Effects of Weed Control Treatments on Weed Population and NPK uptake in Direct Wet Seeded Rice Sown through Drum Seeder

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Abstract

An investigation entitled "Efficacy of different herbicides on growth and yield of direct wet seeded rice sown through drum seeder" was conducted at Sher-e-Kashmir University of Agriculture Sciences and Jammu at Chatha Campus. Fourteen herbicide treatments were tested in randomized block design. The population of weeds was maximum at 60 days after sowing (DAS) followed by 90 DAS in weedy check treatment. However, all the weed control methods showed significant and effective control on population of weeds at all crop growth stages. All the weed control treatments recorded significantly less nutrient uptake by weeds as compared to weedy check. While weed control treatments significantly increased nutrient uptake by the rice crop over weedy check, weed free (WF) treatment was significantly better than other weed control treatments. Among the herbicides, butachlor @ 1.5 kg/ha (7 DAS), Anilophos 312 g a.i + ethoxysulfuron @ 312 g a.i. + ethoxysulfuron @ 15 g a.i./ha at 10 DAS and pretilachlor @ 0.75 kg a.i./ha (3 DAS) proved instrumental in controlling weeds.

Rice is generally established through transplanting method and this practice has been widely adopted by the farmers of this country. With increasing scarcity and cost of human labour, direct seeding of rice through drum seeder is one of the technological options which will not only address this problem but also increase the rice productivity. Direct wet seeding of rice offers the problem but also increase the rice productivity. Direct wet seeding of rice offers the advantage of faster and easier planting, reduce labour requirement, hastens crop maturity, increase water use efficiency and above all assures a better profit. The establishment of rice crop through drum seeding technique by using sprouted rice seed on puddle soil is confronted with problem of profuse growth of weeds. Infestation of heterogeneous weed flora becomes the biggest biological constraint and yield losses even up to 90 percent have been reported (Paradkar *et al.* 1997). The success of direct wet seeded rice is dependent upon efficient weed control. Thus the present study has been made to explore the possibility of use of herbicides under such situations for efficient and economic weed management in direct wet seeded rice.

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Materials and Methods

A field experiment was conducted during Kharif season 2005 at the research farm, division of Agronomy, Sher-e-Kashmir University of Agricultural Science and Technology of Jammu at Chatha Campus. The soil tested sandy loam in texture, neutral in reaction (pH 7.6), medium in organic carbon (0.44%), available phosphorus (10.79 kg/ha) and potassium (162 kg/ha) and low in available nitrogen (223 kg/ha). Rice wheat rotation was followed at the experimental site for the previous two seasons. The sowing of rice done through drum seeder with a row to row spacing of 20 cm. Fourteen weed control treatments were laid out in randomized block design with three replications. The treatment comprised, weedy check (WC), weed free (WF), Butachlor 3 days after sowing (DAS @ 1000 M/ha followed by Metsulfuron methyl +chlorimuron ethyl 4 g a.i./ha at 3 DAS, Butachlor @ 0.75 kg a.i./ha @ 1000 ml/

ha followed by Metsulfuron methyl + clorimuron ethyl 4g a.i./ha at 20 DAS, Butachlor (3 Das) @ 1000 ml/ha followed by Metsulfuron methul+ chlorimuron ethyl 4 g a.i./ha at 3 DAS, Butachlor @ 1.5 kg a.i./ha at 3 DAS, Butachlor @ 1.5 kg a.i./ ha at 5 DAS, Stale bed (Glyphosate 1%) Pretilachlor @ 0.75 kg a.i./ha at 3 DAS. Butachlor @ 1.5 a.i./ha at 5 DAS, Butachlor @ 1.5 kg a.i./ha at 3 DAS. Butachlor @1.5 kg a.i./ha at 7 DAS, Anilophos 312 kg a.i./ha. Ethoxysulfuron @ 15 kg a.i./ha at 20 DAS, Butachlor @ 0.75 kg a.i./ha at 3 DAS and Butachlor @0.75 kg a.i./ha 7 DAS. All the weed control treatments were applied pre emergence (PE) excepting stale bed where pre plant incorporation (PPI) of herbicide was applied. the uniform representative samples of weeds and crop were randomly collected from each plot, dried, processed and analysed to determine NPK content which in turn were multiplied by respective dry matters to determine uptake. Weed population determination was done by quadrant method described by Mishra and Mishra (1997).

