Influence of Starter Fertilizer on Strip - Till Cotton

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ABSTRACT

This research was conducted during 1995 and 1996 on a Dothan sandy loam (fine, loamy siliceous, thermic Plinthic Kandiudults) located at the North Florida Research and Education Center (NFREC), Quincy, FL The objective of this research was to evaluate the influence of starter fertilizer on different varieties of cotton planted in strip tillage. Cotton *(Gossypium hirsutum)* was planted after winter wheat *(Triticum aestivum).* The emergence was significantly higher on cotton with the starter fertilizer application when compared to cotton with no fertilizer application for Deitapine DP 5409 (54.5 and 48.5 %, respectively) and Deltapine 5415 DP (61.1 and 46.3 %, respectively) in 1995, and for Deltapine DP 5409 (37.3 and 33.8%, respectively) in 1996. The cotton emergence was significantly higher for Stoneville St 474, Deltapine DP 51, Deltapine DP 5690, and Deltapine Acala 90 (62.5, 61.9, 61.2, and 60.1 YO, respectively) in 1995, and for Deltapine DP 20, Deltapine DP 51, Deltapine DP 5409, Deltapine DP 5490, and Suregrow SG 501 (38.8, 37.5, 35.6, 35.3, 35.5 %, respectively) in 1996. The yields of cotton were significantly different in 1995 and 1996. In 1995 a significantly higher lint yields were obtained from Suregrow SG501, Deltapine DP 20, and BXN 57 (618.5, 615.2, and 531.6 lb/a, respectively) The difference for starter vs. no-starter was not significant for any of the varieties. In 1996 significantly higher yields were obtained from KC 311, Suregrow SG501, and Stoneville ST474 (778.3, 756.5, 683.1 lb/a, respectively). The starter fertilizer did not influence significantly the cotton yields except for Stoneville ST 453 where the lint yield was higher on the treatments with no starter fertiier when compared to the treatments with the starter application (581.3 and 476.6 lb/a, respectively). In a 2-yr period the significantly higher lint cotton yields were received from Suregrow SG 501 and DP 20 (687.5 and 606.3 lb/a, respectively). Generally, starter fertilizer application did not increase yields, but in a few cases decreased the yields of cotton.

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INTRODUCTION

Torbert and Reeves (1991) have shown that in years of below-normal rainfall during the growing season, strip tillage was found to maintain the highest seed cotton *(Gossypium hirsutum* L.) yield. Fertilizer N application had no effect on cotton yields in an extremely dry growing season indicating that the beneficial effect of fertilizer N may be limited under these conditions.

In 1990 and 1991 increasing N application increased cotton biomass and decreased lint percentage (Torbert and Reeves, 1994). In the dry year of 1990, no-traffic decreased seed cotton yield from 1500 to 1360 kg/ha (1335 to 1210 lb/a), while tillage had no significant effects on cotton yield components. Above-normal rainfall in 1991 resulted in the strip-till with no-traffic treatment having the highest seed cotton yield of 2749 kg/ha (2447 lb/a) and the greatest fertilizer N uptake efficiency (35%). Results indicate that the effects of traffic on N uptake efficiency may be reduced with conservation tillage systems and that higher fertilizer N application rates may not be needed for conservation tillage practices such as strip-till in Coastal Plain soils.

According to Howard and Hutchinson (1993), yields response to starter fertilizer applied to cotton in Tennessee (Loring soil) and Louisiana (Gigger soil) was inconsistent. Compared with broadcast fertilization at 80-40-60 lb/a of N-P-K, cotton yields were increased in only three of eight experiments from 1991-1992. In-furrow applications of starter fertilizer (11-37-0) at 3.0 and 4.5 gal/a usually reduced cotton stands and reduced yields in several instances.

Touchton et al. (1986) reported starter applications increased no-tillage cotton yields 2 out of **3** yr and conventional tillage yields in one out of 3 yr in north Alabama. Yields of cotton were increased by banding 23-23-8 lb/a (N-P-K, respectively) when cotton was subjected to moisture stress during flowering and fruiting, but were not increased by banding either 23-0-0 or 23-23-0 lb/a (N-P-K, respectively).

Banding 150 lb/a of either 10-34-0 or 11-37-0 (N-P-K, respectively) to conventional planted cotton in

Mississippi increased an average lint yield from 17 of 18 locations over a 3-yr period (Funderburg, 1988).

MATERIALS AND METHODS

The experiment was conducted in 1995 and 1996 on a Dothan sandy loam (fine, loamy siliceous, thermic Plinthic Kandiudults) at the North Florida Research and Education Center, Quincy, FL.

