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Efficacy of Orthosulfamuron Against Weeds in Transplanted Rice (*Oryza Sativa* L.)

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ABSTRACT

A field experiment was conducted at Agricultural College Farm, Bapatla during *kharif* 2013 to study the efficacy of orthosulfamuron against weeds in transplanted rice at different doses and times of application.Results of the experiment revealed that orthosulfamuron@120g/ ha pre-emergence as SMA at 3-5 DAT *fb* orthosulfamuron@120g /ha as post-emergence at 25-30 DAT (T_{11}) was found to be effective and economical in managing weeds in rice grown under transplanted conditions without any crop injury as an alternative to manual weeding and it was on par with other sequential treatments and also with hand weeding.

Key words : Orthosulfamuron, Sequential application,Transplanted rice.

Rice (*Oryzasativa*.L) is the most important and extensively grown food crop in India. Among several factors responsible for low productivity of rice crop, weed competition is one of the most important. Transplanted rice faces diverse type of weed flora, consisting of grasses, broad-leaved weeds and sedges. Depending on the intensity of weed infestation, yield losses in transplanted rice may vary from 29 to 63 percent (Nalini *et al.,* 2012). Although many herbicides are available in the market as an alternative to manual weeding which is costly and time taking for controlling weeds in transplanted rice, most of them are pre-emergence herbicides, with high dose, persistent, narrow spectrum, and more pollutant (Vanaja, 2011). Weeds emerging later in the season are escaping from the treatment of pre-emergence herbicides and are not controlled effectively. Therefore, it is essential to develop and evaluate new and alternate herbicides to widen application window and weed control spectrum.

Orthosulfamuron is a new herbicide that belongs to sulfonylurea group reported to control grasses, broadleaved weeds and sedges with flexibility in time of application (Sindhu *et al.,* 2007). As the evaluation of new herbicides is a continuous process under local conditions and in order to provide wider options to the farmers for broad spectrum control of weeds and time of application without any injury to crop plants, the present experiment was undertaken.

MATERIAL AND METHODS

An experiment was conducted at Agricultural College Farm, Bapatla during *kharif* 2013. The soil of the experimental field was sandy clay loam in texture with pH of 7.1. The soil is low in organic carbon (0.33%), available nitrogen (186kgha^{-1}), available phosphorus (30kgha^{-1}) and high in available potassium (314kgha^{-1}). A rainfall of 1084.6 mm was received during crop growth period in 62 rainy days. The experiment was laid out in a randomized block design with eleven treatments (Table 1) and replicated thrice. The recommended does of 160kg N, 60kg $P_2O_5$and 40kg K_2O/ha was applied through urea ,single superphosphate and muriate of potash, respectively. Entire quantity of phosphorus and potassium and one third of the N were applied at the time of final land preparation .At active tillering stage one third of the N was applied through urea. The remaining one third of the N was applied at panicle initiation stage. Twenty eight days old rice seedlings of Cv.NLR-145(Swarnamukhi) were transplanted keeping two seedlings per hill by adopting a spacing of25x15cm. The pre-emergence herbicides were applied at 3 DAT (Days After Transplanting) as Sand Mix Application (SMA) and the early post emergence application were applied at 20 DAT and

Table 1. Weed density (no/m^2) and weed dry weight (g/m^2) under different treatments in transplanted rice.

