

EFFECT OF FOLIAR APPLICATION OF WATER SOLUBLE FERTILIZERS ON GROWTH, YIELD, AND QUALITY OF TOMATO (*Lycopersicon esculentum* L.)

S. N. S. Chaurasia, K.P. Singh and Mathura Rai

Indian Institute of Vegetable Research, Varanasi-221005, India.

SUMMARY

Application of 5 foliar sprays of water soluble fertilizers significantly increased the plant height, number of branches, Number of fruits, average fruit weight, fruit length, fruit diameter, TSS, yield and the net profit of tomatoes. The maximum plant height, number of branches/plant, fruit length, yield, net profit along with maximum C:B ratio were recorded by 5 foliar sprays of water soluble liquid fertilizers 19:09:19 followed by NPK 19:19:19. The minimum values in all the parameters were recorded in the control having only recommended dose of fertilizer.

INTRODUCTION

Tomato is one of the most important, popular and widely grown vegetables in the world ranking second after potato. Ripe tomato is a good source of minerals and vitamins, especially vitamin 'C' and carotenoids, which are consumed through out the world in the form of fresh as well as processed products. Production of crop depends on several factors like soil, nutrition, irrigation and plant protection measures etc. The plant nutrition is one of the most important factors responsible for the proper growth and development of the plants. The methods of nutrient application play an important role in supplying the nutrients to the plants because the efficacy of fertilizers applied in soil being low due to various losses and fixations. Foliar nutrition is designed to eliminate the above problems particularly with respect to macro nutrients. Nowadays application of N, P and K application in different ratios through foliar sprays is modern method of fertilization in vegetable crops due to the nature of heavy feeder of nutrients. The sufficient information regarding the use of water soluble fertilizer is not available so that the present experiment was planned and conducted.

MATERIALS AND METHODS

The study was carried out at the Experimental Farm of Indian Institute of Vegetable Research, Varanasi from 2002-2004 on a well drained sandy loam soil to evaluate the effect of foliar sprays of different water soluble fertilizers on the growth and yield of tomato. The experiment was laid out in a randomized block design having three replications in a 3 x 3 m² plots. The seedlings of tomato indeterminate cv. Tolstoi was transplanted at the spacing of 50 x 75 cm. A basal dose of P and K each at 60 kg/ha along with 50% N (75 kg/ha) was applied at the time of field preparation. Remaining dose of nitrogen (75 kg/ha) was top dressed after 30 days of transplanting. The water soluble liquid fertilizer treatments were applied as a 5% solution (as a foliar spray) initially at 30 days after transplanting for all the treatments and subsequently in 10 day intervals as a 10% solution either 3 times or 5 times, depending on the treatment. Hence 3 or 5 times application of Multi K, NPK-19:19:19, NPK-19:09:19 and NPK-17:10:27 (Nagarjuna Fertilizers) were the treatments. The observations with regards to the growth, yield and quality was recorded from the randomly selected and tagged plants. The TSS content of the fruits were recorded using a hand refractometer and ascorbic acid content was estimated as prescribed by AOAC (1980). The spoilage was worked out by keeping the selected tomato fruits at ambient room temperature. The mean data was subjected to the statistical analysis using ANOVA and mean separation (LSD) procedures.

RESULTS AND DISCUSSION

The data recorded in Table 1 shows that the growth parameters significantly varied with the foliar application of water soluble fertilizers. The maximum plant height (125.4 cm), number branches (4.2), fruit length (4.90 cm), fruit diameter (4.51 cm) and number of fruits (24.6) were found in the treatments with foliar sprays of water soluble formulation NPK 19:09:19, sprayed 5 times followed by NPK 19:19:19, sprayed five times. However, the average fruit weight 81.6 g was recorded in the 5 foliar sprays of multi K. The increase in plant height, number of branches, number of fruits and individual fruit weight were high with 5 foliar sprays in all the combinations of NPK might be a reason of supplying more nutrients at the critical growth stage, i.e. flowering and fruit set. Jeybal *et al.* (1998), Vibhute (1988) and Naik *et al.* (2002) also reported similar findings. This increase is also might be due to the increased vegetative growth under abundance of nitrogenous fertilizers for photosynthesis activity. Application of water-soluble fertilizer also increases the yield with 5 sprays compared to 3 sprays. The maximum yield (631.66 q/ha) recorded in the 5 foliar application of the NPK 19:09:19. The increase in the yield might be due to greater availability of nutrients,

increased uptake of nutrients and water, resulting in more photosynthesis and enhanced food accumulation in edible part of the fruits. The Guievence and Budence (2000) and Singh and Singh (1992) also reported similarly. Similar response in tomato was reported by Palaniappan *et.al.* (1999). The maximum T.S.S. content was noted in NPK at the ratio of 17:10:27. The increase in quality character (TSS) might be due to the growth promoting substances which could have accelerated synthesis of carbohydrate, vitamins and other quality characters. These results are in conformity with those of Fagaria *et.al.* (1992) and Singh and Singh (1992). The maximum net return of Rs.89967.5 and cost: benefit (C:B) ratio of 1:4.1 were reported in the treatment NPK 19:09:19. This might be due to the more yield, average fruit weight and fruit size.

