

**Effects of Three Experimental Adjuvants on the
Performance of a Cotton Defoliant**

F. M. Carasso and R. E. Briggs
Department of Plant Sciences

Introduction

Optimum performance of a physiologically active chemical can only be attained if a sufficient quantity arrives at its site(s) of action. An additive capable of facilitating the penetration of the active chemical and thereby increasing its concentration at the site(s) of action should theoretically result in enhanced efficacy, and possibly permit a reduction in the quantity required. This should result in important economic and environmental benefits. The objective of an investigation, begun in 1980, is to devise adjuvants for this purpose.

An evaluation of the effects of three experimental adjuvants on the performance of a cotton (*Gossypium hirsutum* L.) defoliant, thidiazuron (*N*-phenyl-*N'*-1,2,3-thiadiazol-5ylurea)^a applied at three different rates was conducted in 1984 and 1985. Results of these evaluations are summarized in this report.

Procedures and Materials

The evaluations were conducted at the Yuma Valley Agricultural Center on Deltapine 70 cotton which was grown in a plant two, skip two pattern, to permit accurate spraying and evaluation of individual plots. Each plot comprised two adjacent rows 1.02 M (40 in) apart and 6.1 M (20 ft) long. The experimental design was a randomized complete block with six replications in 1984 and five in 1985. The defoliation treatments were applied on 5 October 1984 and 16 September 1985. All treatments were applied with a hand plot sprayer pressurized with carbon dioxide and calibrated to spray at the volume rate of 234 L/ha (25 gal/ac).

The rates of application of thidiazuron, expressed as active ingredient, were: 0.17 kg/ha (0.15 lb/ac); 0.22 kg/ha (0.20 lb/ac); and 0.28 kg/ha (0.25 lb/ac) in 1984. Temperatures were more favorable at the earlier date in 1985 and the rates of application were reduced accordingly. The lowest rate was 0.11 kg/ha (0.10 lb/ac) and the two higher rates were 0.17 kg/ha and 0.22 kg/ha.

An untreated check, a "thidiazuron alone" check, and a recommended commercially available emulsifiable non-phytotoxic

petroleum oil adjuvant, plus additional nonionic surfactant, were included as standards of comparison. Results were evaluated by visual estimates of the percent defoliation plus desiccation.

^a DROPP

Plants in some of the plots were very large, leafy, and badly lodged. Abscised leaves could not fall to the ground, but dried within the canopy. Some stalks were covered by others and their leaves could not be reached with the spray. These factors resulted in incomplete coverage.

Data were analyzed statistically using Duncan's Multiple Range Test at the 5% level. The following is a brief identification of the adjuvants listed in Table 1:

Atlas AL-411F	Acommercially available emulsifiable non-phytotoxic petroleum oil adjuvant.
Triton X-100	p-octylphenoxy polyoxyethanol (9 to 10 ethyleneoxide groups). (nonionic surfactant)
UAY-100, UAY-101 UAY-102	Experimental adjuvants

Results and Discussion

The performance of the defoliation treatments was influenced by the size and condition of the cotton plants and by the temperatures during the period between spraying and evaluation.

In 1984, with thidiazuron applied at the two lowest rates, Adjuvant UAY-102 (Treatments 10 and 11) was significantly more effective than any other adjuvant with thidiazuron applied at these rates, and far superior to the principal standard of comparison (Treatment 3) with thidiazuron applied at the highest rate, Table 1. The following treatments were most effective: 9 UAY-101 with thidiazuron applied at the rate of 0.28 kg/ha; 11 UAY-102 with thidiazuron applied at the rate of 0.22 kg/ha; and 12 UAY-102 with thidiazuron applied at the rate of 0.28 kg/ha.

In 1985, the performance of the two most effective adjuvants (UAY-101 and UAY-102) with thidiazuron applied at each of the three rates was far superior to that of the principal standard of comparison (Treatment 3) with thidiazuron applied at the highest rate. In this evaluation, the performance of adjuvants UAY-101 and UAY-102 with thidiazuron applied at the rate of 0.11 kg/ha

was superior to that of the principal standard of comparison with thidiazuron applied at twice that rate (0.22 kg/ha). The performance of UAY-102 with thidiazuron applied at the rate of 0.17 kg/ha was adversely affected by the fact that the plants in two of the five replications were unusually large and vigorous.

In these evaluations, the selection of the adjuvant had a greater influence on performance than did the rate of application of thidiazuron. The performance which resulted from the use of the two inferior adjuvants: the principal standard of comparison (Atlas AL-411F plus Triton X-100) and UAY-100, was very poor regardless of the rate of application of thidiazuron.

Results of these evaluations and those obtained in an analogous evaluation conducted in 1982 are indicative of the potential value of superior adjuvants. The information obtained in these evaluations suggests the possibility that rates of application of some biologically active chemicals can be advantageously reduced with the aid of superior adjuvants. It is anticipated that continued study and experimentation will result in further progress.

PHYSIOLOGY AND GROWTH REGULATION

Table 1. Effects of Three Experimental Adjuvants on the Performance of Thidiazuron Applied at Three Different Rates¹

Treatment Number	Adjuvant	Rate ¹ (kg/ha)	1984 ²	Rate ¹ (kg/ha)	1985 ³
			Estimated Percent Defoliation Plus Desiccation ⁴		Estimated Percent Defoliation Plus Desiccation ⁵
1	None	0	5 f (0)	0	5 d (0)
2	None	0.28	14 e (4)	0.22	16 d (1)
3	1.5% (v/v) Atlas-AL-411F plus 0.2% (v/v) Triton X-100	0.28	29 d (2)	0.22	37 c (1)
4	UAY-100	0.17	24 d (2)	0.11	39 c (0)
5	UAY-100	0.22	29 d (3)	0.17	34 c (1)
6	UAY-100	0.28	27 d (2)	0.22	50 bc (0)
7	UAY-101	0.17	43 c (3)	0.11	64 ab (0)
8	UAY-101	0.22	43 c (2)	0.17	69 a (1)
9	UAY-101	0.28	68 a (1)	0.22	67 a (0)
10	UAY-102	0.17	54 b (5)	0.11	72 a (0)
11	UAY-102	0.22	63 a (2)	0.17	58 ab (2)
12	UAY-102	0.28	71 a (4)	0.22	72 a (0)

¹ Rates of application of thidiazuron expressed on the basis of active ingredient.

² Treatments applied on 5 October 1984.

³ Treatments applied on 16 September 1985.

⁴ Averages of six replications. Values followed by the same letter are not significantly different at the 5% level, according to Duncan's Multiple Range Test.

⁵ Averages of five replications. Values followed by a common letter are not significantly different at the 5% level, according to Duncan's Multiple Range Test.

Numbers in parentheses indicate the number of replications in which the plants were unusually large, vigorous, and badly lodged.