

# Defoliation Research on Upland and Pima Cotton at the Maricopa Agricultural Center in 1994

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## *Abstract*

*Field studies were conducted at the Maricopa Agricultural Center to evaluate the effectiveness of selected defoliation treatments on Pima and upland cotton under warm and cool weather conditions. Air temperatures were high for tests conducted on 16 and 22 September and cool for tests conducted on 14 October. In September tests, Pima cotton was more susceptible to leaf desiccation after applications of defoliant than upland cotton. Single applications of Ginstar or Dropp+ Def gave good defoliation in September tests. In October, Pima cotton was effectively defoliated by chemical treatments but a single application of defoliant did not provide acceptable defoliation of upland cotton.*

## **Introduction**

Defoliation research on upland cotton has been conducted by the University of Arizona for many years. There is an ongoing research program at the Maricopa Agricultural Center directed toward developing defoliation strategies for new varieties and evaluating new harvest-aid chemicals as they become available.

Pima cotton has generally been more difficult to defoliate than upland cotton. Defoliation results with Pima have varied between fields, time of year and years. In many cases, two or more applications of defoliant have been required to properly prepare the crop for harvest. What is desired, both for Pima and upland cotton, is a treatment that would consistently defoliate cotton in a single application. Defoliation research on Pima cotton has been conducted in Arizona for several years and progress has been made toward developing an effective treatment. In some instances, under warm weather conditions in September, Dropp defoliant has been effective when used alone (Nelson and Hart, 1991). However, most research has shown that Dropp used with organophosphate materials offers the most potential for a single application treatment for Pima cotton (Silvertooth et al, 1992; Silvertooth et al, 1993).

Currently, there is interest in harvesting cotton earlier in the season than in the past to reduce inputs and insect problems. Cotton for early harvest must be defoliated when air temperatures are high and plants are still actively growing. It has generally been more difficult to defoliate the crop under these conditions than later in the season when temperatures have moderated, growth has slowed and leaves are becoming senescent.

Research conducted the past several seasons has indicated that the new commercial defoliant Ginstar may be as effective as or more effective than the Dropp+ Def combination treatment for defoliating cotton in a single application (Nelson and Hart, 1992; Nelson and Hart, 1993). Additional information is needed on rates of Ginstar to use under different environmental conditions.

The objective of this research was to determine the effectiveness of Ginstar and other presently available defoliants on upland and Pima cotton under both warm and cool weather conditions.

## Materials and Methods

Seed of DP 5415 cotton was planted at the Maricopa Agricultural Center in moist soil on 8 April 1994. The plantings were furrow irrigated and received a total of 90 lbs. of N/acre during the season. The final irrigation for all tests was on 18 Aug. 1994. In all tests, defoliation treatments were applied with a Hi Boy sprayer using a 7 nozzle/row spray boom and a 25 GPA application rate. Descriptions of the defoliation treatments used in the various tests are shown in Tables 1-6. Individual plots were 4 rows wide by 38 ft long. All tests utilized randomized complete block experimental designs with 3 or 4 replications. Plots were rated for percent defoliation and desiccation by 2-3 individuals 7 and 14 days after application of chemicals.

In tests conducted on 16 Sept. (Tables 1 and 2), maximum and minimum temperatures were 103 and 57°F, respectively, on the day defoliant was applied. Average maximum and minimum temperatures for the 14 day period after application were 100 and 65°F, respectively. In the 14 day period after application of defoliant, 329 HU (86/55°F thresholds) were accumulated and 0.04 in. of rainfall was recorded.

In tests conducted on 22 Sept. (Tables 3 and 4), maximum and minimum temperatures were 94 and 64°F, respectively, on the day defoliant was applied. Average maximum and minimum temperatures for the 14 day period after application were 91 and 60°F, respectively. In the 14 day period after application of defoliant, 244 HU were accumulated and 0.04 in. of rainfall was recorded.

