BUREAU OF SUGAR EXPERIMENT STATIONS
QUEENSLAND, AUSTRALIA

PROJECT REPORT
HERBICIDE EFFICACY SCREEN
NORTH QUEENSLAND
1986 SEASON

by

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Project 209.00.001

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CONTENTS

INTRODUCTION.

In 1984 a wide range of herbicide treatments were evaluated against a number of weed species. Results demonstrated the weakness and strengths of various products, and the optimum timing of application. To further improve the knowledge of currently registered herbicides and of those which may have some potential for use in cane, another series of trials were laid down in 1986.

METHODS AND MATERIALS.

A. Treatments.
Standard treatments are listed in Appendix I.
Coded and Unregistered products are shown in Appendix II.

B. Weed species.

		Bayer Code
Grasses		
Brachiaria miliiformis	Green Summer grass	BRAMI
Echinochloa colonum	Barnyard grass	ECHCO
Eleusine indica	Crowsfoot grass	ELEIN
Broadleaves		
Centrosema pubescens	Centro	CENPU
Cleome aculeata	Spiny Spider flower	CLEAC
Ipomoea hederifolia	Red convolvulus	IPOHE
Ipomoea triloba	Pink Convolvulus	IPOTR
Mimosa invisa	Giant Sensitive weed	MIMIN
Spermacoce latifolia	Square weed	SPELA
Urena lobata	Pink burr	URELO

Panicum maximum, Digitaria ciliaris, Ageratum spp and *Calopogonium mucunoides* were planted but failed to germinate.

C. Trial Design.
Consecutive plot with no replication. Increase in chemical rate was used as a form of replication. Plot size consisted of 3 rows per species each 1.0m long. Row spacing was 15 cm.

D. Application Details.
Treatments were applied with a motorized small plot sprayer fitted with a 1m boom consisting of 2 x 8002E nozzles operating at 200 kPa and delivering 351.4 l/ha.
Treatment dates and general weather conditions were;

Treatment Timing	Date	Soil Moisture Top/5 cm	Temp	RH	Wind
Pre-emergent					
PPI*	22/9/86	Dry/Moist	29	75	Nil
Pre	23/9/86	Dry/Moist	29	75	Nil
Post-emergent					
Early	12/10/86	Dry/Moist	27	75	Nil
Late	9/11/86	Dry/Moist	30	85	Nil

* Treatments incorporated by rotary hoe to a depth of 10 cm.

Growth stage at time of treatment;

Weed species	Early Post	Late Post
Brachiaria miliiformis	2 leaf 6 cm	30 cm
Echinochloa colonum	2 till 8 cm	25 cm
Eleusine indica	5 leaf 3 cm	20 cm
Centrosema pubescens	1 true leaf 4 cm	25 cm
Cleome aculeata	2 leaf 3 cm	40 cm
Ipomoea hederifolia	1 true leaf 3 cm	40 cm
Ipomoea triloba	cotyledon 2 cm	50 cm
Mimosa invisa	2 trifoliate 3 cm	30 cm
Spermacoce latifolia	2 leaf 2 cm	4 leaf 4 cm
Urena lobata	2 leaf 4 cm	22 cm

All treatment were irrigated within 24 hours of application. Weather details and amount of irrigation applied are shown in Appendix III.

E. Assessments.
Assessment of plant growth (G) was made on a 0 to 10 basis where;

Rating	Description of main categories	Detailed description
0	NO EFFECT	No weed control No crop damage
1		Very poor weed control Slight crop discoloration or stunting
2	SLIGHT EFFECT	Poor weed control Some crop discoloration or stunting or stand loss
3	Acceptable crop safety	Poor to deficient weed control Crop injury more pronounced but not lasting
4	Unacceptable crop safety	Deficient weed control Moderate injury, crop usually recovers.
5	MODERATE EFFECT	Deficient to moderate weed control. Crop injury more lasting, recovery doubtful.
6	Unacceptable weed control	Moderate weed control Lasting crop injury, no recovery
7	Acceptable weed control	Weed control satisfactory Heavy crop injury and stand loss
8	SEVERE EFFECT	Satisfactory to good weed control Crop nearly destroyed, few surviving plants.
9		Very good to excellent weed control Only occasional live plants
10	COMPLETE EFFECT	Complete weed and crop destruction

Pre-emergent treatments were also assessed on % stand reduction (S) on a 0 to 10 scale

Assessment dates and Growth stage at time of assessment are shown in Appendix IV.

RESULTS.

A. Standard Treatments.

Pre-emergent Treatments. Table 1.

Incorporated Treatments of trifluralin provided excellent grass activity. Some short term control of *S. latifolia* and *I. hederifolia* was also evident.

The comparison between incorporated and non incorporated treatments of atrazine, highlighted the dilution effect of incorporation on atrazine. This was particularly evident against grasses. Pre plant incorporated atrazine at 2.0 kg ai/ha displayed limited grass activity, but post plant non incorporated applications gave 36 days control of *B. miliiformis, E. colonum* and 70 days control of *E. indica.* Pre plant incorporated applications at 4.0 kg ai/ha only successfully controlled *E. indica,* but when non incorporated, total grass control for 70 DAT was achieved. Both rates and means of application provided total broadleaf control, except for *I. triloba* which was the only broadleaf to escape control 70 DAT with incorporated applications 2.0 kg ai/ha.

When trifluralin and atrazine were combined as an incorporated treatment, total weed control was achieved, except again for *I. triloba* 70 DAT at the low rate of atrazine.

The addition of ametryn to atrazine, only slightly increased the spectrum of control of atrazine by controlling *E. colonum. B. miliiformis* still escaped control.

