No-Till Cotton: Redvine Control on Clay Soil

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INTRODUCTION

Redvine [*Brunnichia ovata* (Walt.) Shinners] a perennial vining weed that is difficult to control. It is a member of the buckwheat family, distributed in the United States from Florida to Texas and north to Kentucky, Missouri, and Oklahoma (Shaw and Mack, 1991). Redvine is prevalent on low-lymg clay soils and is a common perennial plant in the Mississippi Delta. In a 1984 Mississippi Delta survey, redvine was the most frequentof six perennial weeds, occupyingmore than 1% area in 43% of cotton *(Gossypium hirsutum* L.) and 31% of soybean *(Glycine max* [L.] Merr.) fields (Elmore, 1984). The recent increased interest in reduced tillage can provide an opportunity for increased redvine infestation if it is not controlled (Hurst, 1995). This is especially relevant on the clay soils where redvine has an adaptative advantage. The objective of this experiment was to evaluate the use of herbicides applied alone and in sequential combinations for controlling redvine in no-till cotton.

MATERIALS AND METHODS

Cotton ('DES 119' in 1995, 'SG 125' in 1996) was planted 10 April and replanted 28 April 1995 and 29 April 1996 on a Sharkey clay (7% sand, 26% silt, 73% clay, 1.9% organic matter, 6.5 pH) with a natural population of redvine. In 1995, the 28 April replanting was made on the old row without destroying plants from the original planting. A randomized block design with four replications was used. Individual plots were four rows 40 in. wide by 80 ft. long. All data were obtained from the two center rows and analyzed using Analysis of Variance. Treatment means were separated with Duncan's Multiple Range Test at P=0.05. All herbicide applications were made with a tractor-mounted spray system using 4-row equipment in 10 [all Roundup D-Pak" (glyphosate) applications] or 20 gal total volume/a (all other broadcast applications). Redvine control was evaluated by visual estimates of foliar injury, control estimates (0 = no injury or control, 100 = complete control) and plant stem counts at the soil level (number of plants/40 in. wide by 80 ft long in each plot). Cotton response was measured by stand counts on one row per plot, visual estimates of foliar injury, and mechanical harvest (2-row plot harvester). Insects were controlled according to normal procedures for this area. Granular Terrachlor Super X" with Di-Syston® (14.6 G at 9 lb/a) was used in-furrow at planting because of the Command® (clomazone) treatments requiring Di-Syston for cotton injury safening. The only soil surface disturbance was made about one month before planting with the application of 150 lb N/a as 32% urea/ammonium nitrate solution with knives 1 to 2 in. deep and 10 in. to each side of the drill. Herbicide treatments and application dates for controlling redvine are listed in Table 1.

Herbicides were broadcast applied to the entire area for the control of annual winter and summer weeds. These were Goal 1.6E® (oxyfluorfen) 0.25 lb ai/a on 2 November 1994 and 23 October 1995; Gramoxone Extra" 2.5E (paraquat) 0.94 lb ai/a on 30 March 1995; Cotoran 4L® or 85DF (fluometuron) 1.75 lb ai/a = Zorial 80DF® (norflurazon) 1.6 lb ai/a + Bladex 4L® or Cy-Pro 4L® (cyanazine) 1.2 lb ai/a preemergence at planting on 12 April 1995 and 30 April 1996 (Zorial omitted on spring-applied Command treatments); and Bladex 4L or Cy-Pro 4L 1.0 lb ai/a + Goal 1.6E 0.25 lb ai/a Post-DIR layby on 13 July 1995 and 1 July 1996. A 20-in. wide band of Staple 85SP® (pyrithiobac) at 0.047 and 0.063 lb ai/a was applied over the row on 16 May 1995 and 6 June 1996, respectively. Bladex 4L or Cy-Pro 4L 1.0 lb ai/a + Bueno 6 6E® (MSMA) 1.5 lb ai/a was applied to a 20-in area between the cotton rows on 6 June 1995 and 6 June 1996. Cotton-Pro 4L® (prometryn) 0.5 lb ai/a + Select 2E® (clethodim) 0.094 lb ai/a was applied broadcast Post-DIR 19 June 1995. Hooded sprayer treatments were made with a Red Ball" unit to a 34-in. wide area between rows in 14 gal total volume/a. Induce" surfactant at 1% volume/volume (v/v) was used with Roundup D-Pak and either Latron AG-98®, Activate Plus", X-77®, or Surf Aid" surfactant at 0.5% v/v was used with other applications. No surfactant was added to Banvel alone or Clarity® (dicamba) treatments. No in-season cultivation was used except on the cultivated control which was cultivated on 12 May, 30 May, and 19 June 1995, and 6 May, 7 June, and 18 June 1996 leaving a 12-in undisturbed band centered on the row. The hand weeded control was hoed on 24 May, 8 June, 30 June, and 20 July I995 and on 6 June, 28 June, and 24 July 1996.

