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Redvine Control in No-Till Soybeans With and Without Irrigation

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Redvine [*Brunnichia ovata* (Walt.) Shinners], a member of the buckwheat family, is distributed in the United States from Florida to Texas, and north to Kentucky, Missouri, and Oklahoma (6). Redvine is a perennial weed that is difficult to control and predominates on low-lying clay soils. The weed is common in the Mississippi Delta. In a 1984 Mississippi Delta survey, redvine was the most frequent of six perennial weeds, occupying more than 1% area in 43% of cotton and 31% of soybean fields (1).

This experiment was conducted to test the influence of irrigation on the efficacy of fall- and spring-applied herbicides for controlling redvine in a no-till soybean production system.

Materials and Methods

The study was initiated in the fall of 1988 on a field naturally infested with redvine plants. The test design was a split-plot with four replications. Main plots consisted of 28, 40-inch rows, 80 feet long and were either (a) irrigated or (b) not irrigated. The main-plot treatment (a) did not require irrigation in 1989 and 1992. Approximately 1.5 acre-inches of water were applied by furrow irrigation when soybean plants were beginning to show low moisture stress on July 2, August 14, and August 30, 1990; July 17 and August 12, 1991; July 29 and August 30, 1993; and June 29, August 17, and September 2, 1994.

Subplot treatments applied to each main-plot treatment were: (1) Control (no treatment); (2) Banvel 4S[Æ]

(dicamba) at 2.0 lb ai/A applied in the fall; (3) Roundup* 4E (D-Pak[Æ] 6.4E in 1993) (glyphosate) at 3.0 lb ai/A applied in the fall; (4) Command[Æ] 4E (clomazone) at 1.5 lb ai/A applied in the fall; (5) Command 4E at 1.0 lb ai/A applied in the fall followed with 1.0 lb ai/A applied in the spring; (6) Command 4E at 1.5 lb ai/A applied in the spring; and (7) Banvel 4S at 2.0 lb ai/A applied in the fall followed with Command 4E at 1.0 lb ai/A applied in the spring.

Subplot treatments were repeated on the same area each year. All herbicides were applied broadcast. Fall-applied subplot treatments were made 4 to 13 days after soybeans were harvested in 1988-1990, and 5 to 18 days before harvest of soybeans in 1991-1993. Individual subplots were four, 40-inch rows, 80 feet long. Roundup was applied in 10 gallons per acre spray volume in 1988-1991 and in 12 gallons per acre spray volume in 1992-1993. The other fall-applied herbicides were applied in 20 and 12 gallons per acre spray volume for 1989-1991 and 1992-1993, respectively. Redvine foliage was removed by an estimated 50 to 65% with soybean harvest in 1988-1990.

An initial count of redvine plants was made before treatments were applied in 1988 from an area 40 inches by 80 feet (266.7 square feet) between the center two rows of each subplot. Subsequent counts from the same area were made each fall from 1989 through 1994. The soil was Sharkey clay (Vertic Haplaquepts) with pH of 6.5 and 1.9% organic matter.

Herbicides applied to the entire area for the control of summer annual broadleaf and grass weeds are listed in Table 1. Roundup alone and in tank mixtures was applied broadcast in 10 gallons per acre, and the other herbicides were applied in 20 gallons per acre total spray volume on the dates indicated.

Soybeans were planted with a John Deere 7100[Æ] planter without a coulter. Planting dates and varieties were: May 23, 1989, 'Leflore'; May 9, 1990, 'Centennial'; May 31, 1991, 'Sharkey'; May 27, 1992, 'Sharkey'; June 3, 1993, Pioneer brand '9592'; and May 18, 1994, Pioneer brand '9592'. The two center rows of each subplot were harvested October 26, 1989; October 30, 1990; October 18, 1991; October 19, 1992; October 26, 1993; and November 2, 1994, with a Massey-Harris 8 plot combine. Combine yields are reported as bushels per acre adjusted to 13% grain moisture.

Data were subjected to an analysis of variance and means were separated by DMRT at the 5% significance level.

