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UTILIZATION OF SELECTED SEED TREATMENTS TO ENHANCE COTTON PRODUCTION

Michael M. Kenty
Helena Chemical Company
Collierville, TN
Donald D. Howard
D and D Research Consulting
Jackson, TN
Tom Blythe
S-L Agri-Development
Senatobia, MS
Charlie Guy
G & H Associates, Inc.
Tillar, AR
Michael T. McCarty
Carolina Ag Research Service, Inc.
Elko, SC
Roger L. Bowman
Helena Chemical Company
Memphis, TN

Abstract

The use of fungicide and insecticide seed treatments in cotton production is an accepted practice to provide early season disease and insect protection. With the rising cost of genetically modified cotton seed and the associated technology fees, treatments that enhance germination and/or early seedling establishment may allow reduced seeding rates thus lowering producer costs. The utilization of precise treating equipment allows uniform application of nutrient-based seed treatment or treatment combinations. A practice utilized in rice production is to apply a small amount of zinc as a seed treatment to aid crop establishment.

The objectives of this trial were to evaluate nutrient-based seed treatments for cotton production. In 2004, replicated trials were established in Arkansas, Mississippi, South Carolina, and Tennessee. Delta and Pine Land Company cultivar DP 444 BG/RR was utilized to reduce variability. Seven treatments were applied to seed and sent to the respective cooperators along with untreated seed. Measurements included plant populations and height measured over time, plant tissue nutrient concentrations at two growth stages, yield, and lint quality. The data was analyzed by location with an additional analysis utilizing treatment mean that were averaged over replications of each location. Plant nutrient differences due to treatment varied with location and nutrient but treatment effects were not observed when evaluated over all locations. Plant populations and heights were not affected by treatment. Treatment effects on yields were significant at one of the four locations but when evaluated over all locations yields were not significantly affected. Yield trends due to treatment were evident. Additional research is needed to further clarify the effectiveness of these treatments for cotton production.

Introduction

Fungicide and insecticide seed treatments are accepted practices for cotton production providing early season disease and insect protection (Rothrick and Winters, 2004; Studebaker, et al., 2003). A seed treatment used to improve rice establishment and stand is to apply a small amount of zinc (Slaton, et al., 2001). The objective of this trial was to evaluate the effect of nutrient-based seed treatments and application rates for cotton production.

Materials and Methods

Field investigations were established in 2004 at selected locations in Arkansas, Mississippi, South Carolina, and Tennessee. The trials were carried out in traditional cotton production areas following standard agronomic practices. Seed treatments and their application rates along with soil and foliar treatments are presented in Table 1. Delta and Pine Land Company cultivar DP 444 BG/RR was utilized in the trial at each location to eliminate possible variety effects. Fungicide and insecticide treatments were applied to the seed followed by applying the seed treatments listed in Table 1. In addition to the seed treatments, a untreated check plot and a 2 lbs a.i./A soil applied zinc treatment were included in the study for comparative purposes.

Stand counts and plant heights were evaluated at 7, 14, and 21 days after emergence. Plant nutrient concentrations were evaluated at the 3 -4 leaf and 7-8 leaf growth stages. Lint yield and quality were also measured.

Statistical analyses were conducted utilizing SAS Mixed Model procedure (SAS Ins., 2001). The Mixed Model procedure provides Type III F values. Mean separation was accomplished through a series of protected pair-wise contrasts among all treatments (Saxton, 1998). Two separate yield analyses were conducted; the first to evaluate treatment effects on cotton produced at each location. The second was conducted to evaluating yields using treatment means, treatment averages across replications for each location with the location treated as a replication in the analyses.

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Table 1. Treatment description, rates, and application timings.

Treatment #	Treatment Name	Application Rate	Application
1	Untreated Check	na	Na
2	HM2048	6.4 fl oz/cwt	Seed treatment
3	HM2048	12.8 fl oz/cwt	Seed treatment
4	HM2048	25.6 fl oz/cwt	Seed treatment
5	HM9741	6.4 fl oz/cwt	Seed treatment
6	HM2048 + HM9741	12.8 fl oz/cwt + 6.4 fl oz/cwt	Seed treatment
7	HM2048	12.8 fl oz/cwt	Seed treatment
	060302-A	1 qt/A	Foliar early post
8	HM9736	12.8 fl oz/A	Seed treatment
9	Zinc sulfate 30%	2 lbs/A	Preplant incorporated

Results and Discussion

There were no significant treatment effects on plant population or height for the three evaluation periods when evaluated by location or across locations, therefore these data will not be presented. Treatment effects on plant nutrient concentration varied with location and nutrient and were not consistent for the two sampling periods. When evaluated over all locations, differences due to treatment were not evident; therefore these data will not be presented.

