EVALUATION OF STARTER FERTILIZER AND AMISORB® FOR MID-SOUTH COTTON PRODUCTION

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Abstract

Each year new products are introduced into the market place that have little research data to support their use but make bold claims as to the benefit in commercial cotton production. This study was designed to evaluate one product, Amisorb® Nutrient Absorption Enhancer™ from Amilar International, along with starter fertilizer (ammonium poly-phosphate) in replicated field trials at the Delta Research and Extension Center, Stoneville, MS. The products were applied as either a 4-in band behind the planter press wheel or as a broadcast application immediately following planting. Lint yields were measured at two harvests following defoliation. Subsamples taken at harvest were ginned and used to determine lint yields. When average over years (1997 and 1998) total lint yields were not significantly affected by the starter fertilizer applications nor were they significantly affected by Amisorb rates. There were no significant interactions between main effects treatments so main effect means were determined. When average over years, total lint yields were 1152, 1165, and 1174 lb/acre for the 0, 1, and 2 qt Amisorb/acre rates, respectively. With respect to starter fertilizer (10-34-0), there was a very slight trend toward an increase in lint yield, however, there was no significant difference present. After examining data for two years, it appears that neither ammonium poly-phosphate nor Amisorb applied as a band or broadcast over the top would supply the producer with sufficient income to cover the cost of the material or the application cost. Planting on time, under optimum soil conditions, with a sound fertility program based on soil testing provides the best alternative.

Introduction

Each year new products appear in the market place with promises of increased yields and good return on investment. Many of these products have not been evaluated in replicated field trials under strict supervision. Producers do not have the means or time to examine these products and rely on the scientific community to evaluate products and provide unbiased information whenever possible. However, the scientific community is often limited in the number of these products that can be evaluated.

One product, Amisorb® Nutrient Absorption Enhancer™ from AmiLar International, received a great deal of press and many questions surfaced from producers concerned about claims being presented in different advertisements. Brochures reported 70 to 200 lb lint/acre increase where the product was used. Since Amisorb was not a fertilizer nor a plant growth regulator, but a whole new product category, fertilizer regulations did not pertain. Amisorb was described in the literature provided, as a long-chain polymer and was made from one of the amino acids used to make products like Nutrasweet® sweeteners. The mode of action listed in the product brochure suggested that the long-chain molecules acted as extensions of the plants' root hairs and thus acted to increase nutrient uptake.

Starter fertilizers have also been evaluated across the cotton producing states and the results from these studies presented at different Beltwide Cotton Conference all through the 1990's. Most of the studies have been conducted to evaluate fertilizer materials containing nitrogen (N) and phosphorus (P). These N-P materials have been applied in-furrow, banded over the row, and as bands to the side of the row. Both conventional and no-tillage systems with starters have been evaluated in Alabama (2, 3), Georgia (1), Tennessee (5, 6, 7, 8), Louisiana (8, 9, 10) and Texas (11). Most of the emphasis has been effects on yield but also on earliness, early season seedling vigor, root growth and stand establishment. Results from many of these studies have been quite variable and inconsistent from year to year.

Little research data has been reported where a starter fertilizer such as ammonium poly-phosphate has been used in combination with Amisorb (12). Research reported from Arkansas (12) which was from only one year of the study found no response to Amisorb application but suggested additional research in the area. This presentation summarizes the data from the Mississippi Delta with respect to starter fertilizer and Amisorb. The objectives of this study were to 1) determine lint yield response to starter fertilizer (10-34-0) with and without Amisorb, and 2) determine the effects of band verses broadcast applications.

Materials and Methods

A 2-year study was initiated in 1997 and a Bosket very fine sandy loam (Mollic Hapludalfs) to determine cotton lint response to soil applications of starter fertilizer (ammonium poly-phosphate, 10-34-0) and a soil amendment called Amisorb® (polyaspartate) Nutrient Absorption Enhancer™ from AmiLar International. Both products were applied in a 4-in band directly over the row at the time of planting or as a broadcast application immediately following planting. The ammonium poly-phosphate was applied at 0 and 10 gal/acre (12.4 lb/gal) but diluted 1:1 to simplify application. Amisorb was applied at rates of 0, 1, and 2 qt/acre either

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alone or in combination with the ammonium poly-phosphate starter. The 2x3x2 factorial arrangement of treatments was included in a randomized complete block design with four (1997) or six (1998) replications.

