Influence of Ironite and Phosphorus on Long and Short Staple Cotton on the Safford Agricultural Center, 2000

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Abstract

Ironite and phosphorus were applied as a combined treatment and also individually to plots planted to long and short staple cotton to find their effect on crop development and lint yield. A statistically significant increase in lint yield was seen with 14 pounds of Ironite and 200 pounds of 16-20-0 per acre compared with the untreated check in the short staple plots. An increase in long staple yield was observed as the Ironite treatment increased from 7 to 28 pounds per acre when coupled with 200 pounds of 16-20-0. Few differences were seen between treatments in any of the plant mapping variables measured or with HVI values. More research and an economic analyses are needed to determine if this would be a recommended procedure in the Safford valley.

Introduction

Ironite is a soil amendment commonly added to crops in alkaline soils to solve problems of iron uptake. Phosphorus availability is also affected by alkaline soils and phosphorous fertilizer is often added to help root development in cold season seeded crops. In 1999 a study was done with ironite and phosphorus on long and short staple cotton. No statistically significant differences were seen, but the highest yields with both long and short staple cotton occurred when both Ironite and phosphorus were applied. This study is a follow-up on the previous study to see if similar effects will be noted. As with the previous study a randomized split plot experiment was designed to test four levels of Ironite and two levels of phosphorus. It is understood that the effect of Ironite and phosphorous are dependant on soil conditions being high in salts and low in available phosphorous or the effects would not be manifest. A soil analysis taken at planting (Table 1) shows the results of the soil tests in 1999 and 2000.

Materials and Methods

The study was implemented on a field that had been in cotton for several years with no applied phosphorous fertilizers. Before planting the beds were dressed with a Lilliston and firmed with a ring roller. Seed was planted with a John Deere 3100 planter with a fertilizer attachment over four 36" beds. The crop history follows:

Crop History:

Elevation: 2954 feet above sea level
Soil type: Pima clay loam variant
Planting date: 28 April 2000 Seeding rate: 25 pounds per acre
Herbicide: Treflan pre-plant
Fertilizer: 200 lbs/ac of 16-20 to appropriate plots at planting, 100 pounds per acre of urea was sidedressed 5/23
Ironite: Applications of 0, 7, 14 and 28 pounds per acre were applied to appropriate plots
Insecticides: 3 applications short staple/5 applications on long staple to control aphid, pink bollworm
Irrigation: Furrow, watered up plus 7 irrigations for a total of ca. 38 acre inches

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Rainfall during the growing season: 3.3 inches
Plot size: 12 feet by 45 feet
Replicates: Four Harvest dates: 30 November

Soil samples were taken at the beginning of the year and submitted for chemical analysis. The results of the soil tests are found in Table 1.

The plots were picked using a modified 2-row cotton picker. The production from each plot was caught in a sack and weighed on an electronic platform scale to determine seed cotton yields.

Results and Discussion

A comparison of the soil analyses taken the two years of the study are shown in Table 1. This Table shows that the field used in the 2000 study had a higher salinity level, higher sodium level and a higher nitrogen level. The rest of the values were lower, including the phosphorus level, which was considered to be 'very low'. This soil was more likely to show a positive response to Ironite and phosphorus than the experimental plots of 1999.

Table 2 provides yield, plant characteristics and HVI data for the plots planted to short staple cotton (DP 655BR). The upper part of the table shows a statistically higher yield where 14 pounds per acre of Ironite plus 200 pounds per acre of 16-20-0 fertilizer were added. The previous study (1) showed this treatment with the highest yield, but with no statistical significance. Comparing the check treatment with the 16-20-0 treatment showed an increase in yield, even though not significant. A similar comparison between the check and the high rate of Ironite showed a non-significant decrease in yield. A comparison between the high Ironite and the 16-20-0 treatments showed a decrease in yield caused by the high Ironite application. These observations would lead one to believe that Ironite can be beneficial to yield in short staple cotton when the soil conditions are conducive, when phosphorus is applied along with the Ironite and when not too much Ironite is applied. Of the other plant variables measured, only the plant heights showed statistical differences. In the bottom part of the table, the HVI data indicate for the most part the values vary around the values of the check plots. It is difficult to know if any of the differences are statistically or economically significant.

Table 3 shows the same information for long staple cotton (HTO variety). The increase in yield from 7 to 28 pounds of Ironite per acre (plus 16-20-0) was much the same as seen in 1999, but in common with last year, no statistically significant differences were seen. Comparing yields with the check, the 16-20-0 alone and the high rate of Ironite alone showed lower yields than the check. So, even with the low phosphorus analysis in the soil, no beneficial effect was seen due to phosphorus additions to the soil. No conclusion can be drawn as to whether Ironite causes a real yield increase in long staple cotton, but the need for phosphorus being present with Ironite for a positive response seems to be true. No significant differences were seen between any of the measured variables on the long staple cotton. The HVI data at the bottom of the table show an apparent increase in fiber length with all of the treatments. The greatest lengths are seen with the high rate of Ironite, but those two treatments also had the weakest fiber. It is not known if these effects are real. It seems apparent that additional research with replication in HVI analyses would be required to define some of these effects.

The data from studies in both 1999 and 2000 point to an increase in yield with additions of Ironite and phosphorus added together and a lack of positive yield response when added separately. More work would be needed to determine if the economics of the yield increase would be positive.

