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Uptake of N, P and K by Weeds and Crop of Aerobic Rice (*Oryza sativa*) as Influenced by Weed Management Practices under Different Seeding Methods

Ch. Prashanthi[1*], P. Laxminarayana[1], G.E.Ch. Vidyasagar[1] and S. Harish Kumar Sharma[2]

[1]Department of Agronomy, College of Agriculture, [2]Department of Soil Science and Agricultural Chemistry, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad - 500 030, India

**Corresponding author*

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A field experiment was conducted to assess the effect of seeding methods and weed management practices on yield of aerobic rice and nutrient removal by the weeds under direct seeded aerobic rice. Among the seeding methods line sowing increased the grain yield than the broadcasting method. Among weed management all the weed management practices were found to be equally effective in reducing the uptake of nutrient by weeds and producing higher grain yield as compare to weedy check. However maximum yield was obtained with the application of Pretilachlor 0.75 kg ai ha^{-1} as PE fb Azimsulfuron 35g.ai ha^{-1} + Cyhalofop butyl 75 g. ai ha^{-1} as PoE 15-20 DAS along with 1HW at 50 DAS indicating that weeds are controlled efficiently with sequential application of herbicides resulted in higher grain yield. Herbicidal treatments resulted in considerably lower cost of cultivation compared to hand weeding.

Introduction

Rice (*Oryza sativa* L.) is the most important and widely cultivated crop in the world and staple food for about three billion people across the globe and the demand for food continue to increase as the population is increasing at faster rate (Carriger and Valle, 2007). Due to resource constraints, especially water and labourers, direct seeding under dry condition is now emerging new trend in rice cultivation. Aerobic rice, the term recently introduced in rice cultivation is a practice of direct drilling of seeds in rows and maintaining aerobic condition of the field under limited water availability. According to IRRI scientists, aerobic rice is production systems of rice in which especially developed "aerobic rice" varieties are grown in well drained, non-puddle and saturated soils (Bouman and Lampayan, 2009). In direct seeding weeds are the major problems and pose serious competition for resources to the crop in early stages and cause heavy reduction in yield of rice. Weeds usually grow faster than crop plants and thus absorb nutrient

earlier resulting in lack of nutrients for growth of plant. Owing to favourable weather conditions, severe weed infestation is a major biotic constraint to rice production. Uncontrolled weeds cause up to 80% reduction in grain yield and sometimes result in complete failure of crop (Pandey *et al.*, 2000; Gopinath and Kundu, 2008).

Materials and Methods

Field experiment was carried out during *kharif*, 2014 at College Farm, Professor Jayashankar Telangana State Agricultural University, Hyderabad to evaluate the efficacy of sequential application of herbicides in different seeding methods in sandy loam soil. The experiment was conducted in factorial RBD with a plot size of 4 x 4m with three replications. Factor 1 includes seeding methods, broadcasting (S_1) and line sowing (S_2) Factor II includes weed management practices, T_1-Pretilachlor 50% EC as PE fb (metasulfuron methyl + chlorimuron ethyl) 20% W.P as PoE + cyhalofop butyl 10% EC as PoE at 15-20 DAS, T_2-Pretilachlor 50% EC as PE fb azimsulfuron 50% W.P + cyhalofop butyl 10% EC as PoE 15-20 DAS, T_3-Pretilachlor 50% EC @ 0.75 kg ai ha^{-1} as PE fb pyrazosulfuron 10% W.P + cyhalofop butyl 10% EC as PoE at 15-20 DAS, T_4-bispyribacsodium 10% EC @ 25 g ai ha^{-1} as early PoE fb 2-4-D 80% W.P @ 0.5 kg.ai ha^{-1} at 40 DAS, T_5- T_1 followed by HW at 50 DAS, T_6- T_2 followed by HW at 50 DAS, T_7- T_3 followed by HW at 50 DAS, T_8- T_4 followed by HW at 50 DAS, T_9- HW at 20, 40 and 60 DAS, T_{10}-unweeded control. The recommended fertilizer dose was 100-60-40 kg of N, P_2O_5 and K_2O ha^{-1} respectively.

