Response of lodging-related morphological traits of wheat to nitrogen fertilization and plant growth regulator

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Introduction

Lodging, which refers to the falling over of the plant, negatively affects yield and quality in wheat (Pinthus, 1974). The incidence of lodging is determined mainly by genetic and environmental factors as well as crop management practices. This study investigated lodging related morphological traits in response to nitrogen (N) fertilization levels and treatment with plant growth regulator (PGR) that inhibits gibberellin (GA) biosynthesis in two spring wheat cultivars with contrasting plant heights.

Materials and methods

Plant material: Two Red spring wheat cultivars, namely Invader (tall) and Wildcat (short) were used in this study.

Growth conditions and N rates: Replicated field trials involving split plot design (main plots, N rates-residual/control, 180 and 280 kg/ha; sub plots, cultivars) conducted for two growing seasons.

Lodging related parameters: Morphological traits associated with lodging, namely plant height, bending moment, and lodging index were recorded at the milk growth stage.

Treatment with plant growth regulator (PGR): Plants were treated with a PGR that inhibits gibberellin (GA) biosynthesis, namely chlormequat chloride (Manipulator 620), at the 2-node stage.

Results

- Elevated N levels increased plant height by 21% and 24%, bending moment by 2.6- and 3.0-fold, and lodging index by 1.8- and 2.7-fold in the tall and short cultivars, respectively (Fig. 1).

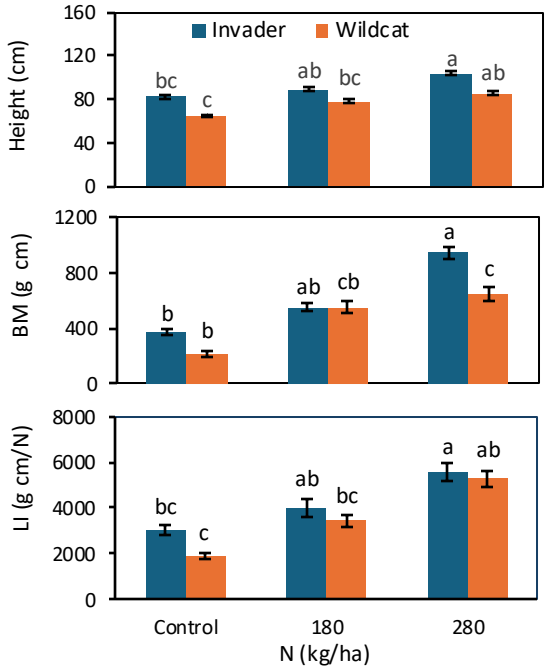

Fig. 1 Effect of N on plant height, bending moment (BM) and lodging index (LI) in Invader and Wildcat cultivars. Data are means of three replicates (15 plants/replicate) ± SE.

- Treatment of the tall cultivar with GA biosynthesis inhibiting PGR reduced plant height (10% to 22%), bending moment (12% to 37%) and lodging index (~23%) irrespective of the N rate (Fig. 2).

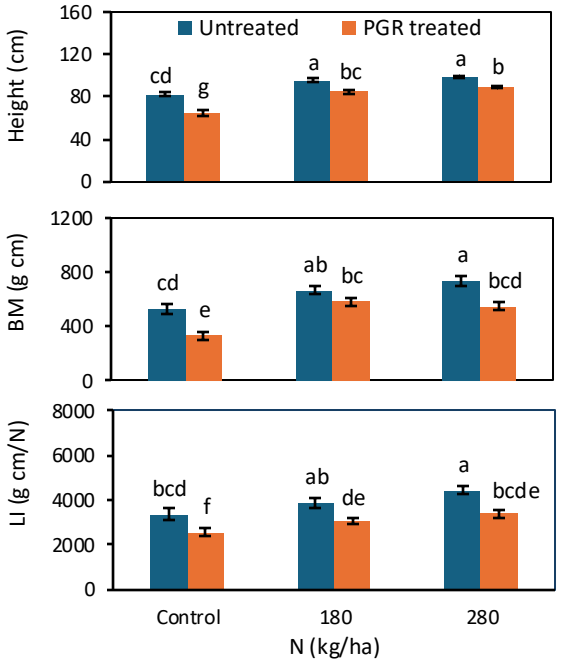

Fig. 2 Effect of GA biosynthesis inhibiting PGR on plant height, bending moment (BM) and lodging index (LI) in the tall cultivar. Data are means of three replicates (15 plants/replicate) ± SE.

Conclusion

An increase in N fertilization rate caused a significant increase in lodging index in both cultivars while treatment with GA biosynthesis inhibiting PGR led to reduced lodging index in the taller cultivar.

References

Pinthus, M. J. (1974). Lodging in wheat, barley, and oats: The phenomenon, its causes, and preventive measures. Advances in Agronomy, 209–263.

Acknowledgments

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