REDEFINING MANAGEMENT STRATEGIES FOR NEW COTTON VARIETIES IN THE POST DP 555 BR ERA

Guy Collins and Jared Whitaker
Crop and Soil Sciences, University of Georgia, Tifton

Introduction

Prior to 2010, approximately 85 percent of the Georgia cotton acreage was planted to DP 555 BR. Due to the expiration of the EPA registration for the Bollgard™ technology, only an approximate 25 percent of the Georgia cotton acreage was planted to DP 555 BR in 2010, with the remaining 75 percent planted to relatively new varieties. In 2011, 100 percent of the Georgia cotton acreage was planted to varieties other than DP 555 BR. The 2011 acreage, and beyond, will likely be comprised of a diverse group of varieties, as a single predominate replacement for DP 555 BR is unlikely in the near future. Some of the most popular new varieties often exhibit vastly different fruiting characteristics than that of DP 555 BR. Most of these varieties tend to set more fruit on lower nodes and less fruit on upper nodes compared to DP 555 BR, and many do not appear to exhibit the excessive vegetative growth characteristics that DP 555 BR did. Therefore, many of the newer varieties may require less aggressive plant growth regulator (PGR) management in order to maximize boll set and lint yields.

Materials and Methods

A series of experiments was conducted during 2010 and 2011 in Tifton, GA and in Midville, GA to investigate the response of several of the newer cotton varieties to various PGR management strategies. These trials were conducted using a randomized complete block design containing four replications. All PGR treatments were applied using a CO_2-pressurized backpack sprayer calibrated to deliver 15 GPA using regular flat-fan nozzles. The objective of Experiment #1 was to quantify the response of several new varieties to an aggressive PGR treatment consisting of Mepiquat Chloride (MC) applied at a rate of 12 oz/A to 9-10 leaf(lf) cotton, followed by (fb) 16 oz/A MC at early bloom (EB), fb 16 oz/A MC at EB+2weeks (wk), and lastly 16 oz/A MC at EB+4wk only if needed to prevent plants from exceeding an optimal plant height. This PGR treatment was representative of a commonly used approach to adequately suppress plant height for DP 555 BR, especially in well-watered environments. The varieties included in Experiment #1 included DP 555 BR, DP 1050 B2RF, DP 1048 B2RF, DP 0949 B2RF, PHY 565 WRF, PHY 375 WRF, PHY 485 WRF, ST 4288 B2F, ST 5458 B2F, and FM 1740 B2F in 2010, and DP 0949 B2RF, DP 1137 B2RF, DP 1050 B2RF, DP 1048 B2RF, DP 0912 B2RF, FM 1740 B2F, FM 1845 LLB2, FM 1773 LLB2, ST 4145 LLB2, ST 4288 B2F, ST 5458 B2RF, PHY 565 WRF, PHY 375 WRF, and PHY 499 WRF in 2011 evaluated in both irrigated and dryland conditions in 2010 and irrigated conditions

in 2011. The objective of Experiment #2 was to determine if a pre-bloom MC application was necessary to adequately suppress plant height for some of the new varieties, which included DP 555 BR (2010 only), DP 0949 B2RF, DP 0912 B2RF, and FM 1740 B2F. PGR treatments used in Experiment #2 included a non-treated control; an aggressive treatment consisting of 12 oz/A MC applied to 9-10 lf cotton fb 12 oz/A MC at EB fb 16 oz/a MC at EB+2wk; a mild treatment consisting of 12 oz/A MC at EB fb 16 oz/a MC at EB+2wk; and a non-aggressive treatment consisting of a single application of 16 oz/a MC at EB+2wk. The objective of Experiment #3 was to determine if Stance™ (ST) (usually resulting in milder, or more forgiving, plant height suppression) is a more appropriately used for pre-bloom applications, if justified, for an earlier maturing variety. Varieties included in Experiment #3 included DP 1050 B2RF and FM 1740 B2F and PGR treatments included a non-treated control; 2 oz/A ST applied to 9-10 lf cotton fb 3 oz/A ST at EB; 2 oz/A ST applied to 9-10 lf cotton fb 16 oz/A MC at EB; 3 oz/A ST applied to 9-10 lf cotton fb 16 oz/A MC at EB; 8 oz/A MC applied to 9-10 lf cotton fb 16 oz/A MC at EB; and 12 oz/A MC applied to 9-10 lf cotton fb 16 oz/A MC at EB.