Results and Discussion

Weed flora such as *Echinocloa colonam* L., *Cynodon dactylon* L., *Eleusine indica* among the grasses; *Cyperus rotundus* L among the sedges and *Eclipta alba* L., *Commelina bengalensis* L., *Ipomoea purpurea, Alternanthera sessillis, Physalis minima, Bacopa monnieri, Cyanotis cristata, Corchorus, Phyllanthus niruri, Ageratum conyzoides,* among the broad-leaved weeds, were found to be predominant weeds in aerobic rice.

Grain yield

Among seeding methods the higher grain yield was recorded with line sowing (S2) (3161.0 kg ha^{-1}) than the broadcasting (S1) (2366.0 kg ha^{-1}) method which might be due to the maintenance of less weed population and higher weed control efficiency.

Herbicidal treatments significantly influenced the grain yield. Among weed management practices, hand weeding at 20, 40 and 60 DAS (T_9) was found to be superior over rest of the treatments.

The highest grain yield was recorded with hand weeding thrice at 20, 40 and 60 DAS followed by sequential application of herbicides along with one hand weeding at 50 DAS *i.e.* T_6-(Pretilachlor 0.75 kg ai ha^{-1} as PE fb Azimsulfuron 35g.ai ha^{-1} + Cyhalofop butyl 75 g. ai ha^{-1} as PoE 15- 20 DAS fb HW at 50 DAS) (3218 kg ha^{-1}), however it was on par with T_7-(Pretilachlor 0.75 kg ai ha^{-1} as PE fb Pyrazosulfuron ethyl 20 g.ai ha^{-1} + Cyhalofop butyl 75 g.ai ha^{-1} as PoE at15-20 DAS fb HW at 50 DAS) (3084 kg ha^{-1}), T_5-(Pretilachlor 0.75kg ai ha^{-1} as PE fb (Metasulfuron methyl+ Chlorimuron ethyl) 4 g.ai ha^{-1} as PoE + Cyhalofop butyl 75 g.ai ha^{-1} as PoE at 15-20 DAS fb HW at 50 DAS) (3150 kg ha^{-1}), T_8-(Bispyribac sodium 25 g ai ha^{-1} as early PoE(10-12 DAS) fb 2-4-D 0.5 kg.ai ha^{-1} at 40 DAS fb HW at 50 DAS) (3003 kg ha^{-1}), found better in increasing the yield significantly over sequential application of herbicides alone.

Weed control efficiency (%) and weed index (%)

Data presented in table 1 on weed control efficiency (per cent) and weed index (per cent) revealed that effect of weed management practices significantly influenced these parameters.

At crop growth stage (60 DAS), T_9 treatment recorded lower weed index as well as higher weed control efficiency (95.5) and was closely followed by T_6 (95.3), T_5 (95.0), T_7 (94.9) and T_8 (94.8).

Significantly lower weed dynamics resulted from supplemental hand weeding at 50 DAS in addition to sequential application of weedicides leading to extended period of weed control. Next treatment having higher weed control efficiency was T_2 followed by T_1, T_2, and T_3.

Uptake of N, P and K by weeds

The data pertaining to the influence of seeding methods and weed management practices on nutrient uptake by weeds at harvest presented in table 2, 3 and 4 revealed that seeding methods, weed management practices and their interaction was found significant on uptake of nutrients by weeds.

Among seeding methods significantly lower uptake of N, P and K by weeds at harvest was observed with line sowing (8.25, 2.74 and 17 kg ha^{-1} respectively) as compared with broadcasting (11.8, 6.01, and 22.0 kg ha^{-1} respectively).

Among weed management practices maximum N, P and K uptake by weeds at harvest was observed in T_{10} -weedy check (18.28, 8.63 and 38.5 kg ha^{-1}) while minimum (6.65, 1.66 and 11.7 kg ha^{-1}, N, P, K respectively) was observed in T_9 (Hand weeding at 20,40 and 60 DAS) Which was followed by T_6 (7.86, 15.5 kg ha^{-1}) and in turn at par with T_5, T_7 and T_8.

However, the interaction effect of seeding methods and weed management practices significantly influenced the uptake of P by weeds at harvest. Significantly highest P uptake (9.53 kg ha^{-1}) was observed with T_4 under broadcasting method. This was closely followed by T_1, T_3 and T_2. Lowest P uptake was observed with T_9 irrespective of method of sowing.