MCPA provided excellent short term control of all weeds, however by 70 DAT, the product failed to control *B. miliiformis, M. invisa, I. triloba* and *U. lobata.*

Significant dose responses were exhibited by diuron in terms of residual control and also number of species controlled. At 1.5 kg ai/ha a poor spectrum of activity was achieved, with only 5 of the 10 weeds controlled. Good grass activity was evident at the high rate of 3.5 kg ai/ha. Broadleaf weeds, which appear to be relative tolerant to diuron are *I. triloba, C. pubescens* and *U. lobata.* All are large seeded weeds. Similarly *B. miliiformis* would appear to be the more tolerant grass species.

Hexazinone/diuron at both rates provided complete weed control.

Metribuzin at rates above 1.0 kg ai/ha also displayed excellent activity. At the low rate *E. colonum* and *C. pubescens* escaped control 70 DAT.

Early Post Emergent. Table 2.

Diuron at 1.5 kg ai/ha provided limited activity, controlling only *S. latifolia, C. aculeata* and *M. invisa* by 40 DAT. At 2.5 and 3.5 kg ai/ha, the only species to escape was *E. colonum*. All other weeds were controlled for at least 53 days.

Atrazine alone at both rates gave total broadleaf control. Results against grasses were variable, and unable to explain. When summer oil was combined with atrazine, there was a slight increase in activity against grasses, but possibly insufficient to justify it's use. No increase in efficacy was evident against broadleaves.

Atrazine/ametryn displayed excellent knockdown and residual control, with only *E. colonum* escaping 53 DAT.

Excellent knockdown and residual control was provided with both rates of hexazinone/diuron. Similarly metribuzin exhibited good activity, however as in pre-emergent treatments at 1.0 kg ai/ha, *E. colonum* proved tolerant.

Paraquat at both rates of 0.2 and 0.3 kg ai/ha exhibited good knockdown of *B. miliiformis, E. indica, C. aculeata, M. invisa* and *I. hederifolia*, but only limited activity against other species.

Late Post Emergent. Table 3.

Late post treatments were applied beyond the optimum growth stage, and could be considered to be out-of-hand treatments.

Excellent broadleaf activity was exhibited by the 3 treatment containing atrazine. The addition of ametryn slightly increasing the grass activity, but plants were too advanced to be successfully controlled.

I. hederifolia was the only weed to be controlled by paraquat at 0.3 kg ai/ha and *C. aculeata, M. invisa, I. triloba* and *C. pubescens* also controlled at 0.4 kg ai/ha. Limited grass activity was achieved.

By 24 DAT, 2,4-D amine had controlled all broadleaves.

DISCUSSION.

A. Summary of Registered Herbicides. Table 7, 8 and 9.

In an overall comparison of efficacy of products, consider Table II and the overhead transparency.

Atrazine at 2.0 kg ai/ha or more displayed excellent broadleaf activity, when applied pre, early or late post emergent. At 3.0 kg ai/ha or greater as a pre-emergent treatment, it also provided short term annual grass control. ie. Digitaria Eleusine Echinochloa. Incorporation of atrazine at 2.0 kg ai/ha, significantly decreased grass activity, but because of optimum conditions displayed excellent broadleaf control.

To obtain the optimum broadleaf performance out of diuron, results indicated, applications should be made early post emergent. As grasses become more advanced, efficacy decreases, but against broadleaves the growth stage of application is less critical. Weeds which are very susceptible to diuron are Eleusine, Cleome and I. hederfolia, but Brachiaria, Digitaria, Calopogonium, Centrosema, Spermacoce and Urena appear relatively tolerant.

Both early and late post emergent applications of ametryn, displayed good broadleaf and grass control. Broadleaf activity was less than that of atrazine or diuron, whilst grass control was greater than atrazine but slightly less than diuron. Ametryn is particularly active against Echinochloa, and as with atrazine, Calopogonium proved difficult to control.

24-D Na salt traditionally performs better under dry conditions than under wet conditions, as were experienced in this trial. 24-D Na salt was inactive against grasses at all timings of application, similarly, poor pre-emergent activity against broadleaves was evident. Acceptable post emergent activity was displayed against broadleaves at both timings, but activity was less than atrazine or diuron.

Early post applications of paraquat, provided quick knockdown of most grasses, particularly Panicums. But because of lack of residual activity, control quickly broke down. A similar trend was evident with late post emergent applications and again Panicums were very sensitive, whilst Echinochloa and Eleusine relatively tolerant. Only limited broadleaf activity was achieved.

MSMA gave variable knockdown of both broadleaves and grasses. This variability can, in part, be attributed to post application of irrigations and associated high humidity, providing conditions not favourable for MSMA activity.

Both pre and post emergent applications of ametryn/atrazine, provided excellent broadspectrum weed control. Early post applications were slightly more active than pre-emergent treatments. Activity displayed by the combination was above that achieved with individual components. Whilst excellent broadleaf control was exhibited with late post applications, very limited grass control was achieved, high-lighting the importance of correct timing of application of the product with regards to grass

Paraquat/atrazine. The excellent broadleaf activity of atrazine was maintained at both timings, whilst the combinations displayed substantially greater grass activity that individual components.

The addition of paraquat to diuron for early post treatments did not display any real advantage over diuron alone. But with late post treatments significantly greater grass activity was evident, particularly with diuron at 2.5 kg ai/ha.

The paraquat/diuron mixture provided slightly greater grass activity than the paraquat/atrazine mixture.

A diuron 2,4-D Na salt mixture did not appear to display any significant advantage over individual components.

Applied early post emergent, atrazine/2,4-D Na salt displayed greater annual grass control than individual components. Also broadleaf activity, when applied late post emergent was faster and more positive as evidenced by activity against Calopogonium.

