POTASSIUM FERTILITY STUDIES FROM NEW MEXICO ACALA 1517

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Abstract

Western soils are typically high in plant available potassium. However, observations by New Mexico cotton producers indicate enhanced fiber quality when potash is broadcast prior to planting cotton despite high levels of soil potassium. A five-year study (1991-1995) was conducted at the NMSU Agricultural Science Center to evaluate additional potassium fertilizer for cotton yield and fiber quality enhancement given a high soil test potassium level. Five replications of a zero control, 50 lb/A and 100 lb/A of 0-0-60 were applied to a long-term (30-year) Acala 1517 production field. There were significant yield (ρ=0.0001) and quality (ρ=0.0002) differences among years of production but no effects were observed due to additional potassium fertilizer. When soil testing reveals high levels of plant available potassium the likelihood of a response or an economic return is essentially zero. However, on-farm soil test potassium levels evaluated for spatial variability in 1998 indicate that some fields can be classified as low to medium in plant available potassium. Under these conditions it is more likely that there may be a response to additional potassium for New Mexico cotton production.

Introduction

An irrigated field of cotton with 960 pound/A seed cotton production capacity can remove approximately 125 lb K_2O per acre. Very high ammonium acetate extractable potassium in western soils along with high potassium mineralogy generally does not cause a concern over potassium fertility. However, with repeated and intensive cropping systems potassium may be needed to insure a healthy and profitable crop. Many producers in New Mexico have observed an improvement in lint micronaire following the addition of potassium to their fertilizer program. However, many of the soil test values on producer farms are rated high to very high in available potassium. The objectives of this study were to evaluate yield and fiber quality parameters as affected by additional potassium fertilizer.

Materials and Methods

Acala 1517 cotton was planted in accordance with established agronomic practices for New Mexico. A field that had been in cotton production for a period of 30 years was utilized in hopes that the levels of soil-K would be moderate or low. However, soil test values indicated that the ammonium acetate extractable K was high to very high (Table 1). This field at least allowed for an evaluation of additional K_2O on fields classified as high in plant available potassium. Fertilizer was applied two weeks before planting and included an equivalent rate of 50 or 100 pounds per acre of a 60% K_2O commercial blend. There was also a treatment receiving no additional K_2O. All plots were furrow-irrigated to avoid water stress. Individual plots were 50 feet by 13 feet (4, 40-inch rows). The center two rows of each plot were harvested twice with a two-row picker. Quality parameters were determined from a 15-boll sample from within each plot prior to picking. Results were analyzed using standard analysis of variance procedures. Means were separated if there was significance at the 0.05 level of probability.

Discussion

Yield (Table 2) and micronaire (Table 3) varied significantly among years of production. The best production year was 1995 with an average of 780 lb lint/A. However, additional potassium had no effect on yield or quality. Second pick cotton lint micronaire also showed no differences due to potassium treatment (Table 4). There were also no differences in boll size, span length, fiber strength, elongation or the uniformity ratio.

Summary

Base additional potash applications for cotton on soil test levels. Extractable potassium classified as high to very high does not support the addition of potassium fertilizers. Based on a 1998 soil survey of cotton fields there are locations in producer fields that can be classified as low to moderate in available potassium. Only with a detailed understanding of field variability would additional potassium be warranted.

Table 1. Soil properties at the beginning of the trial.

	ρH	e.c.	Organic Matter	Phosphorus	Potassium
		mmhos/cm	%	ppm	
Initial	8.0	2.8	1.3	7	450

Table 2. Lint yield as affected by year and potash treatment.

Treatment	1991	1992	Year 1993	1994	1995
lb K_2O/A			lb lint/A		
0	389	322	684	717	787
50	401	345	662	695	770
100	394	328	658	760	783
$LSD_{(0.05)}$	NS	NS	NS	NS	NS
Mean	394	332	668	724	780

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Table 3. First pick lint micronaire as affected by year and potash treatment.

	Year				
Treatment	1991	1992	1993	1994	1995
lb K_2O/A			mic reading		
0	3.28	3.22	4.26	4.32	3.30
50	3.46	3.84	4.08	4.52	3.38
100	3.36	3.72	4.18	4.34	2.84
$LSD_{(0.05)}$	NS	NS	NS	NS	NS
Mean	3.37	3.59	4.17	4.39	3.17

Table 4. Second pick lint micronaire as affected by year and potash treatment.

	Year				
Treatment	1991†	1992	1993	1994	1995
lb K_2O/A			mic reading		
0	.	3.34	3.18	4.30	2.54
50	.	3.52	3.18	4.20	2.82
100	.	3.46	2.92	4.28	2.52
$LSD_{(0.05)}$	.	NS	NS	NS	NS
Mean	.	3.44	4.17	4.26	2.63

† No second picking