Indian Journal of Weed Science **45**(4): 285–288, 2013

Short communication

Performance of low dose high efficacy herbicides in drum seeded rice

R. Naseeruddin and D. Subramanyam*[1]

Department of Agronomy, S.V. Agricultural College, Tirupati, Andhra Pradsh 517 502

Received: 17 November 2013; Revised: 26 December 2013

Key words: Drum seeded rice, Herbicides, Weed management, Yield.

In recent years, rice (*Oryza sativa* L.) production systems are undergoing several changes and one of such changes is shifting from transplanted rice to direct sown rice due to increased cost of labour and non availability of labour during peak periods of agricultural operations. Sowing of sprouted rice seeds in wet puddled soils offers an attractive alternative and labour saving technique for stand establishment to the traditional transplanting. Wet seeded rice is gaining momentum in India and it have the advantages of quick and easier planting, reduces labour requirement and increased water use efficiency. However, direct seeded rice is associated with several constraints like heavy weed infestation, water management immediately after sowing and lack of perfect levelling *etc*. Among them, heavy infestation of heterogenous weed flora becomes the biggest biological constraint as rice and weed seeds germinate simultaneously. The yield loss due to unchecked weed growth was reported upto 30-48% in direct seeded rice (Subramanian *et al*. 2004). The failure and success of the drum seeded rice depends on weed and water management practices. Therefore, the present study was carried out to evaluate the relative efficacy of low dose high efficacy, pre- and post-emergence herbicides along with mechanical weeding with two row power weeder for the broad spectrum control of weeds in drum seeded rice.

A field investigation was conducted during *Kharif*, 2012 at of S.V. Agricultural College farm, Acharya N.G. Ranga Agricultural University, Tirupathi, Andhra Pradesh in order to know the response of drum seeded rice to different pre-and post-emergence herbicides. The soils of the experiment field was sandy loam in texture, neutral in reaction (pH 6.9), low in OC (0.43%), avalible N (215 kg/ha) and phosphorus (23.5 kg/ha) and medium in P (250 kg/ha). Sowing of sprouted seeds of rice variety, *'Somasila'* (NLR–33358) was done through eight row drum seeder with a row to row spacing of 20 cm. The experiment was laid out in randomized block design with three replications. The treatments consisted of ten weed management practices, *i.e* pre-emergence application of pretilachlor 500 g/ha, oxadiargyl 75 g/ha, pretilachlor 500 g/ha followed by *(fb)* mechanical weeding with power weeder at 40 DAS, pre-emergence application of oxadiargyl 75 g/ha *fb* mechanical weeding with power weeder at 40 DAS, pre-emergence application of pretilachlor 500 g/ha *fb* azimsulfuron 30 g/ha at 40 DAS, pre-emergence application of oxadiargyl 75 g/ha *fb* azimsulfuron 30 g/ha at 40 DAS, pre-emergence application of pretilachlor 500 g/ha *fb* bispyribac-sodium 30 g/ha at 40 DAS and pre-emergence application of oxadiargyl 75 g/ha *fb* bispyribac-sodium 30 g/ha at 40 DA besides two hand weeding at 20 and 40 DAS and unweeded check. The required quantities of pre-emergence (pretilachlor and oxadiargyl) herbicides were mixed with fine sand 50 kg/ha and then broadcasted at 7 DAS. Post-emergence herbicides (bispyribac-sodium and azimsulfuron) were applied uniformly at 40 DAS by using spray fluid 500 l/ha with the help of knapsack sprayer. Mechanical weeding with two row power weeder was carried out at 40 DAS as per the treatments. The crop was fertilized with 120 kg N, 60 kg P and 60 kg K/ha. One third dose of nitrogen and entire phosphorus and potassium were applied as basal and remaining dose of nitrogen was top dressed in two equal splits at active tillering and panicle initiation stage. Category wise weed density and dry weights were recorded at 60 DAS and at harvest and these data was subjected to square root ($\sqrt{x + 0.5}$) transformation before statistical analysis to normalize their distribution.

