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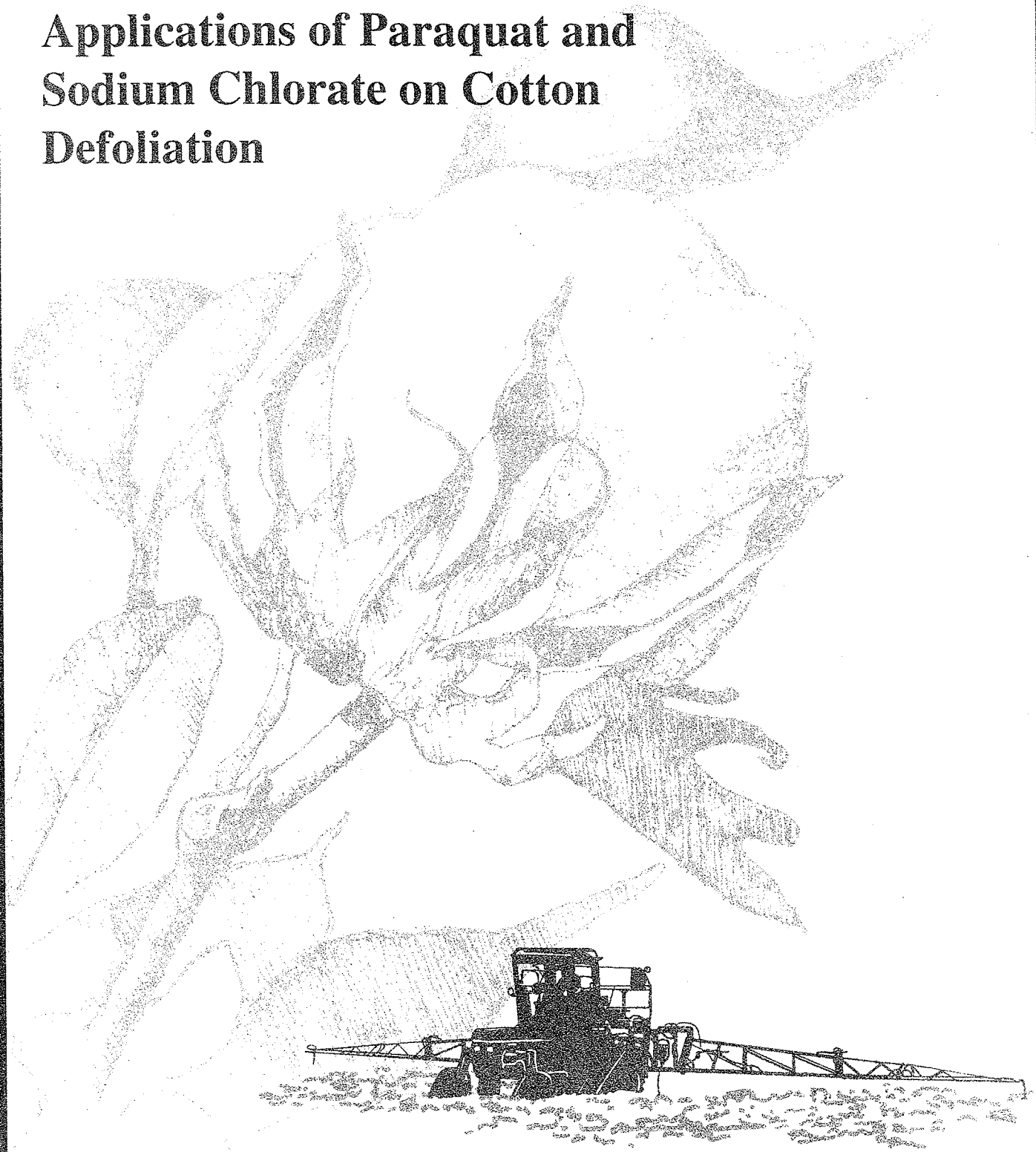

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Effects of Sequential Applications of Paraquat and Sodium Chlorate on Cotton Defoliation

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Effects of Sequential Applications of Paraquat and Sodium Chlorate on Cotton Defoliation

Summary

The effectiveness of paraquat plus sodium chlorate applied 5 to 7 days following a standard application of tribufos or thidiazuron was evaluated in a cooperative series of experiments conducted at Mississippi State University's Delta Branch Experiment Station near Stoneville and at the University of Georgia's Coastal Plain Station near Tifton. At 7 days after treatment (DAT) in Stoneville, tribufos without sequential treatment resulted in 79, 52, and 65% defoliation in 1989, 1990, and 1991, respectively. Defoliation with tribufos at Tifton was 32% in 1990 and 72% in 1990. Sequential treatment with paraquat plus sodium chlorate did not improve defoliation over tribufos alone in 1989 at Stoneville and 1991 at Tifton. However, the sequential treatment improved defoliation following a tribufos application at both locations in 1990 and at Stoneville in 1991.

