INFLUENCE OF TEMPERATURE ON DIURNAL CARBOHYDRATE ASSIMILATION

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Abstract

Heat stress remains one of the more uncontrollable aspects of proper management for the producer. Research has indicated that anthesis is among the most sensitive of stages to heat stress during cotton's development. Temperatures above 32ºC have been implicated in the increased shed of squares and fruits leading to decreased yields within the US Cotton Belt. However, the cotton plant is sensitive to higher than optimal temperatures at all times of the day or night. At night, increased respiration drains hexose concentrations and energy (adenosine triphosphate, ATP) reserves which over time may perpetuate an ATP deficit leading to increased fruit shed. During the day, higher temperatures negatively impact the production of carbohydrates by hindering the capability of Rubisco activase to activate Rubisco. By hindering the ability of carbohydrate manufacture, energy is diverted from starch storage and ATP reserves, and focused instead towards preservation rather than reproduction. Reproductively, increased temperatures significantly decrease carbohydrate levels within the developing ovaries, increasing the likelihood of boll shed. And at reduced soluble carbohydrate levels pollen has a greater likelihood of sterility. The role of sucrose as an mRNA translational regulator has recently been investigated as being able to regulate the transcription of several genes involved in carbohydrate metabolism. Improvements in the understanding of heat stress upon the diurnal production and transport of soluble carbohydrate may ultimately lead to a greater insight of how to bolster fruit retention in cotton.