SHORT COMMUNICATION

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Efficacy of bensulfuron methyl plus pretilachlor for controlling weeds in transplanted rice

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ABSTRACT

Field experiment was conducted at Agricultural Research Station, Gangavathi, Karnataka during the wet season of 2006 and 2007 to assess the comparative performance of Bensulfuron methyl plus Pretilachlor combination against the recommended Butachlor application in controlling weeds in transplanted rice. The results revealed that pre-emergence application of Bensulfuron methyl 0.6% plus Pretilachlor 6.0% G @ 75+750 g ha^{-1}, five days after transplanting gave effective control of sedges, grasses and broad leaf weeds. The combination product was found to be non-toxic to rice crop and resulted in higher mean grain yield (6.06 t ha $^{-1}$), net returns (₹ 57624 ha^{-1}) and benefit cost ratio(3.48) than the recommended herbicide Butachlor.

Key words: *Bensulfuron methyl , Pretilachlor, Pre-emergence herbicide*

The weed flora of rice under transplanted condition is very much diverse and consists of sedges, grasses and broad leaf weeds causing yield reduction up to 76 per cent (Singh *et al* 2004). Herbicides like Pretilachlor applied alone is more effective against grasses, but less effective against sedges. While bensulfuron methyl is found to be more effective against sedges than other weeds. On the other hand, combination products consisting of two or more herbicides have greater activity on diverse weed flora due to differential mode of action and have become popular in recent years. In the present study the combination product of bensulfuron methyl 0.6% plus pretilachlor 6.0% G was evaluated for its efficacy in controlling rice weeds against the individual application of herbicides as well as the recommended butachlor.

Field experiment was conducted during the rainy seasons of 2006 and 2007 at the Agricultural Research Station, Gangavati, Karnataka. The soil of the experimental site was medium deep black clay in texture, neutral to alkaline in reaction (*p*H 8.2 to 8.4) and low in electrical conductivity(0.50 to 0.76dS/m). The soil was low in alkaline $KMnO_4$-N (230 kg ha^{-1}), medium in Olsen's-P_2O_5(30.8 kg ha^{-1}) and high in NH_4OAc extractable K_2O (522 kg ha^{-1}) in the surface 0-20cm depth. The treatments consisted of pre-emergence application of bensulfuron methyl 0.6% plus pretilaclor 6.0%G (BSM+PTL) @ 52.5 +525 g ha^{-1}, BSM+PTL @ 60+600 g ha^{-1}, BSM+PTL @75+750 g ha^{-1}, Pretilaclor 50EC @600 ml ha^{-1} and Bensulfuron methyl 60%DF @ 60g ha^{-1} were compared with pre-emergent Butaclor 5%G @ 1000 g ha^{-1}. The experiment was laid out in randomized block design and replicated thrice.

Thirty days old seedlings of rice, c.v.BPT-5204 were transplanted at a spacing of 20cm x10cm with 3-4 seedlings hill^{-1} on August 5th and August 4th during 2006 and 2007, respectively. In the case of bensulfuron methyl 0.6% plus pretilaclor 6.0%G (BSM+PTL) @ 52.5 +525 g ha^{-1}, BSM+PTL @ 60+600 g ha^{-1}, BSM+PTL @75+750 g ha^{-1} and Butaclor 5%G @ 1000 g ha^{-1} the granules were broadcasted in the field 5 days after transplanting. While in Pretilaclor 50EC @600 ml ha^{-1} and Bensulfuron methyl 60%DF @ 60g ha^{-1} the herbicides were sprayed 5 days after transplanting (DAT) using knapsack sprayer with flat fan nozzle with a spray volume of 500 l ha^{-1}. The crop was fertilized @ 150:75:75 kg, N,P_2O_5 and K_2O ha^{-1}. Need based plant protection measures were taken up.

Visual phyto-toxicity on crop was scored at 3,5,7 and 10 DAT based on the rating 0(no injury, normal),

1(slight stunting, discoloration), 2 (some stand loss), 3 (injury more pronounced but not persistent), 4 (moderate injury recovery possible), 5(injury more persistent recovery doubtful), 6(severe injury no recovery possible), 7(severe injury stand loss), 8(almost destroyed), 9(very few plants alive) and 10(complete destruction). Weed samples were collected from one square meter quadrant at 60 DAT, oven dried and weight recorded. Observations on grain yield and yield parameters were recorded and statistically analysed and the economics was worked.