At Stoneville, thidiazuron provided 55, 58, and 82% defoliation at 7 DAT in 1989, 1990, 1991, respectively. Defoliation was 36 and 51% in 1990 and 1991, respectively, at Tifton. Sequential treatment did not improve defoliation at 7 DAT at either location in 1991. However, defoliation at 7 DAT with paraquat plus sodium chlorate following thidiazuron improved from 55 to 70% in 1989 and from 58 to 76% in 1990 at Stoneville, and from 36 to 77% in 1990 at Tifton.

Tribufos plus paraquat at 0.09 lb/A provided better defoliation at 7 DAT than tribufos alone both years during a 2-year study at Stoneville. Thidiazuron plus paraquat at 0.125 lb/A failed to improve defoliation over that of thidiazuron alone either year.

Introduction

Recent changes in the classification system for cotton fiber evaluation have placed greater emphasis on harvesting cotton free of trash and color pigmentation. Beginning with the 1993 crop year, composite grades of both color and leaf were discontinued and are now reported separately (1). This more clearly defines color and leaf information for the cotton industry (2).

Trash (measured by high-volume instrumentation or HVI) is a measure of nonlint materials in a harvested cotton sample and is similar to a classer's leaf grade, which is a visual estimate of trash (1). HVI color, or the classer's color grade, is the degree of reflectance and yellowness of the cotton fiber. Contact of the cotton fiber with grass or weeds and the cotton plant's leaf are two of several factors that can contribute to color.

The primary purpose of chemical termination or defoliation of cotton is to reduce the effect of weed and cotton leaf stain on trash and fiber color. An ideal defoliation treatment should remove as many of the cotton leaves as possible and prevent any subsequent regrowth of cotton leaves that may affect trash and/or color grade.

Two important factors in successful chemical defoliation of cotton are proper application timing of the defoliant material and proper choice of materials (9). Factors leading to unsuccessful attempts of defoliation usually involve harsh weather conditions or poor crop condition. All of the defoliant materials available have weaknesses that may contribute to unsuccessful defoliation. These weaknesses can be overcome by using combinations of two defoliants (7). Use of these defoliant combinations can achieve optimal results in most circumstances. In some situations it may become necessary to consider a second application to achieve desired results.

Thidiazuron (Dropp®) and tribufos (Def®, Folex®) are two defoliants widely used for chemical defoliation of cotton. Thidiazuron is an excellent regrowth inhibitor while tribufos provides better defoliation under cooler conditions (4). Thidiazuron's regrowth inhibition properties make it a very desirable defoliant. However, it is not recommended when temperatures drop below 65 °F. The activity of thidiazuron was improved with the use of crop oil concentrate and ammonium sulfate but these additives did not alter thidiazuron's activity in cooler temperatures (8). Often, it becomes necessary to follow a thidiazuron treatment with another application of a harvest aid chemical. Tribufos provides better defoliation than thidiazuron under cooler temperatures, but a companion defoliant or a second application of a defoliant is usually needed to achieve desired results (7).

Unsuccessful first attempts and factors such as lodged cotton, a dense crop canopy, and delayed harvest have contributed to the need for evaluation of sequential treatments for achieving desired results from a sub-par defoliant treatment. These sequential treatments should remove any remaining older leaves or newer juvenile leaves present at the time of treatment.

Two harvest aid materials, paraquat (Starfire®) and sodium

chlorate, were considered candidates for use as sequential treatments following a primary defoliation treatment. Sodium chlorate, a defoliant at low rates and a desiccant at high rates, is effective for removing older leaves from the cotton plant (5). Paraquat provides some defoliation at rates of 0.07 lb ai/A and is more effective on regrowth than sodium chlorate (5). At higher rates, it also can serve as a desiccant. Each material provides good regrowth removal, is inexpensive at the desired rate of application, and serves as a harvest aid for removal and/or desiccation of weeds that may be present in the field at the time of harvest (5). Additionally, paraquat assists boll opening and can facilitate an earlier harvest (3,6).

