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Field demonstrations on chemical weed control in transplanted rice

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ABSTRACT

Fourty field demonstrations on chemical weed control practices were laid at four villages of Delang block of Puri district in transplanted rice during *Kharif* season of 2010 to 2012 to analyze the performance and profitability of new generation herbicides, *viz*. oxadiargyl, pyrazosulfuron-ethyl, pretilachlor and chloromuron-ethyl + metsulfuron-methyl at 70, 25, 750 and 4 g/ha, respectively on weed growth and productivity of transplanted rice at farmer's fields. The farmers' fields were found infested with mixed flora of grasses, sedges and broad-leaved weeds. The herbicides used for demonstrations were found to be highly effective in controlling weeds and thereby increasing grain yield of rice by 23–42% over farmers' practice based on the intensity and growth of different weed flora. The economic benefits of herbicide demonstration over the farmers' practice varied from ₹ 4,362 - 9,343/ha.

Key words: Chemical control, Farmers' practice, Field demonstration, Herbicide, Transplanted rice, Weed

Rice (*Oryza sativa*) is the staple food for majority of the population of Odisha. It also holds a significant contribution in the economy of the state. In *Kharif*, rice constitutes more than 70% of total net sown area. The average productivity of the state in the season is below the national level though majority of the rice area in *Kharif* season is covered under transplanted method of rice cultivation. One of the major production constraints in rice production is the poor management of weed due to scarcity of labour in the peak period of transplanting. Hence, successful weed control is essential for obtaining optimum yield of rice (Hussain *et al.* 2008).

The general method of hand weeding as practiced by the farmers is labour intensive, time taking and expensive. Moreover in *Kharif* season, due to continuous rains the manual weeding is problematic and uneconomic. In these situations herbicides play a significant role in controlling the weeds and thereby increasing the production. Hence, selective new generation herbicides were demonstrated at farmers' field to show the efficacy of herbicides and profitability with considerable yield advantage over farmers practice.

MATERIALS AND METHODS

The field demonstrations were carried out in transplanted rice with four established herbicides at randomly selected four villages (Sadhangoi, Singhberhampur, Sujanpur and Munida) of Delang block of Puri district of Odisha during *Kharif* 2010 to 2012. Out of four villages, total 40 adopted farmers were selected (10 farmers from each villages) where the demonstrations were carried out. The selected farmers of the demonstration area were of small and marginal in nature. The soil samples from each adopted farmers were analyzed and found to be low in organic carbon which ranges between (0.23-0.38%) and available N (201-232 kg/ha), medium in available P (28.3-32.7 kg/ha) and available K (262-294 kg/ha). Oxadiargyl 70 g/ha, pyrazosulfuron-ethyl 25 g/ha, pretilachlor 750 g/ha and chloromuron-ethyl+ metsulfuron-methyl 4 g/ha were tested in the farmers field to observe its effectiveness in controlling the weeds and thereby increasing the productivity of rice. All the herbicides were applied as per their recommended practice. Weeds were recorded at different stages and at harvest and the weed control efficiency was calculated as per the method suggested by Mani *et al.* (1973).

The grain yield of the crop with the economics of treatments in each demonstration were recorded and compared with the yield of the farmers' practices. The data were calculated and analyzed to draw the valid inferences.

RESULTS AND DISCUSSION

Major infested weeds at demonstration sites were: *Cynodon dactylon* (L.), *Echinochloa colona* (L.) Link. *Eleusine indica* (L.) Gaertner and *Digitaria ciliaris* L. (Scop.) among grasses, *Cyperus rotundus* L., *Cyperus iria* L. and *Fimbristylis miliaceae* (L.) Vahl among sedges. Among broad-leaved weeds *Ageratum conyzoides* (L.), *Alternanthera sessilis* (L.) DC., *Chrozoffera rottleri* (L.) and *Cleome viscosa* (L.) were dominant. The other weeds

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present in low intensity were: *Dactyloctenium aegypticum* (L.) Willd., *Ludwigia parviflora* (Jacq.), *Eclipta alba* (L.) and *Paspalum scrobiculatum* (L.).

