

Josh B. Bynum

Department of Soil & Crop Sciences

Nature of the Problem

BIOTIC and CropMan have been developed to aid growers in scheduling irrigation of various crops. BIOTIC (Biologically-Identified Optimal Temperature Interactive Console) is a device used to improve irrigation by using crop canopy temperature measurements. BIOTIC triggers irrigation by the use of a thermal kinetic window (TKW). TKW is defined as a temperature range that permits normal enzyme function in plants. The estimated TKW for cotton is 23.50 - 32.0 C (2). Within the TKW, plants are able to cool themselves through transpiration. When the crop canopy temperature exceeds the TKW the BIOTIC device will use a signal as an indicator for irrigation. Regardless of the ambient temperature, crop canopy temperatures may be affected by atmospheric humidity. High humidity levels may retard the transpiration cooling process to which a signal for an application of irrigation from the BIOTIC device would not be effective in reducing crop canopy temperatures. Thus far, the BIOTIC device has been successfully researched and implemented in the Lubbock surrounding area. Further research is needed to test the adaptiveness of this model in regions of high humidity.

CropMan is a computer software model for predicting irrigation by integrating soil moisture measurements, soil type, potential evapotranspiration (PET), water potential and historical weather patterns. Soil moisture measurements will be taken with a multi-segmented Dynamax Theta Probe. These measurements will be extracted daily and entered into the computer model. This model will determine proper scheduling of irrigation through the previous mentioned techniques.

Delta Pine 451 B/RR will be grown under field conditions in a split plot design with four replications. Treatments for BIOTIC plots will consist of three time thresholds: 0 hours (dryland), 5 hours, and 7 hours. Treatments for CropMan plots will consist of three water regimes: 0% PET(dryland), 50% PET, and 100% PET.

Research Objectives

To compare two methods of irrigation timing (BIOTIC versus CropMan) to optimize water use efficiency in cotton.

To determine the impact of water availability on yield, yield parameters, and fiber quality as assessed by BIOTIC and CropMan.

Field experiments will be conducted at the Texas Agricultural Experiment Station near College Station, Texas. The treatments will consist of the following irrigation regimes:

1. BIOTIC time threshold = 0 hours (dryland)
 time threshold = 5 hours
 time threshold = 7 hours

2. CropMan PET = 0% (dryland)
 PET = 50%
 PET = 100%

The research of developing improved irrigation strategies is of great importance due to our depleting water supply. The advantages of using these irrigation prediction models could impact growers statewide. Identifying the adaptation of these models to various climates will assist researchers in continuing the improvement of irrigation strategies.

Intended Career Path Statement

I have been involved in agronomic research at many capacities the past 5 years. I have found a love for this type of research that impacts growers and is beneficial to all those involved with growers. I have committed myself to Texas A&M University through a Ph.D. Upon graduating, I would like to continue my BIOTIC research with Dr. James Mahan at the Texas Agricultural Experiment Station in Lubbock. I believe that irrigation research is cutting edge and affects many statewide. I believe that I can take my irrigation research and knowledge and apply it anywhere.