EVALUATION OF COTTON HARVEST AIDS IN THE BRAZOS BOTTOMS

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Abstract

Cotton defoliation is a continuing challenge for growers in the Brazos Bottoms. A two-year study was designed to evaluate several "standard" defoliation treatments on cotton variety DP&L 50 at the Texas Agricultural Experiment Station near College Station, Texas. Harvest-aid treatments included were: an untreated check; Folex (0.75 pt/A) + Prep (1.33 pt/A); Ginstar (8 oz/A); Dropp 50WP (0.1 lb/A) + Prep (1.33 pt/A); Folex (0.75 pt/A) + Prep (1.33 pt/A) + Dropp 50WP (0.1 lb/A); Harvade (0.5 pt/A) + Folex (0.75 pt/A) + Prep (1.33 pt/A) + Agridex (1 pt/A); Finish (2 qt/A); and Dropp 50WP (0.25 lb/A) followed by Starfire (6 oz/A) + Sodium Chlorate (4.5 lb ai/A) + AG-98 (0.25 % v/v) 5 days after initial treatment (DAIT). All treatments were applied when the cotton was at 60% open boll. Plots were evaluated for percent defoliation and desiccation at 7 and 14 DAIT. Percent open bolls was evaluated at 7 DAIT and basal and terminal regrowth was evaluated at 21 DAIT. In 1997 and 1998, performance of Ginstar 7 DAIT was superior to other treatments and provided a total performance rating of 87%. By 14 DAIT, Ginstar and Dropp followed by Starfire + Sodium Chlorate + AG-98 provided the best defoliation, with performance ratings providing greater than 86% in both years. None of the harvest aid treatments gave acceptable regrowth control 21 DAIT. Boll opening was not enhanced with any harvest aid treatment. Other treatments in the study provided a total performance rating of less than 87% and were not acceptable for harvest-aid treatments.

Introduction

Cotton production costs have continued to increase while the return to the producer has declined or remained the same. One of the main costs is defoliation, which is critical for producing a successful crop. In 1998, the Texas Agricultural Extension Service estimated that, with a cotton price of $0.65 per pound, cotton defoliation costs should not exceed $8 per acre, assuming a yield of 0.75 to 1.0 bale per acre on dryland cotton. Irrigation provides the producer with a higher yield potential and allows a larger allocation of funds toward defoliation. A defoliation cost of $12 to $18 per acre is estimated to be economical with irrigated cotton production.

Defoliants are generally applied when the crop has 60% open bolls (Hake et al., 1996). A defoliant's effectiveness is dependent upon weather conditions prior to, at, and after defoliation. Excessive heat and water stress will produce a thickened leaf cuticle that decreases uptake of defoliants (Roberts et al., 1996). Areas with excessive nitrogen, moisture and actively growing plants are also more difficult to defoliate (Hake et al., 1996). Poor defoliation has the potential to lower cotton yield and fiber quality by staining cotton lint, adding trash to modules, and reducing picking efficiency. While 'standard' defoliation treatments across the Cotton Belt typically provide adequate defoliation, the producer still strives for a defoliation program that will consistently provide optimal performance, in all conditions, at minimal cost.

Objective

The objective of this study was to evaluate the cost effectiveness of seven defoliation treatments applied to 'picker-type' cotton in the Brazos Bottoms of Texas.

Material and Methods

Cultural Information

Cotton variety DP&L 50 was seeded at 45,000 plants per acre in 1997 and 1998. Agronomic inputs were consistent with local production practices for irrigated cotton. Defoliants were applied when the cotton was 60 % open, using TXVS-10 hollow cone spray tips delivering 15 GPA. Treatments are listed in Table 1.

Data Collected	Days After Initial Treatment (DAIT)
% Open Bolls	7
% Defoliation	7 & 14
% Desiccation	7 & 14
% Basal Regrowth	21
% Terminal Regrowth	21

Visual ratings were based on the following formula:
%Defoliation + %Desiccation + %Green leaves = 100%
Regrowth ratings were based upon counting basally and terminally regrown leaves, > 2.5 cm in diameter, on 20 plants per plot.

Analysis

Treatments were analyzed using the General Linear Model in SAS. Means were separated using Fisher's Protected LSD at a significance of 0.05 (SAS, 1989-1996). All rating data was transformed using the arcsine square root transformation. Actual means are reported, but the statistics reflect the transformed data.

Results and Discussion

The performance of the defoliation treatments varied for each year due to weather influence. In 1997 adequate moisture was available throughout the season. Conversely, in 1998 drought and extreme heat were prevalent through the growing season and excessive rainfall occurred after defoliation treatments.

