COTTON (*Gossypium hirsutum*) RESPONSES TO AMISORB™ AND FERTILITY TREATMENTS

Ty K. Witten, J. Tom Cothren, Frank M. Hons, and Philip H. Jost
Texas Agricultural Experiment Station
Texas A&M University
College Station, Texas

Abstract

Availability of nutrients in the soil is vital for proper plant growth. Amisorb™ (polyaspartic acid), a synthetic protein, is used to increase nutrient availability to plants. The objective of this experiment was to determine the effectiveness of Amisorb™ combined with different fertility treatments on fruiting and yield of cotton (*Gossypium hirsutum*). Data collected showed that Amisorb™ provided no significant differences in yield, regardless of rate or fertility treatment. Total number of bolls and percent boll retention were decreased with the use of the rates of Amisorb™ examined in this study. Yield, total number of bolls, percent boll retention, number of reproductive nodes, and height increased significantly with increased fertilizer rates. In conclusion, at the rates tested, Amisorb™ combined with nitrogen did not provide any beneficial effects on cotton growth.

Introduction

Nitrogen is one of the most limiting nutrients in cotton production. Cotton plants respond positively to soil applied nitrogen. Effective management of nitrogen fertilizer is a key factor in cotton production (Nelson, 1949; Matocha and Barber, 1992).

Root interception is important to nutrient uptake into the plant. Therefore, more root biomass could expand the potential for nutrient uptake, through increased root exploration of soil and subsequent contact with more nutrients.

Polyaspartic acid (PA), tradename Amisorb™, is a synthetic protein which purportedly increases nutrient uptake into plants (Below and Wang, 1995). The physiological mechanism for PA is still unknown; however, augmented root and root hair growth are probable candidates (Wang et al., 1996). Experiments conducted in soybeans and wheat have shown increased root length, root hair density, and number of primary roots and branches (Zeko et al., 1996).

Objective

To examine the effect of Amisorb (PA) applied infurrow on cotton fruiting and yield at different nitrogen rates.

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:1461-1463 (1997)
National Cotton Council, Memphis TN

Materials and Methods

A field experiment was conducted at the Texas Agriculture Experiment Station near College Station, Texas. The site was a nitrogen depleted area planted to sorghum the previous year. Cotton variety DPL 50 was planted April 17, 1996. Cultural inputs were made as needed.

The experimental design was a randomized complete block. Each plot consisted of four 40-inch rows 32 feet long. Amisorb was applied as a split application at planting and at fertilization. Amisorb rates were 0, 2, 4, and 8 quarts per acre, with one quart of each rate applied with the fertilizer and the remainder being applied at planting. Fertilizer rates were 30, 90, and 150 pounds of nitrogen per acre applied as ammonium nitrate (34-0-0).

Planting: At planting Amisorb was applied infurrow directly onto the seed. Amisorb was applied in a 2-inch band in 4.7 gallons of water per acre. A CO_2 sprayer with flat fan nozzles placed perpendicular to the row just above the seed furrow was used to make the applications.

Fertilization: Ammonium nitrate was knifed infurrow to each plot when the cotton was at the 2-3 leaf growth stage. One quart of each of the Amisorb rates was applied directly into the slice made by the fertilizer knife. Each fertilizer knife was equipped with a straight stream spraying nozzle delivering 2 gallons of water per acre directly on to the ammonium nitrate in the soil.

Data: Data collected included plant mapping, yield, lint quality, and seed weight. Plant mapping was completed at cut-out and harvest with the Plant Map and Analysis Program (Landivar, 1993). Yields were obtained by hand harvesting 10 feet out of rows 2 and 3 of the 4-row plot. Seed weight and lint quality were obtained from subsamples of the harvested cotton.

All data was factorially analyzed with nitrogen and Amisorb rates as main effects. Means were separated using Duncan's Multiple Range Test (DMRT) at a significance level of 5%.

Results and Discussion

Yield: No significant differences in yield were observed between Amisorb treatments (Figure 1). Nitrogen treatments, however, proved to be statistically different. Cotton grown with 90 and 150 lbs. nitrogen per acre yielded significantly more lint than 30 lbs. nitrogen (Figure 2).

