

Influence of Ironite and Phosphorus on Long and Short Cotton on the Safford Agricultural Center, 1999

L.J. Clark and E.W. Carpenter

Abstract

Ironite and phosphorus were applied to plots planted to long and short staple cotton to find their effect on crop development and lint yield. The soil analysis indicated sufficient iron and phosphorous in the soil for cotton production and that yield increases from additions of these elements were unlikely. No statistically significant increases in lint yield were seen with the addition of Ironite nor phosphorous fertilizer. However, an interesting yield trend with ironite was seen in long staple cotton.

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 many times added to help root development in cold season seeded crops. A randomized split plot experiment was designed to test four levels of Ironite and two levels of phosphorus to find their effect on yield and nutrient uptake. 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) would indicate that effects would be expected to be seen from Ironite, but perhaps marginal for phosphorous.

Materials and Methods

The study was implemented on a field that had been in cotton the two previous years and no phosphorous fertilizers were applied. Following the last cotton crop the ground was prepared using a Pegasus unit that incorporated the cotton stubble into a trench directly under the center of the bed. Before planting the beds were dressed with a Lilliston and firmed with a ring roller. Seed was planted with an John Deere 7100 planter with a fertilizer attachment over four 3-foot beds. The crop history follows:

Crop History:

Elevation: 2954 feet above sea level

Soil type: Grabe clay loam

Planting date: 19 April 1999

Seeding rate: 25 pounds per acre

Herbicide: Treflan pre-plant, prometryne at layby

Fertilizer: 200 lbs/ac of 16-20 to appropriate plots at planting, 100 pounds per acre of urea was sidedressed on June 18th and July 20th

Ironite: Applications of 0, 7, 14 and 28 pounds per acre were applied to appropriate plots

Insecticides: 6 applications to control aphid, pink bollworm, lygus and whitefly

Irrigation: Furrow, watered up plus 8 irrigations for a total of ca. 40 acre inches

Rainfall during the growing season: 3.9 inches

Plot size: 12 feet by 45 feet

Replicates: Four

Harvest dates: 11 November

A soil sample was 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

Table 1 shows the soil analysis which indicates that the soil is a Saline-Sodic soil since the Electro-Conductivity (EC) is > 4 and the Exchangeable Sodium Percentage (ESP) is $> 15\%$. The soil pH of 8.6 would reduce the availability of phosphorous (P) to about its minimum point and the availability of iron (Fe) to about one half of its potential. Interestingly though, P at 13 ppm and Fe at 4.9 ppm were considered in the medium range.

Tables 2 and 3 contain plant mapping data from the short staple plots on 7/27 and 8/11. If iron was a limiting factor for the plants in this trial one would expect some differences to show up in plant growth as well as in lint yields. Statistical differences are seen in plant height at the first plant mapping date, 7/27/99. The plants were at peak flowering at that point and plant growth was close to its maximum. The shortest plants were in the treatment with the high rate of Ironite and no phosphorous added and the tallest plants were with the middle rate of Ironite and with phosphorous added. The untreated check, which also had no phosphorous also had plants shorter than the average, but the evidence is weak that a lack of phosphorous caused a reduction in plant height. Following plant heights through the plant mapping on August 11 and again at harvest (Figure 4) show no statistically significant differences. Differences in the height to node ratios (HNR) at the first date of plant mapping follow the same trend at the plant heights and won't be further discussed. The rest of the plant mapping data show no differences, but a few trends will be pointed out as food for thought. The untreated check had the lowest number of nodes, blossoms and bolls per 8 feet of row and set fruit on the lowest branch on the first plant mapping date, but produced next to the highest yield in the study. The 14 pound per acre Ironite treatment produced tall plants with the highest HNR on the first and last mapping dates, the highest number of bolls per 8 feet, was slower to mature (had a high nodes about white bloom (NAWB) value) and produced the highest lint yield.

Results from the long staple study are found in tables 5, 6 and 7. It will be noted that lack of space in the trial limited the number of treatments and didn't permit a 16-20 check (without Ironite) or the 28 pound rate of Ironite without phosphorous. There were no statistically significant treatment differences in any of the variables measured. The yield trend was strong, however, with yields increasing from the untreated check all the way to the highest Ironite treatment.

The soil test for the trial indicated that both iron and phosphorous were available in quantities sufficient for cotton production, so the addition of Ironite and/or phosphorous were not expected to affect plant growth or yield. It was interesting to note, however, that the addition of both, together, tended to cause an increase in yield. The case is not strong enough, under these soil conditions, to make a recommendation, but may justify further research.

Table 1. Initial soil analyses from the experimental field (I2) at the Safford Agricultural Center, 1999.

pH	Calcium (ppm)	Mg (ppm)	Sodium (ppm)	Potash (ppm)	Fe (ppm)	Zn (ppm)	Mn (ppm)
8.6	7000 VH	704 VH	1530 VH	760 VH	4.9 M	1.1 M	6.9 VH

EC	Cu (ppm)	NO ₃ -N (ppm)	P (ppm)	ESP	S (ppm)	B (ppm)	Free Lime
3.2 M	21.5 VH	18.0 M	13.0 M	13.4	87 VH	0.92 L	High

Table 2. Plant mapping data from 7/27/99 on short staple cotton treated with ironite and phosphorous as soil amendments, Safford Agricultural Center, 1999.

