Government of Saskatchewan

Agricultural Demonstration of Practices and Technologies (ADOPT)

FINAL REPORT

20140425

IMPACT OF THE "MANIPULATOR" ON VARIETIES WITH DIFFERING LODGING RESISTANCE AT HIGH RATES OF N FERTILITY

Funded by: The Saskatchewan Ministry of Agriculture under the Canada-Saskatchewan Growing Forward bi-lateral agreement

April 2016

Prepared by: East Central Research Foundation

Impact of “Manipulator” on Varieties with Differing Lodging Resistance at high rates of N Fertility. ADOPT #20140425

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Abstract

Manipulator is a plant growth regulator that is registered to reduce lodging in spring and winter wheat. This study examined the impact of Manipulator sprayed at Zadok 31 (first node detected) on two varieties of wheat sown with 100, 125 and 150 lbs/ac of actual nitrogen. Increasing nitrogen rate did not significantly increase either lodging or yield. Unity wheat was more susceptible to lodging than Goodeve and benefited more from the application of Manipulator. Applying Manipulator increased Unity yield from 46 to 56 bu/ac whereas it only increased Goodeve yield from 54 to 59 bu/ac.

Description

Producers push nitrogen rates inorder to increase yield and protein of wheat. However, too much nitrogen can result in lodging and yield loss. Producers can reduce lodging through the application of plant growth regulators (pgrs).

Manipulator (chlormequat chloride) is a plant growth regulator distributed by Engage Agro and is now registered for use in Saskatchewan. However, not all elevators are currently accepting wheat treated with Manipulator. Manipulator, is an anti-gibberellin, by reducing gibberellin biosynthesis it interrupts plant signals involved in stem elongation. The reduction in plant height leads to reduced lodging and greater yields. Manipulator is safer than other pgrs because of its wide window of application from Zadok 21 (main shoot 1 tiller) to Zadok 39 (flag). However, Engage Agro recommends Zadok 31 (1st node detected) as the ideal timing which has been proven long term based on European data. Although data from IHARF small plots consistently show better results at Zadok 39 (flag) there may be some risk with this timing. Instead of shortening and strengthening the bottom internodes, the middle internodes may shorten and strengthen which may actually worsen lodging under very adverse conditions. The early Zadok 21 timing is considered to be less efficacious. Manipulator is an anti-gibberellin. Major gibberellin production starts at Zadok 31 to coincide with stem elongation. Manipulator which is applied early has no efficacy until Zadok 31 by which time some of the product has been metabolized by the plant. So going early is equivalent to applying a reduced rate. Engage Agro considers the Zadok 31 timing the most efficacious followed by Zadok 39 and then Zadok 21.

The objective of this study was to compare the effectiveness of Manipulator applied at Zadok 31 (first node detected) on two wheat varieties with different resistance to lodging and at 3 rates of nitrogen. The

wheat varieties were Goodeve and Unity with resistance to lodging ratings of “Very Good” and “Fair”, respectively. The nitrogen rates were 100, 125 and 150 lbs/ac of actual.

Table 1. shows the dates of all the operations.

Table 1. Dates of Operations

Operation	Date
Plot seeded	May 11, 2015
Emergence Counts	May 27, 2015
Simplicity + Frontline	June 2, 2015
Manipulator 620 applied at 1.8 L/ha at zadock 31-first node detectable	June 15, 2015
Lodging Ratings	August 15, 2015
Preharvest Roundup	August 28, 2015
Harvested	Sept 2, 2015

Results

Crop emergence was good. It did decrease somewhat as nitrogen rates were increased. For Goodeve, plant populations declined from 23 to 20.5 plants/ft^2 as nitrogen rates were increased from 100 to 150 lbs/ac of actual. For Unity the decline was from 28 to 24 plants/ft^2.

Increasing nitrogen rate did not statistically increase lodging or wheat yield, even in the absence of a plant growth regulator. Yield was maxed out at 100 lbs/ac of actual nitrogen and grain protein was high (15%). Increasing nitrogen from 100 to 150 lbs/ac only increased protein by a few points.

Goodeve wheat resisted lodging quite well, even at 150 lbs/ac of Nitrogen (Figure 1 and 2).

