ALTERNATING THE SHANK LOCATION ON A PARATILL EVERY OTHER YEAR PROVIDES SOME BENEFITS

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ABSTRACT

Paratill operations are usually conducted with the shanks placed in the same location year after year, disrupting the same volume of soil. Moving the location of the shanks on the toolbar so they alternate from the previous year's location can potentially increase the volume of soil disrupted below ground. A corn-cotton rotation study was initiated in 2004 at the Field Crops Unit of the E.V. Smith Agricultural Research Center, near Shorter, AL. Data were not available until 2005 because of the timing of the alternating shank location tillage treatment. There were no differences in corn yield the first two years of the study. Total rainfall for the May to August period in 2006 was low (13.0). Differences in soil moisture between treatments during both growing seasons were small. However, there were significant differences in cotton yield. The alternating shank location produced greater cotton yield both years, 203 lb/ac greater (3,012 vs. 2,809 lb/ac) in 2005, and 475 lb/ac greater (1,978 vs. 1,503 lb/ac) in 2006. Soil penetration resistance data collected at the end of both seasons suggest that the alternating shank location treatment loosens a greater volume of soil. The alternating shank location could show some benefits to corn in future years.

INTRODUCTION

Paratill™ (Bigham Brothers Inc., Lubbock, TX)[1] operations are usually conducted with the shanks placed in the same location each year, disrupting the same volume of soil. Changing the orientation of the shanks on the toolbar on alternating years (Fig. 1) can potentially increase the volume of disrupted soil below ground. This can potentially improve conditions for root development and soil water redistribution in the root zone, while increasing soil rooting volume. The objective of this work is to determine if alternating the shank orientation each year on a paratill improves below ground disruption, and therefore improves root growth and crop yield.

MATERIALS AND METHODS

An experiment was established at the Field Crops Unit of the E.V. Smith Agricultural Research Center, near Shorter, AL, on a Compass loamy sand (coarse-loamy, siliceous, subactive, thermic plinthic Paleudults). Two tillage treatments were established, 1) Paratill™ with shanks oriented in the same manner each year (fig. 1A), and 2) Paratill™ with the shanks inverted on toolbar each alternating year (fig. 1A and 1B). Because of the nature of the tillage treatments, the experiment was started in spring 2004, but data collection did not begin until 2005. Cotton (*Gossypium hirsutum* L.) and corn (*Zea mays* L.) were grown simultaneously as a rotation. Total number of plots was 16 (4 replicates). Plots were 4-rows wide (36" spacing) and 50 ft long.

1-Mention of a company name or trademark does not constitute endorsement by the USDA to the exclusion of others.

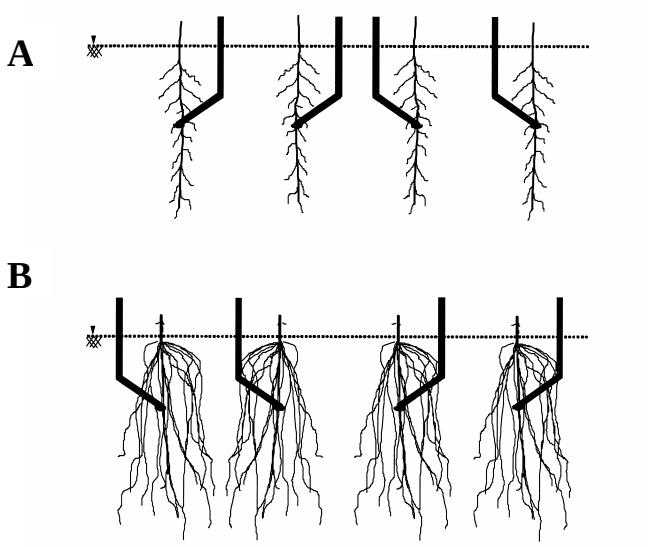

Figure 1. Shank orientation on the toolbar of a Paratill™. The treatment with the shanks on the same orientation each year is shown on top (A). Orientation of the shanks will alternate each year (between A and B) for the other treatment.

Soil moisture sensors were used to monitor soil water content during the growing season, but data is not presented here. Soil penetration resistance was measured at the end of the growing season in 2005 and 2006 (Raper et al., 1999). Corn and cotton yield were measured from the two center rows of each plot.

Statistical analysis was performed using the MIXED model in SAS (SAS Institute Inc., Cary, NC). Tillage treatment was considered as a fixed effect.