Uptake of N, P, K by crop at harvest

The data in table 2, 3 and 4 pertaining to uptake of N, P and K by crop at harvest revealed that N, P and K uptake by crop was significantly influenced by seeding methods, weed management practices but their interaction was found significant on uptake of nitrogen and potassium only.

Among seeding methods significantly higher uptake of N, P and K by crop was observed with line sowing (75.9, 15.09 and 117.5 kg ha^{-1}) when compared with broadcasting (67.14, 11.23 and 86.25 kg ha^{-1}) respectively. Which might be due to in line sowing weeds were controlled efficiently as evidenced with recording less weed dynamics by which the crop performed better and resulted in higher yield and more uptake of nutrients.

Among weed management practices maximum N,P and K uptake by crop at harvest (89.5, 21.3 and 115.1 kg ha^{-1}) was observed in (T_9) Hand weeding at 20,40 and 60 DAS while the minimum N, P, K uptake by crop (28.6, 7.33 and 68.2 kg ha^{-1}) was observed in T_{10}. Among other treatments, higher N, P and K uptake by crop was recorded by T_6 (80.8, 14.98 and 106.8 kg ha^{-1}) which were at par with T_5, T_7 and T_8.

Table.1 Weed index, weed control efficiency (60 DAS) and grain yield of aerobic rice as influenced by weed management practices under different seeding methods

T	weed management practices	Weed index (%)			WCE (%)	Grain yield (kg/ha)		
		S1	**S2**	**Mean**		**S1**	**S2**	**Mean**
T_1	Pretilachlor 0.75 kg ai ha^{-1} as PE fb (Metasulfuron methyl + Chlorimuron ethyl) 4 g. ai ha^{-1} as PoE + Cyhalofop butyl 75 g. ai ha^{-1} as PoE at 15-20 DAS.	21.1	26.7	23.9	**43.2**	2357	2978	**2668**
T_2	Pretilachlor 0.75 kg ai ha^{-1} as PE fb Azimsulfuron 35 g.ai ha^{-1} + Cyhalofop butyl 75 g. ai/ha as PoE 15-20 DAS.	12.0	22.9	17.4	**43.5**	2630	3135	**2883**
T_3	Pretilachlor 0.75 kg ai ha^{-1} as PE fb Pyrazosulfuron 20 g.ai/ha + Cyhalofop butyl 75 g. ai ha^{-1} as PoE at 15-20 DAS.	22.0	20.2	21.1	**43.0**	2330	3245	**2787**
T_4	Bispyribac sodium 25 g ai ha^{-1} as early PoE fb 2-4-D 0.5 kg.ai ha^{-1} at 40 DAS.	25.8	26.7	26.3	**42.6**	2217	2978	**2598**
T_5	T_1 fb Hand weeding at 50 DAS.	11.1	10.4	10.7	**95.0**	2658	3643	**3150**
T_6	T_2 fb Hand weeding at 50 DAS.	9.6	8.1	8.9	**95.3**	2701	3735	**3218**
T_7	T_3 fb Hand weeding at 50 DAS.	14.8	10.9	12.8	**94.9**	2546	3622	**3084**
T_8	T_4 fb Hand weeding at 50 DAS.	14.5	15.1	14.8	**94.8**	2557	3449	**3003**
T_9	Hand weeding at 20, 40, 60 DAS	0.0	0.0	0.0	**95.5**	2989	4064	**3526**
T_{10}	Unweeded (control)	67.9	74.1	71.0	**0**	958	1051	**1005**
	Mean	**19.88**	**21.51**			**2366**	**3161**	
						SEm±	**CD(0.05%)**	
	F1					44.73	128.09	
	F2					100.0	286.4	
	F1×F2					141.4	405.0	

Table.2 Uptake of nitrogen (kg ha^{-1}) by crop and weeds at harvest as influenced by weed management practices under different seeding methods