The objectives of this research were to evaluate the effectiveness of paraquat at 0.07 lb/A applied alone and in combinations with sodium chlorate at 3 or 6 lb/A when applied following a primary defoliant treatment of thidiazuron or tribufos, and to evaluate combinations of these two defoliants with paraquat.

Materials and Methods

Experiments were conducted at the MAFES Delta Branch Experiment Station (DBES) near Stoneville, MS, in 1989, 1990, and 1991, the Coastal Plain Experiment Station (CPES) near Tifton, GA in 1990, and the Attapulgus Research Farm (ARF) near Attapulgus, GA in 1991. 'DES 119' cotton was planted from late April

Table 2. Utilization of paraquat plus sodium chlorate for cotton defoliation following foliar application of thidiazuron or tribufos.[a]

Treatment[b]	Rate	Defoliation at 5 DAT		
		Mississippi		
		1989	1990	1991
	(lb ai/A)	(%)		
Untreated		11 g	14 d	10 e
tribufos	1.125	76 b-e	54 c	65 d
tribufos fb paraquat + NIS	1.125 0.07	89 ab	61 c	77 c
tribufos fb paraquat + sodium chlorate + NIS	1.125 0.07 3.0	84 abc	71 b	85 abc
tribufos fb paraquat + sodium chlorate + NIS	1.125 0.07 6.0	91 a	76 b	82 abc
tribufos fb ethephon	1.125 1.5	94 a	59 c	68 d
thidiazuron	0.1	51 f	54 c	82 abc
thidiazuron fb paraquat + NIS	0.1 0.07	65 e	60 c	80 bc
thidiazuron fb paraquat + sodium chlorate + NIS	0.1 0.07 3.0	69 de	75 b	88 ab
thidiazuron fb paraquat + sodium chlorate + NIS	0.1 0.07 6.0	72 cde	88 a	90 a
thidiazuron fb ethephon	0.1 1.5	81 a-d	60 c	90 a

[a]Means within a column followed by the same letter are not different at the 5% level of probability according to Duncan's Multiple Range Test.
[b]fb = followed by; treatments were applied 5 to 7 days after initial treatment. NIS = nonionic surfactant at 0.25% v/v. DAT = days after final treatment.

Table 1. Rainfall and growing degree days for Mississippi and Georgia[a].

Date	Mississippi						Georgia			
	Rainfall			Growing Degree Days			Rainfall		Growing Degree Days	
	1989	1990	1991	1989	1990	1991	1990	1991	1990	1991
	(inches)			(DD60[b])			(inches)		(DD60[b])	
8/01-8/15	0.4	0.5	0.9	252	257	312	2.5	5.4	346	279
8/16-8/31	3.2	0.0	0.7	344	390	280	0.3	0.5	400	284
9/1-9/15	4.9	2.6	1.2	291	325	304	1.7	0.0	339	285
9/16-9/30	2.1	0.5	2.2	86	201	132	0.1	0.0	231	199
10/1-10/15	0.2	3.9	0.3	104	132	95	4.0	0.0	244	111
10/16-10/31	0.6	0.8	3.1	64	23	119	1.3	0.7	73	123
Total	11.4	8.3	8.4	1,141	1,328	1,242	9.9	6.6	1,633	1,281

[a]Initial dates of application were 9/19/89, 8/28/90, and 9/13/91 in Mississippi, and 9/19/90 and 9/26/91 in Georgia.
[b]DD60 (F) = [(daily maximum temperature + daily minimum temperature)÷2] - 60.

to mid-May in Mississippi, and 'Deltapine 90' was planted during mid-May in Georgia. Experimental design at both locations was a randomized complete block with four replications. Plot size was four rows (36-40 inches) 20 to 40 feet long. Rainfall amounts and growing degree days from August 1 to October 31 at each location are shown in Table 1.

Standard production practices were utilized at all locations to ensure normal crop growth and optimum defoliation response. Cotton was seeded at a rate to achieve four or five plants per linear foot of row. Nitrogen was applied at a rate of 90 to 110 lb/A preplant in Mississippi, and at a rate of 25 to 35 lb/A sidedressed after cotton emergence followed by 25 to 35 lb/A sidedressed at midbloom in Georgia. Cotton was irrigated once in 1990 and 1991 at the Mississippi location, and three times at the Georgia location in 1990.

