See attached excel spreadsheet