International Journal of Farm Sciences **5(2)** : 27-33, 2015

Sequential application of herbicides for weed control in transplanted rice

S MATHIYALAGAN and P MURALI ARTHANARI

Department of Agronomy, Tamil Nadu Agricultural University
Coimbatore 641003 Tamil Nadu, India
Email for correspondence: agronmurali@gmail.com

ABSTRACT

Field experiment was conducted during Kharif 2012 to identify the effect of sequential application of herbicides for weed control in transplanted rice. Herbicides were applied at different stages of the crop. Among the herbicide combinations sequential application of pre-emergence application of pretilachlor 750 g/ha followed by post-emergence application of admixture of chlorimuron ethyl 10 per cent + metsulfuron methyl 10 per cent 4 g/ha effectively controlled the weeds in terms of reduced density of weeds, weed dry weight and higher weed control efficiency at all the stages of observation.

Keywords: Herbicides; transplanted rice; weeds; sequential application

INTRODUCTION

Transplanted rice (*Oryza sativa* L) suffers from more number of weed species as it is grown under favourable moisture and other input environment. The competition between rice and weeds is in high order (Ghosh 2010). The loss of yield due to uncontrolled weed growth in transplanted rice ranges from 16 to 86 per cent (Aurora and DeDatta 1992). To increase the efficiency of the applied inputs weed management is one important operation in transplanted rice. Weeds are the most competitive in their early growth stages than at later stages and hence the crop growth is affected and finally the grain yield decreases (Jacob and Syriac 2005). Barua et al (2008) reported that the critical period of crop weed competition in transplanted rice is 30 to 60 days after transplanting. Usually manual weeding is a popular method of weed control in transplanted rice. Due to paucity of labour force for agricultural operations it is imperative to switch over to economically and environmentally viable chemical weed management. Hence the present study was undertaken to evaluate the sequential application of pre- and post-emergence application of herbicides to control weeds in transplanted rice in western zone of Tamil Nadu.

MATERIAL and METHODS

The experiment was conducted at Tamil Nadu Agricultural University, Coimbatore during Kharif 2012 to evaluate sequential application of herbicides for control of complex weed flora in transplanted rice. The experiment was laid out in randomized block design with three replications. The treatments comprised of different weed management practices viz T_1 (early post-emergence bispyribac sodium), T_2 (pre-emergence pretilachlor), T_3 (post-emergence admixture of chorimuron and metsulfuron), T_4 (pre-emergence pyrazosulfuron-ethyl), T_5 (early post-emergence bispyribac sodium + ethoxysulfuron) (tank mixture), T_6 (early post-emergence bispyribac sodium + admixture of chorimuron and metsulfuron) (tank mixture), T_7 (pre-emergence pretilachlor followed by post-emergence ethoxysulfuron), T_8 (pre-emergence-pretilachlor followed by post-emergence admixture of chlorimuron and metsulfuron), T_9 (pre-emergence- pyrazosulfuron-ethyl followed by hand weeding at 25 DAT), T_{10} (pre-emergence- admixture of pretilachlor + bensulfuron methyl), T_{11} (hand weeding twice at 25 and 45 DAT) and T_{12} (weedy check).

The weed density, weed dry weight and weed control efficiency were recorded to assess the effect of weed management treatments. Weeds were sampled in each plot at 20, 40 and 60 DAT of the crop from an area of 1.0 m^2 counted and dried to constant weights at 80°C in hot air oven. Weed density and dry weight of each group of weeds were expressed as number/m^2 and g/m^2 respectively. Relative density of individual predominant weed species and group-wise weeds was calculated by the method suggested by Kim and Moody (1983).

RESULTS and DISCUSSION

Weed flora of the experimental field

The common weed flora of the experimental field consisted of grasses, sedges and broad leaved weeds which were observed from the unweeded check plot at flowering stage of rice. The pre-dominant grassy weeds were *Echinochloa crus-galli* (L) and *Echinochloa colonum* and the dominant sedge was *Cyperus difformis* (L). Among the broad leaved weeds *Ammania baccifera* (L) and *Marsilea quadrifoliata* were the dominant species.

