NO-TILLAGE TIMING AND PLACEMENT OF FERTILIZER AFFECTS COTTON YIELD

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Abstract

Use of conservation tillage production practices has increased greatly in south Texas over the past few years primarily due to the savings in production costs and tillage trips over the field needed for successful stand establishment and crop maintenance.

Introduction

Retaining crop residue on the soil surface helps to decrease wind and water erosion decreases water runoff after moderate to heavy rainfall events, increases water infiltration rates and soil water retention. Producers are aware of the many benefits of using conservation tillage for cotton production but are reluctant to adopt conservation tillage practices because of real or perceived problems with fertilizer timing and placement as well as crop stand establishment. In no-tillage conditions the soil is not worked with tillage so traditional methods of broadcasting fertilizer and incorporating it with a tandem disc or field cultivator are not an option. If banding of fertilizer is used with no-tillage and the seed trench is not firmly closed the cotton seed may dry out before becoming an established plant. Placing fertilizer directly with the seed in the seed trench can inhibit seedling germination and reduce growth of the seedling. Cotton may have trouble emerging through a surface crust with clay soils. Timing and placement of fertilizer can be problematic for producers who do not incorporate fertilizer in the soil prior to planting because with conservation tillage systems they do not till the soil. The objective of this study was to determine the optimal timing and application method of nitrogen source fertilizer for no-tillage cotton production on a fine sand in the semi-arid subtropical environment of south Texas.

Materials and Methods

The experiment was conducted on a Willacy Fine Sand with an organic matter content of 0.2% and a pH of 8.2. The previous crop had been grain sorghum produced the prior year and the crop residue had been disced once after the grain sorghum had been harvested. The experimental design was conducted as a randomized complete block design with four replications of each treatment. Experimental plot size was six 30 inch wide rows wide and 120 feet long. Treatments included eight treatments with fertilizer type, timing and placement of nitrogen fertilizer. Treatments included deep band chicken litter; starter nitrogen at 9 lb per acre in a band plus a side-dress application of thiosulfate; N32 applied with a coulter spray; pre-emergence N32 applied with a " Maverick" opener 8" below seed; urea applied with a "Mole" knife 8" below seed; N32 - spoke wheel injector; pre-emerge, all at planting; N32 applied with a spoke wheel injector placing one-half of the nitrogen at planting and one-half at 30 days after planting (DAP); and an untreated control. Plant populations were counted from the center two rows of the six row plots at 14 and 40 DAP. Plant height and leaf stage were measured and counted at 40 DAP for 10 randomly selected plants in each of the plots. Cotton yield was determined by hand harvesting two subplots within each plot. Subplots consisted of the two center rows of each plot which were 4m in length. Cotton was ginned with a laboratory gin and lint percentage and weight were measured for each subplot and yields of lint per acre were calculated.

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Results and Discussion

Plant populations were affected by timing and placement of fertilizer (Table 1). The greatest plant populations were with the deep banded chicken litter (48,484 plts/ha) and the N32 applied at planting with a coulter spray (45172 plts/ha). The split application of N32 with a spoke wheel applicator reduced plant populations 7% when compared the untreated control (36,959 -vs- 40244). Plant heights were also affected by timing and placement of fertilizer (Table 2). At 40 DAP the treatment with the shortest plants was the Maverick opener which applied N32 8 inches below the seed prior to planting (15 inches -vs- 17 inches tall with untreated control. Leaf stage of cotton was also affected by the Maverick opener (Table 3) and was 15% less than the untreated control (15 -vs- 17 leaf stage) at 40 DAP.

Deep placement of fertilizer decreased lint yield due to drying of the soil, which decreased plant population. The mole knife with flat bottom dried the soil out too much for uniform plant establishment. N32 split applications with the spoke wheel applicator the did not improve lint yield. Starter fertilizer + side dress of thiosulfate on alkaline soil did not improve lint yield. No-till planting with placement of N all at planting time had the best yields

Table 1. Dryland cotton plant populations as affected by timing and application method of fertilzer 2000.

	Plts/ha
Deep band - chicken litter	48484
Starter + side-dress thiosulfate	40518
N32-coulter spray, pre-emergence	45172
N32 - Maverick opener 8" below seed	44351
Urea - Mole knife 8" below seed	42708
N32 - Spoke wheel injector pre-emerge, all at planting	41066
N32 - Spoke wheel injector ½ at planting, ½ 30 DAP	36959
untreated control	40244

Table 2. Dryland cotton plant height as affected by fertilizer timing and placement method at 40 days after planting for 2000.

	Inches
Deep band - chicken litter	18 ab
Starter + side-dress thiosulfate	21 a
N32 - coulter spray, pre-emergence	19 a
N32 - Maverick opener 8" below seed	15 b
Urea - Mole knife 8" below seed	17 ab
N32 - Spoke wheel injector pre-emerge, all at planting	19 a
N32 - Spoke wheel injector ½ at planting, ½ 30 DAP	18 a
untreated control	17 ab

Table 3. Dryland cotton leaf stage as affected by fertilizer timing and placement method at 40 days after planting for 2000.

	Inches
Deep band - chicken litter	13 a
Starter + side-dress thiosulfate	14 a
N32 - coulter spray, pre-emergence	13 a
N32 - Maverick opener 8" below seed	11 b
Urea - Mole knife 8" below seed	14 a
N32 - Spoke wheel injector pre-emerge, all at planting	14 a
N32 - Spoke wheel injector ½ at planting, ½ 30 DAP	13 a
untreated control	13 a

Table 4. Dryland cotton lint yield as affected by fertilizer timing and placement 2000.

	Lbs/acre
Deep band - chicken litter	251 a
Starter + side-dress thiosulfate	200 ab
N32 - coulter spray, pre-emergence	303 a
N32 - Maverick opener 8" below seed	168 ab
Urea - Mole knife 8" below seed	63 b
N32 - Spoke wheel injector pre-emerge, all at planting	282 a
N32 - Spoke wheel injector ½ at planting, ½ 30 DAP	258 a
untreated control	211