Results and Discussion

Data regarding weed population as effected by various weed control treatments is presented in Table 1. The data revealed that weed control methods showed significantly effective control of population of weeds than weedy check at all crop growth stages. This is obvious due to reduction in weed population by different weed control treatments. At 30 days of crop growth stage, weed free treatment did not record any weeds. The herbicide treated plots were at par with each other except weedy check, which recorded significantly higher weed population. However, butachlor @1.5 kg a.i./ha (7 DAS), Anilophos 312 g a.i.+ ethoxysulfuron @ 15 g kg a.i./ha AT 10 DAS and pretilachlor @ 0.75 kg kg a.i./ha (3 DAS) reduced the total weed population significantly over weedy check and other herbicides treatments. At 60 and 90 days of crop age the population of weeds was maximum and the maximum population of weeds was recorded in weedy check. However, the significant reduction in dry matter accumulation by weeds was recorded when butachlor 1.5 kg a.i./ ha (7 DAS) and a combination of anilopos 312 g + ethoxysulfuron @ 1.5 g a.i./ha at 10 DAS and pretilachlor @ 0.75 kg a.i./ha (3 DAS) produced the lowest dry weight of weeds. This may be due fact that these herbicides not only exhibited significantly less toxicity to rice seedlings but also control the weeds effectively. These findings are incoformity with Angira and Rana (1998) and Mabbayad and Moody (1985).

Nutrient uptake by weeds: The data recorded on the nutrient uptake by weeds is presented in Table 2. The data revealed that there was significantly low uptake of NP and K by weeds in all the treatments as compared to weedy check which recorded higher uptake of N. Application of butachlor @ 1.5 kg/ha at 10 DAS and pretilachlor @ 0.75 kg a.i.\ha (3 DAS), at par with each other recorded lowest N uptake by weeds was in the order of 54.58, 54.12 and 52.75 with respect to butachlor @ 1.5 kg/ha (7 DAS), Anilophos 312 g a.i + ethoxysulfuron @15 g a.i.\ha at DAS and pretilachlor @ 0.75 kg a.i.\ha (3 DAS), respectively, over weedy check. The data on K up-take by weeds revealed that highest uptake of potassium was recorded in weedy check (33.93 kg/ha). Among herbicidal treatments butachlor 1.5 kg a.i/ha at DAS and pretilachlor @ 0.75 kg a.i./ha (3 DAS), respectively, over weedy check. The data on K uptake by weeds (10.87 kg/ha) followed anilophos 312 g a.i + ethoxysulfuron @ 1.5 g a.i/ ha recorded lowest up-take by weeds (10.87 kg/ ha) followed Anilophos 312 g a.i ha+ ethoxysulfuron @ 15 g a.i./ha at 10 DAS (15.50 kg/ha) and pretilachlor @ 0.75 kg a.i/ha (11.01 kg/ ha) at DAS. The higher uptake of NPK in weedy check plots may be due to luxuriant growth of weeds which accumulated higher dry matter. However, all weed control treatments significantly reduced nutrient uptake by weeds. The results are inconformity with those of Singh *et al.* (2000) and Singh *et al.* (2005).

Nutrient uptake by rice crop: The data presented in Table 3 indicated that all the weed control treatments significantly increased the nitrogen uptake by rice crop over weedy check. The maximum nitrogen uptake by grain (94.66 ka/ha)

Table1 : Effect of weed control treatments on total population of weeds in Rice (No./m^2) at different stages crop growth

