The Bioscan 9(3): 973-976, 2014
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.in

BIO-EFFICACY OF POST-EMERGENCE HERBICIDES IN TRANSPLANTED RICE OF CHHATTISGARH PLAINS

MADHULIKA SINGH AND P. R. PAIKRA*
Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur - 492 012 (C.G.) INDIA
e-mail: paikra.pandu16@gmail.com

KEYWORDS
Transplanted rice
Bio efficacy
Weeds control
Hand weeding
Weed growth rate

Received on :
23.11.2013

Accepted on :
20.06.2014

***Corresponding author**

ABSTRACT
A field experiment was conducted at the Instructional cum Research Farm, IGKV, Raipur during *kharif* season of 2011. The experiment consisted of 10 treatments laid out in randomized block design with three replications. The results revealed that significantly lowest density (4.17) and dry matter of weeds/m^2 (2.82) were registered with two hand weeding. The highest weed growth rate (0.80) was observed under control, whereas the lowest weed growth rate (-0.06) was found in two hand weeding, but the highest weed control efficiency (90.21%) were recorded under two hand weeding at all the stages of observation. The highest number of effective tillers/hill (12.67), number of filled grains/hill (135.67), grain yield (5.54 t/ha), straw yield (6.74 t/ha) and harvest index (45.03%) was obtained in two hand weeding.

INTRODUCTION

Rice is the most important staple food crop of millions of mankind from down of civilization (Chakravarti *et al.,* 2012). Among the cereal crops, it serves as the principal source of nourishment for over half of the global population (Davla *et al.,* 2013). In Indian agriculture, rice is the main source of livelihood for more than 150 million rural households. The total area of rice crop in India is 43.97 m ha, production is 100.00 m t and average productivity is 2.37 t/ha (Anonymous, 2013a). Chhattisgarh state is popularly known as "Rice bowl of India" because maximum area is covered under rice during *kharif* and contribute major share in national rice production. It has geographical area of 13.51 m ha of which 5.90 m ha area is under cultivation. Rice occupies an area of 3.77 m ha with the production of 8.53 m t and productivity of 1.60 t/ha (Anonymous, 2013b). One major problem in rice cultivation for productivity is weed management. The various crop stand establishment practices and land type influence the intensity and nature of weed problem. Infestation of weeds in transplanted rice not only results in yield reduction but quality of produce is also impaired. Uncontrolled weeds cause reduction in grain yield up to 76% under transplanted conditions (Singh *et al.,* 2004).The final choice of any weed control measures will depend largely on its effectiveness and economics. Use of herbicides to keep the crop weed free at critical crop weed competition stages will help in minimizing the cost of weeding as well as managing the weeds below the damaging level. Hand weeding is very easy and environment-friendly but tedious and highly labour intensive. Farmers very often fail to remove weeds due to unavailability of labour at peak periods. Therefore, makes hand weeding difficult at early stages of growth due to morphological similarity between grassy weeds and rice seedlings (Rahman *et al.,* 2012). Most of the herbicides have dryer effective options for selective weed control but a single herbicide cannot control all weeds of the community (Corbelt *et al.,* 2004). Bispyribac-sodium is effective for control many annual and perennial grasses, sedges, and broad leaved weeds in rice (Rawat *et al.,* 2012) and Bentazon controlled effectively both broad and narrow leaved weeds and increased rice grain yield (Zhang *et al.,* 2005). The combined application of different herbicides with different mode of action is required for most effective weed management and avoiding development of herbicide resistance. Therefore, it is necessary for high efficacy herbicides and sequential application of herbicides to control mixed weed flora in transplanted rice (Gnanavel and Anbhazhagan, 2010). Keeping these in view, a field experiment was carried out to evaluate the performance of post- emergence of herbicides in transplanted rice.

