

**A BELTWIDE OVERVIEW OF “STAPLE”
PERFORMANCE IN COTTON
WEED CONTROL PROGRAMS
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Abstract

DuPont’s initial field tests with “Staple” (*pyrithiobac sodium*) Herbicide occurred in 1990. After several years of extensive independent studies with Staple, a series of program tests were initiated in cooperation with several universities across the belt. Researchers were to evaluate Staple’s performance as part of a grower’s weed control program. The weed control programs that included Staple would be compared to the standard program for a particular area. In these tests, Staple was applied as an early postemergence treatment at rates of 1-1.5 oz ai/A. Results from the southeast and mid-south provided comparable weed control across the various programs tested. Cotton yields were numerically better on average when Staple was included in the weed control program for these two areas. In the West Texas studies, Staple added considerably more to the control of the problem weed, devil’s claw (*proboscidea louisianica*) and yield results were consistently improved with the Staple programs. Yield results from the California and Arizona studies were improved with the Staple programs compared to the current standard programs. A reduction in the amount of time required to hand-hoe weed escapes was seen in the West Texas, California and Arizona tests. Staple applied early postemergence to cotton and weeds has proven to be a safe and effective part of weed control programs across the cotton belt.

Introduction

DuPont first began testing Staple Herbicide, also known as DPX-PE350 or KIH-2031, in 1990. Since that time over 1300 field tests have been entered into DuPont’s data storage and retrieval system. Field tests with Staple have been conducted in all cotton producing states except Kansas.

Materials and Methods

Several studies were initiated in 1994 and 1995 in cooperation with university researchers across the cotton belt to evaluate weed control programs that would include an over-the-top application of Staple Herbicide. The various programs that included Staple were compared to standard herbicide programs currently being used in a particular area. Staple treatments were applied at the early

postemergence timing of application to cotton and weeds. In most cases, all broadleaf herbicides tested were applied on a band and cultivation was used to control weeds in the row middles.

Results and Discussion

In 1994 two herbicide program tests were established in North Carolina and South Carolina. Overall, the weed control results were good to excellent across all herbicide programs. Of the studies that included Staple early post, Programs #1 and #2, a three step program, provided equivalent weed control as Program #5, the higher performing standard program in this test.

In these tests, Program #3, with only two applications, was less effective on sicklepod (*Cassia obtusifolia*) than the other programs and Program #4, the non-trifluralin standard, was the least effective on palmer amaranth (*Amaranthus palmeri*) (Table 1).

Any crop response to the herbicide programs was minor and ranged from 0-7 % across all programs tested.

All the herbicide programs in these tests out-yielded the hand weeded check except Program #4. All of the weed control programs that included Staple provided cotton yields equivalent to Program #5. In the programs that included Staple, the reduced number of applications in Programs #2 and #3 provided comparable yield results to the full standard program, Program #5, which included treatments of Treflan PPI, Cotoran + Zorial PRE, Cotoran + MSMA Early Post-Directed and a Layby application of Bladex + MSMA (Table 2).

Similar herbicide program studies were also conducted in the midsouth cotton area during 1994 and 1995. Prominent weed pests in these tests were palmer amaranth, pitted, entire and ivyleaf morningglories (*Ipomoea lacunosa*, *Ipomoea hederacea*), prickly sida (*Sida spinosa*) and hemp sesbania (*Sesbania exaltata*). There were two or more evaluation data points for each of these weeds in these studies.

Good to excellent control of these weeds was obtained by all of the herbicide programs in this test.

Any crop response was minor across all programs. Early season visual ratings at 10-20 days after the early postemergence (over-the-top) or the early post-directed applications ranged from 2-9% in 1994 and from 0-6% in 1995.

Only 3 of the 4 tests were yielded in 1994. All five programs out yielded the hand weeded check. In these studies, Program #1 or Treflan PPI, followed by Cotoran PRE, followed by Staple Early Post at 1.2 ounces product per acre, followed by Bladex + MSMA Mid Post and a

Layby of Bladex plus Crop Oil provided the highest numerical yield at 2431 pounds per acre. The two standard programs tested yielded 2342 and 2352 pounds per acre, respectively.

Only yield data from Arkansas and Louisiana was available for both the 1994 and 1995 Midsouth programs tests. In these four studies, conducted over two years, Program #2 consisting of Treflan PPI, followed by Cotoran PRE, followed by Staple Early Post, followed by Bladex + MSMA at Layby provided the highest yield at 2622 pounds of seed cotton per acre. Program #1, also including Staple, was second at 2574 pounds, followed by Program #5, the area standard, at 2538 pounds per acre (Table 3).

The major weed pests in the West Texas herbicide program tests were devil's claw and palmer amaranth. All of the herbicide programs evaluated provided excellent control of palmer amaranth. For devil's claw, the three standard herbicide programs tested only provided 48-78% control while the programs that included Staple early postemergence at 1.2 ounces of product per acre averaged 98-100% control of devil's claw.

