

## Research Note

### *SULFOSATE FOR WEED CONTROL IN COFFEE<sup>1</sup>*

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Coffee is the most important farm crop in Puerto Rico. For 1994-95, local coffee production was 12.8 million kg of dry coffee beans with a farm value of \$65.7 million (Dept. Agric., 1995). Most of our coffee plantations are located in the warm humid mountain regions, where weather conditions favor the constant infestation of a wide variety of weeds. Since manual labor is scarce and expensive, the use of herbicides has become a standard practice in order for Puerto Rican growers to achieve economic production of coffee.

It is relatively easy to kill the broadleaf weeds in coffee plantations. However, grasses are a serious problem. Paraquat provides only short term control of most weeds because of its lack of systemic action. Glyphosate, a systemic herbicide, has proven to be effective against annual and perennial weeds. Glyphosate has also provided a longer duration of weed control than paraquat, but it is too expensive for use by local coffee farmers. Sulfosate is another systemic herbicide recently registered for weed control in non-bearing trees and vines (Anonymous, 1995). The objective of this experiment was to compare the efficacy of sulfosate with that of four other herbicides for weed control in bearing coffee trees.

A field experiment was conducted at the Adjuntas Agricultural Substation of the University of Puerto Rico from 1994 to 1996. The soil at the experimental site is an Alonso clay (clayey oxidic, isohyperthermic Typic Haplohumults) with a pH of 4.2 and 3.9% organic matter. The six treatments were glyphosate at 2.24 kg ai/ha, sulfosate at 1.68 and 3.36 kg ai/ha, paraquat at 1.12 kg ai/ha, fluzifop at 0.29 kg ai/ha + oxyfluorfen at 0.45 kg ai/ha and a non-weeded check. A randomized complete block design with four replications was used. A four-year-old coffee plantation (cv. Caturra) was selected for this experiment. Each experimental plot was 6.1 m × 3.7 m. Each plot had 10 coffee trees arranged in two rows, 1.2 m apart within the row, with 1.8 m between the rows.

Herbicides were applied three times (31 May and 11 Oct. 1994, and 17 May 1995) with a knapsack sprayer, mixed with 350 L/ha of water to cover all weeds. Weed control was evaluated by visual estimate at three weeks and six weeks after the first herbicide application, and at three, six and nine weeks after both the second and third applications. All agronomic and pest management practices were in accordance with recommended practices for growing coffee (Estación Experimental Agrícola, 1976). Fresh berries from ten trees of each plot were weighed. Coffee berries were harvested three times in 1994 (29 Aug., 26 Sept., and 8 Nov.) and four times in 1995 (22 Aug., 26 Sept., 17 Oct., and 6 Nov.). Weed control ratings and coffee yield data were subjected to analysis of variance and means compared with Duncan's Multiple Range Test at  $P < 0.05$ .

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The predominant weed species present in the non-weeded check were junglerice [*Echinochloa colona* (L.) Link], crabgrass [*Digitaria sanguinalis* (L.) Scop.], goosegrass [*Eleusine indica* (L.) Gaertn.], fingergrass [*Chloris inflata* Link], purple nutsedge [*Cyperus rotundus* L.], scarlet bean [*Macroptilium lathyroides* L.], sensitive plant [*Aeschynomene sensitiva* Sw], red tassel flower [*Emilia sonchifolia* (L.) DC.], wild poinsettia [*Euphorbia heterophylla* L.], and morning glory [*Ipomoea tiliacea* (Willd) Choisy]. Sulfosate at 3.36 kg ai/ha controlled more than 95% of the grasses and broadleaf weeds for three and six weeks after the first herbicide application (Table 1). This efficacy is comparable to that of glyphosate and of the mixture of fluazifop + oxyfluorfen at three and six weeks after the first herbicide application (Table 1). Sulfosate at 1.68 kg ai/ha provided significantly less grass control than glyphosate at three and six weeks. However, at three weeks sulfosate at this lower rate provided better control of grasses and broadleaf weeds (86 and 93%, respectively) than paraquat (75 and 80%, respectively). By the end of six weeks, this difference was noted only with grass control (81% with sulfosate versus 64% with paraquat). The efficacious individual performances of fluazifop and oxyfluorfen in coffee have been reported by Liu et al. (1993) and Liu and Boneta (1983). These two herbicides in a mixture appear to be effective for weed control in coffee.

