Potassium Fertilization Influences Cotton Dry Matter and Yield

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Potassium (K) deficiency decreased fiber maturity by causing less cellulose to be deposited in the fiber secondary wall. Potassium fertilization increased lint yields due to more lint turn-out (percent lint) and produced a higher micronaire.

POTASSIUM deficiency of cotton has been reported throughout the Cotton Belt. Our study investigated the genotypic variability in lint yield and fiber quality as affected by nitrogen (N) and K fertilization.

Mississippi Study

A field study was conducted on eight genotypes representing a range of maturity and regional adaptations; DES 119, DPL 5415, HS 26, MD 51 ne, PeeDee 3, STV 453, STV LA 825, and STV 887. All plots received a preplant application of 100 lb/A N. A sidedress application of 36 lb/A N was applied to half of the plots. Potassium was surface-applied at zero and 120 lb/A K_2O. The experimental design was a split-split plot with N levels as the main plot, K levels as the sub plots and genotypes as the sub-sub plots.

Results

Potassium fertilization affected lint yield and fiber maturity in three years of the study. Also, K fertilization reduced the ratings for white speck or dead fiber (**Table 1**).

There was no K x genotype interaction detected for any of the yield or fiber quality components. In addition, N did not interact with K to affect any parameter.

Plant growth was altered by K deficiency (**Table 2**). Low K plants had an 18 percent lower leaf area index (LAI) and a 12 percent lower stem weight. However, the K deficiency increased the specific leaf weight (SLW) by 16 percent. Supplemental N caused DES 119 to allocate more dry matter to vegetative growth. MD 51 ne did not alter dry matter partitioning in response to additional N. Potassium deficiency produced a 7 percent decrease in fiber micronaire, but fiber perimeter was not influenced by K fertilization.

Table 1. Effects of K fertilization on fiber characteristics and lint yield.

Potassium rate, lb/A K_2O	Fiber maturity, %	White speck (dead fiber)[1]	Lint yield, lb/A
0	76.9	3.06	1,042
120	80.3	2.72**	1,139*

[1]White speck rated 1 (good) to 4 (worst).
* and ** denote significance.

The K deficiency resulted in less cellulose being deposited in the secondary wall of the fiber, which caused the decrease in fiber maturity and micronaire. The data from this study imply that all cotton genotypes benefit from higher K availability with higher yield and fiber quality. ■

Table 2. Effect of K deficiency on cotton.

- x Reduced leaf area index (LAI) 18 percent.
- x Reduced fiber maturity 4 percent.
- x Reduced lint turn-out (percent lint) 2 percent.
- x Reduced yield 105 lb/A.
- x Reduced fiber micronaire 7 percent.
- x Increased specific leaf weight 16 percent.
- x Reduced stem weight by 12 percent.

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