The University of Georgia
Cooperative Extension
College of Agricultural and Environmental Sciences

Georgia Cotton

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Considerations for PGR Management (*Collins and Whitaker*)

The current status of the 2011 Georgia cotton crop is extremely variable depending upon geography, planting date, environment (irrigated versus dryland), and recent rainfall patterns. According to USDA NASS July 25, 2011 Crop Progress Report, for the week ending on July 24, 2011 (http://www.nass.usda.gov/Publications/index.asp), approximately half of Georgia cotton is now blooming and setting bolls, while 20 percent has yet to begin squaring, making it even more difficult to generalize the crop for the entire state or make broad-stroke recommendations for growth management. However, we do recommend that growers make growth management decisions on a case-by-case and field-by-field basis, as opposed to a one-size-fits-all approach.

When making plant growth regulator (PGR) decisions, it is important to recognize the actual effects that PGRs (which containing mepiquat chloride or mepiquat pentaborate) have on the plant, and how this may, or may not, benefit the grower. Mepiquat-containing PGRs reduce the production of plant hormones called gibberellins or gibberellic acid. Gibberellins are natural plant hormones that are involved in cell expansion. When mepiquat is applied, the internodes near the terminal of the main stalk or on lateral branches (regions where elongation occurs) may not elongate to the degree that non-treated plants would. This usually results in shorter plants, with more compact nodes. Additionally, mepiquat-containing PGR products, with the exception of Stance®, generally have similar effects on plant growth. Therefore, when applied at similar rates (except for Stance®), similar results should be expected. Stance® contains a different concentration of mepiquat than other meqiquat products, and also includes cyclanilide. This product is used at much lower rates than standard mepiquat products.

It is also important to understand what mepiquat-containing PGRs do not do, as there are some misconceptions out there. Mepiquat does not stimulate flowering and does not create more bolls per plant. At best, mepiquat may improve retention of some bolls, but it does not cause the plant to produce more bolls. Lastly, and most importantly, yield responses to mepiquat are inconsistent at best….yields are improved in some situations but PGRs do not always improve yield!!

So why use PGRs?? Some of the more beneficial effects, again which may or may not occur, are improved fruit retention on lower nodes and earlier maturity (generally more beneficial to later planted cotton, and especially later planted irrigated cotton), improved harvest efficiency, reduced impedance of insecticides/fungicides/harvest aids, reduced boll rot, reduced lodging of plants, and potentially increased yield. The likelihood of achieving one or more of these positive results greatly increases if the environment is likely to result in (or has historically / consistently resulted in) excessive vegetative growth, but even then, these results may or may not occur. Additionally, there are risks associated with mepiquat applications, especially when improper rates and/or premature application timings are implemented. Keep in mind that mepiquat should be used in a manner to prevent rank growth from occurring, but plants still need to be tall enough to support an optimal boll load, thus an optimal yield……an optimal plant height generally varies depending on the situation, therefore this should be determined on a case-by-case basis and could be adjusted for other situations. Also keep in mind that we now are dealing with some newer varieties that tend to be earlier maturing than DP 555 BR with generally less growth capacity than that of DP 555 BR. The range of maturity and growth capacity is very wide among these newer varieties, with some varieties showing somewhat similar characteristics to that of DP 555 BR, so it is important to familiarize yourself with these characteristics of the varieties you choose to plant. When DP 555 BR was still widely planted, most growers began their PGR applications at the 8- to 10-leaf stage, which was generally followed by applications at or near first bloom and again 2 to 3 weeks later. This program was a more preventative-type program that generally worked well for DP 555 BR, especially in irrigated fields, as this variety could consistently result in (and was likely to result in) excessive growth and extremely tall plants. Most (but not all) of the newer varieties tend to develop a larger boll load slightly quicker than DP 555 BR, which can restrain terminal growth to some degree, therefore growers can be more reactive than proactive/preventative with PGR management in some situations, especially with the earlier maturing varieties. In other words, some of the earlier maturing varieties with less growth capacity may not need a pre-bloom PGR application in order to prevent excessive growth, and delaying these decisions until first bloom may allow for better growth management decisions. Keep in mind that some of the earlier maturing varieties may exhibit vigorous or aggressive growth prior to first-bloom, however the growth rate may rapidly decrease once these varieties enter the bloom period when the rapidly developing boll load begins to retrain terminal growth. Aggressive, preventative approaches for early maturing varieties may in fact prevent plants from reaching an optimal plant height in some environments, thereby risking yield loss associated with inadequate numbers of fruiting sites. For later maturing varieties with greater growth potential, especially in timely irrigated fields, a more aggressive preventative approach (which may include pre-bloom applications) may be necessary to prevent excessive growth, but a one-size-fits-all approach is no longer suitable.

