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Efficacy of Different Weed Management on Weed Flora and Productivity of Aerobic Rice (*Oriza sativa* L.)

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ABSTRACT: *The field trial was conducted during kharif 2012 at the Research farm, college of Agriculture, Rewa to evaluate the efficacy of different weed management on weed flora and productivity of aerobic Rice (var. Narendra-97). The major weed flora observed in the experimental field was Paspalum sp., Setania sp., Cynodon dactylon, Echinochloa colonum, Panicum sp. As grassy weeds; Cyperus rotandus and Cyperus esculentus as sedges and Digeria arvensis, Anagalis arvensis, Convolvulus arvensis, Celasia angentia, Eclipta alba, Euphorbia hirta as broad-leaved weeds. Among different herbicide treatments, application of Butachlor 1.5 Kg/ha (3-4 DAS) + Bispyribac sodium 35 g/ha (15-20 DAS) reduced total weeds, fresh weight of weeds and dry weight of weeds/m^2 after sowing of rice and consequently produced significantly maximum grain yield (38.89 q/ha), net income and B: C ratio (3.11) than all the treatments and control, but remained at par to Pendimethalin 1.0 Kg/ ha at 3-4 DAS (day after sowing)+ Bispyribac sodium 35 g/ha (15-20 DAS) in almost all the traits. It also proved the best substitute to Hand weeding at 20 & 45 DAS produced significant and highest grain yield (42.23 q/ha) and net return over all the treatments but remained comparative in B:C ratio and weed accounts during the study. Moreover, it had more weed control efficiency and weed index as compare to others including control. The second equally best treatment was noticed Pendimethalin 1kg/ha + bispyribac sodium 35g/ha in reducing number of weeds.*

Keywords*: Aerobic rice, Grain yield, Net income, B:C Ratio and Weeds.*

INTRODUCTION

Rice is one of the major *Kharif* crops of the region which is grown under various situation The dry broadcast or line sowing under rainfed upland situation experience acute problem of weed management as the weeds get very favourable environment for their growth and compete with entire cycle of the plant growth and its development. The situation is further aggravated resulting initially in poor crop and loss of grain yield. Weed completion is greater in direct seeded rice as weeds germinate along with rice and even grow faster than rice if timely and effective weed control is not done. Aerobic rice systems, wherein the crop is established through direct seeding in non-puddled, non-flooded fields, are among the most promising approaches for saving water (Bhushan *et al.* 2007). Weeds pose a serious threat to the direct seeded aerobic rice by competing for nutrients, light, space and moisture throughout the growing season (Hussain *et al.* 2008). Singh *et al.* (2008) reported that in aerobic direct seeded rice, loss of grain yield due to weed competition ranged from 38 to 92%. In order to realize maximum benefit and applied monetary inputs, weed control at the critical stages of crop is estimated Hand weeding is commonly followed to control the weeds in rice but due to high wages and unavailability of labour, timely control of weeds manually is not possible under such condition. Ample scope exists for improving productivity of rice crop by way of using herbicide for the purpose of increasing productivity and reducing cost of cultivation (Mishra and Singh 2007).Chemical weed control has been found most effective. Many herbicides are available for the effective control of weeds in rice fields.

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The herbicides being selective may not be effective against all species of weeds hence their testing alone and in combination is required. The control of weeds in the upland rice has been manifested in the recent past through the use of pre and post emergence herbicide (Singh *et al*., 2005 and Bali *et al*., 2006). It has been observed that that the pre-emergence herbicides alone fail to reduce weed competition sustainably during the critical periods. With the development of crop production technology in the recent years, some new herbicides are coming forward which are being claimed to be more effective in controlling the existing composition of weed-flora in the rice fields as compared to the already existing herbicides. Therefore it was essential to evaluate the efficiency of newly introduced pos- emergence herbicides.

