

STAPLE PERFORMANCE IN COTTON WEED CONTROL PROGRAMS

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Abstract

Tests were established across the cotton belt in 1994 and 1995 to evaluate the performance of Staple (pyrithiobac sodium) herbicide in various weed control programs. The weed control programs that included Staple would be compared against the standard programs from a given area for weed efficacy and yield results.

In these programs Staple was applied alone or in sequential applications at rates that ranged from 0.5 - 1.5 ozai/A. The method of application was either preemergence, early postemergence or preemergence followed by early postemergence. One program may contain Staple preemergence plus Cotoran (*fluometuron*) followed by Staple at early postemergence; another may have Staple applied at either early postemergence only or both early postemergence and mid - late postemergence.

There was minimal crop injury recorded from any of the application methods or programs among the various tests. In the California study, the early visual crop injury (leaf yellowing, leaf crinkling) ranged from 24-28% at 7 DAT but was not evident at the 28 DAT observation. The early season leaf injury did not have any negative impact at harvest as yields in the Staple programs were equal to that of the hand-weeded check.

Weed control results across the various Staple programs, including the Staple programs with reduced herbicide inputs, were comparable to the standard or full herbicide input programs in most of these tests. In several of the southeast tests where Staple was used in a reduced herbicide input program and where sicklepod (*Cassia obtusifolia*) was the main weed problem, control was not as effective as in the standard programs. However, the slight reduction in control of this weed did not have an adverse impact on yields. The trend in most of these studies appears to be that herbicide inputs can be reduced when Staple is included as a part of the total weed control program.

These tests further demonstrated the flexibility, efficacy and safety of Staple when it is incorporated into the various weed control programs in use across the cotton belt.

Introduction

In 1994 and 1995 herbicide programs studies were established across the belt to evaluate the performance of Staple herbicide in various weed control programs in cotton. These studies were designed to evaluate Staple's performance in various weed control programs versus the local standard programs in use across the different geographic regions of the cotton belt.

Methods

For both years of these studies all the tests were conducted by university researchers. The local knowledge of each investigator was incorporated in the design of the standard herbicide programs as well as the Staple programs used for comparison. Each test contained a minimum of four replications for each program or set of herbicide treatments. Weed control and yield evaluations were taken at all test sites. The data in the specific tables represents the pooled means of the various programs from a given test region. Fiber quality analyses were taken from several locations and this data has also been included.

Results And Discussion

In the southeast region, represented by NC and SC, seven tests were conducted over the two year period 1994 and 1995. The primary weeds evaluated in these tests were palmer pigweed (*Amaranthus palmeri*), smooth pigweed (*Amaranthus hybridus*), sicklepod (*Cassia obtusifolia*) and lambsquarter (*Chenopodium album*). Program #3, the Treflan (*trifluralin*) standard, provided excellent overall weed control results in these studies but similar results could be seen in program #4, one of the reduced herbicide input programs that included Staple (Table 1).

Program #2, the Command (*clomazone*) plus Cotoran (*fluometuron*) standard, was weaker on palmer pigweed but better on sicklepod than Program #7, the reduced herbicide input comparison program, that only had a single early postemergence application of Staple. Programs #8 and #9, included Treflan (*trifluralin*) preplant incorporated followed by a reduced rate of Staple plus Cotoran applied preemergence followed by a single early postemergence application of Staple. These programs were very effective on 3 of the 4 weed species evaluated but without the follow-up Bladex (*cyanazine*) plus MSMA (*monosodium methanearsonate*) treatment these programs were a little less effective on sicklepod (Table 1). However, this slight reduction in sicklepod control did not have a negative impact on the yield results.

When comparing the yield results across the various programs in these studies, the Staple reduced herbicide input programs shown in programs # 7, #8 and #9 provided equivalent results as the full standard herbicide input programs in these tests (Table 2). In programs # 8 and 9,

Staple applied at a reduced rate preemergence plus Cotoran followed by a single early postemergence application of Staple provided the highest numerical yield values in these studies at 2480 and 2483 lbs of seed cotton per acre, respectively (Table 2). Program # 7, which included Command plus Cotoran preemergence followed by a single early postemergence application of Staple provided a yield of 2470 lbs of seed cotton per acre.

