2011 UGA Cotton Defoliant Evaluation Program
Tifton Location

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Field Description

The Tifton trial was conducted at the UGA Gibbs Farm on a Tifton loamy sand. The crop condition and plant maturity were evaluated on September 14, 2011, five days prior to the application of harvest aid treatments on September 19. Leaves on the large majority plants were green with spots of reddening but relatively mature, with very few juvenile leaves throughout the field (Figure 1). Most leaves were beginning to senesce naturally (reddish color indicative of anthocyanin activity associated with leaf aging and chlorophyll degradation), and there were some signs of leaf curling/folding, similar to reddened sun scald symptoms, which can enhance the senescence process in some cases. There were hardly any signs of juvenile regrowth in terminals or the axial node tissue (basal region).

Plant height generally ranged from 35 to 40 inches tall, and the boll population ranged from 70 to 91 percent open bolls, with an average of 90 percent open bolls. Nodes above cracked boll ranged from 0 to 4, with an average of 1.95. Upon examination of internal boll components (seed and fiber maturity), the unopened bolls appeared to be sufficiently mature for harvest aids to be applied without penalty (well-developed seed and mature fiber). The hot and dry weather experienced prior to defoliation caused most of the upper blooms or younger bolls near the terminal to abort. Additionally, the heat and dry conditions prior to defoliation caused the progression of boll opening to be substantially more rapid than normal.

The weather forecast for the anticipated day of treatment (September 16) included a high of 90°F and a low of 60°F, with a 40 percent chance of rain. During the week following anticipated application, daytime highs were expected to slowly increase by 10 degrees (82°F on the day following treatment, steadily climbing to 92°F one week later) and nighttime lows were expected to decrease 5 degrees (61°F on the day following treatment, steadily climbing to 66°F). Chances of rain were 10 percent or less for the week following the anticipated day of treatment. Incidentally, the chances of rain appeared to be significant on the anticipated day of treatment; therefore, application of treatments was postponed and treatments were applied on Monday, September 19.

Figure 1. Crop condition at two days prior to anticipated application of harvest aid treatments.

Trial Description

Individual treatments (tank-mixes of harvest aid products) were determined by the manufacturers based on the crop condition, current weather conditions and the weather forecast. Defoliant treatments were applied on September 19, 2011. All treatments were applied using a CO_2-pressurized backpack sprayer equipped with regular 110-02 flat fan nozzles, calibrated to deliver 15 GPA at 3 mph. Treatments were arranged in a randomized complete block design and replicated four times. Plots consisted of two rows approximately 30 feet long. Percent defoliation, percent desiccation, percent regrowth and percent open bolls were visually estimated at seven and 14 days after treatment (DAT). Percent defoliation, percent desiccation and percent terminal and basal regrowth were also visually estimated at 14 and 24 DAT. Data were subjected to Analysis of Variance, and means were separated using Fisher's Protected LSD at $p \leq 0.05$.

Observations and Results

The Tifton trial was initiated when environmental conditions were relatively warm and dry for the week prior to treatment application. During the week prior to treatment application, nighttime low temperatures ranged from the low- to mid-60s with daytime highs of 90°F or above at the beginning of the week, which suddenly decreased to the mid-70s in the two days prior to treatment (Figures 2 and 3). No rainfall was received during the week prior to application of defoliants, hence the reason that no terminal or basal juvenile growth was apparent at the time of defoliation.

Temperatures on the day of treatment application began with a nighttime low of 61°F and reached a daytime high of 87°F. For the week following application of treatment, daily high temperatures ranged from the low to high 80s, with most days reaching the upper end of this range. Nighttime lows hovered around 70°F with little fluctuation. The trial received appreciable rainfall during this week, creating conditions that were favorable for regrowth.

From seven to 14 days following application of defoliants, daytime highs were in the mid-80s for the first half of the week, and then suddenly decreased to the mid-70s for the latter half of the week. Nighttime lows gradually decreased from the upper 60s to the mid-40s, which has been proven to reduce the activity of hormonal-type defoliants. Some rainfall was received during the early part of the week, and although temperatures decreased, regrowth was still prevalent.