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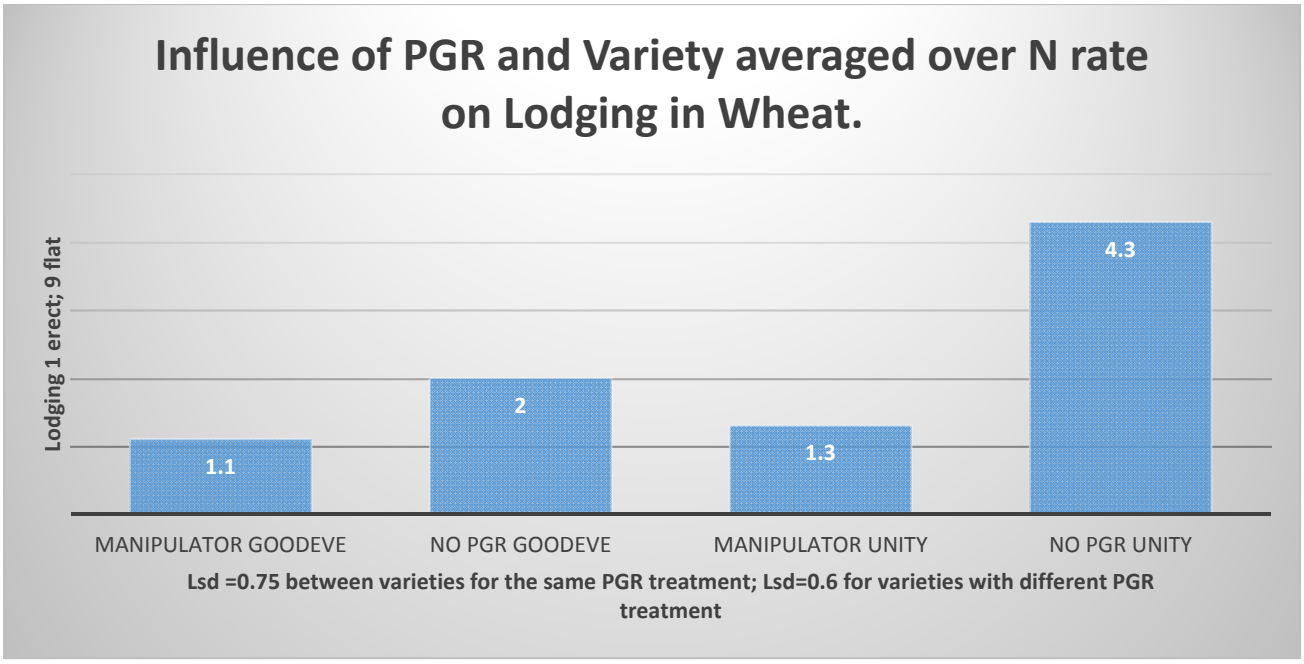
Figure 1. Goodeve Wheat Resists Lodging at 100 and 150 lbs/ac of Nitrogen.

Figure 2.