	Weed management practices	Seeding methods					
		crop			**weeds**		
		S_1	**S_2**	**Mean**	**S_1**	**S_2**	**Mean**
T_1	Pretilachlor 0.75 kg ai ha^{-1} as PE fb (Metsulfuron methyl + Chlorimuron ethyl) 4 g. ai ha^{-1} as PoE + Cyhalofop butyl 75 g. ai ha^{-1} as PoE at 15-20 DAS.	66.5	73.5	**70.0**	13.3	8.16	**10.76**
T_2	Pretilachlor 0.75 kg ai ha^{-1} as PE fb Azimsulfuron 35g.ai ha^{-1} + Cyhalofop butyl 75 g. ai ha^{-1} as PoE 15-20 DAS.	67.4	74.3	**70.8**	12.7	8.20	**10.46**
T_3	Pretilachlor 0.75 kg ai ha^{-1} as PE fb Pyrazosulfuron ethyl 20 g.ai ha^{-1} + Cyhalofop butyl 75 g. ai ha^{-1} as PoE at 15-20 DAS.	66.9	74.4	**70.7**	13.1	8.46	**10.8**
T_4	Bispyribac sodium 25 g ai ha^{-1} as early PoE fb 2-4-D 0.5 kg.ai ha^{-1} at 40 DAS.	66.0	72.5	**69.2**	13.5	8.53	**11.05**
T_5	T_1 fb Hand weeding at 50 DAS.	72.7	84.8	**78.7**	9.7	6.66	**8.18**
T_6	T_2 fb Hand weeding at 50 DAS.	73.6	88.0	**80.8**	9.5	6.2	**7.86**
T_7	T_3 fb Hand weeding at 50 DAS.	73.0	85.5	**79.2**	9.3	6.96	**8.13**
T_8	T_4 fb Hand weeding at 50 DAS.	71.9	83.2	**77.6**	9.5	7.1	**8.33**
T_9	Hand weeding at 20, 40, 60 DAS	87.3	91.7	**89.5**	7.5	5.8	**6.65**
T_{10}	Unweeded (control)	25.9	31.4	**28.6**	20.1	16.4	**18.28**
	Mean	**67.14**	**75.9**		**11.8**	**8.25**	
		SEm±	**CD(0.05%)**		**SEm±**	**CD(0.05%)**	
	F1	0.47	1.35		0.076	0.218	
	F2	1.06	3.04		0.170	0.48	
	F1×F2	1.50	4.30		0.240	0.68	

Table.3 Uptake of phosphorus (kg ha^{-1}) by crop and weeds at harvest as influenced by weed management practices under different seeding methods

	Weed management practices	Seeding methods					
		crop			**Weeds**		
		S_1	**S_2**	**Mean**	**S_1**	**S_2**	**Mean**
T_1	Pretilachlor 0.75 kg ai ha^{-1} as PE fb Metsulfuron methyl + Chlorimuron ethyl 4 g. ai ha^{-1} as PoE + Cyhalofop butyl 75 g. ai ha^{-1} as PoE at 15-20 DAS.	9.03	13.36	**11.2**	8.90	2.76	**5.83**
T_2	Pretilachlor 0.75 kg ai ha^{-1} as PE fb Azimsulfuron 35g.ai ha^{-1} + Cyhalofop butyl 75 g. ai ha^{-1} as PoE 15-20 DAS.	9.63	13.96	**11.80**	8.10	2.93	**5.51**
T_3	Pretilachlor 0.75 kg ai ha^{-1} as PE fb Pyrazosulfuron ethyl 20 g.ai ha^{-1} + Cyhalofop butyl 75 g. ai ha^{-1} as PoE at 15-20 DAS.	9.50	13.76	**11.63**	8.60	2.80	**5.70**
T_4	Bispyribac sodium 25 g ai ha^{-1} as early PoE fb 2-4-D 0.5 kg.ai ha^{-1} at 40 DAS.	8.93	12.93	**10.93**	9.53	3.00	**6.26**
T_5	T_1 fb Hand weeding at 50 DAS.	12.23	16.26	**14.25**	3.46	1.70	**2.58**
T_6	T_2 fb Hand weeding at 50 DAS.	13.06	16.9	**14.98**	3.00	1.70	**2.48**
T_7	T_3 fb Hand weeding at 50 DAS.	12.26	16.36	**14.31**	3.26	1.66	**2.33**
T_8	T_4 fb Hand weeding at 50 DAS.	11.83	15.93	**13.88**	3.73	1.80	**2.76**
T_9	Hand weeding at 20, 40, 60 DAS	19.16	23.4	**21.3**	2.00	1.33	**1.66**
T_{10}	Unweeded (control)	6.66	8.00	**7.33**	9.56	7.7	**8.63**
	Mean	**11.23**	**15.09**		**6.01**	**2.74**	
		SEm±	**CD(0.05%)**		**SEm±**	**CD(0.05%)**	
	F1	0.26	0.76		0.065	0.187	
	F2	0.59	1.70		0.146	0.418	
	F1×F2	0.84	NS		0.20	0.59	

