CULTURAL AND CHEMICAL REDVINE (*BRUNNICHIA OVATA*) CONTROL IN SOYBEAN

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ABSTRACT

A long-term field study was initiated in 1996 to evaluate tillage methods and herbicide treatments for redvine control in soybeans (*Glycine max*). Aerial photography and Global Positioning System (GPS)/ Global Information Systems (GIS) were used to monitor redvine movement. At trial initiation, redvine populations averaged 15 to 25 per m^2 and resulted in 42 to 50% groundcover. A split plot design was used with tillage type as the main plot and herbicide treatment as the subplot. Tillage types included no-till, conventional, hyperbolic subsoiler and moldboard plow. Subsoiling and plowing operations were conducted in the fall of 1996. Herbicide treatments included no herbicide, glyphosate at 1.1 kg ai/ ha (1.0 lb ai/acre) applied annually to V2 and V6 soybeans and dicamba at 2.2 kg ai/h (2.0 lb ai/acre) applied 2 weeks prior to 1996 soybean harvest. When a herbicide was not used, moldboard plowing was the only tillage type that provided acceptable season-long control (83%). The subsoiler provided 50% control of redvine, but by harvest regrowth had occurred, resulting in only 24% control. Stem counts were reduced by moldboard plowing and subsoiling. Conventional tillage actually increased stem counts. Glyphosate increased control of redvine for all tillage treatments except moldboard plowing. Glyphosate at V2 and repeated at V6 provided redvine control for one month after the V6 treatment; however, late-season regrowth resulted in only 54 to 66 % control at harvest. Dicamba provided 96% control regardless of tillage type. Redvine density did not affect soybean yield in 1997.

INTRODUCTION

As reduced tillage systems become more popular, redvine and other perennial weeds are becoming an increasing problem in the Mississippi Delta (Elmore, 1984). Redvine has an extensive underground stem and root system, capable of vegetative propagation (DeFelice and Oliver, 1980). Control of this weed requires that a substantial concentration of herbicide reach the root system (Shaw and Mack, 1991). If applied during the fall, when the redvine plants are translocating sugars to their root structures, dicamba can reduce groundcover levels for at least two years (Elkins et al., 1996). Disruption of the root structure by deep tillage has also been found to reduce redvine groundcover levels (Elkins et al., 1996). Tillage operations may also contribute to the spread of perennial weeds throughout a field (Soteres and Murray, 1982). The objective of this study was to further develop redvine control programs in Roundup Ready soybeans with tillage methods and systemic herbicides and to monitor the regrowth and movement of redvine within the treatment.

MATERIALS AND METHODS

A 10-ha farmer-cooperator field near Keiser, Arkansas, containing a high natural population of redvine was selected for study. A split plot design with four replications was used. The main plots consisted of four tillage methods: no-till, conventional tillage, hyperbolic subsoiler and moldboard plow. Subsoiling and moldboard plowing operations were conducted upon initiation of the experiment in the fall of 1996. Subplots were herbicide treatments and included dicamba applied two weeks prior to harvest in 1996 at 2.2 kg ai/ha, glyphosate applied annually to V2 and V6 soybeans at 1.1 kg ai/ha and an untreated check. 'Asgrow 4701RR' soybean cultivar was drill seeded to the 15- x 15-m plots 13 May 1997. Visual control ratings were taken at planting, one, two and three months after planting and at harvest. Redvine stem counts/m^2 were also taken from the same plot area each year prior to harvest. The entire plot area was harvested for soybean yield. Original plot locations were mapped with Global Positioning Systems (GPS) technology, and aerial photographs are being taken semiannually to monitor the location and movement of redvine with the use of Geographic Information Systems (GIS) software. All data were subjected to analysis of variance, with means separated by Fishers Least Significant Difference (LSD) at the 0.05 significance level.

RESULTS AND DISCUSSION

Tillage Alone

When no herbicide was used for redvine control, moldboard plowing was the only tillage treatment that provided acceptable control for the entire growing season (Fig. 1). When the top portion of the soil profile was turned, subterranean redvine parts were sliced off 20 cm below the soil surface. Regrowth from the remaining taproot was hindered and may have required the formation of new buds from root tissue. Fragmented stem segments were deposited at the soil surface. Exposure to cold and wet condi-

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tions during the winter of 1996-1997 desiccated these fragments and prevented regeneration. Both factors led to an 83% reduction in stem counts (Table 1). Control with the hyperbolic subsoiler was much less. The subsoiler disturbed less than half of the soil matrix, leaving many established roots and rhizomes intact for regrowth. At harvest, control with the subsoiler was similar to that with conventional tillage but higher than the no-till check (Fig. 1). Only the conventional-tillage method increased stem counts (Table 1).

