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Effect of Planting Pattern and Weed Control on Boro Rice

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ABSTRACT

Normal planting (20 x 10 cm) produced significantly higher grain yield (4.18 t ha^{-1}) than wider (25 x 10 cm), closer (15 x 10 cm) and random/haphazard planting patterns. Two hand weedings (25 and 50 DAT) gave significantly higher grain yield (4.15 t ha^{-1}) than anilofos at 0.4 kg ha^{-1} pre-em.+2, 4-D at 0.5 kg ha^{-1} post-em., anilofos at 0.4+2, 4-D at 0.5 kg ha^{-1} pre-em. and anilofos at 0.4+2, 4-D at 0.5 kg ha^{-1} pre-em. followed by 1 HW at 30 DAT and was found most appropriate treatment, when judged in terms of reducing total weed population and dry matter and increasing boro rice grain yield.

INTRODUCTION

Boro rice, winter season photo-insensitive transplanted in December-January to April-May depending on supplementary irrigations, is often cultivated under conditions where farmers are not able to take any other **rabi** season crop (DRR, 1998). It is grown on about 0.03 m ha area in eastern Uttar Pradesh. 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 and Singh, 2003). However, to exploit the production potentiality of boro rice, there is an urgent need of improved agro-technology, therefore, the present study was carried out to elicit the effect of planting patterns and weed control on growth and yield of boro rice.

MATERIALS AND METHODS

The field experiment was conducted consecutively for three seasons at Agricultural Research Farm, Department of Agronomy, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, during seasons (boro) of 2001-02, 2002-03 and 2003-04 in low-lying areas where water was accumulated in the field. The soil was sandy clay loam with 7.3 pH and low in available nitrogen, medium in available phosphorus and potassium. The treatments consisted of four planting patterns random/haphazard (50 hills m^{-2}), normal (20 x 10 cm), wider (25 x 10 cm) and closer (15 x 10 cm) spacing and five weed control treatments [weedy, two hand weedings at 25 and 50 days after transplanting, anilofos at 0.5 kg ha^{-1} pre-emergence (pre-em.)+2, 4-D at 0.5 kg ha^{-1} post-emergence (post-em.) at 25 DAT, anilofos at 0.4+2, 4-D at 0.5 kg ha^{-1} pre-em., anilofos at 0.4+2, 4-D at 0.5 kg ha^{-1} pre-em. followed by (fb) 1 HW at 30 DAT]. Ethyl ester form of 2, 4-D was used. Herbicides were sprayed at spray volume of 600 l water ha^{-1} by a knapsack sprayer with flat fan nozzle. The experiment was laid out in split plot design with three replications, assigning planting patterns in main plots and weed control treatments in sub-plots. Rice cv. Gautam was sown in nursery during first week of November and transplanting (two seedlings/hill) 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. Half nitrogen and full amount of phosphorus and potassium was applied at transplanting. Rest amount of nitrogen was top dressed in two equal splits at tillering and panicle initiation stages. Need-based irrigation was given to the crop. The crop was harvested in the month of May.

Table 1. Effect of treatments on population (No. m^{-2}) and dry weight (g m^{-2}) of weeds in boro rice (Pooled data of three seasons)

Treatment	Population of major weed species 60 DAT				Total weed population 60 DAT	Dry weight of weeds 60 DAT
	M. minuta	*E. colona*	*Cyperus* spp.	*P. distichum*		
Planting patterns						
Random/haphazard	4.51 (21)	3.99 (14)	3.30 (10)	2.67 (7)	7.31 (59)	11.5
Normal (20 x 10 cm)	4.16 (17)	3.14 (9)	2.88 (8)	2.55 (6)	7.37 (60)	11.1
Wider (25 x 10 cm)	4.63 (24)	4.23 (17)	3.17 (9)	2.83 (8)	7.52 (58)	11.3
Closer (15 x 10 cm)	3.81 (14)	2.75 (6)	2.43 (6)	1.67 (4)	6.03 (38)	11.2
LSD (P= 0.05)	0.65	0.75	0.56	0.41	1.10	0.20
Weed management						
Weedy	4.79 (35)	5.06 (32)	4.16 (18)	3.76 (12)	9.58 (101)	15.3
Two HW	3.10 (10)	1.77 (4)	1.66 (4)	1.51 (3)	4.17 (28)	4.2
Anilofos pre-em.+2, 4-D post-em.	3.17 (9)	2.80 (7)	2.47 (6)	2.49 (5)	6.01 (48)	7.1
Anilofos +2, 4-D (pre-em.)	3.11 (12)	2.96 (8)	2.66 (7)	2.77 (7)	5.61 (41)	7.3
Anilofos+2, 4-D (pre-em.)+1 HW	2.91 (8)	2.04 (6)	2.37 (5)	1.92 (4)	5.46 (34)	5.9
LSD (P= 0.05)	0.56	0.39	0.40	0.38	1.20	0.35

Population figures were transformed to $\sqrt{x+0.5}$. Figures in parentheses are original.

