EFFECTS OF NUTRIENT STRESS ON CANOPY SPECTRAL REFLECTANCE AND YIELD

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Abstract

Remotely sensed data has been applied in precision crop management to monitor vegetation (density or vigor), detect insect infestations, and map crop nutrient status. Frequently, vegetation indices are computed from digital images using relatively broad spectral bands of airborne or spaceborne sensors. Ground-based studies with cotton (*Gossypium hirsutum* L.) suggest imaging or non-imaging sensors tuned to reflectance ratios computed within narrow bandwidths (2-5 nm) offer the greatest potential in remote sensing of stress physiology. This study determined the effects of nitrogen (N) stress on cotton growth, physiology and the spectral properties of photosynthetic tissues at full canopy measured in narrow bandwidths (~1.5 nm). Data from 1999 and 2000 were evaluated to determine consistency of difference in crop growth and selected reflectance indices across years. A N deficit commenced at first square (38 days after planting, DAP) led to significant reductions in leaf chlorophyll and plant dry weight accumulation, as compared to well-nourished plants. Stress symptoms were less severe when N deficit commenced at first flower (59 DAP), supporting evidence that fixed N can be readily mobilized to support continued growth in cotton. Among the various canopy waveband ratios investigated, significant difference between N-deficit treatments was detected in R_{840}/R_{700} (Table 2), and to a lesser extent R_{415}/R_{710} and R_{360}/R_{710}. Results suggest canopy reflectance in the red-edge (680-720 nm) or its ratio with reflectance measured in either the blue (near 400 nm) or the very near infrared (755-920 nm) regions of the spectra increased under N stress.

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