Effect of Combinations of Accelerate and other Defoliants on Defoliation and Yield of Pima and Upland Cotton

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Abstract

Field studies were conducted at the Maricopa Agricultural center to evaluate the effectiveness of Accelerate when used in combination with other defoliants. In addition, an experimental compound was tested as a boll opener. Air temperatures were very high at the time these tests were conducted and most defoliant treatments caused desiccation of Pima leaves 7 days after treatments were applied. Several treatments did result in acceptable defoliation of Pima cotton 14 days after application. In the upland test, Ginstar used alone resulted in higher defoliation percentages than any combination of defoliants. Boll opener treatments had no effect on boll opening of Pima or upland cotton. In these tests, there were no differences among treatments in lint yield or fiber properties.

Introduction

There are many chemicals available for defoliating cotton in central Arizona. In this test, the harvest aid Accelerate was evaluated for its effectiveness when tank mixed with other defoliants currently being used in the area. According to its label, Accelerate is to be used in combination with sodium chlorate or organic phosphate defoliants to give a faster more dependable leaf drop.

Currently, there is interest in harvesting cotton earlier in the season than in the past to reduce inputs and insect problems. When harvest is early having as many bolls open as possible is important and one way to accomplish this may be through the used of chemical boll openers. In this test, an experimental chemical was evaluated for its use as a boll opener.

Materials and Methods

Field experiments were conducted at the University of Arizona Maricopa Agricultural Center. Seed of Pima S-7 and DP5415 was planted in moist soil on 8 April 1994. The plantings were furrow irrigated and received a total of 90 lbs. of N/acre during the season. Standard practices for irrigation, fertilization and pest control were followed. The final irrigation was on 18 August.

Descriptions of the defoliation treatments used in the tests are shown in Table 1. Defoliation treatments were applied to Pima and upland cotton on 16 September 1994. Boll opener treatments were applied 4 days later on 20 September. In these tests, defoliation treatments were applied with a HiBoy sprayer using a 7 nozzles/row sprays boom and a 25 GPA application rate. Plots were 4 rows wide by 38 ft. long. Each test utilized a randomized

complete block experimental design with 4 replications. Plots were rated for percent defoliation by 2-3 individuals 7 and 14 days after application of chemicals. Counts of unopened bolls were made on 4 October or 14 days after boll opener treatments were applied. Unopened bolls smaller than three-fourths inch in diameter were not counted as unopened bolls. Boll samples were collected in each plot on 6 October from the open bolls located in the top one-third of the canopy. These samples were ginned and the lint sent to Starlab, Inc., Knoxville, TN for analysis of fiber properties.

To prepare the crop for harvest an additional application of defoliants was made on 10 October using a tank mix of Dropp at 0.15 lb. a.i./acre + Def at 1.0 lb. a.i./acre + Accelerate at 0.065 lb. a.i./acre + 1 pt./acre crop oil. The cotton from 38 ft. of the center 2 rows/plot was harvested by machine on 2 November.

In these tests, maximum and minimum temperatures were 103 and 57°F, respectively, on the day defoliants were applied. Average maximum and minimum temperatures for the 14 day period after application were 100 and 65°F, respectively. In the 14 day period after application of defoliants, 329 HU were accumulated and 0.04 in. of rainfall was recorded.

Results and Discussion

Results of the Pima test are shown in Table 2. Leaf desiccation was very high for most defoliation treatments at the 7 day evaluation with Ginstar treated plots having the highest percentage of desiccation. In these tests, air temperatures were very high and over 300 HU were accumulated in the 14 day period after application of defoliants. However, several windy days helped remove the desiccated leaves and by the 14 day evaluation desiccation was not a problem. Defoliation percentages were low for all treatments at the 7 day evaluation, but several treatments provided acceptable defoliation ($\geq$ 75% leaf drop) 14 days after application. Treatments with the experimental boll opener (TD-2335-2) did not appear to have more open bolls than other treatments 14 days after they were applied. This conclusion was based on the assumption that if boll opener treatments had more open bolls than other treatments they also would have fewer unopened bolls. There were no significant differences among defoliant treatments in lint yield (Table 2) or fiber properties of lint from upper canopy bolls (Table 4).

Results of the upland test are shown in Table 3. In this test, Ginstar used alone provided acceptable defoliation in 7 days and had the highest percentage of leaf drop 14 days after treatment. There appears to be an antagonistic effect when Ginstar is used in combination with Accelerate, at least at the rates we tested. As in the Pima test, boll opener treatments appeared to have no effect on open bolls 14 days after application of the boll opener chemical. Defoliation treatments had no effect on lint yields (Table 3) or fiber properties of lint from upper canopy bolls (Table 5).

