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Effect of planting seedlings and nitrogen on yield of rice (*Oryza sativa*)

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ABSTRACT

A field experiment was conducted during rainy season of 1986–1988 to study the individual and combined effects of number of planting seedlings/hill and different levels of N on yield of 'Subhadra' ('DR 92') rice (*Oryza sativa* L.). Planting 4 seedlings/hill significantly increased the plant height, length of panicle, grains/panicle and 1,000-seed weight than its higher and lower number of seedlings. The treatments also significantly increased the yield. Application of 80 kg N/ha and 4 seedlings/hill gave significantly highest yield (32.65 q/ha), followed by 40 kg N/ha and 4 seedlings/hill. On the basis of pooled data of 3 years, the yield response was 29 q/ha at the optimum dose rate of 40 kg N/ha.

The average rice (*Oryza sativa* L.) yield in Sikkim is less than 1 tonne/ha vis-a-vis all-India average of 1.6 tonnes/ha. Such low yield is associated with climatic factors. Maintenance of adequate plant density and application of required dose of inorganic fertilizers are the important factors needed for obtaining higher yield of rice. Further, rice cultivar 'Subhadra' gives significantly higher yield than others (Gupta and Rai, 1990). Therefore to evolve the suitable cultural practices for cultivation in the state, field trials were conducted.

MATERIALS AND METHODS

The field experiment was conducted during the rainy season from 1986 to 1988 at Tadong. Treatments included 3 levels of planting seedlings/hill (2, 4 and 6) and 4 levels of nitrogen (0, 40, 80 and 120 kg N/ha). Their combined effect was also studied. The treatments were tested in randomized block design in 3 replications. The soil was silty clay loam (give Taxonomic name of soil) having pH 5.8, rich in total nitrogen (0.0.69%), low in available phosphorus (7.5 to 9.3 kg P_2O_5/ha) and medium in available potassium (210–225 kg N/ha). Thirty-day old-seedlings of rice were transplanted as per treatments in the second week of July, while the crop was harvested in the first week of December during all the 3 years. A basal dose of 40 kg/ha each of P_2O_5 and K_2O was applied as single superphosphate and muriate of potash respectively along with N as per treatments. The spacing adopted was 15 cm x 10 cm.

RESULTS AND DISCUSSION

Effect of planting seedlings/hill

Plant height, length of panicle, grains/panicle and 1,000-grain weight varied significantly with number of seedlings/ha (Table 1). Planting of rice with 4 seedlings/hill gave significantly taller plant, higher length of panicle, more grains/panicle, 1,000-grain weight and grain yield than 2 or 6 seedlings/hill during all the 3 years.

Table 1. Yield and yield attributes of rice as affected by number of seedlings and level of nitrogen

Treatment	Yield (q/ha)			Biomass (tonnes/ ha)*	Plant height (cm)*	Tillers/ hill*	Length of panicles (cm)*	Grains/ panicle*	1,000-seed weight (g)*
	1986	1987	1988						
Seedlings/hill									
2	19.06	28.50	29.33	10.74	84.4	8.51	24.7	155	22.2
4	20.23	35.13	32.63	11.32	89.0	9.71	26.1	147	22.3
6	16.32	32.18	25.22	11.36	84.1	9.11	22.4	134	21.9
CD (P = 0.05)	2.55	3.32	2.22	NS	2.3	NS	3.1	12	0.2
N (kg/ha)									
0	16.30	26.46	26.26	8.64	83.3	8.84	22.5	131	22.5
40	19.66	35.04	30.70	11.20	83.8	8.67	23.2	147	23.5
80	21.87	35.56	32.26	11.87	87.8	8.94	26.1	152	21.6
120	16.31	30.68	27.02	12.69	85.4	9.99	22.9	151	20.9
CD (P = 0.05)	3.23	3.82	2.64	1.94	2.95	1.15	3.6	17	0.7

*Mean data of 3 years
NS, Not significant

The yield in 1987 and 1988 was higher than that in 1986. Owing to favourable distribution of rainfall during growth period in those years. The increase in yield with 4 seedlings/hill was 3.5-22.8% in 1986, 9.2–23.3% in 1987 and 11.3–20.4% in 1988 over the 2 and 6 seedlings/hill respectively. The mean increase in yield with this was 14.4% over 2 seedlings/hill and 23.5% over 6 seedlings/hill. Similar was the findings of Ramasamy *et al.* (1987).

Effect of N

Increasing levels of N from 0 to 80 kg/ha significantly increased the plant height, panicle length, grains/panicle, biomass production and grain yield in all the 3 years (Table 1). Application of 80 or 40 kg N/ha being at par significantly improved all these attributes compared with 120 kg N/ha as well as the control.

The grain yield increased correspondingly with the increasing level of N up to 80 kg/ha. However, significant increases in yields were observed only up to 40 kg N/ha in all the 3 seasons and in pooled data.

Table 2. Grain yield (q/ha) of rice as affected by number of seedling and levels of nitrogen (pooled data of 3 years)

N (kg/ha)	Seedlings/hill			Mean yield (q/ha)
	2	4	6	
0	22.31	25.38	21.34	23.01
40	27.08	31.20	27.12	28.47
80	28.90	32.65	28.14	29.90
120	24.23	28.08	18.37	23.56
Mean yield (q/ha)	25.63	29.33	23.74	26.23
CD (P = 0.05)				
Seedling number		0.79		
N levels		1.40		
Interaction		2.81		

The pooled results of the 3 years data showed that the nitrogen dose, for obtaining the highest grain yield (3.01 tonnes/ha) in 'Subhadra' was 67 kg/ha and the most profitable dose of N was 40 kg N/ha. The gross

return was Rs 22.50 and the net profit was Rs 5.80 for every rupee invested on nitrogen with optimum dose.

Effect of N x S interaction

The effect of interaction between nitrogen levels and planting seedling was highly significant (Table 2). Application of 80 kg N/ha and 4 seedlings/hill gave the highest yield of 32.65 q/ha.

REFERENCES

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