

Effects of Megafol and Calcium Metalosate® Applications at Early Bloom on April 2003 Planted DPL555BR Cotton

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Abstract

Foliar fertilizers are not widely used for cotton production in the low desert, and data about their effects on cotton production under these conditions is therefore limited. This study documented the effects of Calcium Metalosate® and Megafol, each applied at the rate of 1 qt/acre to DPL555BR cotton. Treatments were applied on July 7, and plants had been growing vigorously just prior to application. Plots were approximately 0.75 acres in size with four replications. Plant mapping data from late July indicated that non-treated cotton had numerically higher retention rates at each of the first three fruiting positions mapped in addition to slightly more total nodes and a greater number of reproductive nodes in part due to first fruiting structure being retained lower on the plant (node 6.75) than treated cotton (node 7.95 for Megafol, node 8.4 for Calcium Metalosate®). Tractor passage through treated plots may have also knocked off developing squares however.

No statistical differences were noted for lbs. of lint/acre, although treated cotton did have slightly higher yields than the untreated check (1,162 lbs/acre) and treatments were almost identical (1,203 lbs./acre for Megafol; 1,198 lbs./acre for Calcium Metalosate®). Fiber lengths and strengths were significantly different by treatment, with shortest and weakest fibers resulting from cotton treated with Megafol. Cotton from Calcium Metalosate® treatments were significantly longer and stronger than lint from Megafol treated cotton plots, but lint from untreated cotton plots was significantly longer and stronger than either treatment (36.6 staple, 31.0 g/tex). The reasons for these differences are unclear.

It is difficult to correlate the slight yield increases noted with treatments in early July, especially in light of lower retention rates noted with treatments from plant mapping data in late July and the large amount of lint production that occurred in late 2003 due to summer heat. Multiple differences were noted for treatments in regards to lint quality, however, indicating treatments did affect cotton production. Size of bolls and cotton lint from these early summer bolls was not obtained but may have been an overlooked aspect of this study.

Introduction

Foliar fertilizers are not typically applied to cotton in the low desert, in part due to added costs of application, and perhaps partially due to uncertainty of the effects on low desert cotton. There have been only a few replicated university trials conducted over the past 10 years evaluating foliar fertilizers on low desert cotton. Silvertooth et al. (1998) evaluated eleven treatments containing either Macro Sorb (12% amino acids and less than 0.07% each of boron, zinc, and manganese) and Key Plex (multiple micronutrients and amino acids) and noted that untreated cotton had higher yields than treated cotton. Similar results were noted for the use of foliar potassium on upland and Pima cottons (Galadima et al., 1995, 1996). Quality data for these experiments was not included.

A study conducted in 2000 on June planted SureGro 521BR cotton had documented economic benefits of \$65-95/acre from several liquid fertilizers containing calcium, with this benefit derived mainly from increased fiber length of first pick cotton. Lint yields from cotton treated with foliar fertilizers applications were less than or equal to that of untreated cotton (Rethwisch et al., 2003a).

Another study involving a different foliar calcium product (CalMax[®]) conducted in 2002 on DPL655BR noted an increase in strength, yields, slightly lower micronaire, less leaf, and longer fibers compared with the untreated check, and also had higher economic value/acre than the untreated check when CCC loan value premiums/discounts were included (Rethwisch et al., 2003b).

As few data are available, any additional data will be useful to ascertain if foliar fertilizers have the potential to increase cotton yields and economic returns. This trial was initiated to obtain data to document and compare the effects of two foliar fertilizer products applied to low desert upland cotton.

Methods and Materials

A field of DPL555BR cotton that was planted April 18, 2003, was selected for this experiment. Plots were 8 rows wide (40 inch spacing) by field length (1,215 ft). Treatments were replicated four times using a randomized complete block design. As field was rapidly growing and retention was not as high as desired, the field had been treated with mepiquat chloride at the rate of 16 oz/acre approximately 48 hrs prior to experiment initiation.

