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Response of rice (*Oryza sativa*) genotypes to nitrogen level under transplanted condition in Kashmir Valley

AMARJIT S. BALI, M. SIDIQUE, B. A. GANAI, H. U. KHAN, K. N. SINGH AND A. S. BALI

Division of Agronomy, Sher-e-Kashmir University of Agricultural Sciences and Technology, Shalimar, Jammu and Kashmir 191 121

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ABSTRACT

A field experiment was conducted during the rainy season of 1987 and 1988 to study the performance of different genotypes of rice (*Oryza sativa* L.) under various levels of nitrogen. The grain yield of different varieties was found at par and increased on N application up to 120 kg/ha. Increase in growth and yield attributes with this dose increased the grain yield significantly. The increase in mean grain yield with 40, 80 and 120 kg N/ha from the control was 30.3, 50.4 and 62.2% respectively.

In Kashmir valley, average yield of rice (*Oryza sativa* L.) is very low. Nitrogen fertilization and suitable genotype are the important factors for successful production of rice. Development of new rice genotypes resistant to blast has led to their adoption by the farmers of the valley. As nitrogen requirement of the crop differs with varieties (Thakur, 1993), it is essential to work out optimum dose of N for exploiting the yield potential of newly evolved varieties. Therefore an experiment was conducted to assess the response of different rice genotypes to nitrogen levels in Kashmir valley.

MATERIALS AND METHODS

A field experiment was carried out during the rainy season (*kharif*) of 1987 and 1988 at Khudwani, Anantnag. The soil was clay loam in texture having available N, P and K 274, 17 and 132 kg/ha respectively, with pH 6.7. The treatments comprising 3 varieties ('SKAU 23', 'SKAU 27' and 'SKAU 5') and 4 levels of nitrogen (0, 40, 80 and 120 kg N/ha) were tried in randomized block design with 4 replications. The experimental site received total rainfall of 306.3 and 157.4 mm from transplanting to harvesting stage during respective cropping season. A basal dose of 45 kg P_2O_5 and 20 kg K_2O/ha along with half of N as per the treatments was applied at the puddling stage, through diammonium phosphate, muriate of potash and urea respectively. Thirty-day-old seedlings of the 3 genotypes were transplanted at 15 cm x 15 cm spacing in the first week of June during both the years. The crop was top-dressed at tillering and panicle-initiation stages, with the remaining quantity of N in 2 equal splits. Butachlor @ 1.5 kg ai/ha was applied 3 days after transplanting followed by 1 hand-weeding at tillering stage for effective control of the weeds. The continuous submergence of 5 cm ± 1 water depth was

Table 1. Straw and grain yields and yield-attributing characters of rice varieties as influenced by levels of nitrogen

Treatment	Panicles/m²		Grains/panicle		1,000-grain weight (g)		Grain yield (q/ha)			Straw yield (q/ha)	
	1987	1988	1987	1988	1987	1988	1987	1988	Pooled	1987	1988
Variety											
'SKAU 23'	337.4	339.6	74.7	79.8	23.6	23.5	57.8	56.7	57.3	73.6	74.8
'SKAU 27'	341.5	342.5	79.4	80.4	23.6	23.5	60.3	57.0	58.6	72.9	78.5
'SKAU 5'	339.6	341.0	79.0	82.1	23.5	23.5	58.3	55.2	56.7	70.1	79.0
CD (P=0.05)	NS	NS	3.7	NS	NS	NS	NS	NS	NS	NS	NS
N (kg/ha)											
0	256.3	253.1	65.9	67.7	23.0	22.9	44.4	40.4	42.4	54.2	63.3
40	331.1	339.5	72.6	76.8	23.6	23.5	56.7	53.9	55.3	67.6	73.2
80	372.1	374.7	82.5	85.6	23.9	23.8	54.6	62.8	63.7	80.4	82.1
120	395.8	396.7	89.7	92.7	24.0	23.09	69.4	68.1	68.7	88.1	90.2
CD (P=0.05)	7.5	14.5	4.4	3.1	0.22	0.15	3.9	3.3	2.5	5.3	4.9

kept in the crop up to flowering stage and thereafter alternate wetting and drying up to advance dough stage was followed. The crop was harvested at physiological maturity in the second week of September and grain yield was reported at 14% moisture basis. Different varieties were found resistant to blast.

RESULTS AND DISCUSSION

Grain and straw yields

The grain yield of the genotypes during both the years as well as in pooled data showed no significant variation. Similarly, straw yield of different varieties was found at par during both the years (Table 1).

Application of N had a marked effect on grain and straw yields (Table 1). An increase in N level from 0 to 120 kg/ha significantly increased the grain yield during both the years. The magnitude of superiority of mean grain yield with 120, 80 and 40 kg N/ha was 62.2, 50.4 and 30.3 % respectively over the control (Table 1). Straw yield also increased consistently with increase in N from 0 to 120 kg/ha. Higher yield with higher levels of N might be due to better N uptake, leading to greater dry-matter production and its translocation to the sink (Dalal and Dixit, 1987). Higher N levels might be also a reason for higher grain and straw yields. Thakur (1993) also reported similar results.

Growth and yield attributes

Among the different genotypes, 'SKAU 27' was significantly taller than 'SKAU 23' but was on a par with 'SKAU 5' (Table 2). During 1987, 'SKAU 27' gave significantly more number of grains than 'SKAU 23' but remained on a par with 'SKAU 5'. However, during 1988 all the genotypes

Table 2. Growth characters of various rice varieties as influenced by levels of nitrogen

Treatment	LAI at flowering		Plant height (cm)		Days to maturity	
	1987	1988	1987	1988	1987	1988
Variety						
'SKAU 23'	4.12	4.15	97.9	100.7	145.5	139.2
'SKAU 27	4.19	4.20	100.2	105.4	145.4	139.2
'SKAU 5'	4.13	4.16	98.4	103.1	144.9	140.1
CD (P = 0.05)	NS	NS	2.1	3.1		
N (kg/ha)						
0	3.43	3.47	88.0	90.4	142.3	136.4
40	3.75	4.81	94.3	99.5	144.7	138.6
80	4.43	4.42	102.8	108.3	146.3	140.6
120	4.90	4.98	11.3	114.1	147.7	142.3
CD (P = 0.05)	0.16	0.13	2.4	3.5		

LAE, Leaf-area index

produced same number of grains. Different genotypes did not register any significant difference in panicles/m^2, 1,000-grain weight and leaf-area index (Tables 1, 2). The different genotypes matured almost at the same time (Table 2).

Plant height, leaf-area index, panicles/m^2 and grains/panicle increased significantly with increase in N levels, but 1,000-grain weight increased significantly only up to 80 kg N/ha during both the years (Tables 1, 2). The increase in growth and yield attributes may be due to better availability of nutrients under higher levels of N. The results are in conformity with those of Pandey and Singh (1985) and Dalal and Dixit (1987). N @ 120 kg/ha delayed the maturity by 5–6 and 3–4 day over the control and 40 kg N/ha respectively during respective cropping seasons (Table 2).

Economics of N fertilization

The quadratic relationship between grain yield and N levels was found significant and the following quadratic equation was fitted with pooled data:

$$Y = 42.4 + 0.367\ N - 0.001235\ N^2$$
$$(R^2 = 0.99)$$

The economic dose of N was 128.5 kg/ha, yielding 69.2 q/ha of rough rice grain.

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