MANAGING POTASSIUM FERTILITY TO REDUCED SUSCEPTIBILITY OF COTTON TO INFECTION BY *ALTERNARIA MACROSPORA*

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Abstract

Numerous studies have reported interactions between cotton K nutrition and the incidence of several diseases. For example, increased leaf K concentration has been associated with reduced foliar lesions caused by *Alternaria* leaf spot. Research has suggested that expression of K deficiency symptoms is a prerequisite for an *Alternaria* leaf spot epidemic. Recently, an increased level of occurrence and severity of *Alternaria* has been reported in the north central Texas Blacklands region. The problem has been observed across all major varieties (Collin County Cotton Variety Trial 1996), with only limited variation in the degree of severity. In general, all varieties suffered almost complete defoliation with a projected but unquantified level of yield reduction. Although various causes of late-season K deficiency have been proposed, better information is needed regarding soil test K levels in susceptible soils and crop response to variable rates of K fertilization.

Two field locations were established in Collin County in the northern Blackland Prairie of Texas on sites which presented moderate to severe symptoms of Alternaria leaf spot infection in 1996. Each site was intensively soil sampled, with cores collected to 36 inches in increments of 0 to 6, 6 to 12, 12 to 18, 18 to 24 and 24 to 36 inches. A sample also was obtained from the 0 to 3-inch increment to evaluate nutrient stratification. All soil samples were analyzed for pH; primary and secondary nutrients: nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, and micronutrients: iron, zinc, copper and manganese. Field plots were established at each location in spring 1997. Treatments consisted of 3 rates of K fertilization: 0, 30 and 60 pounds of K_2O per acre applied as potassium chloride (0-0-58). Individual plots were 4 rows wide by 400 feet long and each treatment was replicated three times. Fertilizer was surface broadcast using a 6-foot Gandy drop spreader.

On the McMahan site, cotton (DP 50) was flat-planted on 30-inch centers on May 2, 1997. The growers routine fertilizer application for this site included 12 lbs./acre of N and 40 lbs./acre of P_2O_5 applied as 10-34-0 at planting and an additional 64 lbs. of N as 32-0-0 applied at sidedress prior to first bloom. On the Prosper Station site, cotton (DP 50) was planted on 40-inch beds on May 6, 1997. A standard fertilizer application of 68 lbs./acre N as 32-0-0 was applied preplant.

Visual ratings were made a peak bloom to evaluate treatment effects on the level of *Alternaria* infection. Leaf samples were collected at 6 NAWF for determination of tissue K concentrations. Plots were stripper harvested and yield and fiber quality parameters were determined at the end of the growing season to evaluate treatment effects.

Results of soil analyses from the McMahan site indicated plant available K ranged from 91 to 117 ppm in the upper 36 inches of the soil profile. The critical value for plant available soil K based on the Texas Agricultural Extension Service Soil Testing Laboratory procedure is 126 ppm. Thus, plant available K throughout the rooting zone at this study location was considered moderate, and would justify supplemental K fertilization. In contrast, soil test K at the Prosper Station ranged from 214 to 309 which is considered very high. No supplemental K typically would be recommended at this site.

At 6 NAWF, plants in all plots on the McMahan site were exhibiting moderate to severe symptoms of K deficiency. In addition, plants throughout the treatment area had distinct symptoms of *Alternaria* infection. Analyses of leaf tissue samples collected at that time indicated no significant differences among potassium treatments at the McMahan or Prosper Station study sites. However, tissue K concentrations were considered to be low. Tissue nutrient concentrations depend heavily upon the stage of growth. In general, leaf K concentrations may range from 2 to 4% early in the season. Most studies have suggested that late season K concentrations should remain in the range of 1 to 2% for sufficiency.

No significant differences in yield response or turnout among treatments at either of the two locations was observed. However, there was a trend toward a substantial yield improvement for the high rate of K on the McMahan site. The fertilizer treatment was not incorporated at either location due to the flat-planting management scheme. This very likely limited the positional availability of the supplemental K fertilizer. Similarly, there were no

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 1:683-684 (1998)
National Cotton Council, Memphis TN

significant differences in lint quality parameters among K treatments at either of the two study locations.