BUREAU OF SUGAR EXPERIMENT STATIONS

BUNDABERG, AUSTRALIA

HERBICIDE PHYTOTOXICITY SCREENING

CENTRAL/SOUTHERN QUEENSLAND VARIETIES

1988 SEASON

by

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Bundaberg

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1. INTRODUCTION

This report summarises the results of the three sugarcane phytotoxicity trials conducted on the Sugar Experiment Station, Bundaberg during 1988. Twelve approved, or promising varieties, from the central and southern districts were oversprayed with a total of 33 herbicide x growth stage treatments. Visual assessments of effect was carried out over a period of up to 138 days following spraying.

The results of these trials should be taken as a guide only due to variations in weather pattern and microclimate from district to district.

2. MATERIALS AND METHODS

2.1 Varieties

The varieties evaluated were Q110, Q117, Q121, Q145, Q146, CP51-21, 72S24, 74S1109, 76S1483, 77S1199, 77S1540, and 73S1121. Due to variability in growth rate not all varieties were at the same height when sprayed but the differentials should not have been so great as to have caused a significant difference in treatment effect.

2.2 Treatments

The treatments applied, the rates used and time of application are shown in Appendix I. The herbicides screened were restricted to those most commonly used at present due to limitations on space available for the trials. Herbicides were evaluated at three growth stages of sugarcane - pre-emergent, early post-emergent and late post-emergent.

2.3 Trial design

All trials were single plots with the only form of replication being a progression in rate of herbicide, in most instances.Plots were double row x 4m in length with an unsprayed control row every fifth row, where space permitted, to ensure an untreated control abutted every treatment.

2.4 Application

All three sprayings were made using a small plot precision sprayer using two brass 110-200 fan jets per row for the pre-emergent, at a rate of 340 L/ sprayed hectare, and two plastic 02 110 fan jets per row for the early and late post-emergent treatments, at a rate of 280 L/ sprayed hectare. All sprayings were done so as to only spray the cane/drill area, not the interrow. Spraying for early post-emergent application was made directly over the top of the young cane while for the late post-emergent application spraying was made from the side of the stool spraying from ground level to about 60cm up the cane plant. Application details and growth stages at spraying are given in Appendices II and IV respectively .

At planting the setts were covered with 8 cm of a krasnozem soil type. The trifluralin and pendimethalin treatments were soil incorporated following application with a Cotton King implement to a depth of approximately 2 cm.

2.5 Assessments

Visual assessments of cane growth following spraying were made using the scale 0 to 10 where :

0 = no effect
>3 = unacceptable crop damage
10 = complete kill

See Appendix III.

2.6 General comments

Irrigation/rainfall is recorded in the following table :

TABLE I

Irrigation/rainfall
(mm)

Treatment	Weeks post-treatment											
	1	2	3	4	5	6	7	8	9	10	11	12
pre-emergent	145	15	16	0	58	0	25	18	3	99	10	0
early post	0	25	18	3	99	10	1	2	84	3	3	0
late post	3	0	75	0	0	75	0	13	10	0	0	0

3. RESULTS

3.1 Pre-emergent treatments (Table II)

Overall, the herbicide treatments had no effect on cane growth. There was no visual effect on germination due to herbicide treatments apart from a slight treatment effect with Q121 in response to trifluralin at 1.6 kg a.i./ha.. Trifluralin, at this rate, also had a slight effect on variety 76S1483 while pendimethalin at 1.0 kg a.i./ha. showed some minor treatment effects on varieties Q146 and Q121. However, these effects were only slight and short lived. A lesser covering of soil than the 80 mm applied over the setts at planting, or a sandier soil type may have resulted in a more pronounced or longer lasting damage in susceptible varieties.

