

EFFECT OF HERBICIDES ON WEED CONTROL AND YIELD OF WET SEEDED RICE (*ORYZA SATIVA* L.)

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ABSTRACT

To study effect of herbicides on weed control and yield of wet seeded rice which involves three pre-emergent herbicides viz., butachlor, anilophos and oxyflurofen applied as alone and each these followed by two post emergent herbicides 2, 4- sodium salt, bispyribac sodium and one hand weeding at 25 days. The results revealed that sequential application of butachlor and anilophos fb bispyribac sodium, 2, 4-D sodium salt and one hand weeding at 25 days was recorded significantly lower weed population and dry weight of weeds viz., monocots, dicots and sedges in equal manner which ultimately indicates that higher weed control efficiency over rest of the treatments except weed free check and hand weeding thrice. further, grain and straw yield of rice was followed the same trend as well influenced by yield parameters like number of panicles per sq.m and number of seeds/panicle ultimately sequential application butachlor and anilophos fb 2, 4-D sodium salt and bispyribac sodium and one hand weeding at 25 DAS resulted higher grain yield and profitable rice production.

INTRODUCTION

Rice (*oryza sativa* L.) is an important staple crop in India, where it is grown by manual transplanting of seedlings into puddled soil. Recently, however there is trend toward direct seeded rice because of labour and water scarcity. In DSR (dry seeded rice and wet seeded rice) weeds are the main biological constraint. As the weeds and rice emerge simultaneously in DSR, the proper time and method of weed control remains a complex phenomenon (Khaliq and Matloob, 2011). Herbicides are used to manage weeds in DSR systems but the use of herbicides alone does not provide effective and sustainable weed control. However, use of herbicides pre-emergent alone is vital tool for effective and cost efficient weed control in DSR which encounters weed competition from the day of germination. Several pre-emergence herbicides applied either alone or supplemented with hand weeding have been reported to provide fairly adequate weed suppression in DSR (Pellerin and Webster, 2004; Baloch et al., 2005). However, limited application time window (0-5 DAS), a critical water regime and toxicity to main crop are associated challenges. In this scenario, post-emergence herbicides appear to offer alternate possibility.

MATERIALS AND METHODS

A field experiment was conducted during *kharif* 2011 at Agricultural Research Station, Malnoor. Experiment involves 15 treatments includes three pre-emergent herbicides butachlor (50 EC @ 1.25kg ha⁻¹), anilophos (30 EC @ 600g ha⁻¹) and oxyflurofen (23.5 EC @ 200g ha⁻¹) applied alone as

pre-emergent at 8 DAS and each these followed by two post emergent herbicides 2, 4-D sodium salt and bipyribac sodium and one hand weeding at 25 DAS which were compared with hand weeding thrice, weed free check and unweeded check which was laid out under randomized block design with three replication. The field was puddled and leveled as done for transplanting and then pre-germinated seeds of BPT-5204 were broadcasted uniformly. The data on weed population and dry matter were recorded at 60 DAS with quadrat measuring 50 × 50 cm and expressed number /0.25 m² and g/0.25 m², respectively. The data was subjected to square root transformation using the formula $\sqrt{X+0.5}$ and statistical analysis was done as suggested by Gomez and Gomez (1984). Weed control efficiency by Mani et al. (1973) and weed index by Gill and Kumar (1969) were calculated as per the standard formulae.

$$WCE(\%) = \frac{DMC - DMT}{DMC} \times 100$$

Where,

WCE = weed control efficiency (%)

DMC = dry matter of weeds in unweeded plot (g/0.25 m²)

DMT = dry matter of weeds in treated plot (g/0.25 m²)

$$\text{Weed index (\%)} = \frac{x - y}{x} \times 100$$

Where,

x = Grain yield of weed free plot

y = Grain yield from the treatment plot for which the weed

index has to be worked out

RESULTS AND DISCUSSION

Effect on weeds

Among the treatments, sequential application of butachlor fb bispyribac sodium or 2, 4-D sodium salt or hand weeding at 25 DAS recorded significantly the lower weed population and dry weight of weeds viz., monocots, dicot and sedge weeds which were on par with hand weeding thrice. Further, results indicated that sequential application of herbicides were equally more effective in controlling monocots, dicot and sedges weed species coupled with lower dry weight of weeds resulting in higher weed control efficiency and lower weed index. Similar results were reported by Bhanu Rekha *et al.* (2003) and Satyanarayana *et al.* (1997). However, the higher weed population and dry weight of weeds was recorded with the application of oxyfluorfen alone followed by anilophos alone and butachlor alone over the sequential application of

herbicides, indicating the superiority of sequential application of herbicides. Unweeded check recorded the significantly the higher weed population and dry weight of weeds which results in lower weed control efficiency and higher weed index over rest of the treatments.

