

**EVALUATION OF ACTION®
AS A COTTON HARVEST-AID
IN WEST CENTRAL TEXAS**

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Abstract

Action®, formerly CGA-248757 (fluthiacet-methyl) is a herbicidal harvest aid being marketed by Syngenta Crop Protection, Inc. in cotton. Action® has been tested as a harvest-aid product since 1996 in West Central Texas. The information summarized in this report is from plots established in 1999 and 2000. Action® was applied with a self-propelled ground sprayer to small replicated test plots of furrow irrigated cotton. In these small plots Action® was equal in its level of leaf defoliation to any currently labeled harvest aid (as of December, 2000). Leaf drop continued slowly even when night temperatures fell in the 50 to 60°F range. The defoliation of the cotton plant was slowed when night temperatures dropped below 60°F. When Action® is used at rates above the 1.25 ounces per acre rate, leaf desiccation is significantly higher for seven to fourteen days, however, the percent of desiccation falls within an acceptable range of less than 20 percent by fourteen days after treatment. When Action® is applied at the 0.60 to 0.63 ounce per acre rate the level of leaf desiccation was no different by harvest time than harvest aids tested. Action® applied at the 0.6 to 0.63 ounce per acre rate, had an equal amount or more regrowth in the terminal and bottom portion of the plant, when compared to the check and all harvest aids tested.

Introduction

Cotton produced in West Central Texas is generally ready for harvest 30 days before the first killing freeze in the Fall. Due to the extra time that the cotton lint is exposed to weather, both yield and quality are reduced. Normally, cool temperatures occur in late-September and October, when harvest aids are usually applied in the area, tests were initiated to determine the response of cotton conditioners, defoliant, and desiccants under cooler environmental conditions. The harvest aid Action® was applied to small replicated plots of irrigated cotton in 1999 and 2000 with a self-propelled ground sprayer. The objectives of these tests were to compare the effectiveness of Action® with other labeled cotton harvest aids in opening bolls, leaf defoliation, leaf desiccation, and regrowth control or suppression. Action® is a PPO inhibitor that induces accumulation of protoporphyrins which leads to irreversible damage to cell membranes and cell function. This activity on the foliage of cotton is very rapid, and usually shows symptoms within 24 hours. Action® will be marketed as a 0.91 pound per gallon E.C. and used at a rate of 0.6 to 0.9 ounces per acre, but not to exceed 1.25 ounces per acre per year.

Methods and Materials

All tests plots were established in Tom Green County (San Angelo, Texas vicinity) on cotton that had been furrow irrigated. In all test plots, the cotton plants were in an unstressed condition at the time harvest aids were applied.

1999 Test Site

Eight different combinations of cotton harvest-aids were applied with a self-propelled ground sprayer on October 1 to Deltapine 458 B/RR cotton with an average height of 33 inches. The plot was established on Chris Bubenik's Farm, five miles northwest of Wall, Texas. The chemicals were applied to irrigated cotton that had 65 percent of its bolls open. Leaf shed was less than five percent and the cotton plant leaves were still green in color.

The sprayer was equipped with three nozzles per row with one TX 6 hollowcone on each side of the row and one 11002 flat fan over the top of each row, applying 10.5 gallons of water per acre with 30 p.s.i. of pressure. Each treatment plus a check was replicated three times and each of the three plots were 13.33 feet wide by 60 feet long. Treatments were assigned at random within each replication. At the time of application the relative humidity was 23 to 30 percent, the air temperature was 87^o to 89^o Fahrenheit and wind was out of the Southwest at nine to ten miles per hour.

Temperatures the first 14 days after chemicals were applied were not favorable for the defoliation of cotton. During those 14 days, the nighttime air temperature was only above 60°F twice and was below 55°F eight nights. There was 0.14 inch of rain received on day seven and eight after the chemicals were applied. An additional 0.72 inch was received before the plot was harvested. The test was terminated on October 21 with an application of 32 ounces of Cyclone per acre.

Prior to applying harvest aids, 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. The regrowth

rating system used can be viewed and downloaded from <http://sanangelo.tamu.edu/agronomy/harvest/regrowth.pdf>. The plots were evaluated on October 8 (7 DAT) and October 15 (14 DAT). The DAT designation indicates the number of days after treatment. The information collected on October 8 and 15 are reported in Tables 1 and 2, respectively.

