



Plant Growth Regulator Testing to Prevent Winter Wheat Lodging in Tulelake

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Introduction: Tulelake's climate and soils are very favorable for irrigated barley and wheat production, and growers consistently obtain some of the highest barley and wheat yields reported in California. A downside to these high yields is several varieties tend to lodge, the bending over of the stems near the ground level, in Tulelake. Plant breeding efforts reduced the incidence of lodging over the years by developing shorter varieties with stiff straw, but some varieties still tend to lodge on a yearly basis. One solution to lodging is to apply a plant growth regulator (PGR) that shortens the internodes and strengthens the stem through inhibition of cell elongation. This study tested the effectiveness of PGRs applied at different timings and rates for reducing winter wheat lodging. A similar study was conducted in 2018 with reports cited in IREC Research Report #187.

Methods: The study site was established at IREC in fall 2018 using Tubbs, a soft white winter wheat variety. The study was set up as a RCB design with four replications. Treatments included an Eastman PGR (Test PGR) with the active ingredient chlormequat chloride, and a Syngenta PGR (Palisade) applied alone and in combination with the herbicide Harmony Extra and fungicide Quilt Xcel. PGR treatments were applied at three application times: tillering (21), early stem elongation (30-32), and flag leaf emergence (37-39). The trial included a standard fertilizer control and high nitrogen fertilizer control. Evaluations included plant height, lodging, grain yield, and grain quality.

Results: All results are presented in the Table on page 2. PGR treatments applied at stem elongation and flag leaf emergence reduced plant height compared to the high fertility control. PGR treatments at stem elongation and split applied at stem elongation and flag leaf emergence reduced lodging compared to the high fertility control. Wheat yield was negatively correlated (.74) to lodging with wheat yield increasing more than 0.5 tons/acre in PGR treatments that prevented lodging. Grain protein and kernel weight were similar across PGR treatments.

Table. 2019 Plant Growth Regulator (PGR) Results from Tulelake, CA- Tubbs winter soft white wheat

Trt #	Treatment Name ¹	Application Timing ²	Trt Rate per Acre	Unit	Stem width anthesis (mm)	Stem width harvest (mm)	Plant height anthesis (cm)	Plant Height at Harvest (cm)	Lodging Rating		Grain yield (tons/acre)	Bushel wt. lbs	Grain protein (%)	Grain moisture (%)	1000 Kernel Wt. (grams)	Kernels per head (#)
									Soft Dough	Maturity						
									1-9, 1=flat							
1	Control (Std Fertility)	N/A			3.28	3.03b	107abc	102	8a	8a	5.28abc	58.66	9.12b	10.2	42.8a	47.3
2	Control (High Fertility-HF)	N/A			3.32	3.2ab	111a	103	2c	3b	4.76c	56.61	10.92a	10.3	39.5ab	47.4
3	Test PGR (HF)	1	25	fl oz	3.42	3.22ab	108ab	103	5abc	6ab	5.21abc	56.31	10.75a	10.4	38.9ab	46.7
4	Test PGR (HF)	2	25	fl oz	3.26	3.09b	100cde	95	6ab	6ab	5.07abc	57.61	10.47a	10.3	38.5b	47.2
5	Test PGR (HF)	3	25	fl oz	3.41	3.27ab	102bcd	99	4bc	4b	4.84bc	55.97	11.02a	10.3	38.4b	48.9
6	Palisade EC (HF)	2	14.4	fl oz	3.47	3.13b	102bcd	100	8a	7a	5.49ab	57.62	10.35a	10.3	39.4ab	48.4
7	Test PGR (HF)	2	14	fl oz	3.38	3.06b	97de	98	6ab	6ab	5.14abc	56.11	10.9a	10.3	38b	47
		Test PGR (HF)	3	11												
8	Palisade EC	2	14.4	fl oz	3.49	3.24ab	98de	97	8a	8a	5.57a	57.35	10.55a	10.4	39.5ab	44.8
		Test PGR (HF)	3	11												
9	Palisade EC	2	14.4	fl oz	3.41	3.46a	94e	95	8a	8a	5.52ab	57.82	10.5a	10.3	39.4ab	42.3
		Test PGR (HF)	3	25												

¹All treatments included nonionic surfactant (NIS) added at 0.25% v/v; All treatments including controls included Harmony Extra herbicide applied at stem elongation & Quilt Excel applied at flag leaf emergence. PGRs were tank-mixed with these pesticides in cases where the application timing was the same.

²1= tillering (21); 2 = early stem elongation (30-32); 3 = flag leaf emergence (37-39)