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Comparative efficacy of Pyrazosulfuron Ethyl (PSE) alone and its combination with Molinate against weed complex of *boro* paddy

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ABSTRACT

A field experiment was conducted during *boro* season (2000) to study the comparative efficacy of Pyrazosulfuron Ethyl (PSE) alone and its combination with Molinate against weed complex of *boro* paddy at the University Teaching Farm, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal. The predominant weed species were *Echinochloa crusgalli, Cyperus iria, Fimbristylis miliacea, Scripus maritimus, Monochoria vaginalis, Ludwigia parviflora* and *Ammania baccifera*. The result of the experiment revealed that among all the chemicals tried in this investigation PSE 10% WP @ 16 g a.i. /ha was the best in reducing weed population and weed dry weight without showing any phytotoxic symptoms in rice. Though hand weeding twice at 20 and 40 DAT gave the maximum grain yield, benefit : cost ratio clearly showed that PSE 10% WP @ 15g a.i./ha is the right herbicide to replace the hand weeding treatment.

Weed problem in transplanted rice culture is in general less acute than the direct seeded upland rice mainly due to the fact that pre-planting tillage operation kills the existing weeds in this case. Furthermore, continuous submergence checks in weed growth (IRRI Annual Report, 1970 and Mukhopadhyay, 1971). The extent of yield reduction in rice as evidenced from the multilocational testing programme of the All India Co-ordinated Rice Improvement Project, due to weeds alone in India, has been estimated to be around 15 to 20% for transplanted rice, 30 to 50% for direct seeded under puddled condition and over 50% for upland rice (Mukhopadhyay and Bhattacharya, 1969; Mukhopadhyay *et al*., 1972; Mukhopadhyay 1974; Pillai and Rao, 1974).

Generally weeds compete with the crops for light, space, water and mineral nutrients. Plant competition starts when the immediate supply of single important growth factor falls below the levels of demand of both plant and weeds. As the weeds always cause reduction in rice yield, different weed control methods are being tried to keep under control. Although hand weeding is by far the most effective method of weed control, it can not be practiced when weeds are very

young. One or two hand weeding at 20 or 20 and 40 DAT are needed for effective control of weeds in *boro* rice crop (Mukhopadhyay, 1995). The advent of chemical weed killers brought about a revolutionary change in weed management. Application of herbicide is easy, rapid and more effective for controlling weeds over cultural and mechanical methods under many weed problem situation in rice culture (Bharadwaj and Verma, 1969; De Datta, 1972 and 1974; Ray, 1973). Several herbicides such as pendimethalin, Pretilachlor, PSE (Pyrazosulfuron Ethyl) and Butachlor therefore are being tried to keep the weeds under control in transplanted rice.

MATERIALS AND METHODS

The experiment was conducted during the *boro* season of 1999-2000 at the University Teaching Farm under Bidhan Chandra Krishi Viswavidyalaya, Mondouri, Nadia, West Bengal. Ten treatments were replicated thrice in a randomised block design (RBD) with a net plot size of 5m × 3m each. The details of the treatments were as follows (Table 1). The soil of the experimental field was typical Gangetic alluvial soil (Entisol) having clay loam texture with moderate fertility having neutral soil reaction. The climate is subtropical humid. The rice variety used was Satabdi (IET 4786). The crop was transplanted on 31st January, 2000 where a fertilizer dose of 120 kg N,

Table 1 The details of the treatments

Treatment No.	Treatment	Rate (g a.i./ha)	Formulated product (g/ml./ha)	Time of application (DAT)
T_1	Pendimethalin 30 EC	1500	5000	4
T_2	Pyrazosulfuron Ethyl (PSE) 10% WP	15	150	4
T_3	Pyrazosulfuron Ethyl 0.07% + Molinate 5.0% G	500	527	14
T_4	Pyrazosulforon Ethyl 0.07% + Molinate 5.0% G	1000	1054	14
T_5	Pyrazosulfuron Ethyl 0.07% + Molinate 5.0% G	1500	1580	14
T_6	Pretilachlor 50% EC	500	1000	4
T_7	Pretilachlor 50% EC	750	1500	4
T_8	Butachlor 50% EC	750	1500	4
T_9	Hand weeding twice at 20 and 40 DAT			
T_{10}	Unweeded control			

