The Andhra Agric. J 58 (4):559-561, 2011

Effect of Sequential Application of Herbicides on Nutrient Uptake by Wet Seeded Rice and its Associated Weeds

Key words : Nutrient uptake, Sequential application, Wet seeded rice.

Rice is the staple cereal and commercial food crop of farmers of Krishna-Godavari Zone in A.P. Transplantation becoming increasingly difficult and costly due to shortage of labour and increased wages. Wet seeding was found as an alternative technique to transplanting in irrigated and rainfed low lands, since it saves labour, time and energy, minimizes drudgery, early crop maturity and ensures efficient water use (Balasubramanian and Hill, 2002), which is gaining popularity in Krishna Agro-climatic Zone. However, the crop was subjected to greater weed competition for various growth factors, viz., nutrients, light and space than transplanted rice due to emergence of crop and weeds at the same time which may reduce yield ranging from 50-100 percent (Rao *et al*., 2007). Weeds usually grow faster than crop plants and absorb the available nutrients earlier, resulting in poor availability of nutrients for crop growth. Thus weed control facilitates higher absorption of applied nutrients by crop plant and increases the efficiency of fertilizer application to the crop (Amarjit *et al*., 2006.). Further, the work done so far on sequential application of herbicides and nutrient uptake by wet seeded rice and its associated weeds was meagre. Keeping this in view, the present investigation was undertaken to study the effect of different herbicidal treatments in wet seeded rice.

A field experiment was carried out during *kharif*, 2010 at Agricultural College Farm, Bapatla. The soil of the experimental field was sandy clay loam, low in available nitrogen (98 kg ha^{-1}), medium in organic carbon (0.42 %), available phosphorus (20 kg ha^{-1}) and potassium (210 kg ha^{-1}) with pH 8.1 and E.C 0.49 dSm^{-1}. The experiment consisted of ten treatments (Table 1), which was laid out in a randomised block design and replicated thrice. The rice variety taken was 'Jagtial mahsuri' (JGL-11470), adopted a seed rate of 20 kg ha^{-1} and the plot was fertilized with N, P_2O_5, K_2O level of (120-60-60) kg ha^{-1}. The pre- emergence herbicides were applied at 3 DAS as sand mix application and the post emergence herbicides were applied at 20 DAS through knap-sack sprayer using a spray volume of 500 l ha^{-1}. The data on weed density and drymatter were subjected to square root transformation for statistical analysis.

The dominant weed flora of the experimental plots consisted of *Echinochloa colonum, Cynodon dactylon, Paspalum conjugatum* and *Leptochloa chinensis* (grasses); *Cyperus rotundus* and *Scirpus articulatus (*sedges); *Eclipta alba, Ludwigia parviflora, Ammania baccifera, Bergia capensis* and *Euphorbia hirta* **(**broad leaved weeds).

All the herbicides applied alone or in sequence effectively controlled the weeds over weedy check and the sequential treatments recorded higher weed control efficiency ranged from 80 to 83 per cent at harvest. Among the herbicide treatments, sequential application of oxadiargyl @ 100 g ha^{-1} fb penoxsulam @ 25 g ha^{-1} (T_7) recorded the lower weed density, drymatter and high weed control efficiency over the individual application and was on a par with hand weeding twice at 20 and 40 DAS (T_2). This was due to reduced weed growth observed in sequential treatments because of their broad spectrum weed control at later stages. The results are akin to those reported by Walia *et al*. (2008).

Among the herbicide treatments sequential application of oxadiargyl @ 100 g ha^{-1} fb penoxsulam @ 25 g ha^{-1} (T_7) recorded the highest nutrient uptake (89, 32, 155 kg N, P_2O_5, K_2O ha^{-1} respectively) over individual application of some herbicides and was on a par with other sequential treatments and even with hand weeding twice at 20 and 40 DAS (T_2). The increased nutrient uptake by crop in this treatment might be due to reduced weed density which inturn resulted in more crop dry matter accumulation and ultimately higher grain yield.

The nutrient uptake by weeds was recorded maximum in weedy check (19.3, 3.6, 16.5 kg N, P_2O_5, K_2O ha^{-1} respectively) when compared to other treatments. The increased uptake of these nutrients in this treatment might be due to unchecked weed growth that results in high weed density and dry weight and absorbed more nutrients. Similar reports on nutrient uptake in rainfed lowland rice were observed by Jena *et al*. (2002).

