SCREENING OF HERBICIDES FOR WEED MANAGEMENT IN TRANSPLANTED RICE

M. M. Ashraf, T. H. Awan, Z. Manzoor, M. Ahmad and M. E. Safdar

Rice Research Institute, Kala Shah Kaku

ABSTRACT

Studies for weed management in transplanted rice were carried out at the experimental farm of Rice Research Institute, Kala Shah Kaku, Lahore during the Kharif seasons of 2004 and 2005 to find out the best strategy for weed control in transplanted rice (*Oryza sativa* L.). The experiment was laid out in randomized complete block design and replicated thrice with a net plot size of 10X5 m^2. During both the years newly released rice variety Basmati-2000 was used as an experimental material. The nursery was transplanted during second week of July. Six herbicides applied at 4^{th} day of transplanting were compared with weedy check in which no weeds were eradicated as well as with manual hand weeding at 22 DAT. Highest weed control ((93.03%) was recorded in case of sunstar during first year, while during the second year the maximum control of weeds was 94.67 % in case of hand weeding. Regarding number of tillers/plant, hand weeding resulted into 21.4 and 20.8 for the year 2004 and 2005 in comparison to 15.3 and 16.6 for control (weedy check) for first and second year of the experiment, respectively. Where as the highest number of grains / panicle was recorded 132.56 during first year (2004) and 135.50 during the second year (2005). All of the herbicidal treatments did not differ significantly from hand weeding during both the years for this character. In terms of paddy yield, hand weeding gave the highest grain yield but remained statistically at par with certain herbicides. Welchlore and declore gave lower yield for the year 2004 and 2005, respectively. Control (weedy check) produced the lowest yield during both the years.

Key words: Herbicides, *Oryza sativa* L. Weeds.

INTRODUCTION

Doubtlessly rice is a leading cereal in the world and more than 50 % world's population depends upon this commodity for its dietary needs. It plays vital role in Pakistan's economy, as more than one billion dollars are earned by its export (Anonymous, 2006). Weeds grow profusely in the rice fields and reduce crop yields drastically. Normally the loss in yield ranges between 15-20 % yet in severe cases the yield losses can be more than 50 %, depending upon the species and intensity of weeds. The most problematic weeds in rice (*Oriza sativa*) in this tract are *Echinochloa crus galli*, *Echinochloa glabrescens*, *Cyperus rotundus*, *Cyperus difformis*, *Cyperus irria*, *Cyperus maritimus*, *Paspalum distichum*, *Echinochloa Colona*, *Eleusine indica*, *Marsilea minuta* (Sandeep *et al.*, 2003, Rekha *et al.* 2003 and Ahmad *et.al*., 2004). These weeds also pose serious problem in rice growing tract of Punjab Province of Pakistan (Anonymous, 2003). These weeds compete with rice plant for light, space, air and nutrition. Owing to this reason rice plant produces lower yields.

It is reported by many workers that control of weeds promoted the yield and yield attributes including productive tillers /m2, number of filled grains per panicle and 1000- grain weight in rice (Raju *et al* 2003). *Echinochloa crus-galli* plants are so identical with rice plants that labour can not easily differentiate it from rice plant at early stage of development while uprooting through hoeing. More competition will develop among weeds and rice plant because this weed plant has similar stem, leaves and root system as rice plant has.

In addition to that many researchers while working on rice have reported that weeds can be effectively controlled in the crop by the use of herbicides (Tamilsevan and Budhar, 2001 and Bhattacharya *et al*., 2002). Sandeep *et al*., 2002 reported that acetachlore and ready mixture of anilofos + ethoxysulfuron applied in transplanted rice registered 41 and 39% high yield during 1999 and 40 and 42% higher yield in 2000 compared to weedy control. They also observed that the number of tillers/m^2, number of grains/ panicle, panicle length and 1000-grain weight and grain yield of rice were at par with pots kept weed free and significantly better than the weedy check. Prasad *et al*., (2001) reported that manual weeding in transplanted rice gave the highest values for number of tillers, panicles and filled grains, 1000-grain weight and grain and straw yield. However, it did not statistically varied with chemical weed management. Awan *et al* (2002) revealed that manual weed control at six weeks after sowing produced more tillers/ m^2 as compared to acelor and command, however 1000- grain weight and number of panicle/ m^2 were non significant. The present study was therefore, designed to find out the most suitable herbicide for effective weed control in transplanted rice.