DAT = Days after transplanting

60 kg P_2O_5 and 60 kg K_2O per hectare were applied in the form of Urea, SSP and MOP respectively. Half of the total N and full doses of P_2O_5 and K_2O were applied as basal and rest amount of N was top dressed into two equal splits, one at 21 DAT and another at 42 DAT. The herbicides were applied at 4 and 14 days after transplanting according to the treatments. The crop was protected against the incidence of pests and diseases by employing effective plant protection measures as and when necessary. The crop was harvested on 15th May, 2000.

Weed control efficiency of different treatments was obtained by using the following formula –

$$WCE(\%) = \frac{U - T}{U} \times 100$$

Where, U is the dry matter weight of weeds in unweeded plot and T in treated plot.

RESULTS AND DISCUSSION

Predominant weed species, weed density and weed biomass

Predominant weed flora in the experimental field were *Echinochloa crusgalli, Cyperus iria, Fimbristylis miliacea, Scirpus maritimus, Monochoria vaginalis, Ludwigia parviflora* and *Ammania baccifera.*

The total weed population 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, PSE (Pyrazosulfuron Ethyl) 10% WP @ 15g a.i.ha^{-1} and PSE (Pyrazosulfuron Ethyl) 0.07% + Molinate 5% G @ 1500g 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. Other treatments like, PSE 0.07% + Molinate 5% G @ 1000 g a.i./ha, Pretilachlor 50% EC @ 750g a.i./ha and Butachlor 50% EC @ 750g a.i./ha showed satisfactory performance in controlling weeds at all the growth stages (Table 2).

PSE 10% WP @ 15g a.i./ha and PSE 0.07% + Molinate 5% G @ 1500g a.i./ha were highly effective in reducing weed biomass m^{-2} at all the growth stages. Other treatments like Butachlor 50% EC @ 750g a.i./ha, Pretilachlor 50% EC @ 750g a.i./ha and PSE 0.07% + Molinate 5% G @ 1000g a.i./ha gave satisfactory result in reducing weed biomass. Hand weeding gave lowest weed biomass/m^2 among all the treatments tried in this investigation (Table 2).

Weed control efficiency

Weed control efficiency (WCE) was high with treatments of PSE 10% WP @ 15g a.i./ha and PSE 0.07% + Molinate 5% G @ 1500g a.i./ha. Other treatments like Butachlor 50% EC @ 750g a.i./ha, Pretilachlor 50% EC @ 750g a.i./ha and PSE 0.07% + Molinate 5% G @ 1000g a.i./ha also showed satisfactory efficacy on weed control. Hand weeding treatment recorded highest weed control efficiency at all the stages of crop growth.

Yield and weed index

The highest grain yield (5646 kg/ha) was obtained with hand weeding (at 20 and 40 DAT) treatment closely followed by the treatments T_2 (PSE 10%

WP @ 15g a.i./ha) and T_5 (PSE 0.07% + Molinate 5% G @ 1500g a.i./ha). Regarding straw yield, the highest value was obtained with hand weeding treatment (6108 kg /ha) followed by the treatments T_2 and T_5 having no significant difference among themselves (Table – 3).

It can therefore be concluded that the laborious, time consuming, costly and cumbersome hand weeding practice can economically be replaced by low dose herbicide like PSE 10% WP @ 15g a.i./ha (T_2) in transplanted summer rice at 4 DAT resulting an effective control of weeds giving an optimum yield of the crop.

