

TWO PASS WEED CONTROL IN MISSOURI COTTON PRODUCTION

R.M. Cobill, J.A. Kendig, B.A. Hinklin, and P.M. Ezell
Delta Research and Extension Center
University of Missouri
Portageville, MO

Abstract

Field studies were conducted to examine the potential of a two pass weed control program in Missouri cotton production. Studies showed that a three way tank mix of glyphosate+S-metolachlor+propazine applied at the cotyledon (COTYL) or over-the-top at the 3-5 leaf stage (OT3-5) combined with preemergence or post-directed herbicide applications provided season long weed control comparable to that from a three pass program.

Introduction

Weed control with conventional cotton varieties commonly requires multiple herbicide applications incorporating several different herbicides for broad spectrum control. Additional passes for cultivation may also be necessary for season long weed control. Roundup Ready cotton cultivars provide for the use of glyphosate in-season. The ability to use glyphosate as part of an in-season herbicide program reduces the number of herbicides necessary for broad spectrum control, however, multiple passes are still necessary to obtain season long weed control.

Incorporation of residual herbicides into a herbicide program with glyphosate may provide season long weed control in two passes. Previous research has indicated that a tank mix of glyphosate, S-metolachlor and propazine might provide broad spectrum, residual control of common cotton weed species. The objectives of this research are: 1) to determine the best herbicide tank mix combination(s) with glyphosate for a two pass program, specifically examining the use of S-metolachlor and propazine; 2) to determine the best application timings for adequate control, 3) to examine post-directed herbicide options for a two pass program.

Experimental Approach

Field studies were conducted in 2000, 2001 and 2002 at Portageville and Clarkton, MO on a Tiptonville fine sandy loam and Boskett sandy loam soils respectively. Control of large crabgrass (*Digitaria sanguinalis*) and goosegrass (*Eleusine indica*), collectively illustrated as annual grasses, Palmer amaranth (*Amaranthus palmerii*), common cocklebur (*Xanthium strumarium*) ivyleaf and entireleaf morningglory (*Ipomoea hederacea* and *hederacea* var. *integriscula*), and puncturevine (*Tribulus terrestris*) were evaluated.

Preliminary field studies were conducted in 2000 and 2001 to examine the feasibility of a two pass weed control program in Roundup Ready cotton and to evaluate glyphosate tank mixtures with S-metolachlor and propazine. These studies examined two way combinations of preemergence(PRE), cotyledon(COTYL), over-the-top applications at the 3-5 leaf stage(OT 3-5) and post-directed layby(LAYBY) applications. The use of glyphosate with and without residual herbicides was also examined. Preemergence applications included 1.0 lb ai/A pendimethalin (Prowl) + 1.25 lb ai/A fluometuron (Cotoran). Treatments applied at the COTYL and OT 3-5 included 0.75 lb ai/A glyphosate alone, 0.75 lb ai/A glyphosate + 1.0 lb ai/A S-metolachlor (Dual II Magnum), 0.75 lb ai/A glyphosate + 1 lb ai/A propazine (Milo Pro), and 0.75 lb ai/A glyphosate + 1.0 lb ai/A S-metolachlor + 1 lb ai/A propazine. Post-directed applications consisted of 0.375 lb ai/A fomesafen (Reflex) + 2.0 lb ai/A MSMA at LAYBY. Standard three pass herbicide programs were included for comparison. Three pass treatments included 1.0 lb ai/A pendimethalin + 1.25 lb ai/A fluometuron PRE followed by (fb) 1.0 lb ai/A fluometuron + 2.0 lb ai/A MSMA DIR 3-5 fb 0.375 lb ai/A fomesafen + 2.0 lb ai/A MSMA LAYBY and 1.0 lb ai/A pendimethalin + 1.25 lb ai/A fluometuron PRE fb 0.0625 lb ai/A pyriithiobac (Staple) OT 3-5 fb 0.375 lb ai/A fomesafen + 2.0 lb ai/A MSMA LAYBY.

Research was continued in 2002 with treatments based on results of the preliminary studies. These studies continued to examine application timings but also evaluated post-directed options. The rates of fluometuron, pendimethalin, glyphosate, S-metolachlor, propazine and MSMA were the same as in initial studies. Post-directed treatments were 1.0 lb ai/A fluometuron + MSMA or 0.25 lb ai/A fomesafen + MSMA. Standard three pass herbicide programs were 0.75 lb ai/A glyphosate alone at COTYL and OT 3-5 fb fluometuron or fomesafen + MSMA DIR 8-10, 1.25 lb ai/A fluometuron + 1.0 lb ai/A pendimethalin PRE fb 0.75 lb ai/A glyphosate OT 3-5 fb 1.0 lb ai/A fluometuron or 0.25 lb ai/A fomesafen + 2.0 lb ai/A MSMA DIR 8-10, and 1.25 lb ai/A fluometuron + 1.0 lb ai/A pendimethalin PRE fb 0.75 lb ai/A glyphosate + 1.0 lb ai/A S-metolachlor OT 3-5 fb 0.25 lb ai/A fomesafen + 2.0 lb ai/A MSMA DIR 8-10.