Crop response ratings averaged 10% for the standard programs in 1994 versus "0" crop response with the programs that included Staple. No visual crop response was noted in any of the herbicide programs in the 1995 study.

In these studies, all the herbicide programs listed out yielded the hand weeded check. Programs #4 and #5, that included Staple early post over-the-top, provided the highest numerical yields at 596 and 572 pounds per acre, respectively (Table 4).

Hand-hoeing to clean up weed escapes that can slow down harvest and reduce crop value at the gin can be a major additional cost to cotton growers. In these West Texas tests for 1994 and 1995, the herbicide programs that included Staple required the least amount of hand-hoe time to clean up any escaped weeds. The Staple programs needed only an average of 1.4 hours per acre of hoe-time versus an average of 3.5 hours per acre for the standard programs evaluated in these studies.

The 1994 Arizona study provided additional support that herbicide programs that include Staple can significantly reduce the need for follow-up hand-hoeing. The primary weeds evaluated in this study were ivyleaf morningglory and palmer amaranth.

The herbicide programs that included an early postemergence application of Staple required only 0.3 tenths of an hour or just 18 minutes per acre to hand-hoe any escaped weeds. The standard programs evaluated in this study required an average of 3.1 hours per acre of hand-hoeing.

This was a 10 fold reduction in the time spent on hand labor to remove weed escapes. In this study, the total cost savings in reducing hand labor from the addition of Staple was approximately \$16 per acre.

Under the arid growing conditions of the region, Staple was tested primarily as a single early postemergent treatment at 1.8 ounces of product per acre. The herbicide programs in this test that included Staple provided higher numerical yield values than the current standard programs. Program #3, that included Treflan PPI followed by two sequential applications of Staple at 1.2 ounces of product per acre and a Layby treatment of Caparol, provided a significantly higher yield, at 3975 lbs/A, than all of the other programs in this study. Program #5, with Treflan followed by Staple at 1.8 ounces of product per acre followed by Karmex and a layby of Bladex, yielded a close second at 3942 pounds per acre (Table 5).

The herbicide programs study in California was one of the most comprehensive tests of 1994. This test included efficacy, yield, hand-hoe time and fiber quality characteristics information from all the various herbicide programs evaluated.

The primary weeds in this study were redroot pigweed (*Amaranthus retroflexus*), puncturevine (*Tribulus terrestris*) and sheperdspurse (*Capsella bursa-pastoris*). All programs provided excellent control of puncturevine and sheperdspurse but redroot pigweed was a persistent problem for the standard programs in this study.

As in the previous study, Staple was evaluated as an early postemergence application at 1.8 ounces of product per acre except in Program #4. In Program #4 Staple was applied in sequential applications at 1.2 ounces of product per acre following Treflan applied PPI. A Layby application of Bladex followed the two Staple treatments. As in the Arizona study, this herbicide program provided the highest numerical yield of 2455 pounds per acre. In this study, the standard program comparisons yielded an averaged of 648 pounds less per acre (Table 6).

In this study, no further hand weeding was required when Staple was incorporated as a part of the weed control program. The standard herbicide programs required an extra \$16 - \$28 dollars per acre of hand-hoeing costs to clean up the escaped weeds.

Fiber quality tests were conducted on samples taken from each herbicide program plot. The results for each measured parameter (fiber elongation, length, strength and micronaire) were similar across all herbicide programs in this test.

Studies done across the cotton belt have shown Staple to be an effective part of cotton growers' weed control programs. When used as an early postemergence application, it has

provided reliable control of many of the problem weeds found in cotton.

In these studies conducted across the cotton belt, cotton yield, maturity and fiber characteristics have all responded positively from over-the-top applications of Staple.

Staple's efficacy in controlling the key problem weeds can also be seen in the significant reduction in the amount of hand labor needed to remove any weed escapes.

Staple was registered on September 29, 1995. Cotton growers now have the option for effective over-the-top weed control as a part of their herbicide programs.

Acknowledgment

A special thanks to all the university researchers from across the belt for their input and effort in these intensive studies.

Table 5. Yield and hand-hoe time for weed escapes from Arizona programs test - 1994.