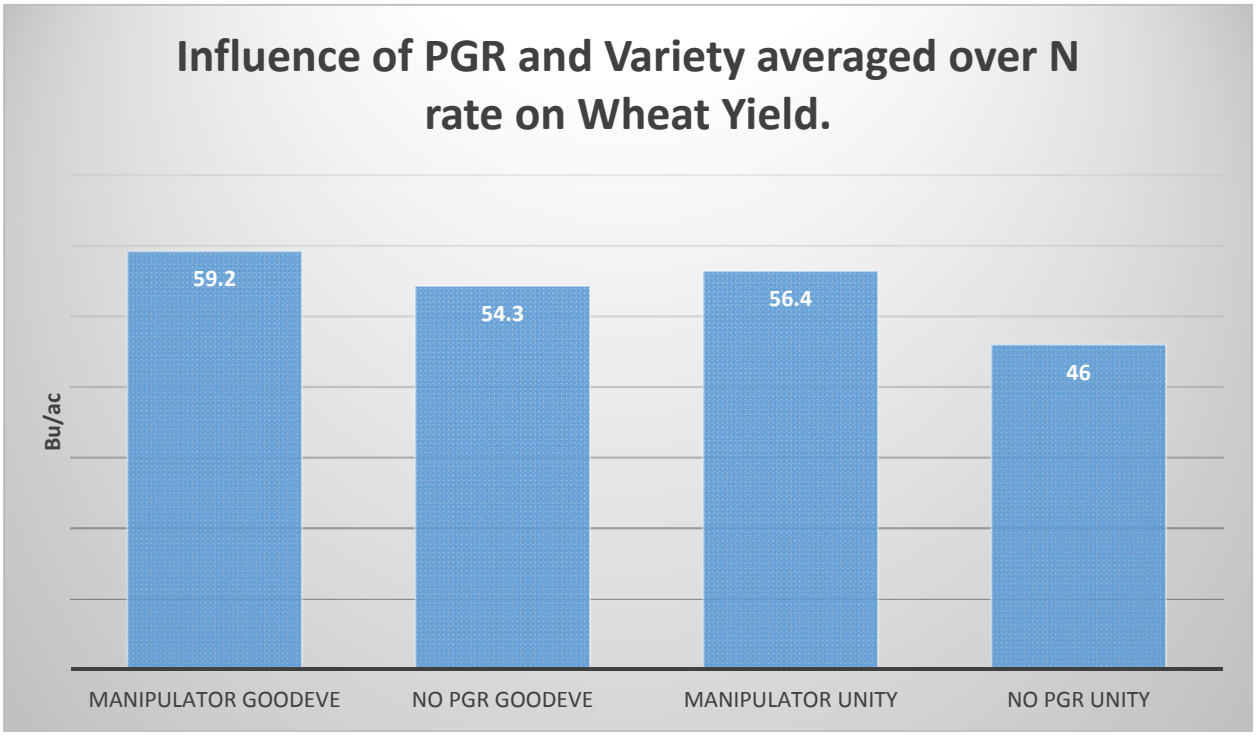


In contrast, Unity wheat was lodging even at 100 lbs/ac of nitrogen. However, with the application of Manipulator lodging was significantly reduced (Figures 2 and 3). Although Goodeve did not significantly lodge compared to Unity, the application of Manipulator improved its standability as well.

Figure 3. Lodging of Unity Wheat Significantly Reduced by the Application of Manipulator

The application of Manipulator statistically increased the yield of Goodeve and Unity wheat. Although there was not a statistically significant Variety by PGR interaction you can see there was a trend for Unity to be more responsive to the application of Manipulator than Goodeve (Figure 4). This makes intuitive sense as lodging was corrected to a greater degree in Unity from the application of Manipulator.

Figure 4.



Conclusions

The application of Manipulator at Zadok 31 (1st node detected) on wheat significantly reduced lodging and increased yield of both varieties of wheat. However, the benefit was greatest for the wheat variety Unity as it is more susceptible to lodging. Applying Manipulator increased Unity yield from 46 to 56 bu/ac whereas it only increased Goodeve yield from 54 to 59 bu/ac. Even though lodging levels were relatively low with Goodeve the application of Manipulator would have still been economical.

Acknowledgements

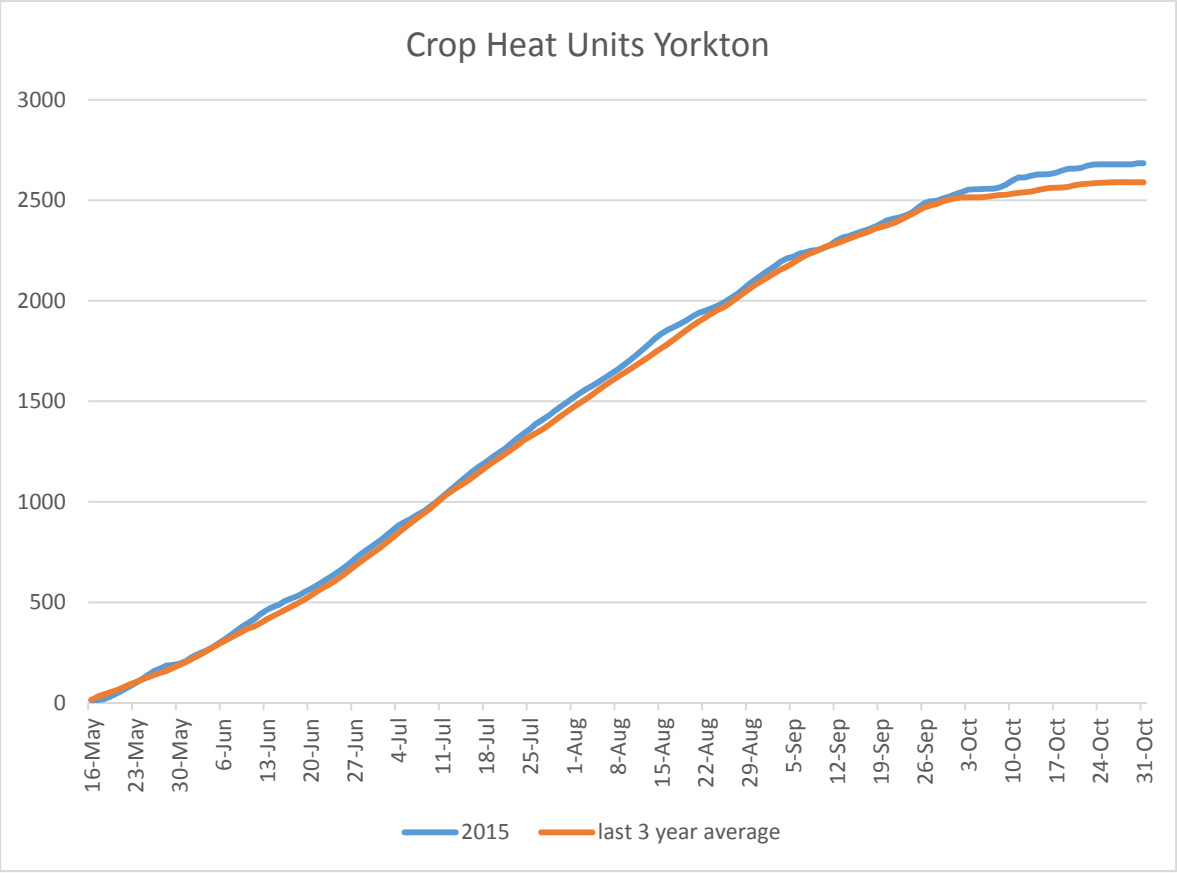
This project was supported by the Agricultural Demonstration of Practices and Technologies (ADOPT) initiative under the Canada-Saskatchewan Growing Forward bi-lateral agreement.

