Soil Amendment Study on Long and Short Staple Cotton
Safford Agricultural Center, 2000

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Abstract

Two soil amendments, Agriblend Plus and Superfloc A-836, were applied to cotton beds prior to planting at rates of 5, 10, 15 and 20 pounds per acre, incorporated and planted to short staple (DP 655BR) or long staple (HTO) cotton. The experimental plots were fertilized, irrigated and managed in a manner to produce optimal cotton yields. No statistically significant yield increases were seen from any of the treatments, even though a few interesting trends were observed. The report contains observations on plant mapping and lint quality data, in addition to yield data.

Introduction

From time to time products come on the market with the promise of increased yields. In 1999 such a product came to our attention and the vendor provided us with a couple of bags of the product. At the Farmer's Day in 2000, the bank who was sponsoring the lunch, indicated that they felt the product should be used by local farmers to insure good yields. With these incentives, an experiment was set up with both long and short staple cotton to test the product along with a polyacrylamide material that was thought to be similar to the original product.

Materials and Methods

The materials used in this study were Agriblend Plus (AB+) provided by American Soils Technologies, Inc. and Superfloc A-836 a polyacrylamide (PAM) provided by Cyanamid. Beds were prepared as normal on the Safford Agricultural Center and the plot area was pre-irrigated. After the beds had dried, the beds were mulched to prevent cracking and drying and pre-shaped with a bed sled. Treflan was applied on April 10th and immediately incorporated with an incorprovator followed by a Lilliston cultivator. Agriblend Plus and Superfloc were applied to the tops of the beds according to the treatments outlined below. With the beds loosened by the Lilliston, the granular material applied to the tops of the beds flowed down into the soil. The sweep on the front of the planter mixed the granules more and the disk hiller behind the planter discs finished that phase of the incorporation of the material. Five days after planting the caps were dragged off the beds leaving the incorporated granules on the sides of the beds. This soil with the granules was then brought around the plants as the plants grew and the cultivator pushed soil back onto the beds.

A history of the experimental plots is listed below:

Crop History:

Previous crop: Small grains
Soil type: Pima clay loam variant/Guest clay
Planting date: 11 April 2000 Rate: 25 pounds of seed per acre
Varieties: The long staple plots were planted to HTO, the short staple plots to DP 655BR
Herbicide: Treflan was applied and incorporated 10 April
Fertilizer: 100 lbs/ac of urea sidedressed on 22 May and again 27 June
Insecticide: 3 applications for aphid and pink bollworms

This is part of 2001 Arizona Cotton Report, The University of Arizona College of Agriculture and Life Sciences, index at http://ag.arizona.edu/pubs/crops/az1224/

Irrigation: Furrow, pre-irrigation + 7 irrigations (32 inches + 3.3 inches of rain)
Irrigations were scheduled when 45% of the available soil moisture had been removed by the plants.
Defoliation: Ginstar
Harvest dates: 1st pick: 29 November 2nd pick: not taken
Heat units (86/55EF) to 1st frost (1 Nov): 3943
Replications: 4
Plot size: 12 feet by 45 feet

Treatments:

Untreated Check	
5 lbs/ac AB+	5 lbs/ac PAM
10 lbs/ac AB+	10 lbs/ac PAM
15 lbs/ac AB+	15 lbs/ac PAM
20 lbs/ac AB+	20 lbs/ac PAM

At harvest time plant populations were determined and plants were measured and nodes counted to determine the basic structure of the plants under various soil amendment treatments. Boll samples were also taken from each plot to determine boll weight. These samples were ginned to determine percent lint turnout and this lint was sent to the classing office to get HVI values. Plots were harvested using a Case IH 1822 cotton picker that had been modified for small plot use. The entire yield from each plot was caught in a mesh bag and weighed to determine yields.

Results and Discussion

Tables 1, 2 and 3 show data from short staple cotton across all the treatments applied. In table 1 there were no statistically significant differences in yields or plant populations between the untreated check and any of the treatments. Small differences in yield appear to be random differences and did not give any encouragement that increases were caused by the increasing rates of either Agriblend Plus or the polyacrylamide. Similarly differences seen in percent lint turnout and boll weight don't show consistent trends with the increasing quantities of the soil amendments added.

Table 2 shows plant growth parameters. There were no significant differences in plant heights, but generally the Agriblend Plus treated plants were shorter and polyacrylamide treated plants taller than the check. On 1st fruiting branch, lower numbers are better than higher numbers. The polyacrylamide treated plants tended to start fruiting at lower nodes than the Agriblend Plus plots or the check plots. No differences were seen in total nodes per plant or with the height to node ratios (HNR).

