Texas Cooperative EXTENSION
The Texas A&M University System

Result Demonstration/Applied Research Report

2001 Tom Green County
Cotton Harvest Aid Demonstration
Cooperator: Chris Bubenik

Rick Minzenmayer, Marvin Ensor, Marc Tucker, and Billy Warrick *

Summary

Eleven harvest aid treatments were applied to Deltapine 458 B/RR cotton on September 28, 2001 to prepare the crop for harvest. The plot was established on Chris Bubenik's Farm, 5 miles north of Wall, Texas. The chemicals were applied to irrigated cotton that had 65 percent of its bolls open. Leaf shed was less than one percent and the cotton plant leaves were still green in color. All applied treatments resulted in a significant level of leaf defoliation when compared to the untreated checks. New plant growth resulting from mid-August rains combined with cool temperatures throughout the test evaluation period proved to be challenging for all harvest aids applied.

Objective

In the Southern Rolling Plains of Texas, cotton is usually planted starting in mid-May. Because of this late planting date, many producers do not use harvest aids to terminate the cotton. When growing conditions are favorable, most of the cotton in this area is ready for harvest thirty days before the first killing freeze. The delay in harvest reduces the income of farmers due to the loss of lint yield and fiber quality. Even though the cost of several of the harvest aid treatments are expensive, there is usually a product that is economically justified that can be used effectively for crop termination. The intent of this field test is to: 1) determine the effectiveness of harvest aids at defoliating, desiccating, and opening bolls on cotton 2) provide producers the opportunity of observing how effectively the harvest aid materials work, and 3) determine the economic feasibility of using the harvest aid material.

* Rick Minzenmayer, Extension Agent - IPM; Marvin Ensor and Marc Tucker, Tom Green County Extension Agents; and Dr. Billy Warrick, Extension Agronomist (San Angelo, Texas).

Materials and Methods

Cooperating Producers: Chris Bubenik
Location: 5 miles north of Wall

Crop Production Information:

Planting Date:	May 14, 2001
Planting Rate:	11.3 pounds per acre
Variety Planted:	Deltapine 458 B/RR
Planting Pattern:	Solid on 40 inch spacing
Herbicide Applied:	Prowl was applied in the Spring of 2001 at 3.0 pints per acre, preplant incorporated, followed by 16 ounces of Direx plus 16 ounces of Caparol applied broadcast at planting. In early June, Roundup Ultra was applied at a 1 quart rate.
Number of Irrigations:	2 applications during the growing season
Insecticides Applied:	None
Fertilizer Applied:	200 pounds of 46-0-0 was applied prior to the first irrigation.

Harvest Aid Application Information:

Date Applied:	September 28, 2001
Time of Day:	2:00 p.m. to 5:30 p.m.
Wind Speed:	7 to 10 miles per hour
Wind Direction:	East by Southeast
Air Temperature:	82 to 84^0 Fahrenheit
Relative Humidity:	29 to 31%
Carrier:	10.75 gallons of water per acre
Pressure:	40 pounds per square inch
Nozzle Size:	11002 air induction flat fan nozzles on 20 inch center
Boom Height:	48 inches
Cotton Height:	Average of 36 to 40 inches
Application Device:	Self propelled rig
Plot Size:	13.33 feet X 70 feet
Test Design:	Randomized complete block design replicated 3 times

Plant Information

Date information was collected: September 28, 2001
Average Height: 38 inches
Average number of bolls above top cracked boll: 4
Percent open bolls: 65
Number of plants per acre: 52,000
Plant health was excellent and the plant was still blooming

Weather Information

Rainfall information was collected onsite and weather information used in the table was obtained from a CR10 weather station located 1 mile south of the test plot.