MATERIALS AND METHODS

Field experiment was conducted at the Instructional cum Research Farm, IGKV, Raipur during *kharif* season of 2011. The soil was sandy loam in texture having low organic carbon (0.44%) and available N, P, K content in the soil was 211.4, 18.4 and 325 kg/ha respectively, slightly alkaline in reaction (pH 7.3) and EC (0.43 dSm^{-2}). The treatments consisted of ten different weed management treatments viz, T_1- Bentazone 48% SL W/V @ 720 ml a.i./ha, T_2- Bentazone 48% SL W/V @ 960 ml a.i./ha, T_3- Bentazone 48% SL W/V @ 1200 ml a.i./ha, T_4- Ethoxysulfuron 15% WDG @ 15 g a.i./ha, T_5-Oxadiargyl 80%

WP @ 80 g a.i./ha, T_6-Pretilachlor 50% EC @ 500 g a.i./ha, T_7 – Bispyribac Na 10% SC @ 20 g a.i./ha, T_8- CME + MSM 20% WP @ 4 g a.i./ha, T_9- Two Hand Weeding and T_{10}-Control. Rice cv. MTU-1010 was transplanted on July 14, 2011 with a spacing of 20 cm x 10 cm and harvesting was done on November 1st, 2011. Recommended dose of nutrient was 100 kg N + 60 kg P_2O_5 + 40 kg K_2O/ha, which was applied through urea, Di-ammonium phosphate and muriate of potash, respectively. The whole quantity of P and K was applied as basal dressing, while nitrogen was applied in three splits *viz*. 50 kg N/ha as basal and remaining 50 kg N in two equal splits at active tillering and panicle initiation stages.

The herbicides were applied by Knapsack sprayer fitted with flat-fan nozzle using 500 litres water/ha. Weed density of major weeds and other associated weeds were recorded at 60, 80 DAT and at harvest by quadrate count method. The quadrate of 0.25 square metres (0.5 x 0.5 m) was randomly placed at five places in each plot and then the species wise and total weed count was recorded. The data thus obtained, were transformed and expressed in number per square metre. The percentage composition of weed flora was estimated from weedy check plot. The weed biomass from different plots under all the treatment was recorded at 60, 80 DAT and at harvest. The weeds were first sun dried and thereafter kept in paper bags and dried in oven at 60°C for 48 hours and dry weight was recorded till constant weight was achieved. Later on, the data on weed biomass was transformed and expressed in g per square metre. The data obtained on various observations were tabulated and subjected to their analysis by using analysis of variance (ANOVA) and the treatment was tested by F test (Gomez and Gomez, 1984). The data on weed count and weed biomass were subjected to square root transformation, *i.e.* $\sqrt{x+0.5}$ before carrying out analysis of variance and comparisons were made on transformed values.

RESULTS AND DISCUSSION

Effect on weeds

The major weed species observed in the experiment field were *Alternanthera triandra, Spilanthes acmella, Ludwigia octovalis, Ischaemum rugosum, Echinochloa colona* and *Cyperus rotundus*. At 60, 80 DAT and at harvest, significantly lowest weed density and weed dry matter was recorded two hand weeding while highest was noted under control (Table 1). Treatment Bispyribac Na 10% SC @ 20 g a.i./ha also recorded comparable total dry matter to two hand weeding. All the weed control treatments caused significant reduction in total weed density and weed dry matter when compared to control. Kiran *et al*. (2010); Gnanavel and Anbhazhagan (2010); Viraputhirun and Balasubramanian (2013) also reported similar findings.

The data given in Table 2 showed that at 40-60 DAT, maximum WGR was noted under control and minimum was noted under two hand weeding. At 60-80 DAT and 80 DAT-at harvest, maximum WGR was registered under control, whereas, minimum was observed under two hand weeding. At 60, 80 DAT and at harvest, highest weed control efficiency was recorded under two hand weeding followed by Bispyribac Na 10% SC @ 20 g a.i./ha and Chlorimuron ethyl + Metsulfuron

Table 1: Effect of post emergence herbicides on weed density (No. m^{-2}) and dry matter (g m^{-2}) at different duration of transplanted rice

