TIMING OF INITIAL AND FINAL IRRIGATIONS IN COTTON

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Summary

Our objectives are to determine stage of cotton crop development when the initial and final irrigations should be applied. This work was conducted at the Coastal Plain Experiment Station Gibbs and Lang Farms in Tift County and the C.M. Stripling Irrigation Research Park (SIRP) in Mitchell County in 2002 and 2003. All locations were planted to DPL 458 (2002) or DPL 555 (2003) in late April or early May. All facilities are equipped with linear move overhead irrigation systems. Treatments for this investigation were (1) delay first in-season irrigation until first square (2) delay first in-season irrigation until first flower (3) irrigate prior to first flower as needed (4) final irrigation at first cracked boll and (5) final irrigation after first cracked boll as needed. Results from this study indicated final irrigations continued after first cracked boll or delayed initial irrigations until first flower decreased yield. Fiber quality data are not complete at this time.

Introduction

Historical weather records indicate Georgia receives approximately 25 inches of rainfall from May 1 to October 31 annually. While precipitation of this magnitude should easily produce a 2-bale cotton crop, the state 5-year average is well below this mark (676 lbs/acre). Availability of this precipitation, in terms of timing and placement, are key factors involved. Also, the sandy soils of the Coastal Plain may hold less than 1 inch of water per foot of soil, which would not meet the crops' water requirements during peak water usage without rainfall or supplemental irrigation. Ultimately, the Georgia cotton crop will experience intermittent drought during the growing season, which is the most limiting factor to cotton production in the state.

Due to modest profit margins, many farming enterprises in the last decade switched from dry land to irrigated crop production. This increase in irrigated production agriculture acreage, along with the increased population growth and water consumption in Georgia's urban areas, have resulted in diminished supplies of the states water resources. Currently, lawmakers and scientists alike are investigating means to sustain Georgia's water resources. One conservation measure suggested is the implementation of irrigation water quotas.

Objectives

Prior to implementation of irrigation water quotas, the water consumption of a particular crop, both in terms of timing and rate, must be discovered. Cotton crop

water use in the southeastern U.S. has never been documented. Our objectives are to determine stage of crop development when the initial and final irrigations should be applied. This information is expected to aid growers with irrigation management decision-making under both unlimited and limited irrigation water scenarios.

Methodology

This work was conducted at the Coastal Plain Experiment Station Gibbs and Lang Farms in Tift County and the C.M. Stripling Irrigation Research Park (SIRP) in Mitchell County in 2002 and 2003. All locations were planted to DPL 458 (2002) or DPL 555 (2003) in late April or early May. All facilities are equipped with linear move overhead irrigation systems. Treatments for this investigation were (1) delay first in-season irrigation until first square (2) delay first in-season irrigation until first flower (3) irrigate prior to first flower as needed (4) final irrigation at first cracked boll and (5) final irrigation after first cracked boll as needed.

Results

Figure 1 illustrates the average yield for the timing of the first irrigation for the three locations in 2002. Results indicate yield is reduced when the first irrigation is delayed until first flower. The water use curve presented in figure 2 shows the crop may use as much as 6 inches of water during the first 60 days (from emergence to first flower). Tifton soils have also been shown to hold about 2.75 inches of plant available water in the rooting zone. Thus, if rainfall is not sufficient, delayed irrigations until first flower may result in depleted soil water.

Figure 3 illustrates the average yield for the timing of the final irrigation for the three locations in 2002. From first cracked boll to 80% open boll (crop maturity) is approximately 30 days. The water use curve in figure 2 indicates the crop will use approximately 2.4 inches of water during this final 30 days. Thus, a final irrigation at first cracked boll to refill the soil profile to the rooting depth should be sufficient.

In 2003 these studies received between 25 and 30 inches of rainfall during the growing season. All study locations were irrigated only one or two times and rainfall was received within 24 hours after each irrigation event. Thus, due to more than sufficient rainfall in 2003, irrigation capacity (at any timing) did not improve lint yields.