Treatment	Plant Height	# of Nodes	First Fruiting Br	Blossoms/8'	Bolls/8'	HNR
Untreated Check	25.1 ab	13.1 a	6.6 a	31.8 a	18.4 a	2.0 ab
7# Ironite+16-20	26.1 ab	15.1 a	6.9 a	38.0 a	19.1 a	1.7 ab
14#Ironite+16-20	28.0 a	13.3 a	6.8 a	36.9 a	21.8 a	2.2 a
28#Ironite+16-20	24.8 ab	14.6 a	7.9 a	41.5 a	19.0 a	1.7 ab
16-20 Check	27.0 ab	14.4 a	7.9 a	35.4 a	20.4 a	1.9 ab
28# Ironite	22.8 b	14.8 a	9.0 a	36.6 a	20.0 a	1.6 b
Avg	25.6	14.2	7.5	36.7	19.8	1.8
LSD(05)	4.9	2.4	2.7	11.8	7.6	0.6
CV(%)	12.8	11	24.1	21.4	25.4	20.5

Table 3. Plant mapping data from 8/11/99 on short staple cotton treated with ironite and phosphorous as soil amendments, Safford Agricultural Center, 1999.

Treatment	Plant Height	# of Nodes	NAWB	HNR
Untreated Check	29.8 a	16.1 a	2.5 a	1.9 a
7# Ironite+16-20	30.9 a	17.1 a	2.5 a	1.8 a
14# Ironite+16-20	31.3 a	17.0 a	2.5 a	1.9 a
28#Ironite+16-20	29.5 a	16.3 a	1.9 a	1.9 a
16-20 Check	31.8 a	15.9 a	1.9 a	2.0 a
28# Ironite	30.3 a	17.3 a	2.5 a	1.8 a
Avg	30.6	16.6	2.3	1.9
LSD(05)	5.5	3.1	1.5	0.3
CV(%)	11.8	12.5	42.9	10.1

Table 4. Yield and other agronomic data on short staple cotton treated with ironite and phosphorous as soil amendments, Safford Agricultural Center, 1999.

Treatment	Lint Yield	Plant Height	First Fruiting Br.	Fruiting Nodes	Total Nodes	Height to Node Ratio	Plant Population
Untreated Check	742 a	37.1 a	6.9 a	12.0 a	26.4 abc	1.41 a	67155 c
7# Ironite+16-20	708 a	40.6 a	6.8 a	11.4 a	28.8 a	1.42 a	68289 c
14#Ironite+16-20	769 a	37.6 a	7.3 a	10.1 a	22.8 c	1.66 a	68743 c
28#Ironite+16-20	703 a	37.3 a	7.5 a	11.4 a	26.5 ab	1.42 a	79179 a
16-20 Check	716 a	37.1 a	6.6 a	10.1 a	25.6 abc	1.45 a	71012 bc
28# Ironite	711 a	36.0 a	7.5 a	10.6 a	24.6 bc	1.49 a	76911 ab
Average	724.9	37.6	7.08	10.9	25.8	1.48	71881.5
LSD(05)	139.6	6.5	1.66	3.75	3.38	0.24	7095.0
CV(%)	12.8	11.5	15.5	22.8	8.7	10.8	6.5

Table 5. Plant mapping data from 7/27/99 on long staple cotton treated with ironite and phosphorous as soil amendments, Safford Agricultural Center, 1999.

Treatment	Plant Height	# of Nodes	First Fruiting Br	Blossom/8'	Bolls/8'	HNR
Untreated Check	24.1 a	14.9 a	7.5 a	15.5 b	25.5 a	1.6 a
7# Ironite+16-20	24.0 a	14.4 a	9.6 a	19.8 a	24.8 a	1.7 a
14#Ironite+16-20	23.8 a	15.6 a	8.9 a	16.3 b	29.6 a	1.5 a
28#Ironite+16-20	26.0 a	16.0 a	8.3 a	16.9 ab	28.5 a	1.6 a
Avg	24.5	15.2	8.6	17.1	26.6	1.6
LSD(05)	2.7	2.2	3.5	3.2	8.4	0.3
CV(%)	6.8	8.9	25.2	11.8	19.6	10.3

Table 6. Plant mapping data from 8/11/99 on long staple cotton treated with ironite and phosphorous as soil amendments, Safford Agricultural Center, 1999.

Treatment	Plant Height	# of Nodes	NAWB	HNR
Untreated Check	25.3 a	14.1 a	2.3 a	1.8 a
7# Ironite+16-20	25.5 a	14.8 a	3.4 a	1.8 a
14#Ironite+16-20	25.8 a	14.3 a	2.4 a	1.8 a
28#Ironite+16-20	25.4 a	15.6 a	2.1 a	1.6 a
Avg	25.5	14.7	2.5	1.8
LSD(05)	3.7	1.9	2.8	0.3
CV(%)	9.0	8.1	38.9	10.4

Table 7. Yields and other agronomic data on long staple cotton treated with ironite and phosphorus as soil amendments, Safford Agricultural Center, 1999.

Treatment	Lint Yield	Plant Height	First Fruiting Br.	Fruiting Nodes	Total Nodes	Height to Node Ratio	Plant Population
Untreated Check	383 a	31.4 a	7.1 a	12.5 a	25.8 a	1.23 a	59441 a
7# Ironite+16-20	449 a	32.0 a	8.0 a	11.4 a	24.6 ab	1.31 a	57173 a
14#Ironite+16-20	469 a	31.9 a	7.5 a	11.9 a	26.4 a	1.21 a	56038 a
28#Ironite+16-20	514 a	31.8 a	8.3 a	11.0 a	21.3 b	1.59 a	56265 a
Average	453.7	31.8	7.7	11.7	24.5	1.34	57229.2
LSD(05)	166.3	3.1	1.6	3.48	4.05	0.47	8568.3
CV(%)	22.9	6.1	13.2	13.2	10.3	22.2	9.4