Daily high temperatures following 14 days after treatment began in the low 80s, which gradually decreased to the low 70s. Nighttime lows slowly increased from the mid-40s to the low- to mid-60s during this time. Three rain events occurred during the latter part of this period, reviving favorable conditions for regrowth when supported by slightly increased temperatures.

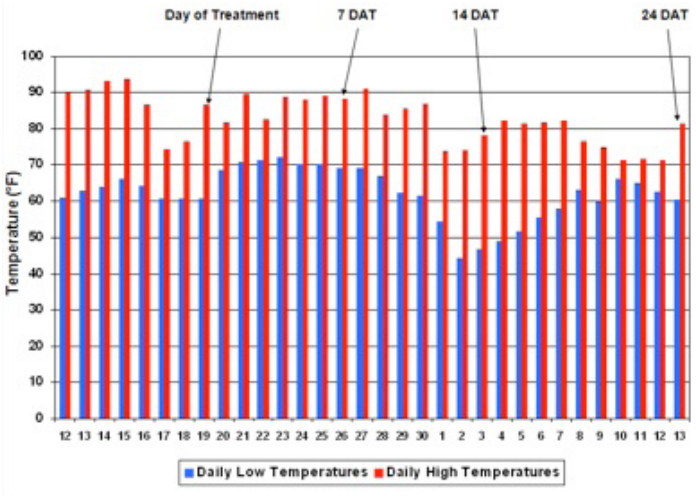


Figure 2. Daily high and low temperatures from September 12, 2011 to October 13, 2011 at the UGA Gibbs Farm near Tifton, Ga.

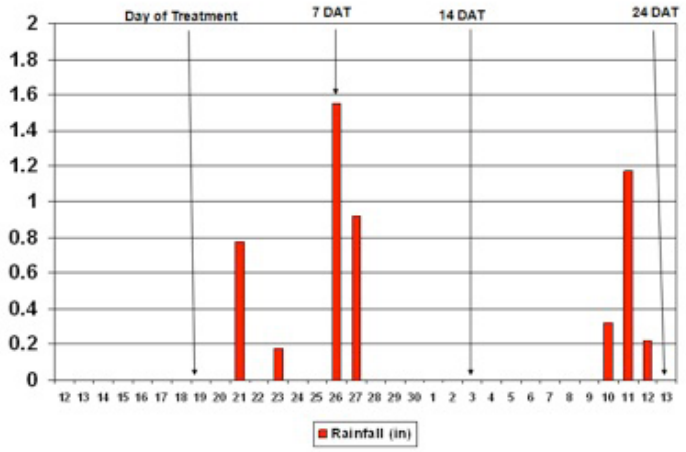


Figure 3. Daily rainfall from September 12, 2011 to October 13, 2011 at the UGA Gibbs Farm near Tifton, Ga.

Environmental conditions surrounding this trial were relatively warm at the beginning, but not considered excessively hot. As previously mentioned, conditions leading up to the day of treatment (warm and dry) were favorable for very rapid boll opening and little regrowth. Although some boll opening was required in this particular trial, the opening of the few remaining bolls was likely driven by the prevailing environment, masking the effect of most treatments. Boll opening had reached 100 percent by 14 days after treatment for most treatments in this trial. However, ethephon-containing products have been shown to aid in the removal of leaves or enhance the activity of other defoliants, even if little or no boll opening activity is needed.