Treatment	Dose	30 DAS	60 DAS	90 DAS	At Harvest
Weedy check (WC)	-	210 (14.50)	256 (16.01)	247 (15.70)	242(12.14)
Weed free (WC)	-	0 (0.70)	0.(70)	0(0.70)	0(0.70)
Butachlor (3 DAS) followed by metsulfuron methyl+ chlorimuron ethyl 3 DAS (PE)	1000 ml	145 (12.06)	168 (12.98)	155 (12.45)	151(12.30)
Butachlor (3 DAS) followed by metsulfuron methyl+ chlorimuron ethyl 3 DAS (PE)	1000 ml + 4 g	140 (11.85)	162 12.74()	152 (12.54)	147(12.14)
Butachlor at 7 DAS(PE)	0.75 kg a.i/ha	109 (10.46)	133 (11.55)	124(11.15)	120(10.97)
Butachlor at 3 DAS (PE)	1.50 a.i./ha	116 (10.79)	119(10.93)	117(10.83)	109(10.46)
Butachlor at 5 DAS (PE)	1.50 kg a.i./ha	108(10.14)	139(11.81)	135(11.42)	128(11.33)
Pretilachlor (PE)	0.75 kg a.i./ha	92 (9.61)	111(10.55)	106(10.31)	99(9.97)
Butachlor at 7 DAS (PE)	1.50 kg a.i./ha	75 (8.68)	98(9.92)	86(9.30)	81(9.02)
Anilophos + Ethoxysulfuron at 10 DAS	312 g + 15g	85(9.24)	102(10.12)	99(9.97)	94(9.74)
Butachlor at 3 DAS (PE)	0.75 kg a.i./ha	127 (11.29)	140(11.85)	135(11.68)	131(11.46)
Stale bed (PPI)	1%	135 (11.64)	131(11.46)	128(11.33)	121(11.02)
Anilophos+ Ethoxysulfuron at 20 DAS (PE)	312 g+15 g	124 (11.15)	122(11.06)	128(11.33)	118(10.88)
Butachlor at 5 DAS (PE)	0.75 kg a.i./ha	120 (10.97)	130(11.32)	130(11.42)	125(11.20)
CD (0.05)		**4.17**	**2.90**	**3.75**	**1.67**

Figures in parenthesis are the values transformed to X+0.5 of actual **DAS**= days after sowing
PE= Pre emergence **PPI**= Pre plant incorporation

Table 2: Effect of different weed control treatment on N, P, K, up-take (kg/ha) by weeds

Treatments	Dose	Nitrogen	Phosphorus	Potassium
Weedy check (WC)	-	23.93(4.94)	4.27(2.18)	33.93(5.86)
Weed free (WF)	-	0.0(0.70)	0.0(0.70)	0.0(0.70)
Butachlor (3 DAS) followed by Metsulfuron methyl + chlorimuron ethyl at 20 DAS (PE)	1000ml+4g	17.13(4.19)	1.53(1.42)	23.92(4.94)
Butachlor (3 DAS) followed by Metsulfuron methyl + chlorimuron ethyl at 3 DAS (PE)	1000ml+4g	15.74(4.02)	1.40(1.37)	23.65(4.19)
Butachlor at 7 DAS (PE)	0.75 kg a.i/ha	13.09(3.68)	0.71(1.11)	17.85(4.28
Butachlor at 3 DAS (PE)	1.50 kg a.i/ha	14.78(3.90)	0.66(1.09)	17.48(4.24)
Butachlor at 5 DAS (PE)	1.50 kg a.i/ha	10.62(3.33)	0.65(1.07)	16.27(4.17)
Pretilachlor (PE)	0.75 kg a.i/ha	7.80(2.88)	0.55(1.03)	11.10(3.39)
Butachlor at 7 DAS (PE)	1.50 kg a.i/ha	7.60(2.84)	0.49(0.99)	10.87(3.27)
Anilophos + Ethoxysulfuron at 10 DAS	312 g+15 g	7.72(2.86)	0.50(1.00)	15.50(3.38)
Butachlor at 3 DAS (PE)	0.75 kg a.i/ha	15.57(4.00)	0.79(1.14)	19.53(4.47)
Stale bed (PPI)	1%	16.26(4.09)	1.12(1.28)	22.38(4.78)
Anilophos + Ethoxysulfuron at 20 DAS (PE)	312 g+15g	15.07(3.95)	0.99(1.22)	19.95(4.52)
Butachlor at 5 DAS (PE)	0.75 kg a.i/ha	15.00(3.94)	0.69(1.09)	19.08(4.42)
CD (0.05)	0.053	0.071	0.033	
DAS=days after sowing PE = Pre emergence PPI= Pre plant incorporation				
Figures in parenthesis are the values transformed of X+0.5 of actual				

