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HYDRA-HUME™ PRODUCTS: EFFECTS ON COTTON FERTILITY MANAGEMENT

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Abstract

Humic substances have been reported to improve plant growth and nutrient uptake. In the current economic climate, cotton (*Gossypium hirsutum* L.) producers are searching for ways to maximize yields while reducing production costs. A possible option is to use amendments, such as humic acids products, for improving fertilizer efficiency. One such amendment is Hydra-Hume™. Hydra-Hume™ is Helena's proprietary product, which is manufactured and marketed to add humus-derived organic acids to inorganic fertilizer and nutrient mixes. The objective of this project was to assess the effects of various fertilizer and Hydra-Hume™ treatments on cotton nutrient status and yield. The yield produced by the Recommended Fertilizer Rates was significantly different from the yield of the Untreated Control at only 3 of 5 locations. Furthermore, the yield produced by the Recommended Fertilizer Rates was significantly different from the yield of the Half Recommended Rates at only 2 of 6 locations. These results suggest that N was generally not limiting in most sites used in this study. Overall, there was no yield increase due solely to the use of Hydra-Hume products under the conditions of this study. However, since there was little response to N, Hydra-Hume™ effects would not be expected at most sites under the conditions of this study. The similarity in yields between the recommended and half recommended N rates suggests that nutrient management in cotton needs to be re-evaluated.

Introduction

Humic substances have been described as a "Heterogeneous mixture of naturally occurring organic materials" (MacCarthy et al., 1990). Components of humic substances include humic acid, fulvic acid, and humin (MacCarthy et al., 1990). In a review, Chen and Aviad (1990) summarize studies reporting that humic substances can influence germination, and growth of seedling, roots, and shoots. Furthermore, Chen and Aviad (1990) state that the beneficial effects of humic substances may be related to "enhanced uptake" of macronutrients. They caution, however, that the "nutritional significance" of this observation is still being evaluated (Chen and Aviad, 1990).

Cotton (*Gossypium hirsutum* L.) producers are searching for ways to maximize yields while reducing production costs. A possible option is to use amendments, such as humic acids products, for improving fertilizer efficiency. One such amendment is Hydra-Hume™. Hydra-Hume™ is Helena's proprietary product, which is manufactured and marketed to add humus-derived organic acids to inorganic fertilizer and nutrient mixes. Hydra-Hume™ contains a number of organic components including potassium humate, potassium fulvate, polycarboxylates, polyphenols, and poly quinines derived from very specific humus sources. Hydra-Hume™ also contains 5 amino acids, peptides, sugars, vanillic acid, as well as a number of other proprietary ingredients. Hydra-Hume Plus™ contains additional compounds that serve as energy sources for soil microflora. Hydra-Hume Plus™ with Estecol contains additional compounds that serve as energy sources for soil microflora and also contains beneficial microflora. The potential benefits of Hydra-Hume™ are improved uptake efficiency of applied fertilizers and reduced fertilizer burn potential. The objective of this project was to assess the effects of various fertilizer and Hydra-Hume™ treatments on cotton nutrient status and yield.

Materials and Methods

(Table 1). The treatments are summarized in Table 2. Treatments were replicated 4 times in a randomized complete block design. The recommended rate of fertilizer (Treatment 1) was determined according to soil test recommendations. Hydra-Hume™ treatments were broadcast near the date of planting. Pesticides and other inputs were made as needed according to standard practices.

Petiole N and K levels were determined by using Cardy nutrient meters (Kenty et al., 2002). Approximately 30 petioles from the center row of every treatment were collected at pin-head, mid bloom, and mid bloom plus 3 weeks. Final yield was determined in accordance with standard procedures for each individual researcher. Relative yield was calculated by dividing the yield for each treatment by the highest yield obtained at each site. Statistical effects were evaluated by using the ANOVA and CONTRAST procedures in SAS (SAS Institute, 1997). All comparisons were made at the 5% significance level.

Results and Discussion

The yield produced by the Recommended Fertilizer Rates (Treatment 1) was significantly different from the yield of the Untreated Control (Treatment 7) at only 3 of 5 locations, Sites 1, 4, and 6 (Figure 1). (Location 2 did not have a Treatment 7). Furthermore, the yield produced by the Recommended Fertilizer Rates (Treatment 1) was significantly different from the yield of the Half Recommended Rates (Treatment 3) at only 2 of 6 locations, Sites 1 and 5 (Figure 1). These results suggest that N was generally not limiting in most sites used in this study. These results also suggest that fertilizer recommendations may need to be re-evaluated.