Relative density

The absolute density and relative density of individual weed recorded at 40 DAT are presented in Table 1. Among the group of weeds broad leaved weeds recorded relative density of 32.70 per cent with an absolute density of 32.05/m^2. It was followed by grass weeds (relative density 37.58 per cent, absolute density 36.84/m^2).

Relative density (per cent) of individual weed species of experimental

Table 1. General weed flora of the experimental field

Weed group	Weed species	Family	Common name	Density /m^2	Relative density (%)
Pre-dominant grasses	*Echinochola crus-galli*	Poaceae	Barnyard grass	12.53	12.78
	Echinochloa colonum	Poaceae	Jungle grass	13.60	13.88
Total				26.13	26.65
Pre-dominant sedges	*Cyperus difformis*	Cyperaceae	Small flower umbrella sedge	8.33	8.50
Total				8.33	8.50
Pre-dominant broad leaved weeds	*Ammania baccifera*	Lythyraceae	Red stem	18.72	19.10
	Marsilea quadrifoliata	Martsileaceae	Water burn	13.33	13.60
Total				32.05	32.70
Less dominant weeds	Grasses- *Dinebra retroflexa*			10.71	10.92
	Sedges- *Cyperus rotundus, Cyperus iria*			11.59	11.82
	Broad leaved weeds- *Eclipta alba, Commelina benghalensis*			9.21	9.39
Total				31.51	32.15
Total weeds				98.02	100

field showed that the broad leaved weed *Ammania baccifera* recorded higher relative density of 19.10 per cent with an absolute density of 18.72/m^2. It was followed by *Marsilea quadrifoliata* with the relative density of 13.60 per cent at 40 DAT and absolute density of 13.33/ m^2 among broad leaved weeds, *Cyperus difformis* with the relative density of 8.50 per cent and absolute density of 8.33/m^2 among sedges, *Echinochloa colonum* with the relative density of 13.88 per cent and absolute density 13.60/m^2 and *Echinochola crus-galli* with the relative density of 12.78 per cent and absolute density of 12.53/m^2 among the grasses.

Total weed density

At 20, 40 and 60 DAT, T_8 recorded significantly lower total weed density (1.44, 3.09 and 4.89/m^2) and at par with T_{11} (Table 2) closely followed by T_7 at 20, 40 and 60 DAT. Total weed control was less in T_6, T_9 and T_{10} and opposite in T_{12} in all stages of observation. T_4, T_1 and T_5 registered poor control of all types of weeds. Similar observations were also made by Singh et al (2012). Obviously unweeded control resulted in higher density of grasses, sedge and broad leaved weeds due to unmanaged and increased weed growth at all the crop growth stages which is in conformity with the findings of Hasan et al (2003).

Table 2. Effect of weed management practices on total weed density in transplanted rice

Treatment		Quantity (g/ha)	Total weed density (#/m²)		
			20 DAT	40 DAT	60 DAT
T_1	EPOE bispyribac sodium	25	3.96 (13.71)	5.91 (32.97)	6.94 (46.22)
T_2	PE pretilachlor	1000	3.61 (1.02)	5.18 (24.92)	6.37 (38.66)
T_3	POE admixture of chorimuron and metsulfuron	4	3.66 (11.44)	5.35 (26.77)	6.11 (35.44)
T_4	PE pyrazosulfuron-ethyl	20	4.76 (20.67)	7.15 (49.16)	8.33 (67.42)
T_5	EPOE bispyribac sodium + ethoxysulfuron (tank mixture)	25 + 18.75	4.29 (16.44)	5.72 (30.79)	6.79 (44.43)
T_6	EPOE bispyribac sodium + admixture of chorimuron and metsulfuron (tank mixture)	20 + 4	3.56 (10.65)	4.37 (17.11)	5.44 (27.61)
T_7	PE pretilachlor fb POE ethoxysulfuron	750 / 18.75	2.51 (4.33)	3.29 (8.82)	3.86 (12.95)
T_8	PE pretilachlor fb POE admixture of chlorimuron and metsulfuron	750 / 4	1.85 (1.44)	2.25 (3.09)	2.62 (4.89)
T_9	PE pyrazosulfuron-ethyl fb hand weeding at 25 DAT	20	3.52 (10.42)	5.23 (25.40)	6.08 (34.95)
T_{10}	PE admixture of pretilachlor + bensulfuron methyl	660	3.59 (10.89)	5.17 (24.77)	6.24 (37.19)
T_{11}	Hand weeding twice at 25 and 45 DAT	-	1.93 (1.73)	2.49 (4.22)	3.09 (7.54)
T_{12}	Weedy check	-	6.75 (43.58)	9.99 (98.02)	11.43 (128.84)
SEd			0.15	0.22	0.25
$CD_{0.05}$			0.33	0.49	0.56