Treatments at each location included tribufos at 1.125 lb ai/A or thidiazuron at 0.1 lb ai/A alone or followed by either paraquat at 0.07 lb ai/A, paraquat at 0.07 lb ai/A + sodium chlorate at 3.0 or 6.0 lb ai/A, or ethephon at 1.5 lb ai/A. All paraquat treatments included a nonionic surfactant at 0.25% (v/v).

Treatments were applied with high clearance ground equipment at the Mississippi location, and a with a tractor-mounted sprayer in 1990 and a CO_2 backpack sprayer in 1991 in Georgia. The treatments were applied at an application volume of 20 gallons per acre (gpa). Estimated crop growth stage was 40 to 60% open bolls in Mississippi, and 60 to 70% open bolls in Georgia for the first application. Sequential applications were applied 5 to 9 days after the initial application of tribufos or thidiazuron.

Visual estimations of percent defoliation were made 5, 7, and 14 DAT in Mississippi, and 7 and 14 DAT in Georgia. Percent regrowth occurring on plants was estimated at 14 DAT in 1989 and 1990 and 20 DAT in 1991 in Mississippi, and 14 DAT in 1991 in Georgia. Rating scales were the same as those reported earlier (7,9). Seed cotton yields were determined from the two center rows of each plot in 1989 and 1990 at the Mississippi location. Data were subjected to analysis of variance and treatment differences were compared using a significance level of 5% with Duncan's Multiple Range Test.

An additional experiment was conducted in 1989 and 1990 in Mississippi to evaluate the effectiveness of paraquat when applied in combination with either tribufos or thidiazuron. Treatments included tribufos applied alone at 1.125 lb ai/A or in combination with paraquat at 0.07, 0.09, or 0.15 lb ai/A and thidiazuron at 0.125 lb ai/A alone or in combination with paraquat at 0.07 lb ai/A. Nonionic surfactant at 0.25% v/v was included in all paraquat treatments. All other treatment criteria for this experiment were the same as for the sequential experiment. Visual estimations of percent defoliation were made at 7, 14, and 21 DAT. Data were subjected to analysis of variance and treatment means were compared using a significance level of 5% with Duncan's Multiple Range Test.

Results and Discussion

Mississippi

Several of the sequential applications improved defoliation

Table 3. Utilization of paraquat plus sodium chlorate for cotton defoliation following foliar application of thidiazuron or tribufos.[a]

		Defoliation at 7 DAT				
		Mississippi			Georgia	
Treatment[b]	Rate	1989	1990	1991	1990	1991
	(lb ai/A)	(%)				
Untreated		26 f	14 f	15 d	0 e	0 f
tribufos	1.125	79 bc	52 e	67 c	32 d	72 b
tribufos fb paraquat + NIS	1.125 0.07	84 ab	65 c	73 c	40 cd	70 b
tribufos fb paraquat + sodium chlorate + NIS	1.125 0.07 3.0	82 abc	72 b	88 ab	51 bc	67 bc
tribufos fb paraquat + sodium chlorate + NIS	1.125 0.07 6.0	88 ab	78 b	87 ab	56 b	70 b
tribufos fb ethephon	1.125 1.5	95 a	60 cd	73 c	52 bc	85 a
thidiazuron	0.1	55 e	58 de	85 b	36 d	51 e
thidiazuron fb paraquat + NIS	0.1 0.07	62 de	64 cd	85 b	52 bc	62 cd
thidiazuron fb paraquat + sodium chlorate + NIS	0.1 0.07 3.0	70 cd	76 b	93 a	77 a	55 de
thidiazuron fb paraquat + sodium chlorate + NIS	0.1 0.07 6.0	76 bc	91 a	92 ab	77 a	58 de
thidiazuron fb ethephon	0.1 1.5	89 ab	64 cd	92 ab	69 a	69 bc

[a]Means within a column followed by the same letter are not different at the 5% level of probability according to Duncan's Multiple Range Test.

