

Effect of spacing on rice (*Oryza sativa*) varieties of various duration under irrigated condition

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ABSTRACT

A field experiment was conducted during the summer season of 1996, 1997 and 1998 at Chiplima (Orissa), to standardize the planting density of rice (*Oryza sativa* L.) varieties of various duration groups. The grain yield of rice under closer spacing was significantly superior to that under wider spacing, mainly owing to higher panicles/m² with the former. Varieties up to 100 days duration gave best result with 10 cm × 10 cm spacing, while varieties up to 135 days duration gave the best result with 15 cm × 10 cm spacing. Variety 'Lalat' (125 days) recorded the highest grain yield. 'Sankar' (80 days) recorded the lowest grain yield. There was no significant difference between 'Birupa' (135 days) and 'Parijat' (100 days) in grain yield.

Key words : Spacing, Rice varieties, Duration groups, Yield attributes, Yield

Rice is the principal crop during summer in Hirakud command area in Western Orissa. However, the yield potential is not fully exploited mainly due to inadequate plant population. Plant density plays an important role in yield maximization of rice (Paraye *et al.*, 1996; Patel, 1999; Siddiqui *et al.*, 1999). But most of the researches are confined to rainy-season rice. Therefore this study was conducted to find out the optimum plant spacing to obtain maximum yield from the rice varieties of various durations during summer season.

MATERIALS AND METHODS

A field experiment was conducted at Chiplima during summer season of 1996, 1997 and 1998. The soil was clay loam in texture, having 256, 16 and 192 kg/ha available N, P₂O₅ and K₂O respectively. Seedlings of 30 days age were transplanted in the second week of February. The treatments comprising 3 spacings (10 cm × 10 cm, 15 cm × 10 cm and 20 cm × 10 cm) and 4 varieties of various durations ('Sankar', 80 days; 'Parijat', 100 days; 'Lalat', 125 days; and 'Birupa', 135 days)

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were laid out in randomized block design with 3 replications. An uniform dose of 80, 40 and 0 kg/ha N, P_2O_5 and K_2O , respectively, was applied to the crop. Full dose of P and K and 25% of N was applied at transplanting as basal dose and 50% N was applied 30 days after transplanting and remaining 25% N at the panicle-initiation stage. Irrigation was provided as and when required. Timely plant-protection measures were taken.

RESULTS AND DISCUSSION

Variety

Varietal variation was significant in yield attributes and yield of summer rice (Table 1). A significantly higher grain yield was recorded with 'Lalat' (125 days). This could be attributed to higher number of panicles/m², panicle length, panicle weight, 1,000-grain weight and grains/panicle. 'Birupa' (135 days) recorded the second highest grain yield, which was comparable

with that of 'Parijat' (100 days). 'Sankar' (80 days) recorded the lowest grain yield. Highest straw yield was recorded with 'Lalat', followed by 'Birupa' (Table 1). Kanungo and Roul (1994) also reported yield variation in rice varieties of various duration.

Spacing

Yield attributes such as effective tillers/hill, panicles/m² and grains/panicle and grain and straw yields were significantly influenced by the different plant spacings (Table 1). Effective tillers/hill increased significantly with wider spacing, while panicles/m² decreased with wider spacing. Closer spacing of 10 cm × 10 cm recorded significantly lower number of grains/panicle than the other 2 wider spacings. The yield attributes such as panicle length, panicle weight and 1,000-grain weight were not influenced by spacing (Table 1).

Significantly higher grain yield was

Table 1. Effect of spacing and variety on yield attributes and yield of rice during summer (mean data of 3 years)

Treatment	Effective tillers/hill	Panicles m ²	Panicle length (cm)	Panicle weight (g)	Grains/panicle	1,000-grain weight	Yield (kg/ha)	
							Grain	Straw
Variety								
'Sankar'	7.00	429	19.73	3.05	96	20.26	4,784	5,860
'Parijat'	7.02	481	20.52	3.21	102	22.40	5,485	6,024
'Lalat'	8.13	568	22.80	3.40	115	23.05	6,324	6,850
'Birupa'	7.86	550	22.55	3.32	107	23.03	5,616	6,732
CD (P=0.05)	0.32	28	1.03	0.15	6	1.20	232	256
Spacing								
10 cm × 10 cm	6.15	615	21.06	3.18	98	22.17	5,734	6,528
15 cm × 10 cm	7.41	496	21.62	3.30	107	22.20	5,532	6,382
20 cm × 10 cm	8.95	448	21.50	3.27	109	22.20	5,391	6,190
CD (P=0.05)	0.27	23	NS	NS	5	NS	198	218

recorded with 10 cm × 10 cm spacing than the other 2 wider spacings. There was no significant difference between 15 cm × 10 cm and 20 cm × 10 cm spacings in grain yield (Table 1). The higher grain yield with closer spacing was owing to more panicles/m². Similar results were also reported by Wagh and Thorat (1987) and Gupta and Sharma (1991).

Closer spacing of 10 cm × 10 cm recorded significantly higher straw yield than the wider spacings (Table 1). The results con-

firm the findings of Siddiqui *et al.* (1999).

Interaction

Interaction effect of varieties and spacing was found significant on grain yield (Table 2). Closer planting of short-duration varieties, i.e. 'Sankar' and 'Parijat', at 10 cm × 10 cm gave the best result. But in case of other 2 medium-duration varieties, 'Lalat' and 'Birupa', there was no significant difference between 10 cm × 10 cm and 15 cm × 10 cm spacing. Spacing of 20 cm × 10 cm

Table 2. Interaction effect of spacing and variety on grain yield of rice during summer

Variety	Spacing					
	10 cm × 10 cm	15 cm × 10 cm	20 cm × 10 cm	Mean	CD (P=0.05)	
1996						
'Sankar'	5,228	4,925	4,745	4,966		
'Parijat'	5,880	5,600	5,580	5,687	Variety	260
'Lalat'	6,625	6,550	6,352	6,509	Spacing	220
'Birupa'	6,008	5,824	5,610	5,814	Interaction	438
Mean	5,935	5,725	5,572			
1997						
'Sankar'	4,910	4,542	4,436	4,629		
'Parijat'	5,594	5,225	5,172	5,330	Variety	226
'Lalat'	6,300	6,162	6,000	6,154	Spacing	193
'Birupa'	5,318	5,540	5,330	5,396	Interaction	378
Mean	5,531	5,367	5,235			
1998						
'Sankar'	5,033	4,678	4,560	4,757		
'Parijat'	5,719	5,340	5,253	5,437	Variety	240
'Lalat'	6,427	6,302	6,198	6,309	Spacing	250
'Birupa'	5,762	5,700	5,455	5,639	Interaction	402
Mean	5,735	5,505	5,367			
Pooled						
'Sankar'	5,057	4,715	4,580	4,784		
'Parijat'	5,731	5,388	5,335	5,485	Variety	232
'Lalat'	6,451	6,338	6,183	6,324	Spacing	198
'Birupa'	5,696	5,688	5,465	5,616	Interaction	390
Mean	5,734	5,532	5,391			

always gave lower yield for all duration group rice varieties.

Thus it may be concluded that the shorter-duration rice varieties up to 100 days transplanted at 10 cm $\times$ 10 cm spacing and varieties up to 135 days duration transplanted at 15 cm $\times$ 10 cm spacing recorded the maximum grain yield.

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