

# Cotton Defoliation Evaluations, 1996

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## Abstract

*Two field experiments were conducted near Coolidge and Marana, AZ in 1996 to evaluate the effectiveness of a number of defoliation treatments on Upland (var. DPL 5415) and Pima (var. S-7) cotton. All treatments consisted of materials commercially available in Arizona, and each showed promise in terms of overall effectiveness. Results do reinforce recommendations regarding the use of low rates (relative to the label ranges) under warm weather conditions and increasing rates as temperatures cool.*

## Introduction

Due to the rather indeterminate nature of the cotton (*Gossypium* spp.) plant, crops are often still actively growing late in the growing season. As a result, many cotton growers have experienced difficulty in satisfactorily defoliating the crop in preparing for harvest. Ideally, growers would like to accomplish a complete and satisfactory defoliation with a single application of defoliant. Historically, it has often required two applications and sometimes even three or four applications to accomplish defoliation. This can be further complicated later in the fall and at higher elevations due to cooler weather conditions, which serves to slow down the physiological activity of the plant and the resultant activity of chemical defoliant on both Upland (*G. hirsutum* L.) and Pima (*G. barbadense* L.) fields.

Defoliation work in this program began in 1987, when a single field experiment was conducted in the Yuma Valley to compare several defoliation treatments on a field of Pima cotton (Silvertooth and Howell, 1988). That experiment was followed by a series of at least four similar experiments each year from 1988 (Silvertooth et al., 1989), 1989 (Silvertooth et al., 1990) and 1990 (Silvertooth et al., 1991) in an effort to expand locations, and treatment comparisons. Some treatment consistencies were identified from the 1987, 1988, and 1989 experiences, which were then used for the 1990, 1991, 1992, 1993, 1994, and 1995 experimental projects (Silvertooth et al., 1992; Silvertooth et al., 1993; Silvertooth et al., 1994; Silvertooth and Norton, 1995; and Silvertooth, 1996). Nelson and his associates have also conducted a number of experiments concerning defoliation factors and refinement (Nelson and Hart, 1991a; Nelson and Hart, 1991b; and Nelson and Silvertooth, 1991). Common treatments resulting from this earlier work include Dropp + DEF and Dropp + Accelerate combinations, with increasing rates as temperature conditions cool. The 1996 experiments represent an extension of this general project in terms of evaluating some new treatments and combinations, and attempting to refine recommendations and guidelines.

## Methods

Field experiments were conducted near Coolidge (Upland cotton, var. DPL 5415) and Marana, AZ (Pima cotton, var. S-7) in 1996 as outlined in Tables 1 and 2. Treatments employed are listed in Tables 3 and 4. All treatments were applied with a ground rig, with treatments being arranged in a randomized complete block design within a commercial production field. Plots were 18 and 6 rows wide at Coolidge and Marana, respectively; and extended the full length of the irrigation run in each case.

After treatments were applied, visual estimates of percent defoliation, and the regrowth/topgrowth control ratings were made at approximately 14 days past the treatment date. Weather conditions following the defoliant treatment applications are described in terms of heat units (HU, 86/55 °F thresholds) accumulated during that 14 day period. Measurements and ratings were made at multiple locations within each plot. Regrowth ratings were made on a scale

of 1 - 10, with a rating of 1 indicating excellent regrowth and topgrowth control and 10 indicating very poor control. The primary objective of this study was to compare and evaluate two relatively new defoliation materials (CottonQuick™ and CutLoose™) with a set of conventional defoliant (Dropp™ and Ginstar™), with Ginstar serving as a standard treatment. An additional objective was to consider the results in terms of current guidelines and recommendations for cotton defoliation in Arizona.

## Results

Defoliation and regrowth (topgrowth) ratings from Coolidge are presented in Table 3, where 295 HU were accumulated 14 days after defoliant were applied (11 October reading). Similarly, Marana results are shown in Table 4. The Marana location is at a slightly higher elevation and the application was made at a later date (10 October), where 199 HU were accumulated 14 days following treatment applications (25 October reading). In general, results were similar at both locations with treatments 3, 4, and 5 performing slightly better, particularly in terms of regrowth or topgrowth control. This was most notable at Coolidge where 1, 2, and 4 were somewhat questionable in terms of satisfactory defoliation for picking, even after the 21 day post-application evaluation (22 October readings). The primary difficulty associated with the overall defoliation ratings were the amounts of leaves left in the upper portion of the plants, resulting in poor topgrowth ratings.