For the midsouth area, in this case two tests each from AR, LA, and TN, the two standard herbicide programs (#2 and #3) provided equivalent weed control results as compared to the Staple programs which are programs #4, #5 and #6 (Table 3). The primary weeds in these studies were cocklebur (*Xanthium strumarium*), smooth pigweed (*Amaranthus hybridus*), pitted morningglory (*Ipomoea lacunosa*), entireleaf morningglory (*Ipomoea hederacea*), and prickly sida (*Sida spinosa*). In these studies, program #5 that had no preemergence herbicide treatment and only Staple applied early postemergence, provided weed control results equal to that seen in the standard programs or the other Staple programs that included a preemergence treatment.

In the harvest data from these studies, there were basically no differences in the yield results across all the weed control programs. All were as good as or better numerically than the hand-weeded check. Program #5, Treflan followed by a total postemergence program that included Staple as an early postemergence treatment, provided equivalent weed control and yield results as all the other programs in these studies (Table 4).

Fiber quality parameters were analyzed in the two TN studies. The results for micronaire, fiber length, fiber strength and uniformity index were very similar across the different herbicide programs in these studies. Each of the herbicide programs provided fiber quality results that were comparable to the hand-weeded check (Table 5).

In the east Texas studies, where palmer pigweed (*Amaranthus palmeri*), velvetleaf (*Abutilon theophrasti*), smelldelon (*Cucumis melo*), and cotton morningglory (*Ipomoea trichocarpa*) were the primary weeds evaluated, the herbicide programs that included Staple, programs #4 - #7, provided the best overall weed control results (Table 6). However, in program #5 where only half rates of Staple were applied preemergence and again early postemergence, the efficacy on smelldelon and cotton morningglory was reduced as compared to program #7 (Table 6) that included a late postemergence application of Bladex (*cyanazine*) plus MSMA (*monosodium methanearsonate*).

With respect to crop yields in the east Texas studies, the herbicide programs that included Staple, even the reduced rate programs #5 and #7, were yielding as well as programs #2 and #3, the standard programs in these studies (Table 7). Program #7 that included reduced rates of Staple applied

preemergence and again early postemergence followed by Bladex plus MSMA late postemergence provided the highest numerical yield value in these studies.

Injury ratings taken at 20 days after the early postemergence treatments show no visual injury symptoms to the cotton from any of the herbicide programs in these studies.

In the west Texas studies, palmer pigweed (*Amaranthus palmeri*) and devils claw (*Probooscidea louisianica*) were the primary weed problems that were evaluated in these tests. The weed control programs that included Staple did provide improved control of devils claw over the standard herbicide programs tested (Table 8). In these studies, Program #4, a reduced herbicide application program which consisted of Treflan (trifluralin) applied PPI followed by Staple applied early postemergence, provided excellent control of both weeds.

Hand-weeding was used to clean up all the test plots in these studies. This data has been extrapolated to an acre basis and the results are shown in Table 9. The programs that included Staple required less hand-weeding costs to remove any weed escapes or later germinating weeds.

Yield results were numerically better in the Staple programs, #4 - #7, as compared to either the standard programs (#2 and #3) or the hand-weeded check in these tests (Table 9).

The primary weeds evaluated in the California studies were black nightshade (*Solanum nigrum*), redroot pigweed (*Amaranthus retroflexus*), shepherdspurse (*Capsella bursa-pastoris*), and puncturevine (*Tribulus terrestris*). At 28 days after the early postemergence application treatments, the Treflan (*trifluralin*) plus Caparol (*prometryn*) PPI treatments in the standard herbicide programs were not controlling black nightshade (Table 10). Both the 1.2 and the 1.8 ounce per acre rates of Staple applied early postemergence were providing good control of black nightshade at 28 DAT. In programs #5 - #8 the early postemergence applications of Staple were providing visual crop injury ratings that ranged from 24% - 28% at 7 days after treatment. Three weeks later, at 28 days after the early postemergence application, no injury symptoms were visible from any of the Staple treatments (Table 10).

As in the west Texas studies, hand-weeding was also performed across all the herbicide programs in these California tests. The lack of early season control of black nightshade in the standard herbicide programs, #2 - #4, did greatly increase the overall weed control costs versus the Staple programs, #5 - #8, which did provide good early season control of this weed (Table 11). The hand-weeding costs associated with the standard programs averaged \$42 per acre more than the weed control programs that included Staple.

As can be seen from the yields of the weed control programs that included Staple, the early season crop injury did not negatively impact crop yields (Table 12). Both program #7 which had sequential applications of 1.2 ounces of Staple applied at early and mid postemergence timings and program #8 with a single application of 1.8 ounces of Staple applied early postemergence provided lint yield values equivalent to the hand-weeded check.

