ACCURACY OF SOIL TEST P AND K RECOMMENDATIONS FOR LOUISIANA COTTON

J. L. Kovar, E. R. Funderburg and P.F. Bell
Agronomy Dept. and Cooperative Extension Service
Louisiana State University Agricultural Center
Baton Rouge, LA

Abstract

Phosphorus (P) and potassium (K) soil test calibration and correlation data were developed thirty to forty years ago for cotton grown in Louisiana. The goal of this research was to verify the accuracy of both our data and the P and K fertilizer recommendations that are based on these data. During a 6-yr. period, four P field trials were conducted on two soil types, and five K field trials were conducted on five soil types. In seven of the nine tests, LSU fertilizer recommendations were correct (78%). Responses to P or K fertilizer did not occur when soil test P or K was rated high or very high. For the two cases in which recommendations were incorrect, fertilizer addition did not increase yield, even though soil test results indicated that a response should occur. In general, the results of these trials suggest that the current P and K fertilizer recommendations for cotton are accurate.

Introduction

Phosphorus and K soil test calibration and correlation data were developed many years ago for cotton grown in Louisiana (Marshall and Sturgis, 1953; Newman, 1971). There is some concern that fertilizer recommendations based on these data are inadequate for modern high-yielding crops that have greater nutrient demand (Funderburg and Kovar, 1996). In addition, accurate fertilizer recommendations are as important as ever, given the current emphasis on nutrient management and environmental quality.

The purpose of this research was to verify the accuracy of both our current soil test P and K data and the P and K fertilizer recommendations that are based on these data. We also wanted to conduct this research on private farms with diverse soil types and management practices, so that the results would be applicable to as many of the cotton-growing areas as possible.

Materials and Methods

This study was conducted during a 6-year period (1992-1997). A total of four field trials with P were conducted on a Hebert silt loam (fine-silty, mixed, thermic Aeric Ochraqualfs) and a Norwood silt loam (fine-silty, mixed, calcareous, thermic Typic Udifluvents). Five field trials with K were conducted on Bruin fine sandy loam (coarse-silty, mixed, thermic Fluvaquentic Eutrochrepts), Commerce silt loam (fine-silty, mixed, nonacid, thermic Aeric Fluvaquents), Commerce silty clay loam, Gigger silt loam (fine-silty, mixed, thermic Typic Fragiudalfs), and Norwood silt loam (fine-silty, mixed, calcareous, thermic Typic Udifluvents).

Typically, treatments included three or four rates of P or K fertilizer, with four or more replications arranged in a randomized complete block design. Plots were four to eight rows in width and 400 to 1000 feet long. If required, a blanket application of K fertilizer was made in the P trials. Similarly, P fertilizer was applied in K trials when needed. Nitrogen fertilizer and other inputs were applied by the cooperators. Plots were harvested with the cooperators' equipment.

Soil samples were collected before any fertilizer was applied, and three to four weeks after treatments were imposed. Samples were collected with a hand probe to a depth of six inches. Eight to ten cores were taken in each plot and bulked for analysis. Available P was determined by Bray 2 extraction (Byrnside and Sturgis, 1958). Exchangeable K was extracted with neutral 1.0N ammonium acetate (Thomas, 1982).

Results and Discussion

In the years 1992 to 1997, experiments were conducted at nine on-farm locations in the cotton-growing areas of Louisiana. LSU fertilizer recommendations were correct in seven of the nine tests (78% accuracy). Responses to P (Table 1) or K (Table 2) fertilizer did not occur when soil test P or K was rated high or very high. For the two trials in which recommendations were incorrect, fertilizer addition did not increase yield, even though soil test results indicated that a response should occur. In one case, a numerical yield increase of 118 lb. lint/A was measured when 60 lb. P_2O_5/A were applied (Table 1); however, variability among replicates negated statistical significance.

In general, the results of these trials suggest that the current P and K fertilizer recommendations for cotton grown in Louisiana are accurate. Although data are not presented here, tissue tests tended to confirm the accuracy of the P and K fertilizer recommendations.

References

Byrnside, D.S., Jr. and M.B. Sturgis. 1958. Soil phosphorus and its fractions as related to response of sugar cane to fertilizer phosphorus. Louisiana Agric. Expt. Sta. Bull. 513.

Funderburg, E.R. and J.L. Kovar. 1996. On-farm soil test calibration and correlation studies. p. 28-29. Proc.

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 1:660-661 (1998)
National Cotton Council, Memphis TN

Southern Soil Fertility Conf. Samuel Roberts Noble Foundation. Ardmore, OK.

Marshall, J.G. and M.B. Sturgis. 1953. Effects of sodium fertilizers on yield of cotton. Soil Science. 22:75-79.

Newman, B.E. 1971. The effects of combinations of lime and fertilizers on yields of cotton, corn, and hairy vetch. Louisiana Agric. Expt. Sta. Bull. No. 654.

Thomas, G.W. 1982. Exchangeable cations. *In:* A.L. Page, R.H. Miller, and D.R. Keeney (eds.). Methods of soil analysis. Part 2. 2nd ed. Agronomy 9:159-165.

Table 1. Accuracy of P fertilizer recommendations for cotton grown on two soils at four locations. Soil test and response data are means of 4 replications.

Soil Type	Soil Test	Recommended Fertilizer	Response
	mg/kg	lb./A	lb. Lint/A
Hebert sil	30 (L)	60	Yes (801 vs. 893 @ 40 lb./A)
Norwood sil	104 (H)	0	No (817 vs. 787 @ 30 lb./A)
Norwood sil	86 (M)	40	No (969 vs. 1087 @ 60 lb./A)
Norwood sil	124 (VH)	0	No (643 vs. 662 @ 30 lb./A)

Table 2. Accuracy of K fertilizer recommendations for cotton grown on five soils at five locations. Soil test and response data are means of 4 replications.

Soil Type	Soil Test	Recommended Fertilizer	Response
	mg/kg	lb./A	lb. Lint/A
Bruin vfsl	122 (M)	40	No (691 vs. 691 @ 50 lb./A)
Commerce sil	>180 (H)	0	No (855 vs. 809 @ 60 lb./A)
Commerce sicl	280 (VH)	0	No (812 vs. 822 @ 50 lb./A)
Gigger sil	169 (H)	0	No (748 vs. 774 @ 120 lb./A)
Norwood sil	199 (H)	0	No (954 vs. 947 @ 50 lb./A)