Table.4 Uptake of potassium (kg ka^{-1}) by crop and weeds at harvest as influenced by weed management practices under different seeding methods

	Weed management practices	Seeding methods					
		Crop			**Weeds**		
		S_1	**S_2**	**Mean**	**S_1**	**S_2**	**Mean**
T_1	Pretilachlor 0.75 kg ai ha^{-1} as PE fb Metsulfuron methyl + Chlorimuron ethyl 4 g. ai ha^{-1} as PoE + Cyhalofop butyl 75 g. ai ha^{-1} as PoE at 15-20 DAS.	76.9	105.8	**91.3**	26.9	15.8	**21.3**
T_2	Pretilachlor 0.75 kg ai ha^{-1} as PE fb Azimsulfuron 35g.ai ha^{-1} + Cyhalofop butyl 75 g. ai ha^{-1} as PoE 15-20 DAS.	78.4	107.0	**92.7**	26.0	16.1	**21.1**
T_3	Pretilachlor 0.75 kg ai ha^{-1} as PE fb Pyrazosulfuron ethyl 20 g.ai ha^{-1} + Cyhalofop butyl 75 g. ai ha^{-1} as PoE at 15-20 DAS.	77.7	106.7	**92.2**	26.6	16.7	**21.7**
T_4	Bispyribac sodium 25 g ai ha^{-1} as early PoE fb 2-4-D 0.5 kg.ai ha^{-1} at 40 DAS.	76.1	104.2	**90.2**	26.7	16.9	**21.8**
T_5	T_1 fb Hand weeding at 50 DAS.	94.4	115.9	**105.1**	18.3	13.6	**15.9**
T_6	T_2 fb Hand weeding at 50 DAS.	96.1	117.5	**106.8**	17.9	13.0	**15.5**
T_7	T_3 fb Hand weeding at 50 DAS.	95.6	116.6	**106.1**	17.5	13.7	**15.6**
T_8	T_4 fb Hand weeding at 50 DAS.	92.6	115.3	**104.0**	18.5	13.8	**16.1**
T_9	Hand weeding at 20, 40, 60 DAS	109.3	121.3	**115.1**	13.8	9.6	**11.7**
T_{10}	Unweeded (control)	65.3	71.1	**68.2**	36.7	40.4	**38.5**
	Mean	**86.25**	**117.5**		**22.9**	**17.0**	
		SEm±	**CD(0.05%)**		**SEm±**	**CD(0.05%)**	
	F1	0.60	1.73		0.17	0.50	
	F2	1.35	3.88		0.39	1.13	
	F1×F2	1.91	5.49		0.56	1.60	

The higher uptake of nutrients with T_9 treatment might be due to effective control of weeds during the critical crop growth stage as evidenced with recording lower weed dynamics that reduced competition for nutrients, and increased the availability of nutrients to the crop.

The interaction effect of seeding methods and weed management practices were found to be significant with respect to uptake of N and K by crop. Uptake of N by crop was significantly influenced by seeding methods and weed management practices. Highest N uptake (91.7 and 87.3 kg ha^{-1}) was observed under both the seeding methods which was found under weedy check T_{10} irrespective of seeding methods. Similar trend was observed with the uptake of K by crop at harvest.

References

Bouman, B. A. M. and Lampayan, R. M. 2009. Aerobic rice 1 & 2. International Rice Research Institute Philippines.

Carriger, F and Vallee, D. (2007). More crop per drop. *Rice Today*. 6 (2): 10-13.

Gopinath, K.A. and Kundu, S. 2008. Evaluation of metsulfuronmethyl+ chlorimuron-ethyl for weed control in direct seeded rice (*Oryza sativa*). *Indian Journal of Agricultural Sciences* 78 (5): 466–69.

Pandey, A.K., Prakash, V., Singh, P., Prasad, K., Singh, R.D. and Mani, V.P. 2000. Weed management in major crops of North-western Himalayas. *Technical Bulletin* 16, VPKAS, Almora. 66 p.

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