Acknowledgements

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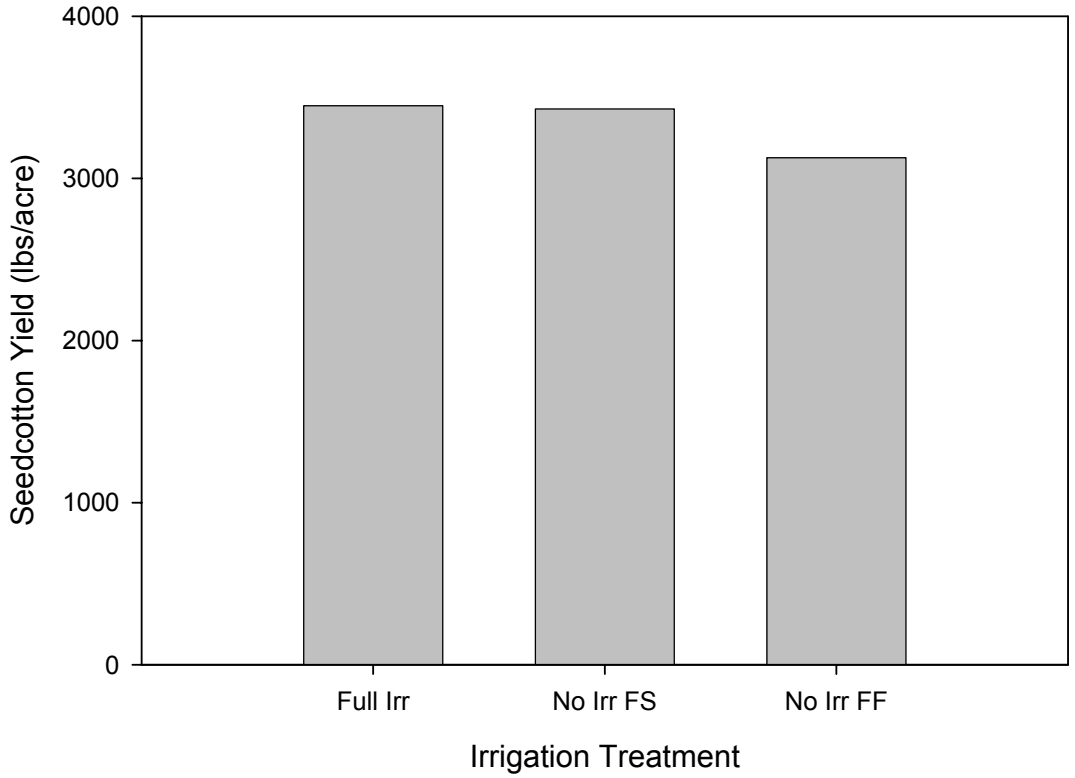

Figure 1. Effects of timing of first irrigation on seedcotton yield in 2002. Results are a combined analysis of three locations (UGA Gibbs Farm, UGA Lang Farm and UGA SIRP).

