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Abstract
A field study initiated in 2006 was designed to evaluate the effects of three wheat stubble heights on subsequent grain yields of corn and grain sorghum. Corn and sorghum yields in 2015 were greater than the long-term average. When averaged from 2007 through 2015, corn grain yields were 10 bu/a greater when planted into either high or strip-cut stubble than into low-cut stubble. Average grain sorghum yields were 6 bu/a greater in high-cut stubble than low-cut stubble. Similarly, water use efficiency was greater for high or strip-cut stubble for corn and high-cut stubble for grain sorghum. Harvesting wheat shorter than necessary causes a yield penalty for the subsequent row crops, especially dryland corn.

Keywords
wheat stubble height, grain sorghum, corn, grain yields strip-cut stubble, high-cut stubble

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Summary

A field study initiated in 2006 was designed to evaluate the effects of three wheat stubble heights on subsequent grain yields of corn and grain sorghum. Corn and sorghum yields in 2015 were greater than the long-term average. When averaged from 2007 through 2015, corn grain yields were 10 bu/a greater when planted into either high or strip-cut stubble than into low-cut stubble. Average grain sorghum yields were 6 bu/a greater in high-cut stubble than low-cut stubble. Similarly, water use efficiency was greater for high or strip-cut stubble for corn and high-cut stubble for grain sorghum. Harvesting wheat shorter than necessary causes a yield penalty for the subsequent row crops, especially dryland corn.

Introduction

Seeding of summer row crops throughout the west-central Great Plains often occurs following wheat in a 3-year rotation (wheat-summer crop-fallow). Wheat residue provides numerous benefits, including evaporation suppression, delayed weed growth, improved capture of winter snowfall, and reduced soil erosion. Stubble height affects wind velocity profile, surface radiation interception, and surface temperatures, all of which affect evaporation suppression and winter snow catch. Taller wheat stubble is also beneficial to pheasants in postharvest and overwinter fallow periods. Using stripper headers increases harvest capacity and provides taller wheat stubble than previously attainable with conventional small-grains platforms. Increasing wheat cutting heights or using a stripper header should further improve the effectiveness of standing wheat stubble. The purpose of this study is to evaluate the effect of wheat stubble height on subsequent summer row crop yields.

Procedures

This study was conducted at the Southwest Research-Extension Center dryland station near Tribune, Kansas. From 2007 through 2015, corn and grain sorghum were planted into standing wheat stubble of three heights. Optimal (high) cutter-bar height is the height necessary to maximize both grain harvested and standing stubble remaining (typically around two-thirds of total plant height), the short cut treatment was half of optimal cutter-bar height, and the third treatment was stubble remaining after stripper header harvest. In 2015, these heights were 7, 14, and 20 in. In 2015, corn and grain sorghum were seeded at rates of 15,000 seeds/a and 40,000 seeds/a, respectively. Nitrogen was applied to all plots at a rate of 60 lb/a. Starter fertilizer (10-34-0 N-P-K) was surface dribbled off-row at a rate of 7 gal/a. Plots were 40 × 60 ft, with treatments ar-

ranged in a randomized complete block design with six replications. Two rows from the center of each plot were harvested with a plot combine for yield and yield component analysis. Soil water measurements were obtained with neutron attenuation to a depth of 6 ft in 1-ft increments at seeding and harvest to determine water use and water use efficiency. No biomass measurements were made for sorghum in 2015.

Results and Discussion

The 2015 growing season was above normal for precipitation with May having more than 6 inches. This produced above average yields for both corn and sorghum (Table 1-4). Corn yields (although quite variable) were 15% greater in high or strip-cut than low-cut wheat stubble. On average, corn yields were 10 bu/a greater when planted into high- or strip-cut stubble. Biomass production and water use efficiency were also greater with the taller stubble.

Grain sorghum yields in 2015 were greater in high-cut stubble than low-cut stubble primarily because of increased number of kernels/head (Table 3). When averaged across years from 2007 through 2015, the highest yields were obtained in the high-cut stubble but were not significantly greater than the other stubble heights. None of the other measured parameters for grain sorghum were affected by wheat stubble height except for greater water use efficiency in high-cut stubble.

Table 1. Corn yield, biomass, and yield components as affected by stubble height, Tribune, Kansas, 2015.

Stubble height	Yield	Plant population	Ear population	Biomass	Residue	1,000-seed weight	Kernels	WUE[1]
	bu/a	---------- 10^3/a ----------		---------- lb/a ----------		oz	no/ear	lb/in
Low	102	15.4a	14.4	10565	5730	9.65	649	375
High	118	15.0b	14.0	11590	6014	10.62	659	412
Strip	120	15.6a	14.8	12150	6494	10.63	675	420
$LSD_{0.05}$	46	0.4	3.0	4212	2998	1.58	140	150
ANOVA (P > F)								
Stubble height	0.666	0.019	0.839	0.705	0.850	0.325	0.915	0.784

[1] Water use efficiency (lb of grain/in. of water use).

Table 2. Corn yield, biomass, and yield components as affected by stubble height, Tribune, Kansas, 2007–2015.

Stubble height	Yield	Plant population	Ear population	Biomass	Residue	1,000-seed weight	Kernels	WUE[1]
	bu/a	---------- 10^3/a ----------		---------- lb/a ----------		oz	no/head	lb/in
Low	72b	13.9	13.4	8739b	5329b	10.21	520	277b
High	82a	13.9	13.8	10021a	6148a	10.52	503	316a
Strip	82a	14.0	13.9	10040a	6165a	10.39	541	317a
$LSD_{0.05}$	6	0.5	0.7	693	594	0.32	95	23
ANOVA (P > F)								
Year	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Stubble height	0.001	0.959	0.293	0.001	0.008	0.164	0.728	0.001
Year × stubble height	0.966	0.989	0.972	0.703	0.312	0.769	0.920	0.948

[1] Water use efficiency (lb of grain/in. of water use).

Table 3. Sorghum yield and yield components as affected by stubble height, Tribune, Kansas, 2015.

Stubble height	Yield	Head population	Biomass	Residue	1,000-seed weight	Kernels	WUE[1]
	bu/a	10^3/a	---------- lb/a ----------		oz	no/head	lb/in
Low	109	55.0	- - -	- - -	0.96	1824b	466
High	120	55.6	- - -	- - -	0.94	2078a	505
Strip	105	54.0	- - -	- - -	0.91	1855b	445
$LSD_{0.05}$	14	8.1	- - -	- - -	0.09	201	76
ANOVA (P > F)							
Stubble height	0.102	0.908	- - -	- - -	0.404	0.036	0.247

[1] Water use efficiency (lb of grain/in. of water use).

Table 4. Sorghum yield, biomass, and yield components as affected by stubble height, Tribune, Kansas, 2007-2015.

Stubble height	Yield	Head population	Biomass[2]	Residue[2]	1,000-seed weight	Kernels	WUE[1]
	bu/a	10^3/a	---------- lb/a ----------		oz	no/head	lb/in
Low	93	51.2	10326	5855	0.87	1934	375b
High	99	52.8	10938	6212	0.88	2012	404a
Strip	95	52.5	10484	5891	0.86	1911	389ab
$LSD_{0.05}$	5	2.7	650	583	0.02	134	23
ANOVA (P > F)							
Year	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Stubble height	0.104	0.472	0.159	0.412	0.146	0.302	0.046
Year × stubble height	0.992	0.830	0.994	0.984	0.630	0.033	0.902

[1] Water use efficiency (lb of grain/in. of water use).
[2] 2015 values not included in average - no samples collected.