Kansas Agricultural Experiment Station Research Reports

Volume 3
Issue 5 *Southwest Research-Extension Center Reports*

Article 10

2017

Wheat Stubble Height on Subsequent Corn and Grain Sorghum Crops

A. Schlegel
Kansas State University, schlegel@ksu.edu

L. Haag
Kansas State University, lhaag@ksu.edu

Recommended Citation

Schlegel, A. and Haag, L. (2017) "Wheat Stubble Height on Subsequent Corn and Grain Sorghum Crops," *Kansas Agricultural Experiment Station Research Reports*: Vol. 3: Iss. 5. https://doi.org/10.4148/2378-5977.7392

Wheat Stubble Height on Subsequent Corn and Grain Sorghum Crops

Abstract

A field study initiated in 2006 at the Southwest Research-Extension Center near Tribune, KS, 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 2016 were greater than the long-term average. When averaged from 2007 through 2016, 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 (but not significantly) 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 than for low-cut stubble. Harvesting wheat shorter than necessary causes a yield penalty for the subsequent row crops, especially dryland corn.

Keywords

wheat stubble height, stripper header, grain sorghum, corn, wheat

Wheat Stubble Height on Subsequent Corn and Grain Sorghum Crops

A. Schlegel and L. Haag

Summary
A field study initiated in 2006 at the Southwest Research-Extension Center near Tribune, KS, 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 2016 were greater than the long-term average. When averaged from 2007 through 2016, 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 (but not significantly) 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 than for low-cut stubble. 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 soil erosion reductions. 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.

Experimental Procedures
This study was conducted at the Southwest Research-Extension Center dryland station near Tribune, KS. From 2007 through 2016, 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. For 2016, these heights were 25, 17, and 8 in. (cut after 2015 wheat harvest). In 2016, corn and grain sorghum were seeded at rates of 15,000 seeds/a and 45,000

seeds/a, respectively. Nitrogen was applied to all plots at a rate of 80 lb/a. Starter fertilizer (10-34-0 nitrogen phosphorus potassium (N-P-K)) was surface-dribbled off-row at a rate of 7 gal/a. Plots were 40 × 60 ft, with treatments arranged 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.

Results and Discussion

The 2016 growing season was above normal for precipitation, with April having more than 5 inches and July more than 4 inches. This produced above-average yields for both corn and sorghum (Tables 1-4). Corn yields were 10 bu/a greater in high- or strip-cut than low-cut wheat stubble, which is consistent with the long-term average. Biomass production and water use efficiency were also greater with the taller stubble.

Grain sorghum yields in 2016 were not affected by stubble height (Table 3). When averaged across years from 2007 through 2016, 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 vs. low-cut stubble.

Table 1. Corn yield, biomass, and yield components as affected by stubble height, Tribune, KS, 2016

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	112	14.0	14.1	12868	7547	13.67	523	353b
High	122	14.1	14.0	11906	6116	13.73	569	397a
Strip	123	14.0	13.9	11715	5911	13.89	568	393a
$LSD_{0.05}$	12	0.7	0.6	1389	1521	0.38	48	35
ANOVA (P > F)								
Stubble height	0.138	0.952	0.814	0.191	0.074	0.470	0.094	0.035

[1] Water use efficiency (lb of grain/inch of water use).
LSD = least significant difference.
ANOVA = analysis of variance.

Table 2. Corn yield, biomass, and yield components as affected by stubble height, Tribune, KS, 2007 - 2016

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	76b	13.9	13.5	9151b	5550	10.56	520	285b
High	86a	13.9	13.9	10210a	6144	10.84	509	324a
Strip	86a	14.0	13.9	10208a	6139	10.74	544	324a
$LSD_{0.05}$	5	0.5	0.6	634	549	0.29	85	21
ANOVA (P > F)								
Year	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Stubble height	0.001	0.970	0.319	0.001	0.052	0.154	0.720	0.001
Year × stubble height	0.979	0.994	0.975	0.351	0.077	0.793	0.932	0.963

[1] Water use efficiency (lb of grain/inch of water use).
LSD = least significant difference.
ANOVA = analysis of variance.

Table 3. Sorghum yield and yield components as affected by stubble height, Tribune, KS, 2016

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	125	66.8	13213	7102	0.93	1792	424
High	131	69.6	13614	7173	0.95	1778	445
Strip	128	66.2	13660	7411	0.93	1855	433
$LSD_{0.05}$	5	0.4	847	777	0.03	80	34
ANOVA (P > F)							
Stubble height	0.059	0.193	0.462	0.661	0.177	0.121	0.439

[1] Water use efficiency (lb of grain/inch of water use).
LSD = least significant difference.
ANOVA = analysis of variance.

Table 4. Sorghum yield, biomass, and yield components as affected by stubble height, Tribune, KS, 2007 - 2016

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	96	52.8	10647	5994	0.88	1920	380b
High	102	54.5	11235	6319	0.89	1988	408a
Strip	98	53.8	10837	6060	0.87	1906	393ab
$LSD_{0.05}$	5	2.4	595	531	0.02	121	21
ANOVA (P > F)							
Year	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Stubble height	0.061	0.384	0.140	0.442	0.104	0.353	0.032
Year × stubble height	0.996	0.846	0.997	0.989	0.673	0.024	0.932

[1] Water use efficiency (lb of grain/inch of water use).
[2] 2015 values not included in average - no samples collected.
LSD = least significant difference.
ANOVA = analysis of variance.