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Studies on weed management in rice-wheat cropping system in *Tarai* conditions of Uttaranchal, India

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ABSTRACT
The field experiment is in progress since 1990-91 at Crop Research Centre of G. B. Pant University of Agriculture and Technology, Pantnagar, U.S.Nagar (Uttaranchal) to study the long term effects of herbicide use in rice-wheat system. Continuous use of butachlor and isoproturon for weed control in rice-wheat system during the last 13 years did not reduce the weed control efficiency of butachlor, however, efficiency of isoproturon was reduced slightly over the years but these herbicides are still providing satisfactory weed control. The crop productivity was not affected over the years due to continuous use of butachlor and isoproturon.

Key words : Rice, Wheat, Butachlor, Isoproturon

INTRODUCTION
The rice-wheat rotation is the most important rotation in India, covering about 12 m ha area and contributing nearly 31% of the total cereal production in the country. Thus, it is backbone of the country's food security.

Weeds are major constraints for the sustainability of production and productivity of this rotation. These are self-grown and appear simultaneously with crop plants creating severe competition for nutrients, space, moisture and solar energy. Weeds, by virtue of their wider adoptability and faster growth dominate the crop habitat and reduce crop yield potential. Hand weeding is the most common, old and effective method of weed control but it is becoming difficult and uneconomical due to high cost and unavailability of labour at peak period. Under such situations, chemical weed control is easier, time saving and economical as compared to hand weeding.

MATERIALS AND METHODS
A field experiment was conducted at the crop Research Centre of G.B. Pant University of Agriculture and Technology Pantnagar, (U.S. Nagar) during year 2003-04 and 2004-05 to study the dynamics of weed flora in rice-wheat cropping system and its effect on yield of rice and wheat. In transplanted rice during *kharif* season treatments consisted of butachlor at 1.5 kg ai ha^{-1} at 3 days after transplanting (DAT), hand weeding (HW) at 30 and 60 DAT and weedy check (WD) and during the following *rabi* season each treatment of *kharif* was followed by isoproturon at 1.0 kg ai ha^{-1}at 35 days after

Table 1 : Details of experimental treatments

S. No	Rice			wheat		
	Treatment	Dose kg ha^{-1}	Stage of application *(DAT)	Treatment	Dose kg ha^{-1}	Stage of application **(DAS)
1.	Butachlor	1.5	3	Isoproturon	1.0	35
2.	Butachlor	1.5	3	Hand weeding	-	30 and 60
3.	Butachlor	1.5	3	Weedy	-	-
4.	Hand weeding	-	30 and 60	Isoproturon	1.0	35
5.	Hand weeding	-	30 and 60	Hand weeding	-	30 and 60
6.	Hand weeding	-	30 and 60	Weedy	-	-
7.	Weedy	-	-	Isoproturon	1.0	35
8.	Weedy	-	-	Hand weeding	-	30 and 60
9.	Weedy	-	-	Weedy	-	-

* DAT = Days after transplanting ** DAS = Days after sowing

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sowing (DAS), hand weeding (HW) at 30 and 60 DAS and weedy check (WD) were used (Table 1). Nine treatments were laid out in randomized block design with three replications. In *kharif* rice cv. Narendra 359 was transplanted on July 2, 04 and July 2, 05. In *rabi* season wheat cv.PBW 343 was sown on Nov.24, 03 and Dec.2, 04 with a row spacing of 20 cm for both the crops.

RESULTS AND DISCUSSION

Major weed species were *Echinochloa* spp., *Caesulia axillaris* and *Cyprus difformis* during *kharif* and *Phalaris minor*, *Chenopodium album* and *Polypogon monspeliensis* during *rabi* season. In *kharif* plots kept weedy in rice and wheat both, weedy in rice and isoproturon applied in wheat, weedy in rice and hand weeded in wheat had significantly higher total weed population in rice at 60 days stage in year 2005. Total weed density in Buta-HW and Buta-Weedy was significantly higher than HW-Weedy treatment. In *rabi* all plots kept weedy in rice and wheat, total weed population increased up to 60 days. Total weed population was highest in Weedy-Weedy treatment during both the years. Plots kept weedy in wheat and butachlor treated in rice, Weedy in wheat and hand weeded in rice recorded higher total weed population (Table 2).

In *Kharif* significantly lower grain yields during 2004 and 2005 were recorded in Weedy-HW and Weedy-Iso treatments, respectively. All the plots kept weedy in rice followed by isoproturon, and hand weeding or weedy in succeeding crop of wheat recorded lower grain yield than the plots treated with butachlor or hand weeded in rice except plots having treatments Buta-HW and Buta-Weedy (Table 3). Similar observations regarding effect of weedy conditions on various yield attributing characters and grain yield of transplanted rice have also been reported by Singh *et al.* (1999) and Singh (2003).

