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EFFECT OF MID-SEASON FOLIAR NUTRIENTS UPON COTTON YIELD AND LINT QUALITY IN WESTERN KANSAS

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Objective

The primary objective was to reduce fruit abortion, thus increasing the average number of bolls per plant and yield. A secondary objective is to observe any effects upon boll maturity and/or lint quality. Being on the northern edge of cotton producing regions, earliness is of major importance. As a relatively new crop for this geographic area of western Kansas, specific production challenges and management practices are being explored.

Procedure

Five irrigated circles were included in this study. The north circle to the south circle is about 14 miles distance, and east to west is approximately 6 miles. Variety on all of the circles was PM2200 BB-RR, with planting dates from May 20 – 23 at a rate of 60,000 seeds per acre on 30" rows. All fertilizer applications were consistent across the circles, with the exception of foliar trials, and included; 200 pounds of a liquid starter (10-20-5-5S) applied 2" X 2" at planting, and 70 units of nitrogen split-applied by injecting through the center pivot.

On July 20th a foliar application consisting of 10 pounds of MagnaGro 10-20-20 soluble plant food, and 4 ounces of MagnaBurst Growth Stimulant was applied in a 3 gallon per acre solution by aerial application. This was repeated from 14 to 16 days days later, depending upon the field. Relative maturity at the time of the first foliar application was Home, West, East, North and South, with Home being the most mature, and South being the least. Of the five circles, the South circle was also quite vegetative in large areas (40% - 45% of the field) due to what appeared to be early insect infestation resulting in almost no first fruit set.

Beginning in mid-October, replicated yield samples were taken from both the north line and south line dividing the control areas from the foliar areas. All of the fields had a high degree of variability from one area to another, with plant height varying from 45" to less 18". For this reason soil maps were first consulted prior to sampling to ensure soil type consistency, and, using the irrigation towers, predetermined locations were then established prior to entering the fields. Samples were done by hand, and included 6 consecutive plants for plant mapping, as well as picking 1 – 1,000th of an acre. The number of replications per field ranged from three to ten per circle. Samples were taken no more than 20 rows apart (8 – 10 rows from the division row), and were then labeled and bagged for later mapping and weighing.

Individual boll analysis included recording the number of bolls per plant, the number of locks per boll and the number of seeds per individual lock. Plant mapping was done using Texas A&M PMAP software. After weighing of all samples, yield estimation was performed using actual field turnout percentages.

Environment

With very little exception, soil types were sandy loams. Common characteristics are low organic matter (less than 1%), with pH ranges from 6.3 – 7.8. Based upon soil analysis, there does appear to also be excessive sodium present. Soil moisture was good at planting time, although there was almost no additional rainfall during June, July and August. All circles received from 10" to 12" inches of irrigation. Temperatures were normal to above normal during July and August, and below normal during September (in fact, September was the coolest on record for this area). Compaction was present in most circles, although it was not consistent across the fields.

Observations

As mentioned, crop variability was quite noticeable, partly due to early insect infestation resulting in no early fruit set. This made Pix applications somewhat challenging, but overall plant vigor was good during the growing season. Major fruit abortion from nutritional deficiencies did not take place until mid-August. Weed pressure (pigweed) was severe in some areas of all of the fields, despite herbicide being applied up to six times. Bollworm pressure was somewhat high during August, and there was noticeable fruit loss in all fields.

Results

Of course the easiest method of obtaining higher yield is to increase the number of bolls per plant. This was achieved on all fields, with average boll set shown in Graph 1. The plants that received foliar nutrients averaged 7.86 bolls per plant, and the control plants averaged 6.56, for an average increase of 1.3 bolls per plant (19.82%).

In addition to the significant increase in the average number of bolls per plant, there was also a small increase in the average number of seeds per boll although it would not be at a significant level.

Table 1 shows data from individual plant and boll analysis, including the number of plants, bolls, seeds, weights, and the various averages. While boll set was increased, boll weight was not increased with the control bolls averaging 4.875 grams per boll and the foliar bolls averaging 4.842 grams. Based upon observation, it is felt that the cool September weather did not allow many of the later bolls to properly mature.

Average yield per acre is shown in both Table 2 and Graph 2. All fields showed an increase, with only one field (Home, which was the most mature at initial application) being perhaps less than a significant amount. The South field had the largest percentage increase, which was also the field that had a significant portion of the field with excessive vegetation and was the least mature at the time of initial application. When averaging all of the fields, the control yielded 1,034.24 pounds of lint per acre, and the foliar yielded 1,260.91 pounds of lint per acre, for a 226.67 pound per acre average increase (21.92%).

Conclusion

One of the two objectives, a yield increase, was achieved due to a significant increase in the average number of bolls per plant. The secondary objective of improving lint quality was not achieved. Gin reports indicated from no difference to a slight decrease in micronaire with the foliar treated cotton. As mentioned earlier, it is felt that the decrease in quality was more a result of the weather in September than a direct result of the foliar nutrients.

In all of the fields, there were bolls set late in the season that although they opened and were able to be harvested, the lint had not matured completely. This not only reduced overall quality, but also had a negative effect on average boll weight, although first position fruits on nodes seven to twelve tended to be heavier from the foliar treated plants.

