COTTON MONITORING FOR IN-SEASON MANGAGEMENT DECISIONS IN FAR WEST TEXAS

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Abstract

Cotton (Gossypium spp.) produced under fully-irrigated conditions in the Desert Southwest is expensive and management intensive, having many factors that affect cotton growth and development throughout the growing season. Therefore, many in-season decisions need to be made in a timely fashion, which can greatly affect final yield. Cotton monitoring assists producers make informed in-season management decisions: Presented here, is a method of taking simple plant measurements and graphing trends of plant growth and development against standard curves to identify if the crop is developing correctly. The standard curves include upper and lower thresholds, so that "normal" growth and development can be easily identified. Trends that cross the thresholds indicate an abnormal situation, which requires a management correction. The standard curves used in this system were developed in the Desert Southwest under environmental conditions similar to the Trans-Pecos region of Texas (Silvertooth, 1994).

Introduction

The cotton plant must maintain a balance between vegetative and reproductive growth for optimum production. Vigorous vegetative growth (vigor) is important since this provides the structure upon which the plant will set fruit (squares, flowers, and bolls). If a plant grows too vigorously there may be problems with harvest operations (especially in stripper-harvested areas). It may also indicate that the plant is out of balance regarding reproductive growth (lost fruit may result in excessive plant height). The ultimate goal is cotton production, so it is important that the plant hold as much fruit as possible. The measures of growth and development used are height-to-node ratio (HNR), which is the measure of crop vigor and fruit retention (FR), a measure of reproductive growth.

Terms and Definitions

Plant height: measured in inches from the cotyledonary node to the top of the plant. Total mainstem nodes: the number of mainstem nodes above the cotyledons, including the top node with a one-inch diameter leaf. First fruiting branch: the first branch on the mainstem (above the cotyledon) that bears fruit. Aborted positions: sites on a fruiting branch where squares or bolls (fruit) have been lost.

Materials and Methods

By taking a few simple measurements in each field on a regular basis (at least every two weeks recommended), a producer can follow the growth and development trend of his crop as it proceeds through the season. The following measurements are required from each field in order to calculate the HNR and FR: plant height, first fruiting branch, total mainstem nodes, and aborted first and second positions on each fruiting branch.

Data from each field is plotted on a graph as a function of heat units accumulated after planting (86/55° F upper and lower thresholds, Brown 1989). Each graph contains the mean (center black line) and the upper and lower thresholds for the measurement (upper and lower black lines, respectively). As the data trend approaches or crosses one of the thresholds, the producer is alerted to the fact that a management change may be warranted. This may require further investigation of the field to determine the cause of the trend (environmental stresses such as lack of water, nitrogen, insect damage, etc.).

To illustrate the use of this crop monitoring system, the HNR and FR from the 1997 El Paso, and 1998 Pecos, Texas counties cotton variety trials are shown with a brief analysis. Both were produced under fully-irrigated conditions.

Discussion

Cotton plant measurements from selected entries in the 1998 Pecos, Texas, County cotton variety trial are shown in Fig. 1 and 2. The HNR (Fig. 1) begins low but increases slightly to stay just above the lower threshold. The FR (Fig 2) begins quite high through about 2500 HUAP, then declines in an acceptable fashion. This indicates that a heavy fruit load is keeping plant height under control. In this case the manager should make sure enough nitrogen has been applied to reach the yield goal (70 lb N/bale) and provide adequate irrigation for the developing boll load.

Figures 3 and 4 show the measurements from selected entries in the El Paso, Texas, County cotton variety trial conducted in 1997. Figure 3 shows that the HNR approaches the upper threshold (DP 90B crosses it). Fruit retention is initially low, especially for DP 90B, but increases until about 2000 HUAP (Fig. 4). Both HNR and FR are increasing at the same time. This indicates that FR is not a problem but plants are still too tall. Therefore, an application of a plant growth regulator (Pix^{O}) was made at about 1500 HUAP to control plant height.

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Summary

It is very important to follow the trends of a cotton crop throughout the growing season. However, simply following the trend of the crop without some established baselines for growth and development will not provide the producer anything to compare his crop with. By plotting measured HNR and FR against the established baselines a producer can determine if his crop is progressing in a reasonable fashion and make informed management decisions based on the needs of his crop on a real time basis.

In addition to the standard curves and thresholds presented here, standard curves for American Pima (G. barbadense L.) cotton also exist (Silvertooth, 1997, personal communication). These can be used in similar fashion for Pima produced in the Trans-Pecos.

References

Brown, P. W. 1989. Heat units. University of Arizona College of Agriculture, Bulletin 8915.