TABLE II

Effect of Pre-Emergent Treatments on Sugarcane

Treatment	kg ai/ha	Q121				Q117				Q110				74S1109				72S24				73S1121			
		A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
diuron	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
diuron	3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
atrazine	4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hexazinone + diuron	0.53 + 1.87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
trifluralin	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
trifluralin	1.6	0	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
pendimethalin	1.0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
metolachlor + atrazine	1.66 + 1.34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
metolachlor + atrazine	2.77 + 2.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2,4-D (Na) Salt	3.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		77S1540				77S1199				76S1483				Q146				CP51-21				Q145			
		A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
diuron	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
diuron	3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
atrazine	4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hexazinone + diuron	0.53 + 1.87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
trifluralin	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
trifluralin	1.6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
pendimethalin	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
metolachlor + atrazine	1.66 + 1.34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
metolachlor + atrazine	2.77 + 2.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2,4-D (Na) Salt	3.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Planted 29/3/88

Sprayed 31/3/88

Evaluated A = 11/5/88 41 DAS C = 15/7/88 106 DAS

B = 27/5/88 57 DAS D = 15/8/88 138 DAS

DAS = Days after spraying

3.2 Early post-emergent treatments (Table III)

Varietal reactions were as follows :

. susceptible	77S1540, 76S1483, CP51-21, 73S1121, Q146
. intermediate	72S24, 77S1199
. tolerant	Q145, Q121, Q117, Q110, 74S1109

Those varieties showing greatest herbicide damage eventually grew out of the symptoms although in the more severe cases the stand appeared smaller with less stooling and probably would result in some yield loss if carried through to harvest.

Treatments most phytotoxic were diuron, hexazinone/diuron, and, to a lesser extent, the ametryne/atrazine mixtures with the greater effects being shown at the higher rates .

3.3 Late post-emergent treatments (Table IV)

Late post-emergent treatments were applied to cane which was well established , with most varieties approaching one metre in overall height. Despite the dry conditions immediately following spraying , phytotoxic symptoms began appearing within one week of spraying.

Some of the phytotoxic symptoms were beginning to grow out of the cane following irrigation applied three weeks post spraying. Treatments most phytotoxic were diuron (mainly at high rates), hexazinone/diuron (both rates) and msma/diuron (at high rates).

Varieties showing unacceptable damage and therefore classed as susceptible were CP51-21, 73S1121 , Q146 , 77S1199. Two varieties, 77S1540 and 72S24, showed a high susceptibility to the MSMA+diuron mixture at the higher rate but were rated only intermediate to the rest of the treatments.

The most susceptible varieties appeared healthy enough in general following the final assessment , though compared with the control rows , yield losses would be likely due to reduced stooling in the treated rows.

Varietal reactions were :

susceptible	CP51-21, Q146, 73S1121, 77S1199
intermediate	76S1483, 77S1540, 72S24
tolerant	Q121 , Q117 , Q110 , Q145 , 74S1109

The phenoxy acid treatments caused no visual phytotoxic effects either alone or in combination .

TABLE III

Effect of Early Post-Emergent Treatments on Sugarcane

Treatment	kg ai/ha	Q121				Q117				Q110				74S1109				72S24				73S1121			
		A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
diuron	2.5	1	1	2	0	1	1	0	0	2	2	1	0	1	1	1	1	2	2	3	1	3	3	3	2
diuron	3.5	2	1	1	0	1	1	1	1	1	2	1	0	1	1	1	1	2	3	2	1	2	3	3	1
atrazine	4.0	0	1	1	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
ametryne + atrazine	1 + 1	1	1	1	0	1	0	0	0	0	1	1	0	0	0	0	0	1	1	2	0	1	1	1	2
ametryne + atrazine	2 + 2	1	1	1	0	0	0	0	0	1	1	0	0	0	0	1	0	1	1	1	0	1	1	1	1
hexazinone + diuron	0.4 + 1.4	1	1	1	1	1	0	0	0	1	1	0	1	0	1	1	1	2	1	1	1	2	2	2	2
hexazinone + diuron	0.66 + 2.34	2	2	2	1	1	1	1	1	1	2	2	1	2	2	2	1	2	3	2	2	2	2	2	4
metolachlor + atrazine	1.66 + 1.34	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
metolachlor + atrazine	2.77 + 2.23	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
atrazine + 2,4-D (iso-oct. ester)	2 + 0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0