Table 1. Effect of weed management practices on nutrient uptake by rice and associated weed species.

Treatment	Dose (g ha^{-1})	Time (DAS)	Weed density at harvest (No. m^{-2})	Weed dry weight at harvest (g m^{-2})	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Nutrient uptake by crop at harvest (kg ha^{-1})			Nutrient uptake by weeds at harvest (kg ha^{-1})		
							N	P_2O_5	K_2O	N	P_2O_5	K_2O
T_1: Weedy check	—	—	10.1(101.5)	14.5 (209.8)	1887	3920	46	12	81	19.3	3.6	16.5
T_2: Hand weeding	—	20 & 40	3.5(11.8)	5.1 (25.5)	5233	5800	92	34	158	2.5	1.0	5.0
T_3: Oxadiargyl	100	3	5.8 (33.1)	9.2 (84.1)	3863	4923	72	20	134	7.0	2.2	7.7
T_4: Pyrazosulfuron ethyl	20	3	6.7(44.4)	9.8 (95.5)	3568	4601	70	16	129	8.3	2.7	8.1
T_5: Penoxsulam	25	20	6.2 (37.9)	9.5 (89.8)	3633	4697	66	18	132	7.4	2.5	7.9
T_6: Azimsulfuron	35	20	7.0 (48.5)	10.1 (101.5)	3399	4418	65	15	125	9.1	2.8	8.5
T_7: Oxadiargyl fb Penoxsulam	100 fb 25	3 fb 20	3.7(13.2)	5.7 (32.0)	5189	5729	89	32	155	2.8	1.2	5.6
T_8: Oxadiargyl fb Azimsulfuron	100 fb 25	3 fb 20	4.2 (17.1)	5.9 (34.3)	5046	5710	87	30	153	3.3	1.4	5.9
T_9: Pyrazosulfuron ethyl fb Penoxsulam	20 fb 25	3 fb 20	4.5 (19.8)	6.2 (37.9)	4975	5670	84	28	148	4.7	1.6	6.2
T_{10}: Pyrazosulfuron ethyl fb Azimsulfuron	20 fb 35	3 fb 20	4.8 (22.5)	6.5 (41.8)	4914	5500	82	26	143	5.1	1.8	6.5
SEm±			0.4	0.7	291	294	4	1	7	0.4	0.2	0.5
CD (P = 0.05)			1.1	2.0	865	874	12	3	20	1.1	0.5	1.3
CV (%)			11.2	14.3	12	10						

Note: fb : follwed by. The data shown on weed density and drymatter follows square root ([**v** x + 0.5) transformation. The figures in parentheses are original values.

From the results it can be concluded that the sequential application of oxadiargyl @ 100 g ha^{-1} (PRE) at 3 DAS (SMA) fb penoxsulam @ 25 g ha^{-1} (POST) at 20 DAS resulted in maximum grain yield and nutrient uptake (NPK) by crop and minimum uptake by weeds, which was comparable with hand weeding twice at 20 and 40 DAS and also on a par with other sequential treatments.

LITERATURE CITED

Amarjit S B, Singh M, Kachroo D, Sharma B C and Shrivam D R 2006. Efficacy of herbicides in transplanted medium-duration rice (*Oryza sativa* L.) under subtropical conditions of Jammu. *Indian Journal of Agronomy*. 51 (2): 128-130.

Balasubrahmanian V and Hill J E 2002. Direct seeding of rice in Asia: Emerging issues and strategic research needs for 21st century. In: Direct Seeding: Research Strategies and Opportunities, S. Pandey *et al.* (eds). *Proceedings of the International Workshop on Direct Seeding in Asian Rice System*, 25-28 January 2000, Bangkok, Thailand. International Rice Research Institute, Los Banos, Philippines.38.

Jena S N, Tripathy S K, Sarangi S K and Biswal S 2002. Integrated weed management in direct seeded rainfed lowland rice. *Indian Journal of Weed Science*. 34(1&2): 32-35.

Rao A N, Mortimer A M, Johnson D E, Prasad B S and Ladha J K 2007. Weed management in direct seeded rice. *Advances in Agronomy*. 93: 155-257.

Walia U S, Bhullar M S, Nayyar S and Walia S S 2008. Control of complex weed flora of dry-seeded rice (*Oryza sativa* L.) with pre and post-emergence herbicides. *Indian Journal of Weed Science*. 40 (3&4): 161-164.

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(Received on 14.06.2011 and revised on 20.08.2011)