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## Effect of weed control measures on yield and economics of rice (*Oryza sativa*)

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**Abstract**

An on farm trial was conducted during the rainy (*khari*) season of 2014-15 at eight locations (farmers' field) of the district, to validate, refine and popularize the technology developed at Directorate of weed science, Jabalpur for managing weeds in rice (*Oryza Sativa* L.). Effectiveness of post emergence application of *bispyribac sodium* @ 25g/ha and *azimsulfuron* @ 35g/ha over pre emergence application of *butachlor* @ 2kg/ha and weedy check (farmer's practices) was studied on yield and profitability of rice. Highest grain yield (5188kg/ha) of rice was recorded with the post emergence application of *bispyribac sodium* @ 25/ha followed by post emergence application of *azimsulfuron* @ 35 g/ha (4991kg/ha), pre emergence application of *butachlor* @ 2 kg/ha (4331 kg/ha) and weedy check (3544kg/ha). However, the highest net return of Rs. 68071/ha was fetched with the application of *bispyribac sodium* as post emergence followed by *azimsulfuron* as post emergence (Rs. 64013/ha), *butachlor* as pre emergence (Rs. 50547/ha) and unweeded control (Rs. 33527/ha).

**Keywords:** Control, measures, economics, *Oryza sativa*

**Introduction**

Rice is the most important cereal crop and widely cultivated in the world. In Madhya Pradesh, it is cultivated over an area of 15.59 Lakh ha with a total production of 14.62 Lakh tones with an average yield of 989 kg/ha, which is much lower than that of national average productivity (1940 kg/ha). Rice is also grown in Sheopur district. With increase in area under irrigation, the area under rice crop is also increasing gradually in the district. However, the productivity of rice is low compared to other rice growing parts of the country. The area under rice is around 16 thousand ha in the district. Productivity of rice is very low due to stiff competition from weeds, low seed replacement rate, multiple nutrient deficiencies, insect pests and incidence of diseases. Infestation by different species of weeds in rice is one of the major problems faced by the farmers which reduces the yield by 25-50 percent. Manual weeding is a common practice in the district but it is less efficient, labour intensive, costly and after not done on right time. Manual weeding is generally done when weed infestation is quite visible in the field and at this stage weeds have already done the damage to the crop. Use of suitable and conventional herbicide like *butachlor* provides more efficient and cost effective weed control in rice, but it is not broad spectrum. To manage the dynamics of weed flora, there is need to evaluate a range of herbicides to have broad spectrum weed control. Hence, present investigation was conducted at selected farmers' fields to validate, assess and refine the sustainability and energy use efficiency of improved technology of weed management over traditional farmers' practices.

**Materials and Methods**

Initially Participatory Rural Appraisal (PRA) was done to identify causes of low yield of rice. It was found that heavy infestation by weeds particularly *Echinochloa crus-galli*, *E. colona*, *Cyperus rotundus*, *Commelina benghalensis* and *Digitaria sanguinalis*, which pose a serious constraint in the district. Therefore, based on PRA five villages, namely Panwada, Bamhori, Dalarna, Raipura and Bardha of Sheopur district of Madhya Pradesh were selected for on farm trials at farmer's fields during the rainy (*Khari*) season of 2014-15. The average rainfall of district is 822mm, most of which occurs during June-September. The soil of the area under study was medium black with medium fertility status.

The experiment comprised 4 treatments viz. weedy check (farmer's practice), pre emergence application of *butachlor* @ 2 kg/ha (farmer's practice), post emergence application of *bispyribac sodium* @ 25g/ha and post emergence application of *azimsulfuron* @ 35g/ha, were conducted at each farmer's field and treatment provided 0.1 ha area. Rice was transplanted during the second fortnight of July. The crop was fertilized with recommended doses of fertilizers vis. 100, 60, 40 kg N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O/ha. Whole quantity of P and K and one third of N were applied as basal and remaining N was applied in 2 equal splits. Herbicides were applied manually operated knapsack sprayer delivering a spray volume of 500 l/ha through flat-fan nozzle (*butachlor* at transplanting and *bispyribac sodium* and *azimsulfuron* at 25 days after transplanting) crop was manually harvested in the first week of November. The yield data were recorded and adjusted to 14% of the moisture content. Economics were computed using the prevailing market price of inputs.

## Results and Discussion

### Effect on weed flora

The major weed flora observed in the experiment sites included *Echinochloa crus-galli*, *E.colena*, *Cyperus rotundus*, *Commelina benghalensis* and *Digitaria sanguinalis*. Post

emergence application of both herbicides *bispyribac sodium* and *azimsulfuron* reduced population of weeds compared to both farmers' practices pre emergence application of *butachlor* and weedy check. It was mainly because of effective weed control. The lowest weed density was observed with post emergence application of *bispyribac sodium* followed by post emergence application of *azimsulfuron* and pre emergence application of *butachlor* respectively. The results are similar to findings of Singh *et al.* (2016)<sup>[1]</sup>.

### Rice yield

Lesser crop weed competition due to effective weed control with post emergence application of herbicide resulted higher grain yield of rice as compared to farmer's practices (table 1). Post emergence application of *bispyribac sodium* and *azimsulfuron* produced the higher grain yield of rice, i.e. 19.78 percent and 15.23 percent higher over pre emergence application of *butachlor* and 46.38 percent and 40.82 percent higher over weedy check respectively. The results are similar to findings of Rao *et al.* (2015)<sup>[2]</sup>. It might be because of difference in number of weeds recorded due to weed control treatment, which resulted in reduced crop weed competition for space, solar radiation, moisture and nutrient uptake.

**Table 1:** Effect of weed control treatments on weed density, yield and economics of Rice

Treatment	Weed density (No./m <sup>2</sup> )	Yield (kg/ha)	Cost of cultivation (Rs./ha)	Gross return (Rs./ha)	Net return (Rs/ha)	Benefit: Cost ratio
Bispyribac sodium @ 25g/ha (POE)	10.80	5188	51253	119324	68071	2.32
Azimsulfuron @ 35 g/ha (POE)	12.20	4991	50780	114793	64013	2.26
Butachlor @ 2 kg/ha (PE)	14.60	4331	49066	99613	50547	2.03
Weedy check	48.80	3544	47985	81512	33527	1.69

### Economic

Owing to higher crop yield and timely management of weeds with post emergence application of herbicides resulted higher net return and benefit: cost ratio over pre emergence application of *butachlor* as well as weedy check (table 1). The maximum net return (Rs. 68071) and benefit cost ratio (2.32) was recorded with post emergence application of *bispyribac sodium*, i.e. Rs. 17524 and 0.29, being higher over pre emergence application of *butachlor* (farmer's practice). This is mainly owing to lower crop yield and poor weed control in farmer's practice. Results are similar to findings of Prameela *et al.* (2014)<sup>[3]</sup>.

Based on present study it may be concluded that weeds associated with transplanting rice in Madhya Pradesh can be effectively managed through post emergence application of *bispyribac sodium* @ 25g/ha at 25 days after transplanting. The effect of post emergence application of *bispyribac sodium* was consistent and resulted in higher grain yield and economic return than that of farmers' practices.

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