

## Studies on chemical weed control in aerobic cultivated rice

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Accepted : February, 2009

### SUMMARY

An experiment on weed control was conducted to evaluate the different herbicides with different concentrations which were sprayed at different days after sowing in drill sown rice at Agricultural Research Station, Mugad, Karnataka. Higher grain yield (1805 kg/ha) was obtained with the application of Mon 46992 @ 2.5 l/ha 12-14 days after sowing. Crop phytotoxicity was observed at 10 days after spraying with Mon 46992 applied either @ 3.75 or 5.0 l/ha of herbicide. Toxic effects were not observed at 20 or 30 days after the treatment. Weed control was better with the higher doses of herbicide irrespective of the time of spray.

**Key words :** Drill sown rice, Herbicides, Weeds.

Upland paddy is cultivated as direct seeded in aerobic and well-drained soils with no or little surface water irrigation for a brief period especially during monsoon season. In India upland rice declined from 5.97 million ha in 1978-80 to 5.06 million ha (Singh, 2002). In general, the decline in area may be due to drought and inconsistent change in the raining pattern. Decline in soil fertility and weeds also contribute a lot to decline in the grain yield of rainfed paddy. Often weed menace results in 70-90 per cent reduction in the rice yield. Weed management is done through mechanically and manually. Manual weeding is laborious and requires more number of laborers and the availability of laborers are scarce in peak season. Mechanical weeding involves wet intercultivation followed by planking to destroy the uprooted weeds completely. Non-availability of laborers in time makes the mechanical weed control ineffective. The success of mechanical weeding depends on rainfall and availability of water. Continuous tillage and stale seed bed technique followed by the farmers is very efficient in controlling the weeds. However, in absence of such measure it is essential to adapt chemical weed control method for effective management. Using of newer chemicals to reduce the risk of development of resistance to herbicide and effective control of broad spectrum of weeds is essential. Looking to these considerations, an experiment was conducted to find out the effectiveness of new herbicides in drill sown rainfed rice situation under moderately heavy rainfall situations.

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### MATERIALS AND METHODS

A field experiment was conducted at Agricultural Research Station, Mugad during *khari* 2001 and 2002 in completely randomized block design with 11 treatments (Table 1) and three replications. The texture of the soil was clay having pH of 7.2. Rice variety Abhilash (150-155 days) was drill sown with an inter row spacing of 20 cm. Rainfall of 664.4 mm and 798 mm was received during the cropping season from June to November in 2001 and 2002, respectively. Fertilizer dose of 100 kg N<sub>2</sub>, 50 kg P<sub>2</sub>O<sub>5</sub> and 50 kg K<sub>2</sub>O was applied. Entire dose of phosphorus and potassium was applied as basal dose at the time of sowing. Nitrogen was applied in three equal

**Table 1: Treatment details used in the experiment**

Sr. No.	Treatments	Time of herbicide application
T <sub>1</sub>	Butanil 55 % EW @ 2.5 l/ha	Herbicide applied at 8-10 DAS
T <sub>2</sub>	Mon 46992 @ 3.75 l/ha	Herbicide applied at 8-10 DAS
T <sub>3</sub>	Mon 46992 @ 5 l/ha	Herbicide applied at 8-10 DAS
T <sub>4</sub>	Mon 46992 @ 2.5 l/ha	Herbicide applied at 12-14 DAS
T <sub>5</sub>	Mon 46992 @ 3.75 l/ha	Herbicide applied at 12-14 DAS
T <sub>6</sub>	Mon 46992 @ 5 l/ha	Herbicide applied at 12-14 DAS
T <sub>7</sub>	Propanil @ 3.75 l/ha	Herbicide applied at 10-12 DAS
T <sub>8</sub>	Propanil @ 5 l/ha	Herbicide applied at 10-12 DAS
T <sub>9</sub>	Sofit @ 2.0 l/ha	Herbicide applied at 3 DAS
T <sub>10</sub>	Clincher 10 % EC @ 0.75 l/ha	Herbicide applied at 20 DAS
T <sub>11</sub>	Unweeded control	

