

Cotton Defoliation Evaluations, 1998

J.C. Silvertooth and E.R. Norton

Abstract

A field experiment was conducted near Marana, AZ in 1998 to evaluate the effectiveness of a number of defoliation treatments on Upland (var. Stoneville 474) 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 Dropp + Def combination treatments. Adding Prep 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; and Silvertooth and Norton, 1998). 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 1998 experiment represents an extension of this general project in terms of evaluating some various treatments and combinations, and attempting to refine recommendations and guidelines.

Methods

A Field experiment was conducted on the University of Arizona Agricultural Center; near, Marana AZ as outlined in Table 1. The treatments employed are listed in Table 2. Treatments were made to Upland cotton (var. Stoneville 474) by ground rig application. Treatments were arranged in a randomized complete block design with two replications. Plots were 8, 40 inch rows wide and extended the full length of the irrigation run (approximately 650 feet).

After treatments were applied, visual estimates of percent defoliation, and the regrowth/topgrowth control ratings were

made 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. 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 a set of conventional defoliants including Drop + Def and Ginstar as standard treatments. An additional objective was to consider the results in terms of current guidelines and recommendations for cotton defoliation in Arizona.

Results

The results from the Marana location (approx. 1,975 ft.) are shown in Table 2. represent a slightly higher elevation and the application was made on 1 October, with 209 HU being accumulated 14 days following treatment applications. The final plant measurements were made on 21 October. Plot conditions and treatment evaluations were no different on 14 October, therefore, the 14 October readings are reported. Of the six treatments evaluated in this study, they were all very similar with respect to percent defoliation and regrowth control. Therefore, any significance in the findings would be with respect to the fact that the simpler, single material treatments involving Ginstar did a completely satisfactory job. No benefit was found in relation to combination treatments or adding Prep to Ginstar in terms of defoliation. This is also consistent with previous studies. Combinations of defoliants such as Genstar with Prep may have improved the rate of boll opening of the crop. However, rate of boll opening was not 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).

Acknowledgements

The support provided by AgrEvo is greatly appreciated. The authors would like to express their appreciation for the friendly and valuable cooperation provided by Mr. Glen Barney at the University of Arizona Marana Agricultural Center.

References

- Nelson, J. M. and G. Hart. 1991a. Defoliation research on Pima cotton at the Maricopa agricultural center in 1990. Cotton, A College of Agriculture Report. University of Arizona, Series P-87:33-35.
- Nelson, J. M. and G. Hart. 1991b. Effect of plant nitrogen status on effectiveness of defoliants for short season cotton production. Cotton, A College of Agriculture Report. University of Arizona, Series P-87:39-41.
- Nelson, J. M. and J. C. Silvertooth. 1991. Defoliation research on Pima cotton at the Marana agricultural center in 1990. Cotton, A College of Agriculture Report. University of Arizona, Series P-87:36-38.
- Nelson, J. M. and G. Hart. 1992. Effect of plant nitrogen status on defoliation of short season Upland cotton. Cotton, A College of Agriculture Report. University of Arizona, Series P-91:317-319.
- Nelson, J. M. and G. Hart. 1993. Defoliation research on Pima and Upland cotton at the Maricopa Agricultural Center in 1992. Cotton, A College of Agriculture Report. University of Arizona, Series P-94:56-60.
- Nelson, J. M. and G. Hart. 1994. Defoliation research on Pima and Upland cotton at the Maricopa Agricultural Center in 1993. Cotton, A College of Agriculture Report. University of Arizona, Series P-96:57-63.