Results for micronaire, fiber elongation, fiber length and fiber strength over the two test years again show no appreciable fiber quality differences between the Staple programs and either the standard programs or the hand-weeded check (Table 13).

In summary, tests from across the belt have proven that Staple can provide an excellent foundation from which to build safe and effective weed control programs in cotton. It's flexibility and broad spectrum weed control activity will allow total herbicide inputs to be reduced in most situations. In these studies, weed control programs that included Staple did not reduce yields or the quality of the fiber being produced.

Tables

Table 1. Southeast weed control results from Staple herbicide programs tests in 1994 and 1995.

HERBICIDE PROGRAMS	RATE (oz/ A)	PPW	SPW	SK P	LQ
1. Handweed Check		99	84	100	40
2. Comd+Cot//Cot+MSMA//Bldx+MSMA	24+48/32+32/26+32	82	100	96	100
3. Tref//Cot+Zor//Cot+MSMA//Bldx+MSMA	24/48+20/32+32/26+32	98	99	95	100
4. Tref//Cot/Staple//Bldx+MSMA	24/48/1.2/26+32	97	100	97	100
5. Tref//Cot+Staple//Staple//Bldx+MSMA	24/32+.6/1.2/26+32	98	100	88	100
6. Tref//Cot+Zor//Staple//Bldx+MSMA	24/32+20/1.2/26+32	99	100	94	100
7. Comd+Cot//Staple	24+32/1.2	95	100	83	100
8. Tref//Cot+Staple//Staple	24/32+.6/1.2	98	100	74	100
9. Tref//Cot+Staple//Staple	24/48+.6/1.2	98	100	82	100

PPW Palmer Pigweed SKP Sicklepod SM Smooth Pigweed LQ Lambsquarter

Table 2. Average of Southeast yield results from Staple herbicide programs tests in 1994 and 1995.

HERBICIDE PROGRAMS	RATE (oz/ A)	Lbs Seed Cotton / A
1. Handweed Check		2154
2. Comd+Cot//Cot+MSMA//Bldx+MSMA	24+48/32+32/26+32	2257
3. Tref//Cot+Zor//Cot+MSMA//Bldx+MSMA	24/48+20/32+32/26+32	2408
4. Tref//Cot/Staple//Bldx+MSMA	24/48/1.2/26+32	2383
5. Tref//Cot+Staple//Staple//Bldx+MSMA	24/32+.6/1.2/26+32	2413
6. Tref//Cot+Zor//Staple//Bldx+MSMA	24/32+20/1.2/26+32	2424
7. Comd+Cot//Staple	24+32/1.2	2470
8. Tref//Cot+Staple//Staple	24/32+.6/1.2	2480
9. Tref//Cot+Staple//Staple	24/48+.6/1.2	2483

Table 3. Midsouth weed control results from Staple herbicide programs tests in 1994 and 1995.

HERBICIDE PROGRAMS	RATE (oz/ A)	C B	S P W	P M G	E M G	P S
1. Handweed Check		99	99	99	96	99
2. Comd+Cot//Cot+MSMA//Bldx+MSMA//Bldx	38+32/26+32/26+32/32	97	93	96	99	98
3. Tref//Cot+Zor//Cot+MSMA//Bldx+MSMA//Bldx	32/38+15/26+32/26+32/32	92	99	95	99	93
4. Tref//Cot+Zor/Staple//Bldx+MSMA//Bldx	32/38+15/1.2/26+32/32	91	99	97	99	93
5. Tref//Staple//Bldx+MSMA//Bldx	32/1.2/26+32/32	93	97	88	99	96
6. Tref//Cot//Staple//Bldx+MSMA//Bldx	32/38/1.2/26+32/32	94	99	94	99	95

CB Cocklebur SPW Smooth Pigweed PMG Pitted MG
EMG Entireleaf MG PS Prickly sida

Table 4. Midsouth yield results from Staple herbicide programs tests in 1994 and 1995.

HERBICIDE PROGRAMS	RATE (oz/ A)	Lbs Seed Cotton / A
1. Handweed Check		2829
2. Comd+Cot//Cot+MSMA//Bldx+MSMA//Bldx	38+32/26+32/26+32/32	2948
3. Tref//Cot+Zor//Cot+MSMA//Bldx+MSMA//Bldx	32/38+15/26+32/26+32/32	2829
4. Tref//Cot+Zor/Staple//Bldx+MSMA//Bldx	32/38+15/1.2/26+32/32	2897
5. Tref//Staple//Bldx+MSMA//Bldx	32/1.2/26+32/32	2902
6. Tref//Cot//Staple//Bldx+MSMA//Bldx	32/38/1.2/26+32/32	2961

Table 5. Midsouth (TN) fiber quality results from Staple herbicide programs tests in 1994 and 1995.