and straw (20.98 kg/ha) was recorded in weed free plots which was significantly higher than other treatments except butachlor 1.5 kg a.i/ha (7 DAS) were N uptake was 91.75 kg/ha and 19.79 kg/ha in grain and straw respectively. The butachlor 1.5 kg a.i/ha kg a.i/ha (7 DAS) was at par with Anilophos 312 g a.i+ ethoxysulfuron @ 15 g a.i/ha (10 DAS) and pretilachlor @ 0.75 kg a.i/ha (3 DAS), but superior thatn other treatments. The up-take of P and K followed the same treand, the lowest P uptake was recorded in weedy check treatment (4.41 kg and 2.13 kg ha by grain and straw), while as, highest P uptake was recorded by weed free treatment (10.62 kg and 6.72 kg/ha by grain and straw) followed by butachlor 1.5 kg a.i 1.5 kg a.i/ha (10.35 kg and 6.72 kg 6.01 kg/ha by grain and straw) at 7 DAS was at par with Anilophos 312 g a.i + ethoxysulfuron @ a.i/ha at 10 DAS and pretilachlor @ 0.75 kg a.i/ha at 10 DAS and pretilachlor @ 0.75 kg a.i\ha at 3 DAS. Maximum potassium uptake was recorded in weed free plots (12.10 kg and 102.13 kg/ha by grain and straw) 7 DAS was at par with Anilophos 312 g a.i + ethoxysulfuron @ 15 g a.i/ha (7 DAS) at par with Anilophos 312 g a.i + ethoxysulfuron @ 15 g a.i/ha at 10 DAS and pretilachlor @ 0.75 kg a.i/ha at 3 DAS. The data corroborate with those of Singh *et al.* (2000) and Singh *et al.* (2005).

Table 3: Effect of different weed control treatments on N,P,K, up-take (kg ha-1) by Rice

Treatments	Dose	Nitrogen		phosphorus		Potassium	
		Grain	Straw	Grain	Straw	Grain	Straw
Weedy check (WC)	-	28.27	9.27	4.41	2.13	5.78	45.45
Weed free (WF)	-	34.66	20.98	10.62	6.72	12.10	102.13
Butachlor (3 DAS) followed by Metsulfuron methyl + chlorimuron ethyl at 20 DAS (PE)	1000ml+4g	49.93	9.94	5.01	3.02	7.24	65.97
Butachlor (3 DAS) followed by Metsulfuron methyl + chlorimuron ethyl at 3 DAS (PE)	1000ml+4g	54.97	10.19	5.52	3.70	7.73	67.73
Butachlor at 7 DAS (PE)	0.75 kg a.i/ha	62.23	12.38	7.63	4.21	8.61	78.51
Butachlor at 3 DAS (PE)	1.50 kg a.i/ha	66.19	12.77	8.07	4.27	8.83	79.75
Butachlor at 5 DAS (PE)	1.50 kg a.i/ha	67.03	13.79	8.27	5.01	8.94	80.80
Pretilachlor (PE)	0.75 kg a.i/ha	88.60	18.47	10.08	5.60	11.11	93.80
Butachlor at 7 DAS (PE)	1.50 kg a.i/ha	91.57	19.79	10.35	6.01	11.65	98.83
Anilophos + Ethoxysulfuron at 10 DAS	312 g+15 g	89.20	16.68	10.13	5.87	11.65	94.25
Butachlor at 3 DAS (PE)	0.75 kg a.i ha^{-1}	57.51	11.77	6.71	3.11	8.59	74.95
Stale bed (PPI)	1%	58.18	11.85	6.82	3.90	8.41	75.67
Anilophos + Ethoxysulfuron at 20 DAS (PE)	312 g+15g	55.32	10.96	5.98	3.16	7.79	72.38
Butachlor at 5 DAS (PE)	0.75 kg a.i ha^{-1}	59.71	12.39	7.08	4.05	8.62	76.38
CD (0.05)		**3.44**	**1.38**	**6.29**	**0.44**	**0.57**	**5.09**

DAS= Days after sowing PE= Pre emergence PPI= Pre plant incorporation

It is concluded from above that application of butachlor @ 1.5 kg/ha (7 DAS), Anilophos 312 g a.i + ethoxysulfuron @ g a.i/ha at 10 DAS and pretilachlor @ 0.75 kg a.i/ha (3 DAS) reduced the weed population and N,P, and K uptake by weeds significantly than other herbicide treatments and weedy check.

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