

# Cotton Defoliation Evaluations, 1993

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## Abstract

*Three field experiments were carried out in several representative cotton producing areas of Arizona to evaluate the effectiveness of a number of defoliation treatments on Upland cotton. These experiments were conducted at Coolidge, Marana, and Safford and utilized defoliation treatments designed for their potential effectiveness under cooler weather conditions commonly experienced later in the defoliation season and at higher elevations. The treatments employed also offer potentials for use in close proximity to urban areas due to not having offensive odors associated with them. All treatments showed promise in terms of effectiveness and the results provide a basis for use recommendations in 1994 as well as further points of study in future experiments.*

## 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 cooler weather conditions, which serves to slow down 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, and 1992 experimental projects. 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 1993 experiments represent an extension of this project in terms of evaluating some new combination treatments and orienting the work to later, cooler temperature conditions.

## Methods

Three field experiments were conducted at various locations across southern Arizona in 1992 as outlined in Table 1. Tables 2 through 4 provide basic crop and experimental conditions for the four locations. Treatments employed at each of the three locations are listed in Table 5. All experiments were carried out with a ground rig application, with treatments being arranged in large blocks within a common field. Plots were a minimum of 40 rows and a maximum of 80 rows wide, 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.

## Results

### Safford

Treatments and their associated results are listed in Table 6. Defoliant applications were made on 15 October and only 126 HU were accumulated in the next 14 days. All treatments, rates and combinations, provided satisfactory defoliations. There was a distinct trend toward greater topgrowth (regrowth) control with increasing rates. It is interesting to note that the sodium chlorate (control) treatment also provided excellent defoliation and the best topgrowth control.

### Marana

Treatments and results from the Marana test are shown in Table 7. Each of the treatments were quite effective in terms of defoliation. There were strong similarities among each of the Ginstar treatments, with no apparent advantage toward higher rates in this case. Among the Accelerate + Prep treatments, there was a trend toward improved defoliation and topgrowth control with increasing rates. The Dropp + DEF treatment served as a standard control in this case, and it also delivered excellent defoliation and regrowth results. Conditions for the Marana study were only slightly warmer than at Safford, with 157 HU accumulated in the 14 days following applications.

### Coolidge

Defoliation and regrowth (topgrowth) ratings from Coolidge are presented in Table 8, where 171 HU were accumulated 14 days after defoliant applications were applied. Once again, all treatments performed very well, including the Dropp + DEF standard. One interesting feature associated with this test was that of slightly lower topgrowth control with the highest Ginstar treatment, which is not consistent with the other locations. Among the Accelerate + Prep combinations, the highest rates resulted in slightly better defoliation ratings and substantially better topgrowth ratings.

### Summary

The information gained from these simple studies provide evidence that Ginstar (a newly available defoliation material expected for 1994, can serve as an adequate, single treatment approach to cotton defoliation. Also, the Accelerate + Prep combinations were consistently effective treatments.

These treatments offer additional alternatives to growers facing defoliation decisions under cooler temperature conditions, which are commonly the most difficult. Each of these treatments also provide potential benefit to

defoliation efforts in terms of plant-back flexibilities, important for many crop rotational programs. The fact that the treatments evaluated in these studies do not have offensive odors, makes them appropriate for use in farming areas that are close to urban developments, which happens to be a matter of concern for many farmers.

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Table 1. Location and cooperators for cotton defoliation experiments, 1993.

<u>Location</u>	<u>Cooperator</u>	<u>Variety</u>
Safford (Graham Co.)	Palmer Farms	Pima S-7
Marana (Pima Co.)	Glen Barney (UA Marana Ag. Center)	Pima S-7
Coolidge (Pinal Co.)	Prechel Farm	Pima S-7

Table 2. Experimental conditions for Safford, AZ, Pima cotton defoliation study, 1993.

Defoliant Application	15 October
HU*, 14 Days Post Defoliation	126
Elevation (approx.)	2,900
Method of Application	Ground
Carrier Rate (gpa)	15

\*HU = Heat Units, 86/55°F limits.

Table 3. Experimental conditions for Marana, AZ, cotton defoliation study, 1993.

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Defoliant Application	19 October
HU*, 14 Days Post Defoliation	157
Elevation (approx.)	2,000 ft.
Method of Application	Ground
Carrier Rate (gpa)	50

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\* HU = Heat Units, 86/55°F limits.