In tests conducted on 14 Oct. (Tables 5 and 6), maximum and minimum temperatures were 77 and 49°F, respectively, on the day defoliant was applied. Average maximum and minimum temperatures for the 14 day period after application were 81 and 51°F, respectively. In the 14 day period after application of defoliant, 164 HU were accumulated and 0.47 in. of rainfall was recorded.

Petioles collected from cotton in all tests on 15 Sept. contained less than 1000ppm NO<sub>3</sub>-N.

## Results and Discussion

Results of 16 Sept. defoliation tests are shown in Tables 1 and 2. In the DP 5415 test, several rates of Ginstar gave acceptable defoliation 7 days after application of treatments. The higher rates of Ginstar resulted in some desiccation (5-10%) within 7 days after application (data not shown). Air temperatures were very high at the time this test was conducted and over 300 HU were accumulated in the 14 day period after application of defoliant. Desiccation was not evident 14 days after application of defoliant and all chemical treatments gave good defoliation. In the Pima test, all rates of Ginstar and Dropp+ Def resulted in high percentages of desiccation 7 days after treatments were applied. However, after 14 days a high percentage of the leaves were defoliated and all chemicals resulted in excellent defoliation percentages.

Results of the 22 Sept. test are shown in Tables 3 and 4. The results of these tests are similar to those of the 16 Sept. test. In the DP5415 test, all of the Ginstar treatments resulted in good defoliation 14 days after application of treatments. In the Pima test, a high percentage of leaves were initially desiccated by the defoliant. The desiccated leaves eventually fell from the plants and at 14 days after application high defoliation percentages were obtained for all treatments involving defoliant.

Results of the 14 Oct. tests are shown in Tables 5 and 6. Temperatures were cool during these tests and less than 200 HU were accumulated during the 14 day period after application of defoliant. In the DP5415 test, none of the defoliant provided acceptable defoliation with a single application. In the Pima test, which was already partially defoliated before chemicals were applied, all treatments gave excellent defoliation 14 days after application.

In tests when air temperatures were very high, Pima cotton was more susceptible to leaf desiccation when defoliant was applied than upland cotton. Upland cotton was difficult to defoliate using a single application of defoliant when air temperatures were cool and less than 200 HU were accumulated during the 14 day period after application.

## References

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**Table 1. DP5415 cotton defoliation test on 16 September 1994.**

Treatments	Rate (lbs. a.i./acre)	Defoliation (%)	
		7 days	14 days
01 Ginstar	0.075	75a <sup>2</sup>	91ab
02 Ginstar	0.094	69a	89b
03 Ginstar	0.100	78a	94ab
04 Ginstar	0.106	61a	84c
05 Ginstar	0.150	80a	97a
06 Ginstar + Prep	0.075 + 1.0	59a	82c
07 Dropp + Def <sup>1</sup>	0.075 + 0.375	68a	83c
08 Check	-----	9b	27d

<sup>1</sup> Treatment 07 was applied with 1 pt/acre Agri-Dex.

<sup>2</sup> Means in columns followed by some letter are not significantly different at the 0.05 probability level.

**Table 2. Pima S-7 defoliation test on 16 September 1994**

Treatments	Rate (lbs. a.i./acre)	Defoliation (%)		Desiccation (%)
		7 days	14 days	7 days <sup>1</sup>
01 Ginstar	0.075	20a <sup>3</sup>	89a	62a
02 Ginstar	0.094	30a	95a	50a
03 Ginstar	0.100	18a	92a	63a
04 Ginstar	0.106	27a	96a	50a
05 Ginstar	0.150	22a	96a	58a
06 Ginstar + Prep	0.075 + 1.0	42a	88a	33a
07 Ginstar + Def <sup>2</sup>	0.075 + 0.375	23a	91a	44a
08 Check	-----	17a	34b	12b

<sup>1</sup> Desiccation was less than 10% in all treatments 14 days after application of defoliant.

<sup>2</sup> Treatment 07 was applied with 1 pt./acre Agri-Dex.