Effect on growth and yield of rice

Grain yield differed significantly due to different weed control treatments. In the present investigation hand weeding thrice recorded significantly higher seed grain (5072 kg/ha) over unweeded check (1864 kg/ha). The increase in yield was to the tune of 63.2%. The highest grain yield of rice in hand weeding thrice was mainly due to minimum crop-weed competition throughout the crop growth period, thus enabling the crop for maximum utilization of nutrients, moisture, light and space which influenced by yield components. On the other hand, the lowest grain yield (1864 kg ha⁻¹) was noticed in weedy check as a consequence of greatest removal of nutrients and moisture by weeds and severe crop weed

Table 1: Effect of weed control treatments on weed population, dry weight of weeds (60 DAS), weed control efficiency and weed index in wet seeded rice

Treatments	Weed population (No./0.25 m ²)			Weed dry weight (g/0.25 m ²)			WCE (%)	WI (%)
	Monocots	Dicots	Sedges	Monocots	Dicots	Sedges		
T ₁	4.40 (18.33)*	3.91 (14.83)	4.69 (21.50)	1.76 (2.58)	1.55 (1.92)	1.95 (3.30)	47.09	27.21
T ₂	4.53 (20.00)	4.00 (15.50)	4.78 (22.33)	1.77 (2.62)	1.56 (1.94)	1.98 (3.42)	45.22	28.80
T ₃	4.74 (22.00)	4.18 (17.00)	4.95 (24.00)	1.98 (3.45)	1.79 (2.71)	2.24 (4.58)	31.15	52.90
T ₄	2.29 (4.77)	2.11 (4.00)	2.65 (6.51)	1.16 (0.84)	1.07 (0.64)	1.29 (1.15)	81.82	5.93
T ₅	2.65 (6.55)	2.54 (6.00)	2.97 (8.36)	1.19 (0.93)	1.10 (0.71)	1.31 (1.23)	80.18	10.36
T ₆	3.85 (14.33)	3.45 (11.42)	4.06 (16.00)	1.52 (1.83)	1.38 (1.40)	1.71 (2.42)	61.79	42.79
T ₇	2.12 (4.00)	1.87 (3.03)	2.54 (5.93)	1.14 (0.81)	1.05 (0.61)	1.27 (1.12)	82.54	4.57
T ₈	2.83 (7.50)	2.68 (6.67)	3.08 (9.00)	1.22 (0.98)	1.12 (0.75)	1.33 (1.26)	79.33	10.97
T ₉	3.56 (12.17)	3.31 (10.45)	3.85 (14.33)	1.49 (1.73)	1.35 (1.32)	1.63 (2.17)	62.20	39.02
T ₁₀	2.51 (5.83)	2.34 (5.00)	2.80 (7.37)	1.17 (0.88)	1.08 (0.68)	1.30 (1.19)	81.08	8.31
T ₁₁	2.97 (8.33)	2.82 (7.50)	3.24 (10.00)	1.23 (1.02)	1.14 (0.80)	1.34 (1.30)	78.52	11.91
T ₁₂	3.73 (13.42)	3.37 (11.06)	3.94 (15.00)	1.52 (1.81)	1.37 (1.38)	1.68 (2.33)	62.00	41.80
T ₁₃	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	100.00	0.76
T ₁₄	6.33 (40.33)	5.77 (33.00)	7.34 (54.33)	2.38 (5.30)	2.19 (4.34)	2.73 (7.10)	0.00	63.45
T ₁₅	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	100.00	0.00
SEm ±	0.17	0.15	0.20	0.06	0.06	0.07	4.51	3.29
CD (p = 0.05)	0.50	0.44	0.58	0.19	0.17	0.21	13.01	9.54