All the herbicides under trial were found effective in controlling weed growth (Table 1). The weed count and dry matter were found higher in farmers practice in all the locations of field demonstrations. Higher weed control efficiency (WCE) was found in all the demonstrated plots of herbicide applications over farmers' practice in all the stages of observations. The WCE varied from 68-84% at 60 DAT depending on the floral composition, density and growth of weeds at different locations. The grain and straw yield was increased from 23-42% and 18-26%, respectively over farmers' practice in different herbicides applied fields at different locations, depending on the growth and intensity of weed populations (Table 2). The average highest grain yield of 4.24 t/ha was found to be at locations with the application of oxadiargyl at 70 g/ha, followed by pyrazosulfuron-ethyl (3.96 t/ha). The higher economic benefit of ₹ 9,343 was realized in oxadiargyl treated plots over the farmers' practice, followed by the pyrazosulfuron-ethyl treatment (₹ 8,425). The increased grain yield was attributed mainly to the timely and effective control of weeds during initial stages of crop growth (Mukherjee

Table 1. Effect of different herbicides on weed growth in transplanted rice at farmers' field (meen of 3 years)

No. of field demonstrations/ farmers' practice	Herbicides treatment intervention/ farmers practice (two HW at 20 and 45 DAT)	Weed count (no./m^2)			Weed dry matter (g/m^2)			WCE (%)		
		30 DAT	60 DAT	Harvest	30 DAT	60 DAT	Harvest	30 DAT	60 DAT	Harvest
10 field demonstrations at four locations	Oxadiargyl 70 g/ha	13.7	23.9	34.6	5.9	11.2	18.5	87	84	81
Farmers practice	FP	44.9	65.8	86.7	27.3	29.8	41.9	-	79	54
10 field demonstrations at four locations	Pyrazosulfuron-ethyl 25 g/ha	8.9	14.3	27.4	8.1	8.3	11.9	80	83	76
Farmers practice	FP	35.4	59.5	105.4	19.4	31.4	62.8	-	74	61
10 field demonstrations at four locations	Pretilachlor 750 g/ha	11.2	20.7	41.6	9. 8	9.2	21.3	68	73	71
Farmers practice	FP	54.8	49.6	116.8	32.7	23.5	56.8	-	68	42
10 field demonstrations at four locations	Chloromuron-ethyl + metsulfuron-methy4 g/ha	21.7	27.9	50.7	9.5	16.1	26.1	72	76	71
Farmers practice	FP	36.1	69.1	156.3	23.7	31.4	84.3	-	64	48

DAT-Days after transplanting; HW- Hand weeding, FP- Farmers' practice

Table 2. Effect of different herbicides on yield and economics of transplanted rice at farmers' field (mean of 3 years)

No. of field demonstrations/ farmers' practice	Treatment intervention/ farmers' practice	Grain yield (t/ha)		Straw yield (t/ha)		Yield increase over FP (%)		B:C ratio	Cost of treatments (`/ha)	Benefit over FP (`/ha)
		FP	Treated	FP	Treated	Grain	Straw			
10 field demonstrations at four locations	Oxadiargyl 70 g/ha	-	4.24	-	5.10	42	26	2.59	1,064	9,343
Farmers' practice	FP	2.95	-	4.06	-	-	-	1.11	3,600	-
10 field demonstrations at four locations	Pyrazosulfuron-ethyl 25 g	-	3.96	-	4.87	32	21	2.41	1,654	8,425
Farmers' practice	FP	2.99	-	4.16	-	-	-	1.09	3,600	-
10 field demonstrations at four locations	Pretilachlor 750 g/ha	-	3.86		4.85	23	18	2.48	1,421	6,273
Farmers' practice	FP	3.15	-	4.01	-	-	-	1.14	3,600	-
10 field demonstrations at four locations	Chloromuron-ethyl + metsulfuron-methyl 4 g/ha	-	3.42	-	4.31	26	20	2.39	2,013	4,362
Farmers' practice	FP	2.71	-	4.25	-	-	-	1.21	3,600	-

and Singh 2005). The average yield of all the locations of farmers' practice was found to be below 3.00 t/ha.

The demonstration indicated that both the grain and straw yield along with benefits due to treatments of herbicides was higher than the farmers' practice. The findings were also corroborated with Singh (2009). The applications of herbicides have registered higher B: C ratio in comparison with farmer's practice in all the locations. Among all the herbicides applied, oxadiargyl at 70 g/ha gave the highest B: C ratio of 2.59 followed by pretilachlor at 750 g/ha (2.48). The cost of herbicides including its application varied from ₹ 1,064 - 2013 was less than the farmers' practice, resulting yield advantage of 23 - 42% at different locations.

The field demonstration through farmers' participation plays a key role in transfer of useful technology. As the rate of adoption of herbicide use in the state is very poor in comparison to other chemicals used in agriculture, it is pertinent to do fruitful demonstrations of herbicides with proper dose and time of applications to get more benefit from the technology along with its rapid dissemination.

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