MATERIALS AND METHODS

These studies were conducted at the Rice Research Institute, Kala Shah Kaku during kharif season 2004 and 2005 to find out the suitable herbicide for effective weed control in transplanted rice crop. The experiment having three replications was laid out in a Randomized Complete Block Design (RCBD) having a net plot size of 10 m x 5 m Basmati- 2000 was used as an experimental material. The physiochemical properties of experimental site are given in table 1.

Table-1: Some physical and chemical properties of the soil used for the study

Parameter	0-6 Inch Depth	6-12 Inch Depth
E.C. mS/cm	1.1	0.9
Soil pH	7.6	8.2
O. M %	0.90	0.75
Nitrogen %	0.069	0.045
Available P	9.3	8.3
Available K	100	80
Saturation %	40	38
Texture	Clay Loam	Clay Loam

ix herbicides viz; Machete 60 E.C @ 800 ml/acre, Topstar 15 WP @40gm/acre, Sunstar 15 WP @ 80 gm/acre, Ryzelon 240 E.C @ 25ml/acre, Hooter 60EC @ 800 ml/ acre and Dechlore 50 EC @100 ml /acre were compared with weedy check in which no weeds were eradicated as well as with manual hand weeding. During the second year ryzelon was replaced with M.C.P.A and Declore. At the time of land preparation 45 Kg N/ha, 84 Kg P_2O_5/ha and 62 Kg K_2O/ha were applied in the form of Urea, Di-ammonium phosphate and potassium sulfate, respectively and land was well prepared during puddling and leveled in the first week of July. One third of Nitrogen and full dose of Phosphorus and potassium was applied at the time of soil preparation, while second and third dose of N was applied after one month after transplanting and at the time of panicle initiation stage, respectively. All other agronomic practices were kept normal and uniform for all the treatments of the experiment. The data on number of tillers /$m^{2,}$ number of grains per panical, 1000-grain weight and paddy yield/ acre were recorded and subjected to statistically analysis by using. Analysis of Variance technique and treatments mean were compared by LSD at 0.05 probability level (Steel and Torrie,1984)

RESULTS AND DISSCUSSION

Weeds Control (%): Weed count was taken during the sixth week after transplanting. *Echinochloa crus galli*, *Echinochloa glabrescens*, *Cyperus rotundus*, *Cyperus difformis*, *Cyperus irria*, *Cyperus maritimus*, *Paspalum distichum*, *Echinochloa Colona*, *Eleusine indica*, and *Marsilea minuta* were the common weeds found in the trial plots. To determine the percentage weed control, the comparison was made with the number of weeds present in the control plots (weedy check) in which no weed control measures were adopted. Significant differences were noticed among the treatment means. Highest weed control (93.03%) was recorded in case of sunstar during first year. while during second year the maximum control of weeds was 94.67 % in hand weeding. Tamilselvan and Budhar, (2001) and Bhattacharya *et al*., (2002) reported similar results as they concluded that weeds can be effectively controlled in the rice crop by the use of herbicides.

Table 2. Effect of Weed Management Studies in Transplanted Basmati Rice for the year 2004.