At Site 5, Treatment 3 (Half Recommended Fertilizer rates with no humic acid applied) and Treatment 4 (Half Recommended Fertilizer Rates with broadcast Hydra-Hume™) produced greater yields than did Treatment 1 (Recommended Rate of Fertilizer without Hydra-Hume™). At Site 5 with the half rate of fertilizer, addition of Hydra-Hume™ (Treatment 4) produced greater yield than did Hydra-Hume Plus (Treatment 5) or Hydra-Hume Plus with Estecol (Treatment 6). There were, however, no yield differences due solely to Hydra-Hume™.

Petiole N (Figure 2) and petiole K (Figure 3) were generally unaffected by Hydra-Hume™ treatments. Petiole N was significantly greater in Treatment 1 than in the other treatments at Site 1 during Mid Bloom and Mid Bloom + 3 weeks.

When combined over all sites, relative yields were influenced by fertilizer addition, but there were no differences in yield produced by the Recommended Fertilizer Rates and the Half Recommended Fertilizer Rates (Table 3). Yield was not influenced by any Hydra-Hume™ treatments. Petiole N data showed similar trends. When data from all sites were combined, petiole K concentrations were not influenced by treatments.

Summary

Overall, there was no yield increase due solely to the use of Hydra-Hume products under the conditions of this study. However, since there was little response to N, Hydra-Hume™ effects would not be expected at most sites under the conditions of this study. The similarity in yields between the recommended and half recommended N rates suggests that nutrient management in cotton needs to be re-evaluated.

References

Chen, Y., and T Aviad. 1990. Effects of humid subsatnces on plant growth. *In* MacCarthy et al. (Eds.) Humid Substances in Soil and Crop Sciences: Selected Readings. ASA, Madison, WI.

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MacCarthy, P., R.L. Malcom, C.E. Clapp, and P.R. Bloom. 1990. An introduction to soil humid substances. *In* MacCarthy et al. (Eds.) Humid Substances in Soil and Crop Sciences: Selected Readings. ASA, Madison, WI.

Table 1. Summary of location and agronomic information

Site	Location	Soil Type	Variety	Plant Date	Rec. N (#/ac)
1	Verona, MS	Leeper Si Cl L	SG 501BR	5/16	80
2	Belle Mina, AL	Decatur Si L	DPL 451 Bt/RR	4/18	60
3	Portageville, MO	Tiptonville Si L	DP 1218 BG/RR	5/16	110
4	Alexandria, LA	Norwood Si L	DPL 436 RR	5/19	90
5	Senatobia, MS	Memphis Si L	DP 451 BR	5/16	100
6	Jackson, TN	Memphis Si L	PM 501 Stacked	5/7	80

Table 2. Summary of treatments

TRT 1	Rec. N based on soil test
TRT 2	Rec. N with 2 gal/A HydraHume
TRT 3	½ Rec. fertilizer rates
TRT 4	½ Rec. fertilizer rates with Hydra-Hume.
TRT 5	½ Rec. fertilizer rates with HydraHume Plus.
TRT 6	½ Rec fertilizer rates with Hydra-Hume Plus with Estecol
TRT 7	Control