Treatment		Dose/ha	Time of application DAT	Density of total weeds (No. m^{-2})			Dry matter of total weeds (g m^{-2})		
				60 DAT	80 DAT	At harvest	60 DAT	80 DAT	At harvest
T_1	Bentazone 48% SL W/V	720 ml	15	9.84(96.33)	10.58(111.50)	10.09(101.33)	7.00(48.47)	8.77(76.51)	9.52(90.24)
T_2	Bentazone 48% SL W/V	960 ml	15	9.16(83.35)	9.94(98.67)	9.33(88.00)	6.68(45.63)	8.40(71.12)	8.90(84.75)
T_3	Bentazone 48% SL W/V	1200 ml	15	7.92(62.27)	8.87(78.33)	8.42(70.06)	6.32(39.48)	8.01(63.74)	8.79(76.91)
T_4	Ethoxysulfuron 15% WDG	15 g	15	8.43(70.73)	9.01(80.77)	8.49(71.67)	6.47(41.43)	8.02(63.95)	8.80(76.97)
T_5	Oxadiargyl 80% WP	80 g	3	8.08(65.00)	9.04(81.67)	8.65(74.33)	6.34(39.74)	8.14(65.75)	8.84(77.81)
T_6	Pretilachlor 50% EC	500 g	3	11.42(130.67)	12.61(158.67)	11.80(138.83)	7.37(54.01)	9.47(89.22)	10.31(105.80)
T_7	Bispyribac Na 10% SC	20 g	20	5.24(27.03)	5.87(34.00)	5.31(28.45)	3.44(11.78)	4.85(23.14)	5.06(25.81)
T_8	CME+MSM 20% WP	4 g	20	7.31(53.00)	7.88(61.67)	7.52(56.13)	5.92(34.59)	7.53(56.40)	8.05(64.44)
T_9	Two hand weeding	-	20 & 40	4.20(17.27)	4.88(23.60)	4.17(17.15)	2.82(7.55)	4.12(16.74)	3.95(15.17)
T_{10}	Control	-	-	13.95(194.67)	14.96(224.00)	14.06(197.33)	8.80(77.13)	10.92(119.10)	11.87(141.3)
SEm ±				0.32	0.52	0.31	0.37	0.28	0.60
CD (P=0.05)				1.54	0.91	1.00	1.09	0.82	1.78

Table 2: Effect of post emergence herbicides on weed growth rate (g day^{-1}) weed control efficiency (%) at different duration of transplanted rice

Treatment		Dose ha^{-1}	Time of application DAT	Weed growth rate (g day^{-1})			Weed control efficiency (%)		
				40-60 DAT	60-80 DAT	80 DAT at harvest	60 DAT	80 DAT	At harvest
T_1	Bentazone 48% SL W/V	720 mL	15	1.28	1.40	0.49	37.16	35.74	36.16
T_2	Bentazone 48% SL W/V	960 mL	15	1.25	1.27	0.49	40.83	40.26	40.04
T_3	Bentazone 48% SL W/V	1200 mL	15	1.09	1.21	0.47	48.82	46.46	45.59
T_4	Ethoxysulfuron 15% WDG	15 g	15	1.12	1.13	0.47	46.29	46.28	45.55
T_5	Oxadiargyl 80% WP	80 g	3	1.22	1.30	0.43	48.47	44.77	44.95
T_6	Pretilachlor 50% EC	500 g	3	1.41	1.76	0.59	29.97	25.06	25.13
T_7	Bispyribac Na 10% SC	20 g	20	0.33	0.57	0.10	84.73	80.57	81.74
T_8	CME + MSM 20% WP	4 g	20	0.95	1.09	0.29	55.15	52.63	54.41
T_9	Two hand weeding	-	20 and 40 DAT	0.20	0.46	-0.06	90.21	85.94	89.27
T_{10}	Control	-	-	1.96	2.10	0.80	-	-	-
SEm ±				0.32	0.24	0.12			
CD (P = 0.05)				0.97	0.72	0.35			

Table 3: Effect of post emergence herbicides on grain yield, straw yield and HI of transplanted rice

Treatment		Doseha^{-1}	Time of application DAT	Effectivetillers hill^{-1} (No.)	Filled grains panicle^{-1} (No.)	Grain yield(t ha^{-1})	Straw yield(t ha^{-1})	HI(%)
T_1	Bentazone 48% SL W/V	720 ml	15	8.67	98.43	3.51	5.39	39.66
T_2	Bentazone 48% SL W/V	960 ml	15	9.22	104.80	3.79	5.43	41.20
T_3	Bentazone 48% SL W/V	1200 ml	15	11.00	119.55	4.81	6.07	44.21
T_4	Ethoxysulfuron 15% WDG	15 g	15	10.67	112.63	4.50	5.85	43.47
T_5	Oxadiargyl 80% WP	80 g	3	9.67	107.97	4.24	5.58	43.14
T_6	Pretilachlor 50% EC	500 g	3	7.78	97.43	3.33	5.30	38.66
T_7	Bispyribac Na 10% SC	20 g	20	11.89	126.30	5.25	6.53	44.56
T_8	CME +MSM 20 % WP	4 g	20	11.77	122.97	4.95	6.27	43.96
T_9	Two hand weeding	-	20 & 40 DAT	12.67	135.67	5.54	6.74	45.03
T_{10}	Control	-	-	5.33	71.70	2.44	4.33	36.13
SEm ±				0.83	7.34	0.29	0.33	1.78
CD (P = 0.05)				2.39	21.83	0.85	0.98	5.28