Treatments in 1995

On 15 May, a Brown Ro-till planter was used to strip rows prior to planting cotton. On 16 May, the study was broadcast sprayed with Prowl @ 21/3pt/a + Cotoran @ 11/2qt/a + Gramoxone @ 1 pt/a in order to control weeds. Fertilizer was applied (broadcast application) at 500 lb/a of 5-10-15. A Cone Planter was used to plant cotton in 6-ft-wide and 23-ft-long plots with 3 ft of space between rows on 17 May. On 18 May, 400 lb/a of 3-9-18 starter fertilizer was applied over the cotton rows. Cotton was direct-sprayed between rows with Cotoran @ 1 pt/a + MSMA @ 1 pt/a using a Redball Hooded sprayer on 2 June. On 27 June, cotton was sidedressed with 70 lb N/a of 34-0-0 fertilizer with a FP row fertilizer applicator. Cotton was direct-sprayed (between rows) with Bladex @ 1 qt/a + MSMA @ 2 pt/a + Induce @ 2 qt/100 gal H_2O on 28 June. Asana (insecticide) was broadcast applied on cotton at 6 oz/a to control the bollworm eggs on 11 July. The Spra-Coupe sprayer was used to broadcast spray Baythroid 2 (insecticide) @ 2 oz/a + Pix (growth regulator) @ 4 oz/a to control the bollworm eggs and the plant's height on 14 July, Baythroid 2 @ 2 oz/a + Pix @ 8 oz/a on 26 July, Baythroid 2 @ 2 oz/a on 27 July and 4 Aug., and Prep @ 1% pt/a + Harvade @ 8 oz/a + Crop Oil @ 1 pt/a on 26 Sept. The Hi-boy sprayer was used to defoliate cotton with Dropp @ 1/8 lb/a + Harvade @ 8 oz/a on 13 Oct. and Harvade @ 8 oz/a + Dropp @ 1/8 lbs/a + Prep @ 11/2pt/a + Gramoxone @ 1/2pt/a + Crop Oil @ 1 pt/a on 8 Nov. Cotton was harvested with a modified International Cotton Picker on 14-16 Nov.

Treatments in 1996

On 11 April, 300 lb/a of 5-10-15 fertilizer was broadcast and the study was sprayed with Roundup Ultra @ 1.5 pt/a. On 12 April, the Brown Ro-till planter was used to prepare the rows for planting cotton. The cotton variety trial was planted following wheat with the Cone Planter in 23-ft-long plots and 3-ft row spacing with the Thimet 20 G (insecticide) applied in furro @ 5 oz/100 ft. of row on 18 April. The same day, the starter fertilizer was applied over the row at 100 lb/a of 5-10-15. On 19 April, Cotoran @ 3 pt/a + Prowl @ 1.8 pt/a + Zorial @ 1.75 lb/a was broadcast before cotton emerged in order to control weeds. The experiment was sprayed on 10 May with Staple @ 1.5 oz/a + Fusillade @ 1 pt/a + Induce @ 1 qt/a to control the weeds. On 10 June, 70 lb. N/a (34-0-0 fertilizer) was sidedressed on all cotton varieties. Cotton was post-direct sprayed with Cotoran @ 1 qt/a + Bueno 6 @ 1 qt/a with a Red-ball Hooded Sprayer. Karate was broadcast on cotton to control the Bollworms population on 10 July (4 oz/a), 2 and 23 Aug. (6 and 4 oz/a respectively). On 19 Aug. all varieties were sprayed with Pix @ 12 oz/a (Growth Regulator) to control the plant's height. Cotton was defoliated with Folex 1% pt/a + Prep @ 11/2pt/a + Induce @ 1 pt/20 gal H_2O on 19 Sept. and with Roundup @ 1pt/a + Prep 1 pt/a on 11 Oct. On 21-25 Oct. cotton was harvested with a modified International Cotton Picker.

Data were analyzed using SAS (1989) by analysis of a variance, and means were separated using Fisher's Least Significant Difference Test at the 5% probability level.

RESULTS AND DISCUSSION

Cotton emergence was sigmficantly lower in 1996 when cornpared to 1995 (33.6 and 56.3 %, respectively) (Table 1). The emergence was significantly higher on cotton with the starter fertilizer application when compared to cotton with no fertilizer application for Deltapine DP 5409 (54.5 and 48.5 %, respectively) and Deltapine 5415 DP (61.1 and 46.3 % respectively) in 1995, and for Deltapine DP 5409 (37.3 and 33.8 %, respectively) in 1996. It was significantly lower with the starter fertilizer than with no starter fertilizer application for KC 311 cotton (62.1 and 53.0 %, respectively). Cotton emergence was significantly higher for Stoneville ST 474, Deltapine DP 51, Deltapine DP 5690, and Deltapine Acala 90 (62.5, 61.9, 61.2, and 60.1 %, respectively) in 1995, and for Deltapine DP 20, Deltapine DP 51, Deltapine DP 5409, Deltapine DP 5490, and Suregrow SG501(38.8, 37.5, 35.6, 35.3, 35.5 %, respectively).

There was a significant difference in lint yields for 1995 and 1996 and for a starter vs. no starter fertilizer applications (Table 2). In 1995, significantly higher lint yields were obtained from Suregrow SG 501, Deltapine DP 20, and BXN 57 (618.5, 615.2, and 531.6 lb/a, respectively) (Table 2). The difference for starter vs. no-starter was not significant for any of the varieties. In 1996, significantly higher yields were obtained from KC 311, Suregrow SG 501, and Stoneville ST 474 (778.3, 756.5, 683.1 lb/A, respectively) (Table 2). Generally, the starter fertilizer did not significantly influence cotton yields except for Stoneville ST 453 where the lint cotton

yields were higher on the treatments with no starter fertilizer when compared to the treatments with the starter application (581.3 and 476.6 lb/a, respectively).

