

Final Report

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Chemical Control of Lodging in Small Grains, 2016

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Summary

Lodging has historically been a problem in small grain production. Palisade is a relatively new plant growth regulator that has shown some promise in reducing lodging. The effect of Palisade on height and lodging of durum, and subsequent yield was tested in a study at the Maricopa Ag Center. Plant height was not affected by Palisade since the chemical was applied at boot, one stage past the recommended window where the plant was near maximum height. Lodging was reduced from 83 to 61% and 28 to 8% under the high and medium input growing conditions, respectively. Grain yield was increased from 4481 to 6152 lb/acre and 5600 to 7330 lb/acre under high and medium input growing conditions, respectively. Palisade is effective in reducing but not eliminating lodging, and can have a large impact on yield as in this study.

Introduction

Lodging is a serious problem in small grain production and can lead to reductions in yield and quality. The introduction of semi-dwarf wheat during the Green Revolution in the late 1960's and early 1970's significantly reduced but did not eliminate lodging problems. Plant growth regulators (PGRs) can reduce the incidence of lodging by shortening and stiffening the stalk. Cerone is a PGR that has been used in the past in Arizona but it has a narrow application window and is ineffective if temperatures are above 85 F, which occurs frequently in Arizona at the time when this chemical should be applied. Palisade is a PGR introduced by Syngenta a few years ago that has been used by many farmers in the region. However, this product has not been tested extensively in Arizona. Palisade has been evaluated as a growth regulator for wheat in Yuma for two years and in Pinal County for one year at two locations. In the Yuma studies, Palisade reduced lodging and increased yield one year where lodging occurred, and had no effect on yield in the absence of lodging the other year. In Pinal County last year, Palisade reduced height and lodging but did not increase yield. More testing is needed on this product so recommendations on its use can be tested on a more robust data set. The purpose of this study is to test the effect of Palisade on durum yield.

Procedure

A study testing the effectiveness of Palisade in reducing lodging in durum was conducted at the Maricopa Ag Center. The study was conducted on Field 1, Borders 67-68 on a Casa Grande sandy loam. The field was fallow in 2015. Mono-ammonium phosphate (11-52-0) was applied preplant at a rate of 100 lb fertilizer/acre providing 11 lb N/acre and 52 lb P₂O₅/acre. The durum variety Kronos was planted on December 7, 2015 at a rate of 150 lb seed/A and irrigated up on December 9. The study was conducted in two borders, medium input and high input. The medium input border had seven irrigations and fertilized with 200 lb N/A and the high input border had twelve irrigations and fertilized with 400 lb N/A (Table 1). The experimental design was a RCB with 2 treatments (Palisade and untreated check), 8 reps, and 2 input levels (medium and high). Palisade EC was applied on March 17 at the end of the boot stage (Feekes 10) one stage later the recommended timing between Feekes 5 and 9 at the maximum rate of 14.4 oz/A. The plots were 20 ft wide and 60 ft long. Heading and flowering occurred for all treatments on March 22 and March 28, respectively, and physiological maturity occurred on April 28 for the medium input plots and May 2 for the high input plots. The center 5 ft of the plots was harvested on May 28, at

which time plant height and lodging were recorded. Grain was harvested with a small plot combine and yields are expressed on an “as is” moisture basis. A sample of plants from 18 inches each of a pair of rows was removed on May 29 for harvest index determination.

Harvest index was determined from whole plants which were dried in an oven at 65 C, weighed, threshed, and grain weighed to determine grain as a percentage of total plant weight. Test weight was calculated from the weight of one pint of grain. Seed weight was determined from 200 seed. HVAC was determined from 10 g of seed. Grain protein was determined from total N multiplied by 5.7, and expressed on a 12% moisture basis.

Results and Discussion

Palisade reduced lodging and increased yield in this study (Table 2). The yield increase due to Palisade was 37% in the high input plots and 31% in the medium input plots for an average increase of 34%. Lodging was reduced from 83 to 61% in the high input plots and from 28 to 8% in the medium input plots. Plant height was not reduced as expected since Palisade was applied at boot one stage past the recommended application window when the plant was close to maximum height. Palisade application had no effect on harvest index, test weight, seed weight, HVAC, grain protein, or heading, flowering, and maturity dates. The magnitude of this yield difference was not expected.

Palisade is effective in reducing lodging in wheat, although it will not eliminate lodging altogether. In the present study, and studies the previous year Palisade reduced lodging. Palisade reduced plant height last year but not in this year's study since it was applied too late. Palisade has an inconsistent effect on yield since a yield increase was recorded this year but not last year even in the presence of lodging. The potential benefit of Palisade is so great compared to its cost that it is probably worth applying this chemical to wheat if lodging is anticipated.

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Table 1. Irrigation and fertilizer schedule for a test of the PGR Palisade at the Maricopa Ag Center.

Date ¹	Medium input			High input		
	Irrigation amount	Fertilizer source	Fertilizer amount	Irrigation amount	Fertilizer source	Fertilizer amount
	inches		lb N/A	inches		lb N/A
12/09	3.92	11-52-0	11	3.92	11-52-0	11
2/03	3.66	Urea	50	3.66	Urea	250
2/15				3.25		
2/24	4.93	Urea	50	4.93	Urea	50
3/02				2.99		
3/09	2.86	Urea	50	2.86	Urea	50
3/18				5.22		
3/23	4.10	Urea	50	4.10	Urea	50
3/30				3.88		
4/06	3.98			3.98		
4/13				3.23		
4/20	3.54			3.54		
Total	26.99		211	45.56		411

¹Urea was applied 1 day before irrigation.

Table 2. Grain yield and other crop characteristics from a test of the PGR Palisade in a study conducted at the Maricopa Ag Center at high and medium levels of irrigation water and nitrogen fertilizer input.

Input level	Palisade	Grain yield	Harvest index	Test weight	Seed weight	Plant height	Lodging	HVAC	Grain protein	Heading	Flowering	Maturity
		lb/A	%	lb/bu	mg	inches	%	%	%			
Hi	Yes	6152	40.5	60.0	56.7	36	61	99	13.4	3/22	3/28	5/06
	No	4481	38.9	59.6	55.8	36	83	99	13.5	3/22	3/28	5/06
Signif.		**	ns	ns	ns	ns	*	ns	ns	ns	ns	ns
Medium	Yes	7330	45.3	60.7	52.0	35	8	100	13.3	3/22	3/28	4/28
	No	5600	45.6	60.0	51.2	35	28	100	13.5	3/22	3/28	4/28
Signif.		**	ns	ns	ns	ns	**	ns	ns	ns	ns	ns
Avg	Yes	6741	42.9	60.3	54.3	35	34	100	13.3	3/22	3/28	5/02
	No	5040	42.2	59.8	53.5	36	55	99	13.5	3/22	3/28	5/02
Signif.		**	ns	ns	+	ns	**	ns	ns	ns	ns	ns

Signif.: ns = not significant at the 10% level and +, *, ** = significant at the 10%, 5%, and 1% levels, respectively.