It is also important to remember that the timing of sequential applications likely has a large impact on final plant height and overall effectiveness of PGR applications. In <u>most</u> cases, aggressive vegetative growth can be regulated adequately with two or three <u>appropriately timed</u> PGR applications. When the number of days between applications is much longer than two weeks, then suppression of aggressive vegetative growth can become more difficult. In situations where a grower has delayed initial applications and vegetative growth has the potential to get out of hand, be sure to closely monitor growth soon after the initial application and make any necessary sequential applications within 10 to 14 days after the initial application, if

expected results from the first application were not observed or terminal growth hasn't adequately slowed.

Once consideration has been given to the variety's growth potential, the environment (irrigated versus dryland), field history, planting date, etc., growers should then make PGR decisions based on other factors that may indicate whether or not excessive growth is likely. Such factors include current soil moisture status, weather forecast for the near future, and signs of current vigorous growth when examining plants. PGRs should not be applied to drought stressed cotton, or cotton that is rapidly approaching cutout, especially if an optimal plant height has not yet been reached. See our comments from the July 2010 newsletter below for detailed information regarding PGR decision considerations.

As mentioned earlier, the 2011 crop is highly variable depending upon rainfall patterns, planting date, and environment, with some of the crop now blooming and showing signs of aggressive growth due to the recent and much appreciated rains in some areas. These fields may justify the use of PGRs to prevent additional excessive growth. Other fields, both irrigated and dryland, that looked grim at the end of June, are now showing signs of significant improvement. Some of these fields are exhibiting a phenomenon generally referred to as a "suspended" or "hovering" cutout, where the crop approached a stress-induced cutout not long after first bloom, but now, the recent rains have renewed terminal growth and the upward progression of boll development. In these cases, the uppermost white bloom tends to closely "follow" the terminal growth, where they tend to develop at a similar rate. These situations need to be closely monitored, but a PGR application to cotton such as this may cause the terminal to cease growing. Delaying PGR applications until an optimal plant height is close to being reached may be more suitable in these situations, as they generally are easier to manage. For the late-planted crop that is not yet blooming, managing the crop for earlier maturity may be beneficial this year, therefore PGRs may be required, however rainfall patterns through August will have more influence on the growth and final outcome of the later planted crop, which has yet to be determined. Very close and frequent monitoring of the late-planted crop will be essential for growers to make the best possible decisions.

The aforementioned comments are to be considered as generalizations. We cannot emphasize enough that PGR decisions need to be made on a case-by-case and field-by-field basis as every situation is different in some regard.

From the July 2010 newsletter….

Plant height prior to, or at, first bloom: When we make PGR decisions, remember that we are trying to achieve a final plant height that can support adequate fruiting sites in order to maximize yield potential, without excessive height which could result in several adversities including: poor retention of earlier-set fruit or delayed maturity, dense canopies that impede other over-the-top applications, promote boll rot diseases, reduced harvest efficiency, lodging of plants, and potentially yield loss. For most situations (but definitely not always), some observations indicate that a very general optimal final plant height is usually within 10 percent of the row width (36 to 40 inches) <u>but this varies from situation to situation</u>. Although much of the crop has likely been treated prior to bloom, an additional or first-time PGR application could be justified when plant height reaches 25 to 30 inches during the first week of bloom (the onset of the bloom period

occurs when one bloom every 5 to 6 feet of row is visible) and when plants exhibit signs of continued vigorous growth. However, growers should consider the other signs of potentially excessive growth, before treating cotton just based on plant height.

Nodes above white flower and fruit load throughout the bloom period: The number of nodes above a first position white flower (NAWF) should be around 9 to 10 at first bloom (14 to 16 total plant nodes) in healthy, vigorously growing cotton and 7 to 8 at peak bloom (2 to 3 weeks after first bloom). This number should gradually decrease throughout the bloom period until the cessation of fruiting. Usually, terminal growth slows as this number decreases and a boll load accumulates. If NAWF is significantly less than 9 or 10 at 1st bloom (7 or less), then this could be an indicator of some sort of stress (primarily drought) which occurred prior to bloom. This could also be a result of prior PGR treatments, thus a PGR application may not be necessary, especially in dryland fields. If NAWF is 9 to 10 or greater at first bloom, a PGR application may be justified if soil moisture is sufficient and there are no signs of current drought stress.