Table 3 lists the HVI lint characteristics on the short staple crop across all treatments. The samples from all reps were combined to send to the classing office, so no statistical inferences are listed with the values. Only one of the treated plots produced a grade better than the check and no trend was seen. Most of the treated plots had micronaire values higher than the check. This would indicate a maturing and thickening of the fiber. The two highest rates of Agriblend Plus raised the micronaire values into the discount range. One treatment had a fiber length greater and 5 had values smaller than the check. This would indicate that the treatments were more detrimental to than beneficial for the increasing fiber length. Strength was quite variable between treatments, but no trends were established between fiber strength and increasing amounts of Agriblend Plus or polyacrylamide. The remaining HVI values are not as critical for establishing lint value and will not be discussed.

Tables 4, 5 and 6 contain data from long staple cotton across all the treatments applied. In Table 4 there were no statistically significant differences between the lint yields of the treated plots and the check plot, however the yields of all the polyacrylamide treatments exceeded that of the check. Concerning the percent lint turnout, plant populations and boll weights, few statistically significant differences or trends were seen to indicate that the treatments had any affect.

Table 5 lists plant mapping variables. No significant differences were seen between treatments on plant height or 1st fruiting branch, even though the plant heights of all the treated plots were shorter than that of the check. The only difference in total plant nodes was between adjacent treatments of polyacrylamide, so it is felt that no real differences existed. Similarly with the height to node ratios (HNR), there were only two differences in values. This time the difference was between the check plot and one of the polyacrylamide treatments. HNRs relate to the environment that a plant encountered in growing. According to Silvertooth, et.al. (1), HNR values for Pima cotton normally to fall in a range between 2.0 and 1.2, those values at the low end of the range indicating less vegetative growth and inferring that the plant environment was somehow limiting. With this reasoning, one could conclude that none of the treatments improved the plant's environment.

Table 6 shows the HVI values for lint samples from each treatment. No differences were seen in the grades. Micronaire values of the treated plots tended to be lower than that of the check plot, but no trends were seen indicating a real effect. Fiber length of the treated plots tended to be longer than that of the check and the plots treated by Agriblend Plus were consistently longer than the rest. The average fiber strength was slightly higher than that of the check plot, but consistent trends were absent. The treatment with the highest rate of Agriblend Plus had the highest value of all, something that bears further study. As with the short staple, the last three HVI values are not as important in establishing lint price and will not be discussed.

The results of this study would indicate that incorporating rates from 5 to 20 pounds per acre of Agriblend Plus or Superfloc A-836 into the top few inches of soil has no statistically significant effect on lint yield, and little if any effect on plant growth or the quality of lint. A few interesting trends were visible and bear future investigation.

References

1. Silvertooth, J.C., E.R. Norton and P.W. Brown. 1996. Cotton growth and development patterns. Cotton, A College of Agriculture Report, The University of Arizona, Tucson, AZ. Series P-103, pp. 75-96.

Table 1. Lint yield, percent lint turnout and plant population for soil amendment treatment on short staple cotton on the Safford Agricultural Center, 2000.

Treatment	Lint Yield (lbs/ac)	% Turnout	Plants per acre	Boll Weight (g)
Check	1701.4 a	36.5 b	65566.9 a	6.4 abc
5# AB	1684.9 a	36.9 ab	61483.1 a	7.3 a
10# AB	1719.5 a	36.3 b	62844.4 a	5.6 bc
15# AB	1659.3 a	36.7 ab	61256.3 a	5.8 abc
20# AB	1709.8 a	36.6 b	64659.4 a	6.5 abc
5# PAM	1686.1 a	37.7 a	64204.6 a	7.2 ab
10# PAM	1723.7 a	36.6 b	64659.4 a	5.4 c
15# PAM	1675.8 a	37.1 ab	62844.4 a	5.7 abc
20# PAM	1647.3 a	37.2 ab	58760.6 a	6.8 abc
Average	1689.8	39.8	62920	6.3
LSD(05)	288.5	1.01	6964.5	1.5
CV(%)	9.25	1.88	7.58	16.4

Table 2. Plant mapping for soil amendment treatment on short staple cotton on the Safford Agricultural Center, 2000.

