

Cotton Yield Enhancement Using Foliar-Applied Potassium Nitrate and PGR-IV

By Derrick M. Oosterhuis

Previous field research has confirmed the value of both foliar feeding with potassium nitrate (KNO_3) and the use of the plant growth regulator PGR-IV to improve cotton yields. Field research in 1991 and 1992 demonstrated the synergistic effect of foliar feeding with KNO_3 following applications of PGR-IV. The likely explanation is that the PGR-IV-treated cotton retained more fruit and the additional potassium (K) was needed to supply the nutrition of these added bolls.

RESEARCH at the University of Arkansas has shown a consistent and significant improvement in cotton yields and fiber quality from foliar feeding with KNO_3 . The introduction of faster-fruited varieties and the increased use of nitrogen (N) in crop management have led to widespread K deficiencies. These deficiencies can be corrected through soil applications, or possibly, by mid-season foliar applications of KNO_3 . Foliar sprays have the advantage of allowing producers to add K when tissue analysis indicates a pending shortage, thereby preventing yield losses.

Other research at the University of Arkansas has shown a consistent increase in cotton yields from applications of the growth regulator PGR-IV. Results indicate that foliar application of PGR-IV increases root growth of seedlings and also increases fruit retention. It was hypothesized that this increase in fruit retention should further increase the need for foliar-applied KNO_3 during the late season boll development period when K deficiencies are normally manifested.

Recent Studies

A field trial was conducted at the University of Arkansas Cotton Branch Station

in Marianna on a Captina silt loam to determine if the positive effects of PGR-IV on cotton yield could be further enhanced by foliar-applied KNO_3 . Treatments consisted of 1) a check with no added K or PGR-IV, 2) foliar-applied KNO_3 at 4 lb/A K_2O at 2, 4, 6 and 8 weeks after first flower, 3) PGR-IV at 4 oz/A applied at pinhead square and first flower, and 4) a combination of PGR-IV and foliar-applied KNO_3 (treatments 2 and 3 combined). Preplant fertilizer was applied at the rate of 54 lb N/A and 123 lb P_2O_5 /A with an additional sidedressing of 36 lb N/A at pinhead square. Initial soil analysis showed 258 lb K/A. The crop was grown using standard recommended practices for irrigated cotton in Arkansas. The foliar KNO_3 was applied in 10 gal/A water using a backpack sprayer.

Results

Boll weight, boll number and yield of seedcotton were significantly increased by foliar application of KNO_3 and PGR-IV (**Table 1**). Foliar KNO_3 increased yields by 54 lb/A (3.2 percent) and PGR-IV increased yield by 95 lb/A (5.6 percent). There was, however, an even greater increase from a combination of PGR-IV

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Table 1. Effect of foliar treatments on seedcotton yield, boll weight and boll number.

Treatment	Boll weight, grams	Boll number, per 3 ft. row	Yield, lb/A	Yield incr., % of check
Check	4.50b	31.8c	1,682c	—
KNO ₃	4.73a	32.9bc	1,736b	3.2
PGR-IV	4.80a	33.9ab	1,777b	5.6
PGR-IV + KNO ₃	4.75a	34.9a	1,910a	13.6

Values within a column followed by the same letter are not significantly different ($p=0.05$).

and KNO₃ which increased yield by 228 lb/A (13.6 percent).

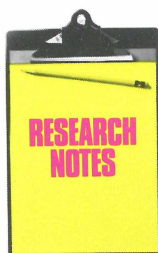
The increase in yield from the KNO₃ spray was consistent with our previous reports although not as large as usually experienced. The PGR-IV yield increase was also slightly less than previously reported. The 13.6 percent increase from the combined treatment was larger than the additive increase of the two individual treatments. This was probably because the PGR-IV treated plants retained more fruit,

and the additional K was needed to supply the nutrition of these added bolls.

A similar study conducted in 1992 confirmed the results of the 1991 investigations. The strong interactive effects of KNO₃ and PGR-IV were repeated, providing a seedcotton yield increase of 12.6 percent . . . very close to the magnitude of yield increase in the 1991 data.

Summary

Proper plant nutrition for optimal crop productivity in cotton requires that mineral deficiencies be avoided. The obvious question is whether the addition of other nutrients would also have been beneficial given the extra fruit retention and nutritional requirement in the PGR-IV treated plants. These preliminary data suggest that foliar feeding with KNO₃ following the application of the plant growth regulator PGR-IV enhances yield synergistically. This research is being continued to further evaluate the beneficial aspects of combining the use of PGR-IV and foliar fertilization as a management tool for cotton producers. ■



Minnesota

Eliminating Off-Farm Nitrogen: A Case Study

THIS STUDY was established on a Minnesota farm to evaluate options available to a farmer who wished to eliminate off-farm nitrogen (N) sources by utilizing only on-farm manure. Researchers evaluated three options: 1) Improving N use without changing crop and livestock enterprises substantially; 2) expanding livestock production; 3) increasing alfalfa production. The economics of each option were analyzed.

It was found that increasing alfalfa production would most likely meet the goal of eliminating purchased N fertilizers.

However, economic returns were not acceptable, primarily because of the loss of government payments, but also because of the problem of finding markets as hay production increased. Applying manure uniformly across the farmer's operation (three sites over an 11-mile area) was difficult because his management program was geared to meet goals other than making the best use of manure.

Researchers concluded that many of the decisions needed to manage fertilizers more efficiently . . . for both economic and environmental reasons . . . are farm-specific, not general in nature. ■

Source: Howard Person and Richard Levins. 1992. *J. Prod. Agric.*, Vol. 5, no. 4.