Urea-ammonium nitrate solution (32% N) at 120 lb N/A was "knifed-in" prior to planting. The spray solutions were pre-mixed in stainless steel containers and delivered through an air-pressurized spray system that was flushed with water between treatments. Cultural practices such as weed and insect control, cultivation, irrigation, and defoliation were maintained uniformly across all treatments during the growing season. Four-row plots (55 or 60 feet long) were used in the study. Plots were relocated each year.
After defoliation, harvests were made utilizing a 2-row spindle picker adapted for plot harvest. The two center rows of each plot were harvested for yield determination. A subsample was taken from each plot at harvest and ginned with a 10-saw sample gin to determine lint turn-out. All results were analyzed statistically (Analysis of Variance, SAS Institute, Inc.) with means across replications presented. Where appropriate means over years are presented in the tables with the appropriate statistics.

Results and Discussion

Lint yields have summarized in Table I through Table 3 for the individual years 1997 and 1998 and for the means over the two years, respectively. Since all plots were sampled at harvest and lint percent determined for each plot, only lint yields are reported in the tables. In 1997 (Table 1), the first harvest lint yield ranged 1124 to 1276 lb/acre and the second harvest yield ranged from 71 to 87 lb/acre. Total lint yield ranged from 1215 to 1357 lb/acre with no significant difference between any of the treatments. Most of the cotton (>93%) was harvested at the first harvest with no apparent difference in maturity. Even though the total lint range difference was 142 lb/acre, the difference was not significant. The untreated check (UTC) produced 1292 lb lint/acre (mean of band and broadcast where no starter fertilizer or Amisorb was applied) which falls midway in the yield range.

In 1998 (Table 2), lint yields ranged from 902 to 1021 lb/acre at the first harvest, 101 to 125 lb/acre at the second harvest, with the average lint yield lower than yields measured in 1997. Total lint yield ranged from 1014 to 1138 lb/acre. The lint yield of the UTC in 1998 was 1046 lb/acre. The highest numerical yields in both years (1357 lb/acre in 1997 and 1138 lb/acre in 1998) were obtained with 10 gal/acre of 10-34-0 and 2.0 qt/acre Amisorb applied as a band application. However, these yields were not statistically different from the UTC (1292 lb/acre in 1997 and 1046 lb/acre in 1998).

When averaged across the two years, total lint yields ranged from a low of 1120 lb/acre to a high of 1226 lb/acre, but as with the individual year results, there was no statistically significant difference between the values. None of the treatments or treatment combinations had a significant effect on maturity as measured by percent first harvest.

There were no significant interactions between treatments as determined by the analysis of variance in either individual years or in the combined analysis. Therefore, main effect means were determined for both the individual years (Table 4 and Table 5) and for the combined years (Table 6). With respect to starter fertilizers, there was no significant increase in lint yield where the starter was applied in either 1997 (Table 4), 1998 (Table 5), or across years (Table 6 and Figure 1). There was a trend toward a slightly higher yield with the starter (Figure 1). However, the difference was not significant and certainly not economical.

The main effect means for Amisorb treatments (averaged over starter fertilizer and application methods) are given in Table 4 (1997), Table 5 (1998), Table 6 (across years) and Figure 2. There were no significant differences between Amisorb rates and no difference in maturity as measured with percent first harvest (PFH). When averaged over years, total lint yields were 1152, 1165, and 1174 lb/acre for the 0, 1, and 2 qt/acre Amisorb rates, respectively. The 22 lb lint/acre range represented only 1.9% difference between the high rate (2 qt Amisorb/acre) and no Amisorb application (when averaged over the other factor) (Figure 2).

