Effect of seeding rate and plant growth regulators on Winter Wheat

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Background and Objectives

Winter wheat varieties have had a 21 per cent higher yield than Canadian Western Red Spring wheat over the past three years in the Prairie Provinces [Western Winter Wheat Initiative]. Return on investment can be more than two times higher than for spring wheat. In addition to providing an effective tool to manage pests, nutrients and moisture, winter wheat can improve crop rotations and distribute cropping activities, enhancing timeliness of operations.

Lodging is a major crop production issue, especially in high yielding winter wheat environments. Lodging can be managed through variety selection and agronomics. Crop varieties vary in their resistance to lodging, with stem length, thickness of stem internodes, root structure, and head density and shape affecting resistance to lodging.

Plant growth regulators (PGRs) are another management tool used to reduce lodging. PGRs are synthetic compounds that alter hormonal activity to modify plant growth and development. PGRs are used to improve crop standability, as they are intended to produce shorter, thicker, and stronger stems.

Similarly, seeding rate is another important factor that determines winter wheat yield. Yield advantage to higher seeding rates happens because of several factors, and not just because of weed competition. In areas where fusarium is a problem, higher plant populations may mean fewer tillers, which may mean more uniform flowering making a fungicide application more precise to protect both yield and quality.

The objective of this project was to evaluate the effects of different PGRs and seeding rates on winter wheat height, lodging and yield.

Materials and methods

Both trials were planted on Sep 15, 2015. At the time of seeding, 27 lbs/acre of P were applied where as later in the spring, 120 lbs/acre of N were broadcasted. For weed control, 0.81 litres/acre of Curtail and 0.48 litres/acre of Axial were applied on June 14. The trials were harvested on August 8 using Wintersteiger small plot combine. The plot size for these trials was 8.22m^2.

In the seeding rate trial, three winter wheat varieties Gateway, Emerson and Moats were seeded in a replicated trial with three replications. Two seeding rates (30 plants/sq ft and higher seeding rate of 37 plants/sq ft) were evaluated for their effect on plant height, lodging and grain yield.

In second trial, PGR Manipulator was either applied at full dose or at two different times as Split application on three winter wheat varieties Gateway, Emerson and Moats. Application timings were around flag leaf emergence. Data on plant height, lodging and grain yield were taken to assess the effects.

Data were analysed using ANOVA and means were compared at P=0.05.

Results

Higher seeding rate did not have any effect on plant height, lodging and grain yield (Table 1). Although winter wheat variety Moats had higher lodging than other two winter wheat varieties, but lodging did not vary between normal and higher seeding rate treatments. Grain yield varied from 101.6 to 112.6 bushels/acre among different treatments, but differences were statistically non-significant.

Table 1. Effect of different seeding rates on winter wheat performance at Arborg site.

Treatment	*Yield (bu/acre)*	*Plant height (inches)*	*Lodging (1-5 scale)*
Moats high	*104.2*	*39.3*	*3.3*
Emerson high	*101.6*	*39.0*	*1.6*
Gateway high	*112.6*	*35.0*	*1.0*
Emerson regular	*104.6*	*37.7*	*1.3*
Moats regular	*109.6*	*38.3*	*2.7*
Gateway regular	*108.1*	*34.0*	*1.3*
P	*0.20*	*0.07*	*0.0004*
CV(%)	*5.3*	*7.6*	*51*

Table 2. Effect of plant growth regulator Manipulator on winter wheat at Arborg site.

Treatment	*Yield (bu/acre)*	*Plant height (inches)*	*Lodging (1-5 scale)*
Moats none	*113.7*	*39.7f*	*2.0*
Moats split app	*105.8*	*37.0de*	*2.3*
Moats full rate	*113.5*	*34.3b*	*2.3*
Emerson none	*105.1*	*38.0e*	*1.0*
Emerson split app	*107.7*	*36.3cd*	*1.3*
Emerson full rate	*106.4*	*34.0b*	*1.0*
Gateway none	*116.3*	*34.7bc*	*1.0*
Gateway split app	*115.8*	*31.7a*	*1.0*
Gateway full rate	*111.4*	*30.3a*	*1.0*
P	*0.10*	*0.02*	*<0.0001*
CV(%)	*6.8*	*12.1*	*44*

The use of plant growth regulator resulted in reduction in plant height, but it did not have any effect on lodging and grain yield (Table 2). Winter wheat plants were shorter when Manipulator was applied either at full or split dose. Although variety Moats had higher lodging than other two winter wheat varieties, but use of Manipulator did not reduce lodging in this variety.

Project findings

Winter wheat holds an important place in crop rotations on the Canadian prairie. The current study showed that higher seeding rate and use of plant growth regulator, Manipulator did not have any effect on lodging and grain yield. Although this PGR resulted in reduction in plant height but this change was not reflected in yield gain. More work is needed to identify best management practices that can maximize winter wheat yield and increase profitability for producers.

References

Western Winter Wheat Initiative. Grow winter wheat. http://www.growwinterwheat.ca/wpcontent/uploads/2016/12/WWWI-Grower-Guide-20161013JF_Approved-Web-Ready.pdf