Table 4. Experimental conditions for Coolidge, AZ, Pima cotton defoliation study, 1993.

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Defoliant Application	20 October
HU*, 14 Days Post Defoliation	171
Elevation (approx.)	1,385 ft.
Method of Application	Ground
Carrier Rate (gpa)	15

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\* HU = Heat Units, 86/55°F limits.

Table 5. Treatments used in Arizona cotton defoliation experiments, 1993.

Treatment *		Rate
		--lbs. a.i./acre--
1.	Ginstar	0.075 lb. a.i.
2.	Ginstar	0.100 lb. a.i.
3.	Ginstar	0.150 lb. a.i.
		--lbs. material/acre--
4.	Accelerate + Prep	1.0 pt. + 1.0 pt.
5.	Accelerate + Prep	1.5 pt. + 1.0 pt.
6.	Accelerate + Prep	1.5 pt. + 1.5 pt.
7.	Dropp + DEF/F**	0.2 lb. + 1.0 pt.
8.	Sodium Chlorate	2.5 gal.

\* All treatments included 1.0 pt. Agridex/acre.

\*\* DEF/F: Represents either DEF-6 or FOLEX, which are identical materials and can be used interchangeably.

Table 6. Results (means values) from the Pima cotton defoliation experiment, Safford, AZ, Palmer Farms, 1993.

<u>Treatment</u>	<u>Defoliation Estimate</u> -----%-----	<u>Regrowth Rating</u>
1. Ginstar (0.075 lb. a.i.)	80	8
2. Ginstar (0.100 lb. a.i.)	80	7
3. Ginstar (0.150 lb. a.i.)	90	6
4. Accelerate + Prep (1.0 pt. + 1.0 pt.)	80	6
5. Accelerate + Prep (1.5 pt. + 1.0 pt.)	85	5
6. Accelerate + Prep (1.5 pt. + 1.5 pt.)	90	3
7. Sodium Chlorate (2.5 gal.)	85	2

\* Means followed by the same letter are not significantly different ( $P \leq 0.05$ ) according to a Duncans multiple range test.

Defoliant applied: 15 October  
 Measurements taken: 27 October  
 14d HU = 126

Table 7. Results (means values) from the Pima cotton defoliation experiment, Marana, AZ, University of Arizona Marana Agricultural Center, 1993.

<u>Treatment</u>	<u>Defoliation Estimate</u> -----%-----	<u>Regrowth Rating</u>
1. Ginstar (0.075 lb. a.i.)	80	2
2. Ginstar (0.100 lb. a.i.)	90	2
3. Ginstar (0.150 lb. a.i.)	90	2
4. Accelerate + Prep (1.0 pt. + 1.0 pt.)	75	8
5. Accelerate + Prep (1.5 pt. + 1.0 pt.)	75	7
6. Accelerate + Prep (1.5 pt. + 1.5 pt.)	80	5
7. Dropp + DEF/F** (0.2 lb. + 1.0 pt.)	80	2

\* Means followed by the same letter are not significantly different ( $P \leq 0.05$ ) according to a Duncans multiple range test.

Defoliant applied: 19 October  
 Measurements taken: 3 November  
 14d HU = 157

Table 8. Results (means values) from the Pima cotton defoliation experiment, Coolidge, AZ, Prechel Farms, 1993.

<u>Treatment</u>	<u>Defoliation Estimate</u> -----%-----	<u>Regrowth Rating</u>
1. Ginstar (0.075 lb. a.i.)	90	4
2. Ginstar (0.100 lb. a.i.)	90	4
3. Ginstar (0.150 lb. a.i.)	90	5
4. Accelerate + Prep (1.0 pt. + 1.0 pt.)	80	8
5. Accelerate + Prep (1.5 pt. + 1.0 pt.)	85	8
6. Accelerate + Prep (1.5 pt. + 1.5 pt.)	90	4
7. Dropp + DEF/F** (0.2 lb. + 1.0 pt.)	80	4

\* Means followed by the same letter are not significantly different ( $P \leq 0.05$ ) according to a Duncans multiple range test.

Defoliant applied: 20 October

Measurements taken: 3 November

14d HU = 171