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Response of Dwarf Rice Varieties to Levels of Nitrogen

Z. G. Patel, C. L. Patel, R. B. Patel, A. G. Naik and I. G. Patel

Department of Agronomy, GAU, Navsari Campus, Navsari

ABSTRACT

A field experiment conducted at college farm, Gujarat Agricultural University, Navsari Campus, Navsari to study the effect of N rates on four varieties of rice revealed that application of only 80 kg N/ha and cultivation of GAUR-3 was the most economical combination as compared to 100 or 120 kg N/ha and Pusa. 33, IR-30 and IR-22 varieties under the agro-climatic condition of South Gujarat in *kharif* season.

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INTRODUCTION

Fertilizer is an effective but costly input in increasing the crop production. About 1/3 of total nitrogenous fertilizer consumed in the country goes to rice crop, however, the efficiency of applied 'N' to this crop is only 30-50 per cent and in many cases even less (Prasad *et al.*, 1970 and Prasad and De-Datta, 1978). The crop response to fertilizers varies not only with nature of the crop but also with its variety. The cultivation of dwarf, high yielding varieties is the first step in achieving higher fertilizer use efficiency, particularly in nitrogen.

Therefore, an attempt was made to assess response of few rice varieties to different levels of nitrogen under agro-climatic condition of South Gujarat.

MATERIAL AND METHODS

A field experiment was conducted during *kharif* seasons of 1980 and 1981 at the college farm, Gujarat Agricultural University, Navsari in split plot design with four replications. The three nitrogen leves viz., 80, 100 and 120 kg/ha were taken as main plot treatments while four varieties viz. GAUR-3, Pusa-33, IR-30 and IR-22 were taken as subplot treatments. The crop was transplanted at a distance of 20×15 cm with two seedings/hill in both the seasons. The nitrogen was applied in the form of ammonium sulphate in three splits i.e. 50% as basal, 25% at tillering stage and the remaining 25% at panicle initiation stage. A common dose of 50 kg P_2O_5/ha was given at the time of transplanting.

The soil was clayey in texture (59.60 per cent clay) with pH 7.6 and organic carbon 0.74 per cent. The available phosphorus was 17.30 kg/ha and available potash was 310.0 kg/ha.

RESULTS AND DISCUSSION

Effect of nitrogen :

The data presented in Table-1 indicated that there were no significant differences in grain yield due to the application of graded dose of nitrogen during both the years. However in pooled data,

TABLE 1

Grain yield of rice varieties as affected by levels of Nitrogen.

'N' levels	*Grain yield (kg/ha)*			*Straw yield (kg/ha)*		
(kg/ha)	*1980*	*1981*	*Mean*	*1980*	*1981*	*Mean*
80	3715	3434	3575	7081	6292	6687
100	4029	3536	3783	6794	6555	6675
120	4087	3874	3981	7525	7916	7721
S.Em. ±	125	112	83	152	557	289
C.D. (5%)	N.S.	N.S.	257	525	N.S.	890
C.V.%	13	12	13	9	32	23
Varieties						
GAUR–3	4406	4212	4309	7047	7854	7900
Pusa–33	3676	3504	3590	7084	6046	6565
IR–30	3780	3835	3808	7177	6175	6676
IR–22	3912	2907	3410	6325	7610	6968
S.Em. ±	107	119	81	263	285	196
C.D. (5%)	305	339	241	747	809	584
C.V. %	9	11	11	13	14	14

N.S. = Non-significant.

the effect was found to be significant. The maximum grain yield (3981 kg/ha) was recorded with an application of 120 kg N/ha, but it was statistically at par with 100 kg N/ha (3783 kg/ha). Though the lowest grain yield (3575 kg/ha) was recorded with an application of 80 kg N/ha, it was at par with 100 kg N/ha. Lenka and Behera (1967) and Mothuswamy *et al.* (1972) also recorded higher grain yield with increasing levels of nitrogen upto 120 kg/ha. The response per kg 'N' application was 10.8 and 10.4 kg of grain at 100 and 120 kg N/ha, respectively. Similar observation was also noticed by Singh and Paliwal (1980). The grain yield equation is $Y = 2525 + 14.62\ x - 0.021\ x^2$.

Significantly the highest (7525 and 7721 kg/ha) straw yields were recorded with the application of 120 kg N/ha during 1980 and in pooled data respectively. The effects of other two levels of N (80 and 100 kg N/ha) on straw yields were at par.

Effect of Varieties :

The grain as well as straw yields were significantly influenced by varieties. Significantly the highest (4406 and 4212 kg/ha) grain yields were obtained from variety GAUR–3 during 1980 and 1981, respectively. With respect to straw yield, variety IR-30 gave the maximum (7177 kg/ha) straw yield, but it remained at par with other varieties (i.e. GAUR-3 and Pusa-33) except IR-22 during 1980, while in 1981, variety GAUR-3 produced the highest (7854 kg/ha) straw yield and remained at par with IR-22. In pooled data, variety GAUR-3 gave significantly the highest (7900 kg/ha) straw yield, followed by IR-22, IR-30 and Pusa-33. The latter three varieties were also at par with each other.

Interaction effect :

The interaction effect of varieties and levels of nitrogen (Table-2) on grain yield was also significant. Application of 120 kg N/ha to variety GAUR-3 gave the highest grain yield (4631 kg/ha) as well as straw yield (9664 kg/ha). However, it was at par with the application of 120 kg N/ha to variety IR-30 and the application of 100 kg/ N/ha to variety GAUR -3.

The lowest grain yield (3273 kg/ha) was obtained by the application of 80 kg N/ha to Pusa-33.

TABLE 2

Interaction effect of nitrogen x varieties on yields of rice (kg/ha, pooled data).

Varieties / *'N' levels* (*kg/ha*)	*GAUR-3*		*Pusa-33*		*IR-30*		*IR-22*	
	Grain	*Straw*	*Grain*	*Straw*	*Grain*	*Straw*	*Grain*	*Straw*
80	4084	6468	3273	6792	3451	6424	3491	7062
100	4214	7569	3864	6349	3748	6736	3303	6045
120	4631	9664	3634	6553	4225	6868	3435	7796
			Grain		*Straw*			
	S.Em. ±		140		339			
	C.D. (5%)		418		1011			
	C.V.%		11		14			

Nitrogen economics :

It could be seen that the application of 120 kg N/ha gave the highest additional income of Rs. 453.90/ha, however, the net ICBR (Table-3) indicated that application of higher levels of nitrogen @100 and 120 kg N/ha were not economical to the farmers at the prevailing price of nitrogen as the corresponding values are not attractive. Mahapatra *et al.* (1974) also suggested that Net ICBR value should not be less than Rs. 1:2.5.

TABLE 3

Economics of nitrogen levels.

'N' levels (*kg/ha*)	*Mean yields* (*kg/ha*)		*Gross income* (*Rs/ha*)	*Additional income* (*Rs/ha*)	*Incremental cost of treatment* (*Rs/ha*)	*ICBR*	*Net ICBR*
	Grain	*Straw*					
80	3575	6687	6365.55	–	–	–	–
100	3783	6675	6675.75	310.20	180	1.72	0.72
120	3981	7721	7129.65	453.90	180	2.52	1.52

(I) Value of produce
(a) Rice grain Rs. 150/q
(b) Rice straw Rs. 15/q

(II) Cost of nitrogen Rs. 9.00/kg. including application cost.

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