# DETERMINING CULTIVAR MATURITY CHARACTERISTICS IN THE SOUTHWEST, MID-SOUTH, AND SOUTHEAST

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## Abstract

Cotton fruit production and retention vary substantially by cultivar, geography, and environmental factors. Furthermore, differences in boll distribution affect crop maturity characteristics, response to stress, and environmental suitability. One of the challenges in choosing cotton cultivars for maturity characteristics is that there is not a single, consistent method for determining cotton crop maturity; however, plants can be mapped to determine crop maturity. The oldest bolls are formed near the base of the plant, and new bolls are progressively produced up the plant. This study was initiated to compare the maturity characteristics of 7 common cotton cultivars in multiple locations of the cotton belt using plant mapping. The cultivars were grown under irrigated conditions in Texas, Tennessee, and Georgia. Nodes above white flower were counted weekly, and then subplots were harvested for boll mapping and boll weight. Estimates of maturity differed significantly between boll distribution measurements and NAWF measurements at all locations. Maturity also varied between cultivars based on the environment they were grown in. Additional work is being conducted to further characterize these differences.

## Introduction

Cotton fruit production and retention vary substantially by cultivar, geography, and environmental factors. Furthermore, differences in boll distribution affect crop maturity characteristics, response to stress, and environmental suitability.

One of the challenges in choosing cotton cultivars for maturity characteristics is that there is not a single, consistent method for determining cotton crop maturity. One quick method of maturity measurement is nodes above white flower (NAWF), but the relationship between NAWF and crop maturity may not be consistent over cultivars.

Plants can be mapped to determine crop maturity. The oldest bolls are formed near the base of the plant, and new bolls are progressively produced up the plant. Bednarz and Nichols (2005) found the following: fruiting interval for adjacent nodes ranged from 2.1-2.7 days; interval for horizontal fruiting position at a fruiting node was 3.2 to 4.4 days; and, fruiting interval depended upon environment and the location of the fruit on the plant.

This study was initiated to compare the maturity characteristics of 7 cotton cultivars in multiple locations of the cotton belt. Specifically, we tried to determine the efficacy of in-season maturity estimates (NAWF) for determining cultivar maturity characteristics and compare relative maturity of cultivars among environments in Texas, Tennessee, and Georgia. Techniques for boxpicking and plant mapping followed protocols established in previous research (Ritchie et al., 2009; Ritchie et al., 2011).

## Materials and Methods

Seven cotton cultivars (DP0912B2RF, DP0949B2RF, DP1050B2RF, DP104B2RF, PHY755WRF, PHY375WRF, and FM1740B2RF) were grown in West Texas, Tennessee, and Georgia, in randomized complete block designs with four replicates in each location in 2011. Plant densities ranged from 11-14 seeds $m^{-2}$. Management was based on extension guidelines in each environment.

In-season measurements included total nodes, NAWF, plant height, and white flower node by position at regular intervals. The plots were all irrigated, and had minimal PGR applied. At the end of season, 1-m samples were hand-harvested, plant mapped, and box-picked by fruiting site. Fiber quality analysis by fruiting site maturity classification is ongoing at the time of this paper, and is therefore not presented for any of the locations.

Distribution of boll numbers and mass were compared with in-season NAWF measurements. Relative maturities of the cultivars in all environments based on boll distribution were also compared. Where appropriate, data were subjected regression analysis, as well as to least-squares means analysis using the GLIMMIX procedure in SAS 9.2.

## Results and Discussion

In order to divide bolls based on fruiting date, the relationship between the nodes of white flower for first- and second-position fruit was measured. As shown in Figure 1, flowering occurred on the 2nd position at the same rate as the 1st position (slope of 0.99 for all Texas data; slope of 0.96 when averaged by cultivar). White flowers occurred about 2 nodes lower on the 2nd position than the 1st position (intercept of -2.45 for all Texas data; intercept of -2 when averaged by cultivar). There were no discernible variety effects on slope or intercept.

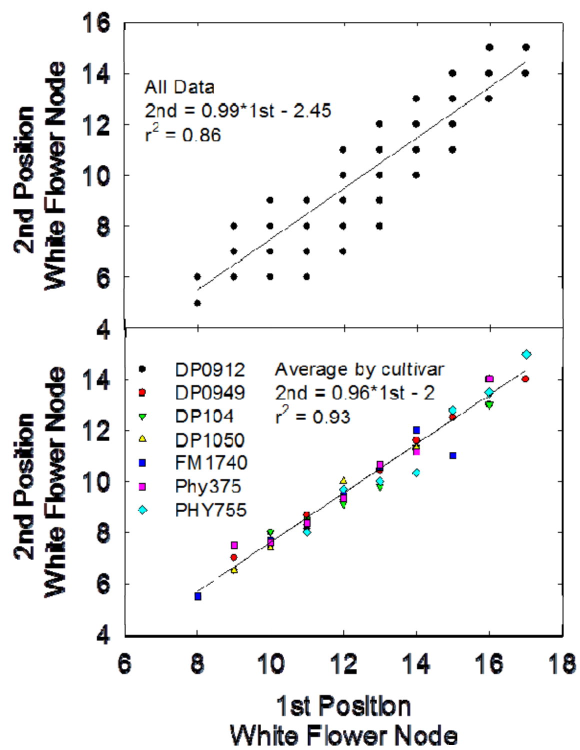


Figure 1. Relationship between white flower location on first and second position nodes on specific sampling dates throughout the growing season in Texas.

