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Use of Palisade Plant Growth Regulator to Prevent Barley and Wheat Lodging in Tulelake

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Introduction: The soils and weather in Tulelake are very favorable for irrigated barley and wheat production. Barley was one of the first crops grown in Tulelake, and growers consistently obtain some of the highest barley and wheat yields reported in California. Growers frequently have a problem with lodging, the bending over of the stems near the ground level. Lodging is caused by several factors including nitrogen, soil moisture, and weather. Plant breeding efforts reduced the incidence of lodging over the years by developing shorter varieties with stiff straw, but many older varieties in high demand tend to lodge. In 2016 many growers experienced significant yield reduction and harvest problems due to barley lodging. One solution to lodging is to apply a plant growth regulator that shortens the internodes and strengthens the stem through inhibition of cell elongation. This study evaluated the use of the plant growth regulator, Palisade, for mitigating lodging in Tulelake barley and wheat. The study tested the effectiveness of Palisade applied at different timings and rates for reducing barley lodging in Tulelake. The study also documented the yield and quality benefit from using Palisade compared to leaving barley untreated.

Methods: A study site was established at IREC in spring 2017 in Copeland spring brew barley and Alpowa spring white wheat. The study was set up as a RCB design with four replications. Treatments included Palisade alone and in combination with herbicide and fungicide tank-mixes applied at two application times. The trial included an untreated control. Evaluations included plant height, lodging incidence and severity, grain yield, and grain quality.

Results: All Palisade treatments significantly reduced barley height and prevented lodging compared to the control (Table 1). Most Palisade treatments also increased grain yield compared to the control (Table 1). Palisade treatments applied Feekes 7 resulted in higher bushel weights compared to Palisade applied at Feekes 5 (Table 1). Palisade treatments applied at Feekes 7 also resulted in slightly higher protein than many of the Palisade treatments applied at Feekes 5.

Palisade applied alone at both timings significantly reduced Alpowa wheat plant height compared to the untreated control (Table 2). When Palisade was tank-mixed with Weedar64 and/or Quilt wheat plant height did not differ from the control (Table 2). All Palisade treatments reduced lodging compared to the control, although lodging was minimal in all treatments (less than 15%). Palisade tank-mixed with Quilt at the Feekes 7 application timing reduced stripe rust compared to the control and all other Palisade treatments (Table 2). Wheat yield, bushel weight, and protein were similar across all treatments (Table 2).

Table 1. Influence of the growth regulator Palisade (trinexapac-ethyl) on Copeland barley height, lodging, and stripe rust incidence

				Milk Stage			Harvest		
trt #	Treatment	Rate/A	Application timing	Plant height (inches)	% lodging	% stripe rust	Grain yield (ton/A)	Bushel weight (lbs)	Protein
1	Untreated	**	**	47a	59a	58a	3.23b	50.8abc	10.9a
2	Palisade NIS	14 fl oz .25%v/v	Feekes 5	40cd	0b	43a	3.94a	50bcd	10.0bc
3	Palisade Weedar64 NIS	14 fl oz 1 pt/A .25%v/v	Feekes 5	39d	0b	43a	3.68a	48.8d	10.0bc
4	Palisade Weedar64 Quilt NIS	14 fl oz 1 pt/A 14 fl oz .25%v/v	Feekes 5	39d	0b	48a	3.78a	49.5cd	9.7c
5	Palisade NIS	14 fl oz .25%v/v	Feekes 7	44b	0b	38a	3.59ab	51ab	10.6ab
6	Palisade Quilt NIS	14 fl oz 14 fl oz .25%v/v	Feekes 7	42bc	0b	33a	3.87a	51.5a	10.9a

Feekes 5 = Leaf sheaths strongly erect; first node showing on a few plants

Feekes 7 = Second node visible; no flag leaves showing

Treatment means with the same letter within columns are not statistically different (Tukey-Kramer HSD test)

Untreated Control & Palisade + Quit Treatment in Barley

Table 2. Influence of the growth regulator Palisade (trinexapac-ethyl) on Alpowa spring wheat height, lodging, and stripe rust incidence

				Soft Dough Stage			Harvest		
trt #	Treatment	Rate/A	Application timing	Plant height (inches)	% lodging	% stripe rust	Grain yield (ton/A)	Bushel weight (lbs)	Protein
1	Untreated	**	**	40.2a	10a	64a	3.90a	62.54b	9.7a
2	Palisade NIS	14 fl oz .25%v/v	Feekes 5	38.0b	0b	58a	3.97a	62.56b	9.7a
3	Palisade Weedar64 NIS	14 fl oz 1 pt/A .25%v/v	Feekes 5	38.4ab	0b	51a	4.00a	62.72ab	9.9a
4	Palisade Weedar64 Quilt NIS	14 fl oz 1 pt/A 14 fl oz .25%v/v	Feekes 5	38.2ab	0b	43a	4.04a	63.07ab	10.1a
5	Palisade NIS	14 fl oz .25%v/v	Feekes 7	37.0b	0b	63a	3.83a	62.89ab	9.9a
6	Palisade Quilt NIS	14 fl oz 14 fl oz .25%v/v	Feekes 7	38.3ab	0b	19b	4.14a	63.32a	10.3a

Feekes 5 = Leaf sheaths strongly erect; first node showing on a few plants

Feekes 7 = Second node visible; no flag leaves showing

Treatment means with the same letter within columns are not statistically different (Tukey-Kramer HSD test)