Plant Mapping: Plant mapping at harvest proved to be the most informative. All rates of Amisorb showed a significant decrease in total boll numbers compared to no Amisorb (Figure 2). Plant mapping data demonstrated that subsequent boll numbers were the same from branches 1 to 15. The observed reduction occurred at branches 16 through 20. On these branches there was a decreased number of total bolls and less boll retention with Amisorb treatments (Figures 4 and 5). On these same branches nitrogen exhibited an increase in total bolls and boll retention (Figures 6 and 7). Increased height and reproductive nodes were also observed with increasing nitrogen rates (Figures 8 and 9).

Seed Weight: There were no significant differences between treatments of Amisorb or nitrogen for seed weight.

Lint Quality and Characteristics: All treatments were tested for micronaire, fiber length, fiber strength, uniformity, and grade which is based upon color, leaf, and preparation. No significant differences were observed for any of the lint characteristics from either nitrogen or Amisorb treatments.

Conclusion

- Data from this study indicates that Amisorb did not effectively enhance cotton production at any nitrogen rate evaluated.
- Greater yields were observed as the rate of nitrogen increased.

Future Research

Further research should be conducted with Amisorb using other types of fertilizers in cotton. Research in a dryland situation should also be considered where growth and expansion of roots may be more easily realized.

Literature Cited

Below, F. E., and X. T. Wang. 1995. Enhancement in plant growth and nutrient use by polyaspartic acid. p. 107. In Agronomy Abstracts, ASA, Madison, WI.

Landivar, J. A. 1993. PMAP, A Plant Map Analysis Program for cotton. Texas Agricultural Experiment Station. MP. 1740. Texas Agricultural Experiment Station, College Station, TX.

Nelson, W. L. 1949. The effect of nitrogen, phosphorus, and potash on certain lint and seed properties of cotton. Agron. J. 41:289-293.

Matocha, J. E., and K. L. Barber. 1992. Fertilizer nitrogen effects on lint yield and fiber properties. Proc. 1992 Beltwide Cotton Conf., Natl. Cotton Council of Amer., Memphis, TN. p. 1103-1105.

Wang, X. T., A. M. Zeko, and F. E. Below. 1996. Physiological basis for enhanced mineral nutrient uptake with polyaspartic acid. p. 106. In Agronomy Abstracts, ASA, Madison, WI.

Zeko, A. M., X. T. Wang, and F. E. Below. 1996. Changes in root morphology by polyaspartic acid. p. 106. In Agronomy Abstracts, ASA, Madison, WI.