Table 2: Weed count species wise at 30 and 60 DAS / sq. m area

Sr. No.	Treatments	<i>Cyperus</i> spp.		<i>Commelina diffusa</i>		<i>Mimosa</i> spp.			<i>Ischaemum rugosum</i>			Total	
		30 DAS	60 DAS	30 DAS	60 DAS	30 DAS	60 DAS	30 DAS	60 DAS	30 DAS	60 DAS	30 DAS	60 DAS
T <sub>1</sub>	Butamil 55 % EW 2.5 l/ha	4.74 bc (22.07)	4.36 d (18.7)	4.25 b (18)	5.25 a (27.3)	2.09 e (4)	6.70 ab (44.7)	3.20 cd (10)	7.19 a (51.3)	7.37 c (74.7)	11.94 a-c (156)		
T <sub>2</sub>	Mon 46992 3.75 l/ha	4.95 bc (24.0)	5.13 cd (26)	6.97 a (5)	4.51 ab (20)	2.99 c-e (8.7)	7.98 a (63.3)	1.52 ef (2)	2.49 d (6)	9.16 bc (108.7)	10.74 b-d (156)		
T <sub>3</sub>	Mon 46992 5 l/ha	4.34 c (19.3)	3.60 d (12.7)	5.65 a (32)	4.66 ab (21.3)	2.66 de (6.7)	4.13 d (16.7)	4.49 b (20)	3.35 cd (11.3)	8.82 bc (96.7)	7.89 f (82.7)		
T <sub>4</sub>	Mon 46992 2.5 l/ha	7.25 ab (56.0)	7.39 ab (58.7)	2.86 b (8)	2.53 de (6)	6.22 a (17.3)	4.12 d (39.3)	2.38 de (5.3)	2.68 d (6.7)	10.27 ab (112.7)	9.19 d-f (150.7)		
T <sub>5</sub>	Mon 46992 3.75 l/ha	7.40 ab (64.0)	3.45 d (12.4)	3.76 b (14)	4.95 ab (24)	2.51 e (6)	5.69 bc (32.7)	3.11 cd (9.3)	2.75 d (7.3)	9.44 a-c (120)	8.77 ef (145.3)		
T <sub>6</sub>	Mon 46992 5 l/ha	4.85 bc (23.3)	6.71 bc (44.7)	2.77 b (7.3)	3.32 cd (10.7)	4.30 b (18)	7.82 a (62)	6.31 a (40)	2.78 d (7.3)	9.41 a-c (120)	11.16 a-c (145.3)		
T <sub>7</sub>	Propanil 3.75 l/ha	8.23 a (68.7)	6.99 bc (48.7)	3.84 b (14.7)	4.10 bc (17.3)	4.75 b (22.7)	5.57 bc (30.7)	3.63 bc (12.7)	3.23 cd (10)	10.81 ab (83.3)	10.35 c-e (137.3)		
T <sub>8</sub>	Propanil 5 l/ha	6.09 a-c (36.7)	7.96 ab (63.3)	2.77 b (7.3)	4.05 bc (16)	4.19 bc (17.3)	5.06 cd (25.3)	3.52 b-d (12)	3.76 c (14)	8.59 bc (146.7)	10.89 b-d (160.7)		
T <sub>9</sub>	Sofit 2.08 l/ha	6.80 a-c (46.0)	8.43 ab (71.3)	3.53 b (12)	2.06 e (4)	4.75 b (22.7)	7.33 a (54.7)	7.10 a (50.7)	5.63 b (31.3)	11.43 a (120)	12.68 a (180)		
T <sub>10</sub>	Clincher 10 % EC 0.75 l/ha	6.70 a-c (45.3)	9.15 a (83.3)	4.06 b (16)	3.33 cd (10.7)	3.87 b-d (14.7)	2.09 e (4)	0.71 f (00)	2.53 d (6)	8.72 bc (144)	10.21 c-e (160)		
T <sub>11</sub>	Unweeded control	5.02 bc (25.3)	8.23 ab (67.3)	6.36 a (40)	5.37 a (28.7)	2.68 de (6.7)	7.10 a (50)	3.50 b-d (12)	2.66 d (6.7)	9.17 bc (144)	12.37 ab (198)		
	S.E.±	0.84	0.62	0.45	0.34	0.40	0.44	0.36	0.29	0.65	0.54		