Yields were significantly affected by treatment at one of the four locations (Table 2). At this location, yields were increased from 541 lbs lint/A for the check to 682 lbs lint/A by treatment 7. All other treatment yields were lower than treatment 7 except treatment 5 (588 lbs lint/A) which was intermediate between 7 and the others. When averaged over all locations, yields were not significantly affected by treatment.

Table 2. Treatment effects on cotton lint yield (lbs lint/A).

Treatment #	Arkansas	Mississippi	South Carolina	Tennessee	Average
1	1528	541 b	1538	1309	1229
2	1671	525 b	1564	1253	1253
3	1676	528 b	1605	1351	1290
4	1539	505 b	1609	1286	1235
5	1656	588 ab	1650	1398	1323
6	1550	531 b	1605	1274	1240
7	1504	682 a	1639	1266	1273
8	1652	567 b	1592	1272	1271
9	1621	553 b	1628	1385	1297

Although the treatment effects on yield were not significant, yield means differed as much as 100 lbs lint/A and some trends due to treatment were observed. Increasing the seed treatment nutrient concentration for HM2048 from 6.4 fl oz/cwt to 12.8 fl oz/cwt (treatments 2 and 3) resulted in slightly higher yields, 1253 to 1290 lbs lint/A (Figure 1). However, increasing the nutrient concentration to 25.6 fl oz/cwt (treatment 4) lowered the mean yield to 1235 lbs lint/A. Higher average yields were observed for cotton produced on the South Carolina coastal plain soil and the Arkansas upland soils for seed treatment 3 and treatment 9, the soil applied zinc, relative to the check as shown in Table 2. The trend for higher yields from these treatments was not observed for cotton produced on the Mississippi delta. The combining of seed treatments HM2048 and HM9741 (treatment 6), a combination of treatments 3 and 5, did not improve average yields, 1240 lbs lint/A, when compared with 1290 lbs lint/A and 1323 lbs lint/A yield produced by treatments 3 and 5, respectively. Yields from these two seed treatments were the highest for the four locations. The HM9741 seed treatment produced the highest mean yield when averaged across the four locations relative to all other treatments. This experimental treatment needs additional research.

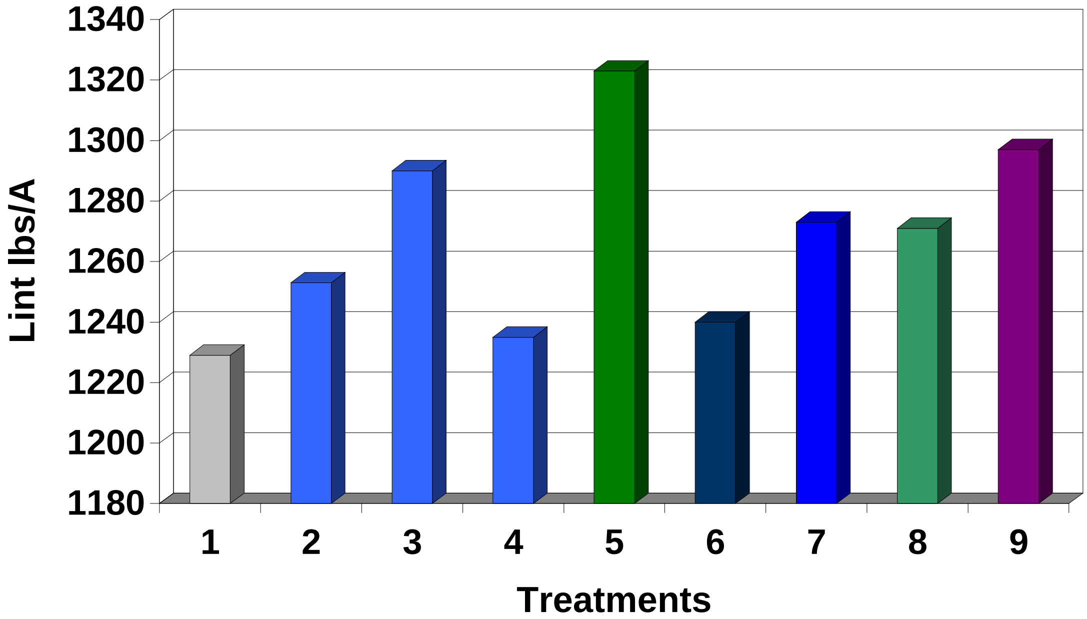

Figure 1. Treatment effect on cotton yield averaged across locations.

Conclusions

Although not conclusive, the average yield means for applying soil zinc and a seed applied nutrient tended to be higher than the untreated yields for three of the four locations. Nutrient-based seed treatments offer an alternative to traditional soil applied micronutrients. The research suggests that seed treatments offer growers improved plant nutrition and production efficiency from uniform applications, which may not occur from normal soil application methods. These data also suggest the need for further research evaluating the seed treatments for cotton production.

Literature Cited

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