# EFFECT OF DESICCATION TREATMENTS ON STORAGE AND FIBER QUALITIES IN THE TEXAS COASTAL BEND

**A.D. Brashears, Agricultural Engineer**
**USDA, ARS**
**Cotton Production and Processing Research Unit**
**Lubbock, TX**
**R.L. Jahn**
**Texas Agricultural Extension Service**
**Port Lavaca, TX**
**J.E. Bremer, Professor Extension Specialist**
**Texas A&M Research and Extension Center**
**Corpus Christi, TX**
**T.D. Valco, Director, Agriculture Research**
**Cotton Incorporated,**
**Raleigh, NC**

## Abstract

Five combinations of harvest aid chemicals were evaluated in the Coastal Bend of Texas for their effectiveness in preparing the cotton for stripper harvest and the subsequent effect of storage on moisture, foreign matter and fiber properties. The treatments included an initial treatment of Ginstar (thidiazuron+diuron)(0.5 p/a) followed by a final treatment of Cyclone (paraquat) (1.5 p/a), an initial treatment of Harvade (dimethipin) plus a crop oil concentrate (0.5 p/a+1 p/a) followed by a final treatment of Cyclone, an initial treatment of Ginstar (thidiazuron+diuron) (0.5 p/a) with no second treatment, an initial treatment of of Harvade (dimethipin) plus a crop oil concentrate (0.5 p/a+1 p/a) with no second treatment, and no initial treatment but a single treatment of Cyclone (1.5 p/a) at the second treatment date. The cotton was harvested in 3 bale lots with a stripper harvester equipped with field cleaner. The cotton was stored in modules built with a 12 ft long module builder. Two modules were built for each treatment with one module being ginned immediately and the second module stored for 24 days. Only four of the treatments were harvested and stored in the module. The Harvade with no second treatment did not sufficiently defoliate the cotton therefore it was dropped from the test and not harvested. Ginstar followed by Cyclone was the only treatment that had seed cotton moisture less than 12%, the recommended safe storage level for modules. The other treatments were above 13% which could result in fiber detoriation . Total trash in seed cotton at the harvester was significantly less for the Ginstar followed by Cyclone and the Ginstar treatments. Harvade followed by Cyclone treatments had significantly more fine trash and the single application of Cyclone had significantly more sticks than the other treatments. The Ginstar followed by Cyclone treatment, the Ginstar treatment, and the single application of Cyclone had the highest number of samples with a color grade of 21 when ginned the day after harvest. The Ginstar followed by Cyclone treatment had the highest percentage of grades, 93%, with color grade 21 while Ginstar and the single application of Cyclone had only 7% and 14%, respectively, with a color grade of 21 when stored for 24 days. This was due to the high initial moisture content at time of harvest and the high foreign matter content which caused the lint to lose brightness and increase in yellowness. Loan values calculated for each of the treatments reflected problems encountered when storing the Ginstar and the single application of Cyclone treatments as their loan values were significantly less than the Ginstar followed by Cyclone and the Harvade followed by Cyclone treatments. This study indicates that the Ginstar followed by Cyclone treatment was the only treatment that could be stored in modules with minimum fiber quality loss. Ginstar and the single application of Cyclone could be used in this area if the cotton can be ginned soon after harvest.

## Introduction

Chemical treatment of cotton for defoliating leaves and drying the cotton plant is the only method available to producers in the Coastal Bend of Texas when preparing their cotton for harvest. The loss of arsenic acid limited the options available to producers in that area and made it necessary to develop other alternatives. Industry introduction of new compounds and the reformulation of old compounds has provided additional combinations for use as harvest aids. State wide evaluations of harvest aid chemicals by Supak, et al. (1994) have shown their effectiveness as defoliants and desiccants in the cotton growing areas of Texas. Brashears, et al. (1995) reported on several combinations of harvest aids that effectively prepared the cotton for stripper harvest. Although these studies included the harvest of plots with and without field cleaners, the cotton was ginned immediately after harvest and the effect of harvest aids on field storage were not evaluated. Brashears (1997) also reported on the use of four harvest aid combinations and their effect on storage for the stripper harvest area of the Texas High Plains. These harvest aids were applied much later in the growing season when daylight hours are shorter and the weather is becoming much cooler thus the effect of defoliation is much different than for the Texas Costal Bend. The objectives of this study was to determine the effectiveness of harvest aids in preparing the cotton for harvest and the subsequent effect of storage on moisture, foreign matter and fiber properties for cotton producers in the Coastal Bend of Texas.