[b]fb = followed by; treatments were applied 5 to 7 days after initial treatment. NIS = nonionic surfactant at 0.25% v/v. DAT = days after final treatment.

over tribufos alone 5 DAT, depending upon year (Table 2). However, only tribufos followed by paraquat + sodium chlorate (6 lb ai/A) improved defoliation over tribufos alone in each of the 3 years when evaluated 5 DAT. Ethephon (Prep®) improved defoliation with tribufos in 1989 only.

All sequential treatments increased defoliation over thidiazuron alone 5 DAT in 1989, a year when cool temperatures were prevalent following thidiazuron application (Table 1). Thidiazuron followed by paraquat + sodium chlorate (either 3 or 6 lb ai/A) improved defoliation when compared to thidiazuron alone in 1989 and 1990. Sodium chlorate (3 lb ai/A) following tribufos provided greater than 70% defoliation all 3 years. There were no differences between thidiazuron treatments in 1991.

At 7 DAT (Table 3), tribufos followed by paraquat + sodium chlorate (3 or 6 lb ai/A) had higher defoliation than tribufos alone or any of the other sequential treatments in 1990 and 1991, and the combination's were better than tribufos followed by paraquat alone. There were no differences between sequential treatments following tribufos in 1989. Thidiazuron followed by paraquat + sodium chlorate (3 or 6 lb ai/A) were the only sequential treatments that improved defoliation over thidiazuron alone in both 1989 and 1990. All thidiazuron combinations provided 85% defoliation or better in 1991. Paraquat + sodium chlorate (3 or 6 lb ai/A) were the only tribufos or thidiazuron sequentials that provided 70% or better defoliation all 3 years. In 1989, tribufos alone was better than thidiazuron alone because of cooler temperatures (Table 1), which supports earlier findings (4). In 1991, when temperatures were warmer, thidiazuron was better than tribufos when either was applied alone.

Tribufos alone and all sequentials provided greater than 80% defoliation 14 DAT in 1989, while in 1990 none of the sequentials provided greater than 70% defoliation 14 DAT (Table 4). This lower percentage of defoliation in 1990 appeared to be caused by extremely dry conditions during the month of August (0.5 inch rainfall) followed by 2.5 inches of rainfall from 7 to 14 days after the sequential application. This led to more than 40% regrowth with all tribufos sequentials (Table 5).

In 1989 and 1991, all of the tribufos sequentials had less than 40% regrowth. Tribufos followed by paraquat + sodium chlorate (3 or 6 lb ai/A) had less than 20% regrowth in both 1989 and 1991. Tribufos followed by paraquat + sodium chlorate (3 or 6 lb ai/A) was better than all other tribufos sequentials in 1989 and 1991. Thidiazuron followed by paraquat + sodium chlorate (6 lb ai/A) was the only thidiazuron sequential that provided greater than 75% defoliation 14 DAT in each of the 3 years (Table 4). This treatment was the best treatment in 1990 providing 86% defoliation. Regrowth was a more severe problem in 1990 than in other years (Table 5). This led to better performance and identified a strength for this particular treatment.

When considering combination treatments, tribufos alone provided 55, 68, and 69% defoliation at 7, 14, and 21 DAT, respectively in 1989 (Table 6). Addition of paraquat at 0.07 lb/A did not increase

Table 4. Utilization of paraquat plus sodium chlorate for cotton defoliation following foliar application of thidiazuron or tribufos.[a]

		Defoliation at 14 DAT				
		Mississippi			Georgia	
Treatment[b]	Rate	1989	1990	1991	1990	1991
	(lb ai/A)	(%)				
Untreated		29 f	12 h	18 e	0 e	0 g
tribufos	1.125	85 abc	41 g	58 d	18 d	65 ef
tribufos fb paraquat + NIS	1.125 0.07	86 abc	49 def	67 cd	17 d	72 de
tribufos fb paraquat + sodium chlorate + NIS	1.125 0.07 3.0	84 abc	60 bc	88 ab	28 cd	71 de
tribufos fb paraquat + sodium chlorate + NIS	1.125 0.07 6.0	86 abc	64 b	83 b	35 bc	84 ab
tribufos fb ethephon	1.125 1.5	96 a	46 efg	68 c	23 cd	89 a
thidiazuron	0.1	58 e	42 fg	88 ab	23 cd	63 f
thidiazuron fb paraquat + NIS	0.1 0.07	66 de	55 cd	88 ab	42 b	75 cd
thidiazuron fb paraquat + sodium chlorate + NIS	0.1 0.07 3.0	75 cd	66 b	95 a	66 a	74 cd
thidiazuron fb paraquat + sodium chlorate + NIS	0.1 0.07 6.0	78 bcd	86 a	92 ab	65 a	81 bc
thidiazuron fb ethephon	0.1 1.5	90 ab	50 de	92 ab	66 a	85 ab

[a]Means within a column followed by the same letter are not different at the 5% level of probability according to Duncan's Multiple Range Test.

