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SHORT COMMUNICATION

NITROGEN REQUIREMENT OF TOMATO

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The precise requirement of nitrogen for the maximum tomato yield was reflected in the NR activity and the optimum dose of nitrogen was between 125-150 kg ha^{-1} irrespective of varieties and locations. The result also indicated that the dose of nitrogen should be split into two applications *viz.* at the age of 25 and 38-days reflected by the peaks of NR activity.

***Key words*: N-assimilation, NR activity, tomato.**

Tomato is one of the major vegetable crops of Bangladesh and its low average yield is attributable to genetical as well as environmental causes. In upland condition plants mostly use NO_3^- as N-source (Sahrawat 1980). Macy (1936) formulated a pattern for nutrient utilization by crops depending on the theory of poverty adjustment and luxury consumption. Application of more nitrogen than its requirement, is lost either through leaching, volatilization or may be taken up by plants as luxury consumption giving no extra benefit for enhancing grain yield as nitrate assimilation depends on enzyme activities, which is controlled by genetic traits (Spiertz and Vos 1983). As tomato plants use large amounts of nitrogen for its maximal productivity, the precise doses have to be determined to avoid N-losses, Nitrate reductase (NR) has been designated as a key enzyme for nitrate utilization by plants (Hageman and Flesher 1960) and the utilization of nitrate solely depends on the interaction of NR at different phases of the ontogenetic development of a particular crop.

The objective of the present investigation was to find out a precise dose of N depending on NR induction, nitrogen accumulation and productivity on the basis of poverty adjustment for nitrogen.

Two experiments were conducted at two locations (Rangpur and Mymensingh) during 1999-2000 with three varieties/genotypes *viz.* Ratan, Bahar, an advanced line E-6 and six nitrogen doses *viz.* control, 75, 100, 125, 150 and 175 kg N ha^{-1}. The experiments were conducted in split plot design with four replications. Nitrogen was applied in the main plots and varieties in the sub-plots. P_2O_5, K_2O and S @ 60, 60 and 20 kg ha^{-1} in the form of TSP, MP and gypsum respectively were applied during land preparation. Twenty-three day-old seedlings were transplanted. Irrigation and other cultural practices were done as and when necessary. Nitrogen was applied in two split doses, at 24 and 40-d after transplanting. Nitrate reductase (NR) activity was determined 48 h after application of nitrogen and at weekly intervals thereafter, up to fruit set stage following the method of Stewart and Orebamjo (1979). Data on fruit and straw yield were also recorded. Total N content (following Kjeldahl method) was determined, in the composite (Stem and leaf) sample and also of dry fruit, at final harvest. Total N removed by the fruit was calculated by multiplying % N with total fruit dry weight.

Results demonstrated differential yield response of tomato genotypes to nitrogen rates at both the locations. Fruit yield increased over control at both the locations (Fig. 1). Higher straw yield was obtained at 175 kg N ha^{-1} at both locations (Table 1). Significantly higher fruit yield was obtained at Rangpur at 100 kg N ha^{-1} than

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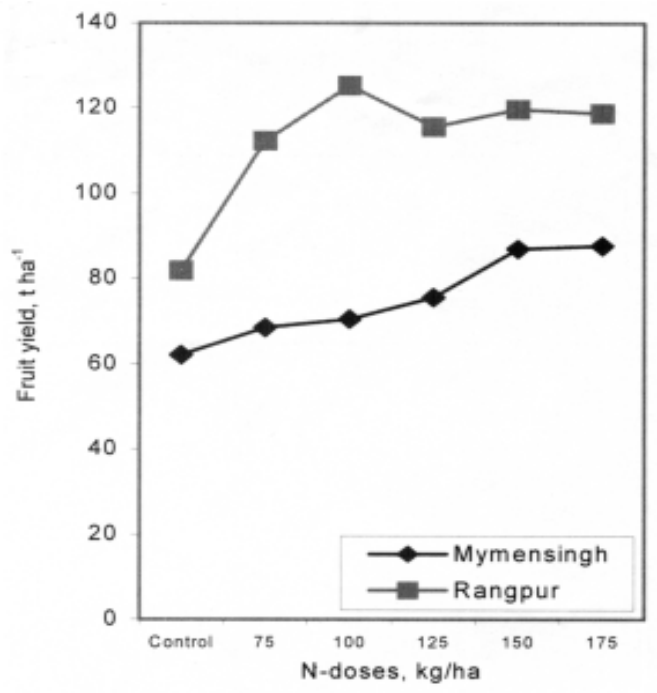

