

Performance of summer rice (*Oryza sativa*) to varying levels of nitrogen

R. B. THAKUR

Department of Agronomy, Rajendra Agricultural University, Pusa, Bihar 848 125

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ABSTRACT

A field experiment was conducted during the summer seasons of 1987 and 1988 to evaluate the performance of 7 varieties of rice (*Oryza sativa* L.) in response to nitrogen levels. A marked increase in all the growth the yield-attributing characters was observed with increase in N levels. Among the varieties tested, 'IET 6148' showed superiority to other varieties in 1987 and it was similar to 'IET 3279', 'Saket 4', 'IET 6263' and IET 7617' in 1988, but showed superiority to 'IET 7613' only.

There is an ample scope for summer rice (*Oryza sativa* L.) in rice-growing tracts of north Bihar with the increasing irrigation facilities. Rice cultivars show considerable variation for growth characters and yield ability in different seasons. Nitrogen requirement of the crop differs with varieties and the growing seasons. Therefore, the present investigation was conducted to evaluate the differential response of pre-released varieties of rice to N levels, so that suitable varieties for summer season could be identified and its optimum dose could be worked out for calcareous soils of north Bihar.

MATERIALS AND METHODS

The field experiment was conducted in split-plot design during the summer seasons of 1987 and 1988 at Pusa. Treatments comprised 4 levels of N (0, 40, 80 and 120 kg/ha) in main plots and 7 varieties ('Saket 74', 'Pusa 33', 'IET 6148' and 'IET 3279' in

1987; and 'Saket 4', 'IET 3279', 'IET 7617', 'IET 7613' and 'IET 6263' in 1988) in subplots. The entire quantity of phosphorus as single superphosphate and potassium as muriate of potash @ 40 kg P_2O_5 and 20 kg K_2O /ha respectively were applied basal. Nitrogen was applied in the form of urea in 3 splits—half at puddling, one-fourth at active-tillering and the remaining one-fourth at panicle-initiation stage.

The soil was calcareous silt loam having total available N 0.07%, available P 35.4 kg/ha and available K 138.0 kg/ha, with pH 8.2. Seedlings of 30 days of rice varieties were transplanted at 15 cm × 15 cm spacing in both the years, and 15 days after transplanting 0.5% $ZnSO_4$ solution (5 kg $ZnSO_4$ + 2.5 kg slaked lime in 1,000 litres water/ha) was sprayed for correcting zinc deficiency.

The crop was harvested at physiological maturity and grain yield was recorded on 14% moisture basis.

Table 1. Growth and yield attributes and yield of rice varieties as influenced by different levels of nitrogen

Treatment	Final plant height (cm)		Effective tillers/m ²		Length of panicle (cm)		Grains/panicle		1,000-grain weight (g)		Yield (q/ha)			
											Grain		Straw	
	1987	1988	1987	1988	1987	1988	1987	1988	1987	1988	1987	1988	1987	1988
<i>N (kg/ha)</i>														
0	64.70	65.50	212.57	247.83	18.08	18.89	56.95	60.33	17.93	18.60	13.99	17.58	23.62	28.13
40	69.82	71.45	254.69	288.00	19.56	19.48	67.74	67.66	18.67	19.16	20.67	26.16	35.34	39.69
80	75.50	77.46	283.23	318.16	20.59	20.58	76.75	78.00	19.13	19.70	27.06	30.01	42.78	44.03
120	81.77	81.36	298.65	333.83	20.84	21.20	78.81	82.16	19.42	20.03	29.06	32.83	48.45	48.60
CD (P = 0.05)	2.77	4.06	11.64	14.17	0.63	0.96	0.94	3.93	0.36	0.48	2.27	1.02	2.60	2.94
<i>Variety</i>														
'Saket 4'	72.67	74.56	262.77	292.50	19.49	19.92	67.50	72.00	18.65	19.40	22.40	26.54	39.22	40.08
'Pusa 33'	72.06		259.38		19.40		67.00		18.60		22.04		38.73	
'IET 6148'	74.89	76.47	272.90	305.75	20.56	20.45	72.25	73.47	19.25	19.51	24.63	28.26	41.34	42.40
'IET 3279'	72.16	76.42	254.07	304.25	19.55	20.32	68.50	72.75	18.65	19.38	21.72	27.05	37.25	40.92
'IET 7617'		75.30		279.75		19.17		69.25		19.38		24.44		37.17
'IET 7613'		76.00		300.75		20.15		72.71		19.35		26.38		41.65
'IET 6263'		75.32		298.75		20.10		72.50		19.37		26.64		39.95
CD (P = 0.05)	NS	NS	12.42	14.18	0.97	0.73	3.20	3.95	NS	NS	1.55	2.91	2.92	3.03