The main effect means for method of application (band vs broadcast) are given in Table 4 through Table 6 and Figure 3. The only significant difference detected throughout the study occurred with respect to application methods and only in 1997. Second harvest lint yields were higher with band application compared to broadcast application but was slightly later in maturity (Table 4). When averaged over starter fertilizer rates and Amisorb rates, there was only 3 lb lint/acre difference (Figure 3).

Summary and Conclusions

After examining the data over two years, it appears that neither ammonium poly-phosphate (10-34-0) starter fertilizer applied as a band over the row at planting or broadcast at planting nor Amisorb (polyaspartate) would supply the producer with sufficient income to cover the cost of the material or application costs. In the case of 10-34-0 or other N-P starter fertilizer materials, there may be more response under cool damp conditions early in the growing season. Phosphorus availability is often less when the root systems are not growing well. Planting on time, under optimum soil conditions, with a sound fertility program, based on soil testing provides the best alternative compared to expensive "solutions".

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Table 1: Lint yields from the evaluation of starter fertilizer (ammonium poly-phosphate, 10-34-0), Amisorb®, and method of application. Delta Research and Extension Center, Stoneville, MS – 1997.

Treatment [1]			Lint yield [2]			Percent
Start.	Amis.	Appl.	1st Harv.	2nd Harv.	Total	1st Harv.
gal/A)	qt/A		---------- lb/A ----------			%
0	0.0	Band	1191.7	87.4	1278.1	93.0
0	0.0	Broad	1221.6	75.4	1297.0	94.1
0	1.0	Band	1230.2	80.8	1311.0	93.7
0	1.0	Broad	1124.3	74.9	1299.1	94.2
0	2.0	Band	1213.1	83.6	1296.7	93.4
0	2.0	Broad	1143.7	71.0	1214.7	94.1
10	0.0	Band	1175.0	79.4	1254.4	93.6
10	0.0	Broad	1210.9	79.1	1290.3	93.8
10	1.0	Band	1192.6	78.8	1271.4	93.8
10	1.0	Broad	1267.5	78.9	1346.4	94.1
10	2.0	Band	1276.2	80.9	1357.1	94.0
10	2.0	Broad	1200.6	72.3	1272.9	94.2
	LSD (0.05) [3]		ns	ns	ns	ns
	Prob. > F		0.9397	0.5551	0.9306	0.6509
	C. V. (%)		9.41	12.47	9.00	0.90

[1] Treatments: ***Start***er- Ammonium poly-phosphate (10-34-0) applied at 10 gal/A (12.4 lb/gal); ***Amis***orb® Nutrient Absorption Enhancer™ applied according to recommendations; ***Appl***ication Method: Band application applied at planting with spray tip directly above the row; Broadcast application made with John Deere Hi-cycle sprayer.

[2] Lint yield calculated using hand-grab samples taken at harvest and ginned through a 10-saw microgin.

[3] LSD's provided for mean comparisons at the 5% level of significance.

Table 2: Lint yields from the evaluation of starter fertilizer (ammonium poly-phosphate, 10-34-0), Amisorb®, and method of application. Delta Research and Extension Center, Stoneville, MS – 1998.

Treatment [1]			Lint yield [2]			Percent
Start.	Amis.	Appl.	1st Harv.	2nd Harv.	Total	1st Harv.
gal/A	qt/A		---------- lb/A ----------			%
0	0.0	Band	901.8	112.4	1014.2	88.9
0	0.0	Broad	952.8	124.9	1077.6	88.4
0	1.0	Band	957.2	112.3	1069.5	89.6
0	1.0	Broad	965.6	109.5	1075.1	89.8
0	2.0	Band	963.0	116.3	1079.3	89.3
0	2.0	Broad	979.9	108.7	1088.6	90.0
10	0.0	Band	948.2	115.8	1064.0	89.1
10	0.0	Broad	996.0	116.8	1112.8	89.5
10	1.0	Band	964.9	100.9	1065.9	90.6
10	1.0	Broad	959.1	108.9	1068.0	89.9
10	2.0	Band	1021.4	116.9	1138.3	89.8
10	2.0	Broad	981.4	110.8	1092.3	89.9
LSD (0.05) [3]			ns	ns	ns	ns
Prob. > F			0.2250	0.8612	0.2692	0.7571
C. V. (%)			6.30	17.40	6.01	1.89

[1] Treatments: ***Start***er- Ammonium poly-phosphate (10-34-0) applied at 10 gal/A (12.4 lb/gal); ***Amis***orb® Nutrient Absorption Enhancer™ applied according to recommendations; ***Appl***ication Method: Band application applied at planting with spray tip directly above the row; Broadcast application made with John Deere Hi-cycle sprayer.