Metribuzin both pre and early post emergent provided excellent broadleaf control, but activity against Brachiaria, Echinochloa and Panicums was limited. Eleusine was very sensitive.

EFFECT OF PRE EMERGENT TREATMENTS ON WEEDS.

Table 1.

Assessment Date: 11/10/86 18 DAT

Treatment		Rate	BRAMI		ECHCO		ELEIN		SPELA		CLEAC		MIMIN		IPOHE		IPOTR		CENPU		URELO	
		Kg ai/ha	S	G	S	G	S	G	S	G	S	G	S	G	S	G	S	G	S	G	S	G
trifluralin	ppi	1.12	10	10	10	10	10	10	7	3	4	5	0	0	10	10	0	0	0	0	0	0
	ppi	1.4	10	10	10	10	10	10	7	3	5	5	0	0	10	10	0	0	0	0	0	0
trifluralin +	ppi	1.12 + 2.0	9	3	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
atrazine	ppi	1.4 + 4.0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
atrazine ppi		2.0	3	3	6	3	0	5	10	10	10	10	10	10	10	10	10	10	10	10	10	10
atrazine pre		2.0	7	0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
atrazine ppi		4.0	3	3	10	10	3	6	10	10	10	10	10	10	10	10	10	10	10	10	10	10
atrazine pre		4.0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
atrazine + ametryn		2.0 + 2.0	5	2	10	10	10	10	10	10	10	10	10	10	10	10	8	0	10	10	9	2
MCPA		5.0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	0	1	6	2
diuron		1.5	5	2	5	3	10	10	10	10	10	10	10	10	10	10	0	0	0	0	6	2
		2.5	8	3	10	10	10	10	10	10	10	10	10	10	10	10	10	10	3	3	9	2
		3.5	9	3	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
hexazinone +		0.4 + 1.5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
diuron		0.5 + 1.9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
metribuzin		1.0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
		2.0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	0	10	10	10	10
		4.0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Assessment Date: 29/10/86 36 DAT

trifluralin		1.12	9	3	10	10	10	10	7	3	2	2	0	0	5	0	0	0	0	0	0	1
		1.4	10	10	10	10	10	10	6	4	3	2	0	0	3	0	0	0	0	0	0	2
trifluralin +		1.12 + 2.0	9	3	10	10	10	10	10	10	10	10	10	10	10	10	10	10	8	0	7	2
atrazine		1.4 + 4.0	9	3	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	2
atrazine ppi		2.0	3	0	4	0	0	0	10	10	10	10	10	10	10	10	7	0	9	0	7	1
atrazine pre		2.0	7	0	9	0	10	10	10	10	10	10	10	10	10	10	8	0	9	0	8	0
atrazine ppi		4.0	3	0	9	0	8	0	10	10	10	10	10	10	3	0	8	0	10	10	8	6
atrazine pre		4.0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	0	7	0
atrazine + ametryn		2.0 + 2.0	3	0	10	10	10	10	10	10	10	10	10	10	10	10	9	9	8	0	9	2
MCPA		5.0	8	0	10	10	10	10	10	10	10	10	10	10	10	10	7	6	0	0	6	2
diuron		1.5	2	0	3	0	10	10	10	10	10	10	10	10	10	10	0	0	0	0	6	0
		2.5	6	0	9	0	10	10	10	10	10	10	10	10	10	10	10	10	0	0	9	5
		3.5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	0	0	8	6
hexazinone +		0.4 + 1.5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	8	7
diuron		0.5 + 1.9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	7
metribuzin		1.0	9	0	9	0	10	10	10	10	10	10	10	10	10	10	9	3	10	10	8	6
		2.0	10	10	9	0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	8	7
		4.0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	0	9	8

EFFECT OF PRE-EMERGENT TREATMENTS ON WEEDS.

Table 1 cont.

Assessment Date: 18/11/86 56 DAT

Treatment	Rate	BRAMI		ECHCO		ELEIN		SPELA		CLEAC		MIMIN		IPOHE		IPOTR		CENPU		URELO	
	kg ai/ha	S	G	S	G	S	G	S	G	S	G	S	G	S	G	S	G	S	G	S	G
trifluralin	1.12	9	3	8	0	10	10	5	4	0	0	0	0	5	0	0	0	0	0	0	1
	1.4	10	10	9	0	10	10	6	4	3	0	0	0	3	0	0	0	0	0	0	2
trifluralin +	1.12 + 2.0	9	3	10	10	10	10	10	10	10	10	10	10	10	10	10	10	8	0	7	3
atrazine	1.4 + 4.0	9	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
atrazine ppi	2.0	3	0	4	0	0	0	10	10	10	10	10	10	10	10	7	0	8	0	7	1
atrazine pre	2.0	7	0	5	0	9	5	10	10	10	10	10	10	10	10	10	10	7	0	8	0
atrazine ppi	4.0	3	0	6	0	8	0	10	10	10	10	10	10	10	10	10	10	10	10	10	10
atrazine pre	4.0	7	4	7	0	10	10	10	10	10	10	10	10	10	10	10	10	8	0	9	2
atrazine + ametryn	2.0 + 2.0	3	0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	8	0	8	2
MCPA	5.0	7	0	9	5	10	10	10	10	10	10	7	5	10	10	7	6	0	0	5	0
diuron	1.5	2	0	3	0	10	10	9	6	10	10	8	5	10	10	0	0	0	0	5	0
	2.5	6	0	9	5	10	10	9	6	10	10	8	5	10	10	10	10	0	0	7	2
	3.5	10	10	10	10	10	10	9	6	10	10	10	10	10	10	10	10	4	0	8	3
hexazinone +	0.4 + 1.5	9	5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
diuron	0.5 + 1.9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
metribuzin	1.0	8	0	6	3	10	10	10	10	10	10	10	10	10	10	10	10	7	2	10	10
	2.0	9	0	9	4	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	4.0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Assessment Date: 2/12/86 70 DAT