Treatment	Plant Height	1st Fruiting Branch	Total Nodes	HNR
Check	35.8 ab	7.0 ab	25.6 a	1.42 a
5# AB	35.3 b	6.6 abc	25.0 a	1.42 a
10# AB	35.5 b	7.4 a	25.5 a	1.39 a
15# AB	34.8 b	7.3 ab	24.4 a	1.44 a
20# AB	35.9 ab	7.3 ab	26.0 a	1.38 a
5# PAM	38.4 a	6.6 abc	25.0 a	1.54 a
10# PAM	36.1 ab	6.4 bc	25.0 a	1.45 a
15# PAM	37.3 ab	6.5 abc	25.5 a	1.47 a
20# PAM	35.9 ab	6.0 c	25.3 a	1.43 a
Average	36.1	6.8	25.3	1.44
LSD(05)	2.39	0.9	2.65	0.19
CV(%)	4.53	8.7	7.19	9.0

Table 3. HVI values for soil amendment treatment on short staple cotton on the Safford Agricultural Center, 2000.

Variety	Grade	Mike	Length	Strength	Uniformity	Color	
						RD	+b
Check	21	4.5	1.13	30.4	82	81	83
5# AB	21	4.6	1.13	32.1	82	81	81
10# AB	21	4.8	1.06	30.5	82	83	77
15# AB	21	5.1	1.08	31.6	82	82	83
20# AB	31	5.0	1.13	33.1	82	81	75
5# PAM	31	4.6	1.11	32.4	82	81	75
10# PAM	11	4.9	1.14	31.5	82	83	83
15# PAM	21	4.5	1.12	31.2	83	82	75
20# PAM	21	4.7	1.09	30.9	81	81	80
Average	--	4.74	1.11	31.5	82.0	81.7	79.1

Table 4. Lint yield, percent lint turnout and plant population for soil amendment treatment on long staple cotton on the Safford Agricultural Center, 2000.

Treatment	Lint Yield	% Turnout	Plants per acre	Boll Weight (g)
Check	866.9 a	36.2 ab	30628.1 ab	3.7 a
5# AB	833.4 a	36.5 ab	32896.9 ab	3.6 a
10# AB	832.0 a	36.6 ab	33350.6 ab	3.7 a
15# AB	957.3 a	36.3 ab	43560.0 a	3.7 a
20# AB	854.2 a	36.7 ab	31308.8 ab	3.7 a
5# PAM	903.3 a	37.4 a	32896.9 ab	3.7 a
10# PAM	981.8 a	35.3 b	32896.9 ab	3.8 a
15# PAM	935.3 a	36.1 ab	28813.1 ab	3.7 a
20# PAM	938.2 a	36.9 ab	26998.1 b	3.7 a
Average	902.5	36.4	32594.4	3.68
LSD(05)	137.8	1.6	13366.5	0.2
CV(%)	10.5	3.02	28.1	4.0

Table 5. Plant mapping for soil amendment treatment on long staple cotton on the Safford Agricultural Center, 2000.

Treatment	Plant Height	1st Fruiting Branch	Total Nodes	HNR
Check	33.5 a	7.1 a	23.6 ab	1.44 a
5# AB	31.5 a	6.3 a	24.8 ab	1.27 ab
10# AB	31.5 a	7.4 a	24.0 ab	1.33 ab
15# AB	32.5 a	6.4 a	24.5 ab	1.34 ab
20# AB	32.3 a	6.1 a	25.6 ab	1.26 ab
5# PAM	29.8 a	6.4 a	24.1 ab	1.24 ab
10# PAM	30.4 a	7.3 a	21.6 b	1.40 ab
15# PAM	31.3 a	7.6 a	26.5 a	1.18 b
20# PAM	31.1 a	7.5 a	25.1 ab	1.26 ab
Average	31.5	6.9	24.4	1.3
LSD(05)	4.11	1.52	3.53	0.2
CV(%)	8.92	15.2	9.9	10.7

Table 6. HVI values for soil amendment treatment on long staple cotton on the Safford Agricultural Center, 2000.

Variety	Grade	Mike	Length	Strength	Uniformity	Color	
						RD	+b
Check	2	4.7	1.32	41.6	86	72	109
5# AB	2	4.3	1.36	42.9	85	72	111
10# AB	2	4.5	1.37	41.7	88	72	110
15# AB	2	4.6	1.36	42.7	88	72	110
20# AB	2	4.5	1.36	45.9	88	72	112
5# PAM	2	4.7	1.33	41.7	87	72	109
10# PAM	2	4.2	1.34	41.4	88	72	112
15# PAM	2	4.4	1.35	39.1	87	71	114
20# PAM	2	4.2	1.32	41.7	82	73	113
Average	2.00	4.46	1.35	42.1	86.6	72.0	111.1