Assessment of the Slow-Release Nitrogen Foliar Fertilizer 
Nitamin® in Comparison to Foliar Urea and Soil-Applied 
Nitrogen to the Yield of Field-Grown Cotton 
(Gossypium Hirsutum, L.)

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RESEARCH PROBLEM

Effective nitrogen (N) management in cotton production is essential in order to achieve proper growth and development. However, soil-incorporated N can undergo a series of chemical conversions along with numerous loss mechanisms (leaching, volatilization and denitrification) that can make N unavailable to the plant. In addition, soil-incorporated N has faced much scrutiny over the years for its role in many detrimental environmental situations. Methods to reduce the amount of soil-applied N such as foliar fertilization have been examined and studied while simultaneously supplying the N that cotton requires. From root and vegetative growth to reproductive development, N is vital in every phase of cotton development and plant demand is high.

BACKGROUND INFORMATION

For over a century, foliar fertilization has been utilized as a source of correcting nutritional imbalances and supplementing soil incorporated fertilizers in order to achieve proper plant development (Oosterhuis and Weir, 2010). However, foliar fertilization of cotton has only become popular within the last twenty years (Oosterhuis and Weir, 2010). The rationale and theory supporting the use of foliar N fertilization is primarily based on the numerous loss mechanisms that soil-applied N fertilizers can endure and the high demand of N by cotton during the reproductive stage (Thompson et al., 1976). Boll development requires a substantial amount of N that is mainly provided by the leaves (Zhu and Oosterhuis, 1992) and any deficiencies in leaf N can result in decreased boll growth and overall yield (Bondada et al., 1997). Therefore, nitrogen applied to cotton via foliar fertilization is looked upon as an option of correcting leaf N deficiencies (Craig Jr., 2002).

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RESEARCH DESCRIPTION

The 2013 field experiment was conducted at the University of Arkansas System Division of Agriculture, Soil Testing and Research Laboratory in Marianna, Ark. and used a randomized complete block design consisting of 3 treatments and 4 replications. A total of 12 plots, each composed of 4 rows, 50 ft by 38 in., were used for the experiment along with cotton (Gossypium hirsutum L.) cultivar Stonewall 4288 B2RF. Urea-ammonium nitrate (UAN 32) was soil-incorporated to all treatment plots at a rate of 45 lb N/acre while foliar applications of urea (46-0-0) and Nitamin (30-0-0), at rate equivalents of 6 lb N/acre respectively, occurred approximately 1 week after first flower using a pressurized CO₂ backpack sprayer. A single measurement of overall yield was determined by a mechanical picker at harvest. Analysis of variance methods were used to determine any significant differences between treatment means at the $P \leq 0.05$ and $P \leq 0.10$ levels using the “Fit Model” platform provided by JMP Pro 10.0 software (SAS Institute, Cary, N.C.).

RESULTS AND DISCUSSION

Statistical analysis of treatment yields determined by a mechanical picker showed significant differences throughout the treatments regarding plot weight measured either in lbs per 100 row ft ($P = 0.0018$) or an extrapolated plot weight demonstrated in lbs per acre ($P = 0.0018$) at $P \leq 0.05$ (Table 1). At this level of significance, the foliar urea and Nitamin treatments were not significantly different from one another but had significantly higher yields than the control. When the analysis was run at the $P \leq 0.10$ level, all treatments were significantly different with the Nitamin treatment having significantly greater yields than the foliar urea treatment which in turn was significantly higher than the control for both yield measurements ($P = 0.0018$) (Table 1).

PRACTICAL APPLICATION

These analyses display a positive response to foliar-applied N in cotton grown under field conditions of limited or low N fertility regardless of the foliar N source. The 45 lb N/acre rate of soil-incorporated UAN was well below the N rates typically recommended for cotton production in Arkansas (97-100 lb N/acre). This limitation of soil-available N may have been the key factor in enhancing effective absorption and utilization of foliar-applied N by cotton leaves as well as its subsequent translocation throughout the plant and to the developing bolls.

ACKNOWLEDGMENTS

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LITERATURE CITED


Table 1. Harvest yield means per treatment for the 2013 Marianna yield study.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield (lb/100 row ft.)</th>
<th>Yield (lb/acre)</th>
<th>Yield (lb/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UAN</td>
<td>20.70 b†</td>
<td>2862 b†</td>
<td>2862 c‡</td>
</tr>
<tr>
<td>Foliar Urea + UAN</td>
<td>22.27 a</td>
<td>3080 a</td>
<td>3080 b</td>
</tr>
<tr>
<td>Nitamin + UAN</td>
<td>23.02 a</td>
<td>3184 a</td>
<td>3184 a</td>
</tr>
</tbody>
</table>

†Columns not sharing a common letter are significantly different (P ≤ 0.05).
‡Column not sharing a common letter are significantly different (P ≤ 0.10).