Fig. 1. Yield of tomato as influenced by N-doses at Mymensingh and Rangpur

obtained at Mymensingh at 175 kg N ha^{-1}. At Rangpur N-doses beyond 100 kg did not show any enhancement of yield, whereas at Mymensingh yield increased with increasing N-doses up to 150 kg N ha^{-1} (Fig. 1). Dutta *et al.* (1996) reported yield increase in mungbean with limited dose of N, where NR activity reached its peak at that dose. Nitrogen content in the straw was found to be the highest (3.11%) with the application of 100 kg N ha^{-1} at Mymensingh, while at Rangpur the highest N-content (3.07%) was obtained with 125 kg N ha^{-1} (Table 1). The highest N accumulation (156 kg ha^{-1}) in the fruit at Mymensingh was observed at 175 kg N ha^{-1} (Fig. 2) without any further increase in fruit yield. At Rangpur the highest fruit nitrogen accumulation (170 kg ha^{-1}) was observed at 150 kg N ha^{-1} (Fig. 2). It has been suggested that N-accumulation in the shoot is an indicator of N-absorbed by the plant (Broaddus *et al.* 1965). Results also indicated variation in the NR activity among the genotypes (Fig. 4) and the highest NR activity was recorded at 125 kg N ha^{-1}. Many authors have reported positive relation of NR with yield (Neyra *et al.* 1980). Dutta *et al.* (1996) had shown variability in NR activity among different crop varieties and among genotypes of the same crop. Moreover significant NR activity was observed throughout the growing period of the genotype Bahar, which maintained the highest NR activity indicating that tomato plant is basically dependent on nitrate assimilation (Fig. 4). Ostream and Collins (1983) reported genotypic differences in leaf nitrate concentration and NR activity in tobacco.

Table1. Effect of nitrogen on straw yield (oven dry) and % N-content in tomato straw at two locations.

N-doses (kg N/ha)	Mymensingh			Rangpur		
	Straw yield yield (t/ha)	Straw N content (%)	Fruit N content (%)	Straw yield (t/ha)	Straw N content (%)	Fruit N content (%)
Control	1.06	2.39	2.30	0.87	2.54	2.15
75	0.98	2.25	2.06	1.17	2.72	2.29
100	0.95	3.11	2.74	1.14	2.83	2.32
125	1.08	3.10	2.80	1.18	3.07	2.58
150	1.31	3.01	2.79	1.30	3.01	2.59
175	1.47	2.99	3.14	1.31	2.73	2.32
F Test	**	**	**	**	**	*
CV%	0.97	5.165	14.25	0.95	11.74	8.55
LSD (0.05)	0.17	0.49	0.45	0.14	0.44	0.30
Correlation	fruit yield	straw yield		fruit yield	straw yield	
with NR (r=)	0.52*	0.27		0.67*	0.50*	

