

INFLUENCE OF SURFACTANTS, NITROGEN SALTS, AND ETHEPHON ON COTTON DEFOLIANTS

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Abstract

Field studies were conducted during 1997 to determine the effect of various harvest aid chemicals on the cotton variety 'DPL 5409' at 60 to 70% boll opening. Applications were applied in water at 10 gallons per acre (gpa) to cotton in plots of four rows each spaced 40 inches apart, 40 feet long and replicated four times in a randomized complete block design. Visual ratings were made of the percent defoliation and percent boll opening at 7 and 14 days after treatment (DAT) and of the percent shoot regrowth at 21 DAT whereby 0 = no effect and 100% = complete effect. The least significant difference (LSD) between means was determined by Fisher's Protected LSD test at the 10% level. The harvest aid chemicals with their descriptions and manufacturers are listed in Table 1.

Results with treatments to cotton 'DPL 5409' are shown in Table 2. The harvest aid chemical, Boll'd®, applied at 1.33 pt/A in combination with Def 6® at 1 pt/A, and Surf Aid® at 1 qt/100 gal resulted in 80% defoliation at both 7 and 14 DAT. Separate treatments with Boll'd at 1.33 pt/A in combination with these same additives plus Dropp 50 WP® at 0.1 lb ai/A and AMS Plus® at 1 pt/A each increased defoliation to 88% at 14 DAT. The chemical, Finish®, applied at 1.0 and 1.5 qt/A resulted in 80 and 74% defoliation, respectively, at 14 DAT.

Boll opening in the untreated control plots increased from 80% at 7 DAT to 93% at 14 DAT. Boll opening at 7 DAT was increased to 90% with Finish at 1 qt/A, 91% with Finish at 1.5 qt/A, 90% with Boll'd at 1.33 pt/A plus Def 6 at 1 pt/A, plus Surf Aid at 1 qt/100 gal, 90% with Boll'd at 2 pt/A plus Def 6 at 1 pt/A plus AMS Plus at 1 pt/A plus Surf Aid at 1 qt/100 gal, 90% with Boll'd at 2 pt/A plus Def 6 at 1 pt/A plus ammonium sulfate at 2 lb/A plus Surf Aid at 1 qt/100 gal, 89% with Boll'd at 1.33 pt/A plus Def 6 at 1 pt/A plus ammonium sulfate at 2 lb/A plus Activate Plus at 1 qt/100 gal, and 88% with Boll'd at 1.33 pt/A plus Def 6 at 1 pt/A plus Activate Plus® at 1 qt/100 gal.

The percent of frozen (or stuck) leaves at 7 DAT was less than 12% except for 23% with Boll'd at 1.33 pt/A plus Def 6 at 1 pt/A plus Dropp 50 WP at 0.1 lb ai/A plus AMS Plus at 1 pt/A plus Surf Aid at 1 qt/100 gal, 14% with Boll'd at 1.33 pt/A plus Def 6 at 1 pt/A plus Dropp 50 WP at 0.1 lb ai/A plus Surf Aid at 1 qt/100 gal and 13% with Boll'd at 2 pt/A plus Def 6 at 1 pt/A plus Surf Aid at 1 qt/100 gal. At 14 DAT, all treatments resulted in ≤10% frozen leaves on the plants.

Shoot regrowth at 21 DAT was ≤16% with all treatments except for 21% regrowth with Boll'd at 1.33 pt/A plus Def 6 at 1 pt/A plus ammonium sulfate at 2 lb/A plus Activate Plus at 1 qt/100 gal and 19% with Boll'd at 2 pt/A plus Def 6 at 1 pt/A plus ammonium sulfate at 2 lb/A plus Surf Aid at 1 qt/100 gal.

Where treatments were the same except for the surfactant, Surf Aid was more effective than Activate Plus for enhancing the percent defoliation and the percent boll opening at 7 DAT.

Table 1. Harvest Aid Chemicals

| Name | Description | Manufacturer |
|-------------------|---|-------------------------------------|
| <i>Defoliant</i> | | |
| DEF 6 | SSS-Tributyl phosphorotrithioate | Bayer Corporation |
| Dropp | Thidiazuron | AgrEvo USA Company |
| Finish | Cyclanilide and Ethephon | Rhone-Poulenc Ag Company |
| <i>Adjuvants</i> | | |
| Activate Plus | Alkylarlpolyoxyethylene glycols, free fatty acids and IPA 90% v/v | Riverside/Terra International, Inc. |
| AMS Plus | Phosphate ester of polyglycoethers 43% v/v, blend of ammoniated salts 18% v/v | Riverside/Terra International, Inc. |
| Boll'd (Ethephon) | Two-chloroethyl phosphonic acid | Riverside/Terra International, Inc. |
| Surf Aid | Alkyl polyethoxy alkylene ethers and other ethoxylated derivatives 80% v/v | Riverside/Terra International, Inc. |

