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Effect of Sources and Split Application of N on Nutrient Uptake by Tomato*

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The effect of application of four sources of N (ammonium sulphate, urea, calcium ammonium nitrate and ammonium chloride) in three and four splits on the uptake of nutrients by Co 1 tomato was investigated. Among the sources, ammonium sulphate recorded enhanced uptake of N, P and K followed by CAN, urea and ammonium chloride. Three split applications significantly increased the uptake of N, P and K over four split applications.

The genetic potential of tomato can be utilised to the maximum through hormonious nutrient balance by the forms and rate of fertilizer application of nutrient elements and their relative concentrations in the tissues of the plant (Anand and Muthukrishnan, 1974). Hence to produce a specified weight, it requires certain mineral nutrients either through the added nitrogenous fertilizers or from soil complex, which increase the dry weight and yield of the crop.

Under these circumstances studies on the uptake of nutrients during different phases of crop growth is considered as a dependable factor for assessing the nutritional requirement of the crop. The present study was taken up (i) to determine the uptake of nutrients at different phases of growth and (ii) to find out the relation between forms of N application and nutrient uptake by plant.

MATERIAL AND METHODS

A field experiment was laid out in a randomised block design with three replications at the Agricultural College and Research Institute, Madurai, with tomato (Co 1) as test crop. Nitrogen was applied in three and four splits at pre-flowering, flowering, fruit set and fruit ripening stages as ammonium sulphate, urea, ammonium choloride and calcium ammonium nitrate, keeping a control without fertilization. Phosphorus was applied as super phosphate and potassium as potassium sulphate. These fertilizers were applied at the rate of 150 kg N/ha, 100 kg P_2O_5/ha and 50 kg K_2O/ha.

Initial soil samples were analysed for available nitrogen by alkaline permanganate method, available phosphoric acid by Olsen's method and available potassium in neutral normal

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ammonium acetate extract. Plant samples collected at pre-flowering, flowering, fruit set and fruit ripening stages were analysed for total nitrogen by micro-kjedahl method (Humphries, 1956), total phosphorus by colorimetric method. total potassium by flame photometer method and total calcium and magnesium by Versenate titration method (Jackson, 1973).

The initial soil analysis indicated that the available nutrients levels were N-330 kg/ha; P_2O_5-8·4 kg/ha and K_2O 376 kg/ha.

RESULTS AND DISCUSSION

Effect on N sources on the uptake of nutrients : Among the sources of N used ammonium sulphate recorded the enhanced uptake of N, P and K followed by calcium ammonium nitrate, urea and ammonium cholride which were significantly different (Table I). However, in the uptake of K, urea and calcium ammonium nitrate were found to be on par.

Addition of nitrogen could have increased the root growth and foraging capacity for P, besides increasing the shoot growth and metabolism of the plants and thereby the availability of P for root absorption might have increased resulting in enhanced P uptake (Russel, 1975) as observed in the present study.

In respect of Ca uptake, calcium ammonium nitrate registered a significant higher uptake followed by urea, ammonium sulphate and ammonium chloride. This may be probably due to the higher availability of Ca in the soil from added calcium ammonium nitrate and consequent absorption by the plants Similarly the uptake of Mg was increased by the treatment with calcium ammonium nitrate followed by ammonium sulphate, urea and ammonium chloride.

Effect of split application on the uptake of nutrients :

TABLE II Uptake of N, P, K, Ca and Mg by tomato (kg/ha).

Frequency of split	A_1	A_2	SE_D	CD P=0.05
N uptake	40.51	20.44	0.52	1.02
P uptake	30.29	17.35	0.47	0.92
K uptake	48.13	25.91	0.83	1.62
Ca uptake	15.83	9.47	0.25	0.49
Mg uptake	11.36	8.31	0.25	0.49

A_1 : Three split application
A_2 : Four split application

TABLE I Uptake of N, P, K, Ca and Mg by tomato (kg/ha)

Sources of N	T_1	T_2	T_3	T_4	T_5	SE_D	CD P=0.05
N uptake	42.67	34.00	36.51	26.61	12.59	0.82	1.61
P uptake	30.54	24.14	29.06	21.13	14.19	0.74	1.46
K uptake	59.03	38.05	39.75	30.85	17.44	1.31	2.57
Ca uptake	12.21	13.79	16.03	12.21	8.99	0.40	0.78
Mg uptake	10.19	10.00	12.18	9.82	6.99	0.39	0.78

T_1 : Ammonium sulphate T_2 : Urea T_3 : CAN T_4 : Ammonium chloride T_5 : Control

TABLE III Uptake of N, P, K, Ca and Mg by tomato (kg/ha)

Stages	S_1	S_2	S_3	S_4	SE_D	CD P=0.05
N uptake	13.55	34.45	34.99	38.91	0.74	1.44
P uptake	6.21	19.79	30.04	39.27	0.67	1.30
K uptake	9.19	22.89	39.10	46.87	1.17	2.30
Ca uptake	7.23	10.53	10.79	22.09	0.36	0.70
Mg uptake	4.79	10.63	11.86	12.07	0.35	0.69

S_1 : Pre-flowering S_2 : Flowering S_3 : Fruit set S_4 : Fruit ripening

From the Table II, it was observed that the three split applications of N increased the uptake of N, P, K, Ca and Mg to a greater extent than the four split application. The indicates that N applied in four splits is not fully utilised by the plant and is therefore wasted.

Uptake of nutrients at different stages :

Uptake of nutrients by tomato gradually increased with the advancing age of the crop. Highest uptake of all the nutrients was recorded at the fruit ripening stage. However, there was only a slight increase in uptake after flowering.

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REFERENCES

ANAND, N. and C.R. MUTHUKRISHNAN. 1974 Effect of nitrogen fertilization on tomato (*Lycopersicon esculentum* Mill.). *South Indian Horticulture*. 22 : 86-91.

HUMPHRIES, E. C. 1956. Mineral components and ash analysis in modern methods of plant analyses. Springer-Verlag Berlin. 1 : 468 - 502.

JACKSON, M. L. 1973. Soil Chemical Analysis Prentice Hall of India (Pvt.) Ltd., New Delhi.

RUSSEL, E. W. 1975. Soil condition and plant growth. The English Language Book Society and Longman, New York.