Table 1. Effect of Water Soluble Fertilizers on Growth Parameters of Tomato

Treatments	Plant height (cm)	No. of branch / plant	Fruit length (cm)	Fruit Diameter (cm)	No. of fruit / plant	Average fruit weight	T.S.S.
Multi K-3 sp	105.4	1.3	4.21	4.65	15.3	81.50	3.10
Multi K-5sp	110.5	2.5	4.82	4.70	163.	81.60	3.35
NPK 19:19:19-3sp	92.20	3.0	4.65	4.17	16.5	65.83	3.20
NPK 19:19:19-5sp	115.5	4.0	4.88	4.75	23.2	78.00	1.78
NPK 19:09:19-3sp	115.7	3.7	4.51	4.32	21.5	70.30	3.26
NPK 19:09:19-5sp	125.4	4.2	4.90	4.51	24.6	73.30	3.23
NPK 17:10:27-3sp	96.20	3.4	4.50	4.20	18.2	72.16	3.31
NPK 17:10:27-5sp	112.2	2.7	4.70	4.51	19.6	75.83	3.54
Control	85.50	2.5	4.02	4.10	13.5	64.16	3.50
LSD at 5%	14.2	0.12	0.03	0.05	2.15	9.94	1.79

(3sp: 3 times foliar application 5sp: 5 times foliar application)

Table 2. Effect of Water Soluble Fertilizers on Yield Parameters of Tomato

Treatments	Yield (q/ha)				Total Return	Net Return	C:B ratio
	1999-2000	2000-2001	2001-2002	Mean			
Multi K-3 sp	499.2	650.2	693.42	597.6	89640	68064.5	1: 3.15
Multi K-5sp	538.12	680.4	720.09	646.2	96390	75129.5	1: 3.44
NPK 19:19:19-3sp	538.83	735.4	672.70	648.97	97345.5	75770.0	1: 3.51
NPK 19:19:19-5sp	549.59	810.3	767.50	708.98	106347	84546.5	1: 3.87
NPK 19:09:19-3sp	515.71	710.5	699.34	641.85	96277.5	74702.0	1: 3.46
NPK 19:09:19-5sp	631.66	892.5	711.20	745.12	111768	89967.5	1: 4.12
NPK 17:10:27-3sp	549.59	640.5	699.34	696.44	104466	82890.5	1: 3.84
NPK 17:10:27-5sp	508.60	742.4	726.50	659.16	98874	77073.5	1: 3.53
Control	410.79	535.6	678.6	541.66	812490	60211.0	1: 2.83
LSD at 5%	85.74	72.24	52.35				

REFERENCES

- Fageria, M.S., Arya, P.S., Jagmohan, K. and Singh, A.K. (1992) Effect of nitrogen levels on growth yield and quality of tomato. *Veg.Sci.*, 19(1): 25-29.
- Guvence, I. and Badem, H. (2000). Effect of foliar application of different sources and levels of nitrogen on growth and yield of tomato (*Lycopersicon esculentum* L.). *Indian J. Agric. Sci.*, 72 :(2)104-105.
- Jeybal, A., Murlidhar Rao, M., Palanippam, S.P. and Chelliah, S. (1998). Technical Bulletin on specialty Fertilizers. Nagarjuna Agricultural Research and Development Institute, Secunderabad.
- M/S Nagarjuna Fertilizer Co. (Pvt). Ltd. Hydrabad.

- Naik, L.B., Prabhakar, M and Tiwari, R.B. (2002). Influence of foliar sprays with water soluble fertilizers on yield and quality of Carrot (*Daucus carota* L). Proc, Int. Conf. Vegetables, Bangalore, P:183.
- Palanippan, S.P, Jeybalm A. and Chelliah, S. (1999). Response of tomato and chillito foliar application of specialty fertilizers. Veg.Sci. 26 (2):198-200.
- Singh, A.B. and Singh, S.S. (1992). Effect of various levels of nitrogen and spacing on growth, yield and quality of tomato. Veg. Sci., 19(1): 1-6.
- Vibhute, C.P. (1988). A process for manufacturing complex solid and liquid completely water soluble fertilizers. Fert. News. 43 (8):63.
- Yadav, B.D., Khandelwal, R.B. and Sharma, Y.K (2004). Response of tomato to foliar feeding of water soluble fertilizers. Veg.Sci.31: (1):98-100.