[2] Lint yield calculated using hand-grab samples taken at harvest and ginned through a 10-saw microgin.

[3] LSD's provided for mean comparisons at the 5% level of significance.

Table 3: Lint yields from the evaluation of starter fertilizer (ammonium poly-phosphate, 10-34-0), Amisorb®, and method of application. Delta Research and Extension Center, Stoneville, MS – Means [4] 1997-1998

Treatment [1]			Lint yield [2]			Percent
Start.	Amis.	Appl	1st Harv.	2nd Harv.	Total	1st Harv.
(gal/A)	(qt/A)		---------- lb/A ----------			(%)
0	0.0	Band	1017.4	102.4	1119.8	90.6
0	0.0	Broad	1060.3	105.1	1165.4	90.7
0	1.0	Band	1066.4	99.7	1166.1	91.2
0	1.0	Broad	1069.1	95.7	1164.7	91.6
0	2.0	Band	1063.1	103.2	1166.3	91.0
0	2.0	Broad	1045.4	93.6	1139.0	91.6
10	0.0	Band	1038.9	101.3	1140.2	90.9
10	0.0	Broad	1082.0	101.7	1183.7	91.2
10	1.0	Band	1056.0	92.1	1148.0	91.9
10	1.0	Broad	1082.0	96.9	1179.4	91.6
10	2.0	Band	1123.3	102.5	1225.8	91.5
10	2.0	Broad	1069.1	95.4	1164.5	91.6
LSD (0.05) [3]			ns	ns	ns	ns
Prob. > F			0.3436	0.7539	0.3220	0.6191
C. V. (%)			6.87	28.95	6.29	2.67

[1] Treatments: ***Start***er-Ammonium poly-phosphate (10-34-0) applied at 10 gal/A (12.4 lb/gal); ***Amis***orb® Nutrient Absorption Enhancer™ applied according to recommendations; ***Appl***ication Method: Band application applied at planting with spray tip directly above the row; Broadcast application made with John Deere Hi-cycle sprayer.

[2] Lint yield calculated using hand-grab samples taken at harvest and ginned through a 10-saw microgin.

[3] LSD's provided for mean comparisons at the 5% level of significance.

[4] Means over years (1997 - 4 replications; 1998 - 6 replications) N=10.

Table 4: Main effects summary for lint yields from the evaluation of starter fertilizer (ammonium poly-phosphate, 10-34-0), Amisorb®, and method of application. Delta Research and Extension Center, Stoneville, MS 1997 (Interactions not significant)

Treatment [1]			Lint yield [2]			Percent
Start.	Amis.	Appl.	1st Harv.	2nd Harv.	Total	1st Harv.
gal/A	qt/A		lb/A			%
0	-----	-----	1203.9	78.9	1282.8	93.8
10	-----	-----	1220.5	78.2	1298.7	93.9
	LSD (0.05) [3]		ns	ns	ns	ns
	Prob. > F		0.6189	0.8322	0.6381	0.5000
-----	0.0	-----	1199.6	80.3	1279.9	93.6
-----	1.0	-----	1228.6	78.4	1307.0	94.0
-----	2.0	-----	1208.4	77.0	1285.3	93.9
	LSD (0.05) [4]		ns	ns	ns	ns
	Prob. > F		0.7623	0.6221	0.7851	0.4502
-----	-----	Band	1213.0	81.8a	1294.8	93.6b
-----	-----	Broad	1211.4	75.2b	1286.7	94.1a
	LSD (0.05) [5]		ns	5.8	ns	0.5
	Prob. > F		0.9633	0.0261	0.8103	0.0447

[1] Treatments: ***Start***er- Ammonium poly-phosphate (10-34-0) applied at 10 gal/A (12.4 lb/gal); ***Amis***orb® Nutrient Absorption Enhancer™ applied according to recommendations; ***Appl***ication Method: Band application applied at planting with spray tip directly above the row; Broadcast application made with John Deere Hi-cycle sprayer.