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RESULTS AND DISCUSSION

Injury to existing redvine plants was evaluated in early- to mid-season (Table 2). These values represent redvine plant injury resulting from treatments applied the previous fall and/or those applied before at, or soon after planting. Treatments with Roundup or Banvel applied in the fall had the greatest foliar injury ratings the following spring and early summer. With some treatments without follow-up in-season application, values declined in 1995 after early-season.

Redvine plant counts were 28% lower in 1995 and 49% lower in 19% than original counts in 1994 when averaged over all treatments (data not shown). In the weedy check treatment 1 with a high count of 228 redvlne plants, the relative values were an increase of 1% in 1995 followed by a decrease of 36% in 1996 (Table 3). For the weedy check treatment 15 with a lower count of 108 redvine plants, the relative values were similar to the original for both 1995 and 1996. Counting error probably could account for the 1994-1995 difference but the 1995-1996 change was too great for counting error alone when the identical area was counted each year. Continued use of herbicides for annual weed control and the mid-season weather conditions of 1995 (very dry) and 1996 (wet) allowed redvine plants to compete without much hindrance in 1995 (roots are very deep) while in 1996 cotton plants provided more competition. Also redvine population is very unpredictable (Hurst, 1995). Herbicide treatments with low original redvine counts (treatments 2, 6, 7, 10) maintained the original control. Treatments 8, 10, and 11 had low original counts and continued to reduce the redvine population over the two years (Table 3).

Cotton stand was not affected by any treatment either year. The stand ranged from a low of 36,100 plants per acre in 1995 to a high of 49,400 in 1996.

Cotton injury in 1995 was not different for any treatment (Table 4). Minimal foliar symptoms were observed on plants in treatments 8 and 10 after Clarity was applied but were considered to be of no great concern at the time. In 1996, cotton injury symptoms were more severe especially with treatments 8 and 10. A 2.3-in. rain occurred two d after applying Clarity on 17 June. Severe dicamba (from Clarity) injury symptoms were present at the 28 June rating date and was even more severe by 22 July. Injury to cotton from other treatments was the result of redvine competition stunting plants.

The seed cotton yields from this clay soil site are considered to be good with these treatments maintaining a very high level of redvine control. Yields in 1995 were low with Clarity in treatments 8 and 10 in 1995 without much evidence of plant injury when compared with the hand weeded treatment. The 1995 season was virtually without rain after 5 July . In 1996, rainfall was greater than normal in July and August resulting in a drastic yield effect from Clarity applied in-season. Apparently, Clarity was absorbed by the cotton roots. The greater rainfall in 1996 also resulted in greater redvine growth which reduced yield in the weedy check treatment when compared to the hand-weed treatment. When compared with the hand-weeded control, only treatments 4, 8, and 10 produced lower yields in 1995. In 1996, treatments 8 and 10 also were lower in yield than the hand-weed control.

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Table 1. Herbicide treatments and application for controlling redvine in no-till cotton on clay, Delta Research and Extension Center, Stoneville, MS, 1995-96.

Trt. No.	Herbicide[1/]	Rate/a (lb a.i.)	Application Type	Application Date(s) (mo/day/yr)
1.	None	--	--	--
2.	Banvel 4S	2.0	Broadcast	10/4/94, 9/13/95
3.	Banvel 4S(94), SGF (95)	1.0	Broadcast	1014194,9113195
	Banvel SGF	1.0	Broadcast2	1111194,9128195
4.	Command 3ME	1.0	Broadcast	4112195,4130196
	Roundup D-Pak	1.0	Band[3/]	6/21/95, 6/17/96
5.	Command 3ME	1.0	Broadcast	10/4/94, 9/13/95
	Command 3ME	1.0	Broadcast	411 2195,4130196
6.	Roundup D-Pak	2.0	Broadcast	10/4/94, 9/13/95
	Roundup D-Pak	1.0	Band?'	6121195,6111196
7.	Banvel SGF	2.0	Broadcast	1014194,9/13195
	Command 3ME	1.0	Broadcast	411 2195,4130196
8.	Clarity	1.0	Band[3/]	7110195,6111196
9.	Roundup D-Pak	1.0	Band?'	6/21/95, 6/17/96
10.	Banvel SGF	1.0	Broadcast	3/23/95, 4/8/96
	Clarity	1.0	Band[3/]	7/10/95, 6/17/96
11.	Banvel SGF	2.0	Broadcast	1014194,9113195
	Roundup D-Pak	1.0	Band?'	6/21/95, 6/17/96
12.	Banvel SGF	2.0	Broadcast	10/4/94, 9/13/95
13.	None	--	Cultivate[4/]	5112 + 5130 + 6119195, 5/6 + 6/7 + 6/18/96
14.	None	--	Hoe	5/24 + 618 + 6/30 + 1120195, 6/6 + 6128 + 1124196
15.	None	--	--	--

Fall applications made 2 to 3 d after harvest (stalks standing):
[1/] Added Induce surfactant to Roundup at 1.0% vlv in 10 GPA, others in 20 GPA.
[2/] Harvest plus 2 wk; 7 d prior to stalk destruction.
[3/] 34-in. area between rows with hooded sprayer in 14 GPA.
[4/] 12-in. band centered on row undisturbed.

