

**RELATIONSHIP OF NDVI TO EARLINESS OF MATURITY AS AFFECTED BY IRRIGATION
REGIME**

C. Owen Gwathmey
University of Tennessee
Jackson, TN
Brian G. Leib
University of Tennessee
Knoxville, TN
Christopher L. Main
University of Tennessee
Jackson, TN

Abstract

Cotton producers are interested in monitoring crop condition by remote sensing of spectral reflectance of the canopy. Earlier research showed that changes in Normalized Difference Vegetative Index (NDVI) of the cotton canopy corresponded to differences in crop maturity governed by nitrogen and potassium fertility. Objectives of this research were to determine if cotton responses to irrigation regime can be detected by remote sensing of NDVI, and to evaluate the suitability of using NDVI to monitor crop maturity as affected by irrigation. We planted 'DP143B2RF' in 2007, and 'PHY375WRF' in 2008, in a Memphis silt loam at Jackson TN. Irrigation treatments were applied to replicated small plots by drip tape that applied three rates of supplemental irrigation (0.5, 1.0, and 1.5 inches/week) starting at first square, and a nonirrigated check. The irrigation run time was adjusted for rainfall in order to apply a total of one inch per week from irrigation plus rainfall to designated plots. Other plots were irrigated proportionately to treatment rates. Canopy NDVI data were collected biweekly starting at mid-bloom, using a hand-held GreenSeeker Red/NIR sensor oriented vertically, 28 to 32 inches above the plants of each row. We collected 200 NDVI data points per plot biweekly. Earliness of maturity was measured as days from planting until plants had four nodes above the highest first-position cracked boll to the highest harvestable boll (NACB=4).

In 2007, irrigation treatments supplied from 23 to 48% of the total water received between planting and harvest. Non-irrigated cotton matured earlier (6 to 12 fewer days to NACB=4) than irrigated cotton. Differences in canopy NDVI due to irrigation appeared ~108 days after planting (DAP), and became more distinct thereafter. Canopy NDVI declined more rapidly with no irrigation or 0.5 inches per week than with higher irrigation rates. The extent of decline in NDVI from maximum values was correlated with earliness ($r=0.95$, $df=14$). Rainfall was more abundant in 2008, and irrigation treatments supplied from 14 to 33% of the total water between planting and harvest. Non-irrigated cotton matured earlier (14 fewer days to NACB=4) than cotton irrigated at 1.5 inches per week. Differences in canopy NDVI due to irrigation started to appear ~90 DAP, as NDVI was significantly lower with no irrigation than with 1.5 inches per week. The extent of decline in NDVI from maximum values was correlated with earliness ($r=0.67$, $df=14$), but the relationship was less distinct than in 2007. Results from both years indicate that cotton crop responses to irrigation were detected by NDVI sensing in late season, and the changes of NDVI from maximum values were associated with earliness of maturity.

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