The weed flora of experimental field consisted of *Cyperus* iria and *Cyperus* difformis among the sedges, *Echinocloa colona* and *Panicum repense* among grasses and *Ludwigia parviflora* and *Marselia quadrifolia* among broad leaf weeds. In the weedy check, broad leaf weeds were predominant (79.1%) followed by sedges (17.2%) and grasses accounted for 3.7% of total weed population.

Weed population was significantly higher in the weedy check (Table1). In contrast, the hand weeding check recorded significantly lower population of weeds. Similarly, pre-emergence application of BSM 0.6%+PTL 6.0% G @ 75 +750 g ha^{-1} gave complete control of sedges and significantly reduced the population of grasses, broadleaf weeds and the total weed population at 60DAT, as compared to either Pretilachlor or Bensulfuron methyl alone and remained on par with hand weeding.

Weed dry weight was lowest in the hand weeding (2.44 g m^{-2}) and highest in the weedy check(8.42 g m^{-2}). Among the herbicides pre-em. application of BSM+PTL @ 75+750 g ha^{-1} gave complete control of sedges as observed by zero growth of sedges. Similarly, the treatment recorded significantly lowest dry weight of grasses, broad leaf weeds and total weed dry weight (Table1) and was significantly superior to pre.em. Butachlor check and individual application of either Pretilaclor or Bensulfuron methyl alone and the performance was comparable with hand weeding. The treatment recorded a mean weed control efficiency of 87.84% against 92.29% in the case of hand weeding. Earlier Sanjoy Saha (2006) and Ramphool punia *et al* (2007) reported

Table1. Effect of herbicides on density and dry weight of weeds in transplanted rice (Pooled data of two seasons)

Treatments	Dose (g ha^{-1})	Weed density (No.m^2) 60 DAT				Weed dry weight (g m^2) 60 DAT				Mean WCE(%)
		Sedges	Grasses	BLW	Total	Sedges	Grasses	BLW	Total	
BSM+PTL	52.5+525	0.71 (0.00)	1.68 (2.33)	1.82 (2.84)	2.38 (5.17)	0.71 (0.00)	4.53 (20.03)	0.85 (0.22)	4.57 (20.25)	71.07
BSM+PTL	60+600	1.15 (0.83)	1.63 (2.17)	1.15 (0.83)	1.87 (3.83)	0.78 (0.12)	3.63 (12.70)	0.78 (0.12)	3.64 (12.94)	81.87
BSM+PTL	75+750	0.71 (0.00)	1.35 (1.33)	1.00 (0.50)	1.78 (1.83)	0.71 (0.00)	2.99 (8.52)	0.74 (0.05)	3.00 (8.57)	87.84
PTL	600	1.15 (0.83)	1.63 (2.17)	2.42 (5.33)	2.97 (8.33)	0.78 (0.12)	4.88 (23.35)	1.23 (1.02)	4.99 (24.47)	65.24
BSM	60	1.07 (0.67)	1.62 (2.17)	1.16 (0.84)	2.04 (3.68)	1.00 (0.50)	4.11 (16.88)	0.82 (0.17)	4.18 (17.55)	75.82
Butachlor	1000	1.96 (3.34)	1.62 (2.17)	1.87 (3.00)	3.00 (8.51)	1.18 (0.92)	4.57 (20.42)	1.41 (0.50)	4.83 (22.84)	67.58
Hand weeding		1.00 (0.50)	1.22 (1.00)	1.21 (1.00)	1.73 (2.50)	1.58 (2.00)	1.90 (3.10)	0.91 (0.33)	2.44 (5.43)	92.29
Weedy check		4.10 (16.33)	2.00 (3.50)	8.72 (75.50)	9.78 (95.33)	3.46 (11.50)	5.43 (29.00)	5.52 (29.92)	8.42 (70.42)	
SEm		0.05	0.08	0.08	0.08	0.05	0.12	0.03	0.11	
CD(5%)		0.15	0.24	0.26	0.25	0.16	0.36	0.09	0.34	

BSM: Bensulfuron methyl, PTL: Pretilachlor, BLW: Broad leaf weeds, WCE: Weed control efficiency
Figures in parenthesis indicate original values which were transformed to $\sqrt{x} + 0.5$

better performance of trisulfuron plus pretilachlor combination in controlling weeds and increasing the grain yield in transplanted rice.

