A NEW HERBICIDE FOR SHORT TERM WEED CONTROL IN SUGARCANE

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Abstract

Impi,* a formulated mixture of chlormesulone and diuron, was evaluated for pre-emergence and post-emergence weed control in sugarcane. A total of 28 trials were carried out on several cane varieties on soil types having a range of clay contents. Early post-emergence treatment gave the best control over a wide range of broadleaf weeds and some grasses, with control lasting for at least 42 days. Weed control was equivalent to that obtained with Actril DS + diuron, a standard mixture used in the sugar industry for a number of years. There were no phytotoxic symptoms on either plant or ratoon cane and there was no adverse effect on cane yield in one phytotoxicity trial, confirming results obtained by the South African Sugar Association Experiment Station.

Introduction

Weeds continue to be a major problem in cane fields. Control of current problem weed species reduces competition and allows other problem weeds to develop. A further complication is the voluntary ban on the use of hormonal herbicides, such as 2,4-D, following damage to vegetable crops in the Tala valley, near Eston (Upton, 1988).

Before this voluntary ban, short term hormone mixtures, such as Actril DS + diuron, were the most widely used treatments in plant and ratoon cane. Herbicides currently used for post-emergence weed control tend to be less effective than Actril DS + diuron, necessitating some hand weeding and increasing the cost per hectare (Turner, 1989).

Impi (previously coded ICIA0051), belongs to the triketone chemical group (Purnell, 1991), and is a selective herbicide in sugarcane. It is formulated as a suspension concentrate and may be applied as a pre-emergence spray, although it is more active when applied soon after emergence. The formulated product contains a mixture of 150 g/l chlormesulone and 300 g/l diuron. The application of 3,3 l per hectare has proved to be effective for the control of a wide range of dicotyledonous and some monocotyledonous weeds. The results of a large number of trials are presented.

Materials and Methods

Twenty eight efficacy trials and one phytotoxicity trial were carried out during the past three seasons. Experiments were conducted throughout the cane growing areas of South Africa and Swaziland, and covered a wide range of varieties (Table 1). Soil clay content of the trial sites ranged from 6 to 50%; trials were evenly distributed over the range of clay contents.

In the efficacy trials various rates of chlormesulone, ranging from 250-750 g ai/ha in combination with diuron at rates of 500 g to 2 kg ai/ha, were compared with a standard treatment of 1,25 l/ha Actril DS (containing 750 g ai/ha, 2,4-D iso-octyl ester and 125 g ai/ha ioxynil) plus 2,5 l/ha Diuron 800 SC (containing 2 kg ai/ha diuron). Treatments were applied in most trials at the two to six leaf stage for broadleaf weeds, before tillering of the grasses and before flowering of the sedges. Chemicals were applied with a knapsack sprayer fitted with an Albuz APM floodjet nozzle, calibrated to apply between 250 and 300 l/ha. Treatments were replicated four times, with each plot comprising of three treated interrows with an untreated interrow on either side for comparison.

Table 1

Grouping of trials according to area and variety

Area	Number of trials	Variety	Number of trials
		NCo376	8
South coast and Midlands	7	N12	7
North coast and Swaziland	11	N11	2
Eastern Transvaal	10	N55/805	1
		N14	10

The phytotoxicity trial was conducted on a ratoon crop of variety N14 to compare results obtained by the Experiment Station. Chlormesulone at either 750 g ai/ha + 2 kg ai/ha diuron or at double these rates were sprayed over the cane row when the crop had five to six leaves. This was compared with both a standard treatment of 1,25 l/ha Actril DS + 2,5 kg l/ha Diuron 800 SC, and a hand weeded control treatment. The treatments were replicated six times. Plot size was five rows of 10 m, with the inner three rows forming the nett plot.

Method of assessment

In efficacy trials individual weed species were assessed at fortnightly intervals, and rated by estimating the percentage control compared with the adjacent untreated areas. Assessments were made until 60 days after application (DAA) in coastal areas and until 42 DAA in irrigated areas. All trials were assessed for phytotoxic symptoms.

In the phytotoxicity trial cane was visually assessed for leaf scorch, chlorosis or stunting, and for shoots killed. Shoot heights and populations were measured three months after treatment. The experiment was harvested after 12 months to determine the effect on yield.

Results

A combination of 500 g ai chlormesulone + 1000 g ai diuron (3,3 l/ha), appeared to be the most economic, and therefore results for this rate only will be presented. Although acceptable weed control was observed up to 50 DAA in most experiments, 42 DAA results are presented as this was in most cases the final recorded assessment date in irrigated areas. Control of individual weeds, expressed as a percentage of control in adjacent unsprayed areas, is compared with results for a standard treatment of 1,25 l/ha Actril DS + 2,5 l/ha Diuron 800 SC.

Table 2 shows the results obtained for weeds that occurred in more than one trial. Results in Table 3 refer to weeds that occurred in only one trial.