- Nelson, J. M. and G. Hart. 1995. Defoliation research on Pima and Upland cotton at the Maricopa Agricultural Center in 1993. Cotton, A College of Agriculture Report. University of Arizona, Series P-99:40-55
- Nelson, J. M. and G. Hart. 1996. Defoliation tests with Ginstar at the Maricopa Agricultural Center in 1995. Cotton, A College of Agriculture Report. University of Arizona, Series P-103:46-52.
- Nelson, J. M. and G. Hart. 1997. Defoliation tests with Ginstar at the Maricopa Agricultural Center in 1996. Cotton, A College of Agriculture Report. University of Arizona, Series P-108:67-75.
- Nelson, J. M. 1998. Defoliation tests with Ginstar at the Maricopa Agricultural Center in 1997. Cotton, A College of Agriculture Report. University of Arizona, Series P-112:61-67.
- Silvertooth, J. C. 1991. Defoliation of Pima Cotton. Report 191052. The University of Arizona, College of Agriculture. 4 pp.
- Silvertooth, J. C. and D. R. Howell. 1988. Defoliation of Pima cotton. Cotton, A College of Agriculture Report. University of Arizona, Series P-72:117-120.
- Silvertooth, J. C., D. R. Howell, S. W. Stedman, G. Thacker, and S. S. Winans. 1989. Defoliation of Pima cotton, A College of Agriculture Report. University of Arizona, Series P-77:77-81.
- Silvertooth, J. C., D. R. Howell, G. Thacker, S. W. Stedman, and S. S. Winans. 1990a. Defoliation of Pima cotton, 1989. Cotton, A College of Agriculture Report. University of Arizona, Series P-81:20-22.
- Silvertooth, J. C., S. W. Stedman, and J. Tollefson. 1990b. Interaction of Pima cotton defoliation and crop water stress index. Cotton, A College of Agriculture Report. University of Arizona, Series P-81:32-34.
- Silvertooth, J. C., S. H. Husman, G. W. Thacker, D. R. Howell, and S. S. Winans. 1991. Defoliation of Pima cotton, 1990. Cotton, A College of Agriculture Report. University of Arizona, Series P-87: 18-32.
- Silvertooth, J. C., S. H. Husman, S. W. Stedman, P. W. Brown, and D. R. Howell. 1992. Defoliation of Pima cotton, 1991. Cotton, A College of Agriculture Report. University of Arizona, Series P-91:289-301.
- Silvertooth, J. C., S. H. Husman, P. W. Brown, and J. Burnett. 1993. Cotton defoliation evaluations, 1992. Cotton, A College of Agriculture Report. University of Arizona, Series P-94:44-55.
- Silvertooth, J. C., S. W. Stedman, R.E. Cluff, and E.R. Norton. 1994. Cotton defoliation evaluations, 1993. Cotton, A College of Agriculture Report. University of Arizona, Series P-96:49-56.
- Silvertooth, J. C., and E.R. Norton. 1995. Cotton defoliation evaluations, 1994. Cotton, A College of Agriculture Report. University of Arizona, Series P-99:34-39.
- Silvertooth, J. C. 1996. Cotton defoliation evaluations, 1995. Cotton, A College of Agriculture Report. University of Arizona, Series P-103:57-60.
- Silvertooth, J. C., and E.R. Norton. 1997. Cotton defoliation evaluations, 1996. Cotton, A College of Agriculture Report. University of Arizona, Series P-108:76-81.
- Silvertooth, J. C., and E.R. Norton. 1998. Cotton defoliation evaluations, 1997. Cotton, A College of Agriculture Report. University of Arizona, Series P-112:55-60.

Table 1. Experimental conditions for Marana, AZ, cotton defoliation study, 1998.

Defoliant Application	1 October
HU*, 14 Days Post Application	209
Elevation (approx.)	1,974 ft.
Method of Application	Ground
Carrier Rate (gpa)	11

*HU = Heat Units 86/55°F limits.

Table 2. Treatments and results from the cotton defoliation experiment, Marana, AZ, 1998.*

Treatment	Rate Material/acre	Defoliation (%) 14 October	Topgrowth
1. Ginstar	8 oz.	85 a	3.5 a
2. Ginstar	10 oz.	90 a	2.5 a
3. Dropp Def Crop Oil	0.2 lb. 1 pt. 1 pt.	90 a	2.0 a
4. Ginstar Prep	8 oz. 2 pt.	85 a	2.0 a
5. Ginstar Prep	10 oz. 2 pt.	90 a	2.0 a
6. Ginstar Prep	8 oz. 1 pt.	90 a	3.0 a
	OSL***	0.50	0.50
	CV(%)	4.1	3.6

* Treatments applied 1 October

** 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