RESULTS AND DISCUSSION

No statistically significant differences in corn grain yield were observed between tillage treatments in 2005 and 2006 (Table 1). Rainfall during the May to August period in 2005 was adequate (14.5") (Table 2), which could have diminished any positive effects of alternating the Paratill™ shank orientation. Additionally, there were small differences in soil moisture between tillage treatments during the growing season, but slightly greater soil moisture values were observed with the alternating shank orientation (data not shown). Total rainfall for the May to August period in 2006 was 11.4", which resulted in overall low corn yields. Also, air temperature during the 2006 growing season was slightly greater than in 2005 (Table 2). Average corn yields for the test in 2006 were 17.6 bu/ac.

Table 1. Corn and seed cotton yield for the 2005 and 2006 growing seasons as affected by paratill shank orientation.

Shank location	Crop			
	2005	2006	2005	2006
	Corn		Seed cotton	
	----- bu/ac -----		----- lb/ac -----	
Same	127.2	19.9	2,809	1,503
Alternating	126.9	15.4	3,012	1,978
P-value	0.970	0.217	0.021	0.063

Table 2. Monthly rainfall amounts and average air temperature at the E.V. Smith research location from May until June.

Month	Rainfall		Average Temperature	
	2005	2006	2005	2006
	---------- in ----------		---------- °F ----------	
May	1.04	3.09	68.9	71.3
June	1.54	0.72	78.3	79.0
July	8.48	3.67	81.5	83.2
August	3.41	3.91	81.1	83.2
Total	14.47	11.39	---	---

Seed cotton yields were significantly greater for the alternating shank treatment in 2005 and 2006 (Table 1). Alternating the shank location every other year increased cotton yield by 7.2 and 31.6% during the 2005 and 2006 seasons, respectively. This increase in yield can be attributed to looser subsoil conditions created by alternating the shank location. Soil penetration resistance, as measured by cone index, was significantly lower in the alternating shank treatment during 2006 (Fig. 2). There were no significant differences in cone index between treatments in 2005. Cotton is more sensitive to soil compaction than corn and might benefit most by alternating shank orientation.

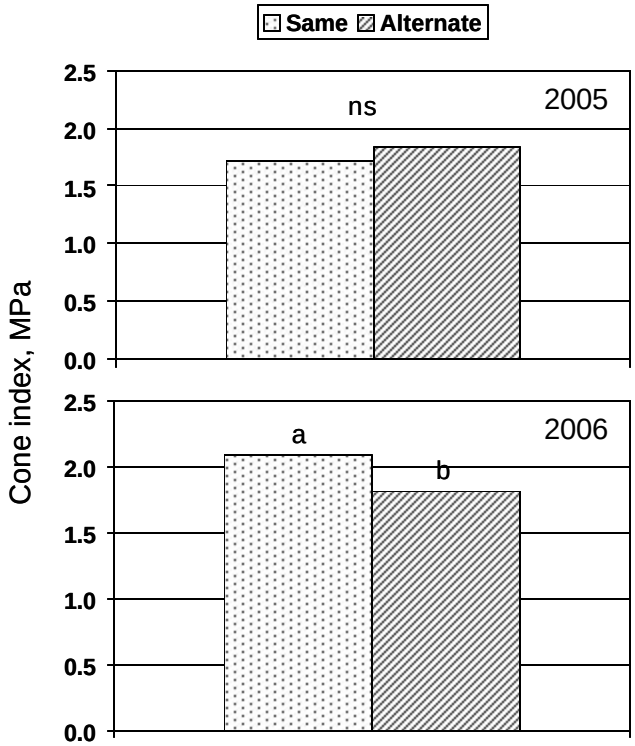

Figure 2. Cone index values after cotton harvest during the 2005 and 2006 cropping seasons. Different letter denote statistical significance between tillage treatments within the same year.

CONCLUSIONS

Data from first two years showed minimal differences in corn yield between tillage treatments. Rainfall was sufficient during the 2005 season, but it was unusually lower in 2006. This lack of rainfall reduced total corn grain yields dramatically.

Cotton benefited most from alternating the Paratill™ shank location every other year. Alternating the shank location increased cotton yields significantly both years. Cotton roots are more susceptible to soil compaction than corn, and thus, cotton might benefit more from alternating the Paratill™ shank orientation each year.

REFERENCES

Raper, R.L., B.H. Washington, and J.D. Jerrell. 1999. A Tractor mounted multiple-probe soil cone penetrometer. Appl. Eng. Agric. 15(4):287–290.