The weed control evaluation made after the second herbicide application indicated that sulfosate at 3.36 kg ai/ha again provided more than 97% control of both grasses and broadleaf weeds up to nine weeks (Table 2). Sulfosate at this rate was as effective as glyphosate in controlling weeds. Sulfosate at 1.68 kg ai/ha gave more than 90% control of grasses and broadleaf weeds for three and six weeks, and 88% control at the ninth week after application. Sulfosate at 1.68 kg ai/ha was not as effective as glyphosate in controlling grasses and broadleaf weeds at three weeks or grasses at six weeks.

The weed control evaluation made after the third herbicide application indicated that sulfosate at 3.36 kg ai/ha gave greater than 94% control of weeds up to six weeks (Table 3). By the end of the ninth week, the effectiveness of sulfosate at 3.36 kg ai/ha had decreased slightly to 88% control of weeds. Sulfosate at 1.68 kg ai/ha provided about as

TABLE 1.—Effect of the first application of sulfosate and other herbicides on weed control in a four-year-old coffee plantation at the Adjuntas Substation (May 1994).

Treatment	Rate kg ai/ha	Weed control			
		Three weeks after herbicide application		Six weeks after herbicide application	
		Grasses	Broadleaves	Grasses	Broadleaves
		----- % -----			
Glyphosate	2.24	99 a <sup>1</sup>	95 a	100 a	94 a
Sulfosate	3.36	99 a	99 a	100 a	95 a
Sulfosate	1.68	86 b	93 a	81 b	84 ab
Paraquat	1.12	75 c	80 b	64 c	78 b
Fluazifop	0.29				
+Oxyfluorfen	0.45	95 a	92 a	97 a	86 ab
Non-weeded check		0 d	0 c	0 d	0 c

<sup>1</sup>Means in a column followed by the same letter or letters do not differ significantly at  $P < 0.05$ .

TABLE 2.—Effect of second application of sulfosate and four other herbicides on weed control performance in a four-year-old coffee plantation at the Adjuntas Substation (October 1994).

Treatment	Rate kg ai/ha	Weed control					
		Three weeks after herbicide application		Six weeks after herbicide application		Nine weeks after herbicide application	
		Grasses	Broadleaves	Grasses	Broadleaves	Grasses	Broadleaves
		----- % -----					
Glyphosate	2.24	100 a <sup>1</sup>	99 a	99 a	100 a	94 a	95 a
Sulfosate	3.36	99 a	99 a	98 ab	99 a	97 a	98 a
Sulfosate	1.68	95 bc	91 b	91 b	91 a	88 a	89 a
Paraquat	1.12	94 c	88 b	95 ab	90 b	95 a	92 a
Fluazifop	0.29						
+Oxyfluorfen	0.45	98 abc	91 b	97 ab	93 b	91 a	90 a
Non-weeded check		0 d	0 c	0 c	0 c	0 b	0 b

<sup>1</sup>Means in a column followed by the same letter or letters do not differ significantly at P < 0.05.

TABLE 3.—*Effect of third application of sulfosate and four other herbicides on weed control performance in a four-year-old coffee plantation at the Adjuntas Substation (May 1995).*

Treatment	Rate kg ai/ha	Weed control					
		Three weeks after herbicide application		Six weeks after herbicide application		Nine weeks after herbicide application	
		Grasses	Broadleaves	Grasses	Broadleaves	Grasses	Broadleaves
		----- % -----					
Glyphosate	2.24	96 ab <sup>1</sup>	97 a	93 a	90 a	85 a	85 ab
Sulfosate	3.36	100 a	95 a	94 a	95 a	88 a	89 a
Sulfosate	1.68	96 ab	89 a	91 a	87 a	86 a	86 ab
Paraquat	1.12	88 b	100 a	81 a	89 a	80 a	85 ab
Fluazifop	0.29						
+Oxyfluorfen	0.45	91 ab	88 a	83 a	84 a	76 a	74 b
Non-weeded check		0 c	3 b	0 b	0 b	0 b	0 c

<sup>1</sup>Means in a column followed by the same letter or letters do not differ significantly at  $P < 0.05$ .

much weed control as glyphosate. Neither paraquat nor the mixture of fluazifop + oxyfluorfen provided better weed control than sulfosate at 1.68 kg ai/ha for a duration of up to nine weeks (Table 3).

In 1994, an average coffee berry production of 5,562 kg/ha was obtained; however, there were no significant berry yield differences among different treatments. In 1995, an average berry production of 35,819 kg/ha was obtained. Again, this yield did not differ significantly among different treatments. We attributed the difference in berry production between 1994 and 1995 either to yearly alternate bearing or to the rainfall differentials (108.69 cm registered for 1994; 190.87 cm registered for 1995), or a combination of both factors.

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