2000 Test Site

Eight different combinations of cotton harvest-aids were applied with a self-propelled ground sprayer on September 13 to Deltapine 458 B/RR cotton with an average height of 36 inches. The plot was established on Chris Bubenik's Farm, five miles northwest of Wall, Texas. The chemicals were applied to irrigated cotton that had 60 percent of its bolls open. Leaf shed was less than three percent and the cotton plant leaves were still green in color.

The sprayer was equipped with three nozzles per row with one TX 6 hollowcone on each side of the row and one 11002 flat fan over the top of each row, applying 11.0 gallons of water per acre with 32 p.s.i. of pressure. Each treatment plus a check was replicated three times and each of the three plots were 13.33 feet wide by 70 feet long. Treatments were assigned at random within each replication. At the time of application the relative humidity was 70 to 73 percent, the air temperature was 75⁰ to 80⁰ Fahrenheit and wind was out of the Southwest at five to eight miles per hour.

Temperatures the first 11 days after chemicals were applied were favorable for the defoliation of cotton. During those 11 days, the nighttime air temperature was above 60⁰F seven nights and was below 55⁰F one night. Nighttime temperatures dropped sharply after day 12 with a low of 38⁰F on day 14. There was 0.82 inch of rain received on day 10 and 11 after the chemicals were applied. No additional rain was received before the test was terminated on October 5 with an application of 32 ounces of Cyclone per acre.

Prior to applying harvest aids, 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. The regrowth rating system used can be viewed and downloaded from <http://sanangelo.tamu.edu/agronomy/harvest/regrowth.pdf>.

The plots were evaluated on September 20 (7 DAT), September 27 (14 DAT) and October 5 (22 DAT). The DAT designation indicates the number of days after treatment. The information collected on September 20, September 27, and October 5, that is significantly different, are reported in Tables 3, 4 and 5, respectively.

Results and Discussion

The First Week (October 1 - 7, 1999)

The seven days after treatment evaluation was conducted on October 8 and the information collected is reported in Table 1. The percent defoliation was significantly different between the treatments. All treatments had significantly more defoliation than the check. Ginstar at 6 ounces plus Finish at 24 ounces had the highest level of defoliation in this test. The use of 0.626 ounces of Action® resulted in significantly more desiccation when compare to the other treatments in this test.

There was no regrowth in the Ginstar treatments and the check plots. Regrowth was very small across the remaining plots. No growth was advanced enough to cause problems in the harvesting or ginning of the cotton.

The Second Week (October 8 - 14, 1999)

Daytime air temperatures ranged from 80 to 91 degrees Fahrenheit. The nighttime temperatures ranged from 46 to 57 degrees. The low night temperatures had an impact on crop development and harvest aid performance resulting in lower than expected boll opening and defoliation. The amount of boll opening now ranged from 75 to 82 percent, an increase of 3 to 12 percent from the seven day evaluation. At the 14 day evaluation there was a significant difference in the percent of defoliation, percent of desiccation, and the amount of regrowth in the top of the plant. The information collected on October 15 is reported in Table 2.

All treatments resulted in more defoliation than the check. Only a few treatments were found to be significantly different from each other in the amount of defoliation achieved. Action® at 0.376 ounces followed by Action® at 0.876 ounces was significantly different from Def at 16 ounces combined with Prep at 16 ounces followed by Cyclone at 16 ounces and Action® at 0.626 ounces followed by Cyclone at 16 ounces.

Desiccation levels dropped in all treatments when compared to the evaluation conducted at 7 days after treatment reported in Table 1 with two exceptions. Both exceptions were in plots where Cyclone was applied on October 8th which had significantly more desiccation than any of the other treatments.

The check plots had very few plants with regrowth in the top of the plant. Several of the Action® treatment plots had significantly more top regrowth than the check plots. However, no regrowth was advanced enough to cause problems in the harvesting or ginning of the cotton.

The First Week (September 13 - September 19, 2000)

Hourly daytime air temperatures ranged from 88 to 97 degrees Fahrenheit and the night temperatures ranged from 52 to 67 degrees.