trifluralin	1.12	9	0	7	0	10	10	3	0	0	0	0	0	2	0	0	0	0	0	0	0
	1.4	10	10	9	0	10	10	5	0	3	0	0	0	0	0	0	0	0	0	0	0
trifluralin +	1.12 + 2.0	9	3	10	10	10	10	10	10	10	10	10	10	8	0	5	0	8	0	7	3
atrazine	1.4 + 4.0	9	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
atrazine ppi	2.0	3	0	3	0	0	0	8	7	10	10	10	10	10	10	5	0	8	0	7	1
atrazine pre	2.0	6	0	5	0	9	0	10	10	10	10	10	10	10	10	8	0	6	0	7	0
atrazine ppi	4.0	3	0	6	0	8	0	10	10	10	10	10	10	10	10	8	0	10	10	8	0
atrazine pre	4.0	7	0	7	0	10	10	10	10	10	10	10	10	10	10	10	10	8	0	8	0
atrazine + ametryn	2.0+2.0	0	0	10	10	10	10	10	10	10	10	9	0	10	10	10	10	8	0	7	0
MCPA	5.0	6	0	9	0	10	10	10	10	10	10	6	0	10	10	3	3	0	0	5	0
diuron	1.5	0	0	0	0	10	10	9	6	10	10	7	0	10	10	0	0	0	0	5	0
	2.5	6	0	8	0	10	10	8	5	10	10	7	0	10	10	5	0	0	0	5	0
	3.5	10	10	10	10	10	10	9	6	9	7	9	0	10	10	6	0	4	0	7	0
hexazinone +	0.4 + 1.5	9	0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
diuron	0.5 + 1.9	10	10	9	0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	8
metribuzin	1.0	8	0	6	0	10	10	10	10	10	10	10	10	10	10	10	10	6	0	8	3
	2.0	9	0	9	0	10	10	10	10	10	10	10	10	10	10	10	10	9	0	9	3
	4.0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	5

EFFECT OF EARLY POST EMERGENT TREATMENTS ON WEEDS.

Table 2.

Assessment Date: 22/10/86 10 DAT.

Treatment	Rate kg ai/ha	BRAMI G	ECHCO G	ELEIN G	SPELA G	CLEAC G	MIMIN G	IPOHE G	IPOTR G	CENPU G	URELO G
diuron	1.5	7	0	1	10	10	10	2	2	8	6
	2.5	10	5	10	10	10	10	10	10	10	10
	3.5	10	10	10	10	10	10	10	10	10	10
atrazine + ametryn	2.0 + 2.0	9	10	10	10	10	10	10	10	10	10
atrazine	2.0	6	6	10	10	10	10	10	10	10	10
	4.0	6	8	8	10	10	10	10	10	10	10
atrazine +	2.0 + 5.5	7	7	9	10	10	10	10	10	10	10
summer oil	4.0 + 5.5	6	7	10	10	10	10	10	10	10	10
hexazinone +	0.4 + 1.4	10	10	10	10	10	10	10	10	10	10
diuron	0.5 + 1.9	10	10	10	10	10	10	10	10	10	10
metribuzin	1.0	10	7	10	10	10	10	10	10	10	10
	2.0	9	9	10	10	10	10	10	10	10	10
	4.0	10	10	10	10	10	10	10	10	10	10
paraquat	0.2	10	5	10	5	10	10	10	5	2	5
paraquat	0.3	10	5	10	5	10	8	10	3	3	5

Assessment Date: 7 /11/86 26 DAT

diuron	1.5	8	0	4	10	10	10	0	2	3	4
	2.5	10	5	9	10	10	10	10	10	10	10
	3.5	10	10	10	10	10	10	10	10	10	10
atrazine + ametryn	2.0 + 2.0	8	9	10	9	10	10	10	10	10	9
atrazine	2.0	3	4	10	9	10	10	10	10	10	8
	4.0	3	5	6	10	10	10	10	10	10	9
atrazine +	2.0 + 5.5	6	5	7	9	10	10	10	9	10	9
summer oil	4.0 + 5.5	6	6	10	9	10	10	10	8	10	9
hexazinone +	0.4 + 1.4	9	10	10	10	10	10	10	10	10	9
diuron	0.5 + 1.9	10	10	10	10	10	10	10	10	10	10
metribuzin	1.0	10	5	10	10	10	10	10	10	10	10
	2.0	9	8	10	10	10	10	10	10	10	10
	4.0	10	10	10	10	10	10	10	10	10	10
paraquat	0.2	8	4	10	5	10	10	10	2	0	3
paraquat	0.3	9	3	10	4	10	7	10	2	0	3

EFFECT OF EARLY POST EMERGENT TREATMENTS ON WEEDS.

Table 2 cont.

