Plant Growth Regulators in Wheat in Semi-Arid West Texas

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Highlights

- Application of Palisade® influenced plant height in dryland wheat without negative effects on grain yield.
- No lodging was observed possibly due to other factors such as overall shorter plant height and weather conditions which were not conducive for lodging.
- Application of Palisade® did not result in consistent improvements in yield.
- PGR applications to wheat may be justified under higher yielding conditions than the sites of this experiment, but are not likely to be economically justified in water-limited or dryland conditions.

Under certain environmental conditions, wheat can be susceptible to lodging, which is the permanent bending or tilting of stems. lodging impacts crop maturity, lower grain quality, make harvesting more difficult, and increases costs. While modern short-stature cultivars have reduced lodging risks, it still occurs due to planting management, soil fertility, excess nitrogen, irrigation, and weather factors *i.e.,* rainfall and wind. To help manage lodging, in-season application of plant growth regulators (PGRs) is often suggested. Research in different wheat producing regions has also shown that PGRs can also improve wheat growth, yield, and grain quality under favorable conditions. However, in semi-arid West Texas, where most wheat is grown under dryland or low-input conditions, research evidence is required on whether PGRs provide measurable benefits.

Dryland wheat, 2023-24

Field trials on dryland wheat in 2023-24 were conducted at Southern Rolling Plains, Research and Demonstration Farm at Wall, and at Millersview, Texas. Simth's Gold was planted at both locations. Treatments included Palisade® application at vegetative, jointing and boot stages at low (10.5 oz acre^{-1}) and high (14.4 oz acre^{-1}) application rates. Both trials received 30 lb acre^{-1} of nitrogen. Measurement included plant height, grain yield, test weight, and lodging score.

Smith's Gold performance

Plant height, grain yield and test weight of Smith's Gold were not affected by the application timing or rate of PGR in dryland conditions both at Wall and Millersview, TX. Wheat yielded only 12 bu/ac at Wall and 21 bu/ac at Millersview

Dryland and supplementary irrigated wheat, 2024-25

Field trials on wheat under dryland and supplementary irrigation were conducted at Southern Rolling Plains Research and Demonstration Farm at Wall, Texas. Dryland and supplementary irrigated wheat were grown in separate fields using randomized complete block design four replicates. The wheat varieties selected for this study were High Cotton (short) and Bob Dole (tall). In addition to control, PGR application treatments were, application of Palisade® (12% TE) applied in full dose (14 oz acre^{-1}) at stem elongation and in split application (7 oz acre^{-1} each) at tillering and stem elongation. The irrigated wheat trial was flood irrigated prior to planting and

once during the growing season at the onset of stem elongation. Both trials received 30 lb per acre of nitrogen.

Dryland wheat performance, 2024-25

Plant Height

Plant height (Figure 1) was affected by variety and application of PGR significantly influenced the plant height under dryland conditions. Full application at stem elongation resulted in lowest average plant height that was 1.4 inches shorter than control.

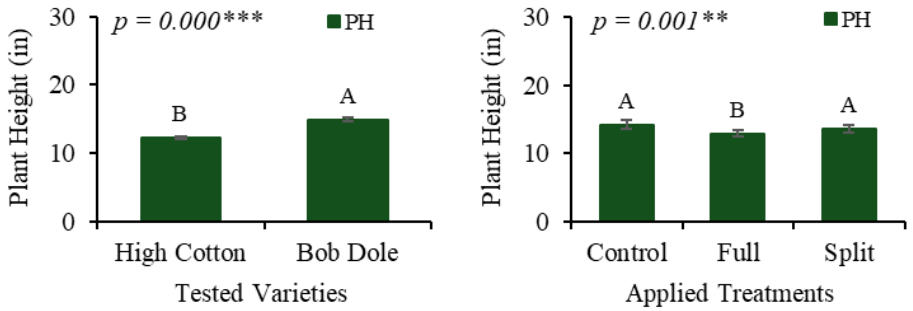

Figure 1: Plant height of High Cotton and Bob Dole and significant effect of PGR application in dryland conditions.

Grain Yield

High Cotton and Bob Dole did not exhibit variations in grain yield in dryland conditions (Figure 2). Similarly, application of PGR also did not affect grain productivity. However, split application indicated a numerical increase (50 lb acre^{-1}) in yield.

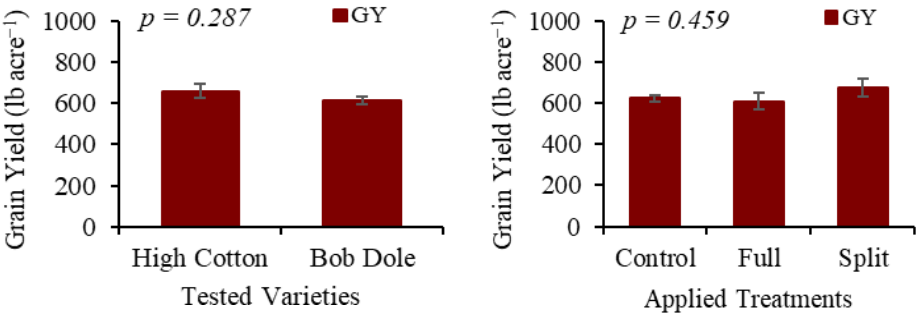

Figure 2: Grain yield of High Cotton and Bob Dole and effect of PGR application in dryland conditions.