The phyto toxicity symptoms on rice at three days after transplanting (DAT) (Table2) varied from normal or no injury(o scoring) in the case of hand weeding/unweeded control to slight discoloration at leaf tips (2.3 scoring) in the case of pre.em Butachlor at 1000 g ha^{-1}. BSM+PTL at all combinations recorded very low scoring of 1.3 to 1.7 with visual symptoms of slight chlorosis at leaf tips. However, the symptoms did not persist longer and crop resumed normal growth after 10 days after treatment imposition.

The economics of weed control revealed that maximum mean net realization was recorded under pre.em application of BSM+PTL @ 75+750 g ha^{-1}(₹. 57624 ha^{-1}) followed by hand weeding (₹. 55852 ha^{-1}) and BSM+PTL @ 60+600 g ha^{-1} (₹. 54508 ha^{-1}). Similarly mean benefit cost ratio was higher with pre.em BSM+PTL @ 75+750 g ha^{-1}(3.48) followed by BSM alone (3.45) but was lower in the case of hand weeding (3.24).

The study over the two years clearly indicated that pre.em application of BSM 0.6%+PTL6.0% G @ 75+750 g ha^{-1} was very effective in reducing the population and biomass of all categories of weeds in transplanted rice and resulted in higher grain yield and net realization and can be safely used for transplanted rice.

Table 2. Effect of herbicides on phytotoxicity, grain yield and economics in transplanted rice

Treatments	Dose (g ha^{-1})	Phytotoxicity ratings (0-10 scale)				Grain yield (t ha^{-1})				Mean NR (₹ ha^{-1})	Mean BCR
		3 DAS	6DAS	9DAS	12DAS	2006	2007	Mean	Panicles m^2		
BSM+PTL	52.5+525	1.3	1.0	0.7	0.0	4.89	6.12	5.51	420	50767	3.24
BSM+PTL	60+600	1.3	1.3	1.0	0.0	5.27	6.32	5.80	428	54508	3.39
BSM+PTL	75+750	1.7	1.7	1.0	0.0	5.58	6.55	6.06	459	57624	3.48
BSM+PTL	600	1.7	1.7	1.0	0.0	5.00	6.37	5.69	444	53363	3.39
BSM+PTL	60	1.7	1.7	1.0	0.0	5.07	6.37	5.72	444	54105	3.45
Butachlor	1000	2.3	2.0	1.3	0.0	4.85	6.20	5.52	405	51468	3.31
Hand weeding		0.00	0.00	0.00	0.0	5.43	6.69	6.06	437	55852	3.24
Weedy check		0.00	0.00	0.00	0.0	3.58	5.48	4.53	351	39207	2.84
CD(5%)						0.65	0.34	0.32	31.5	4160	0.18

BSM: Bensulfuron methyl, PTL: Pretilachlor, NR: Net Returns BCR: Benefit cost ratio

Cost of paddy grain: ₹. 1300 q^{-1} Cost of BSM 0.6%+PTL 6.0% G: ₹ 125 kg^{-1}, Cost of Butachlor : ₹ 200 l^{-1}

Pre-em application of BSM+PTL @ 75+750 g ha^{-1} recorded significantly higher rice grain yield during both years(5.58 and 6.55 t ha^{-1} during 2006 and 2007 respectively) and in the mean data (6.06 t ha^{-1}) than weedy check and pre-em application of Butachlor. However, it remained on par with hand weeding and pre.em application of BSM+PTL @ 60+600 g ha^{-1}.The mean grain yield also revealed the superiority of BSM+PTL @ 75+750 g ha^{-1} over the individual application of either BSM or PTL. The effective control of all types of weeds in the initial stages of crop growth due to pre.em application of BSM+PTL @75+750 g ha^{-1} created weed free environment that lead to better growth of rice as observed by significantly more number of panicles per square meter that had contributed to higher grain yield in these treatment.

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