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Bioefficacy of Oxadiargyl 80% WP and 6% EC in controlling weeds of transplanted summer rice

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ABSTRACT

An experiment conducted during the *boro* season 2003 (January to May 2003) at Mondouri Farm of the Bidhan Chandra Krishi Viswavidyalaya on weed management in summer rice clearly revealed that the dominant weed flora in the experimental field were *Echinochloa crusgalli, Alternanthera sessilis, Fimbristylis miliacea, Sphenoclea zeylanica*. It was further evident that though hand weeding twice (20 and 40 DAT) recorded the highest grain yield it was at par with the treatment T_3 (Oxadiargyl 80% WP @ 100g a.i./ha) and T_7 (Butachlor 50% EC @ 1250 g. a.i./ha). All the above treatments recorded lower weed density and weed dry weight as compared to untreated control without showing any phytotoxicity. It is therefore quite obvious from the experimental findings that Oxadiargyl 80% WP @ 100 g.a.i./ha or Butachlor 50 EC @ 1250 g.a.i./ha as pre-emergence application can safely replace the laborious, time consuming and costly hand weeding.

Generally light, water, space and mineral nutrients are the four important growth factors for which weed compete with the crop. The most critical period of crop-weed competition in rice lies between four to six weeks after transplanting during which weed competition resulted in yield reduction (Gill and Kolar, 1980). Weeds cause a great problem in rice cultivation and minimise the yield drastically. Mukhopadhyay and Bhattacharya, 1969 reported that in transplanted rice culture, 15-20% yield loss was caused due to weeds only.

Bhattacharya *et al.* (1996) reported that although hand weeding given twice at 21 and 42 DAT recorded the highest grain yield of transplanted *boro* paddy, this laborius, time consuming and costly. Chemical weed control can be taken up as a better substitute (Singh and Singh, 1993). Earlier investigations revealed that butachlor at 1.5 kg a.i./hectare on pre-emergence significantly reduced weed dry matter, increased grain yield of transplanted rice and proved an effective alternative to two hand weeding or hoeing (Mishra and Singh, 1989). Although transplanting gives rice a head start over weeds, uncontrolled weeds can still reduce rice yield as much as 50% in rainfed low lands (Ampong – Nyarko and

DeDutta, 1999). As weeds have wide adaptability to compete with crops, it is necessary to invent potential devices for enabling the crop to fight against the awesome challenge of obnoxious harmful weeds. Hence, to find out a suitable weed management measure in transplanted rice field, this investigation was planned.

MATERIALS AND METHODS

The experiment was conducted at the University Teaching Farm, Mondouri, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal during the *boro* season of 1999-2000. The soil of the experimental fields was typical Gangetic alluvial soil (Entisol) having clay loam texture, neutral in reaction and moderate in soil fertility status. The experimental area was under sub-tropical humid climate which is situated just at the south of Tropic of Cancer. The variety of rice (IET 4786 i.e. Satabdi) was transplanted on 04.02.2003. The experimental field was laid out in a randomised block design (RBD) having ten treatments with three replications with a net plot size of 5 m × 3 m. The details of the treatments were as follows (Table 1). Fertilizers applied were 120 kg N, 60 kg P_2O_5 and 60 kg K_2O/ha in the form of urea, single super phosphate (SSP) and muriate of potash (MOP) respectively. Half of the total N and full doses of P_2O_5 and K_2O were applied as basal at the time of final land preparation and 60 kg N in the form of urea was top dressed in two splits, at 20 and 40 days after transplanting (DAT). Other cultural practices and plant protection measures were taken equally in all plots as and when required. Then the crop was harvested on 18.5.2003.