[b]fb = followed by; treatments were applied 5 to 7 days after initial treatment. NIS = nonionic surfactant at 0.25% v/v. DAT = days after final treatment.

defoliation with tribufos further except at 21 DAT. Tribufos plus paraquat at 0.09 lb/A improved defoliation over that of tribufos alone at 7, 14, and 21 DAT. Defoliation with paraquat applied at 0.15 lb/A with tribufos did not differ from that with paraquat applied at 0.09 lb/A at any evaluation period.

In 1990, paraquat at any rate evaluated added to tribufos improved defoliation to 75% or better, with the exception of the 0.07 lb/A rate evaluated at 21 DAT (Table 6). All other rates of paraquat applied in combination with tribufos improved defoliation over that of tribufos alone. Paraquat at 0.07 lb/A did not improve defoliation with thidiazuron at any evaluation period either year.

In 1989, thidiazuron was equal to tribufos alone at 14 and 21 DAT but not at 7 DAT. In 1990, thidiazuron was better than tribufos at 7 and 14 DAT and the same at 21 DAT. In 1989 and 1990, addition of paraquat to tribufos treatments improved defoliation to levels equal to or better than thidiazuron alone. Improvements in defoliation with tribufos applied in combination with paraquat were probably a result of improved regrowth removal with the use of paraquat. Tribufos, a fair regrowth removal defoliant, would benefit from the use of paraquat, whereas thidiazuron would not. Thidiazuron is a superior regrowth inhibitor and better than tribufos at removing existing regrowth (5).

Georgia

None of the tribufos sequentials provided greater than 60% defoliation 7 DAT in 1990, while all tribufos treatments provided greater than 65% defoliation in 1991 (Table 3). Tribufos followed by ethephon was the only treatment that improved defoliation over tribufos alone in both 1990 and 1991, while paraquat plus sodium chlorate (3 or 6 lb/A) improved

Table 5. Utilization of paraquat plus sodium chlorate for cotton regrowth following foliar application of thidiazuron or tribufos.[a]

		Regrowth at 14 DAT[b]			
		Mississippi			Georgia
Treatment[c]	Rate	1989	1990	1991[c]	1991
	(lb ai/A)	(%)			
Untreated		28 a	45 cde	5 de	0 e
tribufos	1.125	33 a	56 ab	37 a	32 a
tribufos fb paraquat + NIS	1.125 0.07	28 a	56 ab	33 ab	10 c
tribufos fb paraquat + sodium chlorate + NIS	1.125 0.07 3.0	13 bc	48 bcd	13 cd	8 cd
tribufos fb paraquat + sodium chlorate + NIS	1.125 0.07 6.0	18 b	40 de	12 de	9 c
tribufos fb ethephon	1.125 1.5	11 cd	54 ab	23 bc	23 b
thidiazuron	0.1	6 de	48 bcd	7 de	23 b
thidiazuron fb paraquat + NIS	0.1 0.07	6 de	50 bc	5 de	2 de
thidiazuron fb paraquat + sodium chlorate + NIS	0.1 0.07 3.0	4 e	39 e	2 e	0 e
thidiazuron fb paraquat + sodium chlorate + NIS	0.1 0.07 6.0	5 e	20 f	2 e	0 e
thidiazuron fb ethephon	0.1 1.5	1 e	59 a	8 de	4 cde
LSD (0.05)		6	9	11	7

[a]Means within a column followed by the same letter are not different at the 5% level of probability according to Duncan's Multiple Range Test.
[b]fb = followed by; treatments were applied 5 to 7 days after initial treatment. NIS = nonionic surfactant at 0.25% v/v. DAT = days after final treatment.
[c]treatments evaluated at 20 DAT.

