

EFFECT OF ETHEPHON, POLYMERIC ADJUVANTS, AND NITROGEN SALTS ON DRIFT CONTROL, BOLL OPENING, AND DEFOLIATION WITH DEF 6® AND DROPP 50WP® DEFOLIANTS

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Abstract

A field study was conducted during 1999 to determine the effect of experimental drift control adjuvants on cotton defoliation, boll opening, and shoot regrowth, and a laboratory study was conducted to determine the diameter of spray droplets using different spray nozzles and spray pressures. The harvest-aid chemicals with their descriptions and manufacturers are listed in Table 1.

The field study was conducted with the adjuvants Arrow®, and Arrow 3® separately mixed with Boll'd®, Boll'd plus Def 6® and Boll'd plus Dropp 50WP® at rates shown in Table 2. These were applied to cotton, 'Suregrow 125' at 50% boll opening. Treatments were applied in water using Turbo TeeJet® 11002 spray nozzles and 44 psi pressure in 10 gallons per acre (gpa) to cotton in plots of four rows each, spaced 40 inches apart, 40 feet long. Treatments were replicated three times arranged 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 the percent shoot regrowth at 14 DAT whereby 0 = no effect and 100% = complete effect. Analyses of variance were conducted on all data sets. The Least Significant Difference (LSD) between means was determined by Fisher's Protected LSD Test at the 5% level.

The laboratory study was conducted to determine the droplet size for mixtures of each, Arrow and Arrow 3 with Boll'd alone, Boll'd plus Def 6, and Boll'd plus Dropp 50WP using a Malvern® 2600Lc laser particle size analyzer. The mixtures analyzed were mixed in water in the same concentrations as those which were sprayed in the field applications in the volume of 10 gallons per acre at 44 psi pressure. The Malvern analyses of droplet size for each mixture were made with three different types of TeeJet® spray nozzles, Extended Range 8004VS, TurboJet 11002VP, and Air Induction 11002VS. Each of these was analyzed at 40 psi spray pressure which was near the psi used in the field study. Each analysis was replicated three times.

In the field applications at 14 DAT, the adjuvants, Arrow, and Arrow 3 each in combination with Boll'd alone resulted in less than 50% cotton defoliation (Table 2).

At 14 DAT, all combinations of Boll'd and adjuvants with each Def 6 and Dropp 50WP resulted in 85 to 96% defoliation. The least percent defoliation was 85% with the combination of Boll'd, Def 6, and Arrow, and 88% with the combinations of Boll'd, Def 6 and Arrow 3. The greatest percent defoliation was 96% with the combination of Boll'd, Dropp 50WP, and Arrow 3.

The percent of open bolls at 14 DAT was greatest (90%) with the combination of Boll'd, Dropp 50WP, and Arrow 3 and least (82%) with the combination of Boll'd and Arrow 3 and with Boll'd, Def 6, and Arrow 3.

Percent shoot regrowth was greater with all combinations with Def 6 (23 to 27%) than with Boll'd alone or with Boll'd plus Dropp 50WP (3 to 13%).

In the laboratory studies, the volume median diameter of spray droplet size for each mixture with each nozzle type as sprayed at 40 psi is shown in Figure 1. The average droplet size was greater with the adjuvant, Arrow than with Arrow 3 for each mixture and nozzle type.

Inversely, there were consistently less fine, highly driftable, spray droplets below 105 microns in diameter, using Arrow than using Arrow 3 at 40 psi spray pressure as shown in Figure 2.

Over both the field and the laboratory studies, there was little to no significant difference in cotton defoliation, boll opening, and shoot regrowth when comparing each of the adjuvants, Arrow, and Arrow 3 with the same harvest aid chemicals, nozzle tip, and spray pressure. Where droplet size was measured, Arrow consistently resulted in larger spray droplets and less percent in droplets <105 microns than did Arrow 3.

Table 1. Harvest Aid Chemicals.