Treatments	Weed density (no./m^2)						Weed dry weight (g/m^2)					
	Grasses at		Sedges at		Broad leaved weeds at		Grasses at		Sedges at		Broad leaved weeds at	
	60 DAT	Harvest	60 DAT	Harvest	60 DAT	Harvest	60 DAT	Harvest	60 DAT	Harvest	60 DAT	Harvest
T_1- weedy check	7.18	8.07	7.96	6.75	8.76	13.30	3.81	4.13	4.45	3.83	3.25	3.84
	(51.6)	(66.3)	(63.6)	(46.0)	(78.0)	(180.6)	(14.2)	(16.7)	(19.5)	(14.2)	(10.6)	(14.4)
T_2-H.W @ 20&40 DAT	2.67	2.91	4.51	2.03	4.43	4.91	0.84	1.63	1.38	1.16	1.21	1.46
	(6.6)	(8.6)	(21.3)	(3.6)	(19.3)	(24.0)	(0.2)	(2.4)	(1.5)	(0.9)	(1.0)	(1.7)
T_3-Oxadiagryl 100g as	3.86	4.72	4.62	2.34	4.59	5.14	1.07	1.88	1.48	1.27	1.35	1.55
SMA *fb* 2,4-D@0.8 kg ha^{-1}	(14.6)	(23.0)	(21.3)	(5.3)	(22.6)	(27.3)	(0.6)	(3.13)	(1.8)	(1.1)	(1.3)	(2.0)
T_4-Orthosulfamuron @80g	5.10	6.23	6.99	5.78	6.97	8.08	1.73	2.73	2.01	1.74	2.37	2.36
ha^{-1} as SMA at 3-5 DAT	(27.3)	(39.3)	(49.3)	(33.3)	(48.3)	(66.0)	(2.6)	(7.0)	(3.6)	(2.5)	(5.1)	(5.1)
T_5- Orthosulfamuron	4.88	5.97	7.14	5.70	6.86	7.98	1.58	2.67	1.91	1.56	2.17	2.20
@120g ha^{-1}as SMA at 3-5 DAT	(24.0)	(36.0)	(51.3)	(32.6)	(47.0)	(65.0)	(2.1)	(6.6)	(2.3)	(2.0)	(4.2)	(4.4)
T_6- Orthosulfamuron	5.86	6.55	7.31	5.90	7.11	8.22	1.82	2.85	2.13	1.90	2.47	2.43
@80g ha^{-1} at 20 DAT	(340)	(42.6)	(53.3)	(34.6)	(50.3)	(68.6)	(2.9)	(7.6)	(4.0)	(3.3)	(5.6)	(5.4)
T_7- Orthosulfamuron	5.58	6.01	7.00	5.86	6.81	7.96	1.67	2.66	1.97	1.72	2.13	2.33
@120g ha^{-1} at 20 DAT	(32.6)	(36.0)	(48.6)	(34.1)	(46.3)	(66.3)	(2.5)	(6.7)	(3.5)	(2.7)	(4.0)	(4.9)
T_8-T_4 *fb* T_6 at 25-30 DAT	3.32	4.19	5.09	2.65	4.99	5.42	0.95	1.96	1.36	1.13	1.47	1.64
	(10.6)	(17.3)	(26.3)	(6.6)	(25.0)	(29.3)	(0.4)	(3.5)	(1.3)	(0.8)	(1.7)	(2.2)
T_9-T_4 *fb* T_7 at 25-30 DAT	3.17	4.39	4.73	2.18	4.52	5.28	0.91	1.80	1.32	0.94	1.06	1.44
	(9.6)	(19.3)	(24.0)	(4.3)	(20.0)	(28.0)	(0.3)	(2..9)	(1.4)	(0.4)	(0.7)	(1.6)
T_{10}-T_5 *fb* T_6 at 25-30 DAT	2.85	3.59	4.08	2.03	4.43	5.11	0.84	1.76	1.15	0.84	0.94	1.29
	(8.0)	(12.6)	(19.0)	(3.6)	(19.6)	(26.6)	(0.2)	(2.6)	(0.8)	(0.2)	(0.5)	(1.3)
T_{11}-T_5 *fb* T_7 at 25-30 DAT	2.67	3.03	3.85	1.95	4.09	4.86	0.82	1.61	1.00	0.80	0.89	1.19
	(6.6)	(8.6)	(14.6)	(3.3)	(17.6)	(24.6)	(0.2)	(2.1)	(0.5)	(0.1)	(0.3)	(0.9)
LSD (P=0.05)	1.51	1.73	1.73	1.19	1.68	2.42	0.5	0.65	0.62	0.49	0.62	0.51

The data are transformed to $\sqrt{x+0.5}$. The figures in parenthesis are original values.

Table 2. Crop growth, weed index and weed control efficiency under different treatments in transplanted rice.