Tillage + Glyphosate

Sequential applications of glyphosate increased redvine control over that of tillage alone, except for moldboard plowing (Fig. 2). Glyphosate provided control for one month after treatment; however, late summer regrowth caused final ratings to decline, resulting in 54 to 66% control for all tillage types. Glyphosate reduced stem counts only in the conventional tillage plots (Table 1).

Tillage + Dicamba

Regardless of tillage type, dicamba provided excellent control for the entire year (Fig. 3). Only minimal regrowth occurred late in the season.

Soybean Yield

Redvine density did not affect yield. While the presence of redvine may alter the microclimate through competition for light and soil moisture, the less-than-complete plot coverage and narrow-row soybeans compensated for the interference. Although redvine may not directly affect returns, the long vines often entangle machinery, causing substantial tillage and harvest complications.

CONCLUSIONS

Acceptable redvine control requires that the underground portion of the plant be killed by either moldboard plowing or the use of dicamba. Split applications of glyphosate can keep redvine at a manageable level below the crop canopy. Subsoiling provided early-season control, but stem counts at harvest were not reduced over no-till. Conventional tillage may actually increase redvine populations and areas of infestation. Redvine did not affect soybean yields.

ACKNOWLEDGMENTS

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Table 1. Reduction in redvine stems/m² 1996-1997.

Tillage Level	Herbicide program		
	Untreated	Glyphosate*	Dicamba**
	----------%----------		
No-till	11	21	**96**
Conventional	-25	19	**99**
Subsoiler	38	46	**100**
Moldboard	**83**	72	**100**
LSD (0.05%) = 22			

*Glyphosate at 1.1 kg ai/ha applied V2 and V6
**Dicamba at 2.2 kg ai/ha applied preharvest 1996.

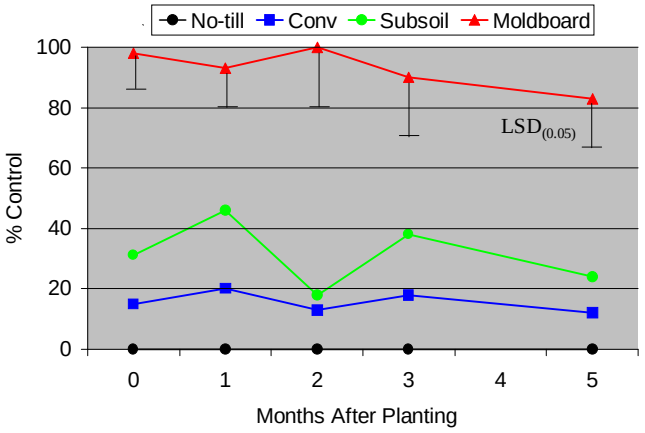

Fig. 1. Redvine control with tillage alone (no herbicide), 1997.

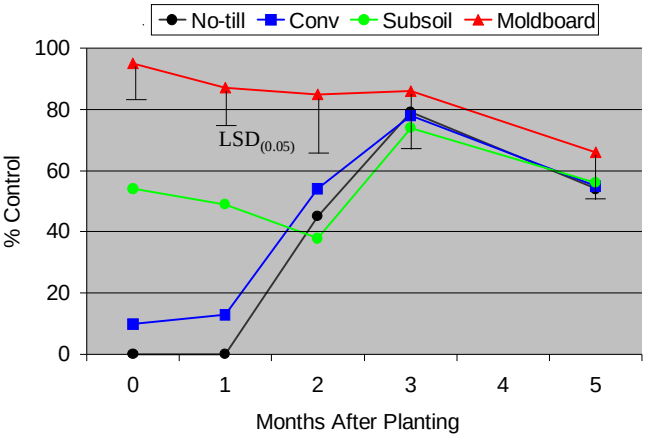

Fig. 2. Redvine control with tillage and glyphosate (1.1 kg ai/ha) applied to V2 and V6 soybeans (1 and 2 months after planting in 1997).

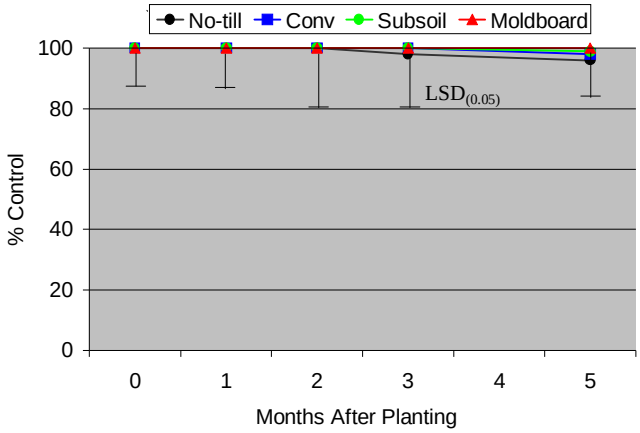

Fig. 3. Redvine control with tillage and dicamba (2.2 kg ai/ha) applied in fall 1996.