RESULTS AND DISCUSSION

Predominant weed species

The most predominant weed flora noted in the experimental field were *Echinochloa crusgalli, Alternenthera sessilis, Fimbristylis miliacea, Sphenochlea zeylanica, Leersia hexandra, Cyperus iria, Cyperus difformis, Eclipta alba, Monochoria vaginalis and Marselia quadrifoliata.*

Table 1 Treatment details

No.	Treatment	Dose g a.i./ha	Formulation ml or g/ha	Time of application (DAT)*
T_1	Oxadiargyl 80% WP	70	87.5 g	3
T_2	Oxadiargyl 80% WP	90	112.5 g	3
T_3	Oxadiargyl 80% WP	100	125 g	3
T_4	Oxadiargyl 6% EC	70	1167 ml	3
T_5	Oxadiargyl 6% EC	90	1500 ml	3
T_6	Oxadiargyl 6% EC	100	1667 ml	3
T_7	Butachlor 50% EC	1250	2500 ml	3
T_8	Hand Weeding twice	-	-	20 and 40
T_9	Unweeded control	-	-	-

* DAT = Days After Transplanting

Effect on weeds

The total weed population per m^2 with all the treatments (both cultural and chemical) were low as compared to unweeded control treatment at all the growth stages. Among the chemical treatments Butachlor 50% EC and Oxadiargyl 80% WP @ 100 g. a.i./ha showed excellent performance in reducing weed population throughout the growing period of rice crop due to prolonged persistance of herbicidal activity in soil. Hand weeding twice controlled the weeds best producing 2.69, 4.87 and 7.90 g/m^2 of weed dry weight at 30, 60, 90 DAT respectively. Although application of Butachlor 50% EC @ 1250 g. a.i./ha and Oxadiargyl 80% WP @ 100 g. a.i./ha were applied as pre-emergence controlled the weeds better at 30, 60 and 90 DAT which were significantly at par with hand weeding treatment (Table 2). In case of weed density similar trend was recorded for the above mentioned three treatments. Among the chemical treatments Oxadiargyl 6% EC @ 70 g.a.i./ha showed maximum weed density at 30 and 60 DAT, whereas, Oxadiargyl 6% EC @ 90 g. a.i./ha recorded maximum weed count/m^2 at 90 DAT which was at par with above mentioned treatment.

Effect on grain yield

Keeping similar trend as in weed dry matter, hand weeding twice produced the highest grain yield (4.5 t/ha) which was closely followed by Butachlor 50% EC @ 1250 g.a.i./ha producing 4.2 t/ha of rice grain. These two were again significantly at par with Oxadiargyl 80% WP @ 100 g a.i/ha treatment which yielded 4.3 t/ha of grain. The lowest rice grain yield was recorded in unweeded control plots producing 2.8 t/ha. Among the chemical treatments the lowest yield (3.1 t/ha) was recorded with Oxadiargyl 80% WP @ 70 g a.i./ha.

Phytotoxicity

None of the herbicide used, showed any phytotoxicity at any stage of crop growth. From the above experimental findings it can be concluded that Oxadiargyl 80% WP can very well be applied in transplanted paddy as pre-emergence application @ 100 g.a.i./ha to obtain satisfactory yield of crop which keeps the weed under control showing no phytotoxicity to the crop. Further this application is considered to be the best among the other treatments as it is not only environment friendly but also economically sound.

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Table 2 Effect of treatments on weed density, dry weight and grain yield of rice

No.	Treatments	Dose/ha (g.a.i./ha)	Weed Density/m^2			Total Weed Biomass (g/m^2)			Grain yield (t/ha)
			30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	
T_1	Oxadiargyl 80% WP	70	27.60	33.33	45.13	6.83	9.61	13.34	3.10
T_2	Oxadiargyl 80% WP	90	29.02	39.66	45.72	5.88	7.74	11.82	3.45
T_3	Oxadiargyl 80% WP	100	21.03	31.02	39.33	3.92	5.60	9.39	4.30
T_4	Oxadiargyl 6% EC	70	31.33	41.67	54.70	8.95	11.64	16.93	3.12
T_5	Oxadiargyl 6% EC	90	29.33	39.33	50.67	7.02	10.67	15.18	3.56
T_6	Oxadiargyl 6% EC	100	28.60	36.80	48.20	6.93	9.61	13.34	4.00
T_7	Butachlor 50% EC	1250	19.66	28.80	37.40	3.84	5.84	8.89	4.20
T_8	Hand Weeding Twice	-	17.33	26.66	35.00	2.69	4.87	7.90	4.50
T_9	Unweeded control		38.00	50.33	86.00	16.61	22.93	31.48	2.80
	S.Em(±)		1.653	1.575	1.623	0.453	0.488	0.548	0.117
	CD at 5%		4.85	4.62	4.76	1.33	1.433	1.61	0.35