The NAWF measurements suggested that there were differences in maturity by cultivar in all locations. In Tennessee and Georgia, the cultivars with the latest decline in NAWF were DP0949 and DP1050. In Tennessee, PHY755 also had a late decline in NAWF, as did FM1740 in Georgia. In Texas, the latest declines in NAWF were noted in DP1050, DP104, and FM1740 (Figure 2).

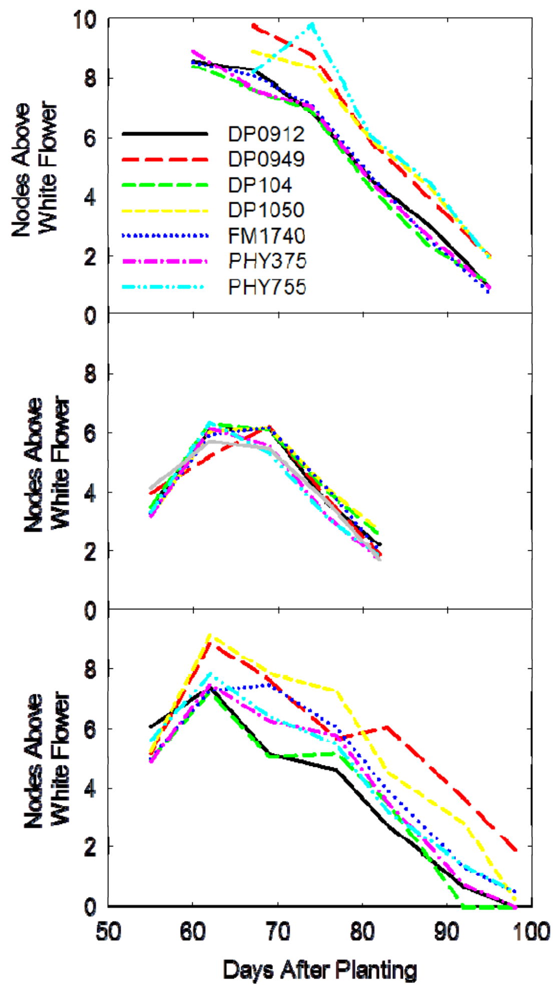


Figure 2. Nodes above white flower (NAWF) by days after planting in Tennessee (top), Texas (middle), and Georgia (bottom) in 2011.

Differences in boll distribution were distinct among locations (Fig. 3). In Tennessee, DP0912, PHY755, and DP104 had the latest fruiting characteristics. DP0949 started late, but reached total yield relatively early. FM1740, PH375, and DP1050 were earliest, based on boll accumulation by node. In Texas, DP0949 and PHY755 exhibited the latest boll accumulation, while DP104 was substantially earlier than the other cultivars. In Georgia, PHY755 and DP0949 were the latest cultivars, but there was little separation between the other cultivars. PHY375 had more early fruit than other cultivars, but exhibited later fruiting characteristics at the top of the plant. Nodes above white flower and boll distribution were not consistent with each other when comparing cultivars.

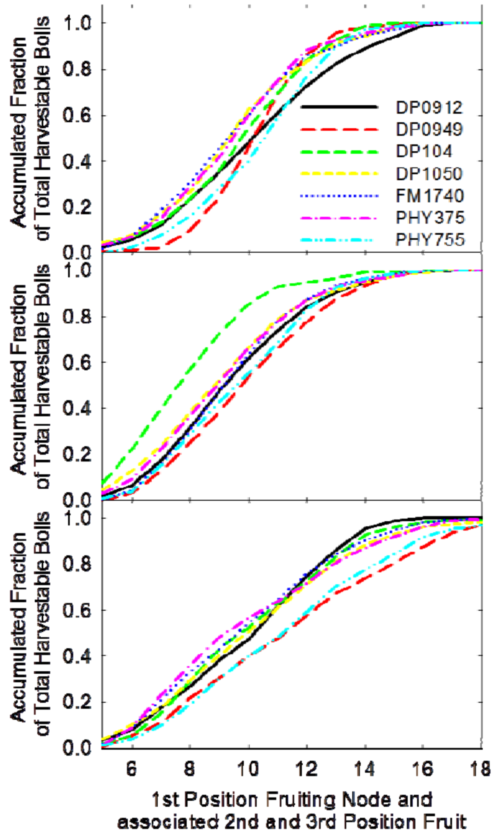


Figure 3. Boll accumulation by fruiting node for all cultivars in Tennessee (top), Texas (middle), and Georgia (bottom) in 2011.

**Summary**

Estimates of maturity differed significantly between boll distribution measurements and NAWF measurements at all locations. Maturity also varied between cultivars based on the environment they were grown in. Additional work is being conducted to further characterize these differences.

**Acknowledgements**

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