Assessment Date: 21/11/86 40 DAT

Treatment	Rate kg ai/ha	BRAMI G	ECHCO G	ELEIN G	SPELA G	CLEAC G	MIMIN G	IPOHE G	IPOTR G	CENPU G	URELO G
diuron	1.5	6	0	0	10	10	10	0	2	0	4
	2.5	8	5	9	10	10	10	10	10	10	10
	3.5	10	10	10	10	10	10	10	10	10	10
atrazine + ametryn	2.0 + 2.0	8	7	10	10	10	10	10	10	10	9
atrazine	2.0	0	2	10	9	10	10	10	10	10	8
	4.0	0	4	6	10	10	10	10	10	10	9
atrazine +	2.0 + 5.5	5	4	6	10	10	10	10	9	10	8
summer oil	4.0 + 5.5	5	6	10	9	10	10	10	8	10	8
hexazinone +	0.4 + 1.4	9	10	10	10	10	10	10	10	10	9
diuron	0.5 + 1.9	10	10	10	10	10	10	10	10	10	10
metribuzin	1.0	10	5	10	10	10	10	10	10	10	9
	2.0	9	8	10	10	10	10	10	10	10	9
	4.0	10	10	10	10	10	10	10	10	10	10
paraquat	0.2	8	3	10	4	10	10	10	2	0	3
paraquat	0.3	9	2	10	4	10	6	10	2	0	3

Assessment Date: 4/12/86 53DAT

diuron	1.5	5	0	0	10	10	10	0	2	0	2
	2.5	8	2	9	10	10	10	10	10	10	8
	3.5	10	10	10	10	10	10	10	10	10	8
atrazine + ametryn	2.0 + 2.0	7	6	10	10	10	10	8	8	10	7
atrazine	2.0	0	0	10	7	10	10	10	8	10	7
	4.0	0	3	6	8	10	10	8	6	10	6
atrazine +	2.0 + 5.5	3	3	6	10	10	10	8	7	10	7
summer oil	4.0 + 5.5	3	6	10	8	10	10	9	7	10	7
hexazinone +	0.4 + 1.4	8	10	10	10	10	10	10	10	10	8
diuron	0.5 + 1.9	10	10	10	10	10	10	10	10	10	9
metribuzin	1.0	10	3	10	10	10	8	10	9	10	7
	2.0	7	8	10	10	10	10	10	9	10	8
	4.0	10	10	10	10	10	10	10	10	10	9
paraquat	0.2	8	2	10	2	10	10	8	0	0	2
paraquat	0.3	9	2	10	2	10	4	7	0	0	2

EFFECT OF LATE POST TREATMENTS ON WEEDS.

Table 3.

Assessment Date: 17/11/86 8 DAT Treatment	Rate Kg ai/ha	BRAMI G	ECHCO G	ELEIN G	SPELA G	CLEAC G	MIMIN G	IPOHE G	IPOTR G	CENPU G	URELO G
atrazine	2.0	0	4	3	10	9	10	10	10	10	10
	4.0	0	5	3	10	9	10	10	10	10	10
atrazine + ametryn	2.0 + 2.0	4	4	6	10	9	10	10	10	10	10
2,4-D	0.5	0	0	0	6	5	5	10	10	4	9
paraquat	0.3	4	3	2	3	5	5	10	4	5	3
	0.4	6	4	4	3	6	10	10	7	7	5
Assessment Date: 2/12/86 24 DAT											
atrazine	2.0	0	2	0	10	10	10	10	7	10	8
	4.0	0	4	0	10	10	10	10	7	10	9
atrazine + ametryn	2.0 + 2.0	0	2	6	10	10	10	9	8	10	8
2,4-D	0.5	0	0	0	8	10	9	10	10	10	10
paraquat	0.3	0	2	0	0	6	6	9	4	3	3
	0.4	5	2	1	0	8	10	7	7	7	3

Length of Residual Control Achieved by Various Pre-emergent Treatments.
Mean of trials in 1984, 1985 and 1986.

Table 4.

Treatment		Rate Kg ai/ha	BRAMI	DIGCI	ECHCO	ELEIN	PANMG	PANMH	CALMU	CENPU	CLEAC	IPOHE	IPOTR	MIMIN	SPELA	URELO
trifluralin	ppi	1.12	54		70	70		81		0	0	0	0		36	0
	ppi	1.4	81		70	70		81		0	0	0	0		18	0
trifluralin +	ppi	1.12 + 2.0	81		70	70		81		81	70	70	70		70	81
atrazine	ppi	1.4 + 4.0	81		70	70		81		81	70	70	70		70	81
atrazine ppi		2.0	0		0	0				70	70	70	70	70	81	81
atrazine ppi		4.0	0		36	70				70	70	70	70	70	81	81
atrazine pre		2.0	28	42	39	63	0	0	78	81	70	70	70	81	81	81
atrazine pre		3.0		56	78	56	0	0	78	81		60		60	60	40
atrazine pre		4.0	35	56	74	63	0	0	78	81	70	70	70	81	81	64
atrazine + ametryn		1.5 + 1.5		56	78	78	78	20	78	78		60		60	60	60
atrazine + ametryn		2.0 + 2.0	0	78	78	78	78	81	78	81	70	70	70	81	70	65
atrazine + ametryn		3.0 + 2.0		78	78	78	78	28	78	78		60		60	60	60
MCPA		5.0	56		70	70				0	70	70	0	0	70	0
diuron		1.5	0	0	42	70	14	35	0	0	70	35	0	0	35	22
		2.5	18	42	56	70	78	81	0	0	70	70	56	50	35	46
		3.5	81	42	56	70	78	81	0	25	70	70	70	50	74	64
hexazinone +		0.4 + 1.5	81		70	70		81		81	70	70	70	81	81	81
diuron		0.5 + 1.9	81		70	70		81		81	70	70	70	81	81	81
metribuzin		1.0	35		36	70		65		68	70	70	70	81	81	81
		2.0	67		70	70		81		81	70	70	70	81	81	81
		4.0	81		70	70		81		81	70	70	70	81	81	81
24-D Na salt		1.64	0	0	0	14	0	0	0	0		0		0	0	0
		3.69	0	0	28	28	14	0	0	14		0		0	0	0
atrazine + 24-D Na		2.0 + 1.64	0							81				81		81
		2.0 + 0.63		0	78	42	0	0	0	78		60		60	78	60
		3.0 + 0.95		42	78	56	0	0	0	78		60		60	78	60
		4.0 + 1.25		42	78	56	0	0	0	78		60		60	78	60
diuron + 24-D Na		1.5 + 1.64		0	42	78	42	14	0	0		0		0	0	0
		3.5 + 1.64		0	78	78	56	14	0	0		60		0	78	0

Effect of Early Post Emergent Treatments on Weeds.
Mean of trials in 1984 and 1986.