Internode distances: A very strong, and one of the best indicators of vigorous growth is the distance between adjacent plant nodes, between the 4th and 5th leaf from the terminal, which is generally the uppermost internode that has fully expanded. Longer distances between these nodes is an indicator of greater terminal "horsepower" or growth potential. This is often a much better indicator of growth potential than height-to-node ratio, because height-to-node ratio may sometimes fail to account for the current growth rate. If internode distances between the 4th and 5th leaf from the terminal are around 3 to 5 inches, then the plants are growing vigorously, possibly requiring a PGR application. If internode distances are much less than 3 inches, then the plants may be encountering some sort of stress (primarily drought) and terminal growth has slowed, therefore a PGR application may not be necessary.

These are just a few of several general guidelines that are useful in determining the need for PGRs for cotton that is approaching the bloom period. The most accurate assessments are made when evaluating the "big picture" or utilizing several of these guidelines in concert. No single approach can determine the optimal PGR rate or timing without predicting the future, nor is a single approach accurate enough to account for all the variation in crop development and environments. Again, it is critical to make these decisions on a case by case basis, and to monitor growth frequently to determine the necessity of additional mid-bloom PGR applications. Remember that environment tends to play a very strong role in the necessity of PGR applications…..just because you grow cotton in a dryland field, does not mean that excessive growth can't occur, and vice versa for irrigated fields. The same idea applies to variety maturity. PGRs should only be applied on an as-needed basis, when there are signs of current and expected vigorous growth. PGRs should not be applied when there is insufficient soil moisture, especially in dryland fields.

<u>Effect of Cleaning at the UGA Microgin on Fiber and Yarn Quality: II:</u> (*Li, Knowlton, Thibodeaux, and Foulk*)

Cotton fiber quality determines yarn quality which is important to textile consumers. Cotton with a higher short fiber content may lead to excessive breakage of yarn, more defects, and less efficient spinning, which could result in discounts to growers. Therefore, it is important to understand how cleaning during the ginning process could affect yarn quality, a primary concern for ginners and spinners alike. A research project was conducted by UGA researchers and USDA scientists to evaluate the effect of cleaning treatments via the UGA microgin (Figure 1) on yarn quality. All cotton samples were harvested using a spindle picker in Georgia during 2009. A total of 54 cotton samples were evaluated. After ginning, cotton bales were sent to USDA Cotton Fiber Quality Research Station of the USDA ARS in Clemson SC for spinning tests and yarn quality measurement.

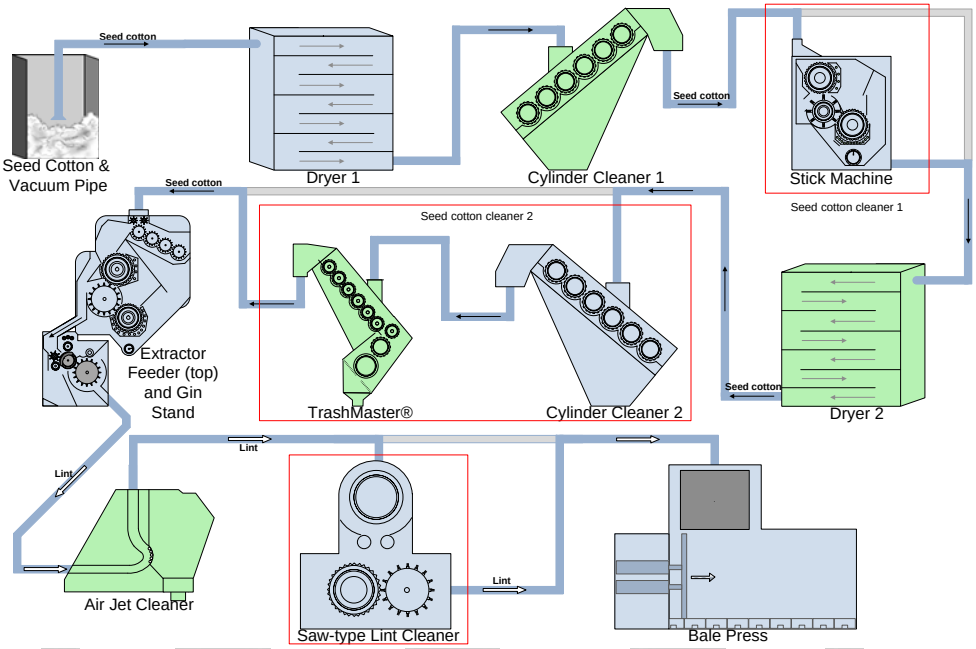

Figure 1. Diagram of the UGA microgin and the three components that were used to create six cleaning treatments