Results

Redvine

With the redvine plant population, neither main-plot by subplot interactions nor main-plot differences were significant in any year (data not shown). This is different from results by Elmore, et al. (2), who reported fewer perennial vine numbers with irrigation with conventional tillage on a Tunica clay (Vertic Haplaquepts).

Subplot treatment averages for 1988-1991 were not different (Table 2). Numbers of redvine plants in November 1992--with treatments of Banvel applied in the fall, Roundup applied in the fall, and Banvel applied in the fall followed by Command applied in the spring--were lower when compared with the no-treatment control. Two of these treatments--Banvel applied in the fall, and Banvel applied in the fall followed by Command applied in the spring--were also lower in redvine plant numbers in 1993 and 1994 when compared with the no-herbicide control treatment. Banvel had the greatest influence on redvine plant reduction when applied sequentially with Command because Command applied alone in the spring at planting did not reduce redvine plant population in any year when compared with the no-herbicide control treatment. In 1994, Roundup applied in the fall reduced the plant population below the no-treatment control.

Table 1. Herbicides applied for annual broadleaf and grass weed control with an experiment on redvine control in no-till soybeans. Delta Branch Experiment Station, Stoneville, MS, 1989-1994.

Year	Date (mo/day)	Herbicide, Rate/A, Adjuvant
"Burndown"		
1989	4/24	Roundup 4E 1.0 lb ai/A + Sterox NJ[Æ] 0.5%
1990	4/18	Roundup D-Pak 6.4E 0.5 lb ai/A + Activate Plus[Æ] 1.0%
1991	5/24	Roundup D-Pak 6.4E 1.0 lb ai/A + Classic 25 DF[Æ] 0.01 lb ai/A + X-77[Æ] 1.0%
1992	4/1	Roundup D-Pak 6.4E 0.75 lb ai/A + Latron AG 98[Æ] 1.0%
	4/30	Canopy 75DF[Æ] 0.5 lb ai/A + Agri-Dex[Æ] 1.0%
1993	4/14	Roundup D-Pak 6.4E 1.0 ai/A + Activate Plus 1.0%
1994	3/17	Roundup D-Pak 6.4E 1.0 lb ai/A + Induce[Æ] 1.0%
Preemergence (Treatments 1-4)		
1989	5/23	Canopy 75DF 0.5 lb ai/A + Gramoxone Super[Æ] 1.5E 0.5 lb ai/A + X-77 0.5%
1990	5/9[1]	Canopy 75DF 0.5 lb ai/A + Gramoxone Extra[Æ] 2.5E 0.94 lb ai/A + X-77 0.5%
1991	5/3[1]	Canopy 75DF 0.5 lb ai/A + Gramoxone Extra 2.5E 0.94 lb ai/A + Triton AG-98[Æ] 0.25%
1993	6/3	Canopy 75DF 0.5 lb ai/A + Gramoxone Extra 2.5E 0.63 lb ai/A + Activate Plus 0.25%
1994	5/17[1]	Gramoxone Extra 2.5E 0.94 lb ai/A + Latron AG 98 0.25%
	5/18	Canopy 75 DF 0.5 lb ai/A + Latron AG 98 0.5%
Preemergence (Treatments 5-7)		
1989	5/23	Command 4E (See Table 2) + Gramoxone Super 1.5E 0.5 lb ai/A + X-77 0.5%
1990	5/9	Command 4E (See Table 2) + Gramoxone Extra 2.5E 0.94 lb ai/A + Triton AG 98 0.5%
1991	5/31	Command 4E (See Table 2) + Gramoxone Extra 2.5E 0.94 lb ai/A + Triton AG 98 0.25%
1992	5/28	Command 4E (See Table 2) + Gramoxone Extra 2.5E 0.94 lb ai/A + Activate Plus 0.25%
1993	6/3	Command 4E (See Table 2) + Gramoxone Extra 2.5E 0.63 lb ai/A + Activate Plus 0.25%
1994	5/18	Command 4E (See Table 2)
Postemergence Over-the-Top		
1989	6/19	Tackle 2E[Æ] 0.25 lb ai/A + Basagran 4E[Æ] 0.75 lb ai/A + Prime Oil[Æ] 0.5%
	6/19	Assure II 0.8E[Æ] 0.125 lb ai/A + X-77 0.25%
	6/24	Basagran 4E 1.0 lb ai/A + Poast 1.5E[Æ] 0.4 lb ai/A + Agri-Dex 1.25%
1990	6/7	Poast 1.5E 0.19 lb ai/A + Dash[Æ] 1.25% + Agri-Dex 1.25%
	6/7	Reflex 2LC[Æ] 0.375 lb ai/A + X-77 0.5%
	7/6	Tornado 1.75E[Æ] 0.44 lb ai/A + X-77 0.5%
1991	6/25	Basagran 4E 0.75 lb ai/A + Classic 25DF 0.012 lb ai/A + Assure II 0.8E 0.75 lb ai/A + Sterox NJ 0.5%
	7/11	Basagran 4E 1.0 lb ai/A + Poast 1.5E 0.25 lb ai/A + Reflex 2LC 0.375 lb ai/A + Triton AG 98 1.0%
	8/1	Classic 25DF 0.012 lb ai/A + Select 0.94E 0.15 lbs ai/A + Activate Plus 0.5%
1992	6/18	Poast Plus 1E[Æ] 0.28 lb ai/A + Dash 1.0%
	6/22	Basagran 4E 0.75 lb ai/A + Reflex 2LC 0.375 lb ai/A + Activate Plus 0.5%
	7/8	Basagran 4E 0.75 lb ai/A + Reflex 2LC 0.375 lb ai/A + Latron AG 98 0.5%
1993	7/1	Classic 25DF 0.01 lb ai/A + X-77 0.5%

