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Short Communication

EFFECT OF NITROGEN AND PHOSPHORUS FERTILIZATION IN SEED PRODUCTION OF TOMATO

RV Singh and S Kumar

Horticulture and Agro Forestry Research Programme (ICAR Research Complex for Eastern Region), Ranchi -834 010

With the growing demand of seeds of newly developed vegetable varieties recommended for the region, it has now become inevitable to produce them locally. The standardization of seed production technologies for different vegetables, thus has gained prime importance. Arka Abha, a bacterial wilt resistant tomato variety being very popular amongst the farmers of the region for rainy season cultivation, was taken up for standardizing the nutritional requirements. As for optimizing production and profitability, the right balance of different nutrients is required. The data on nutritional aspects of field- grown tomatoes for seed production particularly for agro-horticultural practices of this plateau region is lacking.

The field experiments were carried out for three years from 1998-99 to 2000-01 at the Horticulture and Agro Forestry Research Programme, Ranchi on a sandy loam soil having pH 5.2, organic carbon 0.64%, cation exchange capacity 10.4 meq/100 g. The treatments comprising six levels of nitrogen (30, 60, 90, 120, 150 and 180 kg/ha) and four levels of phosphorus (25, 50, 75 and 100 kgP_2O_5/ha) were laid out in factorial randomized block design with three replications. Full doses of phosphorus (as per treatment through single super phosphate) and potassium (50 kg K_2O/ha through muriate of potash) along with half the dose of nitrogen (as per treatment through urea) were applied a day before transplanting. The remaining quantity of N was applied one month after transplanting of crop. All other cultural practices were followed as per the local recommendations. The observations on plant growth, fruit and seed yield and seed quality characteristics were recorded and statically analyzed.

The pooled mean of three years showed significant influence of application of graded levels of nitrogen on fruit and seed yield, number of fruit per m^2 area, number of branch/ plant and plant height in the present study (Table 1). Application of increasing levels of nitrogen from 30 to 180 kg/ha significantly raised the fruit yield of tomato from 320.83 to 591.25 q/ha. The results are in conformity with the findings made by Warner *et al*. (2004).The yield of seed showed an increasing trend with increasing nitrogen levels. Accordingly, the maximum yield (244.69 kg/ha) was recorded with the highest level of nitrogen which was 32.59 and 5.25 per cent higher than the seed yields recorded with 30 and 150 kg levels of N application, respectively. Kusal *et al*. (1977) and Varis and George (1985) also recorded higher fruit and seed yields by raising the levels of N application.

Similarly, the maximum number of fruit per m^2 area (65.35), number of branch/plant (4.499) and plant height (47.83) were recorded in the case of the highest dose of nitrogen (180 kg/ha) application. This was owing to the fact that N being a constituent of amino acids is very essential for normal metabolic activities in the plant. Similar observations were made by Chattopadhyay and Chakrabarty (1990) and Singh *et al*. (2005). Seed quality characteristics viz. one hundred seed weight, per cent germination in vitro and percentage of field emergence did not show any significant influence of varying levels of nitrogen.

Application of nitrogen significantly influenced the net returns from tomato seed production (Table 2). The highest level of nitrogen (180 kg/ha) recorded the maximum net returns (Rs 3,59,522/ha) which were significantly higher than the returns received with 120 kg N/ha and 6.56 per cent more compared to the returns with 150 kg N/ha level. The C:B ratio also improved from 1:3.14 to 1:3.65 with the rising N levels between 30and 180 kg/ha.

Application of graded levels of phosphorus between 25 and 100 kg P_2O_5/ha significantly influenced the

performance of seed crop of tomato (Table 1). The pooled mean of three years showed significant improvement in fruit yield with increasing application of phosphorus from 25 to 50 kg P_2O_5/ha (from 404.90 to 442.37 q/ha). Similar recommendations have been made by Salunkhe *et al*. (1987). A negative response also reported positive response to rising P applications on seed yield in tomato. Phosphorus application beyond 50 kg P_2O_5/ha showed negative effects on the yield of seed.