One other point worthy of noting is associated with the changes in defoliation results between the two dates of ratings shown in Tables 3 and 4. In both cases, improvements in defoliation percentages were noted between approximately 14 and 21 days after application. However, in both cases the principle factor associated with the improvements in overall defoliation was wind. Both locations experienced several days of very windy conditions immediately following the 14 day evaluation, which helped accomplish more complete defoliation with leaves that had well developed abscission zones at the base of the petioles, but simply had not dropped from the plant.

## Summary

One aspect of interest in this study was to compare and evaluate two relatively new defoliation materials (CottonQuick™ and CutLoose™) with a set of conventional defoliant (Dropp™ and Ginstar™). Results from these two tests indicate that treatments including Dropp and Ginstar performed very well and were consistent. The most substantial difference among the treatments compared in these two studies was that of regrowth/topgrowth control.

These results also serve to reinforce current defoliation guidelines and recommendations relative to treatments and rates in accordance to expected weather conditions (i.e. HU accumulations).

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Table 1. Experimental conditions for Coolidge, AZ, cotton defoliation study, 1996.

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Defoliant Application	27 September
HU*, 14 Days Post Defoliation	295
Elevation (approx.)	1,385 ft.
Method of Application	Ground
Carrier Rate (gpa)	10

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\* HU = Heat Units, 86/55 °F limits.

**Table 2. Experimental conditions for Marana, AZ, cotton defoliation study, 1996.**

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Defoliant Application	10 October
HU*, 14 Days Post Defoliation	199
Elevation (approx.)	1,974 f.
Method of Application	Ground
Carrier Rate (gpa)	27

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\* HU = Heat Units, 86/55°F limits.

Table 3. Treatments and results from the cotton defoliation experiment, Coolidge, AZ, 1996.

Treatment	Rate -material/acre-	Defoliation	Topgrowth	Defoliation	Topgrowth
		-----11 October----- - % -		-----22 October----- - % -	
1. CottonQuick	3.5 qts.	52 bc **	8 a	65 c	8 a
2. Cotton Quick + Dropp	2.0qts. 0.2 lbs.	65 ab	5 b	69 bc	6 ab
3. CutLoose + Ginstar	2.0 qts. 8.0 oz.	70 a	3 c	78 b	4 bc
4. CutLoose + Dropp	2.0 qts. 0.2 lbs.	70 a	7 a	62 c	7 a
5. Ginstar	8.0 oz.	78 a	2 c	92 a	2 c
	OSL ***	0.0041	0.0002	0.0003	0.0005
	CV (%)	15.1	25.0	9.3	26.5

\* Treatments applied 27 September 1996.

\*\* Means followed by the same letter are not significantly different according to a Duncans Multiple Range Test (P < 0.05)

\*\*\* OSL = observed significance level; CV = coefficient of variation

Table 4. Treatments and results from the cotton defoliation experiment, Marana, AZ, 1996.

Treatment	Rate -material/acre-	Defoliation	Topgrowth	Defoliation	Topgrowth
		-----25 October----- - % -	-----	-----31 October----- - % -	-----
1. CottonQuick	3.5 qts.	70 a **	8 a	87 b	7 a
2. Cotton Quick + Dropp	2.0qts. 0.2 lbs.	83 a	4 b	95 a	3 b
3. CutLoose + Ginstar	2.0 qts. 8.0 oz.	87 a	2 c	95 a	2 b
4. CutLoose + Dropp	2.0 qts. 0.2 lbs.	87 a	2 c	95 a	2 b
5. Ginstar	8.0 oz.	87 a	2 c	95 a	2 b
	OSL ***	0.0006	0.0001	0.0139	0.0002
	CV (%)	3.7	24.9	2.7	26.5

\* Treatments applied 10 October 1996.

\*\* Means followed by the same letter are not significantly different according to a Duncans Multiple Range Test (P < 0.05)

\*\*\* OSL = observed significance level; CV = coefficient of variation