International Journal of Farm Sciences **6(2)** : 19-23, 2016

Weed management practices in summer rice and their residual effect on black gram

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ABSTRACT

Summer rice cultivation mainly depends on the assured irrigation and modern inputs. Among the modern inputs, weed management aspect plays a vital role. With the view of weed management a field experiment was conducted during summer season of 2014 at the agricultural farm of Palli Siksha Bhavana (Institute of Agriculture) at Visva-Bharati, Sriniketan which lies in the sub-humid subtropical lateritic belt of West Bengal to study the effect of different weed management practices on weed control efficiency, productivity and economics of rice and residual effect of herbicides on black gram. The results showed that the application of bispyribac sodium @ 25 g/ha at 20 DAT (T_1), bispyribac sodium @ 50 g/ha at 20 DAT (T_2) and butachlor @ 1 kg/ha at 3 DAT + hand weeding at 20 DAT (T_6) were essential for higher productivity of summer rice. These treatments and cono weeding twice at 20 and 40 DAT (T_7) efficiently controlled the weeds. Bispyribac sodium @ 25 g/ha provided higher net returns with higher return per rupee invested. The results indicated the need of different weed management practices to reduce the influence of weeds in summer rice cultivation. The study recommends the use of bispyribac sodium @ 25 g/ha at 20 DAT for higher productivity and greater profit of summer rice. There was no harmful effect of the weed management practices on the performance of the residual crop of black gram.

Keywords: Black gram; rice; summer rice; weed management

INTRODUCTION

Rice cultivation is mainly done in the 3 seasons like Aus (autumn rice), Aman (winter rice) and Boro (summer rice). In case of productivity, Boro rice fetches highest productivity due to proper utilization of resource inputs. But there are several reasons for its low productivity and weed infestation is one of them. Mainly in case of summer rice cultivation, weed infestation is the most important cause for low yield. Uncontrolled weed growth caused 33-45 per cent reduction in the grain yield of rice (Manhas et al 2012). Weeds are responsible for heavy yield losses in rice

to the extent of complete crop failure under severe infestation conditions. The weed flora under transplanted condition is very much diverse and consists of grasses, sedges and broad-leaf weeds causing yield reduction of rice crop up to 76 per cent (Singh et al 2004). In these situations herbicides play a significant role in controlling the weeds and thereby increasing the production. Keeping this in view a field experiment was carried out at the agricultural farm of Institute of Agriculture, Visva-Bharati to study the effect of weed management on summer rice and its residual effect on black gram in the year 2014.

MATERIAL and METHODS

A field experiment was conducted during the Boro season of 2014. The experimental site was situated in the sub-humid subtropical lateritic belt of West Bengal with the hot summer and moderately cold and short winter. The experiment was conducted in the randomised block design having three replications with nine treatments viz T_1 (bispyribac sodium @ 25 g/ha at 20 DAT), T_2 (bispyribac sodium @ 50 g/ha at 20 DAT), T_3 (orthosulphamuron @ 80g/ha at 15 DAT), T_4 (orthosulphamuron @ 150g/ha at 15 DAT), T_5 (butachlor @ 1 kg/ha at 3 DAT), T_6 (butachlor @ 1 kg/ha at 3 DAT + hand weeding at 20 DAT), T_7 (cono weeding at 20 & 40 DAT), T_8 (hand weeding at 20 & 40 DAT), T_9 (weedy check). Rice variety IR 36 was transplanted in the experimental field with recommended package of practices. Fertilizers were applied uniformly through urea, single super phosphate and muriate of potash @ 140 kg N, 70 kg P_2O_5 and 70 kg K_2O/ha respectively.

The observations were recorded on weed control efficiency and grain yield recorded at 45 days after transplanting, straw yield, economics and effect on residual crop. The data recorded were subjected to statistical analysis.

RESULTS and DISCUSSION

Weed control efficiency

The observations on weed control efficiency recorded at 45 days after transplanting (DAT) are presented in Table 1.

At 45 DAT highest weed control efficiency values were observed in T_8 treatment followed by T_2, T_6 and T_1 treatment due to lower weed population as well as lower weed dry weight. Lowest weed control efficiency was observed in case of weedy check (T_9). Similar observations on the effect of bispyribac sodium on influencing weed control efficiency were also made earlier (Prakash et al 2011).

Grain yield (tons/ha)

Weed management practices showed significant effect on grain yield of summer rice. The highest grain yield was

Table 1. Effect of Weed management on weed control efficiency (WCE), grain yield and economics of summer rice

Treatment	WCE 45 DAT	Grain yield (tons/ha)	Straw yield (tons/ha)	Net return (Rs)	Return/Re invested
T_1	98.88	6.57	7.93	58776.7	2.67
T_2	98.91	6.20	7.73	53523.3	2.51
T_3	64.73	5.87	7.40	49223.3	2.41
T_4	70.48	5.37	7.80	43060.7	2.23
T_5	66.62	5.83	7.67	48953.3	2.39
T_6	98.89	6.70	8.33	57723.3	2.50
T_7	96.87	6.37	7.93	54606.7	2.49
T_8	100.00	6.80	8.43	56283.3	2.37
T_9	0.00	3.47	6.40	17083.3	1.49
SEm ±	-	0.30	0.30	4073.7	0.10
$CD_{0.05}$	-	0.91	0.90	12208.8	0.30
CV (%)	-	8.9	8.1	14.6	8.6