## Materials and Methods

Five harvest aid treatments combined with 2 storage periods were evaluated. The harvest aid treatments included (1) an initial treatment of Ginstar (thidiazuron+diuron)(0.5 p/a) followed by a second treatment of Cyclone (paraquat) (1.5 p/a), (2) an initial treatment of Harvade (dimethipin) plus a crop oil concentrate (0.5 p/a+1 p/a) followed by a final

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treatment of Cyclone, (3) an initial treatment of Ginstar (thidiazuron+diuron) (0.5 p/a) with no second treatment, (4) an initial treatment of of Harvade (dimethipin) plus a crop oil concentrate (0.5 p/a+1 p/a) with no second treatment, and (5) no initial treatment but a treatment of Cyclone (1.5 p/a) at the second application date, Table 1. The cotton variety was Deltapine 50. All chemical treatments were applied with an 8-row ground sprayer. The initial treatment was applied on August 2, 1996 followed by the later treatment on August 9, 1996. The initial treatment was applied when approximately 90% of the bolls were open. Each harvest aid was replicated 3 times in the field. The treatments were harvested on August 13 and August 14, 1996 with a 4-row brush type cotton stripper equipped with field cleaner. A 12 ft long module builder was used to build the modules for storage and handling of the cotton. The shorter module builder allowed each replication of each treatment to be stored separately with each replication making up 1/3 of the length of a standard module. This also allowed for the replications to be ginned independently.

Two modules were built for each desiccant treatment. One module was ginned the day after harvest while the second module of each treatment was held and stored at the gin yard for 24 days. The modules were stored for 24 days and ginned on September 6, 1996. The cotton was ginned on a commercial gin which included the following sequence: module feeder, incline cleaner, combination bur and stick machine, incline cleaner, stick machine, gin stand, air jet cleaner, and tandem lint cleaners. Drying was accomplished by a hot box at the module feeder and 2 tower dryers. Seed cotton samples for moisture were collected at the harvester, module feeder, and feeder apron while lint samples for moisture were collected at the lint slide. Seed cotton samples for fractionation were collected at the harvester, module feeder and feeder apron. Lint samples were collected after after processing through 2 lint cleaners and sent to the USDA-AMS Cotton Classing Office, Corpus Christi, TX and to Cotton, Inc., Raleigh, NC for fiber quality determinations.

## Discussion

It was determined at time of harvest that the Harvade treatment did not sufficiently defoliate the plant for harvest and therefore it was not included in the harvesting and ginning phase of the test. Seed cotton moisture values at the harvester, module feeder and feeder apron are shown in Table 2. The moisture content of the Ginstar followed by Cyclone treatment, 11.0%, was significantly less than moisture for the Harvade followed by Cyclone treatment, the Ginstar treatment and the single application of Cyclone, for samples collected at the harvester. Only the Ginstar followed by Cyclone treatment met the recommended guidelines for storing moduled seed cotton at less than 12% moisture. Seed cotton moisture for cotton samples collected at the module feeder and feeder apron and ginned the day after harvest followed the same trend as at harvest. The moisture content for Ginstar followed by Cyclone treatment was significantly less than the Ginstar treatment and the Ginstar treatment was significantly less than the Harvade followed by Cyclone or and the single application of Cyclone. There was an increase in moisture for the Harvade followed by Cyclone, Ginstar and the single application of Cyclone between the harvester and module feeder for the 1 day storage period. The Ginstar followed by Cyclone treatment did not reflect this trend. Lint moisture for modules stored 1 day followed a similar trend as the seed cotton moisture at the module feeder and feeder apron. The Ginstar followed by Cyclone treatment and the Ginstar treatment had significantly lower lint moisture than the other two treatments. For modules stored 24 days seed cotton moisture at the feeder apron was significantly less for the Ginstar followed by Cyclone treatment. The Harvade followed by Cyclone treatment was significantly less than Ginstar treatment and the single application of Cyclone. There was a significant change in moisture during storage for two of the treatments. Moisture samples collected at the module feeder indicated the Harvade followed by Cyclone treatment was 5.3% less after 24 days of storage while seed cotton moisture was 4.1% less after storage for the single application of Cyclone. No change was seen in seed cotton moisture during storage for the Ginstar followed by Cyclone treatment or the Ginstar treatment. Lint moisture from stored modules was significantly less for the single application of Cyclone while the Ginstar followed by Cyclone treatment had one of the highest lint moisture contents.

