

SHORT COMMUNICATION

INFLUENCE OF DIFFERENT LEVELS OF NITROGEN ON ITS UPTAKE AND PRODUCTIVE EFFICIENCY OF PADDY VARIETIES

S.N. SINGH* AND LALLU

Department of Soil Science and Agriculture Chemistry, C.S. Azad University of Agriculture & Technology, Kanpur-208002

Received on 22 Aug., 2003, Revised on 27 Dec., 2004

A field experiment was conducted over a period of two years to assess the effect of nitrogen fertilizer on the relative uptake of nitrogen by grain, straw and total uptake by plant, productive efficiency and grain yield of three paddy varieties, viz. PB-1, Sarjoo-52 and Sita at 0, 40, 80 and 120 kg levels of N/ha. Increasing levels of nitrogen increased nitrogen uptake in grain, straw and total productive efficiency and grain yield. Among varieties, Sita showed its superiority in removing highest amount of nitrogen, productive efficiency and produced highest grain yield than the other two varieties.

Key words : N uptake, paddy, productive efficiency

Rice is the principal food crop of more than half of the world population. Of the various essential plant nutrients, nitrogen is most required and has manifold functions being an integral part of almost all biomolecules. The efficiency of nitrogen utilization varies from variety to variety. If suitable variety is not available, application of fertilizers does not help in stepping up the yield in the proportion anticipated (Swaminathan 1980). The present study was conducted to evaluate the nitrogen uptake and productive efficiency of three paddy varieties differing in their genetic make-up.

The experiment was conducted in RBD for two years, *i.e.* 1994 and 1995 *Kharif* seasons at farm of the C.S.A. University of Agriculture and Technology, Kanpur. The soil had a pH of 7.7 with 0.54% organic carbon, 0.065% total nitrogen, 0.089% total P₂O₅, and 0.910% K₂O. There were 12 treatment combinations consisting of 4 levels of nitrogen (0, 40, 80 and 120 kg/ha.) with 3 paddy varieties (Pusa Basant, Sarjoo-52 and Sita) of medium duration with four replications. Half of nitrogen as per treatment, full doses of P₂O₅ (60 kg/ha.) and K₂O (60kg/ha) were applied before transplanting. Remaining of the nitrogen was divided into two equal portions and

top-dressed at tillering and panicle emergence stage. Nitrogen in straw (shoot) and in grain were estimated by micro-kjedhal method and its uptake was calculated by multiplying the concentration of nutrients with the respective dry matter yield of shoot, grain and total dry matter of rice in kg/ha. Productive efficiency was calculated as follows :

$$PE = \frac{X - X_1}{Y - Y_1}$$

where X and X₁ are the grain yield from the treated and untreated plots and Y and Y₁ are the amount of nutrient absorbed from treated and untreated plots, respectively.

Uptake of nitrogen by rice varieties in straw (shoot), grain and total uptake at maturity stage in presented in Table-1 (a, b, c). Plants fertilized with nitrogen absorbed more N than no nitrogen applied treatment. Considering two years average about 22, 35, 43 and 47 kg N/ha. were taken by shoot in treatments, N₀, N₄₀, N₈₀ and N₁₂₀, respectively. Nitrogen accumulated in grains, on the other hand were 46, 56 and 63kg in N₄₀, N₈₀ and N₁₂₀ as against 32kg/ha. accumulated in untreated control. Thus, the total nitrogen taken up by shoot + grain on seasonal

* Corresponding author

INFLUENCE OF NITROGEN ON PADDY

Table 1. Nitrogen uptake (kg/ha) at maturity, grain yield and productive efficiency of paddy varieties as influenced by rates of N application (2 years average)