Treatments	Plant height (cm)	Productive tillers/m^2	Grains/ panicle	1000 grain weight (g)	Grain yield (kg/ha)	Straw yield (kg/ha)	Harvest index (%)	Weed index (%)	WCE at harvest	B:C ratio
T_1- weedy check	83	195	115	19.3	3433	4833	41.2	39.7	-	1.24
T_2-H.W @ 20&40 DAT	101	248	163	19.6	5433	6433	45.7	4.6	65.7	1.15
T_3-Oxadiagryl 100g as SMA *fb* 2,4-D@0.8 kg ha^{-1}	100	236	154	19.6	5133	5933	46.7	9.9	61.4	1.84
T_4-Orthosulfamuron @80g ha^{-1} as SMA at 3-5 DAT	91	217	140	19.6	4100	5100	44.5	28.0	42.4	1.42
T_5- Orthosulfamuron @120g ha^{-1}as SMA at 3-5 DAT	92	221	145	19.6	4266	5266	44.6	25.1	45.4	1.44
T_6- Orthosulfamuron @80g ha^{-1} at 20 DAT	91	198	140	19.6	4066	5000	44.8	28.6	39.1	1.38
T_7- Orthosulfamuron @120g ha^{-1} at 20 DAT	91	202	143	19.6	4133	5200	44.7	27.4	43.5	1.36
T_8-T_4 *fb* T_6 at 25-30 DAT	98	229	145	19.6	5233	6100	46.1	8.1	61.2	1.83
T_9-T_4 *fb* T_7 at 25-30 DAT	99	240	146	19.7	5366	6200	46.2	5.8	66.1	1.82
T_{10}-T_5 *fb* T_6 at 25-30 DAT	100	249	156	19.7	5466	6300	46.4	4.0	68.6	1.87
T_{11}-T_5 *fb* T_7 at 25-30 DAT	102	258	163	19.7	5700	6466	46.7	-	71.3	1.91
LSD (P=0.05)	10	34	24.5	NS	834	1148	NS		9.3	

post emergence application were applied at 30 DAT through knap-sack sprayer using a spray volume of 500 L ha^{-1}.The data on weed density and dry weight were recorded at 60 DAT and harvest and were subjected to square root x+0.5 transformation before statistical analysis to normalize their distribution (Panse and Sukhatme,1978).The growth and yield attributes were recorded at the time of maturity. Economics of different treatments were calculated taking into account of the prevailing market prices of inputs and output.

RESULTS AND DISCUSSION

The dominant weed flora of experimental plot were *Echinochloa colonum, Cynodon dactylon, Echinochloa crusgalli* among grasses, *Cyperus difformis, Fimbristylis miliacea*, *Cyperus rotundus,* among sedges and *Eclipta alba, Ammannia baccifera and Ludwigia parviflora* among broad leaved weeds.

The density and dry weight of weeds at 60 DAT and harvest was significantly reduced under the different treatments of orthosulfamuron than weedy check (Table 1). Among different weed control treatments,orthosulfamuron@120g/ha pre-emergence as SMA at 3-5 DAT *fb* orthosulfamuron@120g /ha as post-emergence at 25-30 DAT (T_{11}) was found significantly superior in reducing the grasses, sedges and broad-leaved weed density and dry weight of dominated weed flora both at 60 DAT and harvest stages. However, it was comparable with other sequential treatments and also with hand weeding. Reduced weed growth in sequential application of orthosulfamuron might be due its high efficacy and broad spectrum control of all groups of weeds. The results are in agreement with the findings of Subrata *et al.(*2005).

Among the herbicide treatments,number of productive tillers/m^2 (258), grains per panicle (163) and the highest grain yield (5700 kg/ ha) was obtained with orthosulfamuron@120g/ hapre-emergence as SMA at 3-5 DAT *fb* orthosulfamuron@120g /ha as post-emergence at 25-30 DAT (T_{11})and it was at par to other sequential treatments, T_{10}, T_9, T_8,$T_3$and also with hand weeding(5433 kg/ ha) with weed control efficiency(71.3%)(Table2). The minimum grain yield and straw yield was observed in weedy check with an yield loss of 39.7% and 25.5% , respectively as compared to T_{11}.An increase in yield of 66.0% over weedy check was observed in case of T_{11} treatment followed by other sequential treatments of T_{10} and $T_9$with 59.2% to 49.5% increase in yield ,respectively.The increased grain yield might be due to cumulative effect of lower weed density , weed dry weight and better weed control efficiency . Further, improvement in yield attributes like productive tillers, no. of filled grains per panicle might have culminated in increasing the grain yield. Straw yield also followed almost similar trend to that of grain yield. These findings are in agreement with that of reported bySindhu *et al.* (2007).

Due to higher cost of cultivation hand weeding recorded the lowest B:C ratio(1.24). However, the treatment orthosulfamuron@120gha^{-1} pre-emergence as SMA at 3-5 DAT *fb* orthosulfamuron@120g/ha as post-emergence at 25-30 DAT (T_{11}) recorded the highest B: C ratio (1.91).

Overall, the study revealed that orthosulfamuron@120g/ ha pre-emergence as SMA at 3-5 DAT *fb* orthosulfamuron@120g /ha as post-emergence at 25-30 DAT(T_{11}) was found effective and economical in managing weeds in rice grown under transplanted conditions without any crop injury as an alternative to manual weeding.

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