		77S1540				77S1199				76S1483				Q146				CP51-21				Q145			
		A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
diuron	2.5	2	3	3	4	1	2	1	0	2	3	2	1	2	3	3	4	2	3	2	1	1	1	1	0
diuron	3.5	2	3	3	4	1	1	0	0	2	2	2	1	2	3	3	4	2	3	3	3	1	2	2	1
atrazine	4.0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ametryne + atrazine	1 + 1	1	2	2	1	1	1	1	0	1	1	1	0	2	2	1	0	1	1	1	0	0	0	1	0
ametryne + atrazine	2 + 2	2	1	1	1	1	1	0	0	2	1	1	0	2	2	1	0	1	2	1	0	1	0	0	0
hexazinone + diuron	0.4 + 1.4	2	2	2	2	1	2	1	0	1	2	1	0	2	3	3	2	1	2	1	0	2	1	1	1
hexazinone + diuron	0.66 + 2.34	2	3	3	4	3	3	3	1	2	3	3	5	3	3	3	3	2	3	3	3	1	1	2	1
metolachlor + atrazine	1.66 + 1.34	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
metolachlor + atrazine	2.77 + 2.23	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
atrazine + 2,4-D (iso-oct. ester)	2 + 0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Planted 29/3/88

Sprayed 6/5/88

Evaluated A = 20/5/88 14 DAS
B = 1/6/88 33 DAS
C = 28/6/88 60 DAS
D = 15/8/88 108 DAS

DAS = Days after spraying

TABLE IV

Effect of Late Post-Emergent Treatments on Sugarcane

Treatment	kg ai/ha	Q121				Q117				Q110				74S1109				72S24				73S1121			
		A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
diuron	2.5	0	0	0	0	1	0	0	0	1	0	0	0	2	1	1	1	1	0	0	0	3	2	2	1
diuron	3.5	1	1	1	1	2	2	2	2	1	1	2	2	2	0	0	0	2	1	1	1	3	4	4	5
atrazine	4.0	1	0	0	0	2	0	0	0	1	0	0	0	1	1	1	2	1	0	0	0	1	1	1	1
ametryne + atrazine	2 + 2	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	2	1	0
ametryne + atrazine + 2,4-D (iso-oct. ester)	2 + 2 + 0.5	0	0	0	0	1	0	0	0	1	1	1	0	2	1	0	0	1	0	0	0	2	0	0	0
hexazinone + diuron	0.4 + 1.4	1	1	0	0	2	1	1	0	2	1	1	0	1	1	1	1	2	0	0	0	3	4	3	3
hexazinone + diuron	0.66 + 2.34	2	1	0	0	2	1	1	1	2	1	1	0	2	1	1	0	1	1	2	3	3	3	2	4
msma + diuron	2.4 + 1.5	2	2	2	1	1	0	0	0	0	2	1	0	0	1	1	1	0	0	1	1	0	1	1	1
msma + diuron	4.8 + 1.5	2	2	2	1	2	1	0	1	2	2	2	2	2	2	2	1	5	5	5	5	3	3	3	4
ioxynil + 2,4-D	0.2 + 1.2	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
2,4-D amine	2.2	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
atrazine + 2,4-D (iso-oct. ester)	2 + 0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
picloram + 2,4-D amine salt	0.225+ 0.9	1	0	0	0	0	0	0	0	0	0	0	0	1	1	2	1	1	0	0	0	0	0	0	0

Treatment	kg ai/ha	77S1540				77S1199				76S1483				Q146				CP51-21				Q145			
		A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
diuron	2.5	3	2	2	2	1	3	2	0	-	-	-	-	2	3	2	1	2	3	3	3	1	1	1	0
diuron	3.5	3	3	3	2	3	3	4	5	2	2	3	3	3	4	4	5	2	3	4	5	1	1	2	2
atrazine	4.0	1	0	0	0	1	0	1	1	1	1	2	2	1	0	0	0	1	0	0	0	0	0	1	0
ametryne + atrazine	2 + 2	2	1	1	1	2	2	1	0	1	0	0	0	2	1	0	0	2	1	1	1	1	0	0	0
ametryne + atrazine + 2,4-D (iso-oct. ester)	2 + 2 + 0.5	2	0	0	0	2	1	1	1	2	1	0	0	2	1	0	0	1	1	0	0	1	0	0	0
hexazinone + diuron	0.4 + 1.4	2	2	2	1	3	3	3	3	1	1	2	1	3	4	4	4	1	2	2	3	2	1	1	0
hexazinone + diuron	0.66 + 2.34	3	2	2	2	2	3	3	4	2	2	2	2	2	3	3	3	3	4	4	5	2	1	1	1
msma + diuron	2.4 + 1.5	1	2	2	2	1	2	1	1	-	-	-	-	2	2	2	2	0	2	2	1	0	0	1	0
msma + diuron	4.8 + 1.5	4	4	4	4	2	2	3	2	2	2	1	1	1	2	2	1	4	3	4	4	2	2	2	2
ioxynil + 2,4-D	0.2 + 1.2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2,4-D amine	2.2	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0
atrazine + 2,4-D (iso-oct. ester)	2 + 0.5	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
picloram + 2,4-D amine salt	0.225+ 0.9	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Planted 29/3/88
Sprayed 19/7/88

