

CLOMAZONE—A NEW HERBICIDE FOR BARNYARD GRASS (*ECHINOCHLOA CRUS GALLI*) CONTROL IN WATER-SEEDED RICE

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Summary Clomazone (CommandTM); an inhibitor of both chlorophyll and carotenoid biosynthesis, is widely used in the USA and Latin America for pre-emergence weed control in soybeans and cotton. Commercial development of clomazone for grass weed control in drill sown rice in Latin America prompted evaluation in the water-seeded rice culture of New South Wales.

Replicated field experiments in New South Wales conducted over three seasons (1993–1995) demonstrated pre- and early post-sowing treatments of clomazone at 180–240 g a.i. ha⁻¹ consistently achieved excellent control of *E. crus galli* in water-seeded rice; equal to or better than standards of molinate at 2400–3600 g a.i. ha⁻¹ or thiobencarb at 3000 g a.i. ha⁻¹.

Field studies of varietal tolerance under weed free conditions showed that all commercial rice cultivars were well-tolerated by clomazone at 240–480 g a.i. ha⁻¹.

INTRODUCTION

Echinochloa crus galli (L.) P.Beauv. (barnyard grass, ECHCG) and *Leptochloa fascicularis* (Lam.) Gray (syn. *Diplachne fusca*, silvertop grass, LEPFA) are the predominant grass weeds infesting water-seeded rice in New South Wales. Molinate and thiobencarb are herbicides commonly applied in New South Wales to control grass weeds.

Clomazone (CommandTM) is widely used in soybeans and cotton in the USA and South America as a pre-emergence herbicide. Development of clomazone for grass

weed control in rice in these countries led to evaluation of clomazone in rice in New South Wales.

MATERIALS AND METHODS

Eight field experiments were conducted at dedicated laser-levelled sites in the Murray valley irrigation area during the seasons 1992–93 to 1995–96. Randomized complete block designs of four replications of plots typically 4.5 × 8 m were used, with earthen bunding and independent watering. Normal agronomic practices were emulated, with pre-germinated seed sown by aircraft or dry-sown plots (crop tolerance only) surfaced seeded using a 2.1 m linkage seeder.

Herbicide applications were made by administering neat or concentrated working solutions directly to flood-water or using a hand-held gas-powered small plot boom sprayer delivering 90–115 L ha⁻¹.

Trials were assessed using visual ratings of rice injury and weed control, counts of rice and weed seedling and inflorescence density and direct harvest of grain yields using Wintersteiger or Kincaid plot harvesters.

RESULTS

Consistently high levels of *E. crus galli* control were achieved across all experiments with clomazone at 180–300 g a.i. ha⁻¹ applied either pre-sowing or at one-leaf stage (rice). Clomazone at 180 g a.i. ha⁻¹ was less effective when applied at two-leaf stage (rice) as some advanced *E. crus galli* escaped control (Table 1).

Leptochloa fascicularis proved less susceptible to clomazone than *E. crus galli*, especially when applied pre-sowing (Table 2).

Rice injury ratings from all experiments showed rising rice phytotoxicity from 120–300 g a.i. ha⁻¹; in excess of that noted with molinate at 2400 g a.i. ha⁻¹ but less than thiobencarb at 3000 g a.i. ha⁻¹. Less rice injury occurred with pre-sow applications of clomazone than post-sowing applications (Table 3). Injury was expressed as transient bleaching of leaves.

Clomazone at 240–480 g a.i. ha⁻¹ did not significantly affect grain yields of seven rice varieties grown under weed free conditions. High levels of experimental error in this trial were associated with varieties that suffered severe floret sterility due to cold weather at flowering.

Table 1. Mean percentage control ratings of *Echinochloa crus galli* collated from eight replicated trials in water seeded rice, 1993–1995, New South Wales.

Clomazone rate g a.i. ha ⁻¹	Application timing			Mean
	Pre-sow	1 LSR	2 LSR	
120	81.9		94.5	88.2
180	97.6	99.6	89.7	95.7
240	96.7	99.0	95.4	97.0
300	99.2	97.5	96.5	97.7
Molinate 2400	61.3	88.8	82.9	77.7
Thiobencarb 3000	72.5	100	95.9	89.5
Mean of clomazone treatments	93.9	98.7	94.0	

Table 2. *Leptochloa fascicularis* control ratings and inflorescence densities in water seeded rice, New South Wales, 1994.

Treatment g a.i. ha ⁻¹	Timing	% Control	Panicles m ⁻²
Untreated		0	61.1
Molinate 2400	2 LSR	83.3	9.4
Clomazone 180	presow	55	19.4
Clomazone 240	presow	83.3	6.1
Clomazone 180	2 LSR	93.3	11.7
Clomazone 240	2 LSR	94.3	3.9
LSD (P>0.05)		20.2	24.4

Table 3. Mean percentage injury ratings of water-seeded rice collated from eight replicated trials, 1993-1995, New South Wales.

Clomazone rate g a.i. ha ⁻¹	Application timing			Mean
	Pre-sow	1 LSR	2 LSR	
120	2.5		2.5	2.5
180	9.0	1.9	13.4	8.1
240	8.1	9.0	16.7	11.3
300	7.1	16.3	23.8	16.7
Molinate 2400	2.5		4.7	3.6
Thiobencarb 3000	55		32.1	37.8
Mean of clomazone treatments	6.7	9.1	14.1	

Table 4. Grain yields (t ha⁻¹) of seven weed free dry-seeded, broadcast rice varieties after treatment with clomazone, 1995-1996.

	Rate				LSD (P>0.05)
	0	240	360	480	
Millin	9.40	9.66	9.22	9.26	0.92
Amaroo	4.85	5.22	5.32	4.74	0.91
Jarrah	6.64	6.97	6.92	6.88	0.80
YRM43	4.74	4.43	5.00	4.59	1.07
Langi	6.23	6.50	7.75	7.47	1.72
YRL38	4.13	3.90	4.46	5.07	1.81
Kyeema	3.70	2.80	3.88	4.64	1.37
Mean	5.67	5.64	6.08	6.09	0.67

DISCUSSION

Clomazone has exhibited excellent efficacy against *E. crus galli*, whilst *L. fascicularis* requires combinations with alternate herbicides such as thiobencarb or molinate. Crop tolerance by water-seeded rice appears adequate with pre-sowing applications at 180-240 g a.i. ha⁻¹.

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