

Flooding Effects on Wheat Growth and Yield

Project Duration: 2019-2021

Objectives

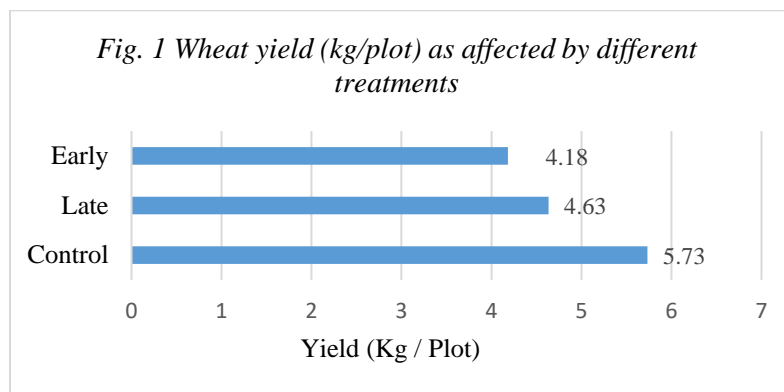
Wheat plots were flooded at the early and late crop stages to assess the effects of flooding on crop growth and yield. Plots were also grown under non-flooding conditions for comparisons.

Collaborators

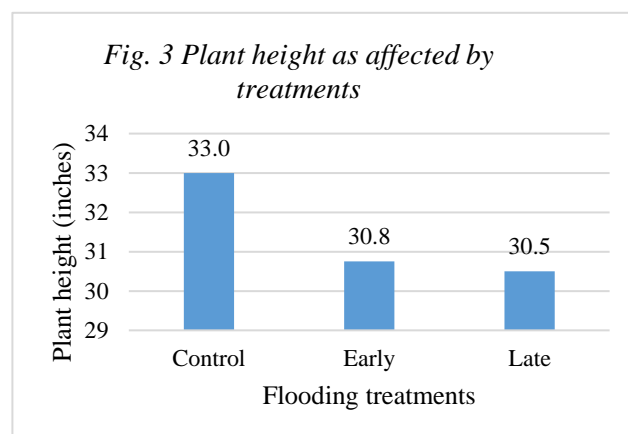
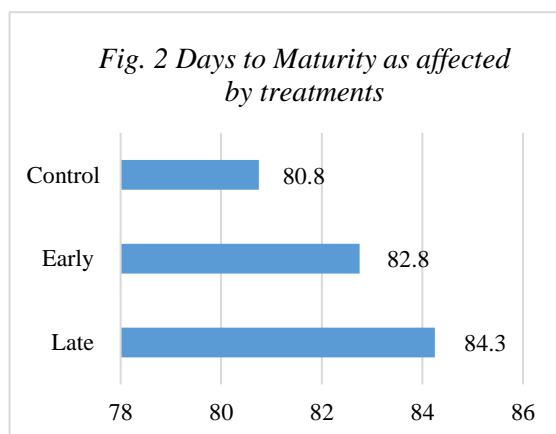
Canadian Agricultural Partnership funding
Curtis Cavers, AAFC Portage la Prairie

Results

Non-flooded plots of wheat had much higher yield than flooded plots ($p=0.008$). There was no difference between the early flooding and late flooding plots as seen below in Figure 1. Plant establishment did not vary among flooding and control wheat plots ($p = 0.662$, data not shown).



Both flooding treatments significantly increased the number of days to maturity ($p=0.002$, Fig 2). Flooding also stunted the growth of the wheat. The control wheat grew much taller ($p=0.02$, Fig. 3).



Project findings

Wheat in control plots grew much taller and it took less number of days to mature. Flooding delayed wheat maturity irrespective of flooding timings. Flooding also exhibited stress on wheat plants resulted in

significant yield loss. The current study had only one wheat variety and this test will be expanded in future by including more number of wheat varieties.

Although weather was exceptionally drier at the Arborg site during the 2019 summer, flooding still caused a decrease in the crop yield.

Background/References/Additional Resources

Extreme moisture in Manitoba causes significant losses to farmers. From 1812-1959 historic records show that crop losses in Manitoba were 10.2% from excess moisture and 35.6% from drought. Extreme moisture during the 1812-1959 period accounted for 45.8% of all crop losses. During 1966-2015, excess moisture accounted for 38% of all crop losses in Manitoba (MASC). Manitoba crop insurance data from 1965-1972 showed clay soils subjected to excess moisture in July experienced the highest yield loss (2-6 bu/ac/day) for barley, oats, wheat and flax crops (Rigaux and Singh, 1977).

Additionally, farmers experience loss of nutrients due to extreme moisture as well as loss of soil. Excessive soil moisture also delays agronomic operations. The impact of these losses on farm net income is significant.

Rigaux, L. R. and Singh, R. H. Benefit-cost evaluation of improved levels of agricultural drainage in Manitoba, Volume 1-3, Research Bulletin No. 77-1, Department of Agricultural Economics and Farm Management, University of Manitoba, June 1977.

Materials & Methods

Experimental Design – Replicated block design

Treatments – Wheat grown in flooded (early and late) 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 wheat crop was at 2-3 leaf stage.

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

Varieties – AAC Brandon

Plot size – 9.12m²

Data collected – plant population, days to maturity, plant height at maturity, yield

Agronomic information

Stubble, soil type – Fallow, Heavy clay

Fertilizer applied – N 100 lbs/ acre, P 30 lbs/acre at the time of seeding.

Pesticides applied – No application

Seeding/Harvesting date – May 30/ Sep 11