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TIMING THE LAST IRRIGATION USING COTMAN IN A *LEPA* IRRIGATION SYSTEM

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Abstract

Irrigation, is a production tool just like tillage, fertilizer or pesticides. Terminating irrigation at the end of the season is always a difficult decision. The challenge of late season irrigation scheduling arises from the need to deplete the soil profile of available moisture during boll opening. The objective of this study was to determine the optimum timing for terminating LEPA irrigation through the use of COTMAN. Once cutout was achieved, heat units (HU) were accumulated up to the targeted treatment level, at which point the irrigation was terminated. Treatments consisted of, 400 HU past cutout, 600 HU past cutout and 800 HU past cutout. The most economical target for timing the termination of LEPA irrigation appears to be when 600HU past cutout has been accumulated.

Introduction

Irrigation, is a production tool just like tillage, fertilizer or pesticides. The goal of water management is to meet the crop demand while optimizing yield with the irrigation available. Terminating irrigation at the end of the season is always a difficult decision and one that producers struggle with every year. If terminated too early, top-set bolls shed or fail to mature; if terminated too late, water is wasted, defoliation is more difficult and fiber quality suffers. Optimum timing of irrigation termination would allow sufficient moisture for the plant to fill the last effective boll population. The challenge of late season irrigation scheduling arises from the need to deplete the soil profile of available moisture during boll opening.

Objective

To determine the optimum timing for terminating LEPA irrigation through the use of COTMAN.

Materials and Methods

This study was conducted using a center pivot irrigation system utilizing Low Energy Precision Application (LEPA) technology. Water was applied through drag socks which deposit water on the ground surface between alternate rows containing furrow dikes. A randomized block design with three treatments and four replications was used. Plots were eight solid planted circular rows by 180 feet. Cotton was planted on May 8th and the variety was PM2326RR. Treatments consisted of:

1) 400 heat units (HU) past cutout,
2) 600 HU past cutout and
3) 800 HU past cutout.

Cutout was defined as physiological, having obtained five nodes-above-first-position-white-flower(NAWF) prior to August 11. Once cutout was achieved, heat units were accumulated up to the targeted treatment level, at which point the irrigation was terminated for the corresponding treatment plots. The actual turning on and off of the drops was done through automation of the pivot. The irrigation system delivered 0.4 inches every two and a half days or pass at a cost of $2.48 per round or $6.20 per inch. Costs include the demand charge.

Cotton was terminated, according to the COTMAN rule of 850 HU past cutout, on October 3, with 8 ounces of Ginstar® and one pint of Boll D® in 10 gallons per acre of formulated solution. Cotton from the middle four rows of each plot was machine harvested and weighed on October 15. A grab sample was collected from each harvested plot, ginned at the Texas Agricultural Experiment Station in Lubbock and fiber quality analysis was obtained through the International Textile Center in Lubbock.

Results and Discussion

Due to the design of the study area, the actual heat unit accumulation past cutout had a range of about 20 HU by the time the pivot passed through all of the corresponding plots (Table 1).

Lint weight per acre (yield) increased significantly as the accumulation of heat units past cutout for scheduling the final irrigation also increased (Table 2). Both the 600HU and 800HU past cutout treatments yielded significantly more lint weight per acre than did the 400HU past cutout treatment, but they did not differ from each other.

Micronaire also increased as the accumulation of heat units past cutout for scheduling the final irrigation increased while fiber length, fiber length uniformity, fiber strength and color grades were virtually unaffected. (Table 3). These fiber qualities were used to calculate a loan rate per lint pound, and the loan rate was multiplied by the lint yield to determine the lint value per acre (Table 4). There were no differences between treatments for loan rate; however, all three treatments were below the Base Loan Rate primarily due to short fiber length. The lint value per acre for the 600HU and 800HU treatments differed significantly from the 400HU treatment but did not differ from each other.

Each treatment received 5.1 inches of irrigation and 6.6 inches of rain from May 8th (planting) to August 3rd when the final irrigation for the 400HU past cutout treatment was initiated. The rainfall all occurred between May 19 and June 9. The 600HU past cutout treatment received an additional 0.8 inches of irrigation, or two more passes, for an additional irrigation cost of $4.96 compared to the 400HU past cutout treatment. The 800HU past cutout treatment received an additional 1.6 inches of irrigation, or four more passes, for an additional irrigation cost of $9.92 and $4.96 compared to the 400HU and 600HU past cutout treatments respectively. The additional irrigations in both the 600HU and 800HU past cutout treatments returned a net profit per acre compared to the 400HU past cutout treatment. However, the 800HU past cutout treatment returned a negative net return per acre when compared to the 600HU past cutout treatment (Table 4).

Conclusions

In the absence of late-summer and/or early-fall rains, terminating LEPA irrigation at 400 HU past cutout or before is too soon. The most economical target for timing the termination of LEPA irrigation appears to be when 600HU past cutout has been accumulated.

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Table 1. Actual HU accumulation past cutout and the corresponding dates in which irrigation was terminated using different HU accumulations past cutout in a LEPA irrigation system. AG-CARES Farm, Lamesa, Texas. 2003.

Target HU Accumulation	Actual HU Accumulation	Date of Last Irrigation
400	410 - 437	August 3 - 4
600	628 - 641	August 12 - 13
800	807 - 826	August 22 - 23

Table 2. Yield (lint pounds/acre) in which irrigation was terminated using different HU accumulations past cutout in a LEPA irrigation system. AG-CARES Farm, Lamesa, Texas. 2003.

Target HU Accumulation	Lint Weight (lbs.) Per Acre
400	294 b [1/]
600	460 a
800	481 a

1/ Means in a column followed by the same letter are not different (P=0.10, LSD).

Table 3. Fiber quality measures in which irrigation was terminated using different HU accumulations past cutout in a LEPA irrigation system. AG-CARES Farm, Lamesa, Texas. 2003.

Fiber	Accumulated Heat Units Past Cutout		
Quality Factors	**400**	**600**	**800**
Mic	3.8 (+) [1/]	4.2 (+)	4.8
Length [2/]	0.99 (32)	1.01 (32)	1.00 (32)
Strength	29.5 (+)	30.8 (+)	29.9 (+)
Uniformity	81.2	82.1	82.6
Color	31	31	31

1/ (+) indicates the fiber measure fell within the premium range
2/ Length given in 1/100ths inches; number in parenthesis is length given in 32nds

Table 4. Loan rate per lint pound, lint value per acre and net return per additional irrigation in which irrigation was terminated using different HU accumulations past cutout in a LEPA irrigation system. AG-CARES Farm, Lamesa, Texas. 2003.

Target HU Accumulation	Loan Rate (points / lint lb)	Lint Value ($ / Acre)	Net return ($) per additional irrigation compared to the 400HU treatment	Net return ($) per additional irrigation compared to the 600HU treatment
400	4950 a [1/]	145.48 b	----	----
600	5001 a	231.79 a	40.68	----
800	4871 a	234.89 a	19.87	-0.93

1/ Compared to the 200 HU past cutout treatment.
2/ Means in a column followed by the same letter are not different (P=0.10, LSD).