* Impi is the registered trade mark of ICI Agrochemicals Plc

Table 2

Weeds present in more than one experiment. Percentage control 42 days after treatment

Botanical name	Common Name	Impi	Actril DS + Diuron	No. of trials
Broadleaf weeds				
Acceptable control				
Chenopodium album	White goosefoot	100	93	2
Convolvulus arvensis	Field bindweed	100	100	2
Flaveria bidentis	Smelter's bush	100	93	2
Solanum nigrum	Black nightshade	100	100	2
Schkuhria pinnata	Dwarf marigold	100	96	2
Ageratum conyzoides	Invading Ageratum	99	94	5
Argemone subfusiformis	Mexican poppy	99	98	3
Acalypha ecklonii		98	99	2
Amaranthus thunbergii	Red pigweed	98	100	3
Cyclospermum leptophyllum	Lawn celery	98	97	2
Amaranthus spinosus	Thorny pigweed	97	96	3
Portulaca oleracea	Purslane	96	99	7
Commelina benghalensis	Wandering jew	93	70	3
Control not acceptable				
Euphorbia hirta	Red milkweed	87	91	2
Datura ferox	Large thorn apple	86	83	2
Bidens pilosa	Common black jack	83	85	6
Grasses				
Acceptable control				
Digitaria sanguinalis	Crab finger-grass	100	100	2
Eleusine indica	Goose grass	97	96	2
Brachiaria eruciformis	Sweet signal grass	94	88	3
Panicum schinzii	Sweet buffalo grass	91	84	4
Control not acceptable				
Panicum maximum	Common buffalo grass	61	73	6
Sedges				
Control not acceptable				
Cyperus esculentus	Yellow nutsedge	83	72	13
Cyperus rotundus	Purple nutsedge	41	14	2

Table 3

Weeds present only once in the series of experiments. Percentage control 42 days after treatment

Botanical name	Common name	Impi	Actril DS + Diuron
Broadleaf weeds			
Acceptable control			
Amaranthus hybridus	Common pigweed	100	100
Coronopus didymus	Swinecress	100	100
Echinochloa colona	Marsch grass	100	100
Galinsoga parviflora	Gallant soldier	100	100
Nicandra physaloides	Apple-of-Peru	100	100
Physalis angulata	Wild gooseberry	100	100
Parthenium hysterophorus		100	100
Hibiscus trionum	Bladderweed	99	98
Ipomoea purpurea	Common morning-glory	96	96
Solanum aculeatissimum	Devil's apple	96	96
Acacia mearnsii	Black wattle	94	94
Sida cordifolia	Heartleaf Sida	93	93
Control not acceptable			
Helichrysum ruderale		84	87
Euphorbia heterophylla	Annual poinsettia	53	13
Grasses			
Acceptable control			
Urochloa panicoides	Herringbone grass	95	88
Control not acceptable			
Rottboellia cochinchinensis	Guinea-fowl grass	86	88
Sorghum bicolor subsp. *arundinaceum*	Common wild sorghum	67	90

Weed control was similar for Impi and Actril DS + diuron at the rates compared. Of the 40 weed species assessed, Impi gave better control of 18, equivalent control of 14, and less control of eight species than did Actril DS + diuron.

The treatments were similar in terms of acceptable control of the weeds assessed (90% control). Impi controlled *Commelina benghalensis* (Wandering jew), *Brachiaria eruciformis* (Sweet signal grass), *Panicum schinzii* (Sweet buffalo grass) and *Urochloa panicoides* (Herringbone grass) better than Actril DS + diuron. The latter treatment controlled *Sorghum bicolor* subsp. *arundinaceum* (Common wild sorghum) and *Euphorbia hirta* (Red milkweed) better than Impi. Both treatments gave some control of *Panicum maximum* (Table 2) and *Rottboellia cochinchinensis* (Table 3), but neither gave acceptable control.

Table 4

Phytotoxicity assessments on variety N14

Treatment	Shoot heights (cm)	Shoot counts per plot	Cane yield (%)
Hand weeded control	48	241	100
Impi standard rate	51	268	98
Impi double rate	50	344	128
Actril DS + diuron standard rate	52	291	127
Actril DS + diuron double rate	49	251	101

Impi standard rate 500 g ai chlormesulone + 1 kg ai diuron/ha **Actril DS + diuron** standard rate 875 g ai + 2 kg ai/ha

Measurements done 104 days after treatment. Cane harvested 353 days after treatment.

There were no signs of phytoxicity due to treatments with Impi in any of the trials and, despite the variability of data, results for the phytotoxicity trial in Table 4 show that there were no adverse effects on either crop growth or cane yield, even at double rates of Impi application.

Discussion and conclusions

At the rates tested, Impi controlled a wide range of broadleaf and grass weeds at least as well as the standard spray of Actril DS + diuron, for a period of at least 6 weeks after application. There was no evidence of phytotoxic effects on variety N14 in respect of either cane growth or cane yield, confirming similar results obtained with variety NCo376 at the Experiment Station (Anon, 1990). It may be concluded therefore that Impi is a suitable replacement for Actril DS + diuron for post-emergent weed control in sugarcane. Application has been made for the registration of Impi for use in cane crops.

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