[2] Lint yield calculated using hand-grab samples taken at harvest and ginned through a 10-saw microgin.

[3] LSD's provided for mean comparisons at the 5% level of significance. Means over Amisorb rates (3),application method (2), and replications (4). [N=16]

[4] LSD's provided for mean comparisons at the 5% level of significance. (Means over starter fertilizer rates (2), application method (2), and replications (4). [N=16]

[5] LSD's provided for mean comparisons at the 5% level of significance. (Means over starter fertilizer rates (2), Amisorb rates (3), and replications (4). [N=24]

Table 5: Main effects summary for lint yields from the evaluation of starter fertilizer (ammonium poly-phosphate, 10-34-0), Amisorb®, and method of application. Delta Research and Extension Center, Stoneville, MS 1998 (Interactions not significant)

Treatment [1]			Lint yield [2]			Percent
Start.	Amis.	Appl.	1st Harv.	2nd Harv.	Total	1st Harv.
gal/A	qt/A		lb/A			%
0	-----	-----	953.4	114.0	1067.4	89.3
10	-----	-----	978.5	111.7	1090.2	89.8
	LSD (0.05) [3]		ns	ns	ns	ns
	Prob. > F		0.0856	0.6187	0.1413	0.2826
-----	0.0	-----	949.7	117.5	1067.2	89.0
-----	1.0	-----	961.7	107.9	1069.6	90.0
-----	2.0	-----	986.4	113.2	1099.6	89.8
	LSD (0.05) [4]		ns	ns	ns	ns
	Prob. > F		0.1126	0.2483	0.1648	0.1123
-----	-----	Band	959.4	112.9	1071.9	89.6
-----	-----	Broad	972.5	113.3	1085.7	89.6
	LSD (0.05) [5]		ns	ns	ns	ns
	Prob. > F		0.3679	0.8578	0.3683	0.9718

[1] Treatments: ***Start***er- Ammonium poly-phosphate (10-34-0) applied at 10 gal/A (12.4 lb/gal); ***Amis***orb® Nutrient Absorption Enhancer™ applied according to recommendations; ***Appl***ication Method: Band application applied at planting with spray tip directly above the row; Broadcast application made with John Deere Hi-cycle sprayer.

[2] Lint yield calculated using hand-grab samples taken at harvest and ginned through a 10-saw microgin.

[3] LSD's provided for mean comparisons at the 5% level of significance. (Means over Amisorb rates (3), application method (2), and replications (6). [N=36]

[4] LSD's provided for mean comparisons at the 5% level of significance. (Means over starter fertilizer rates (2), application method (2), and replications (6). [N=24]

[5] LSD's provided for mean comparisons at the 5% level of significance. (Means over starter fertilizer rates (2), Amisorb rates (3), and replications (6). [N=36]

Table 6: Main effects summary for lint yields from the evaluation of starter fertilizer (ammonium poly-phosphate, 10-34-0), Amisorb®, and method of application. Delta Research and Extension Center, Stoneville, MS Two-year means, 1997-1998 (Interactions not significant)

Treatment [1]			Lint yield [2]			Percent
Start.	Amis.	Appl.	1st Harv.	2nd Harv.	Total	1st Harv.
gal/A	qt/A		---------- lb/A ----------			%
0	-----	-----	1053.6	100.0	1153.6	91.1
10	-----	-----	1075.3	98.3	1173.6	91.5
	LSD (0.05) [3]		ns	ns	ns	ns
	Prob. > F		0.1282	0.5991	0.1601	0.0819
-----	0.0	-----	1049.6	102.6	1152.3	90.8
-----	1.0	-----	1068.5	96.1	1164.6	91.6
-----	2.0	-----	1075.2	98.7	1173.9	91.4
	LSD (0.05) [4]		ns	ns	ns	ns
	Prob. > F		0.3121	0.2288	0.4578	0.1670
-----	-----	Band	1060.8	101.3	1162.1	91.1
-----	-----	Broad	1068.1	97.0	1165.1	91.4
	LSD (0.05) [5]		ns	ns	ns	ns
	Prob. > F		0.6060	0.1735	0.8305	0.9659

