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Occasional Tillage in a Wheat-Sorghum- Fallow Rotation

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Occasional Tillage in a Wheat-Sorghum- Fallow Rotation

Abstract

Beginning in 2012, research was conducted in Garden City and Tribune, KS, to determine the effect of a single tillage operation every 3 years on grain yields in a wheatsorghum- fallow (WSF) rotation. Grain yields of wheat and grain sorghum were not affected by a single tillage operation every 3 years in a WSF rotation. Grain yield varied greatly by year from 2014 to 2016. Wheat yields ranged across years from mid-20s to 80 bu/a at Tribune and about 10 (hail damage) to near 60 bu/a at Garden City. Grain sorghum yields ranged from less than 60 to greater than 130 bu/a, depending upon year and location. In no year or location were grain yields significantly affected by a single tillage operation. This indicates that if a single tillage operation is needed to control troublesome weeds, grain yields will not be significantly affected.

Keywords

tillage, no-tillage, occasional tillage, wheat-sorghum-fallow rotation

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Cover Page Footnote

The U.S. Department of Agriculture, Agricultural Research Service Ogallala Aquifer Program partially supported this research project.

Occasional Tillage in a Wheat-Sorghum-Fallow Rotation

A. Schlegel and J. Holman

Summary

Beginning in 2012, research was conducted in Garden City and Tribune, KS, to determine the effect of a single tillage operation every 3 years on grain yields in a wheat-sorghum-fallow (WSF) rotation. Grain yields of wheat and grain sorghum were not affected by a single tillage operation every 3 years in a WSF rotation. Grain yield varied greatly by year from 2014 to 2016. Wheat yields ranged across years from mid-20s to 80 bu/a at Tribune and about 10 (hail damage) to near 60 bu/a at Garden City. Grain sorghum yields ranged from less than 60 to greater than 130 bu/a, depending upon year and location. In no year or location were grain yields significantly affected by a single tillage operation. This indicates that if a single tillage operation is needed to control troublesome weeds, grain yields will not be significantly affected.

Introduction

Previous research has shown lower dryland wheat and grain sorghum yields with reduced tillage compared with no-tillage in a wheat-sorghum-fallow (WSF) rotation. The reduced tillage systems generally used four or more tillage operations in the 3-yr rotation. With increased incidence of herbicide-resistant weeds, the use of a complete no-tillage system may not be economical, and tillage may be needed for effective control. The objective of the research project is to determine the effect of a single tillage operation every 3 years on grain yields in a WSF rotation.

Experimental Procedures

Research on occasional tillage intensities in a predominantly no-tillage WSF rotation at the Kansas State University Southwest Research-Extension Center research stations at Garden City and Tribune was initiated in 2012. The three tillage treatments in this study were a single tillage in May or June during fallow, a single tillage after wheat harvest, and a complete no-tillage system. A sweep plow was used for all tillage operations. When needed, herbicides were used to control weeds during fallow for all treatments. All treatments used herbicides for in-crop weed control. All other cultural practices (variety/hybrid, seeding rate, fertilization, etc.) were the same for all treatments.

Results and Discussion

At Tribune, wheat yields were 75 to 80 bu/a in 2016, compared with 23 to 28 bu/a in 2014 and 2015 (Table 1). There were no significant yield differences among tillage treatments in any year or across years. Grain sorghum yields were similar in 2015 and 2016 at 118 to 133 bu/a, respectively, which was considerably greater than 2014 with

yields of 77 to 84 bu/a (Table 2). Similar to wheat, there were no significant yield differences among tillage treatments in any year or averaged across years.

At Garden City, wheat yields were greater in 2016 than earlier years (Table 3). Wheat yields in 2014 were severely reduced by hail. There were no significant yield differences among tillage treatments in any year or averaged across years. Favorable growing conditions caused grain sorghum yields in 2016 to be about twice the yields of 2014 and 2015 (Table 4). Similar to wheat, there were no significant yield differences among tillage treatments in any year or averaged across years.

In other research, reduced tillage systems produced lower yields than a complete no-tillage system in a WSF rotation. However, in this study, a single tillage operation in a 3-yr WSF rotation did not affect wheat or grain sorghum yields from 2014 to 2016 at Garden City or Tribune, KS.

Reference

Shlegel, A. (2017) "Tillage Intensity in a Long-Term Wheat-Sorghum-Fallow Rotation," *Kansas Agricultural Experiment Station Research Reports*: Vol. 3 Iss. 5.

Acknowledgment

The U.S. Department of Agriculture, Agricultural Research Service Ogallala Aquifer Program partially supported this research project.

Table 1. Grain yield response of dryland wheat to a single tillage operation (sweep plow) in a 3 year wheat-sorghum-fallow rotation grown from 2014 to 2016 near Tribune, KS

Tillage	Year			Average
	2014	2015	2016	
	----- bu/a -----			
No-tillage	28	24	75	42
June in fallow	26	25	80	44
July post-harvest	24	23	75	41
ANOVA (P > F)				
No-tillage vs. tillage	0.381	0.983	0.350	0.899
June vs. July	0.551	0.555	0.053	0.078
Year	--	--	--	0.001
Year × tillage	--	--	--	0.434

ANOVA = analysis of variance.

Table 2. Grain yield response of dryland grain sorghum to a single tillage operation (sweep plow) in a 3-year wheat-sorghum-fallow rotation grown from 2014 to 2016 near Tribune, KS

Tillage	Year			Average
	2014	2015	2016	
	----- bu/a -----			
No-tillage	77	133	129	113
June in fallow	84	124	131	113
July post-harvest	79	118	129	109
ANOVA (P > F)				
No-tillage vs. tillage	0.445	0.095	0.852	0.469
June vs. July	0.395	0.404	0.617	0.192
Year	--	--	--	0.001
Year × tillage	--	--	--	0.019

ANOVA = analysis of variance.

Table 3. Grain yield response of dryland wheat to a single tillage operation (sweep plow) in a 3-year wheat-sorghum-fallow rotation grown from 2014 to 2016 near Garden City, KS

Tillage	Year			Average
	2014	2015	2016	
	----- bu/a -----			
No-tillage	8	34	55	32
June in fallow	8	37	58	34
July post-harvest	10	33	56	33
ANOVA (P > F)				
No-tillage vs. tillage	0.767	0.686	0.460	0.394
June vs. July	0.222	0.101	0.200	0.230
Year	--	--	--	0.001
Year × tillage	--	--	--	0.097

ANOVA = analysis of variance.

Table 4. Grain yield response of dryland grain sorghum to a single tillage operation (sweep plow) in a 3-year wheat-sorghum-fallow rotation grown from 2014 to 2016 near Garden City, KS

Tillage	Year			Average
	2014	2015	2016	
	----- bu/a -----			
No-tillage	58	63	116	79
June in fallow	57	64	123	81
July post-harvest	53	71	121	81
ANOVA (P>F)				
No-tillage vs. tillage	0.602	0.478	0.115	0.475
June vs. July	0.485	0.204	0.362	0.971
Year	--	--	--	0.001
Year × tillage	--	--	--	0.428

ANOVA = analysis of variance.