Evaluated A = 2/8/88 14 DAS
B = 26/8/88 38 DAS
C = 8/9/88 51 DAS
D = 3/10/88 76 DAS

DAS = Days after spraying
- = None planted - CP44-101 fill-in

APPENDIX I

Treatment/herbicide	Rate kg a.i./ha	Timing		
		Pre	Early-Post	Late Post
diuron	2.5	*	*	*
diuron	3.5	*	*	*
atrazine	4.0	*	*	*
hexazinone + diuron	0.53 + 1.87	*		
ametryne + atrazine	1 + 1		*	
ametryne + atrazine	2 + 2		*	*
ametryne + atazine + 2,4-D iso-oct.	2 + 2 + 0.5			*
hexazinone + diuron	0.4 + 1.4		*	*
hexazinone + diuron	0.66 + 2.34		*	*
trifluralin	1.0	*		
trifluralin	1.6	*		
pendimethalin	1.0	*		
metolachlor + atrazine	1.66 + 1.34	*	*	
metolachlor + atrazine	2.77 + 2.33	*	*	
2,4-D (Na) salt	3.9	*		
msma + diuron	2.4 + 1.5			*
msma + diuron	4.8 + 1.5			*
ioxynil + 2,4-D	0.2 + 1.2			*
2,4-D amine	2.2			*
atrazine + 2,4-D iso-oct.	2 + 0.5		*	*
picloram + 2,4-D amine salt	0.225 + 0.9			*

(All post-emergent treatments included surfactant)

APPENDIX II

Treatment	Date	Temp.°C	Soil surface moisture
planted	29.03.88	22	good
pre-emergence	31.03.88	20	good
early post	06.05.88	16	good
late post	19.07.88	15	dry

APPENDIX III

Ratings should be standardised to the following table :

Rating	Description of main categories	Detailed description
0	No effect	No crop reduction or injury
1		Slight crop discolouration or stunting
2	Slight effect	Some crop discolouration or stunting or stand loss
3	Acceptable crop safety	Crop injury more pronounced but not lasting
4	Unacceptable crop damage	Moderate injury, crop usually recovers
5	Moderate effect	Crop injury more lasting, recovery doubtful
6		Lasting crop injury, no recovery
7		Heavy crop injury and stand loss
8	Severe effect	Crop nearly destroyed, few surviving plants
9		Only occasional live plants
10	Complete effect	Complete crop destruction

APPENDIX IV

Growth stage at time of spraying

Variety	Early Post			Late Post		
	Average Ht. to top of leaves of primary shoot (cm)	TVD (cm)	Growth stage	Average Ht. of top of leaves of primary shoot (cm)	TVD (cm)	Growth stage
CP51-21	38	7	3 leaf	85	21	Stooling
73S24	33	8	3-4 leaf	70	20	Stooling
73S1121	30	6	2-3 leaf	55	16	Stooling
74S1109	32	7	2-3 leaf	115	31	Stooling
76S1483	38	7	3 leaf	120	22	Stooling
77S1199	32	6	3-4 leaf	80	22	Stooling
77S1540	33	6	3-4 leaf	95	30	Stooling
Q110	37	5	3-4 leaf	95	17	Stooling
Q117	37	6	2-3 leaf	70	12	Stooling
Q121	32	7	2-3 leaf	85	23	Stooling
Q145	47	10	3-4 leaf	100	24	Stooling
Q146	35	7	3-4 leaf	80	19	Stooling