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Acknowledgement

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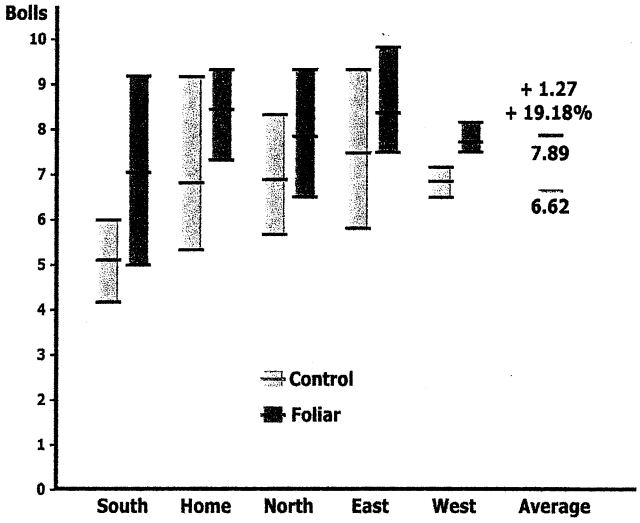
Table 1: Boll Analysis Data.

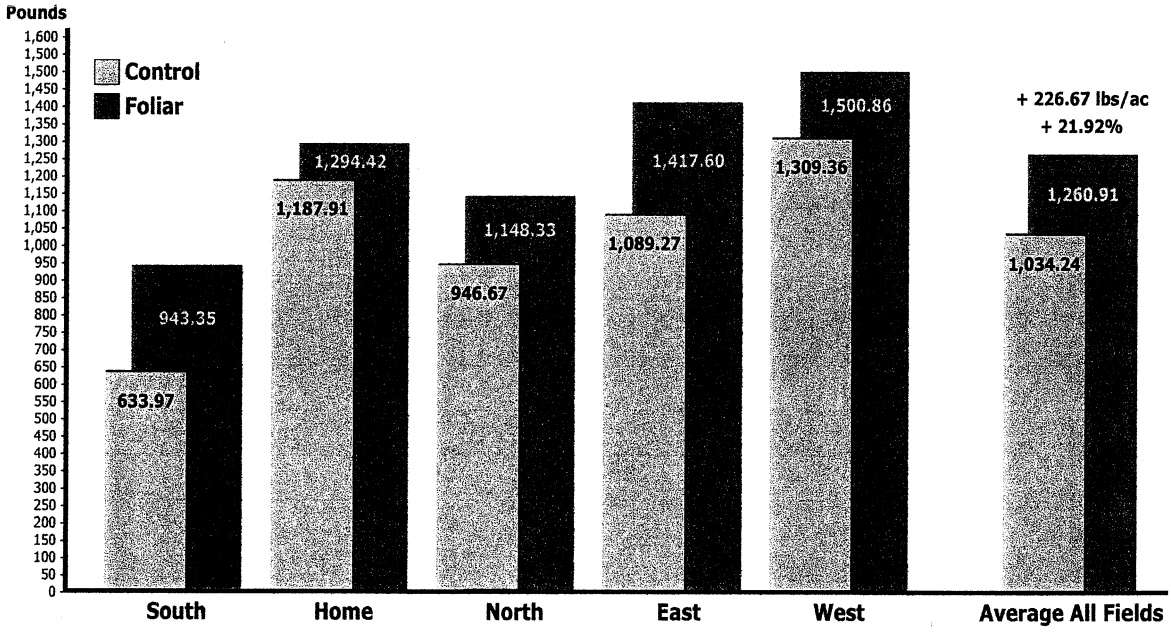
Field ID	# of Plants	# of Bolls	# of Seeds	# Bolls Per Plant	# Seeds Per Boll	Total Weight in Grams	Average Boll Wt. (gms)	Average Seed Wt. (gms)
South - Control	36	184	5,148	5.11	27.98	799.30	4.344	.155
South - Foliar	36	253 + 69	7,713	7.03 +1.92	26.98	986.80	4.100	.133
Home - Control	18	122	3,845	6.78	31.50	671.80	5.531	.176
Home - Foliar	18	152 + 30	4,800	8.44 +1.66	31.81	791.10	5.109	.161
North - Control	30	207	5,821	6.90	27.95	1,088.30	5.218	.187
North - Foliar	30	236 + 29	6,667	7.87 + .97	28.38	1,183.60	5.044	.178
East - Control	36	269	8,202	7.60	30.49	1,199.50	4.405	.145
East - Foliar	36	302 + 33	9,161	8.10 + .50	30.37	1,492.90	4.899	.161
West - Control	18	123	3,834	6.83	31.22	654.2	5.319	.171
West - Foliar	18	142 + 19	4,796	7.89 +1.06	33.82	797.3	5.614	.166
Average - Control	1			6.56	29.83	31.98	4.875	.167
Average - Foliar	1			7.86	30.27	38.06	4.842	.160

Table 2: Yield (Pounds of Lint) Per Acre

Treatment	South	Home	North	East	West	Average
Control	633.97	1,187.91	946.67	1,089.27	1,309.36	1,034.24
Foliar	943.35	1,294.42	1,148.33	1,417.60	1,500.86	1,260.91
Difference	+ 309.38	+106.51	+201.66	+328.33	+191.50	+226.67
	+48.8%	8.9%	+21.3%	+30.1%	+14.6%	+21.92%



Graph 1. Number of Bolls Per Plant, Showing High, Low and Average For All Fields.



Graph 2. Yield (Pounds of Lint) Per Acre