MATERIALS AND METHODS

The experiment was carried out at the JNKVV Regional Research Station, College farm, Rewa (M.P.) during *Kharif* 2012 on silt clay-loam soil with pH 7.2, electrical conductivity 0.32 ds/m, 0.70% organic carbon, available N 252 kg/ha, 15.60 kg/ha, 340 kg/ha of available P_2O_5 and Potash, respectively. The total rainfall received during the crop season was 1293.84 mm with 105 rainy days. The field was infested with the most common seasonal weeds including grasses sedges and broad leaves weeds. The rice crop var. Narendra-97 was sown on first fort night of July, 2012 by line sowing keeping seed rate of 100 kg/ha and 20 cm distance between rows. The fertilizer was applied at the rate 80 kg N, 40 kg P_2O_5 and 30 kg K_2O and 10 kg Zn kg/ha in the form of urea, single super phosphate, muriate of potash, and zinc sulphate respectively. Phosphorus and potash fertilizers were applied as basal and nitrogen was applied in three splits. The weed control treatments were applied as per well decided specifications. The crop was harvested on 16 October 2012. The periodical observations were recorded and the data were statistically computed before presenting the results. The experiment was consist eleven treatments with three replications. The treatments details are given below:

Details of Treatments were Applied during Experimentation

Treatments	*Treatment details*
T_1	Pendimethalin (30EC) @1.00 kg a.i./ha (3-4 DAS) + Bispyribac sodium (10%SC) @ 35 gm.a.i.per ha (15-20 DAS)
T_2	Pendimethalin (30EC) @1.00Kg a.i./ha (3-4 DAS)+2,4 D, Na Salt (80 WP)@0.06 kg a.i. per ha.(20-25 DAS)
T_3	Pendimethalin (30EC) @1.00Kg a.i./ha. (3-4 DAS) + 2,4 D, Ethoxysulfuron (15 WSG) @ 15 gm a.i./ha.(25-30 DAS)
T_4	Pendimethalin (30EC) @1.00Kg a.i./ha.(3-4 DAS)+(Chorimuron+ Metsulfuronmethyl) 20WP @ 40gm a.i./ha.(25-30 DAS)
T_5	Butachlor (50EC) @1.5Kg per a.i.per ha.(3-4 DAS)+ Bispyribac sodium (10%SC) @ 35 gm.a.i./ha (15-20 DAS)
T_6	Butachlor (50EC) @1.5Kg per a.i./ha (3-4 DAS) +2,4 D ,Na Salt (80WP) @ 0.06kg a.i./ ha. (20-25 DAS)
T_7	Butachlor (30EC) @1.0 Kg per a.i./ha (3-4 DAS)+ Ethoxysulfuron (15WSG) @15gm a.i. per ha.(25-30 DAS)
T_8	Butachlor (30EC) @1.5Kg per a.i./ha (3-4 DAS) + (Chorimuron+ Metsulfuronmethyl) 20WP @ 40gm a.i./ha (25-30 DAS)
T_9	Mechanical weeding /weeders at 20 & 45 DAS
T_{10}	Hand weeding at 20 & 45 DAS
T_{11}	Unweeded control-

RESULT AND DISCUSSION

Studies on Weeds

The most common weed-flora observed in the experimental field were *Paspalum sp., Setania sp., Cynodon dactylon, Echinochloa colonum, Panicum sp.* As grassy weeds; *Cyperus rotandus and Cyperus esculen*tus as sedges and *Digeria arvensis, Anagalis arvensis, Convolvulus arvensis, Celasia angentia, Eclipta alba, Euphorbia hirta* as broad-leaved weeds. All the control treatments (T_1 to T_{10}) proved significantly effective in controlling the existing weed flora over unweeded control (T_{11}). Out of these different weed management treatments, T_1, T_5 and T_{10} were found equally effective in controlling maximum weeds. Out of total 88 weeds /m^2, only 12 weeds /m^2 were observed in case of T_1 which means 76 weeds /m^2 were controlled. In treatment of T_5, out of 74 total weeds /m^2 only 10 weeds /m^2 were noted which means 64 weeds /m^2 were controlled. Thus T_1 and T_5 both these treatments having pendimethalin or butachlor along with bispyribac sodium played unique role in selective killing of all kinds of the existing weed-flora up to the maximum extent equal to that of two hand weeding (T_{10}). Therefore, T_1 and T_5 treatments may prove the best substitute of hand weeding twice.