Plots were treated the morning of July 7 with a tractor mounted three point sprayer calibrated to deliver 13.33 gpa, and had a single nozzle positioned above each row. Treatments consisted of one qt./acre of Calcium Metalosate[®], an amino acid chelated calcium (2-0-0, 6% Ca, 10.0 lbs./gal, Albion Laboratories, Clearfield, Utah), and one qt./acre of Megafol, a liquid fertilizer marketed by Nutreco. This is a 4-0-2 formulated product, with label stating that it is specially formulated to improve the quality and vigor of fruits, vegetables and field crops. These special formulations may be due to the large number of amino acids (aspartic acid, glutamic acid, alanine, arginine, cystine, glycine, histidine, isoleucine, leucine, lysine, methionine, praline, phenylalanine, serine, threonine, tryptophan, tyrosine, and valine) contained in the product.

Cotton plants were vigorous and in treated plots were brushed by the tractor axles as the tractor went through the field, resulting in plants that had a short-term (1-2 days) bend of stalks in the tractor rows. This vigorous brushing may have also knocked off developing fruiting structures off the top of stalks in these rows as well.

Plots were plant mapped on July 30th to ascertain if any differences existed at this time due to treatments. Plant mapping was completed using five plants per plot; data were obtained for plant height, total nodes, first fruiting node, and fruiting site retention at site 1-3 for each fruiting node as applicable. For each plot the following averages were calculated: height:node ratio; plant height, first fruiting node, nodes, average retention for positions (fruiting sites) 1, 2, 3; and retention for positions 1-2 and positions 1-3.

Plots were harvested December 22 with a John Deere 9976 four row cotton picker. All eight rows of each plot were harvested. After each plot was harvested, seed cotton was emptied into a trailer on scales so that seed cotton weights for each individual plot could be obtained. Cotton from plots receiving the same treatment were kept together and not allowed to be mixed with cotton from other treatments. Seed cotton for all four plots of each treatment were combined for ginning (Modern Gin, Blythe, CA), thus allowing quality data to be collected for each treatment.

Cotton lint yields for each plot were calculated by multiplying average turn-out (36.36%) from the entire treated area for each treatment. Quality data for each bale from each respective treatment were obtained and average quality factors calculated for each treatment. Economic values for cotton lint were also calculated using data from each individual bale by applying the average premium or discount applied to the lint based on the CCC loan schedule.

Means and separations for all treatments were calculated using Fisher's least significant difference (Statgraphics Plus for Windows, version 3; Manugistics, Inc.). Quality data used a completely randomized design as cotton from all plots of a single treatment was co-mingled, however, each treatment had a minimum of seven ginned bales for data analyses.

Results

Plant mapping

No statistical differences were noted any plant mapping aspect for either treated or non-treated cotton (Tables 1-2). Non-treated cotton had numerically higher retention rates at each of the first three fruiting positions mapped in addition to slightly more total nodes and a greater number of reproductive nodes in part due to first fruiting structure being retained lower on the plant (node 6.75) than treated cotton (node 7.95 for Megafol, node 8.4 for Calcium Metalosate®).

Some of the decreased retention have been due to the application. Spraying resulted in plants whose tops were leaning over, and the tractor did not also go through the untreated plots. The possibility of knocking off fruiting structures by the tractor where it brushed over plants in treatment plots cannot be dismissed as a contributing factor of retention rates. The reason why fertilizer applications would cause fruit loss on lower nodes when these potential fruits are still present on untreated cotton is unclear however.

Yields

No statistical differences from lint/acre (Table 3), although treated cotton was numerically higher than the untreated check (1,162 lbs/acre) and treatments were almost identical (1,203 lbs./acre for Megafol; 1,198 lbs./acre for Calcium Metalosate®).

The summer of 2003 had considerable heat stress, this resulted in a lower retention and low lint production during the majority of the growing season. Vigorous growth and low retention rates had been noted prior to experiment initiation, necessitating a mepiquat chloride application. The overwhelming majority of lint was located in the upper two foot of the plant, with the lower five feet of stalk and nodes having much less cotton apparent at harvest, indicated that yield was made in the latter part of the growing season (September and October). DPL555BG/RR cotton is noted to have a unique growth pattern than most currently grown varieties, as it accumulates its boll load more slowly than other varieties such as DPL451B/RR and will have 10-20% less bolls than DP451B/RR until about node 22. (Anon., 2003). Node 22 was not reached in this experiment until plant mapping on July 30, 23 days after foliar fertilizer application.