The most evident impact of the materials applied was the increased amount of leaf defoliation. All treatments had significantly more leaf defoliation than the check. Two treatments (Action® at 0.6 ounce + Finish at 24 ounces + Crop Oil Concentrate at 16 ounces; and Def at 16 ounces + Dropp at 0.1 pound) had significantly more leaf defoliation than all the other treatments except for Action® at 0.6 ounce + Dropp at 0.1 pound + Prep at 16 ounces + Crop Oil Concentrate at 16 ounces.

Desiccation was significantly higher in the Action® at 0.6 ounce + Dropp at 0.1 pound + Crop Oil Concentrate at 16 ounces treatment, however, at 10.67 percent desiccation it was of limited concern. After the ratings were made on September 20th the plots with followup treatments were sprayed with the appropriate products at the desired rate.

The Second Week (September 20 - September 26, 2000)

Hourly daytime air temperature ranged from 69 to 101 degrees Fahrenheit. The nighttime temperatures ranged from 38 to 72 degrees. The 38 degree temperature occurred on September 26th and some frost injury resulted; this injury impacted leaf defoliation ratings on October 5th (22 days after treatments were applied).

The amount of boll opening now ranged from 80 to 85 percent which is an increase of 15 to 20 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 defoliation and the percent of top regrowth. The information collected on September 27 is reported in Table 4.

In this test, all treatments had significantly more defoliation than the check. The percent defoliation was significantly different between four of the treatments. Def at 16 ounces + Dropp at 0.1 pound; Action® at 0.6 ounce + Finish at 24 ounces + Crop Oil Concentrate at 16 ounces; and Action® at 0.6 ounce + Crop Oil Concentrate at 16 ounces followed by Action® at 0.6 ounce + Crop Oil Concentrate at 16 ounces had significantly more leaf defoliation than Def at 16 ounces + Prep at 16 ounces.

Regrowth in the top portions of the plant was significantly different between treatments, however, none of the leaves had reached a level that would have impacted cotton harvest or lint quality at the time of this evaluation.

The Third Week (September 27 - October 3, 2000)

Hourly daytime air temperature ranged from 84 to 101 degrees Fahrenheit. The nighttime temperatures ranged from 42 to 71 degrees. On September 26th, the nighttime temperature dropped to 38 degree and some frost injury resulted; this injury impacted leaf defoliation ratings made on October 5th (22 days after treatments were applied).

The amount of boll opening now ranged from 80 to 95 percent which is an increase of 0 to 10 percent from the 14 day evaluation. At the 22 day evaluation (15 days after the followup treatments were applied) there was a significant difference in the percent of open bolls, the percent of defoliation and the amount of regrowth in the bottom of the plant. The information collected on October 5 is reported in Table 5.

In this test, all treatments had significantly more boll opening than the check. Two treatments (Action® at 0.6 ounce + Finish at 24 ounces + Crop Oil Concentrate at 16 ounce; and Def at 16 ounces + Dropp at 0.1 pound) had significantly more boll opening than Def at 16 ounces + Prep at 16 ounces; and Action® at 0.6 ounce + Crop Oil Concentrate at 16 ounces.

In this test, all treatments had significantly more leaf defoliation than the check. Three treatments (Action® at 0.6 ounce + Finish at 24 ounces + Crop Oil Concentrate at 16 ounce; Def at 16 ounces + Dropp at 0.1 pound; and Action® at 0.6 ounce + Crop Oil Concentrate at 16 ounces followed by Action® at 0.6 ounce + Crop Oil Concentrate at 16 ounces) had significantly more leaf defoliation than Def at 16 ounces + Prep at 16 ounces; and Action® at 0.6 ounce + Crop Oil Concentrate at 16 ounces.

In this test, all treatments had significantly more regrowth in the bottom of the plants than the check plots. However, no regrowth was advanced enough to cause problems in the harvesting or ginning of the cotton.