Table 5.

Treatment	Rate kg ai/ha	BRAMI	DIGCI	ECHCO	ELEIN	PANMG	PANMH	CALMU	CENPU	CLEAC	IPOHE	IPOTR	MIMIN	SPELA	URELO
diuron	1.5	15	0	21	64	64	10	34	37	50	36	0	73	64	18
	2.5	29	0	37	64	64	40	55	73	50	73	50	73	64	36
	3.5	53	0	64	64	64	39	55	53	50	73	50	73	64	59
atrazine	2.0	0	0	0	38	0	0	34	73	50	73	50	73	64	73
	3.0		0	0	41	0	0	34	73	50	73		73	64	73
	4.0	0	23	5	43	0	0	55	73	50	73	50	73	64	73
atrazine +	2.0 + 5.5	5		10	26		0		53	50	50	50	53	64	53
Summer oil	4.0 + 5.5	0		10	53		5		53	50	50	50	53	64	53
atrazine + 2d-D Na	2.0 + 1.64	0					0		31				31		
	2.0 + 0.62			34	64	0	0	34	61		73		59	55	
	3.0 + 0.95			64	64	0	0	34	73		73		59	55	
	4.0 + 1.25			64	64	0	0	55	73		73		59	55	
2d-D Na salt	1.64	0	0	0	73	0	0	23	0		73		0	55	19
	3.69	0	41	0	0	0	0	34	48		73		0	64	19
ametryn	1.5		23	64	23	64	20	34	39		73		73	64	7
	2.0		59	59	64	64	7	34	35		73		73	64	23
atrazine + ametryn	1.5 + 1.5		64	64	64	64	39	64	73		73		73	64	41
	2.0 + 2.0	53	64	63	64	64	52	64	73	50	73	50	73	64	73
	3.0 + 2.0		64	64	64	64	43	64	73		73		73	64	73
diuron + 2d-D Na	1.5 + 1.64		64	0	64	64	28	34	39		73		73	64	73
	3.5 + 1.64		64	64	64	64	52	55	43		73		73	64	59
MSMA	2.4		0	59	7	23	0	0	12		73		7	0	7
	4.8		0	59	0	23	7	7	15		73		41	0	7
diuron + MSMA	2.5 + 2.4		0	73	64	64	35	7	43		73		53	64	23
hexazinone +	0.4 + 1.4	53		53	53		31		50	50	50	50	53	53	53
diuron	0.5 + 1.9	53		53	53		31		50	50	50	50	53	53	53
metribuzin	1.0	27		10	53		0		25	50	50	50	53	53	53
	2.0	27		40	53		0		25	50	50	50	53	53	53
	4.0	53		53	53		31		25	50	50	50	53	53	53
paraquat	0.2	53		0	53		31		0	50	50	00	27	0	2
	0.3	53		12	31	23	15	0	3	50	73	0	21	0	8
paraquat + 2d-D Na	0.2 + 1.64	31					31		0				31		31
paraquat + 2d-D amine	0.2 + 0.2	31					31		0				0		5
paraquat + atrazine	0.3 + 2.0			23	23	64	23	55	73		73		73	64	41
	0.3 + 3.0			55	23	64	15	64	73		73		73	64	23
	0.3 + 4.0		41	55	23	23	15	64	73		73		73	64	59

Effect of Late Post Emergent Treatments on Weeds.

Mean of trials in 1984 and 1986.

Table 6.

Treatment	Rate Kg ai/ha	BRAMI	DIGCI	ECHCO	ELEIN	PANMG	PANMH	CALMU	CENPU	CLEAC	IPOHE	IPOTR	MIMIN	SPELA	URELO
diuron	1.5		0	0	0	0	0	35	35		56		56	35	56
	2.5		0	0	21	0	0	35	56		56		56	35	56
	3.5		0	16	21	0	0	35	56		56		56	35	56
atrazine	2.0	0	0	0	0	0	0	35	56	24	56	24	56	35	56
	3.0		0	0	0	0	0	35	56		56		56	35	56
	4.0	0	0	0	0	0	0	35	56	24	56	24	56	35	56
ametryn	1.5		0	0	0	0	0	35	0		56		21	0	56
	2.5		0	0	0	0	0	35	56		56		56	35	56
atrazine + ametryn	1.5 + 1.5		0	0		0	0	35	35		56		56	35	56
	2.0 + 2.0	0	0	0	16	0	0	35	56	24	56	24	56	35	56
	3.0 + 2.0		0	0	35	0	0	35	56		56		56	35	56
24-D Na salt	1.64	0	0	0	0	0	0	35	0		56			35	56
	3.69	0	0	0	0	0	0	35	56		56		56	35	56
2,4-D amine	0.5	0	0	0	0	0	0		24	24	24	24	24	24	24
paraquat	0.3	0	7	0	0	35	16	0	0	0	8		0	0	0
	0.4	0		0	0				24	24	24	24	24	0	0
paraquat + atrazine	0.3 + 2.0		7	0	0	35	56	35	56		56		56	35	56
	0.3 + 3.0		35	7	0	35	56	35	56		56		56	35	56
	0.3 + 4.0		35	35	0	35	35	35	56		56		56	35	56
paraquat + diuron	0.3 + 1.5		0	0	35	16	0	35	35		56		56	35	35
	0.3 + 2.5		35	35	35	35	56	35	56		56		56	35	35
	0.3 + 3.5		35	35	35	35	56	35	28		56		56	35	35
atrazine + 24-D Na	2.0 + 0.625		0	0	0	0	0	35	56		56		56	35	56
	3.0 + 0.95		0	0	0	0	0	35	56		56		56	35	56
	4.0 + 1.25		0	0	0	0	0	35	56		56		56	35	56
diuron + 24-D Na	1.5 + 1.64		0	21	35	0	56	35	56		56		56	35	56
	3.5 + 1.64		0	35	35	35	56	35	56		56		56	35	56
MSMA	2.4		35	0	0	35	18	35	18		0		56	0	0
	4.8		35	0	0	35	28	35	18		7		35	35	0
diuron + MSMA	2.5 + 2.4		35	35	35	35	56	35	56		56		56	35	56

