

Excess moisture effects on Canola growth and yield

Project Duration

2019-2021

Objectives

The purpose of this project is -

- 1) 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.
- 2) To find out how timing of excess moisture stress affects yield.

Collaborators

Canadian Agricultural Partnership funding
Curtis Cavers, AAFC Portage la Prairie

Results

Flooding did not affect plant stand. However, it did influence plant height at maturity, lodging and days to maturity. Flooding stress at later crop stage resulted in shorter canola plants (Table 1). In contrast, canola took more days to mature, when flooded at early crop stage. Although lodging differences were evident among the flooding treatments, but overall lodging scores were low enough to cause any significant yield loss. Canola suffered significant yield losses when flooded at later crop stage.

Table 1. Effect of flooding on canola growth and grain yield at Arborg site.

Treatment	Plant Stand (plants/ft ²)	Plant height (inches)	Days to Maturity	Lodging (1-5 scale)	Yield (bu/acre)
Early Flooding	38.2	35.7b	84.0b	1.11a	49.6a
Late Flooding	36.4	30.8a*	79.8a	1.42b*	10.7b*
No Flooding	37.1	35.2b	80.7a	1.03a	45.6a
Significant Difference	No	Yes	Yes	Yes	Yes
P	0.75	<0.0001	0.005	<0.0001	<0.0001
CV%	15.0	7.0	3.7	7.9	11.4

* Severe disease incidence was noticed in the plots.

Project Findings

Canola grew shorter in plots where flooding stress was imposed at later crop stage. Flooding stress at early crop stage resulted in delayed maturity. Grain yield was severely affected when plots were flooded at later crop stage. This might not be only due to flooding effect as these plots also showed severe root rot symptoms after flooding stress. Variety-flooding interaction was not significant for the grain yield. All canola varieties were able to tolerate flooding stress at the early crop stage. No Canola variety, however, exhibited flooding tolerance when plots were flooded at later crop stage.

Background / References / Additional Resources

Extreme moisture in Manitoba soil causes significant losses to farmers. Canola is quite susceptible to water logging and shows a yield reduction if exposed to excess moisture in 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.

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 & Methods

Experimental Design – Replicated block design with three replications

Treatments – Four canola varieties were grown in flooded (early- and late-crop stage) and non-flooded set ups. Early flooding plots were flooded between June 20-July 4 and a total of 5 inches of flooding was applied in addition to natural precipitation. Flooding was started, when the canola crop was at 2-3 leaf stage.

Flooding was started in late-flooded plots on July 8, when the crop was at early flowering stage. Flooding continued until July 29 and a total of 7.5 inches of flooding was applied in addition to natural rainfall.

Varieties – L233P, L234PC, L252, L255PC

Plot size – 9.12m²

Data collected – plant stand, plant height, days to maturity, lodging and grain yield

Agronomic information

Stubble, soil type – Fallow, Heavy clay

Fertilizer applied – Early/ late flooding sets: N 55 - P 25 – K 0 (lbs/acre)

Control set: N 43 - P15 – K 0 (lbs/acre)

Pesticides applied – Liberty@1.35 L/acre + Decis @ 50ml / acre on Jun 16

Decis @ 50ml /acre on Jun 25

Liberty @1.35 L/acre on July 02 (Only late flooding and control sets)

Coragen @ 50ml/acre for grasshoppers on July 10

Coragen @100ml/acre for grasshoppers on Aug 11 (only Control set)

Silencer @ 34ml/acre for flea beetles on Aug 14 (only Control set)

Silencer @ 34ml/acre for flea beetles on Aug 20

Seeding / Harvesting date – Jun 02 / Sep 04