Table 2. Redvine foliar injury from treatments applied to no-till cotton on clay, 1995-96, Delta Research and Extension Center, Stoneville, MS.

Trt. No.	Estimated redvine plant injury (0-100)[1/2/]					
	1995			1996		
	May 15	June 2	July 12	April 30	May 6	May 22
	(%)					
1.	9 d	Od	1 e	o c	35 d	28 de
2.	78 ab	75 ab	50 cd	99 a	100 a	100 a
3.	86 ab	71 abc	63 hc	100 a	100 a	94 ab
4.	59 bc	31 bcd	78 abc	45 b	80 abc	60 bcd
5.	65 bc	26 bcd	5 e	55 b	75 bc	49 cde
6.	98 a	48 bcd	86 abc	95 a	89 ab	69 a-d
7.	93 a	25 bcd	63 bc	100 a	96 a	97 ab
8.	38 cd	16 cd	45 cd	10 c	38 d	13 e
9.	14 d	Od	14 ahc	o c	34 d	14 e
10.	20 d	I d	58 bcd	100 a	98 a	56 bcd
11.	98 a	71 abc	90 ab	100 a	100 a	78 abc
12.	94 a	71 ab	19 de	100 a	95 ab	76 abc
13.	23 d	9 d	4 e	o c	26 d	5 e
14.	13 d	100 a	100 a	19 c	48 cd	30 de
15.	29 d	I d	3 e	o c	26 d	10 e

1/0 = no foliar injury, 100 = complete foliar removal.

2/A common letter in the same column indicates menas are not different according to DMRT at $P \leq 0.05$

Table 3. Redvine population at harvest from herbicide treatments applied to no-till cotton on clay. Delta Research and Extension Center, Stoneville, MS, 1994-96.

Trt. No.	Redvine population[1]			Plants in 1996 as % of	
	7 October 1994	1 September 1995	2 October 1996	1995	1994
	(plants/267 ft²)				
1.	228.0 ah	3.08 ab	146.3 a	63.4	64.1
2.	7.5 b	1.5 h	2.5 b	166.7	33.3
3.	298.5 a	55.8 ah	52.0 ab	93.3	17.4
4.	207.0 ab	258.3 a	120.3 ab	48.8	58.1
5.	242.3 ab	148.9 ah	96.3 ah	64.6	39.7
6.	21.8 ab	16.5 h	28.0 ab	169.7	128.7
7.	5.3 h	9.5 b	4.3 h	44.7	81.0
8.	27.5 ab	7.0 h	7.5 h	107.1	27.3
9.	233.5 ah	135.5 ab	125.8 ah	92.8	5.9
10.	20.3 ab	7.3 h	11.8 ab	162.1	58.0
11.	6.3 b	3.2 b	0.3 h	7.7	4.0
12.	109.0 ah	94.3 ab	63.8 ah	67.6	58.5
13.	48.8 ab	110.5 ah	80.3 ah	72.6	53.9
14.	20.8 ab	14.0 h	15.0 ah	107.1	72.3
15.	108.0 ab	111.3 ab	103.0 ab	92.6	95.4

[1]/ A common letter in the same column indicates means are not different according to DMRT at $P \leq 0.05$.

Table 4. Cotton response to herbicides applied for controlling redvine in no-till cotton on clay, Delta Research and Extension Center, Stoneville, MS, 1995-96.

Trt. No.	Estimated cotton injury (0-100%)[1/]				Seed cotton yield	
	1995		1996			
	July 14	July 24	June 28	July 22	1995	1996
	(%)				(lb/a)	
1.	14 a	18 a	16 b	41 b	1488 bc	1131 c
2.	0 a	0 a	0 c	0 c	1812 a	1916 a
3.	0 a	0 a	0 c	0 c	1682 ab	1845 ab
4.	13 a	14 a	13 bc	15 c	1381 cd	1487 b
5.	0 a	0 a	4 bc	13 c	1590 abc	1720 ab
6.	0 a	0 a	0 c	0 c	1841 a	1829 ab
7.	0 a	0 a	0 c	0 c	1739 ab	1912 a
8.	8 a	10 a	45 a	81 a	1176 de	303 d
9.	0 a	1 a	3 bc	15 c	1636 abc	1696 ab
10.	6 a	14 a	39 a	76 a	989 e	588 d
11.	0 a	0 a	0 c	0 c	1742 ab	1867 ab
12.	0 a	0 a	0 c	0 c	1727 ab	1821 ab
13.	0 a	0 a	8 bc	10 c	1713 ab	1689 ab
14.	0 a	0 a	0 c	0 c	1744 ab	1850 ab
15.	0 a	0 a	1 c	14 c	1746 ab	1701 ab

[1/] A common letter in the same column indicates means are not different according to DMRT at $P \leq 0.05$