It is difficult to correlate the slight yield increases noted with treatments in early July, especially in light of lower retentions noted with treatments from plant mapping data in late July. Multiple differences were noted for treatments in regards to lint quality, however, indicating treatments did affect cotton production. Size of bolls and cotton lint from these early summer bolls was not obtained but may have been an overlooked aspect of this study.

Lint Quality Parameters

Leaf - No significant differences were noted for leaf values, although numerically most (2.78) was noted in the untreated check (Table 4). Megafol and Calcium Metalosate® treatments also had lint with leaf values over 2 (2.57 and 2.43 respectively).

Micronaire - Although similar numerically, the untreated check (5.14) was statistically higher than either treatment (both 5.1).

Length - Fiber lengths were significantly different by treatment, with shortest fibers resulting from cotton treated with Megafol (35 staple, 1.10 inches). Cotton from Calcium Metalosate® treatments were significantly longer (36.0 staple, 1.12 inches) than lint from Megafol treated cotton plots, but lint from untreated cotton plots was significantly longer than either treatment (36.57 staple 1.136 inches). The reason for these differences are unclear, but may represent a trade off of yield for quality, and parallels strength results.

Strength - Fiber strengths were significantly different by treatment, with weakest fibers resulting from cotton treated with Megafol (29.7 g/tex). Calcium Metalosate® treatments were significantly stronger (30.4 g/tex) than lint from Megafol treated cotton plots, but lint from untreated cotton plots was significantly stronger than either treatment (31.1 g/tex).

Uniformity - Megafol treated cotton resulted in lint with slightly less fiber uniformity (80.0) which was statistically different than Calcium Metalosate® or the untreated check (81.0)

Color

Red - Significant differences existed by treatment for red. Untreated cotton lint had a red color value of 81.2 which was significantly different from both Megafol treated cotton (82.6) as well as Calcium Metalosate® (80.4)

+*b* - Values for this lint parameter were very similar and were not statistically different, but were similar in pattern to red values with cotton in Megafol treated plots having the highest value (7.6) followed by the untreated check (7.5) and Calcium Metalosate® (7.4).

Literature Cited

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Table 1. Cotton plant mapping data from July 30, 2003.

<u>Treatment</u>	<u>Rate/acre</u>	<u>Ht (in)</u>	<u>Nodes</u>	<u>Ht:Node ratio</u>	<u>First Fruiting Node</u>
Megafol	1 qt	41.1a	21.95a	1.88a	7.95a
Calcium Metalosate®	1 qt	43.8a	22.0a	2.02a	8.40a
Untreated check	-----	43.3a	22.6a	1.92a	6.75a

Table 2. Retention percentages of fruting structures on mapping data from July 30, 2003.

<u>Treatment</u>	<u>Rate/acre</u>	<u>Position 1</u>	<u>Pos. 2</u>	<u>Pos. 3</u>	<u>Pos. 1-2</u>	<u>Pos. 1-3</u>
Megafol	1 qt 47.8a	47.7a	31.8a	47.7a	42.4a	
Calcium Metalosate®	1 qt 47.5a	41.6a	30.3a	44.6a	39.8a	
Untreated check	-----	52.2a	48.1a	40.0a	50.2a	46.8a

Table 3. Cotton lint yields at end of season following fertilizer application on July 7, 2003.

<u>Treatment</u>	<u>Rate/acre</u>	<u>Lbs/acre</u>	<u>\$+/-</u>	<u>Value/acre</u>
Megafol	1 qt	1,203a	0.30 b	\$628.80
Calcium Metalosate®	1 qt	1,198a	0.44 b	\$628.15
Untreated check	-----	1,162a	0.95a	\$614.27

Table 4. Cotton lint quality parameters

<u>Treatment and rate/acre</u>	<u>Bales</u>	<u>Leaf</u>	<u>Mic</u>	<u>Staple</u>	<u>Length</u>	<u>Strength</u>	<u>Uniform</u>	<u>Color</u>		
								<u>+b</u>	<u>Red</u>	
Megafol	1 qt	7	2.57a	5.1a	35.0 c	110.0 c	29.7 c	80.0 b	7.6a	82.6a
Calcium Metalosate	1 qt	7	2.43a	5.1a	36.0 b	112.0 b	30.4 b	81.0a	7.5a	80.4 c
Untreated check	-----	14	2.79a	5.14 b	36.6a	113.6a	31.0a	81.0a	7.5a	81.2 b