T_1 (bispyribac sodium @ 25 g/ha at 20 DAT), T_2 (bispyribac sodium @ 50 g/ha at 20 DAT), T_3 (orthosulphamuron 50 WG @ 80 g/ha at 15 DAT), T_4 (orthosulphamuron 50 WG @ 150 g/ha at 15 DAT), T_5 (butachlor @ 1 kg/ha at 3 DAT), T_6 (butachlor @ 1 kg/ha at 3 DAT + hand weeding at 20 DAT), T_7 cono weeding at 20 & 40 DAT), T_8 (hand weeding at 20 & 40 DAT), T_9 (weedy check)

obtained in the hand weeding at 20 and 40 DAT (T_8) plot with a record yield of 6.8 tons/ha. Butachlor @ 1 kg/ha at 3 DAT + hand weeding at 20 DAT (T_6), bispyribac sodium @ 25 g/ha at 20 DAT (T_1), cono weeding at 20 and 40 DAT (T_7) and bispyribac sodium @ 50 g/ha at 20 DAT (T_2) were statistically at par with T_8 treatment. However lowest yield was recorded in the weedy check (T_9) plot. The results showed that the higher grain yield was obtained due to the lower weed menace in the T_8, T_1, T_2, T_6 and T_7 plots. The increase in yield over weedy check by application of different weed management practices was 47, 44, 48 and 45 per cent in T_1, T_2, T_6 and T_7 treatments respectively. The results are in agreement with the earlier findings regarding increase in rice yield due to application of bispyribac sodium (Jabran et al 2012).

Straw yield (tons/ha)

The highest straw yield was recorded in the hand weeding at 20 and 40 DAT (T_8) plot. All the treatments except orthosulphamuron 50 WG @ 80g ai/ ha at 15 DAT (T_3) and weedy check (T_9) were statistically at par with T_8 treatment. The lowest straw yield was observed in case of T_9 treatment. The results are in conformity with the findings of Rawat et al (2013).

Economics

The highest net return and return per rupee invested was recorded in case of bispyribac sodium @ 25 g/ha at 20 DAT (T_1) treatment and was significantly higher

than that of all other weed management treatments. All other treatments except T_4 and T_9 treatments were statistically at par with T_8 treatment. The weedy check (T_9) treatment paid the lowest net return and return per rupee invested which was significantly lower than all other weed management treatments.

The increase in net return over weedy check by application of different weed management practices was 71, 68, 65, 65, 70, 69 and 69 per cent in T_1, T_2, T_3, T_5, T_6, T_7 and T_8 treatments respectively. The study indicated the need of weed management in summer rice for greater productivity along with higher profit. Similar findings were reported earlier by Veeraputhiran and Balasubramanian (2013).

Residual effect on crop

The plant population/m^2 of black gram recorded in each plot after 25 DAS showed that no significant differences among the treatments were found (Table 2).

Table 2. Residual effect of weed management on plant population, seed and stalk yield of black gram

Treatment	Plant population/m^2	Seed yield (kg/ha)	Stalk yield (kg/ha)
T_1	34.0	970.7	2274.0
T_2	33.0	846.3	2290.0
T_3	35.0	829.0	2283.3
T_4	34.0	960.0	2100.0
T_5	35.7	1140.0	2035.7
T_6	36.7	1070.0	2152.0
T_7	36.3	1150.0	1816.7
T_8	35.3	1179.0	2473.3
T_9	31.0	750.0	1916.7
SEm ±	1.3	100.2	198.7
$CD_{0.05}$	NS	NS	NS
CV (%)	6.4	17.6	16.0

T_1 (bispyribac sodium @ 25 g/ha at 20 DAT), T_2 (bispyribac sodium @ 50 g/ha at 20 DAT), T_3 (orthosulphamuron 50 WG @ 80 g/ha at 15 DAT), T_4 (orthosulphamuron 50 WG @ 150 g/ha at 15 DAT), T_5 (butachlor @ 1 kg/ha at 3 DAT), T_6 (butachlor @ 1 kg/ha at 3 DAT + hand weeding at 20 DAT), T_7 cono weeding at 20 & 40 DAT), T_8 (hand weeding at 20 & 40 DAT), T_9 (weedy check)

The seed and stalk yield of black gram followed a similar trend as in the case of population/m^2. No phytotoxic symptoms on black gram were noticed due to the herbicidal treatments made on rice. The results confirm the findings of Parthipan et al (2013).

The results indicated the need of different weed management practices to be

adopted to reduce the influence of weed in summer rice cultivation. The study from yield, economics and weed control efficiency recommends the use of bispyribac sodium @ 25 g ai/ha at 20 DAT (T_1) for getting better growth, higher productivity and greater profit of summer rice.

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Received: 10.2.2016 ***Accepted: 28.3.2016***