The dominant weed flora associated with drum seeded rice were sedges; *Cyperus difformis* (40.0%), *Cyperus iria* (21.40%) and *Cyperus rotundus* (12.22%), grasses; and *Echinochloa colonum* (10.1%) and *Eclipta alba* among broad-leaved weeds, Hassk (6.5%) and *Ammania baccifera* (4%). All the weed management practices at 60 DAS and at harvest were significantly reduced the density and dry weight of weeds. Hand weeding twice at 20 and 40 DAS showed the superiority in suppressing the density and dry weight of all the categories of weeds,

***Corresponding author:** subbuagro@yahoo.com

[1]Programme Coordinator, Krishi Vigyan Kendra, Kalikiri, Chittoor 517 234

which was significantly lesser than with the rest of the weed management practices (Table 1). Pre-emergence application of oxadiargyl 75 g/ha or pretilachlor 500 g/ha *fb* by post-emergence application of bispyribac-sodium 30 g/ha were very effective in suppressing the density and dry weight of grasses and broad-leaved weeds and these two weed management practices were at par with each other. Post-emergence application of bispyribac-sodium 30 g/ha was very effective in suppressing the density and dry weight of grasses and broad-leaved weeds. Pre-emergence application of oxadiargyl 75 g/ha *fb* by post-emergence application of bispyribac-sodium 30 g/ha reduced the dry weight of grasses and broad-leaved weeds by 90.8 and 88% respectively compared to unweeded check at harvest. Yadav *et al*. (2011) reported that post-emergence application of bispyribac-sodium 25 g/ha significantly reduced the density and dry weight of weeds in wet direct seeded rice. This clearly indicated that post-emergence application of azimsulfuron 30 g/ha was found superior in suppressing the annual sedges, *viz*. *Cyperus iria* and *Cyperus difformis* more effectively than bispyribac-sodium 30 g/ha by inhibiting the acetolactate synthase enzyme in target plants due to reduced production of branched chain amino acids, *viz*. leucine, isoleucine and valine leading to death of weeds (Ferrero *et al*. 2002).

The lowest density and dry weight of total weeds with higher weed control efficiency (94%) was resgistered with two hand weedings at 20 and 40 DAS in drum seeded rice. The next best treatment was with the pre-emergence application of oxadiargyl 75 g/ha *fb* post-emergence application of azimsulfuron 30 g/ha, which was at par with bispyribac-sodium 30 g/ha in reducing the total density and dry weight. Pre-emergence application of pretilachlor 500 g/ha or oxadiargyl 75 g/ha supplemented with mechanical weeding with two row power weeder was not effective in controlling weeds as the weed density was very high in between the plants. Among the herbicidal treatments, pre-emergence application of pretilachlor 500 g/ha or oxadiargyl 75 g/ha alone recorded the highest density and dry weight of weeds coupled with lower weed control efficiency of 75 and 76%, respectively in drum seeded rice.

Table 1. Effect of pre- and post-emergence low dose high efficiency herbicides against weeds in drum seeded rice

