

PRE-HARVEST APPLICATION OF ROUNDUP AND FUSILADE SUPER AS A MINIMUM TILLAGE TECHNIQUE FOR SUGARCANE

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Abstract

Ten field experiments, in which high rates of Roundup (glyphosate, 410 g ai/l) and Fusilade Super (fluazifop-butyl, 125 g ai/l) were sprayed onto sugarcane crops shortly before harvest, were carried out over a period of two years. Changes in cane quality were measured and regrowth of the subsequent ratoon was assessed. Treatment with Fusilade Super did not result in an acceptable kill of the stool and treatment with Roundup resulted in an acceptable control only where a very poor crop of variety N8 growing on a light sandy soil was treated. High rates of Roundup did not improve plant kill, nor did the use of additives. In two experiments sugarcane quality remained unchanged when harvest was delayed more than 11 days after Roundup application, whilst the quality of unsprayed sugarcane improved.

Introduction

A disadvantage of the conventional minimum tillage system using Roundup (glyphosate, 410 g ai/l) is that the final ratoon cane to be sprayed must tiller fully before it can be killed completely and it may take several months for the crop to reach the correct growth stage. A system was tested by de Robillard² in which high rates of Roundup were applied to a crop shortly before harvest. Field comparisons indicated that the sprayed sugarcane had a higher sucrose content than that from adjacent unsprayed crops and a reasonable kill of the cane stool was obtained on light sandy soils. A series of replicated field experiments was undertaken therefore, to investigate further the preliminary findings.

Ten experiments were carried out over a two year period with different varieties growing under a range of conditions. Various rates of Roundup and Fusilade Super (fluazifop-butyl, 125 g ai/l) were applied shortly before harvest and changes in cane quality were monitored. The amount of ratoon regrowth was subsequently assessed.

Materials and Methods

Essential details of the experiments are given in Table 1. All experiments were fully replicated and plot sizes were between 60 and 115 m². Data were extremely variable from plough-out ratoon crops. Some experiments were carried out on young plant cane crops.

Chemicals were usually applied between 2 and 6 weeks before harvest by walking between cane rows with a CO₂ pressurized Pamro lance operating at 200 kPa. The Pamro lance is a vertical boom fitted with two TK 1 nozzles placed so that they spray into the upper part of the foliage of two adjacent sugarcane rows. Most treatments were applied in every interrow but comparisons were also made with spraying every other interrow. Application rates varied between 100 and 180 l/ha. Some treatments were also applied with a sugarcane ripener boom. This is an upright boom with a 3 m cross-piece with one TK 1,5 nozzle at each end, spraying a swath of 6 m at a pressure of 250 kPa. The nozzles spray backwards about 60 cm above the crop and apply between 40 and 80 l/ha, depending on crop conditions and walking speed.

Samples of 16 stalks per plot were taken at the time of spraying and at intervals thereafter to monitor changes in cane quality. Stalks were topped at the natural breaking point and taken to the laboratories of the Experiment Station of the South African Sugar Association at Mount Edgecombe for analysis. Standard methods were used to determine sucrose and moisture contents. The estimated recoverable sugar % (ers %) in the samples was determined using the following formula:

$$\text{ers \%} = \text{sucrose \%} - 0,485 \text{ non-sucrose \%} - 0,056 \text{ fibre \%}$$

The regrowth of ratoon crops was assessed by either a visual rating or by counting the number of 25 cm row lengths in which live shoots were visible and expressing this as a percentage of the total number of 25 cm row lengths (hoe units) in the net plot.

Results

None of the treatments had any effect on the regrowth of N55/805 in Experiment 1, nor was Fusilade Super effective in other experiments. Reasonably good control of ratoon regrowth was obtained only in Experiments 2 and 9 (Table 2), which were on poor sandy soils. Initially regrowth appeared to be well controlled in some experiments, particularly at high rates of Roundup application, but these effects were of short duration. In nine of the ten experiments regrowth was considered to be not commercially acceptable.