Table 2. Effect of various combinations of defoliants and adjuvants applied to cotton 'DPL 5409' at 60 to 70% boll opening (average of 4 replications.)

| No. | Chemical(s) | Rate in 10 gpa | % Defoliation | | % Boll Opening | |
|-----|---------------|----------------|---------------|--------|----------------|--------|
| | | | 7 DAT | 14 DAT | 7 DAT | 14 DAT |
| 1 | Boll'd | 1.33 pt | 80 | 80 | 90 | 94 |
| | Def 6 | 1 pt | | | | |
| | Surf Aid | 1 qt/100 gal | | | | |
| 2 | Boll'd | 1.33 pt | 78 | 88 | 86 | 95 |
| | Def 6 | 1 pt | | | | |
| | Dropp 50WP | 0.1 lb ai | | | | |
| | Surf Aid | 1 qt/100 gal | | | | |
| 3 | Boll'd | 1.33 pt | 81 | 88 | 85 | 94 |
| | Def 6 | 1 pt | | | | |
| | AMS Plus | 1 pt | | | | |
| | Surf Aid | 1 qt/100 gal | | | | |
| 4 | Boll'd | 1.33 pt | 64 | 84 | 86 | 96 |
| | Def 6 | 1 pt | | | | |
| | Dropp 50WP | 0.1 lb ai | | | | |
| | AMS Plus | 1 pt | | | | |
| | Surf Aid | 1 qt/100 gal | | | | |
| 5 | Boll'd | 1.33 pt | 73 | 81 | 86 | 94 |
| | Def 6 | 1 pt | | | | |
| | Am. sulfate | 2 lb | | | | |
| | Surf Aid | 1 qt/100 gal | | | | |
| 6 | Boll'd | 1.33 pt | 70 | 81 | 85 | 94 |
| | Def 6 | 1 pt | | | | |
| | Dropp 50WP | 0.1 lb ai | | | | |
| | Am. sulfate | 2 lb | | | | |
| | Surf Aid | 1 qt/100 gal | | | | |
| 7 | Boll'd | 1.33 pt | 55 | 71 | 80 | 94 |
| | Dropp 50WP | 0.1 lb ai | | | | |
| | Surf Aid | 1 qt/100 gal | | | | |
| 8 | Boll'd | 1.33 pt | 50 | 71 | 83 | 95 |
| | Dropp 50WP | 0.1 lb ai | | | | |
| | AMS Plus | 1 pt | | | | |
| | Surf Aid | 1 qt/100 gal | | | | |
| 9 | Boll'd | 1.33 pt | 35 | 48 | 84 | 94 |
| | Dropp 50WP | 0.1 lb ai | | | | |
| | Am. sulfate | 2 lb | | | | |
| | Surf Aid | 1 qt/100 gal | | | | |
| 10 | Boll'd | 1.33 pt | 63 | 75 | 88 | 97 |
| | Def 6 | 1 pt | | | | |
| | Activate Plus | 1 qt/100 gal | | | | |
| 11 | Boll'd | 1.33 pt | 63 | 70 | 81 | 93 |
| | Def 6 | 1 pt | | | | |
| | AMS Plus | 1 pt | | | | |
| | Activate Plus | 1 qt/100 gal | | | | |
| 12 | Boll'd | 1.33 pt | 70 | 81 | 89 | 96 |
| | Def 6 | 1 pt | | | | |
| | Am. sulfate | 2 lb | | | | |
| | Activate Plus | 1 qt/100 gal | | | | |
| 13 | Boll'd | 2 pt | 71 | 83 | 83 | 94 |
| | Def 6 | 1 pt | | | | |
| | Surf Aid | 1 qt/100 gal | | | | |
| 14 | Boll'd | 2 pt | 76 | 81 | 90 | 96 |
| | Def 6 | 1 pt | | | | |
| | AMS Plus | 1 pt | | | | |
| | Surf Aid | 1 qt/100 gal | | | | |
| 15 | Boll'd | 2 pt | 75 | 85 | 90 | 97 |
| | Def 6 | 1 pt | | | | |
| | Am. sulfate | 2 lb | | | | |
| | Surf Aid | 1 qt/100 gal | | | | |
| 16 | Boll'd | 0.33 pt | 55 | 63 | 86 | 96 |
| | Dropp 50WP | 0.1 lb ai | | | | |
| | Am. sulfate | 1 lb | | | | |
| | Surf Aid | 1 qt/100 gal | | | | |
| 17 | Finish | 1 qt | 70 | 80 | 90 | 96 |
| 18 | Finish | 1.5 qt | 68 | 74 | 91 | 96 |
| 19 | Untreated | | 0 | 0 | 80 | 93 |
| | LSD (0.1) | | 4.4 | 3.9 | 3.5 | 3.1 |