During 2004 highest grain yield of rice (7384 kg ha^{-1}) was recorded in HW-Weedy which was significantly

Table 2 :Total weeds density as influenced by different herbicide treatments at 60days stage

Treatments	Rice		Wheat	
	2004	2005	2003-04	2004-05
Buta-Iso	2.34(10.0)*	2.29(9.0)	4.42(82.0)	4.32(75.0)
Buta-HW	2.77(15.0)	2.54(12.0)	3.76(43.0)	3.94(51.0)
Buta-WD	2.39(10.0)	2.29(9.0)	5.67(290.0)	5.63(280.0)
HW- Iso	1.79(5.0)	1.06(2.0)	4.37(78.0)	4.21(67.0)
HW-HW	1.61(5.0)	1.75(5.0)	3.71(41.0)	3.97(53.0)
HW-WD	1.61(4.0)	1.93(6.0)	5.69(300.0)	5.64(281.0)
WD- Iso	3.87(47.0)	3.78(43.0)	4.35(77.0)	4.19(65.0)
WD-HW	4.02(59.6)	3.79(43.3)	3.80(45.0)	3.86(47.0)
WD-WD	4.10(59.6)	3.90(49.0)	5.72(308.0)	5.69(296.3)
LSD(P=0.05)	0.54	0.42	0.33	0.22

*Original values in parenthesis

Table 3 :Grain yield (kg ha^{-1}) of rice and wheat as influenced by different treatments

Treatments	Rice		Wheat	
	2004	2005	2003-04	2004-05
Buta- Iso	6713	6691	5303	3634
Buta-HW	6481	6134	4331	3958
Buta-WD	6614	6435	2870	2477
HW- Iso	6666	6157	4792	4190
HW-HW	6898	6713	5370	4144
HW-WD	7384	6019	2523	2824
WD- Iso	6620	4514	4977	4144
WD-HW	6250	4537	4329	4051
WD-WD	6512	4606	2245	2245
LSD(P=0.05)	475	1102	1068	1310

Buta=Butachlor, Iso=Isoproturon, HW=Hand weeding, WD=Weedy

higher than all other treatments while during the following year HW-HW produced highest grain yield (6713 kg ha^{-1}) and it was *at par* with all the treatments having butachlor or hand weeding in rice.

In *rabi* season highest grain yields during 2003-04 and 2004-05 were recorded with HW-HW (5370 kg ha^{-1}) and HW-Iso (4190 kg ha^{-1}), respectively and these treatments were *at par* with all the treatments having isoproturon or hand weeding in wheat. All the treatments involving isoproturon or hand weeding in wheat produced higher number of spikes than the treatments kept weedy in wheat except Buta-HW in 2003-04. The reduction in grain yields in weedy plots of wheat was associated with lower number of spike m^{-2} and number of grains $spike^{-1}$ (Table 3). The reduction in these yield contributing characters was due to heavy crop- weed competition in these plots as evident by higher nutrient uptake by weeds, and less by the crop, reduced number of shoots m^{-2} and less crop dry matter production. Loss in wheat grain yield due to uncontrolled weeds have been reported to be 22.5 per cent by Prasad,(1985) in *Kumaun* hills at Almora (Uttaranchal) and 66 per cent by Singh, (2003) at Pantnagar (Uttaranchal).

Based on above discussion in rice-wheat cropping system it may be concluded that continuous use of butachlor and isoproturon for weed control in rice-wheat system during the last 13 years did not reduce the weed control efficiency of butachlor, however, efficiency of isoproturon was reduced slightly over the years but these herbicides are still providing satisfactory weed control. The crop productivity was not affected over the years due to continuous use of butachlor and isoproturon.

REFERENCES

Prasad, K. (1985). Efficacy of post-emergence weedicides applied at different stages for control annual weeds of irrigated wheat under mid-Himalayan conditions. *Pesticides*. **19 (6):** 20-22.

Singh, P. (2003). Studies on the use of herbicide and organic matter in rice-wheat cropping system. Thesis Ph.D. G.P.B.U.A.&T., Pantnagar, U.S. Nagar. pp58.

Singh, G., Singh, R.K., Singh, V.P., Nayak, R. and Singh, R.S. (1999). Weed management in transplanted rice under rainfed, lowland situation. *Indian J. Agron*., **44 (4):** 728- 732

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