Treatment	Dose (g/ha)	Time of application (DAS)	Weed density (no./m^2)						Weed dry weight (g/m^2)					
			60 DAS			At harvest			60 DAS			At harvest		
			G	S	BLWs	G	S	BLWs	G	S	BLWs	G	S	BLWS
Pretilachlor	500	7	3.53 (12.0)	6.74 (45.0)	3.02 (8.7)	3.80 (14.0)	7.44 (55.0)	3.18 (9.7)	3.11 (9.2)	6.03 (36.0)	2.72 (6.9)	3.44 (11.4)	6.04 (36.0)	3.04 (8.79)
Oxadiargyl	75	7	3.38 (11.0)	6.65 (44.0)	2.85 (7.7)	3.67 (13.0)	7.29 (52.7)	3.13 (9.3)	3.05 (8.8)	5.97 (35.2)	2.60 (6.3)	3.36 (10.8)	5.92 (34.6)	3.01 (8.59)
Pretilachlor *fb* power weeder	500	7+40	2.67 (6.7)	3.53 (12.0)	2.54 (6.0)	3.02 (8.7)	4.52 (20.0)	2.79 (7.3)	2.41 (5.3)	3.24 (10.0)	2.30 (4.8)	3.06 (8.1)	3.93 (15.0)	2.80 (7.40)
Oxadiargyl *fb* power weeder	75	7+40	2.54 (6.0)	3.48 (11.7)	2.48 (5.7)	2.91 (8.0)	4.41 (19.3)	2.73 (7.0)	2.30 (4.8)	3.13 (9.3)	2.2 (4.5)	3.00 (7.8)	3.88 (14.6)	2.77 (7.20)
Pretilachlor *fb* azimsulfuron	500+30	7+40	2.12 (4.0)	2.48 (5.7)	1.95 (3.3)	2.41 (5.3)	2.97 (8.3)	2.33 (5.0)	1.92 (3.2)	2.38 (5.2)	1.89 (3.1)	2.64 (6.5)	2.95 (8.2)	2.54 (6.00)
Oxadiargyl *fb* azimsulfuron	75+30	7+40	2.03 (3.7)	2.40 (5.3)	1.95 (3.3)	2.33 (5.0)	2.79 (7.3)	2.11 (4.0)	1.84 (2.9)	2.27 (4.7)	1.77 (2.7)	2.54 (6.0)	2.77 (7.2)	2.46 (5.60)
Pretilachlor *fb* bispyribac-sodium	500+30	7+40	1.55 (2.0)	3.23 (10.0)	1.60 (2.3)	1.85 (3.0)	3.76 (13.7)	1.67 (2.3)	1.44 (1.6)	2.91 (8.0)	1.61 (2.1)	2.34 (5.0)	3.42 (11.2)	2.28 (4.70)
Oxadiargyl *fb* bispyribac-sodium	75+30	7+40	1.46 (1.7)	3.07 (9.0)	1.55 (2.0)	1.77 (2.7)	3.53 (12.0)	1.55 (2.0)	1.34 (1.3)	2.77 (7.2)	1.51 (1.8)	2.25 (4.6)	3.27 (10.2)	2.19 (4.30)
HW twice	-	20+40	1.07 (0.7)	2.03 (3.7)	1.07 (1.7)	1.35 (1.3)	2.34 (5.0)	1.22 (1.0)	1.00 (1.0)	2.05 (3.7)	1.34 (1.3)	1.87 (3.0)	2.54 (6.0)	1.87 (3.00)
Unweeded check			6.81 (46.0)	13.35 (178)	5.58 (30.3)	6.95 (48.0)	13.79 (190)	6.09 (5.8)	6.09 (36.)	11.95 (142)	4.99 (24.5)	7.10 (50)	12.26 (25.0)	5.04 (25.00)
LSD (P=0.05)			0.32	0.24	0.17	0.30	0.33	0.27	0.11	0.20	0.13	0.19	0.21	0.14

Figures in parentheses are original values. Data transformed to ($\sqrt{X+0.5}$). *fb:* followed by. G: Grasses, S: Sedges, BLWs: Broad leaved weeds

Table 2. Effect of pre- and post-emergence low dose high efficiency herbicides on weed parameters, yield components and yield of drum seeded rice

Treatment	Dose (g/ha)	Time of application (DAS)	Weed density (no./m^2)	WCE (%)	Panicles (no./m^2)	No. of filled grains/ panicle	1000-grain weight	Grain yield (t/ha)	Net returns (x10^3 ₹ /ha)	B:C Ratio
Pretilachlor	500	7	8.88 (78.66)	75.02	275	80.2	18.00	3.81	39.97	2.50
Oxadiargyl	75	7	8.68 (75.0)	76.00	280	82.4	18.06	3.93	41.80	2.53
Pretilachlor *fb* power weeder	500	7+40	6.03 (36.0)	86.44	289	89.3	18.33	4.59	50.83	2.92
Oxadiargyl *fb* power weeder	75	7+40	5.90 (34.3)	86.84	290	89.8	18.35	4.60	52.27	2.91
Pretilachlor *fb* azimsulfuron	500+30	7+40	4.37 (18.6)	90.79	303	97.5	18.54	5.18	59.41	3.00
Oxadiargyl *fb* azimsulfuron	75+30	7+40	4.09 (16.33)	91.73	318	105.8	18.75	5.75	68.76	3.30
Pretilachlor *fb* bispyribac-sodium	500+30	7+40	4.41 (19.0)	90.71	300	96.3	18.50	5.10	58.93	3.01
Oxadiargyl *fb* bispyribac-sodium	75+30	7+40	4.14 (16.6)	91.59	305	98.6	18.63	5.20	60.41	3.08
HW twice	-	20+40	2.79 (7.3)	94.66	314	105	18.70	5.71	65.91	3.06
Unweeded check	-	-	16.46 (271)	-	230	74.1	17.50	2.82	23.69	1.91
LSD (P=0.05)			0.200	0.700	8	3.6	NS	0.139	2.90	0.04

Among the weed management practices, pre-emergence application of oxadairgyl 75 g/ha *fb* post-emergence application of azimsulfuron 30 g/ha recorded significantly higher yield attributes, *viz.* panicles/m^2, filled grains/panicle, number of grains/panicle and thousand grain weight and grain yield of drum seeded rice (Table 2) and it was comparable with hand weeding twice at 20 and 40 DAS with respect to all the above yield attributes and yield. The former weed management practice increased the no. of panicles/m^2 and filled grains/panicle by 39.1 and 42.8%, respectively over unweeded check.

