Effect of Fertilizer Treatments on the Fiber Properties of Cotton

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Although extensive tests have been conducted to determine the effects of fertilizer applications on cotton lint yields, less attention has been given to their influence on fiber characteristics. The results that have been reported are inconsistent. Crowther (1) and Godoy (3) reported increases in lint length from nitrogen fertilizer treatments. Gipson et al. (2) stated that fertilizer had no effect upon fiber properties. On the other hand, Gulati (4) reported reductions in both length and strength from nitrogen applications. Nelson and Ware (5) found no effect of fertilizers on fiber length, but suggested that methods more precise than hand pulling should be used to detect small differences. Nelson (6) reported that nitrogen and potash applications increased length. Nelson also found that potash resulted in finer and weaker staples and that phosphorus had no influence on the fiber properties.

Because of the lack of consistency among the reports concerning the effects of fertilizers on fiber properties, lint samples from plots of two fertilizer experiments conducted in Oklahoma were analyzed in the fiber laboratory.

PROCEDURE

The experiments were conducted for three years under two different environments typical of southwestern Oklahoma. One test was conducted under dryland conditions near Mangum, Oklahoma. The soil at this location is a Miles loamy fine sand with a clayey subsoil. The influence of fertilizers would be expected to depend on the deficiency of nutrient elements. Since yield increases of 100% are often obtained on this soil from the application of nitrogen and phosphorus fertilizers (7), an examination of the effects of fertilizers upon fiber characteristics should be appropriate at this location.

The other test was conducted near Altus, Oklahoma, under irrigation. This soil is a Hollister-Tillman silt loam complex. Irrigation was applied as needed to prevent plant moisture stress. Good yield responses to fertilizer applications are also obtained at Altus, which makes this site suitable for this investigation. Tests were also conducted at various other locations, but the results were similar to those of the two tests reported here.

The experiments were arranged in randomized blocks with four replications. The varieties used in the tests at Altus and Lankart 57 at Mangum. Planting dates were consistent with those normally practiced in the area. The fertilizers used were urea, triple superphosphate, and muriate of potash. The various rates as indicated in Tables 1 and 2 were applied at planting time with a cone-type fertilizer distributor.

Fiber samples were taken from each replication each year, 1961-1963. The samples were blended and otherwise prepared for analyses in the fiber laboratory at Stillwater. Fiber length was measured on a digital fiberograph; fineness was measured with the micronaire; and the strength was measured with the stelometer using 1/8-inch gauge jaws.

RESULTS AND CONCLUSIONS

Statistical analyses of the data presented in Tables 1 and 2 showed that in no case were there significant differences among the fiber properties of the cotton harvested from plots with different fertilizer treatments. In these 2 experiments, which were conducted over a period of 3 years on widely different soils, cotton lint yield responses were obtained to nitrogen and phosphorus, but no consistent effect of fertilizer treatment on length, strength, or fineness of the fiber was found.

Although certain environmental conditions such as moisture and temperature greatly affect both yield and the characteristics of the fiber, the data presented here suggest that fertilizer exerts its influence primarily on yield components and not on lint quality. Apparently, the cotton plant requires a certain level of nutrients to produce a given amount of seed, which controls lint yield. Once sufficient soil nutrients are available to allow a seed to develop, the properties of its cellulosic seed hairs are determined by factors other than the levels of nitrogen, phosphorus, and potassium. Additional research needs to be conducted to verify these suggestions.

LITERATURE CITED