STANDARD TREATMENTS.

Appendix I.

Treatment	% ai	Form	Kg ai/ha	Prod/ha	PPI	PRE	EPE	LPE
Trifluralin	40	EC	1.12	2.8	*			
			1.4	3.5	*			
Trifluralin + atrazine	40 + 80		1.12 + 2.0	2.8 + 2.5	*			
			1.4 + 4.0	3.5 + 5.0	*			
atrazine	80	WP	2.0	2.8	*	*	*	*
			4.0	3.5	*	*	*	*
ametryn + atrazine	22.5+22.5	F	2.0 + 2.0	8.0		*	*	*
atrazine + summer oil	80 + 100		2.0 + 5.5	2.8 + 5.5			*	
			4.0 + 5.5	3.5 + 5.5			*	
MCPA	50		5.0	10.0		*	*	
Diuron	80	WP	1.5	1.87		*	*	
			2.5	3.13		*	*	
			3.5	4.38		*	*	
Hexazinone + diuron	46.8 +	WP	0.4 + 1.4	3.0		*	*	
	13.2		0.5 + 1.9	4.0		*	*	
Metribuzin	70	WP	1.0	1.4		*	*	
			2.0	2.86		*	*	
			4.0	5.7		*	*	
2,4-D amine	50		0.5	1.0				*
Paraquat	20	SC	0.2	1.0			*	
			0.3	1.5			*	*
			0.4	2.0				*

Where required all post emergent treatments had wetter included (BS 100 at 1.2 ml per L).

Weather and Irrigation Details.

Appendix II

Month	Day	Temp Max	Temp Min	RH	RF	Irr mm
July	01	26.5	11.5	78		
July	02	27.5	16.0	95		
July	03	25.0	17.5	91	2.8	
July	04		20.0	91		
July	05					
July	06					
July	07	27.0	18.0	87		
July	08	28.0	16.5	87		
July	09	27.0	17.0	82		
July	10	22.0	11.0	72		
July	11		13.0	90		
July	12					
July	13	23.0				
July	14	24.5	13.5	91		
July	15	23.5	18.5	95	8.2	
July	16	26.5	20.5	91	6.2	
July	17	26.5	19.0	95	0.6	
July	18		18.5	95	2.0	
July	19					
July	20	27.0				
July	21	25.0	18.0	95	10.4	
July	22	24.5	17.5	91	3.0	
July	23	25.5	17.0	91	1.2	
July	24		16.0	91	1.0	
July	25					
July	26					
July	27	28.5				
July	28	23.5	15.5	91	14.2	
July	29	21.0	17.0	81		
July	30	22.5	15.0	76		
July	31		11.0	72		

Month	Day	Temp Max	Temp Min	RH	RF	Irr mm
August	01		17.0	95	19.4	
August	02	0.0	0.0	0	0.0	
August	03	26.5				
August	04	26.0	15.5	86	9.7	
August	05	24.0	13.5	67		
August	06	23.0	10.5	61		
August	07	24.5	8.0	70		
August	08		15.0	69		
August	09					
August	10	26.5				
August	11	26.5	7.5	87		
August	12	28.5	17.5	87		
August	13	26.0	19.0	91		
August	14	24.5	20.0	76	5.0	
August	15		18.0	91	4.4	
August	16					
August	17	25.5				
August	18	26.0	18.5	91	7.4	
August	19	25.5	15.0	91		
August	20	24.0	19.0	86	0.0	
August	21	23.0	19.5	91	0.3	
August	22		16.0	86		
August	23					
August	24	26.5				
August	25	31.0	14.0	82		
August	26	29.5	18.0	75		
August	27	21.0	20.0	91		
August	28	25.5	19.5	95		
August	29		19.0	91	1.4	
August	30					
August	31					

Month	Day	Temp Max	Temp Min	RH	RF	Irr mm
September	01	21.0	18.5	95	9.0	
September	02	23.5	17.5	74	48.0	
September	03	24.5	18.0	86	6.2	
September	04	25.0	19.0	91	2.8	
September	05		18.5	91	4.8	
September	06					
September	07	27.5				
September	08	26.5	17.0	79	2.6	
September	09	25.0	18.5	87	2.8	
September	10	26.5	16.5	75	0.6	
September	11	26.0	15.5	82	0.4	
September	12		15.5	72		
September	13					
September	14	30.5				
September	15	31.5	14.5	79		
September	16	28.5	17.0	80		
September	17	30.0	20.0	80		
September	18	31.0	20.0	84		
September	19		18.5	80		
September	20					
September	21	32.5				
September	22	32.0	17.5	81		
September	23	30.0	17.5	73		25
September	24	29.5	16.5	83		25
September	25	28.5	16.5	76		25
September	26		17.0	72		25
September	27					
September	28	28.5				25
September	29	28.5	17.5	87	1.8	
September	30	30.5	18.0	76		

Weather and Irrigation Details.