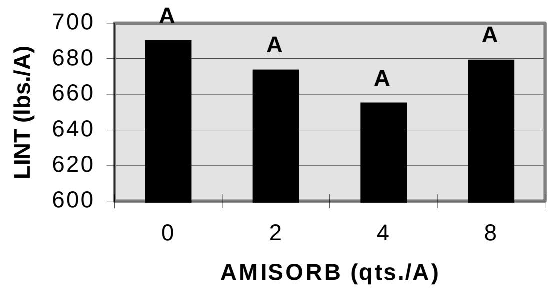

Figure 1 - Effect of Amisorb on Yield

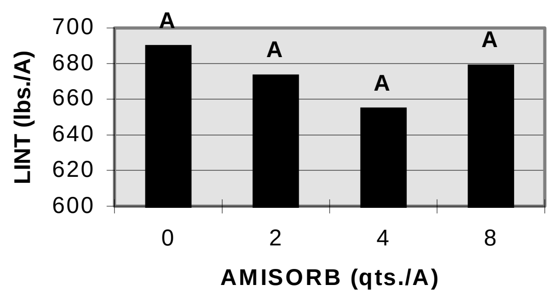

Figure 2 - Effect of Nitrogen on Yield

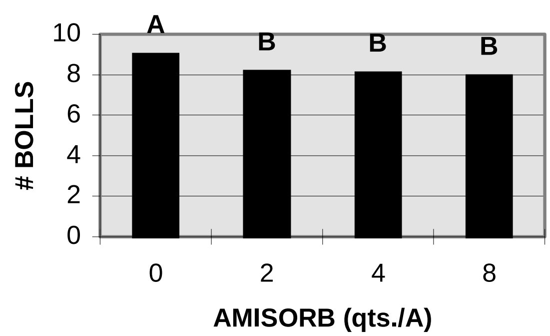

Figure 3 - Total Number of Bolls Per Plants

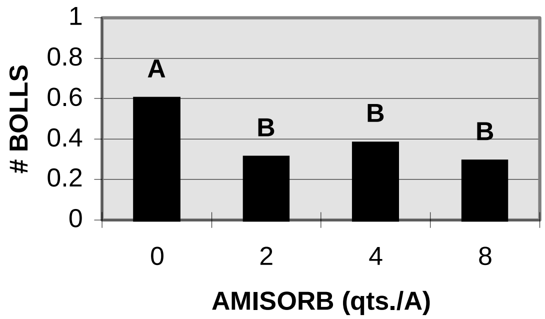

Figure 4 - Total Number of Bolls at Branches 16-20

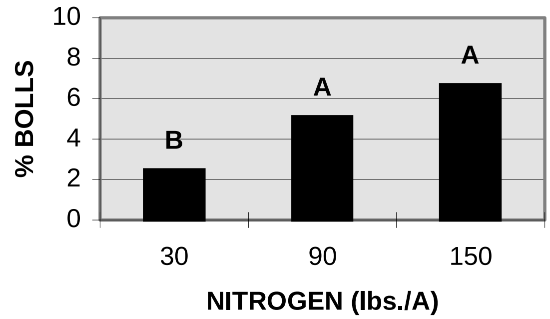

Figure 7 - Percent Boll Retention at Branches 16-20

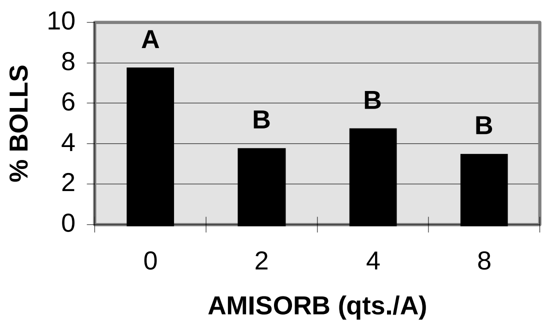

Figure 5 - Percent Boll Retention at Branches 16-20

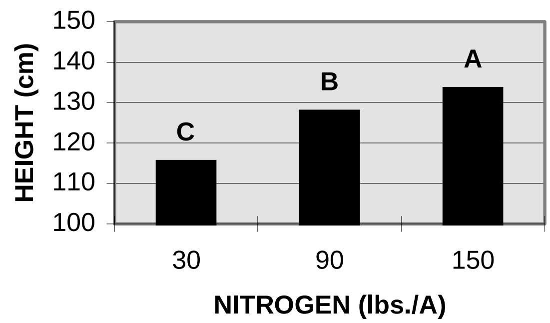

Figure 8 - Effect of Nitrogen on Height

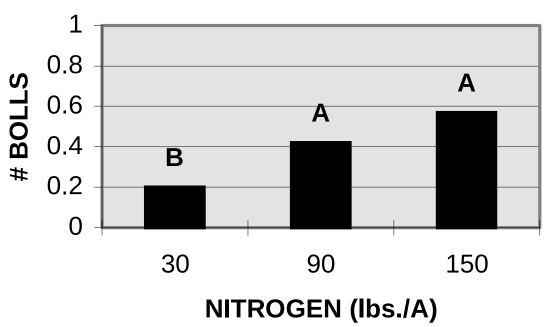

Figure 6 - Total Number of Bolls at Branches 16-20

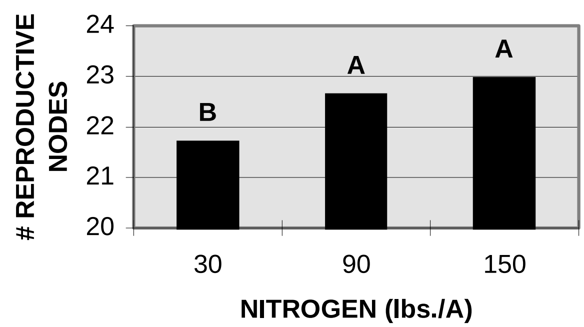

Figure 9 - Effect of Nitrogen on Reproductive Nodes