# EFFECTS OF CULTIVAR MATURITY, NITROGEN AND IRRIGATION RATES ON PHYSIOLOGY AND YIELD OF COTTON

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## Abstract

Since the drought of 2007, irrigated cotton acreage in Tennessee has doubled to over 6% of the total cotton acreage as of 2012. However, this is still far less than the irrigated acreage of neighboring states. With approximately 69% of total production costs of cotton sunk before crop emergence, irrigation provides not only a way to increase yield, but also a way to safe-guard that upfront investment in the event of drought. The increase in irrigated cotton acreage has resulted in a surge of questions from producers on when and how much irrigation to apply and whether the recommended nitrogen application rates should be increased for irrigated cotton. Research was conducted to determine the optimal nitrogen application rate and the optimal rates of irrigation to apply at different growth stages to maximize yield and also to assess the effects and interaction of irrigation and nitrogen rates on growth and physiology of cotton. The study consisted of three sub-surface drip irrigation fields, each in a split split-plot design with irrigation rates at different growth stages as the whole plot factor and nitrogen rate and cultivar as the sub-plot factors. Each plot consisted of 4, 38”-rows, 30’-long, and planted at 41,200 seeds per acre. The crop was managed in accordance with UT recommendations. Multiple irrigation and nitrogen rates and early- (PHY367WRF) and mid-maturing (PHY499WRF) cultivars were assessed. Boll mapping of the 1$^{st}$ and 2$^{nd}$ positions (approximately 90% of yield) was conducted at each major growth stage. Overall, PHY499WRF had 14% (200 lbs/A) greater lint yield than PHY367WRF in two fields owing a majority of the response to irrigated treatments suggesting that PHY499WRF may be slightly more responsive to irrigation. At early bloom, PHY499WRF had significantly greater light interception (8% greater) and significantly greater leaf area than PHY367WRF, possibly establishing a greater source of carbohydrates prior to boll development. Irrigation of 0.5”/week at square and 1.5”/week during bloom significantly increased lint yield as compared to the rain fed regime in one field but no significant differences were found between irrigation rates at individual growth stages. Nitrogen rates up to 40 lbs/A significantly increased the number of fruiting branches and first position bolls at harvest and significantly increased lint yield for irrigated treatments. There was no positive yield response to nitrogen rates above 80 lbs/A but rather a clear downward trend in yield response at rates above 120 lbs/A which significantly reduced lint yield in one field. This study suggests that the long-standing nitrogen recommendation for Western Tennessee holds true for new cultivars regardless of irrigation regime.