Figures in the parentheses are original values  
DAS= Days after sowing

splits at sowing, tillering and panicle initiation stage. The observations on visual per cent weed control at 20, 40 and 60 days after sowing the application of herbicide, weed count species wise per sqm at 30 and 60 days after sowing (DAS), crop phytotoxicity (%) at 10, 20 and 30 days after treatment, yield parameters and yield were recorded. The data was statistically analyzed and compared using Duncan's multiple range test.

## RESULTS AND DISCUSSION

The results obtained from the present investigation are presented below:

### Effect on weeds:

Predominant weeds observed were *Commelina diffusa*, *Cyperus* sp. *Mimosa* sp. *Ischaemum rugosum* and *Echinochloa colona*. Number of grassy weeds was very low. In general the weed number increased from 0 to 60 days after sowing (Table 2). Number of *Mimosa* spp. weed increased from 30 DAS except in Clincher 10% spray after 20 DAS. Other weeds did not show any definite trend. However, when the total count of all the weeds was taken, the numbers increased from 30 DAS to 60 DAS except in Mon 46992 @ 5.0 l/ha spray applied at 10 – 12 DAS. All the treatments were effective up to 30 DAS then afterwards their efficacy was decreased which resulted in the increased number. At 30 DAS, total weed count was less in Butamil 55% EW @ 2.50 l/ha. At 60 DAS application of Mon 46992 @ 5.0 l/ha at 8-10 DAS (T<sub>3</sub>) was efficient in reducing the total weed count.

Visual per cent weed control was more at 20 days after treatment and subsequently decreased at 40 DAT and 60 DAT in all the treatments (Table 3). In general the

**Table 3: Visual per cent weed control of on different weed species at 20, 40 and 60 days after treatment with herbicides**

Sr. No.	Treatments	<i>Cyperus</i> spp.			<i>Commelina diffusa</i>			<i>Alternanthera sessile</i>			<i>Mimosa</i> spp.		
		30 DAT	40 DAT	60 DAT	30 DAT	40 DAT	60 DAT	30 DAT	40 DAT	60 DAT	30 DAT	40 DAT	60 DAT
T <sub>1</sub>	Butanil 55 % EW 2.5 l/ha	33.3	0	0	40	30	20	33.3	30	23.3	66.6	56.6	46
T <sub>2</sub>	Mon 46992 3.75 l/ha	13.3	10	0	33.3	23.3	20	63.3	50	40	63.3	56.6	50
T <sub>3</sub>	Mon 46992 5 l/ha	63.3	46.6	36.6	43.3	33.3	26.6	90	77.6	70	60	50	43
T <sub>4</sub>	Mon 46992 2.5 l/ha	30	23.3	20	66.6	60	50	93.3	86.6	70	60	50	43
T <sub>5</sub>	Mon 46992 3.75 l/ha	63.3	50.1	46.6	80	76.6	63.3	96.6	86.3	70	66.6	56.6	43
T <sub>6</sub>	Mon 46992 5 l/ha	50	46.6	46.6	66.6	66.6	56.6	90	80	63.3	40	30	23
T <sub>7</sub>	Propanil 3.75 l/ha	40	26.6	20	76.6	60	50	86.6	70	60	60	56.6	43
T <sub>8</sub>	Propanil 5 l/ha	30	26.6	20	60	43.3	30	90	70	63.3	66.6	60	50
T <sub>9</sub>	Sofit 2.08 l/ha	56.6	53.3	46.6	46.6	36.6	26.6	96.6	80	66.6	60	56.6	43
T <sub>10</sub>	Clincher 10 % EC 0.75 l/ha	30	23.3	16.6	56.6	46.6	40	83.3	73.3	63.3	43.3	63.3	53
T <sub>11</sub>	Unweeded control	0	0	0	0	0	0	0	0	0	0	0	0
	S.E.±	4.03	3.07	2.16	3.09	1.86	1.23	2.39	2.2	2.2	1.02	1.23	0.51