<sup>3</sup> Means in columns followed by the same letter are not significantly different at the 0.05 probability level.

**Table 3. DP5415 cotton defoliation test on 22 September 1994.**

Treatments	Rate (lbs. a.i./acre)	Defoliation (%)	
		8 days	14 days
01 Ginstar	0.075	59ab <sup>2</sup>	84ab
02 Ginstar	0.094	66ab	83ab
03 Ginstar	0.100	69a	88a
04 Ginstar	0.106	63ab	78ab
05 Ginstar	0.150	62ab	90a
06 Ginstar + Prep	0.075 + 1.0	69a	89a
07 Dropp + Def <sup>1</sup>	0.075 + 0.375	53b	73b
08 Check	-----	20c	22c

<sup>1</sup> Treatment 07 was applied with 1 pt./acre Agri-Dex.

<sup>2</sup> Means in columns followed by the same letter are not significantly different at the 0.05 probability level.

**Table 4. Pima S-7 defoliation test on 22 September 1994.**

Treatments	Rate (lbs. a.i./acre)	Defoliation (%)		Desiccation (%)
		8 days	14 days	8 days
01 Ginstar	0.075	23b <sup>2</sup>	92a	64a
02 Ginstar	0.094	21b	92a	66a
03 Ginstar	0.100	21b	95a	64a
04 Ginstar	0.106	22b	94a	67a
05 Ginstar	0.150	21b	92a	67a
06 Ginstar + Prep	0.075 + 1.0	22b	91a	65a
07 Dropp + Def <sup>1</sup>	0.075 + 0.375	22b	92a	60a
08 Check	-----	41a	42b	1b

<sup>1</sup> Treatment 07 was applied with 1 pt./acre Agri-Dex.

<sup>2</sup> Means in columns followed by the same letter are not significantly different at the 0.05 probability level.

**Table 5. DP5415 cotton defoliation test on 14 October 1994.**

Treatments	Rate (lbs. a.i./acre)	Defoliation (%)	
		7 days	14 days
01 Ginstar	0.094	30a <sup>3</sup>	54a
02 Ginstar	0.117	31a	57a
03 Ginstar	0.141	31a	60a
04 Ginstar	0.164	32a	60a
05 Ginstar	0.188	29a	56a
06 Ginstar + Def <sup>1</sup>	0.094 + 0.375	32a	54a
07 Dropp + Def <sup>2</sup>	0.20 + 0.75	32a	58a
08 Dropp + Def + Accelerate <sup>2</sup>	0.20 + 0.75 + 0.065	34a	60a

<sup>1</sup> Treatment 06 was applied with 1/2 pt./acre Agri-Dex.

<sup>2</sup> Treatments 07 and 08 were applied with 1 pt/acre Agri-Dex.

<sup>3</sup> Means in columns followed by the same letter are not significantly different at the 0.05 probability level.

**Table 6. Pima S-7 cotton defoliation test on 14 October 1994.**

Treatments	Rate (lbs. a.i./acre)	Defoliation (%) <sup>1</sup>	
		7 days	14 days
01 Ginstar	0.094	76a <sup>4</sup>	86ab
02 Ginstar	0.117	77a	87ab
03 Ginstar	0.141	77a	85b
04 Ginstar	0.164	77a	85b
05 Ginstar	0.188	77a	93a
06 Ginstar + Def <sup>2</sup>	0.094 + 0.375	77a	90ab
07 Dropp + Def <sup>3</sup>	0.20 + 0.75	79a	87ab
08 Dropp + Def + Accelerate <sup>3</sup>	0.20 + 0.75 + 0.065	77a	86ab

<sup>1</sup> At the time defoliant was applied, Pima cotton was approximately 60% defoliated by natural means.

<sup>2</sup> Treatment 06 was applied with 1/2 pt./acre Agri-Dex.

<sup>3</sup> Treatments 07 and 08 were applied with 1 pt./acre Agri-Dex.

<sup>4</sup> Means in columns followed by the same letter are not significantly different at the 0.05 probability level.