Silvertooth, J. C. 1994. Practical uses of crop monitoring for Arizona cotton. p. 18-23. *In* Cotton. College of Agriculture Report Series P-96. University of Arizona, Tucson.

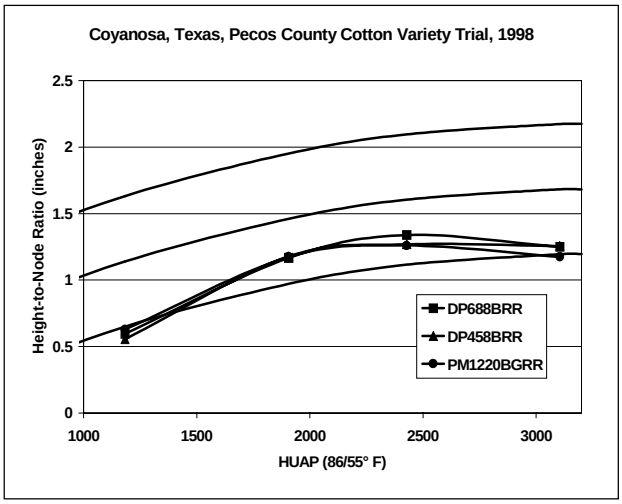

Figure 1. Height-to-node ratio for selected entries in the Pecos County cotton variety trial, 1998.

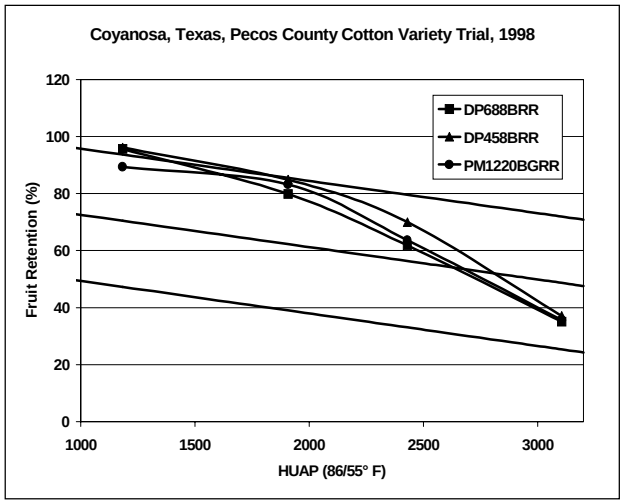

Figure 2. Fruit retention for selected entries in the Pecos County cotton variety trial, 1998.

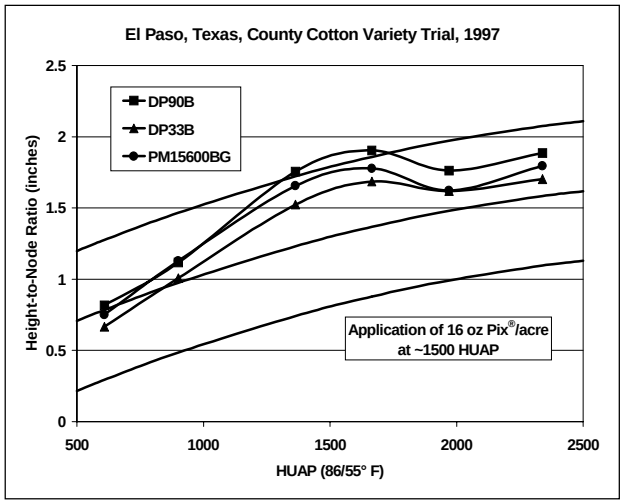

Figure 3. Height-to-node ratio for selected entries in the El Paso County cotton variety trial, 1997.

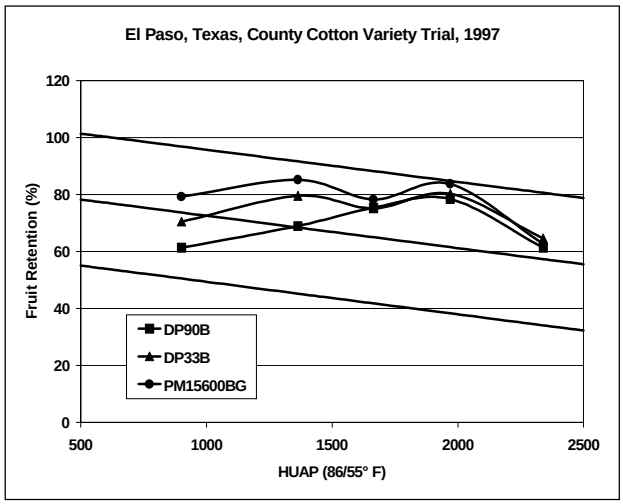

Figure 4. Fruit retention for selected entries in the El Paso County cotton variety trial, 1997.