HERBICIDE PROGRAMS	RATE (oz/ A)	Mic.	Lgth	Stgth	Unif. Index
1. Handweed Check		4.2	1.12	29.4	81
2. Comd+Cot//Cot+MSMA//Bldx+MSMA//Bldx	38+32/26+32/26+32/32	4.3	1.11	28.6	81
3. Tref//Cot+Zor//Cot+MSMA//Bldx+MSMA//Bldx	32/38+15/26+32/26+32/32	4.1	1.11	29.2	81
4. Tref//Cot+Zor//Staple//Bldx+MSMA//Bldx	32/38+15/1.2/26+32/32	4.0	1.12	28.7	83
5. Tref//Staple//Bldx+MSMA//Bldx	32/1.2/26+32/32	4.0	1.11	29.5	82
6. Tref//Cot//Staple//Bldx+MSMA//Bldx	32/38/1.2/26+32/32	4.1	1.12	27.9	81

Table 6. East Texas weed control results from Staple herbicide programs tests in 1994 and 1995.

HERBICIDE PROGRAMS	RATE (oz/ A)	PP	VL	SM	CMG
1. Handweed Check		96	100	75	85
2. Tref//Cap//Cot+MSMA//Bldx+MSMA//Bldx+MSMA	19/26/26+43/26+43/26+43	94	60	90	91
3. Tref//Cap//Cot+MSMA//Bldx+MSMA	19/26/26+43/26+43	94	55	81	84
4. Tref//Staple//Staple//Bldx+MSMA	10/.6/1.2/26+43	94	80	92	94
5. Tref//Staple//Staple	19/.6/.6	98	80	76	84
6. Tref//Cap//Staple//Cot//Bldx+MSMA	19/26/1.2/16/26+43	95	85	92	94
7. Tref//Staple//Staple//Bldx+MSMA	19/.6/.6/26+43	96	80	92	94

PP Palmer Pigweed VL Velvetleaf SM Smellmelon
CMG Cotton MG

Table 7. East Texas yield and crop injury results from Staple herbicide programs tests in 1994 and 1995.

HERBICIDE PROGRAMS	RATE (oz/ A)	Yield Lbs Seed Cotton / A	Crop Injury 20 DAT EP
1. Handweed Check		1125	0
2. Tref//Cap//Cot+MSMA//Bldx+MSMA//Bldx+MSMA	19/26/26+43/26+43/26+43	1090	0
3. Tref//Cap//Cot+MSMA//Bldx+MSMA	19/26/26+43/26+43	1165	0
4. Tref//Staple//Staple//Bldx+MSMA	10/.6/1.2/26+43	1154	0
5. Tref//Staple//Staple	19/.6/.6	1175	0
6. Tref//Cap//Staple//Cot//Bldx+MSMA	19/26/1.2/16/26+43	1200	0
7. Tref//Staple//Staple//Bldx+MSMA	19/.6/.6/26+43	1349	0

Table 8. West Texas weed control results from Staple herbicide programs tests in 1994 and 1995.

HERBICIDE PROGRAMS	RATE (oz/ A)	Palmer Pigweed	Devil's Claw
1. Handweed Check		100	0
2. Tref//Karmex//MSMA	24/20/21	100	78
3. Tref//Caparol//MSMA	24/38/21	99	68
4. Tref//Staple	24/1.2	100	94
5. Tref//Karmex//Staple	24/15/.88	100	96
6. Tref//Karmex//Staple	24/20/1.2	100	100
7. Tref//Caparol//Staple	24/38/1.2	100	98

Table 9. West Texas yield and hand-weed costs from Staple herbicide programs tests in 1994 and 1995.

HERBICIDE PROGRAMS	RATE (oz/ A)	Yield (LB Seed Cotton/A)	Hand weed (HR/A)	Labor Cost (\$/A)
1. Handweed Check		501	3.5	14.88
2. Tref//Karmex//MSMA	24/20/21	486	3.0	12.54
3. Tref//Caparol//MSMA	24/38/21	501	2.0	8.50
4. Tref//Staple	24/1.2	513	2.8	11.90
5. Tref//Karmex//Staple	24/15/.88	570	.85	3.62
6. Tref//Karmex//Staple	24/20/1.2	581	1.1	4.78
7. Tref//Caparol//Staple	24/38/1.2	596	1.4	6.12

Table 10a. California weed control results from Staple herbicide programs tests in 1994 and 1995.

