Evaluate Commercial Cultivars of Canola to Monitor the Breakdown of Resistance to Clubroot

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Objective: To monitor the resistance potential of commercial canola cultivars against the mutant clubroot pathotype in field conditions.

Canola cultivars/varieties: Nine commercial canola cultivars having resistance to the clubroot pathogen were planted to monitor the level of resistance against the known mutant pathotype in the research ground (Table 1). The field had a natural soil population of *P. brassicae* of 140,625 resting spores/g of soil. The clubroot susceptible canola cultivars InVigor L233P and CP9978TF were planted as the checks.

Planted: First week of June (hand planted after thorough tillage with a rototiller).

Field design: Randomized complete block design (RCBD) with four replications.

Plot size: 10 ft. x 5 ft.

Table 1: Commonly cultivated canola cultivars/varieties in North Dakota.

Cultivar	Description
CP9978TF	Croplan Genetics
CP7130LL	Croplan Genetics
CP7144LL	Croplan Genetics
INVIGORLR344PC	BASF
INVIGORL340PC	BASF
INVIGORL255PC	BASF
INVIGORL345PC	BASF
INVIGORL343PC	BASF
INVIGORL233P	BASF
CP9221TF	Croplan Genetics
CP7250LL	Croplan Genetics

Clubroot Evaluated: Early August (60 days after planting).

Minor sulphur deficiency (refer to stunting data in Table 1) was observed at early stage of canola (Figure 1). To correct the deficiency an EC formulation of sulphur (BLUE LAVA®) was applied at 3 pt/a as a foliar spray and the plants were able to recover in 10 days (refer to Table 1 for the stunting data due sulphur deficiency and Figure 1 & 2).

Table 1: Mean clubroot disease index (%) recorded on various commercial cultivars of canola tested in 2023.

	Response to Clubroot	HR Trait	CRDI %	Stunting*
CP9978TF	Susceptible	Roundup	42	3
CP7130LL	Resistant	Liberty	3	5
CP7144LL	Resistant	Liberty	14	4
InVigorLR344PC	Resistant	Liberty	0	4
InVigorL340PC	Resistant	Liberty	0	4
InVigorL255PC	Resistant	Liberty	0	3
InVigorL345PC	Resistant	Liberty	0	4
InVigorL343PC	Resistant	Liberty	0	5
InVigorL233P	Susceptible	Liberty	54	5
CP9221TF	Resistant	Roundup	0	4
CP7250LL	Resistant	Liberty	1	4
		Mean	10	4
		CV%	122	19
		LSD	18	NS
		P-Value (0.05)	0.00001*	NS

*Stunting observations were rated as: 1-severely stunted; 5-healthy

Results: Canola plants had recovered from stunting after 10 days of the foliar spray with BLUE LAVA® sulphur (height data is non-significant after 20 days, data not shown in the table). Low rainfall in the early stages of canola this year around Langdon resulted in a lower level of clubroot infections on reference checks. Clubroot susceptible cultivars CP9978TF and InVigor L233P were used as reference checks to compare resistance levels. The reference checks showed 42 and 54 percent of CRDI, respectively, indicating the validity of the trial. Other canola cultivar results showed: CP7130LL (CRDI 3%), CP7144LL (CRDI 14%), InVigor LR344PC, InVigor L340PC, InVigor L255PC, InVigor L345PC, InVigor L343PC and CP9221TF had zero CRDI, and CP7250LL (CRDI of 1%). These cultivars are holding their resistance to clubroot and are statistically significant from the reference checks tested.

Figure 1 (LEFT): Sulphur deficiency was observed in the canola plants at an early stage at which sulphur (BLUE LAVA) was applied.

Figure 2 (RIGHT): Recovered canola plants from sulphur deficiency after foliar spray of sulphur.

Future research: Screening large numbers of commercial cultivars of canola will be helpful to growers. Monitoring clubroot resistance breakdown in commercially available resistant cultivars each year will be a crucial survey objective.

<u>Canola Council of Canada's Monitoring Clubroot in Resistant Varieties</u>

"***Growers using clubroot-resistant cultivars in clubroot-infested fields may experience some infected plants, which can be attributed to susceptible volunteers and off-types. Volunteer canola seed can germinate many years after it was last grown, and if this comes from a susceptible canola crop, then the volunteers will be susceptible. Off-types are a normal part of hybrid canola production – no canola hybrid is 100% pure, so there may be a small proportion (1 to 4%) of the seed that is susceptible.***

When scouting, if more than 10% of seeded plants (do not count volunteers) are infected, that may indicate that the clubroot resistance is no longer functional against the pathogen population in the field. These infected plants may be restricted to a small patch which indicates a recent pathogen change."

Ideal Recommendation: Practice longer crop rotations in clubroot endemic areas and use a clubroot resistant variety every three years minimum.

Acknowledgments: Funding from the Northern Canola Growers Association and Todd Christianson (Simplot, Langdon, ND). Thanks to all the product suppliers. Special thanks to Jacob Kram (NDSU), Kartheek Chapara, and Brock Freer.