Soil Amendments on Cotton, Safford Agricultural Center, 1988

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ABSTRACT

Cotton was grown in the fourth year of a soil amendment trial that evaluated 4 different soil amendments in 12 treatments on the Safford Agricultural Center. Yields varied from 1,659 to 1,392 pounds of lint per acre but none of the treatments yielded statistically different from the check. The higher yields were seen in the treatments with high and medium rates of soil sulfur, Boligrow, or gypsum, the lower yields were seen in the treatments with low rates of those amendments or with a biological amendment, but the conclusion of the study is that soil amendments did not significantly increase yields on that soil with its EC value of 2.3 dS/m. Crop and fiber quality measurements are reported here.

INTRODUCTION

A soil amendment study was initiated on the Safford Agricultural Center in 1985, using four different amending materials, Boligrow (an aluminum sulfate material from Sweden), gypsum (calcium sulfate), sulfuric acid and a biological product (Huma-Blend from Bio Huma-Netics Co.). The study was located on a field with a history of soil problems. An initial soil analysis indicated a pH of 7.8, electrical conductivity of 2.5 dS/m, and an estimated exchangeable sodium percent (ESP) of 12.9. A long-term experiment, the same treatments were to be repeated on the same site for 3 or 4 years and the residual effects were to be followed for an additional 3 or 4 years. 1988 was the fourth year of the study and the first year cotton was grown for the study. It was preceded by barley in 1985, beans in 1986, and barley again in 1987. Only the highest rates of Boligrow and sulfuric acid caused significant yield increased on barley in 1985 (1) and it was questionable whether cotton, with its salt-tolerant capacity, would receive any benefit from the soil amendments. To test the hypothesis, cotton was planted and the results evaluated.

MATERIALS AND METHODS

Twelve treatments of the 4 soil-amending materials were applied to the same experimental plots by hand for 4 consecutive years. Because of the difficulty of handling sulfuric acid, its treatments were supplanted with equivalent amounts of soil sulfur. The treatments are listed below:

Treatment 1	Boligrow 500 pounds per acre
Treatment 2	Boligrow 1,000 pounds per acre
Treatment 3	Boligrow 2,000 pounds per acre
Treatment 4	Gypsum 1,000 pounds per acre
Treatment 5	Gypsum 2,000 pounds per acre
Treatment 6	Gypsum 3,000 pounds per acre
Treatment 7	Soil sulfur 320 pounds per acre
Treatment 8	Soil sulfur 640 pounds per acre
Treatment 9	Soil sulfur 1,280 pounds per acre
Treatment 10	Huma-Blend low rate

Treatment 11 Huma-Blend high rate
Treatment 12 Check

Materials were applied by hand over the furrows and were then incorporated with a rolling cultivator. The experiment was then pre-irrigated and allowed to dry in preparation for planting the cotton. Delta Pine 90 was planted at a rate of 25 pounds per acre. Trifluralin and prometryne were incorporated prior to pre-irrigation to control weeds and 300 pounds per acre of 16-20-0 was applied in a similar manner. The experimental unit was managed in a manner to avoid insect damage and stress.

RESULTS AND DISCUSSION

Table 1. Yield and Crop Characteristics on Soil Amendment Treatments at the Safford Agricultural Center, 1988.

Treatment	Lint Yield (lb/ac)	Percent of Chk	Percent 1st Pick	Percent Turnout	Plant Height (in)
T1 Boli low	1459 ab*	97.3	89.4 a	33.8 b	51.5 a
T2 Boli med	1658 a	110.6	87.5 a	36.2 a	47.1 a
T3 Boli hi	1506 ab	100.4	87.4 a	33.3 b	49.8 a
T4 Gyp low	1511 ab	100.8	87.7 a	33.4 b	50.4 a
T5 Gyp med	1538 ab	102.6	92.3 a	34.2 b	52.7 a
T6 Gyp hi	1565 ab	104.4	90.2 a	33.6 b	49.1 a
T7 SS low	1392 b	92.9	87.7 a	32.6 b	50.7 a
T8 SS med	1540 ab	102.8	89.5 a	33.7 b	48.9 a
T9 SS hi	1659 a	110.7	88.6 a	34.7 b	50.7 a
T10 H-B low	1428 ab	95.2	89.0 a	33.2 b	52.0 a
T11 H-B hi	1446 ab	96.5	87.8 a	33.9 b	49.5 a
T12 Check	1499 ab	100.0	88.1 a	-	52.0 a
LSD (05)	142		3.6	1.4	5.7

* Values within a column followed by the same letter are not significantly different at the 5% level using the Student-Newman-Keul's test.

Not too much can be inferred statistically from Table 1, with the relatively large LSD's, none of the yields varied significantly from that of the check. One can, however, look at the trends to see if it appeared that one material or rate was more efficacious than another. Looking at Boligrow: yields, percent lint turnout, and plant height varied independent of rate, percent first pick declined with rate, the average yield was slightly higher than the check. Looking at gypsum: yields increased with rate increase, all other parameters varied independently of the rate, the average yield was slightly higher than the check. Looking at soil sulfur: yields and percent lint turnout varied almost linearly with the increase in rate, the other parameters varied independently, the average yield was only slightly higher than the check. Looking at Huma-Blend: yields and percent lint turnout increased slightly with rate; the other parameters varied independently, the average yield being slightly lower than the check.

Table 2. Fiber Quality Characteristics on Soil Amendment Treatments at the Safford Agricultural Center, 1988.

Treatment	Grade	Staple	Micronaire	Strength	Uniformity
T1 Boli low	41 a*	36/37 a	38.5 a	27.5 a	82.0 a
T2 Boli med	41 a	37 a	38.0 a	29.0 a	81.0 ab
T3 Boli hi	41 a	36/37 a	36.0 a	28.0 a	80.0 ab
T4 Gyp low	41 a	37 a	36.0 a	29.0 a	79.5 abc
T5 Gyp med	41 a	35/36 a	37.0 a	26.5 a	79.0 bc
T6 Gyp hi	41 a	36 a	35.0 a	27.5 a	77.0 c
T7 SS low	31/41 a	37 a	35.5 a	30.0 a	78.5 bc
T8 SS med	-	-	-	-	-
T9 SS hi	41 a	37 a	38.0 a	28.0 a	80.0 ab
T10 H-B low	31/41 a	37/38 a	35.0 a	30.0 a	80.0 ab
T11 H-B hi	41 a	36/37 a	38.0 a	30.5 a	79.5 abc
T12 Check	-	-	-	-	-
LSD (05)		1.5	2.6	2.8	1.8

* Values within a column followed by the same letter are not significantly different at the 5% level using the Student-Newman-Keul's test.

Uniformity appeared to decline slightly with increased rate for all materials except soil sulfur, but with no explanation. There were no statistical differences in the other parameters.

Soil samples are being analyzed to determine the effect of the soil amendments applied over the past 4 years; they will be reported at a later time. What seems apparent from this portion of the study is that a soil with an electrical conductivity of 2.3 dS/m is well below the threshold of yield reduction for cotton. That is corroborated by Maas (2) who reports that the threshold value for cotton is 7.7 dS/m.

REFERENCES

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