| No. | Chemical(s) | Rate in 10 gpa | % Leaf Freezing | | % Shoot Regrowth |
|-----|---------------|----------------|-----------------|--------|------------------|
| | | | 7 DAT | 14 DAT | 21 DAT |
| 1 | Boll'd | 1.33 pt | 6 | 5 | 15 |
| | Def 6 | 1 pt | | | |
| | Surf Aid | 1 qt/100 gal | | | |
| 2 | Boll'd | 1.33 pt | 14 | 4 | 5 |
| | Def 6 | 1 pt | | | |
| | Dropp 50WP | 0.1 lb ai | | | |
| | Surf Aid | 1 qt/100 gal | | | |
| 3 | Boll'd | 1.33 pt | 8 | 5 | 16 |
| | Def 6 | 1 pt | | | |
| | AMS Plus | 1 pt | | | |
| | Surf Aid | 1 qt/100 gal | | | |
| 4 | Boll'd | 1.33 pt | 23 | 10 | 5 |
| | Def 6 | 1 pt | | | |
| | Dropp 50WP | 0.1 lb ai | | | |
| | AMS Plus | 1 pt | | | |
| | Surf Aid | 1 qt/100 gal | | | |
| 5 | Boll'd | 1.33 pt | 8 | 5 | 10 |
| | Def 6 | 1 pt | | | |
| | Am. sulfate | 2 lb | | | |
| | Surf Aid | 1 qt/100 gal | | | |
| 6 | Boll'd | 1.33 pt | 8 | 5 | 6 |
| | Def 6 | 1 pt | | | |
| | Dropp 50WP | 0.1 lb ai | | | |
| | Am. sulfate | 2 lb | | | |
| | Surf Aid | 1 qt/100 gal | | | |
| 7 | Boll'd | 1.33 pt | 6 | 6 | 5 |
| | Dropp 50WP | 0.1 lb ai | | | |
| | Surf Aid | 1 qt/100 gal | | | |
| 8 | Boll'd | 1.33 pt | 9 | 6 | 4 |
| | Dropp 50WP | 0.1 lb ai | | | |
| | AMS Plus | 1 pt | | | |
| | Surf Aid | 1 qt/100 gal | | | |
| 9 | Boll'd | 1.33 pt | 6 | 5 | 3 |
| | Dropp 50WP | 0.1 lb ai | | | |
| | Am. sulfate | 2 lb | | | |
| | Surf Aid | 1 qt/100 gal | | | |
| 10 | Boll'd | 1.33 pt | 10 | 6 | 16 |
| | Def 6 | 1 pt | | | |
| | Activate Plus | 1 qt/100 gal | | | |
| 11 | Boll'd | 1.33 pt | 8 | 6 | 16 |
| | Def 6 | 1 pt | | | |
| | AMS Plus | 1 pt | | | |
| | Activate Plus | 1 qt/100 gal | | | |
| 12 | Boll'd | 1.33 pt | 5 | 5 | 21 |
| | Def 6 | 1 pt | | | |
| | Am. sulfate | 2 lb | | | |
| | Activate Plus | 1 qt/100 gal | | | |
| 13 | Boll'd | 2 pt | 13 | 9 | 7 |
| | Def 6 | 1 pt | | | |
| | Surf Aid | 1 qt/100 gal | | | |
| 14 | Boll'd | 2 pt | 9 | 5 | 11 |
| | Def 6 | 1 pt | | | |
| | AMS Plus | 1 pt | | | |
| | Surf Aid | 1 qt/100 gal | | | |
| 15 | Boll'd | 2 pt | 11 | 5 | 19 |
| | Def 6 | 1 pt | | | |
| | Am. sulfate | 2 lb | | | |
| | Surf Aid | 1 qt/100 gal | | | |
| 16 | Boll'd | 0.33 pt | 4 | 6 | 5 |
| | Dropp 50WP | 0.1 lb ai | | | |
| | Am. sulfate | 1 lb | | | |
| | Surf Aid | 1 qt/100 gal | | | |
| 17 | Finish | 1 qt | 9 | 8 | 16 |
| 18 | Finish | 1.5 qt | 11 | 5 | 13 |
| 19 | Untreated | | 0 | 0 | -- |
| | LSD (0.1) | | 4.8 | 3.1 | 3.9 |