methyl @ 4 g a.i./ha. These results are similar with the findings of Patra *et al*. (2006), Jadhav *et al*. (2008), Mukherjee and Singh (2005) and Bali *et al*. (2006).

Effect on crop

The treatment two hand weeding registered highest number of effective tillers which was significantly superior over others, however, application of Bentazone 48% SL W/V @ 1200 ml/ha, Bispyribac Na 10% SC @ 20 g a.i./ha and Chlorimuron ethyl + Metsulfuron methyl 20% WP @ 4 g a.i./ha recorded at par effective tillers/hill. The lowest number of effective tillers/hill was noted under control. Two hand weeding recorded maximum number of filled and minimum number of unfilled grains/panicle. As regards to filled grains/panicle the best performing treatment two hand weeding was at par to Bentazone 48% SL W/V @ 1200 ml/ha, Bispyribac Na 10% SC @ 20 g a.i./ha and Chlorimuron-ethyl + Metsulfuron-methyl 20% WP @ 4 g a.i./ha whereas, for unfilled grains/panicle it was at par to Bispyribac Na 10% SC @ 20 g a.i./ha and Chlorimuron-ethyl + Metsulfuron-methyl 20% WP @ 4 g a.i./ha. The lowest number of filled grains/panicle was noted in control, whereas this treatment also recorded the highest number of unfilled grains/panicle. The perusal of data given in Table 3 reveal that treatment two hand weeding registered significantly highest grain yield (5.54 t/ha), however, it was found at par with the application of Bentazone 48% SL W/V @1200 ml/ha (4.81 t/ha), Bispyribac Na 10% SC @ 20 g a.i./ha (5.25 t/ha) and Chlorimuron ethyl + Metsulfuron-methyl 20% WP @ 4 g a.i./ha (4.95 t/ha). The minimum seed yield was observed under control (2.44 t/ha). Similar results were also reported by Narwal *et al*. (2002), Yadav *et al*. (2009), Halder and Patra (2007) and Gnanavel and Anbhazhagan (2010). This is due to suppression of weed competition by integrated weed control treatments offering efficient and prolonged weed control leading to higher grain yield. The straw yield was significantly influenced by different treatments. Two hand weeding (6.74 t/ha) produced the highest straw yield and it was significantly superior to others but it was at par to application of Bentazone 48% SL W/V @ 1200 ml ha^{-1} (6.07 t/ha), Ethoxysulfuron 15% WDG @ 15 g a.i./ha (5.85 t/ha), Bispyribac Na 10% SC @ 20 g a.i./ha (6.53 t/ha) and Chlorimuron ethyl + Metsulfuron-methyl 20% WP @ 20 g a.i./ha (6.27 t/ha). The minimum straw yield (4.33 t/ha) was noted under control. Similar results were noted by Rawat *et al*. (2012). Different post emergence herbicides influenced harvest index (%) significantly. Two HW at 20 and 40 DAT recorded significantly highest (45.03%) harvest index, but it was found at par to Bentazone 48 % SL W/V @ 960 ml/ha, Bentazone 48 % SL W/V @ 1200 ml/ha, Ethoxysulfuron 15 % WDG @ 15 g a.i./ha, Oxadiargyl 80% WP @ 80 g a.i./ha, Bispyribac Na 10 % SC @20 g a.i./ha and Chlorimuron ethyl + Metsulfuron methyl 20% WP @ 20 g a.i./ha. The lowest harvest index

(36.13%) was obtained under control.

REFERENCES

Anonymous 2013a. Directorate of Economics and Statistics. Department of Agriculture and Cooperation. *Ministry of Agriculture, Government of India*.