Brno.	Treatments	Weed control %age	Tillers/plant	Grains/Panicle	Paddy yield (t/ha)	1000-grain weight
1	T_1 (Welchlor)	66.50c	19.5a	124.57ab	3.77b	23.06a
2	T_2 (Ryzelon)	60.47c	18.5ab	128.43ab	4.01ab	23.07a
3	T_3 (Sunstar)	83.70b	18.8ab	120.37ab	4.18a	24.05a
4	T_4 (Hooter)	46.50d	17.5ab	121.30ab	3.99ab	23.37a
5	T_5 (Machete)	76.74b	19.2ab	127.63ab	4.12a	23.18a
6	T_6 (Hand weeding)	93.03a	21.4a	132.56a	4.27a	23.78a
7	T_7 (Control)	00.00e	15.3b	116.00b	2.49c	21.17b
	EMS	25.693	5.016	65.242	0.048	0.701
	CV (%)	8.31	12.04	6.41	5.70	3.63
	S.E.	1.915	0.8465	3.0529	0.0826	0.3165
	LSD Value	9.017	3.984	14.37	0.3898	1.489

Tillers/plant: Weed control both by Chemical and physical means effected number of tillers per plant significantly during both the years. The highest numbers of tillers/plant were recorded in case of hand weeding. All herbicidal treatments as well as hand weeding did not

differ statistically among themselves. But there were highly significant differences between hand weeding and weedy check. The highest numbers of tillers/plant for hand weeding were recorded as 21.4 and 20.8 for the year 2004 and 2005, respectively. While the lowest numbers of tillers/plant for control (untreated check) were recorded as 15.3 and 16.6 for first and second year of the experiment, respectively. Sandeep *et al*., (2002) were of the view that number of tillers/m^2 where the plots were kept weed free were better than the weedy check. Awan *et al*., (2001) reported that manual weed control produced more tillers than Acelor @ 250 ml/ ha and Command 3E @ 668 ml/ha.

Table 3: Effect of Weed Management Studies in Transplanted Basmati Rice for the year 2005.

Sr.No.	Treatments	Weed control % age	Tillers / plant	Grains / Panicle	Paddy yield (t/ha)	1000-grain weight NS
1	T_1 (Welchlor)	79.67b	19.7ab	125.90ab	4.40ab	22.46
2	T_2 (Ryzelon)	80.10b	18.2ab	129.30ab	4.22ab	22.39
3	T_3 (Sunstar)	77.30bc	18.5ab	121.60ab	4.31ab	22.15
4	T_4 (Hooter)	67.87c	17.8ab	121.60ab	4.01b	21.95
5	T_5 (Machete)	77.00bc	19.3ab	128.70ab	4.24ab	22.23
6	T_6 (Hand weeding)	94.67a	20.8a	135.50a	4.61a	22.53
7	T_7 (Control)	00.00d	16.6b	114.10b	3.10c	21.60
	EMS	39.817	4.98	64.05	0.063	0.617
	CV (%)	9.26	11.94	6.42	6.05	3.55
	S.E.	2.385	0.8975	3.025	0.0945	0.2918
	LSD Value	11.23	3.970	14.24	0.5116	1.397

Grains / panicle: Number of grains / panicle is one of the main yield contributing factors. During both the years, the effect of experimental treatments on the number of grains / panicle was quite identical. The highest number of grains / panicle was 132.56 during the year 2004 and 135.50 during the year 2005. All herbicidal treatments did not differ significantly from hand weeding during both the years; though the number of grains / panicle was lesser. Although the number of grains was not much lesser in control (weedy check) yet it was significantly different from the treated plants. Prasad *et al*., (2001) reported that manual weeding gave the highest value for filled grains/panicle as compared to herbicides. Whereas Tamilselvan and Budhar reported the highest number of grains /panicle with 03 kg anilophos a.i. /ha and noted that all weed control treatments were equally effective.

