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Effect of Weed Management and Cultivars on Boro Rice (*Oryza sativa* L.) and Weeds

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ABSTRACT

Effect of weed management and boro rice cultivars on growth and yield of boro rice and weeds was evaluated for three seasons. Cultivar 'Gautam' recorded the highest grain yield of 4.12 t ha^{-1} and cultivar 'Prabhat' proved better in minimizing the weed infestation. Application of butachlor at 1.5 kg pre-emergence+2,4-D at 0.5 kg ha^{-1} post-emergence produced grain yield similar to hand weeding twice (30 and 50 DAT).

INTRODUCTION

Boro rice cultivation pertains to rice cultivation in water-logged lowlying or medium lands with irrigation during November to May. It is grown on about 0.03 m ha area in eastern Uttar Pradesh and its rapid expansion in recent years established that about 0.5 m ha area can be exploited for boro rice cultivation particularly in low productive deepwater and other lowland/midland rice areas (Singh, 2003; Singh and Singh, 2003). Traditionally, tall, weak-stemmed and awned cultivars with low grain yields and poor quality are cultivated resulting in low productivity. Weeds also pose problems and if not properly controlled cause severe reduction in boro rice yield. Even a marginal increase in the productivity of boro rice in eastern U. P. will significantly increase the total rice production in the State. Therefore, the present study was carried out to elicit the effect of weed management and cultivars on growth and yield of boro rice.

MATERIALS AND METHODS

The field experiment was conducted consecutively for three years at Agricultural Research Farm, Department of Agronomy, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi during dry (boro) season of 1997-98, 1998-99 and 1999-2000 in lowlying areas where water was accumulated in the field. The soil was sandy clay loam with 7.2 pH and moderately higher in fertility status. The treatment consisted of six rice cultivars (Gautam, Prabhat, CN-88-C-1-271, RAU-504-48-4, Pusa-2-21 and Rasi) and three weed management (weedy check, hand weeding twice at 30 and 50 days after transplanting (DAT) and butachlor at 1.5 kg fb 2,4-D at 0.5 kg ha^{-1}). Butachlor was applied 4 DAT and 2,4-D at 25 DAT as follow up treatment. The experiment was laid out in split plot design with three replications, keeping cultivars in main-plots and weed management treatments in sub-plots. Seeds were sown in nursery in the first week of November in low-lying field near the source of irrigation and transplanting was done in first fortnight of February. Fertilizer at 120, 60 and 60 kg N, P_2O_5 and K_2O ha^{-1} was used. Need-based irrigation was given to the crop. The crop was harvested in the month of May.

RESULTS AND DISCUSSION

Effect on Weeds

The weed flora observed in the experimental plots consisted of : *Echinochloa colona* (L.) Link,

Paspalum disticum L., *Cynodon dactylon* (L.) Pers., *Cyperus rotundus* L., *Sirpus erectus* L., *Marsilea minuta* L., *Eclipta alba* (L.) Hassak, *Ipomoea aquatica* Forsk, *Pistia stratiotes* L., *Nymphea nouchali* Burn and *lsoetes lacustris* L. were the predominant one contributing major part of the weed flora.

Rice cultivars had significant influence on weed population and dry matter accumulation. Total weed population and dry weight of weeds were maximum in cultivar RAU 504-48-4 due to slower plant growth at initial stage. Whereas minimum weed density and dry weight were obtained due to cultivar Prabhat on account of its more vigorous growth, canopy coverage and droopy lower leaves as compared to other cultivars (Table 1). Vigorous crop growth and droopy lower leaves were reported for curtailing the sunlight and checking weed growth (Pillai, 1977; Thakur *et al.*, 1995; Singh and Singh 2001). Significantly higher weed density and dry weight were recorded in unweeded check as compared to manual and herbicidal treatments.

Table 1. Effect of cultivars and weed management on crop and weeds (Pooled data of three seasons)

Treatment	Total weed population (No. m^{-2}) 60 DAT	Weed dry matter production (g m^{-2}) 60 DAT	Plant height (cm)	Tillers $hill^{-1}$	Panicles $hill^{-1}$	Grains $panicle^{-1}$	Test weight (g)	Grain yield (kg ha^{-1})
Cultivars								
Gautam	6.66 (58)*	18.7	74.6	19	11	89.2	21.4	4120
Prabhat	6.03 (37)	17.3	65.4	16	9	83.9	19.3	3600
CN-88-C-1-271	7.36 (67)	20.3	80.3	17	9	82.5	19.2	3500
RAU-504-48-4	7.72 (72)	25.5	72.0	16	10	62.6	18.2	3360
Pusa-2-21	7.52 (64)	23.7	76.5	16	10	77.8	17.6	3530
Rasi	7.30 (71)	20.2	77.5	17	8	83.1	20.2	3690
LSD (P=0.05)	1.4	8.0	7.8	2	2	12.5	0.5	680
Weed management								
Weedy check	9.33 (88)	28.8	73.4	16	7	72.5	18.9	2960
Two hand weedings	4.97 (36)	15.4	75.4	18	9	84.6	20.5	4020
Butachlor+2, 4-D	5.60 (36)	17.4	76.0	18	9	83.4	19.9	3850
LSD (P=0.05)	0.8	5.3	2.6	1	1	8.7	0.3	540

*Population figures are transformed to $\sqrt{X+0.5}$. Figures in parentheses are original.
DAT–Days after transplanting, fb–followed by.

Minimum weed density was recorded by hand weeding twice at 30 and 50 DAT which was statistically at par with butachlor at 1.5 kg fb 2, 4-D at 0.5 kg ha^{-1} which had maximum weed control efficiency.

Effect on Crop

The cultivar Gautam produced the highest grain yield on account of maximum number of panicles $hill^{-1}$, grains $panicle^{-1}$ and test weight (Table 1). This might be due to more efficient utilization of applied resources either due to genetic potential of the cultivar or due to more weed-free environment, resulting in higher grain yield than the other tested cultivars. All the weed control treatments significantly produced higher crop growth, yield attributes and yield than weedy check. Hand weeding twice was the most effective in minimizing the weed competition and maximizing the yield. However, it was at par with application of butachlor+2,4-D. These treatments recorded significantly higher growth, yield attributes and yield due to higher weed control efficiency. The interaction effect was not found significant in respect to these parameters.

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