Anonymous 2013b. Report of Agriculture Department, Chhattisgarh Government. *Krishi Diary, Directorate of Extension Services, IGKV, Raipur*.

Bali, A. S., Singh, M., Kachroo, D., Sharma, B. C. and Shivran, D. R. 2006. Efficacy of herbicides in transplanted, medium-duration rice (*Oryza sativa* L.) under sub-tropical Conditions of Jammu. *Indian J. Agron.* **51(2):** 128-130.

Chakrawarti, S. K., Kumar, H., Lal, J. P. and Vishwakarma, M. K. 2012. Induced mutation in traditional aromatic rice-frequency and spectrum of viable mutations and characterizations of economic values. *The Bioscan.* **7(4):** 739-742.

Corbelt, J. L., Askew, S. D., Thomas, W. E. and Wilcut, J. W. 2004. Weed efficacy evaluations for bromaxil, glufosinate, glyphosate, pyrithiobac and sulfosate. *Weed Technol.* **18**: 443-453.

Davla, D., Sasidharan, N., Macwana, S., Chakraborty, S., Trivedi, R., Ravikiran, R. and Shah, G. 2013. Molecular characterization of rice (*Oryza sativa* L.) genotypes for salt tolerance using microsatellite markers. *The Bioscan.* **8(2):** 498-502.

Gnanavel, I. and Anbhazhagan, R. 2010. Bio-efficacy of Pre and Post-emergence Herbicides in Transplanted Aromatic Basmati Rice. *Res. J. Agril. Sci.* **1(4):** 315-317.

Gomez, K. A. and Gomez, A. A. 1984. Statistical procedures for Agricultural Research. A Willey Interscience Publication, *J. Willey and Sons, New York*. pp 108-127.

Halder, J. and Patra, A. K. 2007. Effect of chemical weed control methods on productivity of transplanted rice. *Indian J. Agron.* **52(2):** 111-113.

Jadhav, A. B., Gupta, R. and Katiyar, P. 2008. Effect of weed control on weed growth and grain yield of transplanted rice. *Advances of Plant Sci.* **21:** 289-290.

Kiran, Y. D., Subramanyam, D. and Sumathi, V. 2010. Growth and yield of transplanted rice (*Oryza sativa*) as influenced by sequential application of herbicides. *Indian J. Weed Sci.* **42(3&4):** 226-228.

Mukharjee, D. and Singh, R. P. 2005. Effect of micro herbicides on weed dynamics, yield and economics of transplanted rice. *Indian J. Agron.* **50(4):** 292-295.

Narwal, S., Singh, S., Panwar, K. S. and Malik, R. K. 2002. Performance of acetachlor and anilofos + ethoxysulfuron for weed control in transplanted rice (*Oryza sativa* L.). *Indian J. Agron.* **47(1):** 67-71.

Patra, A. K., Haldar, J. and Tripathy, S. K. 2006. Chemical weed control in transplanted rice in Hirakund command area. *Ann. Agric. Res. New Ser.* **27(4):** 385-388.

Rahman, M., Juraimi, A. S., Jaya Suria, A. S. M., Azmi, B.M. and Anwar, P. 2012. Response of weed flora to different herbicides in aerobic rice system. *Scientific Res. Ess.* **7(1):** 12-23.

Rawat, A., Chaudhary, C. S., Upadhyaya, V. B. and Jain, V. 2012. Efficacy of bispyribac-sodium on weed flora and yield of drilled rice. *Indian J. Weed Sci.* **44(3):** 183-185.

Singh, V. P., Govindra, S. and Mahendra, S. 2004. Effect of fenoxaprop-p-ethyl on transplanted rice and associated weeds. *Indian J. Weed Sci.* **36(1/2):** 190-192.

Viraputhirun, R. and Balasubramanian, R. 2013. Evaluation of Bispryibac-sodium on transplanted rice. *Indian J. Weed Sci.* **45(1):** 12-15.

Yadav, D. B., Yadav, A. and Punia, S. S. 2009. Evaluation of bispyribac-sodium for weed control in transplanted rice. *Indian J. Weed Sci.* **41(1 & 2):** 23-27.

Zhang, W., Webster, E. P., Blouin, D. C. and Leon, C. T. 2005. Fenoxaprop interactions for barnyard grass (*Echinochloa crus-galli*) control in rice. *Weed Tech.* **19(2):** 293-297.