Over the 2-yr period highest lint yields were received from Suregrow SG 501 and DP 20 (687.5 and 606.3 lb/a, respectively). Generally, starter fertilizer did not increase yields or emergence, but in a few cases, it decreased the yields of cotton.

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Table 1. The emergence of State Cotton Trial with and without Starter at NFREC, Quincy, FL in 1995 and 1996.

Cotton Variety	Percent emergence in 1995				Percent emergence in 1996				Mean
	No starter	Starter	Mean	LSD (0.05)	No starter	Starter	Mean	LSD (0.05)	
Calgene BXN 57	50.8	58.9	54.8	NS	30.8	32.2	31.5	NS	43.2
Deltapine DP 20	54.0	59.9	56.9	NS	38.8	38.8	38.8	NS	47.9
Deltapine DP ---51	62.6	61.3	61.9	NS	38.7	36.3	37.5	NS	49.7
Deltapine DP 5409	48.5	54.5	51.5	2.83	33.8	37.3	35.6	2.44	43.5
Deltapine DP 5415	46.3	61.1	53.7	12.65	34.6	32.1	33.3	NS	43.5
Deltapine DP 5690	56.8	65.6	61.2	NS	35.5	35.2	35.3	NS	48.3
Deltapine ACALA 90	57.8	62.5	60.1	NS	34.7	33.0	33.8	NS	47.0
KC 311	62.1	53.0	57.6	8.68	30.1	31.4	30.7	NS	44.1
Stoneville ST 453	56.1	52.8	54.4	NS	26.3	26.9	26.6	NS	40.5
Stoneville ST 474	62.4	62.6	62.5	NS	31.3	30.9	31.0	NS	46.8
Suregrow SG 1001	54.5	57.5	56.0	NS	34.9	32.9	33.9	NS	45.0
Suregrow SG 501	44.4	44.6	44.5	NS	36.0	35.0	35.5	NS	40.0
Mean	**54.7**	**57.9**	**56.3**	**NS**	**33.8**	**33.5**	**33.6**	**NS**	**44.9**
$LSD_{(0.05)}$	-	-	7.88	-	-	-	2.96	-	1.71

$LSD_{(0.05)}$ for Year = 1.71
$LSD_{(0.05)}$ for Variety = 4.20
$LSD_{(0.05)}$ for Starter = NS
$LSD_{(0.05)}$ for Year x Variety = 5.94
$LSD_{(0.05)}$ for Year x Starter = 2.42
$LSD_{(0.05)}$ for Year x Variety x Starter = NS

Table 2 The lint cotton yield of State Cotton Trial with and without Starter at NFREC, Quincy, FL in 1995 and 1996.

Cotton Variety	Lint cotton yield (lbs/a) in 1995				Lint cotton yield (lbs/a) in 1996				Mean (lbs/a)
	No starter	Starter	Mean	LSD (0.05)	No starter	Starter	Mean	LSD (0.05)	
Calgene BXN 57	501.5	561.7	531.6	NS	614.5	585.5	600.0	NS	565.8
Deltapine DP 20	595.1	635.3	615.2	NS	600.1	594.8	597.5	NS	606.3
Deltapine DP 51	407.9	441.4	424.6	NS	714.2	641.7	678.0	NS	551.3
Deltapine DP 5409	394.5	441.3	417.9	NS	612.1	546.0	579.1	NS	498.5
Deltapine DP 5415	321.0	240.7	280.8	NS	752.0	601.8	676.9	NS	478.9
Deltapine DP 5690	374.5	374.5	374.5	NS	591.1	661.6	626.4	NS	500.4
Deltapine ACALA 90	247.4	240.7	244.0	NS	646.2	661.1	653.7	NS	448.8
KC 311	334.4	294.2	314.3	NS	804.9	751.6	778.3	NS	546.3
Stoneville ST 453	508.2	414.6	461.4	NS	581.3	476.6	529.0	24.4	495.2
Stoneville ST 474	367.8	394.5	381.1	NS	687.5	678.6	683.1	NS	532.1
Suregrow SG 1001	401.2	381.1	391.2	NS	662.8	627.5	645.2	NS	518.2
Suregrow SG 501	608.5	628.6	618.5	NS	788.8	724.2	756.5	NS	687.5
Mean	**421.8**	**420.7**	**421.3**	**NS**	**669.6**	**629.3**	**649.2**	**39.6**	**534.6**
$LSD_{(0.05)}$	-	-	131.2	-	-	-	97.1	-	81.9

$LSD_{(0.05)}$ for Year = 33.4
$LSD_{(0.05)}$ for Variety = 81.9
$LSD_{(0.05)}$ for Starter = NS
$LSD_{(0.05)}$ for Year x Variety = NS
$LSD_{(0.05)}$ for Year x Starter = NS
$LSD_{(0.05)}$ for Year x Variety x Starter = NS