A total of nine yarn quality properties were evaluated in five aspects: processing efficiency, tensile properties, yarn appearance, yarn defects, and waste (Table 1). No significant difference was observed among the six cleaning treatments in ends-down and the two tensile properties (elongation and strength). Hairiness and irregular CV measure the appearance of the yarn. The data suggest that irregular CV is positively related to the amount of cleaning performed in the microgin: more cleaning leads to higher irregular CV. Treatments 2 and 3 did not show a significant difference, suggesting that seed cotton cleaner 2 and lint cleaner might have similar effect on irregular CV.

All three defect properties (neps, thicks, and thins) showed significant differences among the six treatments. For neps, a clear trend was observed that treatments 2, 5, and 6 had lower neps than

treatments 1, 3, and 4, indicating that more mechanical processes during the cleaning leads to higher neps in yarn. A similar pattern was observed in the data from both thins and thicks: less cleaning had lower defects. It can be confirmed by the fact that treatment 5, as the least cleaned treatment, consistently exhibited the lowest defect values in all three properties.

A clear-cut pattern was observed in "waste" that the least cleaned treatments (5 and 6) showed significantly higher waste values than treatments with more cleaning operations (treatments 1, 2, 3, and 4). This result clearly indicates that spinning waste is a direct result of the trash level in the cotton fiber: less cleaning leads to higher trash level in lint and more waste in the spinning mill. Since larger trash particles are easier to manage than smaller trash particles caused by excessive ginning, reduced cleaning during the ginning process could be beneficial to the yarn quality.

In summary, the six cleaning treatments did not affect ends-down and yarn tensile properties, but exhibited significant effect on hairiness, yarn defects, and waste. Fewer cleaning processes tended to produce the yarn with lower defects, lower hairiness (irregular CV), and more waste.

Table 1. ANOVA test of ring yarn quality in comparison of six cleaning treatments.

Yarn quality	Ends-down	Elongation	Strengths	Hairiness	Irregular CV	Neps	Thicks	Thins	Waste
Cleaning Treatment									
Treatment 1	3.33	5.32	14.37	5.55	16.70 a	169.22 abc	393.60 ab	18.57 ab	1.75 c
Treatment 2	6.44	5.41	14.50	5.52	16.45 bc	154.07 bcd	362.31 bc	15.92 bc	3.45 b
Treatment 3	2.67	5.31	14.21	5.53	16.67 ab	173.93 ab	394.98 ab	19.99 a	1.89 c
Treatment 4	5.89	5.32	14.15	5.55	16.73 a	178.58 a	403.74 a	20.08 a	1.92 c
Treatment 5	6.22	5.43	14.41	5.53	16.35 c	144.41 d	352.38 c	14.48 c	3.70 a
Treatment 6	4.11	5.36	14.30	5.57	16.41 c	150.56 cd	358.54 bc	15.66 bc	3.88 a
LSD	8.49	0.27	0.43	0.18	0.22	22.06	38.38	3.88	0.18

1. Same lower case letters indicate no significant difference between treatments.
2. No letters indicate no significant difference across treatments or varieties.

SE Research & Education Center Field Day, August 16, 2011, Midville:
Contact Anthony Black at 478-589-7472 for information. A detailed schedule of speakers and registration information will be forthcoming.

Cotton & Peanut Research Field Day, September 7, 2011 Tifton: Mark your calendars for the 4th Annual UGA Cotton and Peanut Research Field Day scheduled for September 7, 2011. The tour will begin between 8:30 and 9:00 a.m. and conclude with lunch; a detailed schedule of speakers and registration information will be forthcoming. The field day is being sponsored by the Georgia Cotton Commission and the Georgia Peanut Commission.

Contributions by:

Guy Collins, Extension Cotton Agronomist
Jared Whitaker, Extension Agronomist
Changying "Charlie" Li, Biological and Agricultural Engineer
Andy Knowlton, Microgin Operator and Manager
Devron Thibodeaux, USDA Clemson Spinning Lab Textile Technologist
Jonn Foulk, USDA Clemson Spinning Lab Engineer

Your local County Extension Agent is a source of more information on these subjects.

Edited by: Guy Collins, Extension Cotton Agronomist