Table 3. Significance levels of contrasts for various treatment effects

		Pin Head Square		Mid Bloom		Mid Bloom + 3 wk	
Contrast	**Rel. Yield**	**Petiole N**	**Petiole K**	**Petiole N**	**Petiole K**	**Petiole N**	**Petiole K**
Control vs Treated	0.0001	0.0388	NS[a]	0.0519	NS	0.0064	NS
Control vs Recommended	0.0001	0.0821	NS	0.131	NS	0.0168	NS
Control vs 1/2 Rec	0.0001	0.0273	NS	0.006	NS	0.0035	NS
Rec vs 1/2 Rec	NS	NS	NS	NS	NS	NS	NS
Control vs No Hydrahume	0.0001	0.0714	NS	0.036	NS	0.0183	NS
Rec vs 1/2 Rec + Hydrahume	NS	NS	NS	0.0541	NS	NS	NS
Rec vs Rec + Hydrahume	NS	NS	NS	NS	NS	NS	NS
1/2 Rec vs 1/2 Rec + Hydrahume	NS	NS	NS	NS	NS	NS	NS
1/2 Rec vs 1/2 Rec + Hydrahume Plus	NS	NS	NS	NS	NS	NS	NS
1/2 Rec vs Any Hydrahume Products	NS	NS	NS	NS	NS	NS	NS
Hydrahume Alone vs Others	NS	NS	NS	NS	NS	NS	NS
Hydrahume vs Others	NS	NS	NS	NS	NS	NS	NS
Hydrahume Plus vs Hydrahume	NS	NS	NS	NS	NS	NS	NS
HHP Estecol vs HHP	NS	NS	NS	NS	NS	NS	NS
HHP Estecol vs Hydrahume	NS	NS	NS	NS	NS	NS	NS

[a] Denotes non-significant at the 0.05 level.