Burs, stick, and fine trash and total trash content at the trailer are shown in Table 3. The Ginstar treatment had the lowest bur content while the single application of Cyclone and Harvade followed by Cyclone had the highest bur content. Stick content was found to be significantly less for the Ginstar followed by Cyclone treatment and significantly greater for the single application of Cyclone. Fine trash content was significantly less for Ginstar and significantly greater for the Harvade followed by Cyclone treatment. Total trash was significantly less for the Ginstar followed by Cyclone treatment and the Ginstar treatment. These two treatments, Ginstar followed by Cyclone and Ginstar, averaged 4.4% less total trash than the Harvade treatment and the single application of Cyclone. Foreign matter fractions in seed cotton at the module feeder are shown in Table 4. Burs, sticks and total trash at the feeder apron was significantly less for Ginstar followed by Cyclone and Ginstar when the modules were ginned the day after harvest. Burs, sticks, and total trash were significantly greater for the Harvade followed by Cyclone and the single application of Cyclone. Burs, sticks and total trash was significantly less for the Ginstar followed by Cyclone treatment when stored in modules for 24 days. The single application of Cyclone had significantly less sticks, fine trash, and total trash than the Harvade followed by Cyclone treatment and the Ginstar treatment. No significant differences between treatments were seen for the bur content of seed cotton at the feeder apron when stored for 1 day, Table 5. Sticks, fine trash and total trash were found to be significantly less for the Ginstar followed by Cyclone treatment. Burs, sticks, and total trash were significantly greater for the Harvade followed by Cyclone and the single application of Cyclone. Modules stored for 24 days had significantly less sticks, fine trash and total trash in the Ginstar followed by Cyclone treatment.

Lint samples were collected after processing through 2 lint cleaners. Since color grades cannot be averaged they are summarized in Table 6. Each treatment had a total of 15 samples. Modules stored for 1 day had color grades of 21 and 31. The Ginstar followed by Cyclone treatment, Ginstar and the single application of Cyclone had 80%, 93%, and 87% of their grades, respectively , in color grade 21. The Harvade followed by Cyclone treatment had a majority of its grades, 67%, in color grade 31. Storage of the cotton had a significant effect on color grades. The Ginstar followed by Cyclone treatment had 93% of its samples in color grade 21 and 7% of its sample with color grade 31. Harvade followed by Cyclone had 60%, 27%, and 13% samples of color grades of 21, 22, and 31, respectively; Ginstar had 7%, 67%, 27%, and 27% samples of color grades of 21, 22, 32, and 33 respectively; and the single application of Cyclone had 13%, 27%, 13%, 7%, 33%, and 7% samples with color grades of 21, 22, 31, 32, 33 and 43, respectively. The high moisture content of seed cotton at harvest for the Ginstar and single application of Cyclone adversly affected lint color grade during storage. Staple, micronaire, strength, and leaf grade are shown in Table 7. Staple was significantly longer for Harvade followed by Cyclone treatment for the one day storage, but no significant difference was found between treatments for the 24 day storage. Micronaire was not significantly affected by desiccation treatments or storage period. Strength was significantly less for the Ginstar treatment for 1day storage and the single application of Cyclone after 24 days of storage. Leaf grade was significantly worse for the Harvade followed by Cyclone treatment in modules stored for 1 day and the Ginstar treatment stored in modules for 24 days. Reflectance values, Rd, are shown in Table 8. The lint for Ginstar followed by Cyclone treatment was significantly brighter than the lint for the other treatments. The lint from the Harvade followed by Cyclone treatment had significantly lower reflectance for samples ginned the day after harvesting. Modules stored for 24 days had a significantly brighter lint for the Ginstar followed by Cyclone treatment while the single application of Cyclone had the lowest reflectance. Yellowness values, +b, were less for the Ginstar followed by Cyclone treatment and significantly higher values for the single application of Cyclone for modules stored for 1 day. Modules stored for 24 days had less yellowing for the Ginstar followed by Cyclone treatment while the Ginstar and the single application of Cyclone had a significantly greater degree of yellowing. The lesser values indicates less yellow color in the cotton, a more desirable trait. HVI trash readings were significantly higher for the Harvade followed by Cyclone when ginned immediately while no difference was found for treatments when stored 24 days. The HVI length was significantly longer for the Harvade followed by Cyclone and single application of Cyclone treatments for 1 day storage. No difference in HVI length and length uniformity were found for the treatments when stored in modules for 24 days.