	7/16	Poast Plus 1E 0.2 lb ai/A + Agri-Dex 1.25%
	7/21	Basagran 4E 0.75 lb ai/A + Reflex 2LC 0.375 lb ai/A + Prime Oil 1.0%
1994	6/14	Assure II 8E 0.063 lb ai/A + Prime Oil 1.0%
	6/15	Classic 25DF 0.012 lb ai/A + Prime Oil 1.0%
	6/16	Pursuit 2E 0.078 lb ai/A + Basagran 4E 0.75 lb ai/A + Latron AG 98 0.5%
	7/6	Reflex 2LC 0.375 lb ai/A + Select 2E 0.156 lb ai/A + Agri-Dex 1.0%

[1]Applied to Treatments 1-7.

Soybeans

Main-plot irrigation treatments did not influence soybean stand in any year (data not shown). Also, there were no interactions of main plots by subplots with soybean stand. Soybean stand with any subplot treatment was not different from the no-herbicide control in 1989, 1991, 1992, and 1994 (Table 3). In 1990, the no-herbicide control treatment had fewer soybean plants than treatments with Banvel applied in the fall, Roundup applied in the fall, and Command applied in the fall and repeated in the spring. The no-treatment control also had a reduced stand in 1993 compared with the subplot treatment of Banvel applied in the fall followed by Command applied in the spring. This was probably due to planter variability and/or counting error.

The combine yield of soybeans is presented in Table 4. There were no significant main-plot by subplot yield interactions in any year. Main-plot treatment (a) irrigation was higher in yield in all years dry enough to require irrigation. The lower yield with irrigation in 1989 cannot be explained.

Subplot treatments were not different in yield from the no-herbicide control in 1989 and 1990 (Table 4). Although the subplot treatments were not different in the number of redvine plants in 1991 (Table 2), soybean yield was higher with the fall-applied Roundup and Banvel subplot treatments (Table 4). The Roundup treatment had the lowest number of redvine plants. Overall yields were low in 1991 so apparently the redvine population was suppressed sufficiently to provide higher yields with fall-applied Banvel and Roundup.