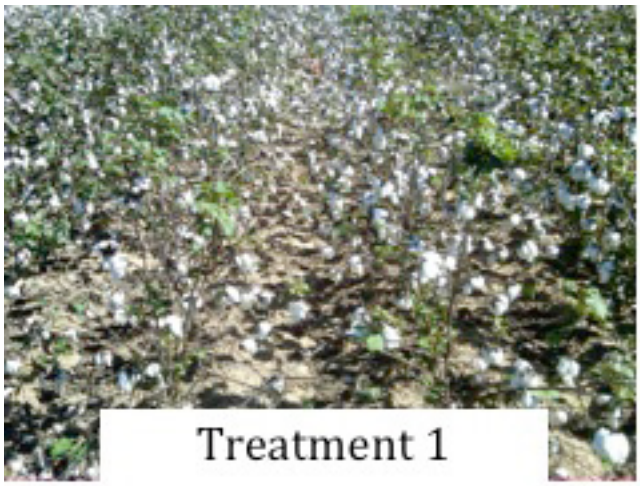
By seven days after treatment, treatment containing higher rates of thidiazuron+diuron, tribufos+ethephon+thidiazuron, or some combination thereof, resulted in significantly greater percent defoliation than these same products applied at lower rates or the ppo-inhibiting defoliants. Defoliation for all but one treatment significantly improved by 14 days after treatment, with defoliation ranging from mid-80 to mid-90 percent. By 24 days after treatment, the mixtures described above generally resulted in the highest percent defoliation. Although differences were observed at 24 days after treatment, all treatments resulted in 90+ percent defoliation.

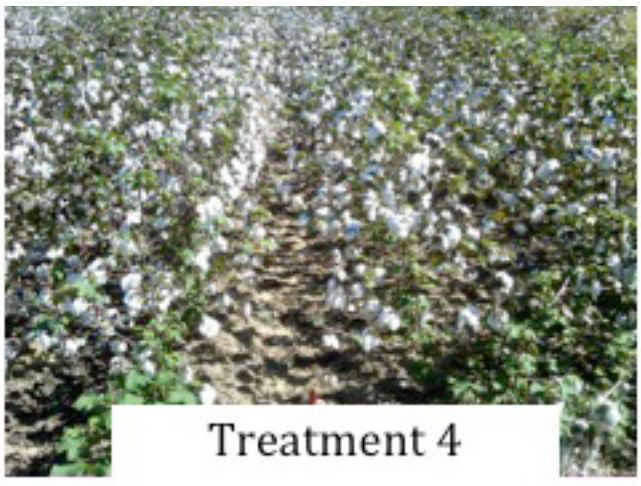
Desiccation was relatively low throughout the course of this evaluation, likely due to the periodic rainfall and absence of excessively hot temperatures. Differences between treatments were observed in the early evaluations, but these differences nearly disappeared by 14 days after treatment and completely disappeared by 24 days after treatment.

Regrowth started to become evident by seven days after treatment and was significant throughout the remainder of the evaluation period. At that time, some rainfall had been received and most treatments containing higher rates of thidiazuron or thidiazuron+diuron resulted in the lowest percent regrowth. A similar effect was observed at 14 days after treatment for both terminal and especially basal regrowth, with the previously mentioned products/combinations generally resulting in the lowest percent regrowth. By 14 days after treatment, appreciable rainfall had occurred and percent terminal regrowth ranged from 5.3 to 39.5 percent for defoliant treatments and 14.5 percent in the non-treated control. By 14 days after treatment, percent basal regrowth ranged from 3.5 to 32.5 percent for defoliant treatments and 14.3 percent in the non-treated control. By 24 days after treatment, terminal regrowth ranged from 22.5 to 97.5 percent for defoliant treatments and 100 percent for the non-treated

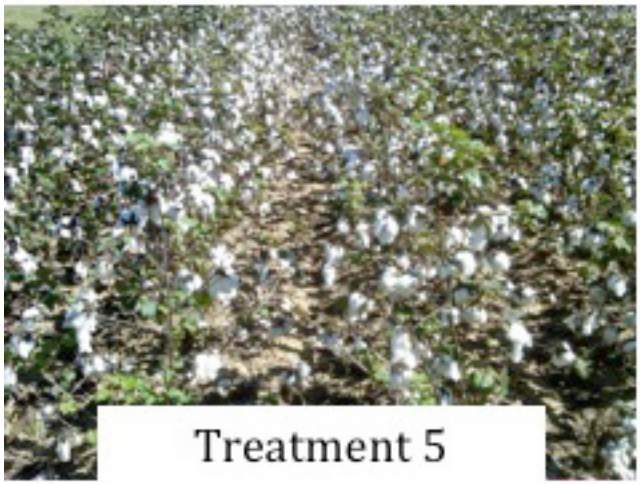
control. Basal regrowth at this time ranged from 36.3 to 77.5 percent for defoliant treatments and 71.3 percent for the non-treated control. It is important to realize that the removal of leaves allows light to contact axial tissue at the base of most branches, which can stimulate regrowth more than a non-treated control that has had no leaves chemically removed. Additionally, the onset and progression of regrowth is commonly influenced by the prevailing environment. When conditions are favorable, regrowth may be observed in even the best treatments.