Rainfall Information (Date and Amount)

August 15 to 31	4.50 inches	After plot establishment	
September 4	1.00 inch	October 11	0.25 inch
September 17	0.35 inch		
September 22	0.10 inch		

Aug. 15 to Sept. 22--Total	5.95 inches		

Data Collection:

An area in each treatment was marked to make ratings on the percent open bolls, percent defoliation, percent desiccation, and regrowth in the top and bottom portion of the plants. Actual leaf counts and boll counts were made in each of the marked areas. Percent open bolls was determined by dividing the total number of bolls open enough to be harvested by the total number of bolls on the same plants. Percent defoliation was determined by dividing the total number of leaves remaining on the cotton plants by the original number of leaves (250 leaves) on the plants. Percent desiccation was determined by dividing the total number of leaves that had dried and remained attached to the plants by the original 250 leaves. A rating system was used to reflect the growth of new leaves in the top and bottom portion of the plants within each marked area. A copy of the regrowth rating system used is attached. Due to the rainfall received 30 days prior to the initiation of the test, new plant growth was significant with most plants developing a minimum of 8 inches of additional plant height. Regrowth after harvest aids were applied did not develop to a level that they would interfere with harvest efficiency, however, the potential for increased leaf grade discounts were a concern. The information collected on October 5, October 12 and October 19 are reported in Tables 1, 2 and 3, respectively.

Results and Discussion

The First Seven Days

On the next page is a table that indicates the maximum and minimum air temperature during the 21 days these products were evaluated. From September 28 to October 4, daytime air temperatures ranged from 76 to 88 degrees Fahrenheit and the night temperatures ranged from 46 to 61 degrees.

At the time of application, the upper most cotton bolls were cross-sectioned and the seed coats were dark and the cotyledons well developed. The percent of open bolls increased by 10 percent in the first week. At the seven day evaluation, there was a significant increase in the percent of desiccation. The information collected on October 5 is reported in Table 1., none of the treatments had significantly more bolls open than the check.

Maximum and Minimum Air Temperatures for September 28 - October 18, 2001

Date	Max Air	Min Air	Date	Max Air	Min Air	Date	Max Air	Min Air
28	85	50	5	75	54	12	81	55
29	80	53	6	67	50	13	72	48
30	77	53	7	78	47	14	83	44
1	76	46	8	83	59	15	80	52
2	82	46	9	83	70	16	66	41
3	85	55	10	85	58	17	77	41
4	88	61	11	74	55	18	83	54

The most evident impact of the materials applied was the increased amount of leaf desiccation. All treatments had significantly more leaf desiccation than the check. The amount of desiccation ranged from 0 to 40 percent. The amount of defoliation ranged from 2 to 45 percent. The cool daytime and nighttime temperatures slowed the cottons response to all the treatments applied. No regrowth was found in the top and bottom portions of cotton plant in any of the treatments.

The Second Week (October 5 - October 11, 2001)

Hourly daytime air temperature ranged from 67 to 85 degrees Fahrenheit. The nighttime temperatures ranged from 47 to 70 degrees. These temperatures when compared to 2000 were 8 to 12 degrees cooler for the daytime air temperatures. The cooler temperatures slowed the plants response to harvest aids applied some products took almost a week longer to reach normal expected performance.

The amount of boll opening now ranged from 75 to 85 percent which is an increase of 0 to 10 percent from the seven day evaluation. At the 14 day evaluation (7 days after the followup treatments were applied), there was a significant difference in the percent of boll opening, percent of defoliation, percent of desiccation, and regrowth in the bottom portion of the plant. The information collected on October 12 is reported in Table 2.

In this test, all treatments had significantly more boll opening than the check. About half of the treatments had significantly more boll opening than the check. All treatments had significantly more leaf defoliation than the check. Folex at 16 ounces plus Prep at 16 ounces had significantly more leaf defoliation than Aim at 0.66 ounce plus Ginstar at 3 ounces per acre, Dropp at 0.2 pound plus DyneAmic at 2 ounces per acre, Dropp at 0.1 pound plus Folex at 16 ounces per acre, Ginstar at 6 ounces per acre, and Cyclone Max at 8 ounces plus LI-700 at 0.25 percent v/v treatments.