Results

Results from Experiment #1 in 2010 indicated that newer varieties differ in their responses to an aggressive PGR treatment, which was previously required to manage growth of DP 555 BR. The greatest responses in the irrigated trial occurred with DP 555 BR, DP 0949 B2RF, ST 5458 B2RF, ST 4288 B2F, and PHY 565 WRF, however the first two varieties resulted in optimal plant height when treated with this aggressive PGR strategy – the latter three varieties tended to dramatically cease vegetative growth once treated. The greatest responses in the dryland trial occurred with DP 0949 B2RF and PHY 565 WRF, however a large number of the varieties tested were within the optimal plant height range without being PGR-treated. Some other key findings include the following: DP 0949 B2RF exhibited very similar growth potential to that of DP 555 BR in 2010 - all other varieties resulted in less aggressive growth and tended to respond more to PGR treatments; early maturing varieties such as ST 4288 B2RF, FM 1740 B2F, and most of the FM Liberty Link™ varieties (2011 only) tended to result in modest growth potential, suggesting that aggressive PGR management may not be necessary to achieve optimal plant height. In 2011, similar results occurred from this experiment, however the evaluation of newer varieties, including the LLB2 varieties, were interesting (Figures 1-3). Varieties like DP 0949 B2RF, DP 1050 B2RF, DP 1048 B2RF and the new PHY 499 WRF appear to have the most aggressive growth potential. ST4145 LLB2 ranked relatively high based on non-treated plant height but fell two positions in relative ranking when PGR-treated plant height was accounted for. This indicates that ST 4145 LLB2 may respond more so the PGRs than other varieties, but still exhibits growth potential on the medium range. A similar effect was observed for FM 1773 LLB2 and DP 0912 B2RF which also ranked higher than PHY 375 WRF and DP 1133 B2RF in the absence of PGRs, however their relative ranking fell below the latter two varieties once PGR-treated plant height was accounted for. FM 1845 LLB2 and FM

1740 B2F held a lower rank than other varieties regardless of PGR treatment, however some data suggests that FM 1845 LLB2 may be slightly more aggressive than FM 1740 B2F. Results from Experiment #2 indicated that a pre-bloom PGR application was necessary to achieve optimal plant height (38 to 45 inches) for DP 555 BR (2010 only) and DP 0949 B2RF, however the pre-bloom application resulted in less-than-optimal final plant height for the two early maturing varieties; DP 0912 B2RF and FM 1740 B2F. Especially in the case of FM 1740 B2F, optimal plant height was achieved when PGRs were applied at EB or thereafter, suggesting that similar earlier maturing varieties would require very little PGR management if any at all. Results from Experiment #3 suggest that 2 oz/A ST applied to 9-10 lf cotton fb 3 oz/A ST at EB resulted in taller plants compared to 12 oz/A MC applied to 9-10 lf fb 16 oz/A MC at EB for DP 1050 B2RF, however plant height was similar between these two PGR treatments when applied to FM 1740 B2F, suggesting that Stance™ may adequately suppress plant height for FM 1740 B2F whereas MC may be more appropriate for DP 1050 B2RF. Results from Experiment #4 (conducted only during 2010) indicated that 12 oz/A MC applied thrice resulted in significantly different plant height between DP 555 BR and FM 1740 B2F, however these two varieties responded similarly to all other PGR treatments. These results also indicated that 8 oz/A MC applied thrice to DP 555 BR resulted in similar plant height to that of 2 oz/A ST applied thrice to FM 1740 B2F. These data suggests that ST may be a more appropriate PGR option to suppress height for early maturing varieties, whereas standard MC products may be more appropriate for growth management of more vigorous later maturing varieties.