HERBICIDE PROGRAMS	RATE (oz/ A)	BNS	RPW	SHP
1. Handweed Check				
2. Tref//Caparol//Bladex	24/45/38	0	68	100
3. Tref//Caparol//Caparol	24/45/51	0	90	100
4. Tref//Caparol//Goal	24/45/12	0	90	100
5. Tref//Staple//Goal	24/1.8/12	80	70	100
6. Tref//Staple//Caparol	24/1.8/51	90	87	100
7. Tref//Staple//Staple//Bladex	24/1.2/1.2/38	85	90	100
8. Tref//Staple//Bladex	24/1.2/38	80	73	100

BNS Black nightshade RPW Redroot pigweed SHP Shepherdspurse

Table 10b. California weed control and crop injury results from Staple herbicide programs tests in 1994 and 1995.

HERBICIDE PROGRAMS	RATE (oz/ A)	PV	Crop 7 DAT	Injury 28 DAT
1. Handweed Check				
2. Tref//Caparol//Bladex	24/45/38	100	0	11
3. Tref//Caparol//Caparol	24/45/51	100	0	11
4. Tref//Caparol//Goal	24/45/12	100	0	12
5. Tref//Staple//Goal	24/1.8/12	100	27	0
6. Tref//Staple//Caparol	24/1.8/51	100	24	0
7. Tref//Staple//Staple//Bladex	24/1.2/1.2/38	100	28	0
8. Tref//Staple//Bladex	24/1.8/38	100	29	0
	PV	Puncturevine		

Table 11. California handweed costs from Staple herbicide programs tests in 1994 and 1995.

HERBICIDE PROGRAMS	RATE (oz/ A)	Handwee d (min/plot)	Labor Cost (\$/A)
1. Handweed Check		5.4	74.90
2. Tref//Caparol//Bladex	24/45/38	4.3	54.54
3. Tref//Caparol//Caparol	24/45/51	4.1	50.87
4. Tref//Caparol//Goal	24/45/12	5.0	67.67
5. Tref//Staple//Goal	24/1.8/12	1.0	9.34
6. Tref//Staple//Caparol	24/1.8/51	1.4	13.07
7. Tref//Staple//Staple//Bladex	24/1.2/1.2/38	1.9	17.74
8. Tref//Staple//Bladex	24/1.8/38	2.5	23.24

Table 12. California yield results from Staple herbicide programs tests in 1994 and 1995.

HERBICIDE PROGRAMS	RATE (oz/ A)	Seed Cotton (Lbs/A)	Lint (Lbs/A)	% Lint
1. Handweed Check		2940	1025	35
2. Tref//Caparol//Bladex	24/45/38	2580	907	35
3. Tref//Caparol//Caparol	24/45/51	2675	943	35
4. Tref//Caparol//Goal	24/45/12	2629	925	35
5. Tref//Staple//Goal	24/1.8/12	2641	938	36
6. Tref//Staple//Caparol	24/1.8/51	2734	974	36
7. Tref//Staple//Staple//Bladex	24/1.2/1.2/38	2826	1000	35
8. Tref//Staple//Bladex	24/1.8/38	2894	1022	35

Table 13. California fiber quality results from Staple herbicide programs tests in 1994 and 1995.

HERBICIDE PROGRAMS	RATE (oz/ A)	Mic.	Elonga- tion (94 only)	Length	Strength
1. Handweed Check		4.0	5.8	1.16	35.2
2. Tref//Caparol//Bladex	24/45/38	4.0	5.7	1.18	33.8
3. Tref//Caparol//Caparol	24/45/51	4.1	5.6	1.16	34.2
4. Tref//Caparol//Goal	24/45/12	4.0	5.8	1.17	34.0
5. Tref//Staple//Goal	24/1.8/12	4.1	5.9	1.16	33.2
6. Tref//Staple//Caparol	24/1.8/51	4.1	5.8	1.17	33.4
7. Tref//Staple//Staple// Bladex	24/1.2/1.2 /38	4.0	5.9	1.16	33.4
8. Tref//Staple//Bladex	24/1.8/38	4.1	6.0	1.17	34.0