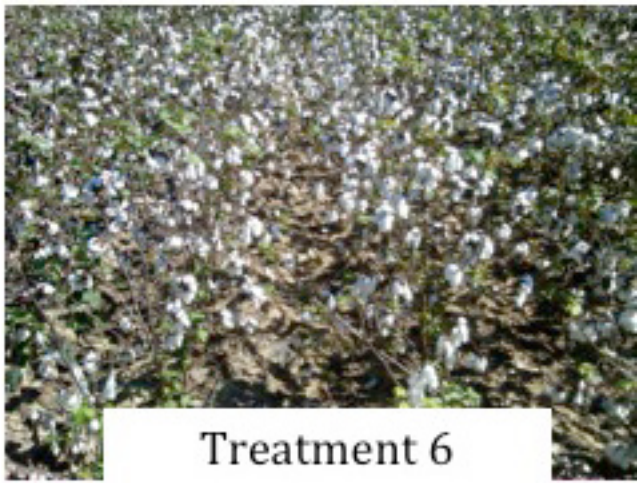
The outcome of any particular defoliation strategy is very difficult to predict, even among experienced agronomists. Although performance is the primary parameter from which decisions are made, the costs of a defoliant mixture should also be calculated to determine if potential gains could offset the costs. These results illustrate performance in these specific conditions; therefore, performance in slightly different conditions or at slightly different rates may be quite different. There are numerous product / rate / tank-mix combinations currently available. Growers should always consult their UGA county Extension agent when making defoliation decisions, as any two situations are rarely exactly alike. Growers should also realize that harvest aid performance can be highly variable and unpredictable, and is dependent upon crop and environmental conditions at application and thereafter. Additionally, it is always advised to consult the label of any harvest aid product regarding directions for use, rates and safety information. The photos below illustrate defoliant performance in one replication taken at 14 days after treatment. Treatment numbers correspond to treatments listed in the data table.