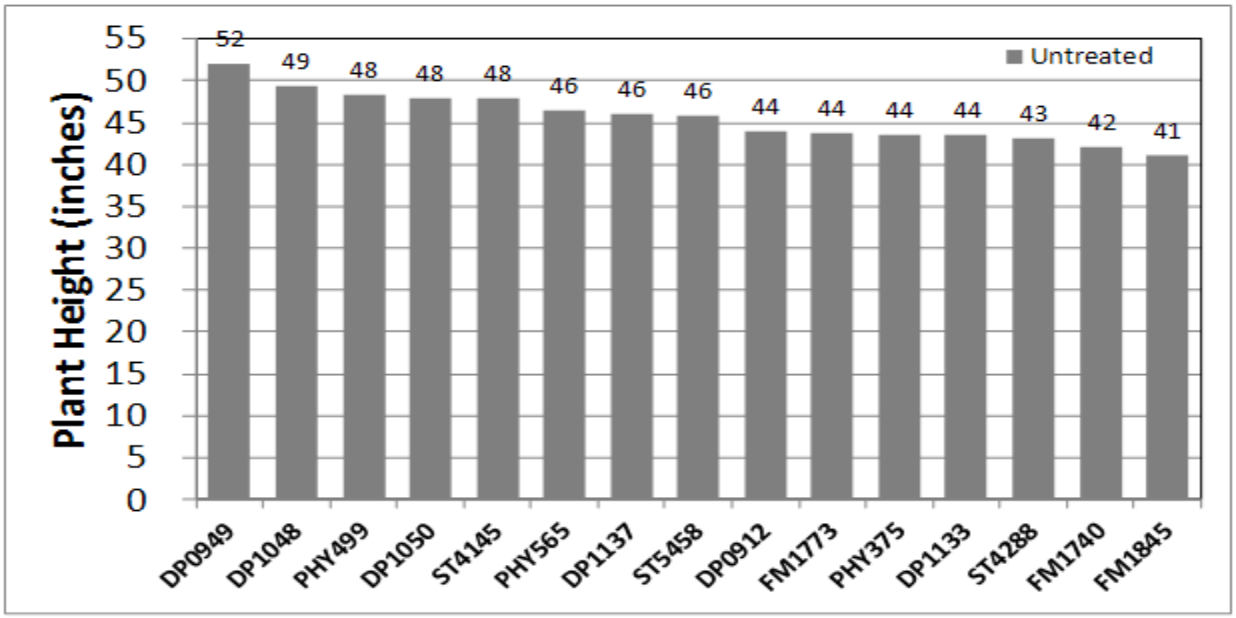

Figure 1. Plant height of non PGR-treated cotton varieties ranked in descending order. Data are combined over 2011 Tifton and Midville trials.

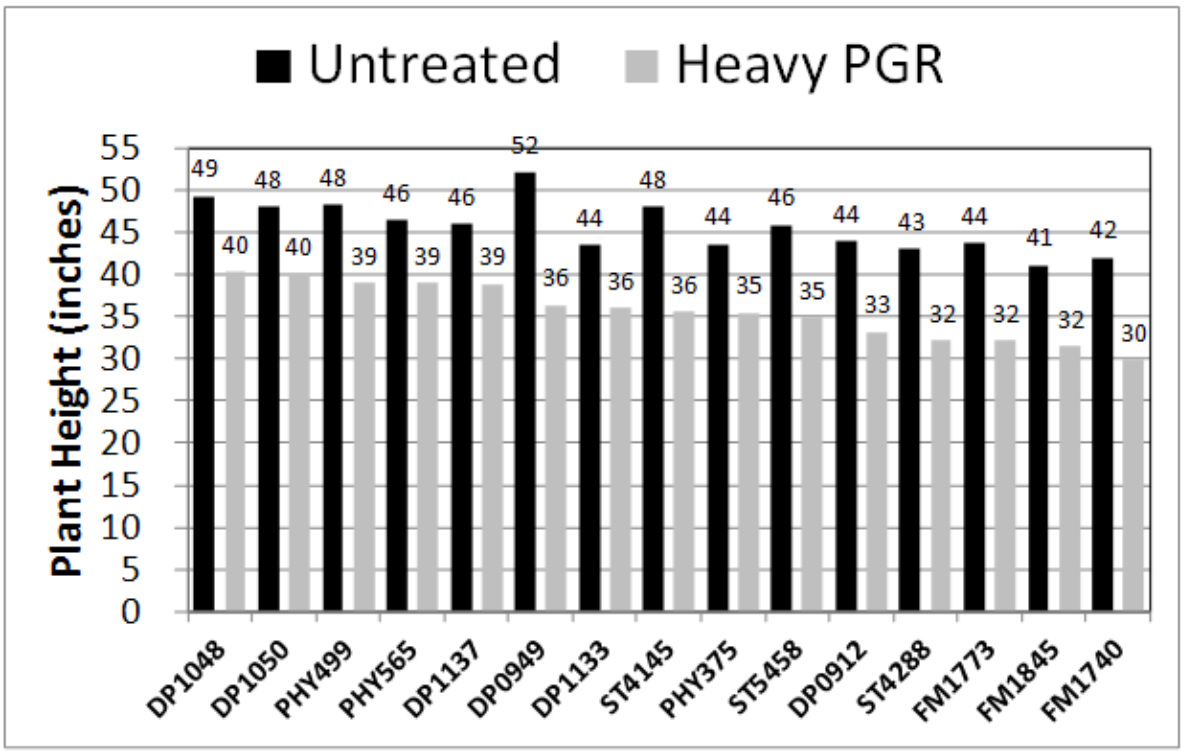

Figure 2. Plant height of PGR-treated cotton varieties ranked in descending order. Data are combined over 2011 Tifton and Midville trials.