Varieties	Nitrogen levels (kg/ha)				Mean
	0	40	80	120	
(a) N uptake (kg/ha)					
PB-1	52.11	75.21	87.95	99.03	78.58
Sarjoo-52	52.43	81.03	98.72	112.65	86.21
Sita	58.63	86.83	108.81	118.93	93.20
Mean	54.35	81.02	98.49	110.20	-
CD at (5%)	V=1.46	N=1.68	V×N=2.92		
(b) N uptake in grains (kg/ha)					
PB-1	29.46	40.30	46.69	52.00	42.11
Sarjoo-52	32.00	46.86	57.56	66.29	50.68
Sita	35.25	50.68	63.32	70.92	55.04
Mean	32.24	45.95	55.86	63.07	-
CD at (5%)	V=0.68	N=0.79	V×N=1.37		
(c) N uptake in straw (kg/ha)					
PB-1	22.65	35.04	41.26	47.05	36.50
Sarjoo-52	20.44	34.18	41.15	46.36	35.53
Sita	22.38	36.15	45.49	48.01	38.26
Mean	22.16	35.12	42.63	47.14	-
CD at (5%)	V=0.40	N=0.46	V×N=0.79		
(d) Grain yield (kg/ha)					
PB-1	2605	3513	3965	4357	3610
Sarjoo-52	2883	4043	4885	5627	4360
Sita	3129	4300	5316	5845	4648
Mean	2872	3952	4722	5276	-
CD at (5%)	V=0.93	N=1.07	V×N=1.85		
(e) Productive efficiency (kg seed/kg N-absorbed)					
		0-40	40-80	80-120	
PB-1	-	39.3	37.9	37.6	38.3
Sarjoo-52	-	40.5	43.2	45.5	43.1
Sita	-	41.5	43.1	44.8	43.1
Mean	-	40.4	41.4	42.6	-

V = Varieties

N = Nitrogen levels

mean basis, amounted to 55, 81, 98 and 110 kg/ha in N₀, N₄₀, N₈₀ and N₁₂₀, respectively. The N fertilization increased N absorption by rice crop has also been reported by Singh and Namdeo (2004). Varieties also differed in N absorption as on two years average basis it was Sita

which was found efficient due to its own genetic make-up to absorb higher amount of nitrogen followed by Sarjoo-52 and lowest by PB-1 in straw, grains and total uptake by plant. Differences at varietal level in nitrogen uptake have also been reported by Panda *et al.* (1994).

Productive efficiency increased with the application of nitrogen fertilizer. On two years average basis about 40, 41 and 43kg additional grain yield was produced for every kg of nitrogen absorbed in treatment N_{40} , N_{80} and N_{120} respectively (Table-1e). So far as varieties are concerned, Sita, remaining almost at par with Sarjoo-52, appeared most productive in which efficiency increased with increase in nitrogen levels. On the other hand PB-1 showed least productive efficiency and its efficiency slightly decreased with increase in N levels. On season mean basis, Sita and Sarjoo-52 proved equally productive (43kg grains produced/kg nitrogen absorbed) while PB-1 could convert each kg of nitrogen taken up into only 38kg grain. The findings of present study are in line with the findings of Srivastava and Mehrotra (1982) in wheat, that efficiency varies from variety to variety.

Grain yield increased progressively with increased the doses of nitrogen supply over control level and the highest grain yield was recorded at 120 kg nitrogen/ha. (Table-1d). Of the three varieties tested, Sita yielded

highest whereas lowest grain yield was obtained in PB-1 and Sarjoo-52 ranked in between. Similar results were also obtained by Sharma and Gupta (1992) in paddy crop.

REFERENCES

- Panda, S.C., Panda, P.C. and Nand, S.S. (1994). Effects of levels of nitrogen and phosphorus on yield and nutrient uptake of rice. *Oryza* **32** : 18-20
- Sharma, A.K. and Gupta, P.C. (1992). Response of rainfed upland rice to nitrogen fertilization at different levels of weed management in hills. *Indian J. Agron.* **37** : 363-365.
- Singh, R.K. and Namdeo, K.M. (2004). Effect of fertility levels and herbicides on growth, yield and nutrient uptake of direct seeded rice. *Indian J. Agron.* **49**:34-36.
- Srivastava, R.D.L. and Mehrotra, O.N. (1982). Physiological studies on nitrogen utilizing efficiency of dwarf wheat. *Indian. J. Plant Physiol.* **25** : 213-219.
- Swaminathan, M.S. (1980). Role of fertilizers in realizing agriculture production prospects in India. *Fert. News* **25**: 17-24.