# Irrigation And Nitrogen Fertility Effects On Cotton Yield And Fiber Quality

**DR. WILLIAM T. PETTIGREW**

**STONEVILLE, MISS.**

Although the price for cotton has appreciated to historically high levels in recent years, the cost for productions inputs has also steadily increased over the past few years. Rising costs have been particularly problematic with petroleum based inputs, such as nitrogen fertilizers and diesel fuel needed to run irrigation pumps. Because of these increasing input costs, it is important for producers to understand how to make the most efficient use of any input they incorporate into their production strategies. This research investigated the effectiveness of three rates of nitrogen fertilization under both irrigated and dryland conditions for 4 different cotton varieties.

Cotton was grown at Stoneville, MS in the years 2009-2011. The four varieties grown were 'DPL 0935B2RF', 'FM 840B2RF', 'PHY 485WRF', and 'STV 4554B2RF'. These varieties represented a range of maturities and breeding programs. Half the plots were furrow-irrigated and half the plots were grown under non-irrigated dryland conditions. All plots received one of three nitrogen fertility treatments (0 kg N ha-1, 56 kg N ha-1, or 112 kg N ha-1). Plots consisted of 4 rows spaced 1-m apart. The plots were 18.3 m long in 2009 – 2010 and 15.2 m long in 2011. The experimental design was a randomized complete block design with a modified split plot treatment arrangement and 6 replicates. The irrigation regimes were the main plots and the split plots were the variety by nitrogen treatments arranged factorially. Dry matter partitioning, canopy light interception, lint yield, yield components, and fiber quality data were collected.

The 2009 growing season was characterized by rains occurring on a regular basis such that the few irrigation events were needed, and those irrigations provided no beneficial effects on yield. Therefore, the 2009 data will not be presented. 2010 and 2011 were both dry years where a strong positive effect from the irrigation was observed. All the varieties responded similarly to both the nitrogen fertilization and irrigation. Although nitrogen fertilization produced a yield increase each year, the extent of that yield response was dependent upon whether the plots were irrigated or not. In 2010, the yield response to the highest nitrogen treatment under irrigated conditions was over twice as much as that observed under dryland conditions (270 kg ha-1 vs. 649 kg ha-1). The yield response to the highest nitrogen level in 2011 was only 208 kg ha-1, but under dryland conditions no significant response to nitrogen fertilization was detected.

Both irrigation and nitrogen fertilization impacted the quality of the fiber produced in 2010. Irrigation increased fiber length and micromaire by 3% and 8%, respectively. In contrast, irrigation caused a 1% decrease in fiber strength. Nitrogen fertilization increased fiber length by 1% and increased fiber strength by 3%. However, the fiber micronaire was 5% lower when the highest level of nitrogen fertilization was applied. Although these fiber quality differences caused by irrigation and nitrogen fertilization are statistically significant, most of those differences were relatively small and would generally not trigger a premium or discount on the price received for the fiber produced.

As the costs and availability of inputs becomes more challenging for cotton producers going into the future, producers will have to make difficult decisions as how to best allocate their input dollars. This research indicates that when water is limited during the growing season (through the lack of precipitation, insufficient irrigation capabilities, or restrictions on the ground or surface water supply available for irrigation), then the nitrogen fertilizer that is applied will not be used as efficiently by the plant to produce yield. Δ

*DR. WILLIAM T. PETTIGREW: Plant Physiologist, USDA-ARS, Crop Production Systems Research Unit, University of Mississippi*