RESULTS AND DISCUSSION

Effect on Weeds

Main weed flora of the experimental field consisted of *Marsilea minuta* L. (31.1%), *Echinochloa colona* (L.) Link (20.8%), *Cyperus* spp. (14.5%) and *Paspalum distichum* L. (11.8%). The other weeds observed were *Cynodon dactylon* (L.) Pers., *Scirpus erectus* L., *Eclipta alba* (L.) Hassk, *Ipomoea aquatica* Forsk, *Nymphea nouchali* Burm, *Isoetes lacustris* L., *Digitaria ciliaris* (Retz.) Koel., *Eleusine indica* (L.) Gaertn and *Pistia stratiotes* L.

Planting patterns had significant influence on weed population and dry matter accumulation (Table 1). Closer planting recorded the minimum weed population and dry matter accumulation of weeds. Normal planting recorded significantly lower dry weight of weeds over random/haphazard planting although it was at par with wider (25 x 10 cm) planting. Among the weed control practices, all the treatments caused reduction in the density of different weed species and dry weight of weeds in comparison to weedy check. The minimum weed population and weed dry weight were recorded by two hand weedings followed by anilofos at 0.4+2, 4-D at 0.5 kg ha^{-1} pre-em. fb 1 HW at 30 DAT, anilofos at 0.5 kg ha^{-1} pre-em.+2, 4-D at 0.5 kg ha^{-1} post-em. and anilofos at 0.4+2, 4-D at 0.5 kg ha^{-1} pre-em. (Table 1).

Effect on Crop

Normal planting recorded the maximum grain yield (4.18 t ha^{-1}) which was significantly higher than wider (4.05 t ha^{-1}) and closer (3.96 t ha^{-1}) spacing. Haphazard planting recorded the lowest yield (3.77 t ha^{-1}). The higher grain yield under normal planting pattern was on account of higher number of panicles m^{-2} and grains $panicle^{-1}$ (Table 2). This might be due to efficient utilization of space, water, nutrients and less interplant competition. Though weed population and dry weight in closer spacing were lowest yet this treatment recorded relatively lower yield than normal and wider planting patterns due to higher inter- and intra-plant competitions (Singh and Singh, 2003). Straw yield was also significantly higher in

Table 2. Effect of treatments on yield attributes and yield of boro rice (Pooled data of three seasons)

Treatment	Panicles (No. m^{-2})	Panicle length (cm)	Grains $panicle^{-1}$	Test weight (g)	Grain yield ($t\ ha^{-1}$)	Straw yield ($t\ ha^{-1}$)
Planting patterns						
Random/haphazard	354	20.9	83.3	20.6	3.77	5.34
Normal (20 x 10 cm)	379	21.1	93.2	20.5	4.18	6.04
Wider (25 x 10 cm)	367	20.9	92.6	22.7	4.05	5.38
Closer (15 x 10 cm)	351	20.6	89.0	20.1	3.96	5.64
LSD (P=0.05)	012	00.3	6.78	0.09	0.07	0.50
Weed management						
Weedy	342	20.5	80.4	19.5	3.63	5.45
Two HW	382	20.9	95.9	20.6	4.15	6.67
Anilofos pre-em.+2, 4-D post-em.	370	21.2	93.1	20.1	4.02	5.57
Anilofos+2, 4-D (pre-em.)	357	20.8	89.2	20.4	3.96	5.46
Anilofos+2, 4-D (pre-em.) +1 HW	364	20.6	90.4	20.1	4.06	5.86
LSD (P=0.05)	006	00.2	5.72	0.12	0.08	0.40

normal planting. All the weed control treatments produced significantly higher number of panicles m^{-2}, grains $panicle^{-1}$, test weight and grain yield over the weedy check. Highest grain yield was obtained with two hand weedings and it was followed by anilofos at 0.4+2, 4-D at 0.5 kg ha^{-1} pre-em. fb 1 HW 30 DAT, anilofos at 0.4 kg ha^{-1} pre-em.+2, 4-D at 0.5 kg ha^{-1} post-em. and anilofos at 0.4+2, 4-D at 0.5 kg ha^{-1} pre-em.

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