*The value in parenthesis indicates original values

Table 2: Effect of weed control treatments on yield parameters and yield of wet seeded rice

Treatments	No of panicles per sq. m	No. of grains per panicle	Test weight (g)	Grain yield (kg/ha)	Straw yield (kg/ha)
T ₁	322	80.00	16.60	3710	4195
T ₂	305	78.00	16.55	3630	4110
T ₃	238	70.00	15.50	2397	2828
T ₄	398	93.00	17.05	4801	5227
T ₅	384	87.00	16.97	4566	4998
T ₆	243	71.67	16.20	2820	3309
T ₇	400	95.00	17.10	4871	5269
T ₈	380	84.33	16.90	4536	4995
T ₉	250	76.33	16.33	3072	3552
T ₁₀	390	91.50	17.00	4671	5109
T ₁₁	378	82.67	16.83	4488	4979
T ₁₂	245	73.50	16.28	2947	3317
T ₁₃	414	98.33	17.17	5072	5449
T ₁₄	182	57.17	15.00	1864	2273
T ₁₅	419	102.33	17.23	5108	5460
SEm ±	16	3.64	0.66	171	189
CD (p = 0.05)	47	10.95	1.93	497	549

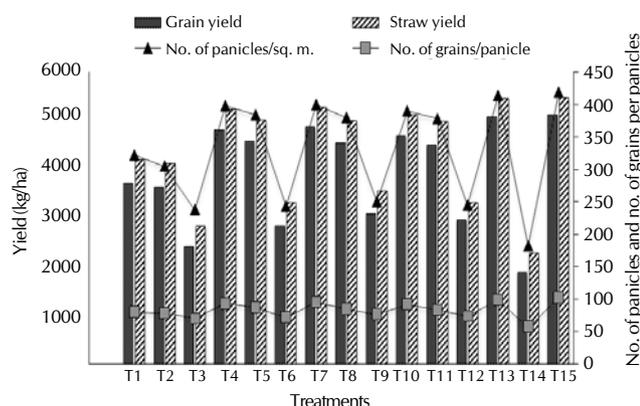


Figure 1: Effect of weed control treatments on number of panicles per sq.m, number of grains per panicles, grain yield and straw yield of wet seeded rice

competition resulting in poor source and sink development with poor yield components and higher weed index (63.45%) similar results were reported by Hussain *et al.* (2008).

Among different weed control treatments significantly the higher grain yield was recorded in sequential application of butachlor fb bispyribac sodium or 2,4-D sodium salt or hand weeding recorded the increased grain yield to the tune of 61.73%, 61.17% and 60.09%, respectively, which were on par with hand weeding thrice. Increase in grain yield may be attributed to improved yield components viz., panicles per sq.m, grains per panicle and test weight. These treatments recorded on par data with respect to panicles per sq.m, grains per panicles and test weight with hand weeding thrice, which attributed to on par grain yield. Unweeded check recorded 56% less panicles per sq.m over hand weeding thrice, thus reduced in grain yield significantly. The above results could be corroborated with the findings of Mahajan *et al.* (2009) Swapankumar Maity and Mukherjee (2009)

It can be concluded that under scarcity of labour sequential application of butachlor fb 2, 4-D sodium salt, bispyribac sodium and hand weeding at 25 DAS resulted in higher grain yield, net returns and BC ratio besides giving effective weed control.

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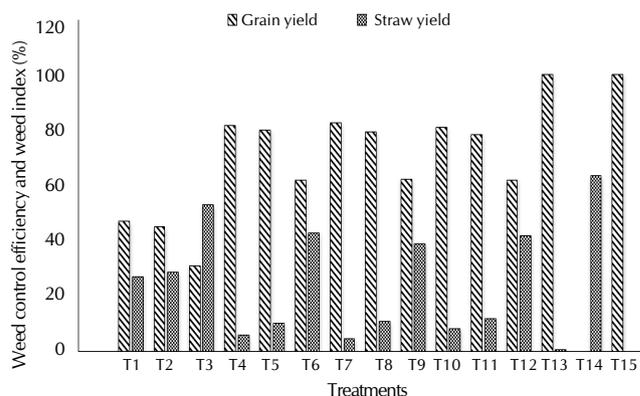


Figure 2: Effect of weed control treatments on weed control efficiency and weed index of wet seeded rice

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