Paddy yield (t/ha): The yield data showed that all the weed control treatments gave much better yield than control (weedy check) during both the years. Hand weeding treatment resulted into the highest yield during both the years by producing a grain yield of 4.27 and 4.61 t/ha during the year 2004 and 2005, respectively. The lowest yield during both the years was recorded in case of control as 2.49 and 3.10 paddy grains t/ha for the first and second year, respectively. Among the herbicides Sunstar produced higher yield (4.18 t/ha) during the 1st year while Welchlor produced a yield of 4.40 t/ha and remained better amongst the herbicides for the second year. In the year 2005 none of the herbicide differed statistically from hand weeding except Declore which produced a yield of 4.01 t/ha. The lowest paddy yields during both the years were recorded for control (weedy check).Many researcher workers including Tamilsevan and Budhar (2001), Awan, *et al*., (2002) and Rekha *et al*., (2003) while studying the efficacy of different herbicides explained the results which are quite in line with those reported above. More over Sandeep *et al*., (2002), Bhattacharya, *et al*., (2002), Raju, *et al*., (2003) and Ahmad, *et al*., (2004) also reported that plots kept weed free gave yield which were at par with those obtained with dfferent herbicide applications.

1000 grains weight (g): Thousand grains weight is one of the main contributing factors towards yield. During the first year of the experiment statistically significant differences were noticed between treated and untreated plots. The highest 1000 grains weight was recorded as 24.05 gram for Sunstar whereas the lowest grain weight was noticed in case of weedy check (control). However during the second year of the experiment though there were no statistically significant differences recorded among treatment means yet the control produced the lowest 1000 grains weight as 21.60 grams Awan *et al* 2002 revealed that herbicides showed significant differences for 1000 grains weight. They recorded the highest grains weight as 27.67 grams for Rifit 500 EC applied @ 1 liter / ha. Bhattacharya *et al*., 2002 while studying effect of sulfonylurea on transplanted rice reported similar number of 1000 grains weight during both the year 1999 and 2000 for treated and untreated plants. Sandeep *et al*., (2002) noted higher 1000- grain

weight for weed control with different herbicides which was at par with those for plots kept weed free.

REFERENCES

Ahmad, M., T. H. Awan, G.M. Sarwar, M.Ahmad and S. Yaseen (2004). Harmful insects, diseases, weeds of rice and their control. pp.7

Anonymous, (2003). Booklet on rice, Rice Research Institute Kala Shah Kaku.

Anonymous. (2006). Economic Survey, Govt. of Pakistan, Finance Division, Economic Adviser's Wing, Islamabad. pp. 13

Awan, I. M.A. Nadeem, and M. Qazafi. (2002). Impact of manual and chemical control over weeds in wet seeded rice (Oryza Sativa L.) Asian Journal of Plant Science, 1(6) p. 638-639.

Bhattacharya, S.P., S. Sitangshu, A.J. Karmakar. P. Bera, S. Sarkar (2002). Weed management through sulfonyle urea herbicide and its effect on yield in transplanted rice. Environment and Ecology, 20:2 P. 426-428.

Prasad, S. M., S. S Mishra, and S. J. Sing. (2001). Effect of establishment methods, fertility levels and weed management practices on rice (Oryza sativa). Indian Journal of Agronomy, 46(2) p. 216-221.

Raju, A., B.J. Pandian, P. Thukkaiyannan, and N. Thavaprakash, (2002). Effect of weed management practices on the yield attributes and yields of wet-seeded rice. Acta-Agronomica-Hungarica. 51:461-464.

Rekha, K.B., M.S. Raju, and M.D. Reddy, (2003). Effect of herbicides on weed growth, grain yield and nutrient uptake in rain fed low land rice. : Indian, J. Weed-Sci. 35: 121-122.

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

Steel, R.G.D. and J.H. Torrie (1984). Principles and procedures of statistics. Mc Graw Hill Book Co. Inc. Singapore pp. 172-177.

Tamilselvan, N and M.N. Budhar, (2001). Weed control in Puddled rice. Madras Agricultural Journal, 88: 10-12 P. 745-746.