In 1992-1994, yields with subplot treatments of Banvel alone and Roundup were higher than the no-herbicide treatment. In 1992 and 1994, treatments with Banvel followed by Command and Command in the spring had higher soybean yields than the no-herbicide treatment. In 1994, the fall-applied Command treatment was higher in yield than the no-herbicide control.

Table 2. Redvine plant population with an experiment evaluating herbicides in no-till soybeans. Delta Branch Experiment Station, Stoneville, MS, 1988-1994.

Trt. no.	Herbicide	Rate/Acre	Application timing	Redvine plant population[1] Date						
				10/9/88	10/26/89	11/7/90	10/9/91	11/1/92	10/11/93	10/7/94
		(lb ai)		---------- (Plants/266.7 square feet) ----------						
1.	None	--	--	42.6 a	38.6 a	79.3 a	76.0 a	43.6 a	100.3 a	229.9 a
2.	Banvel 4S	2.0	Fall	46.0 a	22.0 a	45.4 a	31.9 a	4.9 d	11.8 b	5.0 c
3.	Roundup 4E	3.0	Fall	32.4 a	31.8 a	58.4 a	26.1 a	13.6 bcd	40.6 ab	39.4 bc
4.	Command 4E	1.5	Fall	34.1 a	30.4 a	64.4 a	78.0 a	39.1 ab	89.6 a	194.8 ab
5.	Command 4E	1.0	Fall	33.6 a	41.1 a	58.9 a	46.8 a	35.9 abc	50.9 ab	149.3 abc
	Command 4E	1.0	Spring							

6.	Command 4E	1.5	Spring	35.6 a	42.1 a	46.9 a	46.8 a	32.1 abcd	61.1 ab	200.3 ab
7.	Banvel 4S	2.0	Fall	40.5 a	26.3 a	47.5 a	48.1 a	8.9 cd	16.1 b	5.3 c
	Command 4E	1.0	Spring							

[1]A common letter in the same column indicates means are not different according to DMRT at P <= 0.05

Table 3. Soybean stand with an experiment evaluating herbicides for redvine control in no-till soybeans. Delta Branch Experiment Station, Stoneville, MS 1988-1994.

Trt. no.	Herbicide	Rate/Acre	Application timing	Soybean Stand[1]					
				1989	1990	1991	1992	1993	1994
		(lb. ai)		---------- [Plants (1,000's)/acre] ----------					
1.	None	--	--	95.2 a	93.7 c	40.9 a	114.4 a	68.9 b	93.8 a
2.	Banvel 4S	2.0	Fall	96.3 a	112.7 ab	46.1 a	110.4 a	79.0 ab	93.7 a
3.	Roundup 4E	3.0	Fall	85.6 a	127.4 ab	45.2 a	114.7 a	75.6 ab	97.8 a
4.	Command 4E	1.5	Fall	91.9 a	118.8abc	45.6 a	111.1 a	77.0 ab	96.4 a
5.	Command 4E	1.0	Fall	83.0 a	130.0 a	47.0 a	109.6 a	73.5 ab	93.8 a
	Command 4E	1.0	Spring						
6.	Command 4E	1.5	Spring	80.3 a	104.3 bc	44.2 a	105.3 a	72.5 ab	97.8 a
7.	Banvel 4S	2.0	Fall	86.6 a	102.5 bc	44.7 a	111.1 a	82.6 a	102.3 a
	Command 4E	1.0	Spring						

[1]A common letter in the same column indicates means are not different according to DMRT at P <= 0.05.

Table 5 presents a summary for subplot treatments of the initial redvine population in November 1988, and the population as a calculated percentage of the original at each counting date. It is apparent that redvine population reductions with effective subplot treatments did not begin until the fourth year. Herbicide applications to redvine plants after soybean harvest when shoot growth had been reduced (1988-1990) did not reduce the population. After treatments were made to plants with full shoot growth (1991-1993), the effective herbicide treatments continued to reduce the redvine population or maintain it at a low level. The no-herbicide and ineffective herbicide treatments allowed the redvine population to increase until it reached 4 to 5 times the original count by the sixth year (1994).