References

1. Clark, L.J. and E.W. Carpenter. 2000. Influence of Ironite and phosphorus on long and short staple cotton on the Safford Agricultural Center, 1999. Cotton, A College of Agriculture Report, The University of Arizona, Tucson, AZ. Series 121, pp. 243-247.

Table 1. Initial soil analyses from the experimental fields at the Safford Agricultural Center, 1999.

Field/Year	pH	Calcium (ppm)	Mg (ppm)	Sodium (ppm)	Potash (ppm)	Fe (ppm)	Zn (ppm)	Mn (ppm)
H/1999	8.6	7000 VH	704 VH	1530 VH	760 VH	4.9 M	1.1 M	6.9 VH
B/2000	8.6	5400 VH	470 VH	2300 VH	530 VH	--	--	--

Field/Year	EC	Cu (ppm)	NO_3-N (ppm)	P (ppm)	ESP	S (ppm)	B (ppm)	Free Lime
H/1999	3.2 M	21.5 VH	18.0 M	13.0 M	13.4	87 VH	0.92 L	High
B/2000	4.0 H	--	23.0 H	3.2 VL	23.7	—	—	High

Table 2. Yield, plant mapping and HVI values for short staple cotton (DP 655BR) across treatments of Ironite and 16-20-0 fertilizer, Safford Agricultural Center, 2000.

Treatment	Lint Yield (lbs/ac)	% Turnout	Plants per acre
Check	1545.4 bc	36.0 a	71238.8 a
7# Irn +200# 16-20	1540.9 bc	38.8 a	74415.0 a
14# Irn + 200# 16-20	1732.4 a	36.9 a	79860.0 a
28# Irn + 200# 16-20	1420.8 c	36.9 a	78952.5 a
200# 16-20	1584.9 b	36.0 a	78498.8 a
28# Ironite	1507.2 bc	35.9 a	83036.3 a
Average	1555.3	36.3	77666.9
LSD(05)	136.5	1.52	17501.2
CV(%)	3.41	1.64	8.77

Treatment	Plant Height (in)	1st Fruiting Branch	Total Nodes	HNR
Check	34.0 ab	7.0 a	22.5 a	1.51 a
7# Irn +200# 16-20	31.0 b	5.5 a	23.3 a	1.34 a
14# Irn + 200# 16-20	37.0 a	7.0 a	23.5 a	1.58 a
28# Irn + 200# 16-20	30.0 b	6.8 a	22.0 a	1.36 a
200# 16-20	33.2 ab	6.5 a	21.8 a	1.53 a
28# Ironite	34.5 ab	6.5 a	23.5 a	1.47 a
Average	33.3	6.5	22.8	1.46
LSD(05)	4.82	2.13	3.73	0.3
CV(%)	5.64	12.7	6.37	8.03

Treatment	Grade	Mike	Length	Strength	Uniformity	RD	+b
Check	21	4.6	1.12	31.7	81	80	85
7# Irn +200# 16-20	11	4.8	1.13	31.2	83	81	89
14# Irn + 200# 16-20	21	4.6	1.11	32.2	81	80	87
28# Irn + 200# 16-20	21	4.2	1.11	31.5	83	81	82
200# 16-20	11	4.8	1.11	32.1	83	83	83
28# Ironite	11	4.7	1.13	32.4	82	81	90
Average	--	4.62	1.12	31.85	82.17	81.00	86.00

Table 3. Yield, plant mapping and HVI values for long staple cotton (HTO) across treatments of Ironite and 16-20-0

fertilizer, Safford Agricultural Center, 2000.

Treatment	Lint Yield (lbs/ac)	% Turnout	Plants per acre
Check	1480.7 a	36.4 a	46736.3 a
7# Irn +200# 16-20	1370.1 a	36.7 a	44013.8 a
14# Irn + 200# 16-20	1459.3 a	36.2 a	42652.5 a
28# Irn + 200# 16-20	1566.1 a	37.0 a	44921.3 a
200# 16-20	1239.1 a	35.9 a	43560.0 a
28# Ironite	1343.4 a	36.7 a	34031.3 a
Average	1409.8	36.5	42652.5
LSD(05)	317.8	1.54	23226.7
CV(%)	8.77	1.64	21.18

Treatment	Plant Height (in)	1st Fruiting Branch	Total Nodes	HNR
Check	34.8 a	7.5 a	22.8 a	1.53 a
7# Irn +200# 16-20	32.8 a	6.0 a	22.0 a	1.50 a
14# Irn + 200# 16-20	35.3 a	6.5 a	23.0 a	1.54 a
28# Irn + 200# 16-20	34.8 a	7.0 a	23.0 a	1.51 a
200# 16-20	33.8 a	6.8 a	25.0 a	1.36 a
28# Ironite	32.5 a	7.3 a	23.5 a	1.39 a
Average	34	6.8	23.2	1.47
LSD(05)	4.75	2.8	3.37	0.22
CV(%)	5.45	15.9	5.65	5.97

Treatment	Grade	Mike	Length	Strength	Uniformity	RD	+b
Check	2	4.6	1.29	40.1	86	72	111
7# Irn +200# 16-20	2	4.6	1.34	40.3	87	72	107
14# Irn + 200# 16-20	2	4.3	1.37	44.0	88	71	105
28# Irn + 200# 16-20	3	4.7	1.39	39.8	87	70	109
200# 16-20	2	3.9	1.35	44.3	87	71	111
28# Ironite	3	4.7	1.38	39.9	87	72	110
Average	2.33	4.47	1.35	41.40	87.00	71.33	108.83