Table 1. Description of treatments used in Pima S-7 and DP 5415 tests.

Treatment[1]	Rate (lbs. a.i./acre)
01 Accelerate + Def	0.065 + 0.75
02 Accelerate + Def + TD-2335-2[2]	0.065 + 0.75 + 0.50
03 Accelerate + Def + TD-2335-2[2]	0.065 + 0.75 + 0.75
04 Ginstar	0.15
05 Accelerate + Ginstar	0.065 + 0.10
06 Accelerate + Ginstar	0.065 + 0.075
07 Dropp + Def + Accelerate	0.075 + 0.75 + 0.033
08 Accelerate + Prep	0.065 + 0.75

[1] Treatments 01, 02, 03, 07 and 08 were applied with 1 pt./acre Agri-Dex.
[2] All defoliants were applied on 16 September. TD-2335-2 (an Elf Atochem experimental compound) was applied in a separate application on 20 September.

Table 2. Effect of defoliant treatment on defoliation, leaf desiccation, unopened bolls and lint yield of Pima S-7 cotton.

	Defoliation (%)		Desiccation (%)	Unopened bolls	Lint Yield
Treatment	7 days	14 days	7 days[1]	per ft. of row[2]	(lbs./acre)
01	40b[3]	56b	9b	3.6a	979a
02	43ab	66b	11b	3.0ab	918a
03	35b	74ab	25b	2.2ab	837a
04	18c	96a	70a	0.6b	814a
05	56a	76ab	18b	2.6ab	922a
06	50ab	81ab	28b	1.9ab	926a
07	34b	85ab	41b	2.5ab	892a
08	40b	71ab	25b	2.1ab	933a

[1] Before the 14 day evaluation most of the desiccated leaves had been removed, partly by wind.
[2] Counts were made in 20 ft. of row/plot on 4 October.
[3] Means followed by the same letter are not significantly different at the 0.05 probability level.

Table 3. Effect of defoliant treatment on defoliation, unopened bolls and lint yield of DP 5415 cotton.

Treatment	Defoliation (%) 7 days	14 days	Unopened bolls per ft. of row[1]	lint yield (lbs./acre)
01	52b[2]	62bc	2.0a	1586a
02	68a	71b	1.3a	1542a
03	51b	66bc	1.8a	1586a
04	78a	93a	1.2a	1509a
05	35b	47d	2.1a	1590a
06	43b	56cd	1.6a	1589a
07	67a	76b	1.6a	1532a
08	38b	49d	1.4a	1553a

[1] Counts were made in 20 ft. row/plot on 4 October.
[2] Means in columns followed by the same letter are not significantly different at the 0.05 probability level.

Table 4. Effect of defoliant treatment on fiber properties of upper canopy bolls of Pima S-7 cotton.

Treatment	LEN	UR	STR	EI	MIC	RD	b
01	1.35a[1]	89.1a	52.1a	10.8a	3.8a	70.4a	10.9a
02	1.35a	89.1a	52.0a	10.8a	3.7a	69.7a	10.9a
03	1.34a	88.5a	49.5a	10.5a	3.8a	70.6a	10.7a
04	1.35a	88.6a	51.8a	10.8a	3.8a	70.7a	11.0a
05	1.34a	88.9a	52.7a	10.8a	3.7a	70.6a	10.9a
06	1.35a	89.2a	53.7a	11.3a	3.7a	70.4a	11.1a
07	1.35a	89.2a	51.0a	10.8a	3.7a	70.6a	10.8a
08	1.36a	89.7a	51.3a	10.8a	3.9a	70.8a	10.8a

[1] Means in columns followed by the same letter are not significantly different at the 0.05 probability level.

Table 5. Effect of defoliant treatment on fiber properties of upper canopy bolls of DP 5415 cotton.

Treatment	LEN	UR	STR	EI	MIC	RD	b
01	1.11a[1]	82.5a	29.0	9.8a	5.3a	78.9a	6.8a
02	1.11a	83.0a	28.8a	10.0a	5.4a	79.4a	6.8a
03	1.11a	82.8a	28.9a	9.8a	5.3a	79.8a	7.0a
04	1.11a	82.6a	29.1a	10.0a	5.5a	79.8a	7.1a
05	1.09a	82.3a	28.8a	9.8a	5.4a	79.6a	7.0a
06	1.09a	82.6a	27.9a	9.8a	5.4a	77.3a	6.9a
07	1.11a	82.6a	29.9a	10.0a	5.3a	79.2a	6.8a
08	1.10a	82.5a	30.0a	9.9a	5.3a	79.1a	7.1a

[1] Means in columns followed by the same letter are not significantly different at 0.05 probability level.