This might be due to effective control of all the categories of weeds during critical period of crop weed competition, which lead to increased growth resources and better translocation of photosynthates from source to sink (Dharminder *et al.* 2012). The next best weed management practice to obtain broad spectrum weed control with increased yield attributes and yield with the pre-emergence application of oxadiargyl 75 g/ha or pretilachlor 500 g/ha *fb* post-emergence application of bispyribac-sodium 30 g/ha. The lowest grain yield attributes and yield were recorded with unweeded check followed by pre-emergence application of oxadiargyl 75 g/ha or pretilachlor 500 g/ha alone. The reduction in grain yield in unweeded check was 51% competed to the best weed management practice *i.e.* pre-emergence application of pretilachlor 500 g/ha *fb* azimsulfuron 30 g/ha. These results are in conformity with those of Tiwari *et al.* (2006).

The highest net returns (₹ 68,766/ha) were realized with pre-emergence application of oxadiargyl 75 g/ha *fb* azimsulfuron 30 g/ha, which were comparable with two hand weedings at 20 and 40 DAS and both of them were significantly higher than with rest of the weed management practices (Table-2). However, the highest benefit-cost ratio of 3.30 was registered with the pre-emergence application of oxadiargyl 75 g/ha *fb* azimsulfuron 30 g/ha, which was significantly higher than with rest of the weed management practices tried In conclusion, pre-emergence application of oxadiargyl 75 g/ha followed by post emergence application of azimsulfuron 30 g/ha applied at 40 DAS resulted in the highest grain yield and economic returns as well as broad spectrum weed control in drum seeded rice.

SUMMARY

A field experiment was conducted at S.V. Agricultural College Farm, Tirupati to identify the effective and economic weed management practices for the control of weeds in drum seeded rice. The major weed flora in experiment field were *Cyperus difformis* (40.0%), *Cyperus iria* (21.40%), *Cyperus rotundus* (12.22 %), *Echinochloa colonum* (10.1%), *Eclipta alba* (6.5%) and *Ammania baccifera* (4%). Among the weed management practices, pre-emergence application of oxadiargyl 75 g/ha *fb* azimsulfuron 30 g/ha was found to be the most effective weed management practice in reducing the density and dry weight of weeds with higher weed control efficiency,

higher yield attributes and yield (5.75 t/ha) including benfit : cost ratio (3.30) but it was being at par with two hand weedings. The reduction in grain yield due to heavy weed infestation in unweeded check was 51% compared to best weed management practice. Post-emergence application of azimsulfuron 30 g/ha was found effective in controlling sedges and bispyribac-sodium 30 g/ha was very effective in suppressing the grasses and broad-leaved weeds in drum seeded rice.

REFERENCES

Dharminder, Singh Y, Singh JP, Pandey RK, Bharati V and Singh AK. 2012. Efficacy of herbicides for controlling weeds in direct seeded rice. In: *Biennial Conference of Indian Society of Weed Science*, 19-20 April 2012, Kerala Agricultural University, Thrissur, Kerala.

Ferrero A, Tabacchi M and Vidotto F. 2002. Italian rice fields weeds and their control, pp. 535-544. In: "*Second Temperate Rie Conference"* (Eds. JE Hill and B Hardy), International Rice Research Institute, Los Banos, Phillipines.

Tiwari N, Kohle SS, Savu RM, Mahobia RK and Sahu TD. 2006. Effect of herbicides on dry matter accumulation, crop growth rate and grain yield of direct seeded rice (*Oryza sativa* L.) under inceptisols of Chhattigarh plains. *Journal of Interacademicia* **10**: 40-43.

Subramanian E, Ramachandra Boopathi SNM and Balasubramanian R. 2004. Relative efficacy of different weed control methods in drum seeded wet rice under puddle conditions. *Oryza* **41**: 51-52.

Yadav DB, Yadav Ashok, Malik RK and Gurjeet Gill. 2011. Efficacy of azimsulfuron alone and tank-mix metsulfuron–methyl for weed control in wet direct seeded rice. *Environment and Ecology* **29**: 1729-1735.