One method of evaluating the effect of treatments on fiber quality is to evaluate market values. Table 9 gives the loan value for the desiccation treatments and storage periods. No significant difference in loan values were found for treatments when the cotton was ginned the next day. Modules stored for 24 days had significantly lower loan values for the Ginstar and the single Cyclone treatment. These low loan values were apparently caused by a combination of high seed cotton moisture and foreign matter contents that resulted in excessive yellowing during storage.

This study indicates the need for effective harvest aid treatments for the stripper harvester of cotton in the Coastal Bend of Texas can be obtained with an initial application of Ginstar followed by an application of Cyclone. While this treatment is more costly, the other treatments may result in loss of fiber quality during module storage and subsequent loss in producer returns.

## Disclaimer

Mention of a trade name, propriety product or specific equipment does not constitute a quarantee or warranty by the U.S. Department of Agriculture and does not imply approval of a product to the exclusion of others that may be suitable.


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Table 1. Harvest aid treatments and rates of application.

| | First Treatment | | Second Treatment | |
|---|---|---|---|---|
| G→C | Ginstar | (0.5 p/a) | Cyclone | (1.5 p/a) |
| H→C | Harvade+COC | (0.5 p/a+1 p/a) | Cyclone | (1.5 p/a) |
| G→NT | Ginstar | (0.5 p/a) | No Treatment | |
| H→NT | Harvade +COC | (0.5 p/a+1 p/a) | No Treatment | |
| NT→C | No Treatment | | Cyclone | (1.5 p/a) |

Table 2. Moisture content of seed cotton at trailer and feeder apron and lint moisture after 2 lint cleaners.

| Harvest Aid Treatment | Trailer | Seed Cotton Module Feeder | Feeder Apron | Lint After 2LC |
|---|---|---|---|---|
| | | % | | |
| | | Module, 1 day | | |
| G→C | 11.0 b[1] | 10.1 c | 7.5 c | 5.0 c |
| H→C | 13.7 a | 17.7 a | 9.6 a | 5.5 a |
| G→NT | 13.2 a | 14.4 b | 8.5 b | 4.9 c |
| NT→C | 13.3 a | 18.1 a | 9.6 a | 5.2 b |
| | | Module, 24 days | | |
| G→C | – | 10.8 c | 8.5 b | 5.6 a |
| H→C | – | 12.4 b | 9.1 b | 5.5 ab |
| G→NT | – | 14.4 a | 9.6 ab | 5.3 b |
| NT→C | – | 14.0 a | 10.4 a | 4.9 c |

[1]Means within data columns and for each module storage period followed by the same letter are not significantly different at the 10% level of DMRT.

Table 3. Foreign matter fractions of seed cotton at trailer.

| Harvest Aid Treatment | Burs | Sticks | Fine Trash | Total Trash |
|---|---|---|---|---|
| | | % | | |
| G→C | 7.5 bc[1] | 2.7 c | 6.5 bc | 16.7 b |
| H→C | 8.7 a | 3.4 b | 8.1 a | 20.2 a |
| G→NT | 6.6 ab | 3.3 bc | 5.6 c | 15.5 b |
| NT→C | 8.6 ab | 5.0 a | 7.2 b | 20.8 a |

[1]Means within data columns followed by the same letter are not significantly different at the 0% level of DMRT.

Table 4. Foreign matter fractions of seed cotton at module feeder.

| Harvest Aid Treatment | Burs | Sticks | Fine Trash | Total Trash |
|---|---|---|---|---|
| | | % | | |
| | | Module, 1 day | | |
| G→C | 6.9 b[1] | 2.2 c | 4.7 c | 13.8 c |
| H→C | 10.8 a | 5.1 a | 5.9 b | 21.9 a |
| G→NT | 7.8 b | 3.0 b | 5.4 bc | 16.2 b |
| NT→C | 10.4 a | 4.8 a | 7.2 a | 22.5 a |
| | | Module, 24 day | | |
| G→C | 6.2 b | 2.3 c | 4.7 c | 13.1 c |
| H→C | 7.3 a | 3.9 a | 6.7 a | 18.0 a |
| G→NT | 7.8 a | 4.3 a | 6.3 b | 18.4 a |
| NT→C | 7.9 a | 2.9 b | 4.7 c | 15.6 b |

[1]Means within data columns and for each module storage period followed by the same letter are not significantly different at the 10% level of DMRT.