	Treatment	Application Rate	7 DAT 9/26/2011				14 DAT 10/3/2012					24 DAT 10/13/2012			
			% Open Bolls	% Defoliation	% Desiccation	% Regrowth	% Open Bolls	% Defoliation	% Desiccation	%Terminal Regrowth	% Basal Regrowth	% Defoliation	% Desiccation	% Terminal Regrowth	% Basal Regrowth
1	CutOut SuperBoll	6.4 oz/a 32 oz/a	93.0 a	70.8 a	0.5 c	3.25 cd	100.0 a	96.8 a	0.3 bc	6.8 ef	7.3 ef	98.5 ab	0.0 a	33.8 d	40.0 f
2	CutOut SuperBoll	8 oz/a 32 oz/a	93.0 a	80.0 a	1.3 bc	1.75 d	100.0 a	97.8 a	0.5 bc	5.5 f	3.5 f	99.3 a	0.0 a	38.3 d	36.3 f
3	Aim ethephon (6 lb ai/gal) NIS	1 oz/a 24 oz/a 0.25 % v/v	96.8 a	7.5 de	0.0 c	7.25 b	100.0 a	71.3 b	0.0 c	32.5 ab	27.5 ab	92.3 g	0.0 a	93.8 a	70.0 ab
4	tribufos (6 lb ai/gal) ethephon (6 lb ai/gal) NIS	16 oz/a 24 oz/a 0.25 % v/v	94.3 a	70.8 a	0.0 c	15.00 a	100.0 a	94.8 a	0.0 c	25.0 a-d	32.5 a	96.5 bcd	0.0 a	96.3 a	77.5 a
5	Aim thidiazuron (4 lb ai/gal) ethephon (6 lb ai/gal) NIS	0.5 oz/a 1.6 oz/a 24 oz/a 0.25 % v/v	96.0 a	23.8 cde	0.5 c	2.25 d	98.8 a	89.8 a	0.0 c	14.3 def	6.5 f	95.0 de	0.0 a	71.3 abc	40.0 f
6	tribufos (6 lb ai/gal) thidiazuron (4 lb ai/gal) ethephon (6 lb ai/gal) NIS	8 oz/a 1.6 oz/a 24 oz/a 0.25 % v/v	92.5 a	73.0 a	1.0 bc	2.25 d	100.0 a	95.3 a	0.0 c	14.5 def	10.0 def	97.3 abc	0.0 a	46.3 bcd	47.5 def
7	Adios Ethephon 6	6.4 oz/a 32 oz/a	70.0 a	42.0 bc	0.0 c	2.5 d	100.0 a	91.8 a	0.0 c	23.8 bcd	7.8 ef	95.8 cd	0.0 a	75.0 ab	36.3 f
8	Adios Ethephon 6	8 oz/a 32 oz/a	96.5 a	72.5 a	0.0 c	2.75 d	100.0 a	95.0 a	0.0 c	18.0 cde	6.3 f	97.3 abc	0.0 a	80.0 a	41.3 ef
9	Folex ethephon (6 lb ai/gal) thidiazuron (4 lb ai/gal)	8 oz/a 21 oz/a 2 oz/a	92.8 a	57.5 ab	3.5 b	2.00 d	100.0 a	94.8 a	0.8 b	5.3 f	4.0 f	97.5 abc	0.0 a	22.5 d	36.3 f
10	Folex ethephon (6 lb ai/gal) thidiazuron (4 lb ai/gal)	12 oz/a 24 oz/a 2 oz/a	94.3 a	63.3 ab	7.3 a	2.25 d	100.0 a	96.0 a	1.8 a	9.0 ef	7.0 ef	97.3 abc	0.0 a	29.3 d	38.8 f
11	ET ethephon (6 lb ai/gal) COC	1.5 oz/a 32 oz/a 0.5 % v/v	95.2 a	17.9 de	0.8 bc	4.53 bcd	100.0 a	89.7 a	0.0 c	35.9 a	22.3 bc	91.4 g	0.0 a	98.8 a	57.2 cd
12	ET Private ethephon (6 lb ai/gal) COC	1.36 oz/a 1.21 oz/a 32 oz/a 0.5 % v/v	96.8 a	30.5 cd	0.3 c	6.13 bc	100.0 a	89.3 a	0.0 c	24.0 bcd	14.0 de	94.8 def	0.0 a	81.3 a	52.5 cde
13	Private ethephon (6 lb ai/gal) COC	1.6 oz/a 32 oz/a 0.5 % v/v	97.0 a	21.8 cde	0.5 c	6.00 bc	100.0 a	88.5 a	0.0 c	27.0 abc	15.5 cd	92.8 fg	0.0 a	97.5 a	62.5 bc
14	Private ethephon (6 lb ai/gal) COC	1.5 oz/a 32 oz/a 0.5 % v/v	94.0 a	17.5 de	2.0 bc	3.75 cd	100.0 a	89.3 a	0.0 c	11.5 ef	10.0 def	93.0 efg	0.0 a	42.5 cd	38.8 f
15	Non-Treated Control		94.8 a	0.0 e	0.0 c	7.50 b	100.0 a	0.0 c	0.0 c	14.5 def	14.3 de	0.0 h	0.0 a	100.0 a	71.3 ab
	LSD @ p≤0.05		19.14	23.84	2.70	3.198	0.93	13.38	0.67	11.62	7.4	2.05	0	29.69	12.39


Treatment 5


Treatment 6


Treatment 7


Treatment 8


Treatment 9


Treatment 10


Treatment 11


Treatment 12


Treatment 13


Treatment 14


Treatment 15

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The Georgia Cotton Commission
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