Defoliation

***1997*:** At 7 DAIT, Ginstar was the only treatment that provided greater than 85% defoliation (Figure 1).

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Dropp/Folex/Prep provided 78% defoliation with all other treatments providing less than 65% (Figure 1). At 14 DAIT, Ginstar, Dropp/Starfire/Defol 6, and Dropp/Folex/Prep provided greater than 93% defoliation (Figure 2). Dropp/Folex/Prep provided greater than 85% defoliation; at this time all other treatments showed less than 79% defoliation (Figure 2).

1998: At 7 DAIT, none of the treatments provided adequate defoliation (Figure 1). However, the Ginstar and the Dropp/Starfire/Defol 6 treatments tended to be the superior treatments. At 14 DAIT, Dropp/Starfire/Defol 6 and Ginstar were the only treatments having defoliation ratings greater than 85% (Figure 2).

Defoliation is the removal of cotton leaves from the stem. Cotton defoliants need to provide at least 85% defoliation to be considered an effective harvest-aid. Inadequate defoliation may lead to difficulty in picking and a decrease in lint quality. Timely removal of the crop from the field is also essential to avoid unnecessary yield losses. Ginstar was the only treatment at 7 DAIT that provided adequate defoliation for early harvest. Treatments containing Dropp tended to provide adequate defoliation by 14 DAIT.

Desiccation

1997: Overall desiccation was less than 15% at 7 DAIT; however, Dropp/Starfire/Defol 6 showed the most desiccation (Figure 3). Desiccation, at 14 DAIT, was negligible (Data not shown).

1998: Overall desiccation was less than 10% at 7 DAIT, with Ginstar and Dropp/Starfire/Defol 6 exhibiting the most defoliation (Figure 3). Desiccation, at 14 DAIT was negligible (Data not shown).

Desiccation is defined as dead leaves of cotton remaining attached to the stem ('leaf stick'). Excessive desiccation can lead to lint trash or 'barky' cotton. Desiccation was not a significant problem with any treatment.

Basal and Terminal Regrowth

1997: All treatments at 21 DAIT showed basal and terminal regrowth, with Dropp/Folex/Prep and Harvade/Folex/Prep showing the most (Figure 5 & 6). Dropp/Starfire/Defol 6 and Dropp/Prep had less than 55% basal and terminal regrowth (Figure 5 & 6).

1998: No treatment provided adequate suppression of basal or terminal regrowth at 21 DAIT (Figure 5 & 6). An overabundance of rainfall following application of treatments contributed significantly to the excessive regrowth.

Regrowth typically is a problem on cotton that has excess moisture or nitrogen fertilizer. Excessive regrowth can complicate harvesting and lead to staining of lint. Dropp showed the greatest tendency to suppress basal and terminal regrowth. However, the addition of Folex to Dropp appeared to decrease the ability of Dropp to suppress regrowth.

Percent Open

1997 & 1998: Several harvest aids are marketed to increase boll opening. However, no treatment, in 1997 or 1998, consistently increased boll-opening rate. In 1997, Dropp/Starfire/Defol 6 had the greatest percentage of open bolls 7 DAIT (Figure 4). In 1998, Finish tended to increase boll opening more than all other treatments (Figure 4).

Conclusion

Defoliation in the Brazos Bottoms will continue to be of critical concern to producers. The best overall treatments, considering performance and cost, in this two-year study are were follows:

#1 – Ginstar ~ *$10.65/A*
#2 – Dropp/Starfire/Defol ~ *$10.55/A*
#3 – Dropp/Folex/Prep ~ *$17.60/A*
#4 – Dropp/Prep ~$13.60/A
#5 – Harvade/Folex/Prep ~$17.20/A
#6 – Folex/Prep ~$12.30/A
#7 – Finish ~$26.00/A

Future Research

Research of new harvest aid products needs to be continued. However, older compounds, chemistries, and cotton varieties should continue to be evaluated utilizing different rates and combinations. The most promising compound for economical defoliation may be the use of Dropp at variable rates and with different defoliants/desiccants. In particular, varying rates of Dropp and Folex combinations should be evaluated for their defoliation capability and low cost.

Literature Cited

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Table 1 : Approximate cost analysis associated with each treatment†

Treatment (code)	Rate/A	Timing	Approx. Cost $ / A
Folex +	0.75 pt	60 % Open	4.00
Prep	1.33 pt		8.30
(Folex/Prep)			***Total = 12. 30***
Ginstar	8 oz	60 % Open	10.65
(Ginstar)			***Total = 10.65***
Dropp 50 WP +	0.1 lb	60 % Open	5.30
Prep	1.33 pt		8.30
(Dropp/Prep)			***Total = 13.60***
Dropp 50 WP+	0.1 lb	60 % Open	5.30
Folex +	0.75 pt		4.00
Prep	1.33 pt		8.30
(Dropp/Folex/Prep)			***Total = 17.60***
Dropp 50 WP	0.25 lb	60 % Open	5.30
*Starfire +	6 oz	5 DAIT‡	2.25
Defol 6	3 qt	5 DAIT	3.00
(Dropp/Starfire/Prep)			***Total = 10.55***
*Harvade +	0.5 pt	60 % Open	4.90
Folex +	0.75 pt		4.00
Prep	1.33 pt		8.30
(Harvade/Folex/Prep)			***Total = 17.20***
Finish	2.0 qt	60 % Open	26.00
(Finish)			***Total = 26.00***