Table 6. Influence of paraquat on defoliant activity of tribufos and thidiazuron.[a]

		Defoliation					
		1989			1990		
Treatment[c]	Rate	7	14	21	7	14	21
	(lb ai/A)	(%)					
Untreated	–	6 e	14 d	29 e	25 c	28 d	28 c
tribufos	1.125	55 bc	68 bc	69 d	61 b	64 c	60 b
tribufos + paraquat + NIS	1.125 0.07	61 ab	79 ab	82 ab	75 a	78 ab	71 ab
tribufos + paraquat + NIS	1.125 0.09	68 a	81 a	85 a	75 a	81 a	75 a
tribufos + paraquat + NIS	1.125 0.15	68 a	75 ab	81 abc	75 a	81 a	75 a
thidiazuron	0.125	42 d	62 c	66 d	75 a	76 ab	70 ab
thidiazuron + paraquat + NIS	0.125 0.07	42 d	68 bc	70 cd	65 ab	67 bc	65 ab

[a]Means within a cloumn foloowed by the same letter are not different at the 5% level of probability according to Duncan's Multiple Range Test.
[b]NIS = nonionic surfactnant at 0.25% v/v.

defoliation over that of tribufos alone in 1990. The ethephon sequential was also better than any of the other sequential applications in 1991, providing 85% defoliation. All sequential applications provided improved defoliation 7 DAT when compared to thidiazuron alone in 1990, while only thidiazuron followed by paraquat only or by ethephon improved defoliation in 1991.

Only tribufos followed by paraquat + sodium chlorate (6 lb/A) improved defoliation 14 DAT over tribufos alone in 1990 (Table 4). However, none of the tribufos combinations had higher than 35% defoliation in 1990. This is possibly because no rainfall occurred during September and through the first of October of that year (Table 1). Therefore, at the time of application, cotton plants were under stress, which resulted in lower defoliation. In 1991, all tribufos sequentials 14 DAT had 70% or better defoliation. Tribufos followed by paraquat + sodium chlorate (6 lb ai/A) or followed by ethephon increased defoliation when compared to tribufos alone. These treatments provided 84 and 89% defoliation, respectively.

All sequential applications improved defoliation 14 DAT when compared to thidiazuron alone in both 1990 and 1991. There were no differences between thidiazuron followed by paraquat + sodium chlorate (3 or 6 lb/A) or followed by ethephon in 1990 each of which were better than paraquat alone. In 1991, thidiazuron followed by ethephon or paraquat + sodium chlorate (6 lb/A) provided greater than 80% defoliation. Paraquat or paraquat + sodium chlorate (3 lb/A) provided similar results.

Percent regrowth was evaluated only in 1991 at the Georgia location (Table 5). Only tribufos followed by paraquat or followed by paraquat + sodium chlorate (3 or 6 lb ai/A) and any thidiazuron sequential application had 10% or less regrowth 14 DAT. Regrowth was lower with thidiazuron alone when compared to tribufos alone. Tribufos followed by ethephon reduced regrowth when compared to tribufos alone but was not better than thidiazuron alone. Except for ethephon, all sequential treatments reduced regrowth following tribufos to levels generally considered commercially acceptable. However, the paraquat plus sodium chlorate sequential following thidiazuron was superior to the same treatments following tribufos.

Conclusions

Tribufos or thidiazuron followed by paraquat plus sodium chlorate were better than either product alone in 3 of 5 year-locations. At 7 DAT, an average of 15% defoliation was gained following tribufos and 22% following thidiazuron. At 14 DAT, an average improvement in defoliation of 14 and 26% occurred from tribufos and thidiazuron, respectively. The sequential application of paraquat plus sodium chlorate at 6.0 lb/A was an acceptable alternative for tribufos but seemed more suited to thidiazuron. When the rate of sodium chlorate was reduced to 3.0 lb/A inconsistency resulted. It is important to harvest in a timely fashion to prevent excess decay of cotton stems following these types of treatments.

When paraquat was applied in combination with tribufos, defoliation was improved depending upon the rate of paraquat used. Paraquat at 0.09 lb/A provided the most consistent results. Paraquat at 0.07 lb/A improved defoliation but on a less consistent basis. Higher rates did not improve defoliation further and have the potential to increase desiccation.

Generally, rates of 0.07 or 0.09 lb/A of paraquat applied in combination with tribufos at 1.125 lb/A were better than tribufos alone. However, paraquat at 0.07 lb/A applied in combination with thidiazuron did not improve defoliation over thidiazuron alone.

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