DAT – Days after treatment of herbicide 100 % - Complete control (kill), 0 – No control (kill)

control had more in Mono 46992 @ 3.75 l/ha at 12-14 DAS. *Alternanthera sessile* weed was easily controlled by the chemicals followed by *Commelina diffusa*. *Cyperus* spp. was the least controlled. Delayed application (12-14 DAS) of Mon 46992 was more effective in comparison to the early applications (8-10 DAS). Such an effective weed control was observed in wet seeded rice by the use of butanil 55% EW (Budhar and Tamilselvan, 2002).

#### Effect on crop:

Crop phytotoxicity was not observed at 20 and 40 days after treatment. Toxicity was visible in the early stages of crop growth at 10 days after treatment. These

weedicides were (Table 4) when applied at 8-10 days after sowing 50 per cent toxicity was observed in Mon 46992 @ 5 l/ha and the toxicity was more prominent under medium and higher doses (3.75 l/ha and 5.0 l/ha) when applied at later stages of the crop *i.e.* 12-14 DAS. In general, the application of herbicides resulted in significantly higher grain yield over unweeded control. Grain yield was increased with increase in the doses of herbicide used irrespective of the time of spray except in Sofit @ 2.0 l/ha. Significant increase in grain yield in herbicide applied treatments is mainly due to significant increase in the yield component such as number of panicles per square meter. Mean panicle weight and 1000 grain weight were not significantly influenced by the herbicide

**Table 4 : Effect of weedicides on crop phytotoxicity % and yield and its components of paddy (Mean of 2001 and 2002)**

Sr. No.	Treatments	10 DAT	20 DAT	30 DAT	Mean panicle weight (g)	No of panicle/ sqm	1000 grain weight (g)	Grain yield (kg/ha)
T <sub>1</sub>	Butanil 55 % EW 2.5 l/ha	0	0	0	2.17 a	170 cd	30.54 a	1527 c
T <sub>2</sub>	Mon 46992 3.75 l/ha	0	0	0	2.39 a	137 d	28.52 a	1759 a-c
T <sub>3</sub>	Mon 46992 5 l/ha	5	0	0	2.60 a	215 bc	29.92 a	1944 ab
T <sub>4</sub>	Mon 46992 2.5 l/ha	0	0	0	2.32 a	186 b-d	29.46 a	1805 a-c
T <sub>5</sub>	Mon 46992 3.75 l/ha	5	0	0	2.30 a	187 b-d	29.03 a	1736 bc
T <sub>6</sub>	Mon 46992 5 l/ha	5	0	0	2.62 a	248 ab	29.85 a	2083 a
T <sub>7</sub>	Propanil 3.75 l/ha	0	0	0	2.21 a	189 b-d	27.82 a	1967 ab
T <sub>8</sub>	Propanil 5 l/ha	0	0	0	2.95 a	296 a	29.65 a	2083 a
T <sub>9</sub>	Sofit 2.08 l/ha	2	0	0	2.71 a	123 d	29.14 a	1018 d
T <sub>10</sub>	Clincher 10 % EC 0.75 l/ha	0	0	0	2.68 a	222 bc	29.23 a	2013 ab
T <sub>11</sub>	Unweeded control	0	0	0	2.69 a	132 d	30.36 a	1064 d
	S.E.±				0.44	19.87	1.42	102.5

DAT – Days after treatment of herbicide 0- No toxicity 10- Toxicity and death of weeds

treatments. Such weed control in wet seeded rice with low concentration of butanil (1.0 kg a.i/ha) was reported by Badhar and Tamilselvan (2002).

It can be concluded that Mon 46992 @ 2.5 l/ha

applied at 12-14 DAS gave better control of weeds in drill sown rice with no phytotoxic effects and also higher grain yield.

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### REFERENCES

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