RESULTS AND DISCUSSION

Effect of N

Increasing levels of N increased growth and yield attributes significantly in both the years (Table 1). Plant height, effective tillers/m² and grains/panicle increased significantly up to 120 kg N/ha, whereas length of panicle and 1,000-grain weight increased only up to 80 kg N/ha in both the years. This increase in plant height and yield-attributing characters may be due to better nutrition of plants. Pandey and Singh (1985), Dalal and Dixit (1987) and Thakur *et al.* (1988) also reported similar results.

Nitrogen had marked effect on yield. Grain and straw yields increased significantly at each successive level of N. During 1987 the grain yield was maximum under 120 kg N/ha which was statistically at par with 80 kg N/ha. Higher yield with higher level 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).

Effect of variety

'IET 6148' was the best in respect of

growth and yield-attributing characters. Plant height was the same in all the varieties, however 'IET 6148' recorded the highest height. In case of yield attributes (Table 1), 'IET 6148' produced significantly higher values than the other varieties, such as effective tillers/m², length of panicle and grains/panicle, and it was similar to 'IET 7679', 'IET 7613', 'IET 6263' and 'Saket 4' for length of panicle and grains/panicle in 1988 only. All the varieties were statistically alike for 1,000-grain weight. However, 'IET 6148' rice recorded the highest 1,000-grain weight among all the varieties.

Among the pre-released short-duration varieties, 'IET 6148' gave the maximum yield (grain and straw) and was significantly superior to rest of the varieties in 1987, whereas it was statistically similar to 'IET 3279', 'IET 6263', 'Saket 4' and 'IET 7613' only in 1988. The highest yield of 'IET 6148' was owing to more panicles/m², length of panicle, grains/panicle and 1,000-grain weight. However, panicles/m² and grains/panicle were mainly responsible for higher yield in 'IET 6148'. Dalal and Dixit (1987) also reported that number of panicles/m² was the main factor responsible for higher grain

Table 2. Interaction between levels of nitrogen and varieties on the yield of rice (q/ha) in 1987

Variety	N (kg/ha)			
	0	40	80	120
'Saket 4'	12.40	18.87	28.48	30.05
'Pusa 33'	14.33	20.50	25.21	29.12
'IET 6148'	15.01	23.10	29.27	31.12
'IET 3279'	13.94	20.41	25.29	27.23
				CD (P = 0.05)
Main treatment means at same levels of sub-treatment				3.11
Sub-treatment means to same levels of main treatments				3.90

yield among the yield-attributing characters. 'IET 7617' gave the lowest yield (Table 1), might be due to least panicles/m² and grains/panicle.

Interaction

Interactions between varieties and N levels for grain yield was significant in 1987 only (Table 2). All the varieties gave significantly higher yield at all the levels of N, however, it showed superiority to other varieties only at 80 kg N/ha. This indicated that 'IET 6148' followed by 'Saket 4' were the more suitable varieties for the calcareous

soil of north Bihar.

REFERENCES

- Dalal, P. K. and Dixit, L. 1987. Response of medium duration rice varieties (dwarf indica) to levels of nitrogen. *Indian Journal of Agronomy* 32 (3) : 286-287.
- Pandey, J. and Singh, R. P. 1985. Response of newly developed medium duration and high yielding rice genotypes to nitrogen. *Indian Journal of Agronomy* 30 (1) : 114-116.
- Thakur, R. B., Mishra, S. S. and Sharma, N. N. 1988. Effect of pesticides on N-use efficiency and growth dynamics in rice. *Indian Journal of Agronomy* 33 (2) : 181-185.