The Cyclone Max at 8 ounces plus LI-700 at 0.25 percent v/v treatment had the highest percentage of leaf desiccation compared to all other treatments that had 10 percent or less desiccation. Regrowth in the bottom portion of the plants was significantly higher in all treatments when compared to the check. The regrowth rating was 1, and at this level would not impact harvest efficiency but might impact leaf grade.

Table 1. Chris Bubenik's 2001 Aventis Cotton Harvest Aid Test (Tom Green County) October 5, 2001 (Seven days after treatments were applied)

Harvest Aids Applied	Rate Applied Per Acre	Harvest Aid Cost Per Acre	% Open Bolls (7 DAT)	% Defoliation (7 DAT)	% Desiccation (7 DAT)	Regrowth Rating Top (7 DAT)	Regrowth Rating Bottom (7 DAT)
Dropp + Dyne-Amic	0.2 lb. + 2 oz.	$11.60	75	5	0.00 f	0	0
Dropp + Def/Folex	0.1 lb. + 16 oz.	$5.80 + $5.98	75	10	6.67 c	0	0
Dropp + Ginstar + Dyne-Amic	0.7 lb. + 3 oz.	$4.06 + $4.56	75	10	5.00 d	0	0
Ginstar	6 oz.	$9.12	75	10	1.00 e	0	0
Ginstar + Ammonium Sulphate	5 oz. + 17#/100 gal.	$7.60	75	15	2.00 e	0	0
Ginstar + Finish	3 oz. + 16 oz.	$4.56 + $10.44	75	20	2.00 e	0	0
Ginstar + Finish + Dyne-Amic	3 oz. + 8 oz. + 2 oz.	$4.56 + $5.22	75	15	5.00 d	0	0
Finish + Def/Folex + Prep	8 oz. + 8 oz. + 8 oz.	$5.22 + $2.99 + $3.37	75	25	10.00 b	0	0
Cyclone Max + L.I. 700	8 oz. + 0.25% v/v	$2.40	75	10	40.00 a	0	0
Def/Folex + Prep	16 oz. + 16 oz.	$5.98 + $8.84	75	45	0.00 f	0	0
Check			75	2	0.00 f	0	0
Aim + Ginstar	0.66 oz. + 3 oz.	$5.12 + 4.56	75	5	10.00 b	0	0

Table 2. Chris Bubenik's 2001 Aventis Cotton Harvest Aid Test (Tom Green County)
October 12, 2001 (14 days after initial treatments were applied / 7 days after followup treatments)

Harvest Aids Applied	Rate Applied Per Acre	Harvest Aid Cost Per Acre	% Open Bolls (14 DAT)	% Defoliation (14 DAT)	% Desiccation (14 DAT)	Regrowth Rating Top (14 DAT)	Regrowth Rating Bottom (14 DAT)
Dropp + Dyne-Amic	0.2 lb. + 2 oz.	$11.60	78.33 cd	33.33 cde	0.00 f	0	1 a
Dropp + Def/Folex	0.1 lb. + 16 oz.	$5.80 + $5.98	78.33 cd	30.00 de	6.67 c	0	1 a
Dropp + Ginstar + Dyne-Amic	0.7 lb. + 3 oz.	$4.06 + $4.56	83.33 ab	46.67 abc	5.00 d	0	1 a
Ginstar	6 oz.	$9.12	78.33 cd	35.00 cde	1.00 e	0	1 a
Ginstar + Ammonium Sulphate	5 oz. + 17#/100 gal.	$7.60	83.33 ab	51.67 ab	2.00 e	0	1 a
Ginstar + Finish	3 oz. + 16 oz.	$4.56 + $10.44	83.33 ab	46.67 abc	2.00 e	0	1 a
Ginstar + Finish + Dyne-Amic	3 oz. + 8 oz. + 2 oz.	$4.56 + $5.22	83.33 ab	50.00 ab	5.00 d	0	1 a
Finish + Def/Folex + Prep	8 oz. + 8 oz. + 8 oz.	$5.22 + $2.99 + $3.37	85.00 a	41.67 abcd	10.00 b	0	1 a
Cyclone Max + L.I. 700	8 oz. + 0.25% v/v	$2.40	83.33 ab	40.00 bcd	30.00 a	0	1 a
Def/Folex + Prep	16 oz. + 16 oz.	$5.98 + $8.84	83.33 ab	55.00 a	0.00 f	0	1 a
Check			75.00 d	3.00 f	0.00 f	0	0 b
Aim + Ginstar	0.66 oz. + 3 oz.	$5.12 + 4.56	80.00 bc	23.33 e	10.00 b	0	1 a