[1] Treatments: ***Start***er- Ammonium poly-phosphate (10-34-0) applied at 10 gal/A (12.4 lb/gal); ***Amis***orb® Nutrient Absorption Enhancer™ applied according to recommendations; ***Appli***cation Method: Band application applied at planting with spray tip directly above the row; Broadcast application made with John Deere Hi-cycle sprayer.

[2] Lint yield calculated using hand-grab samples taken at harvest and ginned through a 10-saw microgin.

[3] LSD's provided for mean comparisons at the 5% level of significance. (Means over Amisorb rates (3), application method (2), and years x replications (10). [N=60]

[4] LSD's provided for mean comparisons at the 5% level of significance. (Means over starter fertilizer rates (2), application method (2), and years x replications (10). [N=40]

[5] LSD's provided for mean comparisons at the 5% level of significance. (Means over starter fertilizer rates (2), Amisorb rates (3), and years x replications (10). [N=60]

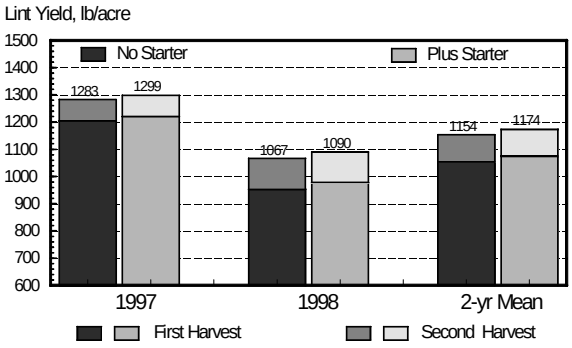

Figure 1: Lint yield from applications of ammonium poly-phosphate starter (10-34-0) and Amisorb. Main Effects for starter fertilizer (Means across application method and Amisorb rates). MAFES-DREC, Stoneville, MS

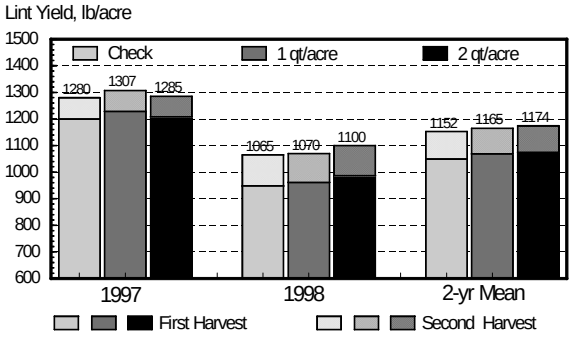

Figure 2: Lint yields from applications of ammonium poly-phosphate starter (10-34-0) and Amisorb. Main Effects for Amisorb rate (Means across application method and starter fertilizer rates). MAFES-DREC.

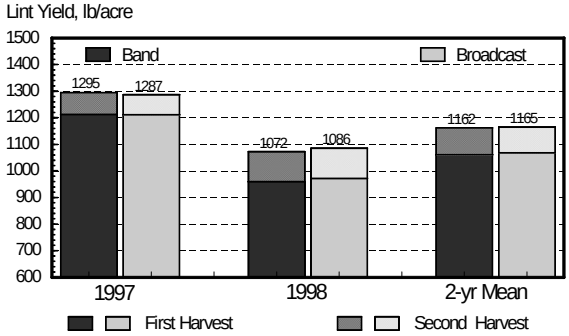

Figure 3: Lint yields from applications of ammonium poly-phosphate starter (10-34-0) and Amisorb. Main Effects for application method (Means across starter fertilizer and Amisorb rates). MAFES-DREC.