Herbicide Program	RATE OZ/PR/A	YIELD LBS SEED COT/A	HNDWD HOURS/A	HNDWD \$/A
Treflan / Staple / Bladex	24 / 1.8 / 38	3773	0.2	\$0.85
Tref / Cap / Staple / Bladex	24 / 45 / 1.8 / 38	3894	0.2	\$0.85
Tref / Staple / Staple / Cap	24 / 1.2 / 1.2 / 45	3975	0.6	\$2.55
Tref / Staple / Blad / Blad	24 / 1.8 / 26 / 38	3857	0.2	\$0.85
Tref / Staple / Karmax / Blad	24 / 1.8 / 13 / 38	3942	0.3	\$1.28
Treflan / Caparal / Bladex	24 / 45 / 38	3191	2.3	\$9.78
Treflan / Caparal / Caparal	24 / 45 / 51	2776	3.4	\$14.45
Tref / Cap / Karmax / Bladex	24 / 45 / 13 / 38	3395	1.6	\$6.80
Treflan / Caparal	24 / 45	2869	5.2	\$22.10
Handweed Check	--	3227	2.1	\$8.93

Table 6. Yield and hand-hoe time for weed escapes from California herbicide programs test - 1994.

Herbicide Program	RATE OZ/PR/A	YIELD LBS SEED COT/A	HNDWD HOURS/A	HNDWD \$/A
Treflan / Staple / Bladex	24 / 1.8 / 38	2217	0	--
Tref / Staple / Caparal	24 / 1.8 / 51	2023	0	--
Tref / Staple / Goal	24 / 1.8 / 120	2324	0	--
Tref / Staple / Staple / Blad	24 / 1.2 / 1.2 / 38	2455	0	--
Caparal + Treflan / Bladex	45 + 24 / 38	1734	3.7	\$20.72
Caparal + Treflan / Caparal	45 + 24 / 53	1898	3.0	\$16.80
Caparal + Treflan / Goal	45 + 24 / 120	1789	5.0	\$28.00
Handweed Check	--	2206	5.8	\$32.48

*Avg. hourly cost in CA @ \$5.60/hour

Table 1. Southeast weed control results from herbicide programs test - 1994

Herbicide Program	RATE OZ/PR/A	POHG	AMAPA	XANST	CASOR	CHEAL
Tref / Cot + Zor /	24 / 32 + 20 /	100	99	95	84	100
Staple / Bladex + MSMA	1.2 / 26 + 32					
Tref / Cot / Staple	24 / 48 / 1.2	100	96	88	94	100
Cot + Com / Staple	32 + 24 / 1.2	98	94	99	67	100
Cot + Com / Cot + MSMA	32 + 24 / 32 + 32	100	75	99	92	96
Bladex + MSMA	26 + 32					
Tref / Cot + Zor /	24 / 32 + 20 /	99	98	100	92	99
Cot + MSMA / Bladex	32 + 32 / 26 +					
+ MSMA	32					

Table 2. Yield and crop response results from southeast herbicide programs tests - 1994.

Herbicide Program	RATE OZ/PR/A	YIELD LBS SEED COT/A	% CROP RESPONSE
Tref / Cot + Zor /	24 / 32 + 20 /	2818	4
Staple / Bladex + MSMA	1.2 / 26 + 32		
Tref / Cot / Staple	24 / 48 / 1.2	2838	4
Cot + Com / Staple	32 + 24 / 1.2	2872	0
Cot + Com / Cot + MSMA	32 + 24 / 32 + 32	2555	7
Bladex + MSMA	26 + 32		
Tref / Cot + Zor /	24 / 32 + 20 /	2889	5
Cot + MSMA / Bladex	32 + 32 / 26 +		
+ MSMA	32		
Handweed Check		2710	--

Table 3. Average yield results for the years 1994-1995 from Midcoast herbicide programs tests.

Herbicide Program	RATE OZ/PR/A	YIELD AVG LBS SEED COT/A (4 Tests)
Tref / Cot / Staple / Bladex +	32 / 38 / 12 / 26 +	2574
MSMA / Bladex	32 / 32	
Tref / Cot / Staple / Bladex + MSMA	32 / 38 / 1.2 / 32 + 32	2622
Com + Cot / Staple /	32 + 38 / 1.2 /	2286
Blad + MSMA / Blad	26 + 32 / 32	
Com + Cot / Cot + MSMA	32 + 38 / 26 + 32	2414
Bladex + MSMA / Bladex	26 + 32 / 32	
Tref / Cot + Zor / Cot + MSMA /	32 / 38 + 15 /	2598
Bladex + MSMA / Bladex	26 + 32 / 26 + 32 / 32	
Handweed Check		2259

Table 4. Average yield and hand-hoe time for weed escapes for West Texas herbicide programs tests, 1994-1995.

Herbicide Program	RATE OZ/PR/A	LBS SEED COT/A	YIELD HDWD HOURS/ A	HDWD \$/A
Treflan / MSMA	24 / 32	448	5.4	\$22.95
Treflan / Caparal / MSMA	24 / 38 / 32	501	2.0	\$8.50
Treflan / Karmax / MSMA	24 / 20 / 32	486	3.0	\$12.75
Treflan / Caparal / Staple	24 / 38 / 1.2	596	1.4	\$5.95
Treflan / Karmax / Staple	24 / 20 / 1.2	572	1.4	\$5.95
Handweed Check		355	5.5	\$23.38