Conclusions

Irrigation resulted in an additional 10.2 to 27.3 bushels per acre of soybeans during years when natural rainfall was not sufficient. The control of redvine was not influenced by irrigation in this study. Redvine control was obtained with fall applications of Banvel and Roundup and with fall applications of Banvel followed by spring applications of Command. However, control was reduced when fall applications were made after soybean harvest when redvine foliage was removed by the harvest operation. Soybean yield was not affected by redvine during the first 2 years of the study. The most effective redvine control treatments resulted in greater soybean yield each year of the final 4 years of the study when compared with the no-herbicide control.

Table 4. Soybean yield with an experiment evaluating herbicides for redvine control in no-till soybeans. Delta Branch Experiment Station, Stonevill, MS, 1988-1994.

Trt. no.	Herbicide	Rate/Acre	Application timing	Soybean Yield at 13% Moisture [1]					
				1989	1990	1991	1992	1993	1994
		(lb. ai)		---------- (bu/Acre) ----------					
Subplot treatment [1]									
1.	None	--	--	34.1 a	22.2 a	19.0 c	36.7 c	27.5 c	23.5 c
2.	Banvel 4S	2.0	Fall	37.9 a	22.8 a	22.2 ab	40.4 a	35.4 a	28.8 a
3.	Roundup 4E	3.0	Fall	38.1 a	25.3 a	23.5 a	40.1 a	33.7 ab	28.8 a
4.	Command 4E	1.5	Fall	35.3 a	27.6 a	21.9 abc	37.9 bc	30.1 abc	26.7 ab
5.	Command 4E	1.0	Fall	37.1 a	20.3 a	19.1 bc	37.2 bc	28.4 bc	24.1 bc
	Command 4E	1.0	Spring						
6.	Command 4E	1.5	Spring	37.7 a	24.2 a	20.0 bc	39.0 ab	29.4 abc	28.3 a
7.	Banvel 4S	2.0	Fall	36.6 a	24.0 a	21.5 abc	39.1 ab	31.9 abc	28.1 a
	Command 4E	1.0	Spring						
Main-plot treatment [1]									
a.	Irrigated-1990 (3X), 1991 (2X), 1993 (2X), 1994 (3X)			33.6 b	37.4 a	27.0 a	38.7 a	36.0 a	38.0 a
b.	Not irrigated			39.8 a	10.1 b	15.0 b	38.5 a	25.8 b	15.8 b

[1]A common letter in the same column indicates means are not different acccording to DMRT at P <= 0.05.

Table 5. Initial redvine population and subsequent population as a percent of the original count with an experiment for evaluating herbicides to control redvine in no-till soybeans. Delta Branch Experiment Station, Stoneville, MS, 1988-1994.

Trt. no.	Herbicide	Rate/Acre	Application timing	Redvine Plants per 266.7 sq ft 10/9/88	Percent of Original Count					
					10/26/89	11/7/90	10/9/91	11/1/92	10/11/93	10/7/94
		(lb. ai)								
1.	None	--	--	42.6	89.9	186.2	178.4	102.3	235.4	539.7
2.	Banvel 4S	2.0	Fall	46.0	47.8	98.7	69.3	10.7	25.4	10.9
3.	Roundup 4E	3.0	Fall	32.4	98.1	180.2	80.6	42.0	125.3	121.6
4.	Command 4E	1.5	Fall	34.1	89.1	188.9	228.7	114.7	262.8	571.3
5.	Command 4E	1.0	Fall	33.6	122.3	175.3	139.3	106.8	151.5	444.3
	Command 4E	1.0	Spring							
6.	Command 4E	1.5	Spring	35.6	118.3	131.7	131.5	90.2	171.6	562.6

7.	Banvel 4S	2.0	Fall	40.5	64.9	117.3	118.8	22.0	39.8	13.1
	Command 4E									

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Photos of redvine control

- Photo 1
- Photo 2
- Photo 3
- Photo 4
- Photo 5