

**EFFECTS OF SHADE ON COTTON
CARBOHYDRATE METABOLISM
AND SQUARE DEVELOPMENT**

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Abstract

Light is a major factor affecting cotton carbon metabolism, growth and lint yield. Experiments were conducted in 1993-1995 under field and a controlled environment growth chamber conditions to investigate the effects of timing and duration of shade on cotton square development, leaf photosynthesis, respiration, chlorophyll concentration and non-structural carbohydrate (hexose, sucrose and starch) contents in cotton components. Cotton (*Gossypium hirsutum* L.) cultivar Deltapine 20 was used. Results indicated that shade (63% light reduction) at the pinhead square stage did not affect square abscission. However, shade during flowering and fruiting significantly increased fruit shedding. Fruit shedding increased as shade duration increased. Shade treatments did not affect square size and bract area. Under shade conditions, leaf photosynthetic rate decreased by 43-55% for field-grown cotton, and by 64-73% for growth chamber-grown cotton. Shade did not affect leaf dark respiration. Leaf chlorophyll content increased significantly during shade, and the ratio of chlorophyll *a/b* decreased because of a greater increase in chlorophyll *b*. Starch content in cotton leaves and bracts showed the greatest decrease under shade, whereas hexose only showed minor changes. The total non-structural carbohydrate content of shaded field-grown cotton decreased 48-70% in leaves, 36-52% in bracts, and by 4-18% in floral buds compared to unshaded control plants. The decreases in leaf photosynthesis and non-structural carbohydrate contents in the plant components, and an increase in fruit shedding resulted in lower yield of shaded cotton. These results provide information for an improved understanding of cotton growth and development under overcast conditions.