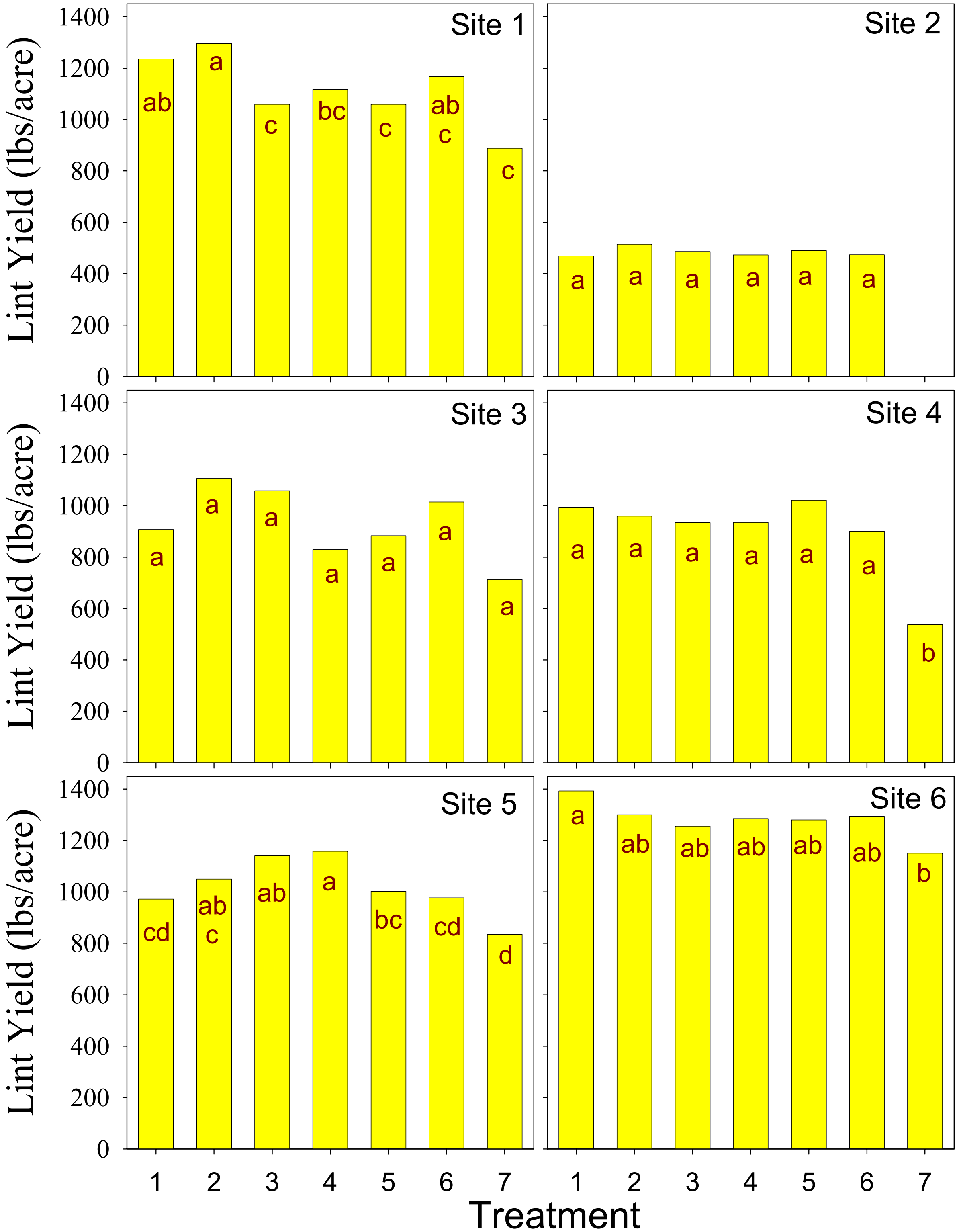

Figure 1. Cotton lint yield as influenced by various fertilizer and Hydra-Hume amendments.

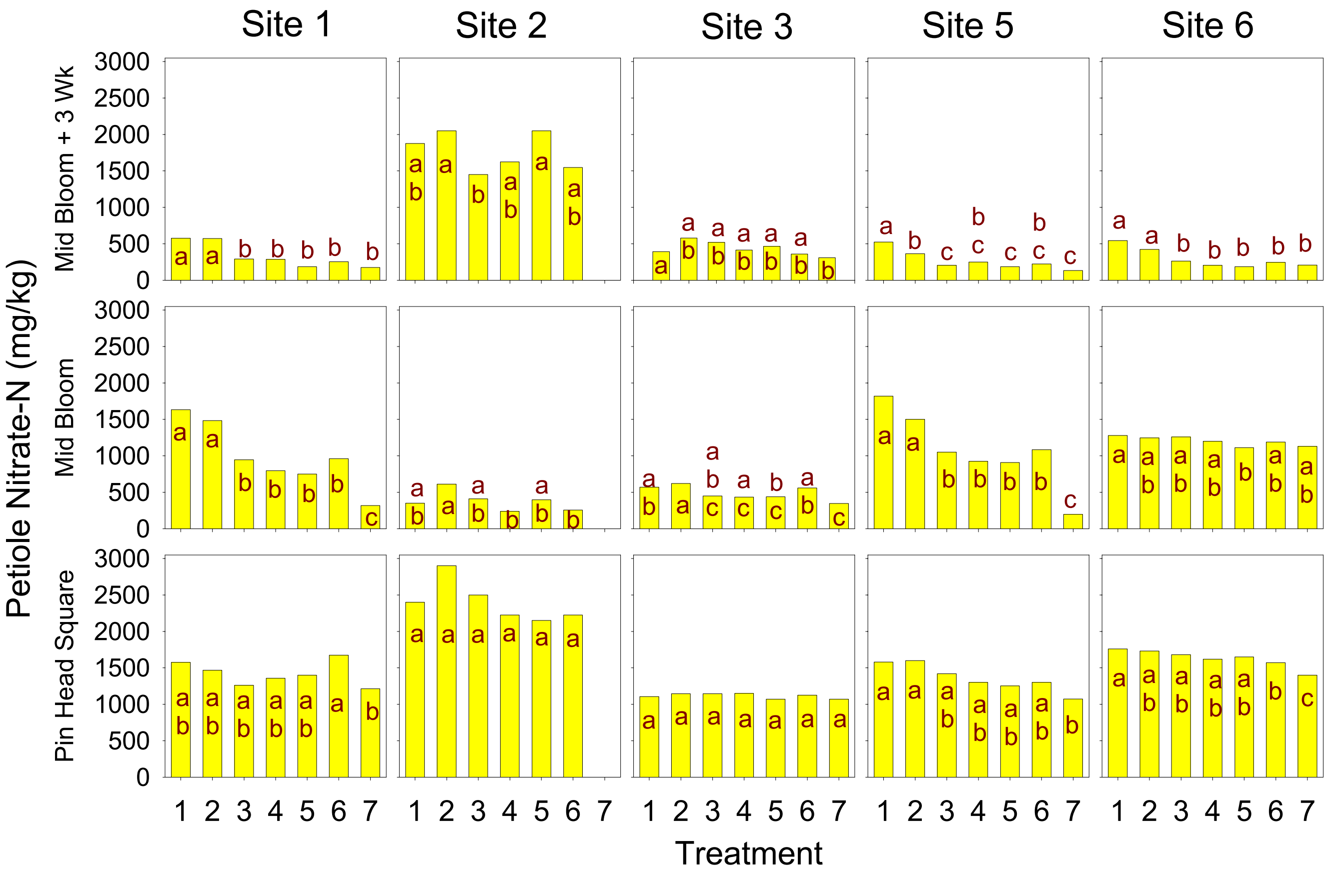

Figure 2. Petiole nitrate concentrations as influenced by various fertilizer and Hydra-Hume amendents.