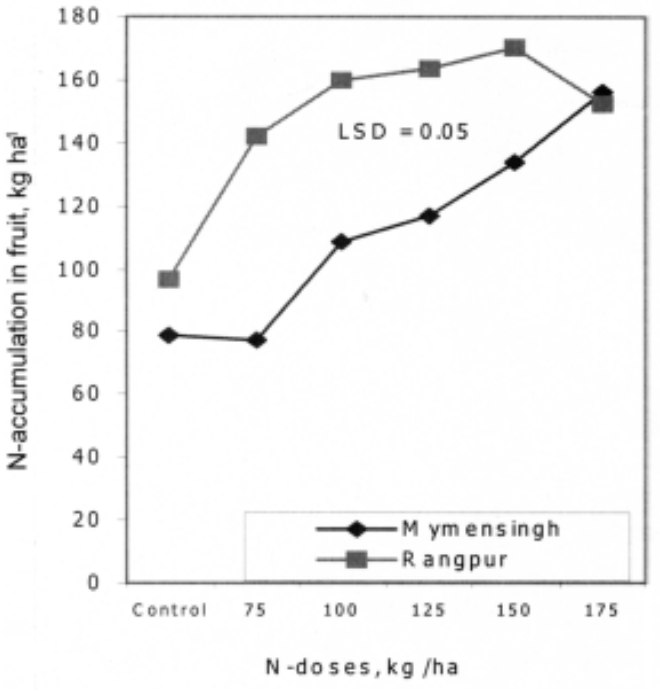

Fig. 2. Effect of N-doses on N-accumulation in tomato at Mymensingh and Rangpur

The NR activity recorded two peaks at early ontogeny, irrespective of N-doses (Fig. 3 and 4). Similar results have been reported by Dutta and Badruddin (1998) in rice. From the results it is clear that NR activity is a positive indicator of the tomato yield and that higher accumulation of N in the straw had no impact on fruit yield. The variation in N-requirement for higher fruit yield at Mymensingh and Rangpur could be due to variation in fertility of land. The higher accumulation of N due to higher N rate may be termed as luxury consumption without any impact on fruit yield.

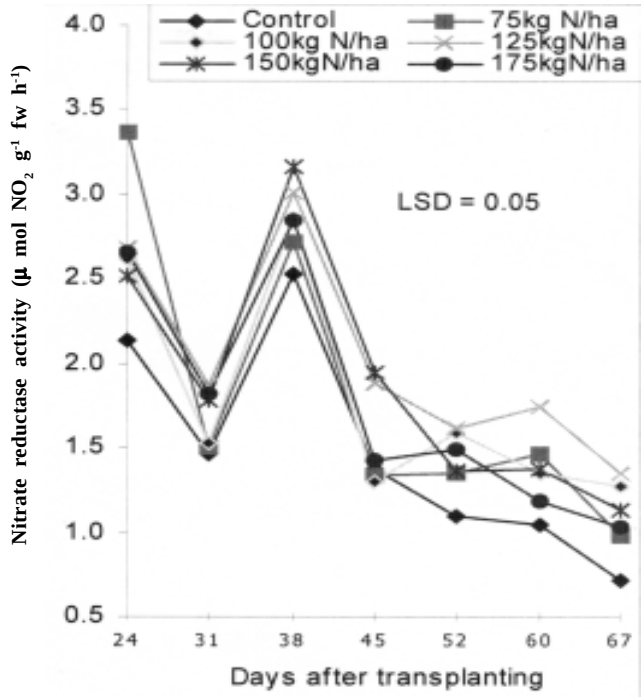

Fig. 3. NR activity as affected by N doses

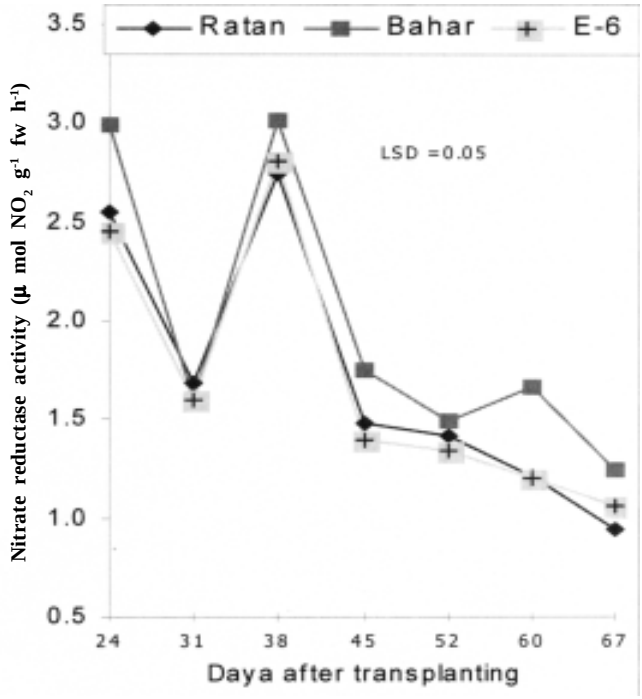

Fig. 4. Varietal variation in NR activity

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