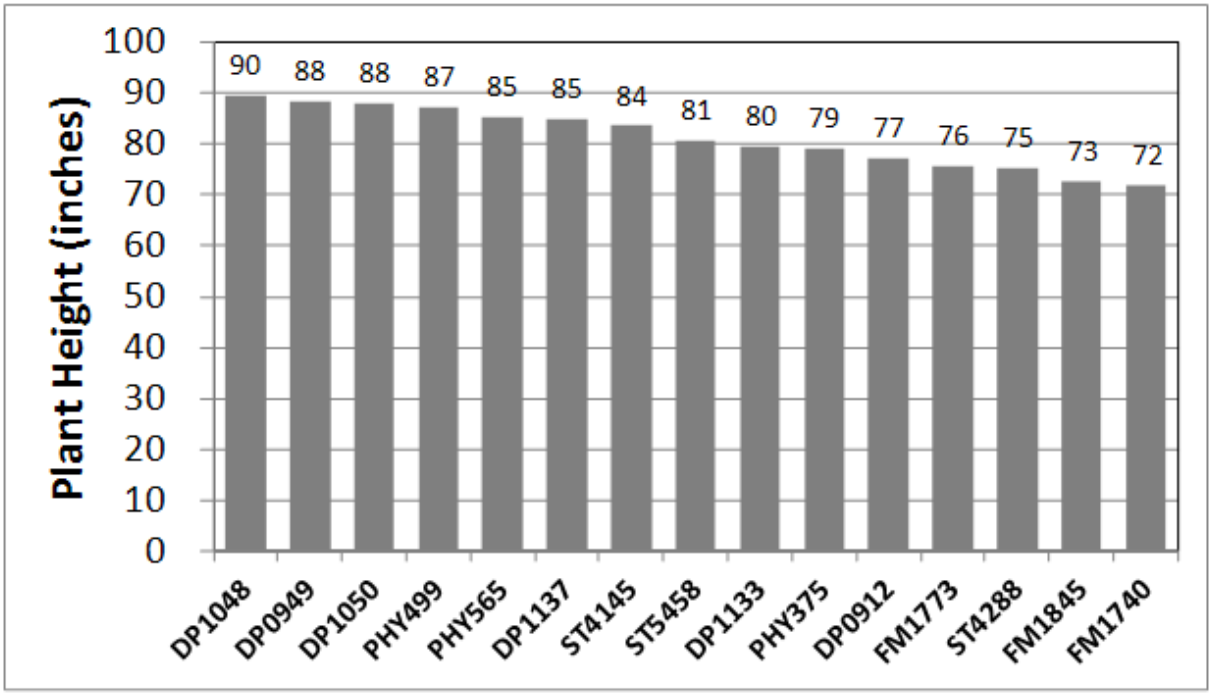

Figure 3. Plant height of the sum of Non-treated plus PGR-treated cotton.
Data are combined over 2011 Tifton and Midville trials.

Discussion

In summary, results from these trials suggest that responses to PGR treatments vary among the varieties tested, and that an aggressive PGR strategy may result in suboptimal plant height for some varieties. Therefore PGR decisions should be made on a case by case basis with the variety's growth potential and fruiting characteristics (and especially the environment) taken into consideration. For some of the earlier maturing varieties, a pre-bloom PGR application may not be necessary to adequately suppress plant height. Through this research, varieties can also be grouped based on similarities in growth potential, and PGR recommendations can be made according to variety growth potential, as opposed to a one-size-fits-all management strategy that was used on DP 555 BR. Additionally, the use of Stance™ may be more appropriate than standard mepiquat products for earlier maturing varieties in some environments. This information provides new tools that enable growers to manage growth of new varieties for maximum yield potential. The tools developed through two years of this research may prevent growers from making unnecessary, and potentially yield-inhibitory PGR applications while also preventing excessive vegetative growth of new varieties. In addition, these tools serve as a guide for the appropriate use of certain PGR products in specific varieties and environments. The UGA Extension Cotton Agronomists, Dr. Guy Collins and Dr. Jared Whitaker, sincerely appreciate this opportunity to serve the cotton growers of Georgia through the gracious support of the Georgia Cotton Commission.