

**EFFECTS OF SHADE ON CARBOHYDRATE
AND MINERAL NUTRIENT STATUS
OF FIELD-GROWN COTTON**

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shedding and the decreased lint yield and fiber quality of shaded cotton.

Abstract

Our recent studies have shown that low light intensity significantly depressed cotton (*Gossypium hirsutum* L.) leaf photosynthetic rate and reproductive growth, increased fruit shedding, and reduced lint yield and fiber quality. The effects of shade (low light intensity) on cotton growth and yield have been closely associated with the amount of light reduction, and the timing and duration of shade. However, little is known about effects of shade on nonstructural carbohydrates and mineral nutrient status of field-grown cotton. A three-year study was conducted in 1993-1995 under field conditions in Fayetteville, Arkansas to determine the effects of shade at different growth stages on nonstructural carbohydrate (hexose, sucrose and starch) and mineral nutrient contents in cotton plant components.

Starch was the dominant nonstructural carbohydrate in cotton leaves, bracts and floral buds, accounting for 84%, 61% and 87% of total nonstructural carbohydrates, respectively. Sucrose accounted for 5%, 28% and 8% of the total carbohydrates in leaves, bracts and buds, respectively. The remainder was hexose. 8-d shade (63% sunlight reduction) significantly depressed the carbohydrate contents in leaves and bracts, but only had a small effect on carbohydrates in the floral buds. Compared with unshaded control plants, the total nonstructural carbohydrate contents of shaded cotton plants decreased 57% in leaves, 42% in bracts and 10% in 20-d old floral buds. The reduction in leaf total carbohydrates was most sensitive to shade at the peak flowering stage (12 days after the first flower stage), but the reduction in the carbohydrates in bracts and buds of 20-d old squares was the most sensitive to shade at the boll development stage (24 days after the first flower stage). Shade caused significant increases in the petiole $\text{NO}_3\text{-N}$ and leaf total N, but only a numerical decrease in total N of bracts and floral buds. Under the shade conditions the P, K and S concentrations in plant components increased, and the C/N ratio decreased under the shade conditions. The increased mineral nutrient contents of shaded cotton were closely associated with the decreased nonstructural carbohydrate contents rather than increased mineral nutrient uptake. Insufficient carbohydrate supply and a decreased C/N ratio were the major factors causing the increased fruit