Table 2 Treatment effects on total weed density, total weed biomass and weed control efficiency at different growth stages

Treatments	Total weed density/m^2			Total weed biomass (g/m^2)			Weed control efficiency (%)		
	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT
T_1	17.67	25.67	31.00	6.37	9.21	17.15	44.22	51.14	44.58
T_2	8.00	11.33	17.00	3.21	4.21	8.28	71.89	78.09	73.24
T_3	17.33	25.00	29.33	6.14	9.06	15.94	46.23	51.93	48.49
T_4	10.67	16.00	21.67	3.87	5.28	9.68	66.11	71.98	68.72
T_5	9.33	13.67	17.67	3.58	4.66	8.67	68.65	75.27	71.98
T_6	14.67	21.67	26.33	5.05	7.10	12.60	55.77	62.33	59.28
T_7	12.00	16.67	23.67	4.48	5.92	10.94	60.77	68.59	64.65
T_8	13.33	19.33	24.67	4.56	6.58	11.08	60.17	65.09	64.20
T_9	6.00	8.67	15.33	1.94	2.68	6.28	83.01	82.00	76.47
T_{10}	24.33	39.67	52.67	11.42	18.85	30.95	0	0	0
S.Em ±	0.79	0.96	0.74	0.26	0.47	0.51			
C.D. (P=0.05)	2.34	2.86	2.21	0.79	1.44	1.52			

Table 3. Grain yield, straw yield and weed index for different treatments

Treatment	Grain yield (Kg/ ha)	Straw yield (kg/ha)	W.I.(%)
T_1	4435	4840	21.45
T_2	5406	5872	4.25
T_3	4452	4862	21.15
T_4	5128	5540	9.17
T_5	5275	5737	6.57
T_6	4642	4950	17.78
T_7	5045	5383	10.64
T_8	5012	5370	11.23
T_9	5646	6108	0
T_{10}	3815	4335	32.43
S.Em ±	56	73	
C.D. (P=0.05)	167	218	

REFERENCES

Bharadwaj, R.B.L. and Verma R.D. 1969. The control of weeds in rice fields. *Indian J. Agron.*, **4** (2) : 123-129.

De Datta, S.K. 1972. Chemical weed control in tropical Asia, PANS, **18** (4) : 433-440.

De Datta, S.K. 1974. Weed control in rice. Present Status and Future challenge, *Philippines weed Sciences Bulletin*, **1** : 1-16.

IRRI Annual report, 1970, March-April, **5** (2).

Mukhopadhyay, S. K. 1974. Increasing fertilizer efficiency through weed control. *Fertilizer News*. Dec., 56-58.

Mukhopadhyay, S.K. 1971. Nature of weed problem in different rice culture and advances in weed control in rice fields. *Paper presented at the All India Workshop on Crop Protection*, Lucknow, 5-11 Nov. 1971.

Mukhopadhyay, S.K. 1995. Weed management in *boro* rice. *Boro rice technology* : A manual (Eds. D. Dasgupta, P. K. Gangopadhyay and A. K. Das) Pallisree Press, Sriniketan Rd., Bolpur, W. B.; 70-77

Mukhopadhyay, S.K. and Bhattacharya, S.P. 1969. Weed control in rice by chemical and cultural methods. *Proc. Internat. Symp. on Plant Growth Subs.*, Jan. 1967, UGC and C.U. pp. 503-507.

Mukhopadhyay, S.K., Khara, A.B. and Ghosh, B.C. 1972. Nature and intensity of competition of weeds with direct seeded upland IR-8 rice crop. *Int. Rice Comm., Newslett.*, **21** (2) : 10-14.

Pallai, K.G. and Rao, M.V. 1974. Weed control for rice in India. *Paper presented at the Int. Rice Res. Conf.*, IRRI, Philippines, pp. 22.

Ray, B.R. 1973. Weed control in rice. *A review, Indian J. Weed Sci.*, **5** (1) : 60-71