†These projected costs do not include application costs
* Indicates surfactant needed at time of application (minimal cost)
‡Days After Initial Treatment

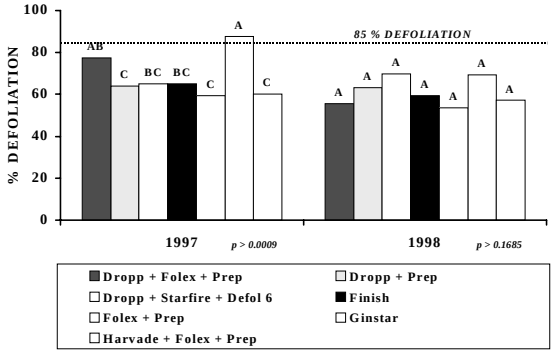

Figure 1: Percent Defoliation @ 7 DAIT

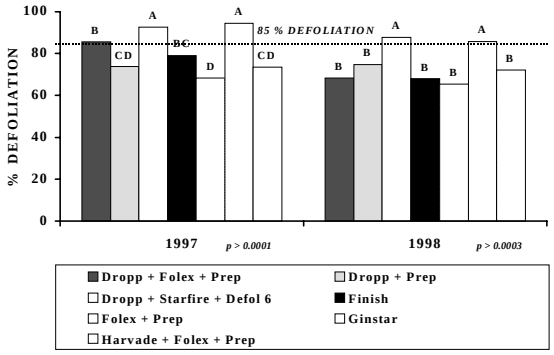

Figure 2: Percent Defoliation @ 14 DAIT

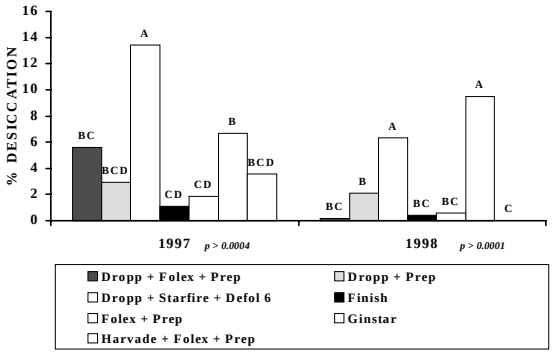

Figure 3: Percent Desiccation @ 7 DAIT

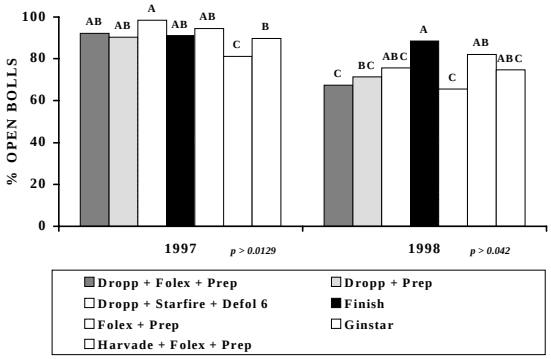

Figure 4: Percent Open Bolls @ 7 DAIT

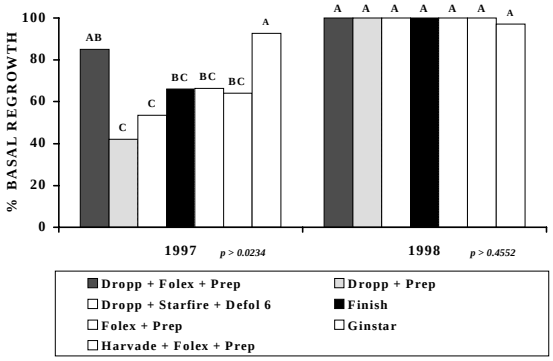

Figure 5: Percent Basal Regrowth @ 21 DAIT

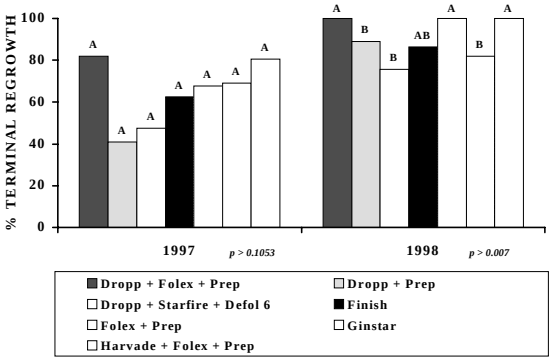

Figure 6: Percent Terminal Regrowth @ 21 DAIT