The Third Week (October 12 - October 18, 2001)

Hourly daytime air temperature ranged from 66 to 83 degrees Fahrenheit. The nighttime temperatures ranged from 41 to 55 degrees. These temperatures when compared to 2000 were 1 to 13 degrees cooler for the daytime and nightime air temperatures. The cooler temperatures slowed the plants response to harvest aids applied.

The amount of boll opening now ranged from 80 to 92 percent which is an increase of 5 to 7 percent from the 14 day evaluation. At the 21 day evaluation (14 days after the followup treatments were applied), there was a significant difference in the percent of open bolls, the percent of defoliation, the percent of desiccation, and the amount of regrowth in the top and bottom portion of the plant. The information collected on October 19 is reported in Table 3.

In this test, all treatments had significantly more boll opening than the check with the exception of Aim at 0.66 ounce plus Ginstar at 3 ounces per acre, Dropp at 0.1 pound plus Folex at 16 ounces per acre, and Ginstar at 6 ounces per acre treatments.

In this test, all treatments had significantly more leaf defoliation than the check. Aim at 0.66 ounce plus Ginstar at 3 ounces per acre treatment had significantly less defoliation than any of the treatments applied. Most of the treatments had a significantly high level of leaf defoliation.

The Inspire at 10.7 ounces plus Activator 90 at 0.25 percent v/v followed by Inspire at 1.7 ounces plus Activator 90 at 0.25 percent v/v treatment had significantly more defoliation than, Action at 0.6 ounce + Crop Oil Concentrate at 16 ounces followed by Action at 0.6 ounce + Crop Oil Concentrate at 16 ounces treatment, and followup treatments of Cyclone Max at 16 ounces plus Activator 90 at 0.25 percent v/v and Cyclone Max at 16 ounces plus Spraymaster at 16 ounces per acre.

In this test, all treatments had significantly more desiccation than the check and Folex at 16 ounces plus Prep at 16 ounces and Dropp at 0.2 pound plus DyneAmic at 2 ounces per acre treatments. Cyclone Max at 8 ounces plus LI-700 at 0.25 percent v/v treatment had the highest level of desiccation.

In this test, all treatments had significantly more regrowth in the top and bottom potions of the plant than the check plots. The regrowth rating was 1, and at this level would not impact harvest efficiency but might impact leaf grade. No regrowth was advanced enough to cause problems in ginning of the cotton.

The low performance shown by Aim at 0.66 ounce plus Ginstar at 3 ounces per acre treatment may have been due to a problem getting the product into solution and retaining it in solution. Also, no Crop Oil Concentrate (COC) was added to the mix and the manufacturer of the material recommends COC be added when Aim is applied.

Economics

For 2001, we have had an open October and most of 100,000 acres of cotton still has not been terminated. New plant growth resulting from mid-August rains combined with cool temperatures throughout October has proved to be challenging for all harvest aids applied. The delay in harvest has resulted in a reduction in yield and quality (mostly from a change in grade). Some fields were treated with only a desiccant and over 70 percent of the leaves remained on the plant at the time of harvest. This has resulted in reduced income due to leaf discounts, some have lost as much as 5 cents a pound.

