

The Impact of Irrigation and Nitrogen Rate on Yield and Fiber Quality of Determinate and Indeterminate Cotton Cultivars

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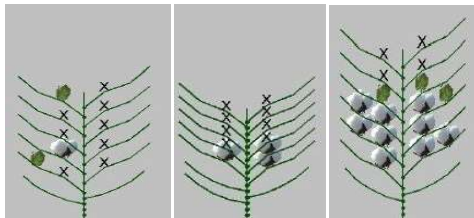
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Introduction



Optimizing irrigation quantity and timing at each growth stage is essential to maximizing cotton lint yield and preventing poor fiber quality.

Furthermore, yield and fiber quality responses to nitrogen (N) rate and irrigation regimes are hypothesized to vary by cultivar, especially between cultivars of varying maturities and determinacies.



How to optimize irrigation in/wk and N application lb/A to maximize cotton yield and fiber quality

In order to quantify cultivar response to N rate and irrigation, a study was conducted during 2012-2014 at the West Tennessee Research and Education Center (WTREC) in Jackson, TN.

Materials and Methods

Two cotton cultivars:

- PHY 367 WRF (early determinate)
- PHY 499 WRF (late indeterminate)

Were subjected to six sub-surface drip irrigation regimes:

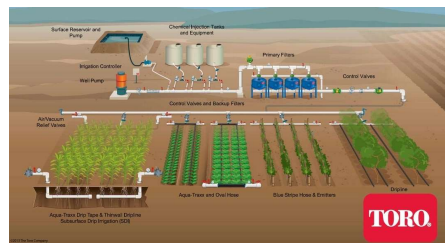
- Rainfed
- 0.5" water per week at mid-square
- 0.5-1.5" per week during late bloom
- 1.0-1.5" per week during late bloom

Two N rates:

- 80 lb N/ac
- 120 lb N/ac

The field trial design:

- Trial design was a **split-split-plot** with four replicates.



A schematic picture of a sub-surface drip irrigation system (The Toro Company, 2013)

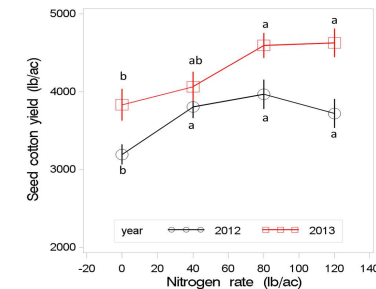


The sub-surface drip irrigation regimes system at WTREC designed and assembled by Tennessee Tractor LLC - Jackson John Deere Dealership

Results

- The response of lint yield and fiber quality to N rate, irrigation regime and cultivar varied in each of three years due to different rainfall amounts.
- During 2012 and 2013, PHY 499 WRF significantly out-yielded PHY 367 WRF.
- Also, in 2012, the 0.5"/wk mid-squaring-1.5"/wk late bloom irrigation regime significantly out-yielded the rainfed treatment.
- However, excessive amounts of rainfall relative to the 30 year normal trends for the location during 2013 and 2014 resulted in no significant yield or fiber quality differences associated with irrigation regimes.

- The effect of nitrogen rate was only significant during 2014, the 120 lb N/ac rate increased yield more than the 80 lb N/ac rate in most irrigation regimes.



Nitrogen rates (lb/ac) in 2012 and 2013
In 2012 and 2013, the 120 lbs N/ac rate did not significantly improve these parameters over the 80 lbs N/ac rate.

Sub-surface drip study lint yields (2012 and 2013)

	Lint yield (lb/A)
Cultivar	
PHY499WRF	1671.7 a*
PHY367WRF	1472.2 b
Irrigation Regime	
no irrigation	1191.1 b
0.0" mid-square, 0.5" mid-bloom, 1.0" late bloom	1502.3 ab
0.5" mid-square, 1.0" mid-bloom, 1.0" late bloom	1448.3 ab
0.5" mid-square, 1.0" mid-bloom, 1.5" late bloom	1778.1 a
0.5" mid-square, 1.5" mid-bloom, 1.5" late bloom	1704.3 a
0.5" mid-square, 1.5" mid-bloom, 1.0" late bloom	1807.8 a
Nitrogen Application Rate	
80 lbs N/A	1557.8 a
120 lbs N/A	1586.2 a

Discussion

However, there was no consistency found in interaction between irrigation regime, N rate and cultivar that impacted yield and fiber quality among the three years of study.

Additional research should be conducted to investigate this irrigation system and interactions during more normal-rainfall years.

References

- Gwathmey, C.O. 2009. Cotton Response to Nitrogen and Potassium Fertility. Cotton Focus meeting, UT Extension, 12 Feb 2009, Jackson TN.
- Subsurface drip irrigation by Netafim https://www.youtube.com/watch?v=8l_k_qy722U.
- United States Department of Agriculture. National Agricultural Statistics Service. 2012. URL: <http://quickstats.nass.usda.gov>.