Table 5. Foreign matter fractions of seed cotton at feeder apron.

| Harvest Aid Treatment | Burs | Sticks | Fine Trash | Total Trash |
|---|---|---|---|---|
| | | % | | |
| | | Module, 1 day | | |
| G→C | 0.6 a[1] | 0.7 b | 0.5 b | 1.8 c |
| H→C | 0.7 a | 2.1 a | 0.9 a | 3.7 a |
| G→NT | 0.9 a | 1.1 b | 0.5 b | 2.5 b |
| NT→C | 0.7 a | 1.8 a | 0.8 a | 3.3 a |
| | | Module, 24 day | | |
| G→C | 0.3 b | 0.6 c | 0.3 b | 1.2 c |
| H→C | 1.6 a | 1.2 a | 0.5 a | 3.3 a |
| G→NT | 0.5 ab | 1.3 a | 0.6 a | 2.4 ab |
| NT→C | 0.7 ab | 0.9 b | 0.6 a | 2.3 ab |

[1]Means within data columns and for each module storage period followed by the same letter are not significantly different at the 10% level of DMRT.

Table 6. Color grades after 2 lint cleaners.

| Harvest Aid Treatment | Color Grades 21 | 22 | 31 | 32 | 33 | 43 |
|---|---|---|---|---|---|---|
| | | | % | | | |
| | | Module, 1 day | | | | |
| G→C | 80 | 0 | 30 | 0 | 0 | 0 |
| H→C | 33 | 0 | 67 | 0 | 0 | 0 |
| G→NT | 93 | 0 | 7 | 0 | 0 | 0 |
| NT→C | 87 | 0 | 13 | 0 | 0 | 0 |
| | | Module, 24 day | | | | |
| G→C | 93 | 0 | 7 | 0 | 0 | 0 |
| H→C | 60 | 27 | 13 | 0 | 0 | 0 |
| G→NT | 7 | 67 | 13 | 13 | 0 | 0 |
| NT→C | 13 | 27 | 13 | 7 | 33 | 7 |

Table 7. Fiber quality after 2 lint cleaners.

| Treatment | Staple | Micronaire | Strength | Leaf Grade |
|---|---|---|---|---|
| | | Module, 1 day | | |
| G→C | 32.9 bc[1] | 5.1 | 24.2 bc | 2.0 b |
| H→C | 33.3 a | 5.2 | 24.6 ab | 2.5 a |
| G→NT | 32.7 c | 5.2 | 23.8 c | 2.0 b |
| NT→C | 33.1 bc | 5.2 | 25.0 a | 2.1 b |
| | | Module, 24 day | | |
| G→C | 33.0 a | 5.1 | 24.8 a | 2.0 b |
| H→C | 33.1 a | 5.1 | 24.4 a | 2.0 b |
| G→NT | 33.1 a | 5.2 | 24.6 a | 2.1 a |
| NT→C | 32.9 a | 5.2 | 23.8 b | 2.0 b |

[1]Means within data columns and for each module storage period followed by the same letter are not significantly different at the10% level of DMRT.

Table 8. Fiber quality after 2 lint cleaners.

| Treatment | HVI Rd | +b | HVI Trash | Length | Length Unif. |
|---|---|---|---|---|---|
| | | Module, 1 day | | | |
| G→C | 78.6 a[1] | 8.79 c | 0.93 b | 1.02 b | 81.5 ab |
| H→C | 76.4 d | 9.10 b | 1.53 a | 1.04 a | 81.7 a |
| G→NT | 77.8 b | 8.99 b | 1.00 b | 1.02 b | 80.8 b |
| NT→C | 77.1 c | 9.39 a | 1.20 b | 1.03 a | 81.3 ab |
| | | Module, 24 day | | | |
| G→C | 77.6 a | 9.39 c | 0.93 a | 1.03 a | 80.9 a |
| H→C | 75.9 b | 9.78 b | 1.20 a | 1.03 a | 81.1 a |
| G→NT | 74.2 c | 10.46 a | 1.00 a | 1.03 a | 81.3 a |
| NT→C | 72.9 d | 10.47 a | 1.20 a | 1.03 a | 80.6 a |

[1]Means within data columns and for each module storage period followed by the same letter are not significantly different at the10% level of DMRT.

Table 9. Net loan price.

| Treatment | Module, 1 day | Module, 24 day |
|---|---|---|
| | ----------------------cents/lb------------------ | |
| G→C | 51.17 a | 51.17 a[1] |
| H→C | 51.00 a | 51.17 a |
| G→NT | 51.17 a | 49.52 b |
| NT→C | 51.17 a | 49.12 b |

[1]Means within data columns followed by the same letter are not significantly different at the10% level of DMRT.