

Cotton Defoliation Evaluations, 1999

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Abstract

Two field experiments were conducted near Marana and Coolidge, AZ in 1999 to evaluate the effectiveness of a number of defoliation treatments on Upland (var. DP 33b and AP 6101) cotton. All treatments consisted of materials commercially available in Arizona. Results reinforce general recommendations regarding the use of low rates (relative to the label ranges) under warm weather conditions and increasing rates as temperatures cool. Defoliation treatments of Ginstar alone did a satisfactory job of defoliation and regrowth/topgrowth control and were very similar to treatments including Prep or Integrate. Adding Prep or Integrate to Ginstar in this experiment did not improve defoliation or topgrowth control.

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 defoliants 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; Silvertooth, 1996, Silvertooth and Norton, 1997; Silvertooth and Norton, 1998; Silvertooth and Norton, 1999). Nelson and his associates have also conducted a number of experiments concerning defoliation factors and refinement (Nelson and Hart, 1991a; Nelson and Hart, 1991b; Nelson and Silvertooth, 1991; Nelson and Hart, 1992; Nelson and Hart, 1993; Nelson and Hart, 1994; Nelson and Hart, 1995; Nelson and Hart, 1996; Nelson and Hart, 1996; and Nelson, 1998). Common treatments resulting from this earlier work include Dropp + DEF and Dropp + Accelerate combinations, and Ginstar treatments with increasing rates as temperature conditions cool. The 1999 experiment represents an extension of this general project in terms of evaluating some various treatments and combinations, and attempting to refine recommendations and guidelines.

The primary objective of this study was to compare and evaluate a set of conventional defoliants including Ginstar as a standard treatment compared with different rates and with or without Prep or Integrate. An additional objective was to consider the results in terms of current guidelines and recommendations for cotton defoliation in Arizona.

Methods

Two field experiments were conducted on grower-cooperator farms near Marana (Table 1) and Coolidge, AZ (Table 2). The treatments employed were the same at both locations and are listed in Tables 3 and 4. Treatments were made to Upland cotton (var. DP 33b at Marana and AP 6101 at Coolidge) by ground rig application at both sites in a randomized complete block design with four replications. Plots were 24, 40 inch rows wide at Marana and 18, 40 inch rows wide at Coolidge. Plots extended the full length of the irrigation run (approximately 1200 feet) at both locations.

After treatments were applied, visual estimates of percent defoliation, and the regrowth/topgrowth control ratings were made seven and 14 days after the treatment date. Weather conditions following the defoliant treatment applications are described in terms of heat units (HU, 86/55 °F thresholds) accumulated during the 14 day period following defoliant applications. In general, conditions were dry and warm at both sites. 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

The final plant measurements and evaluations were made on 13 October. The results from Coolidge and Marana are shown in Tables 3 and 4, respectively. Of the six treatments evaluated in this study, they were all very similar with respect to percent defoliation and regrowth control at both locations. Complete defoliation was realized for all treatments at Marana (actually within seven days). Defoliation at Coolidge was difficult do to rank crop canopy conditions and some degree of honeydew deposits from a whitefly infestation. Any significance in the findings from these studies concern the fact that a simple, single material treatment (involving Ginstar in this case) did a satisfactory job. No benefit was found in relation to combination treatments by adding Prep or Integrate to Ginstar in terms of defoliation. This is also consistent with previous studies. Combinations of defoliants such as Ginstar with Prep or Integrate may improve the rate of defoliation or boll opening of the crop. Treatments at both locations were also very similar in terms of defoliation and/or regrowth control seven days post-application (data not shown). Also, rate of boll opening was note measured in this study.

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, 1999.

| | |
|-------------------------------|--------------|
| Defoliant Application | 30 September |
| HU*, 14 Days Post Application | |
| Elevation (approx.) | 1,385 ft. |
| Method of Application | Ground |
| Carrier Rate (gpa) | 11 |

*HU = Heat Units 86/55°F limits.

Table 2. Experimental conditions for Marana, AZ, cotton defoliation study, 1999.

| | |
|-------------------------------|--------------|
| Defoliant Application | 29 Spetember |
| HU*, 14 Days Post Application | |
| Elevation (approx.) | 1,974 ft. |
| Method of Application | Ground |
| Carrier Rate (gpa) | 11 |

*HU = Heat Units 86/55°F limits.

Table 3. Treatments and results from the cotton defoliation experiment, Coolidge, AZ, 1999.*

| Treatment | Rate Material/acre | Defoliation (%) 14 October | Topgrowth |
|-------------------------|-----------------------|-------------------------------|-----------|
| 1. Ginstar | 8 oz. | 53.3 a | 6.3 ab |
| 2. Ginstar | 10 oz. | 60.0 a | 6.3 ab |
| 3. Ginstar Prep | 8 oz 1.3 pt | 68.3 a | 5.3 ab |
| 4. Ginstar Prep | 10 oz 1.3 pt | 58.3 a | 5.7 ab |
| 5. Ginstar Integrate | 8 oz 1 qt | 53.3 a | 6.7 a |
| 6. Ginstar Integrate | 10 oz 1 qt | 60.0 a | 5.0 b |
| | OSL*** | 0.4827 | 0.2037 |
| | CV(%) | 16.6 | 14.4 |

* Treatments applied 30 September

** Means followed by the same letter are not significantly different according to a Duncan's Multiple Range Test (P<0.005)

*** OSL = Observed significance level, CV = coefficient of variation

Table 4. Treatments and results from the cotton defoliation experiment, Marana, AZ, 1999.*

| Treatment | Rate Material/acre | Defoliation (%) | Topgrowth |
|-------------------------|-----------------------|-----------------|-----------|
| | | 14 October | |
| 1. Ginstar | 8 oz. | 95 | 1.3 |
| 2. Ginstar | 10 oz. | 95 | 1.3 |
| 3. Ginstar Prep | 8 oz 1.3 pt | 95 | 1.3a |
| 4. Ginstar Prep | 10 oz 1.3 pt | 95 | 1.3 |
| 5. Ginstar Integrate | 8 oz 1 qt | 95 | 1.3 |
| 6. Ginstar Integrate | 10 oz 1 qt | 95 | 1.3 |
| | OSL*** | ---- | ---- |
| | CV(%) | ---- | ---- |

* Treatments applied 29 September

** Means followed by the same letter are not significantly different according to a Duncan's Multiple Range Test (P<0.005)

*** OSL = Observed significance level, CV = coefficient of variation