The fresh and dry weight of weeds /m^2 was eventually adopted the same trend as observed in case of total weeds/m^2. The treatment T_1, T_5 and T_{10} recorded the lowest fresh and dry weight of weeds before pre and post emergence IWM treatments recorded comparatively higher fresh and dry weight of weeds/m^2 and the unweeded control treatment

Table 1
Effect of Different Weed Management on Weed Studies, Grain Yield and Economics of Aerobic Rice

Treatments	*Total weeds//m²*		*Fresh weight of weeds/m²(g)*		*Dry. Weight of weeds/m²(g)*		*Weed control efficiency (%)*	*Weed index (%)*	*Grain yield (q/ha)*	*Net income (Rs/ha)*	*B:C Ratio*
	Before	*After*	*Before*	*After*	*Before*	*After*					
T_1	88.95	12.65	440.38	62.65	172.05	23.54	81.23	8.54	38.62	27156	2.88
T_2	76.36	24.15	380.78	120.65	95.99	30.54	84.43	13.83	36.39	25790	2.88
T_3	61.34	20.25	304.64	100.35	100.66	33.00	87.27	13.83	36.39	24751	2.73
T_4	78.33	17.69	391.68	8535	145.45	31.74	91.10	15.14	35.84	24763	2.80
T_5	74.98	10.75	371.31	50.48	169.67	22.94	85.27	7.92	38.89	28403	3.11
T_6	72.36	19.56	361.56	96.65	127.96	33.70	82.87	12.51	36.95	25808	2.82
T_7	69.25	23.26	348.28	116.25	97.34	32.54	85.84	16.46	35.28	24805	2.83
T_8	71.14	18.38	351.36	90.96	132.98	33.67	69.20	19.09	34.17	22846	2.60
T_9	74.41	37.56	299.89	185.25	78.23	34.14	76.03	15.14	35.84	24646	2.68
T_{10}	74.35	10.95	300.36	50.68	152.98	27.00	92.70	0.0	42.23	29847	2.93
T_{11}	116.38	129.36	600.28	644.34	106.43	109.40	0.00	46.72	22.50	11844	1.93
S.Em±	4.15	3.98	4.07	1.26	1.71	3.11	5.28	4.2	0.80		
C.D. (P=0.05)	12.20	11.68	12.21	3.71	5.026	9.15	15.53	12.6	2.34		

(T_{11}) resulted in the significantly highest fresh and dry weight of weeds /m². The maximum WCE up to 92.70% was recorded under two hand weeding treatment (T_{10}). This was however followed by T_4 (pendimethalin + chlorinur + metsulfuron methyl) i.e. 91.10% WCE and then T_3 (pendimethalin + 2, 4-D + ethoxysulfuron) i.e. 87.27% WCE. On the other hand, T8 having butachlor + chlorimuron + metsulfuron methyl resulted in significantly lowest WCE of 69.20%, closely followed by mechanical weeding twice (T_9) i.e. 76.03 %. The trend was reserve in case of weed index with respect to the above treatment. However the treatment T1 T_5 and T_{10} giving higher WCE accorded the lower weed index.

PRODUCTIVITY OF RICE

Amongst the weed control treatment, HW-twice (T_{10}) recorded significant higher grain yield of rice (42.23q/ha). However this was followed by Pendimethalin 1kg/ha or butachlor 1.5k/ha with bispyribac sodium 35g/ha (T_1 and T_5) which resulted in 38.62 to 38.89 q/ha grain yield. The higher yield from T_{10}, T_1 and T_5 treatments may be due to maximum wed control which reduced the weed competition with the crop plant for space light nutrients and moisture, thereby increased photosynthates and grain yield. These results are in accordance with those of Bali *et al.*, 2006; Sanjay and Prajapati (2006) and Mishra and Singh (2007).

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