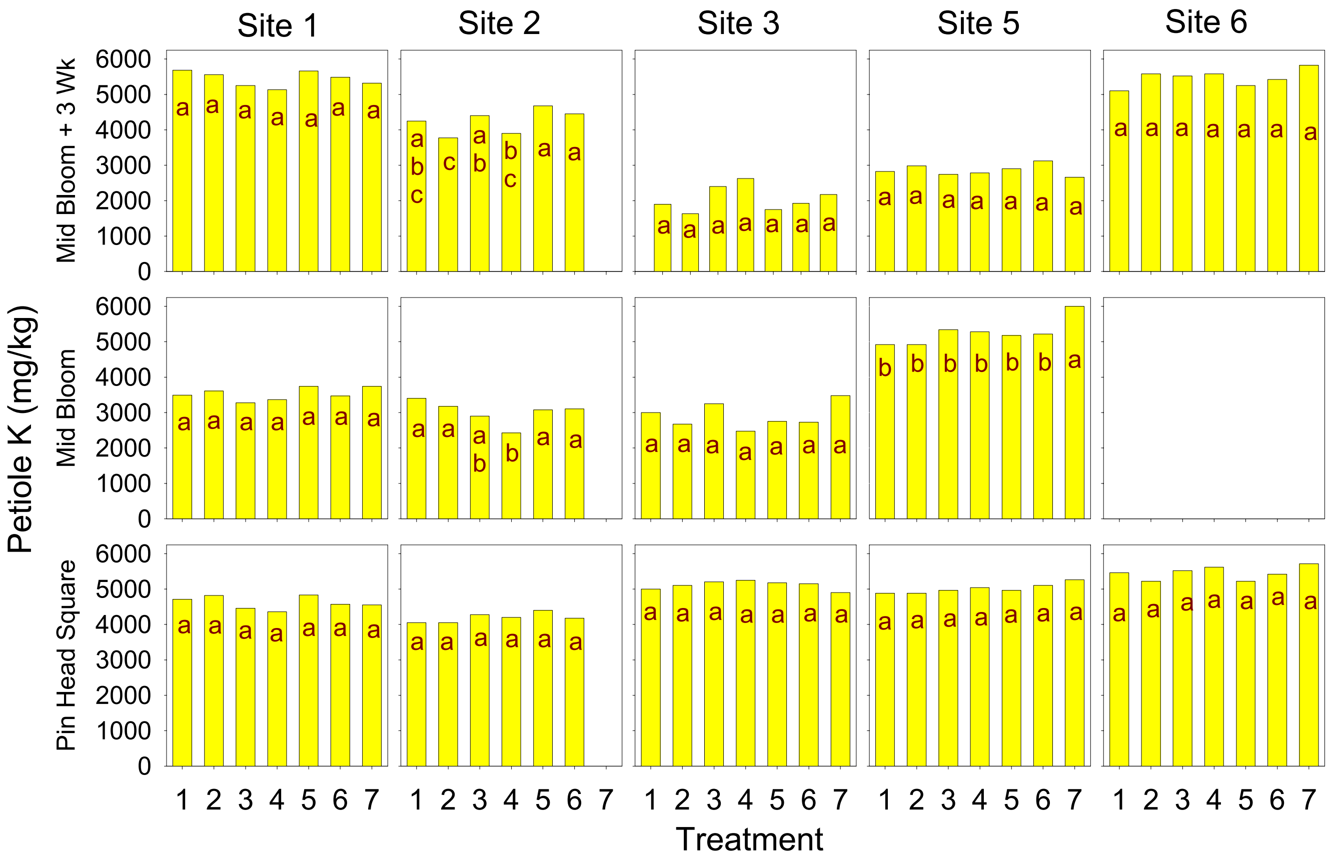

Figure 3. Petiole K concentrations as influenced by various fertilizer and Hydra-Hume amendments.