



Research Article

FRONT LINE DEMONSTRATIONS ON CHEMICAL WEED CONTROL IN TRANSPLANTED RICE (*Oriza sativa*)

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Abstract: The losses in rice crop yield caused by weeds range between 9-51% in varying agro climatic conditions. Butachlor herbicidal application was observed very common amongst farmers during participatory rural appraisal survey (PRA) of KVK adopted villages in Gwalior district of Madhya Pradesh. Butachlor was reported less effective by the farmers during the participatory survey of the villages. Therefore fifteen front live demonstrations on chemical weed control practices with newer broad spectrum herbicides were laid down in 05 villages of Bhitwar and Dabra blocks of district Gwalior in transplanted rice during three consecutive *kharif* seasons of the year 2012-13 to 2014-15 to demonstrate the performance and profitability of new herbicides viz. chloromuron-ethyl + metsulfuron-methyl and bispyribac sodium at 0.020 and 0.025 kg/ha, respectively. The farmers' fields were observed infested with mixed flora of grasses, sedges and broad leaf weeds. The herbicides used for demonstrations were found to be very effective in controlling weeds and thereby increasing grain yield of rice by 12-17.5 percent over farmers practice and gave higher weed control efficiency of 75.25 to 93.23 percent over the farmers practice. The herbicidal weed control demonstration also proved economically superior over F.P. by recording higher net income ranging from 1,06,255 to 1,20,345 per ha and B:C ratio from 4.70-6.08 during three years of study.

Keywords: Rice, Herbicidal weed control, Front Line Demonstrations, Farmers practice

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Introduction

Rice (*Oryza sativa*) constitutes staple food for more than 50% of the world population and its yearly production holds the key to food security for the global human population. India is world's largest rice producer country contributing 20 % of all world rice production. This crop holds a significant contribution in the economy of the country by sharing 108.86 million tons (mt) grain production in the food basket. This crop also occupies important place among various cereals grown in the state of Madhya Pradesh and district Gwalior where it is grown on 20.24 and 0.53 lakh ha. respectively and contributing 18.80% and 29.14% share total cereals production in the Madhya Pradesh and Gwalior district respectively [1]. Majority of the rice area in *Kharif* in Gwalior district covered under transplanted method of rice cultivation. One of the major constraints in rice production during PRA survey of the KVK adopted villages in the district was observed to be poor weed management due to unavailability of labour during weeding peak. The share of weed management cost is also higher than other operations in puddled transplanted rice (PTR). Farmers were realizing the need of suitable post emergence herbicide to combat the wide spectrum of weeds emerged during later stage of crop growth. The farmers were practicing the application of butachlor as pre-emergence applied at 3-5 days after transplanting (DAT) which was not controlling several weeds even 30-40 DAP growth stage of crop in their fields. In these situations, post emergence broad spectrum herbicide application plays a significant role in controlling the majority of the weeds and thereby increasing the productivity. Hence, new molecules of selective herbicides were demonstrated at farmer's field to show their broad-spectrum efficacy and profitability due to considerable yield advantage over farmers practice.

Materials and Methods

The front-line demonstrations on established new molecules of herbicides for broad spectrum weed control were carried out in transplanted rice in KVK adopted

villages *Kachhuoa*, *Badkisarai*, *Amrol* in Bhitwar block and *Salvai* and *Samudan* in Dabra block of the Gwalior district during *Kharif* 2012-13 to 2014-15. Out of 05 villages total 15 farmers were selected (05 farmers each year) with whom demonstrations were carried out. These selected farmers of the above villages were belonging to small and medium category. The soil samples from each selected farmer were collected and analyzed. The soil was clay loam having pH in the range 7.6-8.3, observed low in organic carbon ranges between 0.30-0.48 % and available nitrogen (210-242 kg/ha), medium in available P_2O_5 (24.6-25.2 kg/ha) and available K (220-294 kg/ha). Chloromuron-ethyl + metsulfuron-methyl @ 4 g/ha, Bispyribac sodium 10 % SL @ 25 g/ha were demonstrated in the farmers' fields and compared with farmers practice of application of butachlor @ 1.5Kg/ha at 3-5 days after transplanting (DAT) applied as broadcasting with sand mixing. Recommended dose of 80 kg N, 50 kg P_2O_5 , 30 kg K_2O and 5 kg Zn was applied by each farmer to the rice crop in all the three years of demonstrations. The rice variety Pusa Sugandha 5 was grown on each participating farmer with all other standard practices of puddled rice cultivation during all the three years of demonstration programme. Both the herbicides under demonstrations were sprayed by *knap sack* sprayers using a spray volume of 500 liters/ha. At 25-30 DAT. Data pertaining to weed count and weed bio mass from each demonstration plots were recorded at 60 DAT stage from an area enclosed in a quadrat of 1m² from 5 randomly marked places. The total number of weeds falling with in quadrat was counted and were cut closer to ground level and collected for dry matter accumulation. Weed control efficiency was calculated at this stage in relation to the total weed dry matter and expressed in percentage using formula suggested by [2].

$$WCE = \frac{\text{Dry matter of weeds in control plot} - \text{Dry of weeds in treated plot}}{\text{Dry matter of weeds in controlled plot}} \times 100$$

Table-1 Impact of different herbicides on weed growth and weed control efficiency (WCE) in transplanted rice at Farmer's field under front line demonstrations