Standard weed science methodology was used. Herbicide applications were made with a compressed CO₂ backpack or a tractor mounted compressed CO₂ post-direct sprayer. Application volume was 20 GPA. Studies were arranged in a randomized complete block with four replications.

Results and Discussion

Preliminary studies showed that the best two pass treatments tended to be those incorporating a three way mix of glyphosate + S-metolachlor + propazine postemergence and these treatments were comparable to the standard three pass treatment (Table 1). Treatments incorporating postemergence glyphosate alone generally exhibited the poorest control.

Annual grass control was similar across two pass treatments, ranging from 90 to 94%, and was similar to three pass treatments, 91 to 95%. Common cocklebur control ranged from 86 to 95% with two pass treatments and 89 to 95% with three pass treatments. Palmer amaranth control with the two pass treatments ranged from 85 to 92% and 89 to 92% with three pass treatments. Seed cotton yield ranged from 2230 to 2974 lbs/A with the two pass treatments and 2230 to 3450 with three pass treatments.

Summary

Overall weed control in 2002 with two pass treatments ranged from 85 to 95% across weed species (Table 2). The control exhibited by this system was comparable to control achieved by three pass comparisons, 86 to 95% across weed species. Results were similar with yield. Post-directed use of either fluometuron or fomesafen also provided similar control in post-directed treatments.

Acknowledgment

This research was funded, in part, by the Cotton Incorporated CORE program.

Table 1. Preliminary two pass vs. three pass weed control and yield from Portageville and Clarkton, MO.

Treatment			Weed Control					Yield seed cotton lbs/A
Herbicide	Rate lb ai/A	Timing ¹	Annual grasses	Palmer amaranth	Common cocklebur	Morning- glory	Puncture- vine	
			-----% control-----					
pendimethalin	1	PRE	76	61	33	30	98	924
fluometuron	1.25	PRE						
glyphosate	0.75	OT 3-5						
pendimethalin	1.0	PRE	96	97	81	90	96	1011
fluometuron	1.25	PRE						
glyphosate	0.75	OT 3-5						
propazine	1.0	OT 3-5						
pendimethalin	1.0	PRE	99	98	59	65	99	1176
fluometuron	1.25	PRE						
glyphosate	0.75	OT 3-5						
S-metolachlor	1.0	OT 3-5						
pendimethalin	1.0	PRE	99	98	83	89	98	1133
fluometuron	1.25	PRE						
glyphosate	0.75	OT 3-5						
S-metolachlor	1.0	OT 3-5						
propazine	1.0	OT 3-5						
glyphosate	0.75	COTLY	66	41	76	84	74	836
fomesafen	0.375	LAYBY						
MSMA	2.0	LAYBY						
glyphosate	0.75	COTYL	74	97	85	88	100	758
propazine	1.0	COTYL						
fomesafen	0.375	LAYBY						
MSMA	2.0	LAYBY						
glyphosate	0.75	COTYL	93	86	76	75	85	1133
S-metolachlor	1.0	COTYL						
fomesafen	0.375	LAYBY						
MSMA	2.0	LAYBY						
glyphosate	0.75	COTYL	98	99	63	71	100	1350
S-metolachlor	1.0	COTYL						
propazine	1.0	COTYL						
fomesafen	0.375	LAYBY						
MSMA	2.0	LAYBY						
glyphosate	0.75	OT 3-5	79	77	83	88	99	1011
fomesafen	0.375	LAYBY						
MSMA	2.0	LAYBY						
glyphosate	0.75	OT 3-5	85	95	86	91	100	1176
propazine	1.0	OT 3-5						
fomesafen	0.375	LAYBY						
MSMA	2.0	LAYBY						

Table 1. Preliminary two pass vs. three pass weed control and yield from Portageville and Clarkton, MO. (cont'd)

Treatment			Weed Control					Yield seed cotton lbs/A
Herbicide	Rate lb ai/A	Timing ¹	Annual	Palmer	Common	Morning-	Puncture-	
			grasses	amaranth	cocklebur	glory	vine	% control-----
glyphosate	0.75	OT 3-5	92	66	89	91	100	1150
S-metolachlor	1.0	OT 3-5						
fomesafen	0.375	LAYBY						
MSMA	2.0	LAYBY						
glyphosate	0.75	OT 3-5	96	100	93	100	100	1036
S-metolachlor	1.0	OT 3-5						
propazine	1.0	OT 3-5						
fomesafen	0.375	LAYBY						
MSMA	2.0	LAYBY						
pendimethalin	1.0	PRE	98	94	95	96	100	871
fluometuron	1.25	PRE						
fluometuron	1.0	DIR 3-5						
MSMA	2.0	DIR 3-5						
flomesafen	0.375	LAYBY						
MSMA	2.0	LAYBY						
pendimethalin	1.0	PRE	96	81	88	89	100	1175
fluometuron	1.25	PRE						
pyrithiobac	0.0625	OT 3-5						
fomesafen	0.375	LAYBY						
MSMA	2.0	LAYBY						
glyphosate	0.75	OT 3-5	93	93	95	95	100	1115
glyphosate	0.75	LAYBY						
fluometuron	1.25	PRE	96	85	85	78	100	1377
glyphosate	0.75	OT 3-5						
glyphosate	0.75	LAYBY						
glyphosate	0.75	COTYL	92	90	91	89	100	1228
glyphosate	0.75	OT 3-5						
glyphosate	0.75	LAYBY						
LSD(.05)			16	33	27	21	18	551