TABLE 1
Details of the experiments

Experiment and site	Cultivar	Crop	Age at treatment (months)	Soil system	Date sprayed	Treatments (l ha ⁻¹)	
						Roundup	Fusilade
1 Canelands	N55/805	Ratoon	13	Umzinto lowlands	17/5/83	9,10,13,18	
2 Mtunzini	N8	Ratoon	18	Berea	2/6/83	5,7*,8,10,12	7
3 Mgayi	NCo 376	Plant	10	Umzinto midlands	7/7/83	8,8†,10,13	4,8
4 Lewisham	NCo 376	Plant	9	Umzinto lowlands	20/9/83	7#,8,8†,10,12	8
5 Hilton	NCo 293	Plant	11	Nottingham	15/9/83	7‡,7+,8†,7,10,12	7,10
6 Beneva	NCo 376	Ratoon	15	Umzinto river valley	26/10/83	6,8#,8‡,9†,9,11,13	
7 Kranskop	NCo 376	Ratoon	24	Nottingham	15/9/83	10	
8 Paddock	NCo 376	Ratoon	22	Nottingham	2/11/83	6†,6,8†,8,10	
9 Shakaskraal	NCo 376	Ratoon	17	Umzinto lowlands	29/3/83	4,5,8#,6,7,8	
10 Mtunzini	NCo 376	Ratoon	14	Berea	19/3/83	4#,6#,8#,4,6,8,4,6,8	

- * applied with ripener boom
- # every other row sprayed
- † plus Frigate, 1% by vol
- ‡ plus Actipron, 0,5% by vol
- + Getdown, 0,3% by mass

TABLE 2
Percentage ratoon regrowth in various experiments

Assessment method	Hoe units							Visual
	2	3	4	5	8	9	10	
Experiment number	2	3	4	5	8	9	10	6
Days after treatment	98	126	68	78	27	115	65	91
Treatment (l ha ⁻¹):								
Roundup 4	22+					30	72	
Roundup 5						24		
Roundup 6						28	59	76
Roundup 7						18		
Roundup 8)	17+*	65	65+	76+	59	21	52	71
Roundup 8)			72		26	41+		70
Roundup 10)	20+*	46	74	50	23			55
Roundup 10)				74+				
Roundup 11								
Roundup 12			64	57+				
Roundup 13	14+*	38						
Fusilade 4		70						
Fusilade 8		66	67	65+				
Fusilade 10				91+				

+ treatments applied in every other interrow
* statistically significant (P=0,05)

The effectiveness of chemicals was not as good when applied with the ripener boom as with the Pamro lance. The additives Getdown, Actipron and Frigate did not improve control significantly, compared with Roundup on its own (Table 3).

TABLE 3

The effect of Roundup alone and with Frigate on ratoon cane regrowth in Experiments 8 and 10

Roundup rate (l ha ⁻¹)	Percentage regrowth			
	Experiment 8		Experiment 10	
	Alone	plus Frigate	Alone	plus Frigate
4	-	-	72	72
6	59	45	59	60
8	26	24	52	56
Mean	42	34	61	63

Cane quality and sucrose yield were not affected in eight experiments where Roundup did not kill the sugarcane foliage completely. However in Experiments 2 and 3, where there was a marked effect on the foliage, ers % cane and mass of ers remained little changed in Roundup-treated cane whilst the yield and quality of unsprayed and Fusilade Super-treated cane improved with time (Figure 1). Fusilade killed spindle leaves quickly but took longer than Roundup to kill the remainder of the foliage.

Discussion

Initially Roundup, and to a lesser extent Fusilade Super, stunted ratoon regrowth and reduced stool populations, but the amount of regrowth was not acceptable in most trials. Regrowth was often patchy, apparently because of poor spray coverage when leaves shielded one another excessively, and it is considered unlikely that increasing spray volume would have overcome this problem. Increasing rates of Roundup and the use of additives did not improve results appreciably, even when crops were poorly grown (Experiments 2 and 9). Spraying above the crop with the ripener boom was not successful.