Appendix II cont.

Month	Day	Temp Max	Temp Min	RH	RF	Irr ms
October	01	30.0	20.0	74		25
October	02	30.5	18.5	73		25
October	03		18.0	81		25
October	04					25
October	05	31.5				
October	06	30.5	17.0	76		25
October	07	30.5	18.0	77		25
October	08	32.5	17.5	76		
October	09	32.0	17.5	76		25
October	10		19.5	73		25
October	11					
October	12	31.5			9.6	
October	13	29.5	19.0	64	0.0	
October	14	29.5	17.0	73		25
October	15	30.0	17.0	80		
October	16	31.5	18.5	81		25
October	17		21.5	74		
October	18					25
October	19	33.0				25
October	20	28.5	19.5	87	2.2	
October	21	30.0	22.0	85		
October	22	31.0	22.0	74		
October	23	28.0	22.0	92		
October	24		19.5	83	4.0	
October	25					
October	26	34.0				25
October	27	32.5	19.5	75		
October	28	31.5	21.5	85		
October	29	29.5	22.0	88	4.8	
October	30	30.0	22.5	78	4.0	
October	31		20.0	88		

Month	Day	Temp Max	Temp Min	RH	RF	Irr ms
November	01					
November	02	30.0				
November	03	32.5	18.0	96	5.6	
November	04	28.5	18.0	96	10.4	
November	05	28.5	21.0	99	16.8	
November	06	28.0	21.5	99	13.2	
November	07	0.0	20.0	84	3.8	
November	08					
November	09	30.0				
November	10	31.0	18.5	81	4.8	
November	11	30.5	19.0	96		
November	12	32.0	19.5	71		
November	13	33.5	21.5	62		
November	14		21.5	65		
November	15					
November	16	34.5				
November	17	32.0	21.0	85		
November	18	35.5	24.0	85		
November	19	32.5	21.0	57	8.8	
November	20	29.5	15.0	53		
November	21		14.5	59		
November	22					
November	23	31.5				
November	24	31.5	14.5	77		
November	25	31.0	19.0	70		
November	26	31.0	19.0	60		
November	27	32.5	19.5	72		
November	28		18.0	64		25
November	29					25
November	30	33.5				

Month	Day	Temp Max	Temp Min	RH	RF	Irr ms
December	01	32.0	19.0	77		
December	02	32.0	21.0	71		
December	03	31.5	22.0	81	0.4	
December	04	33.5	23.0	96	27.0	
December	05		21.5	86	27.8	
December	06					
December	07	30.0				
December	08	31.0	21.0	84	16.4	
December	09	31.5	21.5	74		
December	10	31.5	21.0	77		
December	11	34.0	21.0	74		
December	12		20.0	58		
December	13					
December	14	33.0				
December	15	33.0	21.0	71		
December	16	33.5	21.0	75		
December	17	33.0	22.0	81		
December	18	32.5	21.5	74		
December	19		24.0	75		
December	20					
December	21	35.0				
December	22	33.0	24.0	78		
December	23	31.5	25.5	72		
December	24		23.0	85		
December	25					
December	26					
December	27					
December	28	33.0				
December	29	33.0	20.0	85		
December	30	33.0	21.0	70		
December	31		22.0	55		

Growth Stage at Time of Assessment.

Appendix III.

Assessment Date	DAT	BRAMI	ECHCO	ELEIN	CENPU	CLEAC	IPOHE	IPOTR	MIMIN	SPELA	URELO
Pre-emergent Treatments.											
11/10/86	18	6cm 2 til	8 cm 2 till	3 cm 5 leaf	4 cm 1 tri	3 cm 2 tl	3 cm 1 tl	cotyledon	3 cm 2 tri	2 cm 2 leaf	4 cm 2 tl
29/10/86	36	25 cm	18 cm	18 cm	8 cm 3 tri	15 cm	18cm	18 cm	15 cm	4 cm 4 leaf	8 cm 6 leaf
18/11/86	56	30 cm	25 cm	20 cm	25 cm	40 cm	40 cm	50 cm	30 cm	15 cm branched	40 cm
2/12/86	70	80 cm	75 cm	75 cm	100 cm	50 cm	100 cm	100 cm	75 cm	40 cm	65 cm
Early Post Emergent.											
22/10/86	10	10cm 5til	10 cm 3 til	7 cm 4 til	4 cm 2 tri	7 cm	7 cm 3 leaf	5 cm 3 leaf	7 cm	3 cm 3 leaf	6 cm 4 leaf
7/11/86	26	28 cm	20 cm	18 cm	15 cm	25 cm	28 cm	25 cm	22 cm	10 cm	20 cm
21/11/86	40	30 cm	25 cm	20 cm	25 cm	40 cm	40 cm	50 cm	30 cm	15 cm	40 cm
4/12/86	53	80 cm	75 cm	75 cm	100 cm	50 cm	100 cm	100 cm	75 cm	40 cm	65 cm
Late Post Emergent											
17/11/86	8	30 cm	25 cm	20 cm	25 cm	40 cm	40 cm	50 cm	30 cm	15 cm	40 cm
2/12/86	23	80 cm	75 cm	75 cm	100 cm	50 cm	100 cm	100 cm	75 cm	40 cm	65 cm