1 - Application timings: PRE, preemergence, application following planting; COTYL, application made when cotton is at the cotyledon growth stage, OT 3-5, over-the-top at the 3-5 leaf stage; DIR 3-5, post-directed at the 3-5 leaf stage, LAYBY, post-directed when cotton is 8-12 inches tall.

Table 2. Two pass yield control and yield from Portageville and Clarkton, MO, 2002.

Herbicides	Treatment		Weed Control			Yield seed cotton lbs/A
	Rate	Application timing ¹	Annual grasses	Common cocklebur	Palmer amaranth	
pendimethalin	1.0	PRE	90	86	85	2387
fluometuron	1.0	PRE				
glyphosate	0.75	COTYL				
S-metolachlor	0.96	COTYL				
propazine	1.0	COTYL				
pendimethalin	1.0	PRE	93	90	88	2230
fluometuron	1.0	PRE				
glyphosate	0.75	OT 3-5				
S-metolachlor	0.96	OT3-5				
propazine	1.0	OT3-5				
glyphosate	0.75	COTYL	92	91	91	2736
S-metolachlor	0.96	COTYL				
propazine	1.0	COTYL				
fomesafen	0.25	DIR 8-10				
MSMA	2.0	DIR 8-10				
glyphosate	0.75	OT 3-5	94	95	92	2770
S-metolachlor	0.96	OT 3-5				
propazine	1.0	OT 3-5				
fomesafen	0.25	DIR 8-10				
MSMA	2.0	DIR 8-10				
glyphosate	0.75	COTYL	94	93	90	2974
S-metolachlor	0.96	COTYL				
propazine	1.0	COTYL				
fluometuron	1.0	DIR 8-10				
MSMA	2.0	DIR 8-10				
glyphosate	0.75	OT 3-5	94	94	93	2718
S-metolachlor	0.96	OT 3-5				
propazine	1.0	OT 3-5				
fluometuron	1.0	DIR 8-10				
MSMA	2.0	DIR 8-10				
glyphosate	0.75	COTYL	93	95	91	2230
glyphosate	0.75	OT 3-5				
glyphosate	0.75	DIR 8-10				
glyphosate	0.75	COTYL	91	95	89	2649
glyphosate	0.75	OT 3-5				
fomesafen	0.25	DIR 8-10				
MSMA	2.0	DIR 8-10				
glyphosate	0.75	COTYL	91	94	86	3101
glyphosate	0.75	OT 3-5				
fluometuron	1.0	DIR 8-10				
MSMA	2.0	DIR 8-10				

Table 2. Two pass yield control and yield from Portageville and Clarkton, MO, 2002. (cont'd)

Treatment			Weed Control			Yield
Herbicides	Rate	Application timing ¹	Annual grasses	Common cocklebur	Palmer amaranth	seed cotton lbs/A
pendimethalin	1.0	PRE	94	95	89	2753
fluometuron	1.0	PRE				
glyphosate	0.75	OT 3-5				
fomesafen	0.25	DIR 8-10				
MSMA	2.0	DIR 8-10				
pendimethalin	1.0	PRE	92	95	92	3450
fluometuron	1.0	PRE				
glyphosate	0.75	OT 3-5				
fluometuron	1.0	DIR 8-10				
MSMA	2.0	DIR 8-10				
glyphosate	0.75	COTYL	95	95	92	2457
glyphosate	0.75	OT 3-5				
S-metolachlor	0.96	OT 3-5				
fomesafen	0.25	DIR 8-10				
MSMA	2.0	DIR 8-10				
pendimethalin	1.0	PRE	93	95	92	2579
glyphosate	0.75	OT 3-5				
diuron	1.0	DIR 8-10				
MSMA	2.0	DIR 8-10				
LSD(0.05)			4	3	12	1365

¹ - Application timings: PRE, preemergence, application following planting; COTYL, application made when cotton is at the cotyledon growth stage, OT 3-5, over-the-top at the 3-5 leaf stage; DIR 3-5, post-directed at the 3-5 leaf stage, LAYBY, post-directed when cotton is 8-12 inches tall.