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Nitrogen response of promising rice entries under rainfed shallow lowland of red and laterite zone of West Bengal, India

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Rice (*Oryza sativa* L.) is an important cereals crop and grown across the world. 'Rice is life': It is an important and prominent slogan since the International year of rice in 2004. Most of the peoples of the world depend on rice for their secured livelihood and a way of life. It is the staple food for more than 65 per cent of the people and provides employment and livelihood to 70 per cent of the Indians. There is a need to enhance the productivity of the rice to meet the growing demand under conditions of declining quantity and quality of land (Raju, 2013). Nitrogen is a key nutrient in promoting the plant growth and determining the yield level of rice. Recovery of applied nitrogen in rice is very low owing to various losses. Optimization of applied nitrogen at critical growth stages, coinciding with the period of efficient utilization is essential to meet the nitrogen requirement of crop throughout the growing season (Pandey *et al.*, 2002). Nitrogen management is an important aspect for obtaining good yield of rice. Optimum dose and schedule of fertilizer application is necessary to achieve higher yields, minimize lodging and damage from insect pests (DRR, 2013). Nutrition is the critical input in yield realization of rice under rainfed shallow lowland situation as availability of required nutrients is low-medium in red and lateritic areas of West Bengal.

A field experiment was conducted to evaluate the yield potentiality of promising rice entries with different levels of nitrogen response under rainfed shallow lowland situation (*'kanali'/'sol'*)of red and laterite zone of West Bengal, India' during *kharif* season, 2012 at Rice Research Station, Bankura, West Benagl, India. The soil of experimental field was sandy loam in texture. The experiment was laid out in a split plot design in 3 replications with three levels of nitrogen (N) [N_1 = 50% recommended dose of nitrogen (RN) *i.e.* 30 kg N ha^{-1}, N_2 = 100% RN *i.e.* 60 kg N ha^{-1}, N_3= 150% RN *i.e.* 90 kg N ha^{-1}] randomly allotted in the three main plots; while four promising rice entries [V_1 = IET 20761, V_2 = IET 21987, V_3 = Dhiren (IET 20760) and V_4 = Swarna (MTU 7029)] were randomly allotted in the four sub plots of each main plot. The recommended fertilizer dose (RFD) was N, P_2O_5 and K_2O @ 60, 30 and 30 kg ha^{-1}, respectively. The source of N, P_2O_5 and K_2O were urea, single super phosphate (S.S.P.) and muriate of potash (M.O.P.), respectively. 25% of recommended dose of N and full dose of P_2O_5 and 75 % of K_2O were applied as basal. 50% of recommended dose of nitrogen was top dressed at active tillering stage (AT) and rest 25% N along with 25% K_2O were applied at panicle initiation (PI) stage. Initial soil sample were collected and were analysed for important properties using standard procedures. The soil was slightly acidic (pH 5.6) in nature, EC: 0.17 dsm^{-1}, organic carbon (%): 0.42, available P_2O_5 43 kg ha^{-1} and K_2O 186 kg ha^{-1}, respectively. Plot size was 4 x 3m. Spacing was 20 x 15cm. For weed management, applied Butachlor 50EC was applied @ 1.5 kg *a.i* ha^{-1} at 5 DAT (days after transplanting) followed by two hand weeding at 35 and 55 DAT., respectively were done. Observation on yield parameters and yield were statistically analyzed.

The results of the experiment reveals that among the promising rice entries, IET 21987 recorded the highest grain yield of 4.55 t ha^{-1}, which was significantly superior to that of Dhiren (4.13 t ha^{-1}) and Swarna (4.01 t ha^{-1}) and at par with that of IET 20761 (4.22 t ha^{-1}) during *kharif*, 2012 (Table 1). Among the nitrogen levels, the highest grain yield (4.6 t ha^{-1}) was recorded from the N_3 (150% RN *i.e.* 90 kg N ha^{-1}), but it was statistically *at par* with N_2 (100% RN *i.e.* 60 kg N ha^{-1}) [4.52 t ha^{-1}] and significantly higher than N_1 (50% RN *i.e.* 30 kg N ha^{-1}) [3.55 t ha^{-1}]. There was a significant increase in grain yield with the increase in N level from 30 to 60 kg ha^{-1} and further increase in N level upto 90 kg ha^{-1} could not increase the grain yield significantly. The interaction effects of N levels and varieties on grain yield were found to be significant. The highest grain yield (4.92 t ha^{-1}) was obtained from IET 21987 at 90 kg N ha^{-1} and it was statistically *at par*

Short Communication

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Table 1: Effect of different rice entries and levels of N on grain yield, number of panicle and panicle weight under rainfed shallow lowland

Nitrogen levels (N)	Promising rice entries (V)	Grain yield (t ha^{-1})	Number of panicles m^{-2}	Panicle weight (g)
N_1	V_1	3.69	198.3	1.98
	V_2	3.87	234.6	2.12
	V_3	3.42	175.2	1.85
	V_4	3.23	157.9	1.81
N_2	V_1	4.45	289.2	2.23
	V_2	4.85	328.4	2.42
	V_3	4.41	282.3	2.15
	V_4	4.38	277.2	2.08
N_3	V_1	4.53	306.8	2.28
	V_2	4.92	342.4	2.47
	V_3	4.55	290.1	2.21
	V_4	4.42	282.9	2.12
N at same V				
SEm (±)		**0.40**	**20.56**	**0.13**
LSD(0.05)		**1.21**	**61.08**	**0.41**
V at same of different N				
SEm (±)		**0.37**	**18.50**	**0.12**
LSD(0.05)		**1.12**	**56.27**	**0.39**
Nitrogen levels				
N_1 (50% RN i.e. 30 kg N ha^{-1})		3.55	191.5	1.94
N_2 (100% RN i.e. 60 kg N ha^{-1})		4.52	294.2	2.22
N_3 (150% RN i.e. 90 kg N ha^{-1})		4.60	305.5	2.27
SEm (±)		**0.10**	**5.02**	**0.04**
LSD(0.05)		**0.29**	**19.72**	**0.18**
Promising rice entries				
V_1 (IET 20761)		4.22	264.7	2.16
V_2 (IET 21987)		**4.55**	301.8	2.34
V_3 [Dhiren (IET 20760)]		4.13	249.2	2.07
V_4 [Swarna (MTU 7029)]		4.01	239.3	2.00
SEm (±)		**0.13**	**11.87**	**0.08**
LSD(0.05)		**0.38**	**35.20**	**0.23**

with that (4.85 t ha^{-1}), which was obtained with 60 kg N ha^{-1}. Similar trend was also observed in case of number of panicles m^{-2} and panicle weight (Table 1). Higher value of yield attributes and grain yield under these treatment might be due to better synchronization between crop N demand and supply at critical physiological stages crucial for better assimilation and translocation of photosynthates towards grains (Avasthe, 2009).

From the present study, it may be concluded that IET 21987 recorded the highest grain yield, which was significantly superior to that of Dhiren (IET 20760) and Swarna (MTU 7029) and at par with that of IET 20761 under rainfed shallow lowland situation of red and laterite zone of West Bengal. The highest grain yield was obtained from IET 21987 at 90 kg N ha^{-1}and it was statistically at par with that, which was obtained with 60 kg N ha^{-1}.

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