Figures in parentheses are mean of original values
EPOE= Early post-emergence (15 DAT), POE= Post-emergence (25 DAT), PE= Pre-emergence (3 DAT),
fb= Followed by

Total weeds dry weight (Table 3)

Significant variations were observed in total weed dry weight at 20, 40 and 60 DAT due to the weed management practices (Table 3). At 20, 40 and 60 DAT the total weed dry weight was significantly lower in T_8 which was comparable with T_{11} at all the stages except at 40 DAT and it was at par with T_7 at 20 and 60 DAT. This might be due to less total weed density during the cropping period. Consequent on the weed control treatments the total dry weight of the weed species was lower in the above treatments than weedy check. Similar results

Table 3. Effect of weed management practices on total weed dry weight in transplanted rice

Treatment		Quantity (g/ha)	Total weed dry weight (g/m^2)		
			20 DAT	40 DAT	60 DAT
T_1	EPOE bispyribac sodium	25	2.98 (6.89)	4.42 (17.59)	5.63 (29.83)
T_2	PE pretilachlor	1000	2.70 (5.29)	4.16 (15.31)	5.31 (26.24)
T_3	POE admixture of chorimuron and metsulfuron	4	3.01 (7.06)	4.40 (17.44)	4.80 (21.14)
T_4	PE pyrazosulfuron-ethyl	20	3.89 (13.11)	5.91 (32.96)	6.64 (42.17)
T_5	EPOE bispyribac sodium + ethoxysulfuron (tank mixture)	25 + 18.75	3.34 (9.18)	4.81 (21.14)	5.04 (23.48)
T_6	EPOE bispyribac sodium + admixture of chorimuron and metsulfuron (tank mixture)	20 + 4	2.10 (2.39)	2.97 (6.80)	2.89 (6.34)
T_7	PE pretilachlor fb POE ethoxysulfuron	750 / 18.75	1.79 (1.21)	2.27 (3.15)	2.47 (4.11)
T_8	PE pretilachlor fb POE admixture of chlorimuron and metsulfuron	750 / 4	1.59 (0.53)	1.77 (1.14)	2.03 (2.14)
T_9	PE pyrazosulfuron-ethyl fb hand weeding at 25 DAT	20	2.63 (4.93)	3.79 (12.35)	4.42 (17.56)
T_{10}	PE admixture of pretilachlor + bensulfuron methyl	660	2.78 (5.74)	4.56 (18.81)	4.96 (22.66)
T_{11}	Hand weeding twice at 25 and 45 DAT	-	1.65 (0.72)	1.89 (1.58)	2.12 (2.50)
T_{12}	Weedy check	-	5.71 (30.66)	9.13 (81.66)	10.00 (98.34)
SEd			0.12	0.19	0.21
$CD_{0.05}$			0.27	0.42	0.47

Figures in parentheses are mean of original values
EPOE= Early post-emergence (15 DAT), POE= Post-emergence (25 DAT), PE= Pre-emergence (3 DAT),
fb= Followed by

were also reported by earlier workers (Deepthi Kiran and Subamaniyan 2010). Total weed dry weight was moderately lower in T_9 and T_2 at all the stages of observation whereas T_{12} recorded lucidly higher (30.66, 81.66 and 98.34 g/m^2) total weed dry weight at all the stages of observation. T_4 and T_5 exhibited poor control of total weed dry weight at 20, 40 and 60 DAT.

