

20. Flooding effects on canola growth and yield

Project Duration

- 2019-2021

Collaborators

- Canadian Agricultural Partnership funding
- Curtis Cavers, AAFC Portage la Prairie

Objectives

- To quantify the tolerance and recovery of current cultivars of canola to excess moisture stress, with the intention of identifying a cultivar that has improved tolerance.
- To find out how timing of excess moisture stress affects yield.

Results

Flooding did not affect canola plant stand. However, it did influence plant height at maturity and days to maturity. Flooding at early crop stage resulted in taller canola plants (Table 20.1). Canola plots took more days to mature, when flooded at early crop stage. Although lodging differences were evident but lodging scores were low enough to cause any significant yield loss. Canola had higher yield when flooded at early crop stage.

Table 20.1. Effect of flooding on canola growth and grain yield at Arborg site.

Treatment	Plant height	Plant stand	Days to maturity	Lodging	Grain yield
	<i>inches</i>	<i>plants/ft²</i>		<i>1-5 scale</i>	<i>bu/acre</i>
Early Flooding	29.6b	14	96.8c	1.75b	50.7b
Late Flooding	27.4ab	13	73.4a	1.75b	*
No Flooding	26.8a	15	77.2b	1.00a	4.2a
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Flooding	0.0373	0.1204	<.0001	0.035	<.0001
Variety (Flooding)	0.5449	0.5435	0.0004	0.1329	0.2759
CV (%)	9.6	20.7	2.8	50.6	18.1
Sig. diff.	Yes	No	Yes	No	Yes

*no data collected as plots were severely infected by root rots after flooding.

Among Canola varieties, flooding had similar effects on grain yield, plant stand, plant height and lodging. However, flooding at early crop growth increased days to maturity in L252 and L255 PC varieties only (data not shown).

Project findings

Flooding at the early crop stage resulted in taller plants, delayed maturity and greater canola yield. However, no yield was obtained when plots were flooded at later crop stage. These plots were severely infected by root rots after flooding. All canola varieties benefitted similarly, when crop was flooded at the early crop stage. The year 2021 was a drought year and the control plots only produced 4 bu /acre. The soil moisture was deficit during the whole crop season and early flooding actually benefitted the crop by supplying adequate moisture.

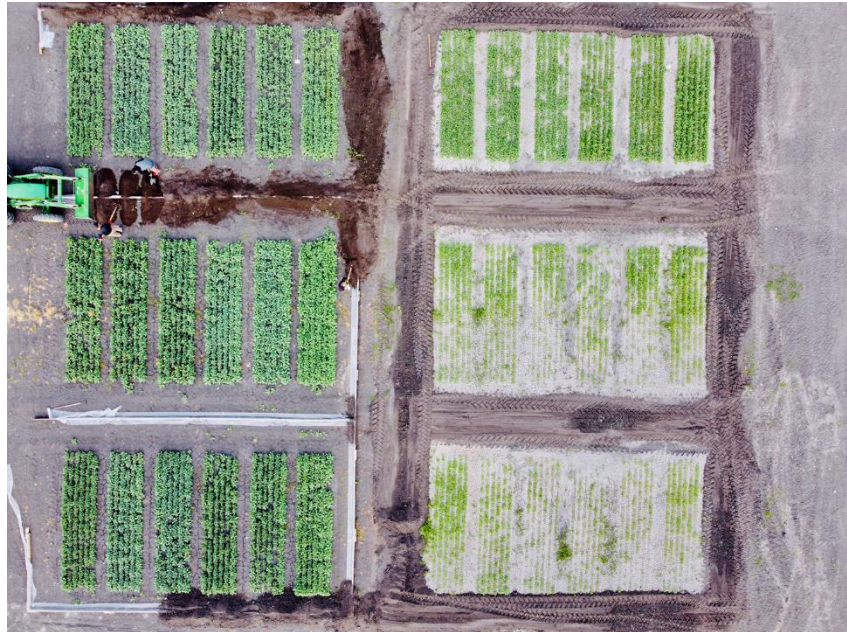


Fig.20.1. Early (right – pale green) and late flooding (left – dark green) plots of different canola varieties as of June 30 (before late flooding treatment).

Background / References / Additional resources

Excessive soil moisture conditions cause significant losses to farmers in Manitoba. Canola is quite susceptible to water logging and shows a yield reduction if exposed to excess moisture during the earlier phase of crop growth. Wet soils cause an oxygen deficiency, which reduces root respiration and growth (Canola Council of Canada). This attributed to reduced nutrient uptake in canola. Zhou and Lin (1995) reported that plant height, stem width and the number of primary branches per plant were decreased by waterlogging at seedling and floral bud appearance stages of canola. Pods per plant and seeds per pod were also reduced, giving 21.3% and 12.5% decrease of seed yield from the control for treatments at the seedling and floral bud appearance stages, respectively. No significant difference in seed yield was observed between the control and treatments applied at flowering and pod formation stages.

References

W. Zhou, and X. Lin (1995) Effects of waterlogging at different growth stages on physiological characteristics and seed yield of winter rape (*Brassica napus L.*). *Field Crops Research* **44**: 103-110.

Materials and methods

Experimental design – Randomized complete block design

Plot size – 8.22m²

Treatments –3:

Early flooding (2-3 leaf stage)

Late flooding (Early flowering stage)

No flooding (control)

Varieties-4;

L233P

L234PC

L252

L255PC

Four canola varieties were grown in flooded (early- and late-crop stage) and non-flooded set ups. Early flooding treatments was imposed when canola was at 2-3 leaf stage. These plots were flooded between June 21-28 and a total of 5 inches of flooding was applied in addition to natural precipitation.

Late flooding treatment was applied when the crop was at early flowering stage. Flooding in these plots was started on July 15 and continued until July 20 and a total of 7.5 inches of flooding was applied in addition to natural rainfall.

Data collected

plant stand at harvest, plant height at harvest, days to maturity, lodging and grain yield

Agronomic information

Stubble, soil type – Fallow, Heavy clay

Fertilizer applied –

- Nitrogen: 55 lb /acre
- Phosphorus: 25 lb /acre

Seeding date – May 28, 2021

Harvest date -

Control plots: Aug 27, 2021

Early flooding: Sep 14, 2021

Pesticides applied –

- Silencer @ 34ml/acre was applied on June 14 for flea beetles control
- Silencer @34ml/acre was applied on July 29 (only early flooding set) and on July 13 & Aug 6 (only no flooding set) for grasshoppers control
- Liberty@1.35 L/acre was applied on Jun 25 & July 7