Name	Description	Manufacturer
<u>Defoliant</u>		
DEF 6	SSS-Tributyl phosphorotrithioate	Bayer Corporation
Dropp 50WP	Thidiazuron	AgrEvo USA Company
<u>Adjuvants</u>		
Arrow	Ammonium salts, elastopolymer adhesives	AGRO Distribution, LLC
Arrow 3	Ammonium salts, polyacrylimide polymer	AGRO Distribution, LLC
Boll'd	Two-chloroethyl phosphonic acid (ethephon)	AGRO Distribution, LLC

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Table 2. Effect of various combinations of defoliant and adjuvants applied to cotton 'Suregrow 125' at 50 percent boll opening (average of 3 replications).

Chemical	Treatment Rate in 10 gpa	Percent Defoliation DAT		Percent Open Bolls DAT		Percent Regrowth 14 DAT
		7	14	7	14	
Boll'd	1.33 pt	33	37	60	83	3
Arrow	9 lbs/ 100 gal					
Boll'd	1.33 pt	27	33	63	82	10
Arrow 3	2.5 gal/ 100 gal					
Boll'd	1.33 pt	87	93	67	88	13
Dropp 50WP	0.1 lb ai					
Arrow	9 lbs/ 100 gal					
Boll'd	1.33 pt	93	96	77	90	7
Dropp 50WP	0.1 lb ai					
Arrow 3	2.5 gal/ 100 gal					
Boll'd	1.33 pt	82	85	60	83	23
Def 6	1 pt					
Arrow	9 lbs/ 100 gal					
Boll'd	1.33 pt	85	88	67	82	27
Def 6	1 pt					
Arrow 3	2.5 gal/ 100 gal					
LSD (0.05)		5	5	5	4	9

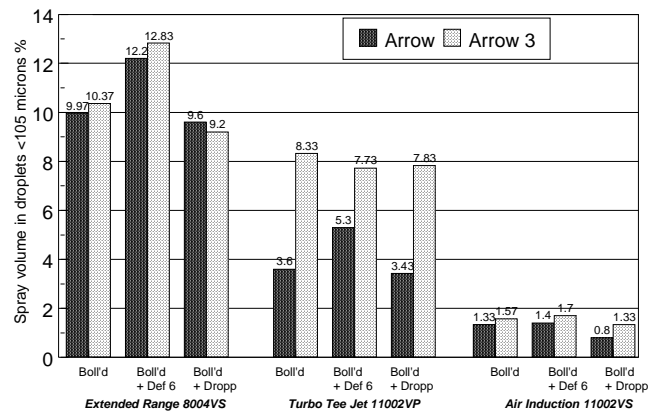


Figure 2. Percentage of spray volumes resulting in spray droplets <105 microns when applying Arrow or Arrow 3 with Boll'd alone and with Boll'd plus Def 6 or Dropp 50WP cotton defoliant at 10 gpa and 40 psi using different nozzle tips.

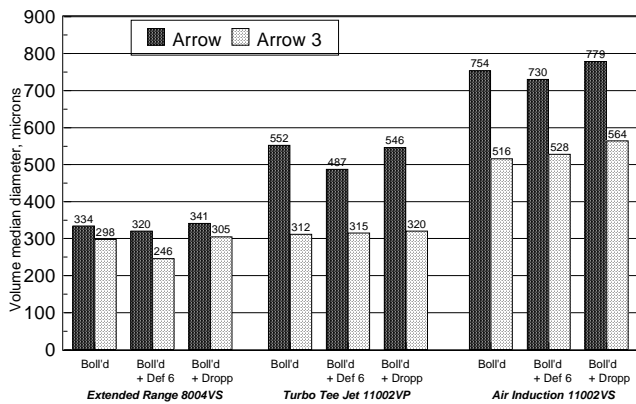


Figure 1. Average droplet size in microns when applying Arrow or Arrow 3 with Boll'd alone and with Boll'd plus Def 6 or Dropp 50 WP cotton defoliant at 10 gpa and 40 psi using different nozzle tips.