Weed control efficiency (Table 4)

The efficiency of treatments on control of weeds in terms of dry weight in

Table 4. Effect of weed management practices on weed control efficiency in transplanted rice

Treatment		Quantity (g/ha)	Weed control efficiency (%)		
			20 DAT	40 DAT	60 DAT
T_1	EPOE bispyribac sodium	25	77.5	78.5	69.7
T_2	PE pretilachlor	1000	82.7	81.3	73.3
T_3	POE admixture of chorimuron and metsulfuron	4	77.0	78.6	78.5
T_4	PE pyrazosulfuron-ethyl	20	57.2	59.6	57.1
T_5	EPOE bispyribac sodium + ethoxysulfuron (tank mixture)	25 + 18.75	70.0	74.1	76.1
T_6	EPOE bispyribac sodium + admixture of chorimuron and metsulfuron (tank mixture)	20 + 4	92.2	91.7	93.6
T_7	PE pretilachlor fb POE ethoxysulfuron	750/18.75	96.1	96.1	95.8
T_8	PE pretilachlor fb POE admixture of chlorimuron and metsulfuron	750 / 4	98.3	98.1	97.8
T_9	PE pyrazosulfuron-ethyl fb hand weeding at 25 DAT	20	83.9	84.9	82.1
T_{10}	PE admixture of pretilachlor + bensulfuron methyl	660	81.3	77.0	77.0
T_{11}	Hand weeding twice at 25 and 45 DAT	-	97.7	98.6	97.5
T_{12}	Weedy check	-	-	-	-

fb= Followed by

Data not analyzed statistically

comparison to control plot was worked out and is presented in Table 4. The different weed management practices resulted in better weed control efficiency ranging from 57.2 to 98.3 at 20 DAT, 59.6 to 98.6 at 40 DAT and 57.1 to 97.8 per cent at 60 DAT. T_8, T_{11} and T_7 recorded weed control efficiency above 95 per cent at all the stages of observation of which T_8 registered higher weed control efficiency. The higher weed control efficiency of this treatment can be attributed to the effective, long term and broad spectrum action of the herbicides against the grasses, sedge and broad leaved weeds in transplanted rice. Dharumarajan et al (2009)envisaged that herbicides applied at different intervals during critical crop growth period recorded higher weed control efficiency in transplanted rice ecosystems. Less than 75 per cent weed control efficiency was observed in T_4 and T_5. Among the treatments weed control efficiency was lowest in T_4.

CONCLUSION

It can be concluded that pre-emergence application of pretilachlor 750 g/ha followed by post-emergence application of admixture of chlorimuron ethyl 10 per cent + metsulfuron methyl 10 per cent 4 g/ha resulted in lowest weed

density, weed dry weight and higher weed control efficiency.

REFERENCES

Aurora MB and DeDatta SK 1992. Weed management in rice. Weed Abstract **41(11):** 495-508.

Barua IC, Borah N, Deka J and Deka NC 2008. Weed flora of transplanted autumn rice of Barak valley, Assam. Proceedings, Biennial Weed Science Conference, 27-28 February, Rajendra Agricultural University, Pusa, Bihar, India, pp 178.

Deepthi Kiran Y and Subamaniyam D 2010. Performance of pre- and post-emergence herbicides on weed flora and yields of transplanted rice (*Oryza sativa*). Indian Journal of Weed Science **42(3&4):** 229-231.

Dharumarajan S, Sankar R and Arun S 2009. Evaluation of bio-efficacy and residues of pretilachlor in transplanted rice. Indian Journal of Weed Science **41(1&2):** 62-66.

Ghosh RK 2010. Weed management in transplanted and direct seeded rice in India. Proceedings, Biennial Conference of Indian Society of Weed Science, 25-26 February, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chattisgarh, India.

Hasan KM, Begum MK, Salim M and Islam N 2003. Comparative performance of the herbicides Ronster 25 EC, Setoff 20 WG and Golteer 5G at different rates for weed control in Aman rice (BR-11). Asian Journal of Plant Science **2(4):** 380-383.

Jacob D and Syriac EK 2005. Performance of transplanted scented rice (*Oryza sativa* L) under different spacing and weed management regimes in southern Kerala. Journal of Tropical Agriculture **43(1/2):** 71-73.

Kim SC and Moody K 1983. Comparison of some methodologies for vegetation analysis in transplanted rice. Korean Journal of Crop Science **28:** 310-318.

Singh AP, Singh AK, Chaturvedi S, Singh S and Mishra OP 2012. Bio-efficacy of sulfonylurea herbicides on mixed weed flora in transplanted rice. Indian Journal of Agricultural Research **46(1):** 9-15.

Received: 24.2.2015 ***Accepted: 4.4.2015***