Supplementary irrigated wheat performance, 2024-25

Plant Height

Plant height (Figure 3) was affected by variety. Application of PGR did not influence the plant height under irrigated conditions.

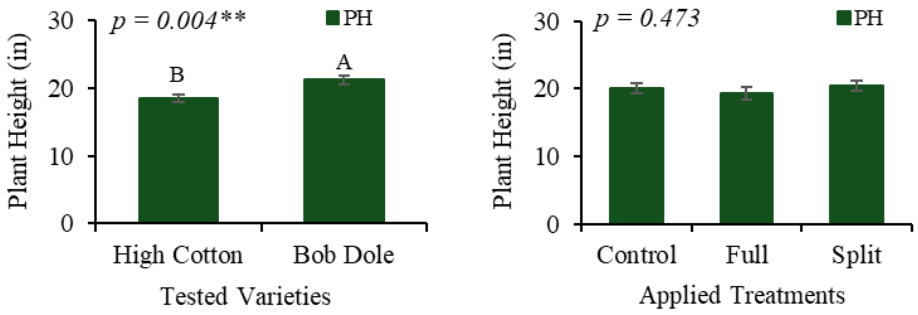

Figure 3: Plant height of High Cotton and Bob Dole and effect of PGR application in irrigated conditions.

Grain Yield

High Cotton and Bob Dole produced similar yields and application of PGR did not negatively impact wheat yield in limited irrigated conditions (Figure 4). High cotton produced 204 lb acre^{-1} more compared to Bob Dole. Application of Palisade® resulted in numerical increase in the yield. Average grain yield was 59 and 180 lb acre^{-1} higher than that of control when applied in split and full, respectively.

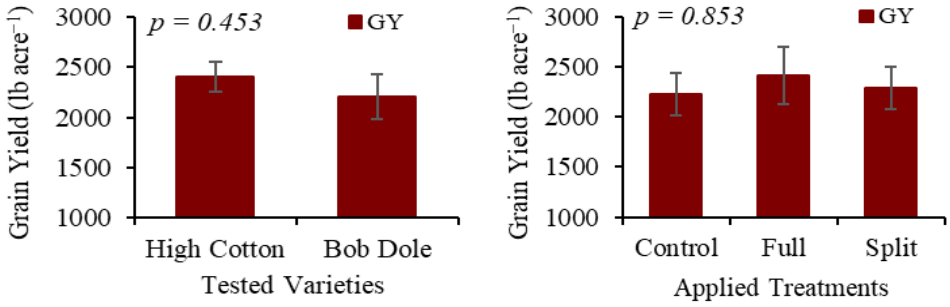

Figure 4: Grain yield of High Cotton and Bob Dole and effect of PGR application in irrigated conditions.

Should I use plant growth regulator in wheat

The decision of PGR application is dependent upon several factors such as crop (variety), environment (weather) and management (planting, fertilization, Irrigation etc.) and their interactions. Factors influencing application of PGRs and critical considerations are provided Table 1. Application of PGR will benefit when there are higher lodging risks, however overall economics may influence decision making. Growers should check with retailers to verify actual costs and determine the economic feasibility of PGR application.

Table 1: Factors influencing application of plant growth regulators (PGRs) and key considerations.

Factor	Key considerations
Variety	Variety with lower lodging rating means lower lodging potential. Early maturing varieties may not require PGR applications compared to late maturing. Short or varieties resistant to lodging may be better choice in environments vulnerable to lodging.
Planting management	Planting density and seeding depth influence crop stands. Optimal planting density and seeding depth ensure vigorous plants, uniform emergence and strong anchorage. Higher seeding rate or shallow planting depths due to limited soil moisture at planting may require in-season PGR application.
Irrigation	High soil moisture may pose lodging risks in irrigated wheat. Optimal irrigation management should be considered, and a suitable rate of PGR application may be considered.
Nitrogen	High nitrogen along with moisture availability promotes excessive vegetative growth. Optimal nitrogen management including split applications should be considered. PGR applications may become necessary if excessive vegetative growth occurs.
Weather	Weather forecasts and prevailing conditions suitable for excessive vegetative growth may require PGR application with suitable timing and rate.
Economics	The cost per acre of PGR applications relative to yield stability and gains determine economic feasibility. Potential benefits such as improved harvest efficiency and reduced losses might be considered.

Acknowledgement

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