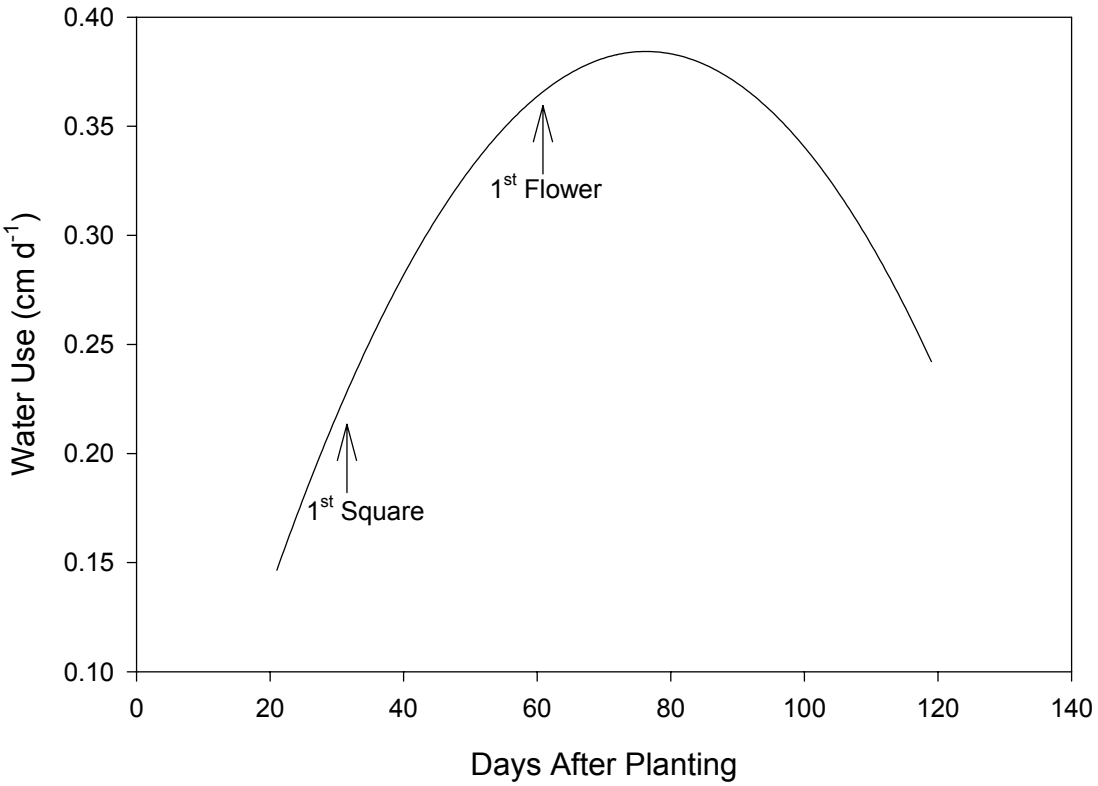

Figure 2. Average daily crop water use in irrigation studies conducted at the University of Georgia Coastal Plain Experiment Station on a Tifton Loamy Sand in 2000, 2001 and 2002.

$Y = -0.0686 + 0.0119X - 7.7838e^{-5}X^2$

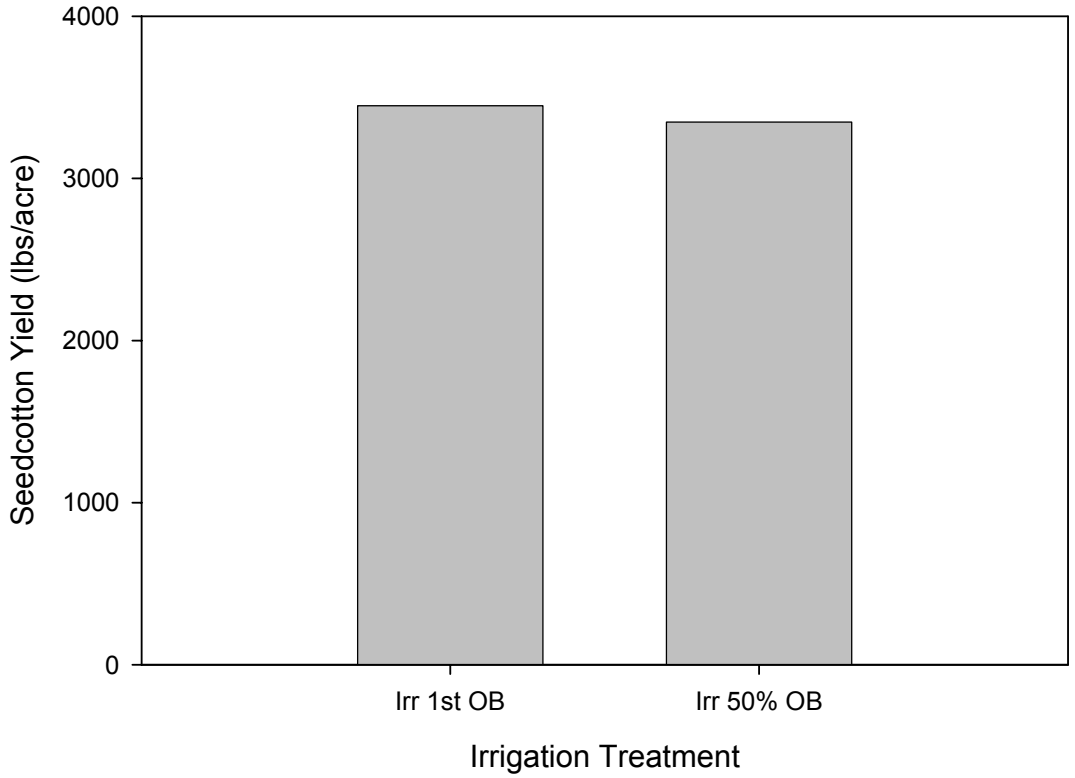

Figure 3. Effects of timing of final irrigation on seedcotton yield in 2002. Results are a combined analysis of three locations (UGA Gibbs Farm, UGA Lang Farm and UGA SIRP).