Environmental Data

Data for Yorkton was obtained from Environment Canada from the following internet site: [http://www.climate.weatheroffice.gc.ca/climateData/canada_e.html]. Crop heat units were calculated using the formula available from Omafra website: [http://www.omafra.gov.on.ca/english/crops/pub811/10using.htm]

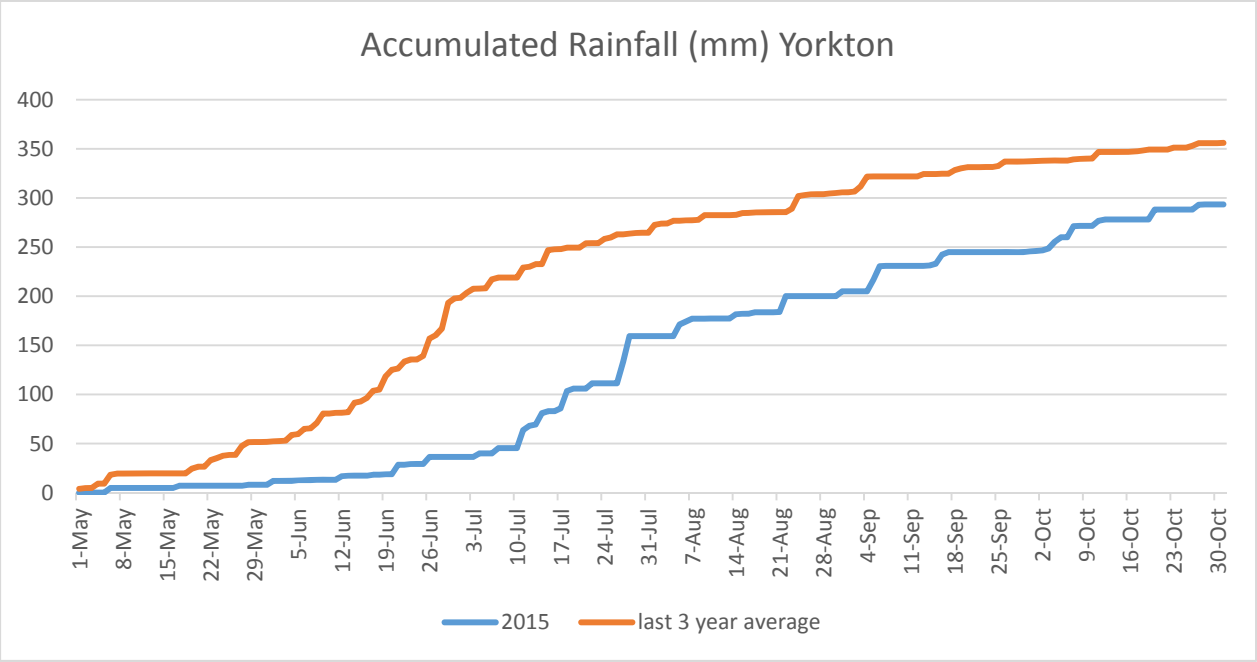
Overall, 2015 was a good year at the research farm and yields were average to above average depending on the trial. The crops suffered a frost evident (minus 2 to 4°C) on May 30th. The Peas, Fababeans and cereals recovered nicely but many of the canola trials had to be reseeded due to frost and flea beetle damage. Flax was also thinned out by the frost. The accumulation of crop heat units was quite comparable to the last 3 year average until Oct when conditions were much warmer than normal (Table 1). This added heat was much needed to help Soybean, Fababean, late emerging or reseeded crops to mature.

Table 1.



Rain fall was below the last 3 year average (Table 2). It was particularly dry in early spring which in some cases lead to delayed emergence or variable emergence of some trials. Rainfall picked up in July which saved the yield potential of many crops.

Table 2.


Accumulated Rainfall (mm) Yorkton
400
350
300
250
200
150
100
50
0
1-May
8-May
15-May
22-May
29-May
5-Jun
12-Jun
19-Jun
26-Jun
3-Jul
10-Jul
17-Jul
24-Jul
31-Jul
7-Aug
14-Aug
21-Aug
28-Aug
4-Sep
11-Sep
18-Sep
25-Sep
2-Oct
9-Oct
16-Oct
23-Oct
30-Oct
2015
last 3 year average