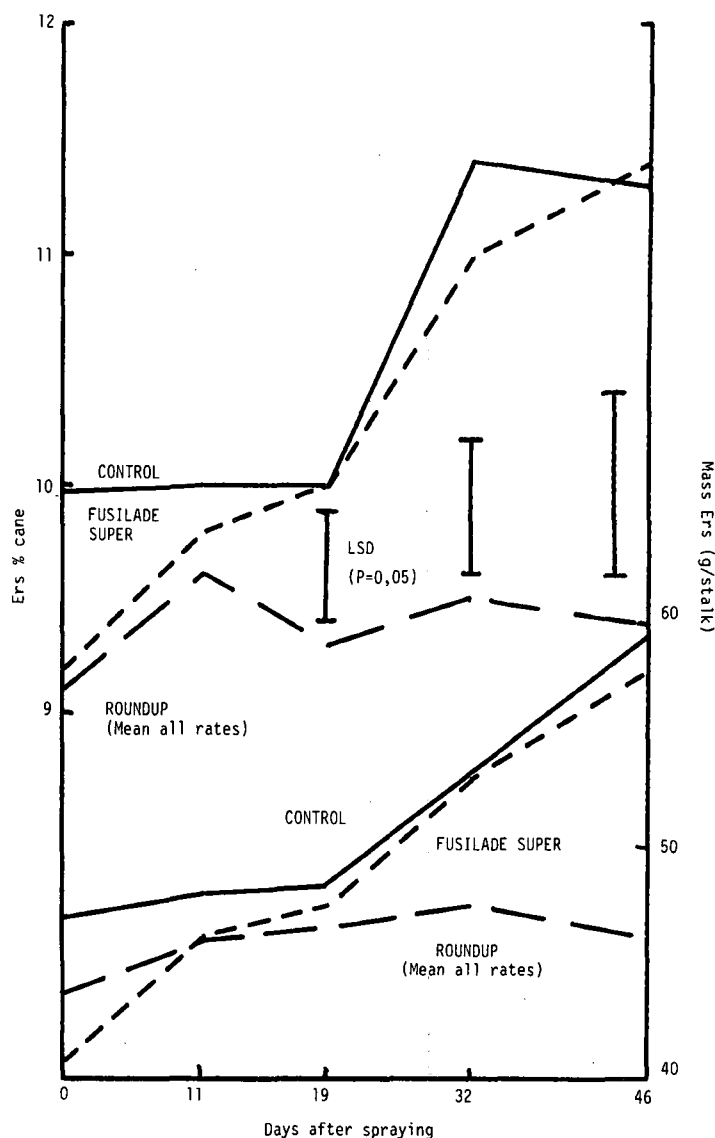


FIGURE 1 The effect on cane quality of pre-harvest spraying with Fusilade Super or Roundup in Experiments 2 and 3.

Results from Experiments 2 and 3 showed that stressed crops should be harvested within two weeks of spraying or there would be a loss of sucrose relative to untreated cane. Neither Roundup or Fusilade Super had any beneficial effect on cane quality, although both are effective chemical ripeners when applied under the correct conditions (Clowes,¹ Rostron³). This was probably because most of the crops were either suffering from moisture stress or were too old to respond when treated. Young, well grown plant crops were harvested too soon after spraying for ripening to have occurred.

The hoe unit method of assessment exaggerated the amount of regrowth, when expressed as a percentage, but in most experiments there were ultimately too many new ratoon shoots to be removed easily during normal cultivation operations. There may be some limited circumstances where this practice is acceptable in order to re-establish a new crop quickly (de Robbillard).² However, the pre-harvest application of Roundup should be considered only where a plough-out crop is on a poor soil, is very poorly grown, and the farmer is prepared to remove all regrowth before the shoots become fully re-established.

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