Year	Herbicide intervention/farmer's practice	No. of front line demonstrations	Area(ha)	Weed count no./m ²	Weed dry matter (g/m ²)	Weed control efficiency (%)
2012-13	RP:Chloromuron+ metsulfuron @ 0.004kg/ha	5	4	15.2	9.8	75.25
	F.P.: Butachlor @ 1.5 kg/ha			85.6	39.6	-
2013-14	RP:Bispyribac sodium @ 0.025 kg/ha	5	4	6.8	3.9	85.28
	F.P.: Butachlor @ 1.5 kg/ha			45.2	26.5	-
2014-15	RP:Bispyribac sodium @ 0.025 kg/ha	5	4	4.5	2.8	93.23
	F.P.: Butachlor @ 1.5 kg/ha			85.6	41.4	-

Table-2 Impact of different herbicides on yield and economics of transplanted rice at farmer's field under front line demonstrations

Year	Herbicide Intervention	No. of FLDs	Area (ha)	Grain Yield (g/ha)	Yield increases over FP (%)	Gross cost (/ha)	Gross income (/ha)	Net income (/ha)	B:C
2012-13	R.P.: Chloromuron + Metsulfuron @0.004kg/ha	5	4	48.9	17.5	20885	1,27,140	106255	6.08
	F.P.: Butachlor @ 1.5 kg/ha			41.6	-	18690	1,08,160	89470	5.78
2013-14	R.P.: Bispyribac sodium @ 0.025 kg/ha	5	4	45.6	12	28350	1,36,800	1,08,450	4.83
	F.P.: Butachlor @ 1.5 kg/ha			40.8	-	26980	1,22,400	95,420	4.53
2014-15	R.P.: Bispyribac sodium @ 0.025 kg/ha	5	4	56.6	13.43	32475	1,52,820	1,20,345	4.7
	F.P.: Butachlor @ 1.5 kg/ha			49.9	-	30885	1,34,730	1,03,845	4.36

The grain yield of the crop with the economics of the practices in each demonstration were recorded and compared with the Farmers practice. The data were computed, arranged and analyzed to draw the valued inferences.

Results and Discussion

The demonstration sites were observed infested with complex weed flora, consisting of grasses, sedges and broad leaf weeds. *Echinochloa colona* (L), *Echinochloa crusgalli* (L), *Digitaria ciliaris* L., *Eleusine indica*, among grasses, *Cyperus iria* L., *Cyperus deformis* L. and *Fimbristylis miiaecae* (L.) among sedges. Among broad leaved weeds *Ipomea aquatica* (L), *Alternanthera sessalis* (L), *Caesulia auxillaris*, *Ageratum conyzoides* and *Cleome viscosa* (L.) were dominant. Both the post emergence herbicides under demonstration trial were found effective in controlling weed growth [Table-1]. The weed count and weed dry matter was recorded higher in farmers practice in all the locations of frontline demonstrations. Higher weed control efficiency (WCE) was observed in all the demonstration plots having application of post emergence broad spectrum herbicides at 60 DAT during all three years of demonstration over farmers practice. WCE varied from 75.25-93.23 % depending upon the floral composition, density and growth of weeds at different locations. Post emergence application of broad-spectrum herbicides gave 12-17.5% higher grain yield under improved practice demonstrated during all the three years over farmers practice in different locations. The higher levels of yield under improved practice during all the three years of demonstration might be due to more congenial field environment to crop for its growth and development in the critical period of crop-weed competition in crop life cycle as evident from lower weed count and lesser weed dry weight over farmers practice. Similar findings were reported by [3], [4] and [5]. The economic analysis of herbicidal weed control practices revealed that higher economic benefits were realized under post emergence application of newer broad-spectrum herbicides over farmers practice [Table-2]. Post emergence application of Bispyribac-sodium at 0.025 Kg/ha registered highest net profit of Rs. 1,52,820 and 1,36,800 during 2013-14 and 2014-15 while highest B:C ratio was recorded with post emergence application of Chlorimuron + Metsulfuron @0.004kg/ha during the year 2012-13 because of low market price as compared to Bispyribac sodium in the succeeding two years of investigation. Both broad spectrum post emergence herbicides gave higher economic returns over farmers practice during all the three years of study. The front-line demonstration with farmers participation plays a key role in transfer of new technologies for wider adoption. Hence front-line demonstration bridges the gap between technology generation and its transfer to farmers' fields. FLDs educate farmers through learning by doing and believing by seeing the results obtained in terms of higher yield levels over their practice.

Application of research: The present FLDs on chemical weed control in transplanted rice has motivated the farmers to adopt new molecules of herbicides having wide spectrum weed control ability in transplanted rice fields. The extension functionaries working in the areas of demonstrations were also convinced with the results of effective weed control and have communicated the

technologies to other farmers in the district Gwalior.

Research Category: Applied Research for wider adoption.

Abbreviations: WCE: Weed Control Efficiency,

PRA: Participatory Rural Appraisal, KVK: Krishi Vigyan Kendra, FLDs: Front Line Demonstrations, DAT: Days After Transplanting, PTR: Puddled Transplanted Rice, DAP: Days After Planting

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Study area / Sample Collection: Kachhua, Badkisarai, Amrol in Bhitwar block and Salvai and Samudan in Dabra block, Gwalior district

Cultivar / Variety / Breed name: Pusa Sugandha 5

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

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