Conclusions

Action®, formerly CGA-248757 (fluthiacet-methyl) is a herbicidal harvest aid being marketed by Syngenta Crop Protection, Inc. in cotton. Action® was applied with a self-propelled ground sprayer to small replicated test plots of furrow irrigated cotton. In these small plots Action® was equal in its level of leaf defoliation to any currently labeled

harvest aid (as of December, 2000). Leaf drop continued slowly even when night temperatures fell in the 50 to 60°F range. The defoliation of the cotton plant was slowed when night temperatures dropped below 60°F. When Action® is used at rates above the 1.25 ounces per acre rate, leaf desiccation is significantly higher for seven to fourteen days, however, the percent of desiccation falls within an acceptable range of less than 20 percent by fourteen days after treatment. When Action® is applied at the 0.60 to 0.63 ounce per acre rate the level of leaf desiccation was no different by harvest time than harvest aids tested. Action® applied at the 0.6 to 0.63 ounce per acre rate, had an equal amount or more regrowth in the terminal and bottom portion of the plant, when compared to the check and all harvest aids tested.

Product Information and Disclaimer

Action® is a product marketed by Syngenta Crop Protection, Inc.,
 Cyclone® is a product marketed by Syngenta Crop Protection, Inc.,
 Def® 6 is a product marketed by Bayer Corporation,
 Dropp® 50WP is a product marketed by Aventis Crop Sciences,
 Finish® is a product marketed by Aventis Crop Sciences,
 Folex® 6-EC is a product marketed by Aventis Crop Sciences,
 Ginstar® is a product marketed by Aventis Crop Sciences,
 Prep™ is a product marketed by Aventis Crop Sciences

Mention of a trademark or a proprietary product does not constitute an endorsement of the product by the Texas Agricultural Extension Service and does not imply its approval to the exclusion of other products that also may be suitable.

Table 1. Chris Bubenik's 1999 Cotton Harvest Aid Test (Tom Green County) October 8, 1999 (Seven days after treatments were applied).

Harvest Aids Applied	Rate Applied Per Acre (ounces)	% Defoliation (7 DAT)	% Desiccation (7 DAT)	Regrowth Rating Top (7 DAT)
Ginstar + Finish	6 + 24	68 a	4.3 bc	0.33 ab
Ginstar	6	58 b	4.3 bc	0.00 b
Action followed by Cyclone	0.626 16	50 bc	7.3 ab	0.67 ab
Ginstar	8	50 bc	2.0 bc	0.00 b
Action followed by Action	0.376 0.876	48 bc	4.0 bc	1.00 a
Action	0.626	47 c	11.3 a	1.00 a
Action followed by Action	0.626 0.626	47 c	12.3 a	0.33 ab
Def + Prep followed by Cyclone	16 + 16 16	43 c	1.7 bc	0.33 ab
Check	0	9 d	0.0 c	0.00 b

Table 2. Chris Bubenik's 1999 Cotton Harvest Aid Test (Tom Green County)
October 15, 1999 (14 days after treatments were applied).

Harvest Aids Applied	Rate Applied Per Acre (ounces)	% Defoliation (14 DAT)	% Desiccation (14 DAT)	Regrowth Rating Top (14 DAT)
Action followed by Action	0.376 0.876	80 a	4.0 cd	1.0 a
Ginstar + Finish	6 + 24	77 ab	4.0 cd	0.5 abc
Action followed by Action	0.626 0.626	77 ab	7.7 c	0.67 ab
Ginstar	8	75 ab	1.7 d	0.5 abc
Ginstar	6	75 ab	4.3 cd	0.33 bc
Action	0.626	73 ab	2.3 cd	1.0 a
Def + Prep followed by Cyclone	16 + 16 16	67 bc	20 a	0.67 ab
Action followed by Cyclone	0.626 16	60 c	13 b	0.83 ab
Check	0	10 d	0 d	0 c

Table 3. Chris Bubenik's Cotton Harvest Aid Test (Tom Green County)
September 20, 2000 (Seven days after treatments were applied)