The number of fruit/ m^2 of area did not show any significant influence of increasing levels of phosphorus

Table 1: Effect of nitrogen and phosphorus fertilization on the performance of seed crop of tomato cv. Arka Abha (pooled mean of 3 years)

Treatment	Yield of seed (kg/ha)	Yield of fruit (q/ha)	Number of fruit/ m^2	Number of branch/ plant	Height of plant (cm)	One hundred seed weight (mg)	Germination (%)	
							Lab	Field
Nitrogen level (kg/ha)								
30	184.54	320.83	48.24	4.06	41.84	251	88.5	69.8
60	208.37	398.58	56.06	4.28	45.11	242	89.4	66.8
90	205.62	428.45	58.69	4.54	44.55	242	88.0	66.2
120	219.28	454.85	60.93	4.29	44.97	243	88.8	67.0
150	232.48	470.55	61.78	4.37	45.53	238	86.8	68.8
180	244.69	591.25	65.35	4.50	47.83	242	86.6	66.8
C.D. at 5%	21.36	42.16	4.87	0.35	1.45	N.S.	N.S.	N.S.
Phosphorus level (kg/ha)								
25	203.47	404.90	56.53	4.12	44.11	247	87.5	69.1
50	227.00	442.37	59.51	4.22	45.48	241	89.2	66.3
75	218.10	439.03	58.56	4.51	45.59	244	88.7	67.6
100	214.75	419.65	59.44	4.51	44.69	241	86.6	67.3
C.D. at 5%	17.44	34.27	N.S.	0.28	1.18	N.S.	N.S.	N.S.

of yield to further increase in levels of phosphorus was observed. Similarly, the maximum yield of seed (227.00 kg/ ha) was recorded with 50 kg P_2O_5/ha level which was significantly higher (11.56%) than the yield recorded in case of the lowest level of phosphorus application (25 kg P_2O_5/ha). Varis and George (1985)

Table 2: Effect of nitrogen and phosphorus fertilization on gross and net returns and cost: benefit ratio from seed crop of tomato cv. Arka Abha (pooled mean of 3 years)

Treatment	Gross returns (Rs/ha)	Net returns (Rs/ha)	C:B ratio
Nitrogen level (kg/ha)			
30	3,69,167	2,47,550	1:3.14
60	4,16,833	2,92,079	1:3.37
90	4,11,333	2,86,763	1:3.33
120	4,38,667	3,12,201	1:3.45
150	4,64,917	3,37,394	1:3.59
180	4,89,333	3,59,522	1:3.65
C.D. at 5%	-	42,712	-
Phosphorus level (kg/ha)			
25	4,07,000	2,83,119	1:3.34
50	4,54,000	3,26,917	1:3.54
75	4,36,194	3,10,329	1:3.47
100	4,29,500	3,03,308	1:3.40
C.D. at 5%	-	34,873	-

but the maximum fruit number was recorded with 50 kg P_2O_5/ha level. The number of branch/plant showed significant improvements up to 75 kg level while significantly more height of plant was observed with 50 kg P_2O_5/ha level of phosphorus application. This may be due to adequate supply of phosphorus to plant which increased the growth of conducting tissues thus resulting in expansion of secondary laterals. Similar response was observed by Besford (1979). Seed quality characteristics viz., one hundred seed weight, germination percentage and field emergence did not show any significant effect of phosphorus fertilization.

Phosphorus application showed significant influence on net returns (Table 2). Increasing P_2O_5 level from 25 to 50 kg per hectare raised the net return by Rs 43,798/ ha. Further increase in phosphorus levels to 75 kg P_2O_5/ha and beyond resulted in decreased net returns. Similarly, the highest C: B ratio of 1:3.54 was also observed in the case of 50 kg P_2O_5/ha level in the present study.

Application of graded levels of nitrogen and phosphorus showed significant interaction effect on seed yield (Table 3). The maximum yield of 265.0kg/ ha was recorded with the treatment combination

Table 3: Interaction effect of nitrogen and phosphorus levels on seed yield (kg/ha) of tomato cv. Arka Abha (pooled mean of 3 years)

Levels of nitrogen (kg/ha)	Levels of phosphorus (kgP_2O_5/ha)			
	25	50	75	100
30	162.83	211.83	206.11	157.39
60	209.67	234.78	201.67	187.39
90	183.72	218.06	193.67	227.06
120	202.39	217.56	229.78	227.39
150	233.28	233.67	238.67	224.28
180	228.94	246.11	238.72	265.00
C.D at 5%	42.71			

180kg nitrogen and 100 kg P_2O_5/ha but it was statistically at par with the yield recorded in the case of 150 kg N and 75 kg P_2O_5 per hectare (238.67 kg/ha). The least yield of seed was recorded with 30 kg N and 100 kg P_2O_5 kg per hectare combination (157.39 kg/ha). This was due to the fact that high level of nitrogen increased the uptake of phosphorus. Similar observations were also made by Kusal *et al*. (1977).

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