Table 3. Chris Bubenik's 2001 Aventis Cotton Harvest Aid Test (Tom Green County)
October 19, 2001 (21 days after initial treatments were applied / 14 days after followup treatments)

Harvest Aids Applied	Rate Applied Per Acre	Harvest Aid Cost Per Acre	% Open Bolls (21 DAT)	% Defoliation (21 DAT)	% Desiccation (21 DAT)	Regrowth Rating Top (21 DAT)	Regrowth Rating Bottom (21 DAT)
Dropp + Dyne-Amic	0.2 lb. + 2 oz.	$11.60	88.33 ab	71.67 ab	0.00 f	1 a	1 a
Dropp + Def/Folex	0.1 lb. + 16 oz.	$5.80 + $5.98	85.00 bc	56.67 c	6.67 c	1 a	1 a
Dropp + Ginstar + Dyne-Amic	0.7 lb. + 3 oz.	$4.06 + $4.56	88.33 ab	76.67 a	5.00 d	1 a	1 a
Ginstar	6 oz.	$9.12	85.00 bc	61.67 bc	1.00 e	1 a	1 a
Ginstar + Ammonium Sulphate	5 oz. + 17#/100 gal.	$7.60	88.33 ab	72.33 ab	2.00 e	1 a	1 a
Ginstar + Finish	3 oz. + 16 oz.	$4.56 + $10.44	91.67 a	80.00 a	2.00 e	1 a	1 a
Ginstar + Finish + Dyne-Amic	3 oz. + 8 oz. + 2 oz.	$4.56 + $5.22	88.33 ab	68.33 abc	5.00 d	1 a	1 a
Finish + Def/Folex + Prep	8 oz. + 8 oz. + 8 oz.	$5.22 + $2.99 + $3.37	88.33 ab	70.00 ab	10.00 b	1 a	1 a
Cyclone Max + L.I. 700	8 oz. + 0.25% v/v	$2.40	88.33 ab	73.33 ab	20.00 a	1 a	1 a
Def/Folex + Prep	16 oz. + 16 oz.	$5.98 + $8.84	86.67 ab	68.33 abc	0.00 f	1 a	1 a
Check			80.00 c	5.00 e	0.00 f	0 b	0 b
Aim + Ginstar	0.66 oz. + 3 oz.	$5.12 + 4.56	83.33 bc	28.33 d	10.00 b	1 a	1 a

NOTE: In Tables 1, 2 and 3 the individual or combination of letter a, b, c, d, e or f shown beside the number are to indicate statistical significance. There is no statistical difference between numbers that have the same letter to the side (even when there appears to be a large difference in results between the materials applied).

Results and Discussion Continued

The proper timing of harvest aid application and the selection and use of the proper harvest aids is apparent this season. The application of a desiccant at a high rate of more than 16 ounces per acre in many cases this year will reduce the farmers profit. For producers that selected and applied the proper harvest aids at the proper rates, harvested lint at a premium value which more than offset the cost of the harvest aid applied.

Acknowledgments

I want to take this opportunity to thank:

- Chris Bubenik for his help in plot establishment and management.
- Aventis Crop Sciences for supporting harvest aid research conducted in the Trans-Pecos and Southern Rolling Plains areas of Texas.

I would also like to thank the companies that provided the chemicals for this harvest aid test, these included:

- Aventis who provided the Dropp, Finish, Folex, Ginstar, and Prep
- Bayer Corporation who provided the Def
- FMC Corporation who provided the Aim
- Helena Chemical Company who provided the Dyne-Amic and Ammonium Sulphate
- Syngenta Crop Protection, Inc. who provided the Cyclone Max
- Tri-State Chemical DBA United Agra Products (UAP) who provided the LI-700