Harvest Aids Applied	Rate Applied Per Acre	% Defoliation (7 DAT)	% Desiccation (7 DAT)
Check	0	2.00 c	0.00 c
Action 0.91 EC + C.O.C.	0.6 ounce + 16 ounces	48.33 b	5.67 b
Action 0.91 EC + C.O.C. followed by —> Action 0.91 EC + C.O.C.	0.6 ounce + 16 ounces followed by 0.6 ounce + 16 ounces	45.00 b	7.00 ab
Action 0.91 EC + C.O.C. + Dropp	0.6 ounce + 16 ounces + 0.1 pound	46.67 b	10.67 a
Action 0.91 EC + C.O.C. + Finish	0.6 ounce + 16 ounces + 24 ounces	68.33 a	5.00 bc
Action 0.91 EC + C.O.C. + Dropp + Prep	0.6 ounce + 16 ounces + 0.1 pound + 16 ounces +	53.33 ab	5.33 b
DEF 6 + Dropp	16 ounces + 0.1 pound	66.67 a	5.33 b
DEF 6 + Prep	16 ounces + 16 ounces	43.33 b	0.00 c
Dropp followed by —> Action 0.91 EC + C.O.C.	0.1 pound followed by 0.9 ounce + 16 ounces	36.67 b	0.00 c

Table 4. Chris Bubenik's Cotton Harvest Aid Test (Tom Green County)
September 27, 2000 (14 days after treatments were applied)

Harvest Aids Applied	Rate Applied Per Acre	% Defoliation (14 DAT)	Regrowth Rating Top (14 DAT)
Check	0	6.67 c	0 b
Action 0.91 EC + C.O.C.	0.6 ounce + 16 ounces	73.33 ab	1.00 a
Action 0.91 EC + C.O.C. followed by → Action 0.91 EC + C.O.C.	0.6 ounce + 16 ounces followed by 0.6 ounce + 16 ounces	78.33 a	0 b
Action 0.91 EC + C.O.C. + Dropp	0.6 ounce + 16 ounces + 0.1 pound	68.33 ab	1.00 a
Action 0.91 EC + C.O.C. + Finish	0.6 ounce + 16 ounces + 24 ounces	80.00 a	0.67 ab
Action 0.91 EC + C.O.C. + Dropp + Prep	0.6 ounce + 16 ounces + 0.1 pound + 16 ounces +	75.00 ab	0.67 ab
DEF 6 + Dropp	16 ounces + 0.1 pound	85.00 a	0.33 ab
DEF 6 + Prep	16 ounces + 16 ounces	58.33 b	0.67 ab
Dropp followed by → Action 0.91 EC + C.O.C.	0.1 pound followed by 0.9 ounce + 16 ounces	76.67 ab	0 b

Table 5. Chris Bubenik's Cotton Harvest Aid Test (Tom Green County)
October 5, 2000 (22 days after treatments were applied)

Harvest Aids Applied	Rate Applied Per Acre	% Open Bolls (22 DAT)	% Defoliation (22 DAT)	Regrowth Rating Bottom (22 DAT)
Check	0	80.00 d	36.67 c	0 b
Action 0.91 EC + C.O.C.	0.6 ounce + 16 ounces	88.33 c	78.33 b	1.00 a
Action 0.91 EC + C.O.C. followed by → Action 0.91 EC + C.O.C.	0.6 ounce + 16 ounces followed by 0.6 ounce + 16 ounces	93.33 ab	91.00 a	1.00 a
Action 0.91 EC + C.O.C. + Dropp	0.6 ounce + 16 ounces + 0.1 pound	91.67 abc	83.33 ab	1.00 a
Action 0.91 EC + C.O.C. + Finish	0.6 ounce + 16 ounces + 24 ounces	95.00 a	95.00 a	1.00 a
Action 0.91 EC + C.O.C. + Dropp + Prep	0.6 ounce + 16 ounces + 0.1 pound + 16 ounces	93.33 ab	90.00 ab	1.00 a
DEF 6 + Dropp	16 ounces + 0.1 pound	95.00 a	91.67 a	1.00 a
DEF 6 + Prep	16 ounces + 16 ounces	90.00 bc	78.33 b	0.67 a
Dropp + followed by → Action 0.91 EC + C.O.C.	0.1 pound followed by 0.9 ounce + 16 ounces	93.33 ab	90.00 ab	1.00 a

NOTE: In Tables 1, 2, 3, 4 and 5 the individual or combination of letter a, b, c or d shown beside the number are to indicate statistical significance. The statistical difference between treatments using Duncan's mean separation procedure at alpha=0.05. 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 herbicides applied).