AJH
eISSN- 0976-724X

THE ASIAN JOURNAL OF HORTICULTURE
Volume **10** | Issue 1 | June, 2015 | 41-44
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RESEARCH PAPER

DOI : 10.15740/HAS/TAJH/10.1/41-44

Article history :
Received : 07.06.2014
Revised : 21.03.2015
Accepted : 07.04.2015

Effect of water soluble fertilizers on qualitative parameters of tomato

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ABSTRACT : The investigation on the effect of water soluble fertilizers (starter and booster) on quality of tomato was carried out at P.G. centre, UHS campus, Gandhi Krishi Vignana Kendra, Bengaluru during summer season, 2011. Combination of starter and booster at 2 per cent along with RDF has resulted in a significant increase in qualitative parameters like pericarp thickness (7.36 mm), fruit firmness (3.81 kg cm^{-2}), total soluble solids (4.33), shelf-life (14.12 days) and less physiological loss in weight (28.68 %). However, less titrable acidity (0.51 %) was recorded with combined application of starter and booster at 1.5 per cent.

KEY WORDS : Tomato, Water soluble fertilizers, Qualitative parameters

HOW TO CITE THIS ARTICLE : Krishnan, Anoop and Indiresh, K.M. (2015). Effect of water soluble fertilizers on qualitative parameters of tomato. *Asian J. Hort.*, **10**(1) : 41-44.

Tomato (*Solanum lycopersicum* L.) is one of the most popular vegetable belonging to family solanaceae. Cultivated tomato originated in a wild form in the Peru-Equador-Bolivia area of Andes (South America). Tomato is one of the best source of income to small and marginal farmers and contributes to the nutrition of the consumers. Tomato is a rich in minerals, vitamins and organic acids. Escalation of prices of fertilizers and increasing concern about ground water pollution resulting from indiscriminate or excessive fertilization are problems that may be solved by more efficient fertilizer application. Foliar nutrition is one possibility for minimising these environmental hazards. Foliar nutrition is highly beneficial when used as supplement to soil fertilization. Foliar nutrition plays an important role in increasing the yields, especially when roots are unable to provide plants with adequate nutrients. Adsorption of nutrients through foliage is known to affect the plant metabolism faster than their absorption through roots (Bould and Tolhurst, 1952). Foliar application of water soluble fertilizers is designated to eliminate the problems particularly with respect to macro-nutrients.

RESEARCH METHODS

The present investigation on the response of water soluble fertilizers in improving the growth and yield of tomato var. Vaibhav was undertaken at the departmental farm, P.G. centre, University of Horticultural Sciences, Bangalore, during the month of January-2011 to May-2011. The experimental site was located at 12°59' latitude and 77°35' east longitude with an altitude of about 930 above mean sea level (MSL). Soil of the experimental area was red sandy loam (Alfisol) with pH range 6.0 - 6.86. The plot size was 2.8 m × 2.8 m with a population of 16 plants per plot at spacing of 60 cm × 75 cm. The soil of the experimental area had a pH of 6.86 (acidic), available N 327 kg/ha (medium), available P 49.2 kg/ha (medium), available K 283.4 kg/ha (medium). The experiment was carried out in Randomized Completely Block Design with twelve treatments and three replications. Each plot consisted of sixteen plants. This experiment was conducted to test the viability of two new water soluble fertilizer formulations called starter (NPK- 11: 36: 24) and booster (NPK- 8: 16: 39) on tomato. The treatment comprised of water soluble

fertilizers at 3 doses and their combinations along with recommended dose of fertilizers NPK at the rate of 115: 100: 60 kg/ha and FYM @ 25t/ha. Overall six sprays were given at three doses at 15, 30, 45, 60, 75, 90 days after transplanting. NPK (11: 36: 24)/starter was sprayed at 15, 30, 45 days after transplanting and NPK (8: 16: 39)/booster was sprayed at 60, 75, 90 days after transplanting. Combination sprays were also given to higher treatments. The treatment schedule was as follows. Absolute control (T_1); Recommended dose of fertilizers (T_2); RDF along with water spray (T_3); starter at 1 per cent along with RDF (T_4); starter at 1.5 per cent along with RDF (T_5); starter at 2 per cent along with RDF (T_6); booster at 1 per cent along with RDF (T_7); booster at 1.5 per cent along with RDF (T_8); booster at 2 per cent along with RDF (T_9); both starter and booster at 1 per cent along with RDF (T_{10}); both starter and booster at 1.5 per cent along with RDF (T_{11}); both starter and booster at 2 per cent along with RDF (T_{12}). Half N and full P and K of the recommended dose of fertilizers (115:100:60 kg/ha of NPK, respectively) in the form of urea, single super phosphate and muriate of potash were applied prior to transplanting in the furrows. The remaining 50 per cent of N was top dressed twice with split application at 4 weeks and 6 weeks after transplanting and earthing up was done. The variety used in this study was Vaibhav. It is an early maturing variety with high yields and recommended in South India during summer when tomato leaf curl virus is present. It is a vigorous variety having light green shoulder and attractive smooth, oval shaped fruits weighing 90-100 g with admirable red colour having excellent firmness. The observations with regard to growth and yield were recorded from the randomly selected and tagged plants. Observations were recorded on pericarp thickness (mm), cavity diameter (cm), number of locules per fruit, fruit firmness (kg cm^{-2}), titrable acidity (kg), TSS (°Brix), shelf-life (days) and physiological loss in weight (%) and analysed.

Statistical analysis :

The obtained data was analyzed by statistical significant at P<0.05 level, S.E. and C.D. at 5 per cent level by the procedure given by (Panse and Sukhatme, 1994).

RESEARCH FINDINGS AND DISCUSSION

The quality parameters of tomato var. Vaibhav differed significantly with the foliar application of water soluble fertilizers. The treatment with three sprays of starter (NPK 11:36:24) along with three sprays of starter (NPK 8:16:39) and RDF recorded maximum pericarp thickness (7.36 mm). The least pericarp thickness (6.25 mm) was observed in control plot. Increase in the above pericarp thickness can be attributed to application of potassium in water soluble form which resulted in increased fruit size. These results are in agreement with the findings of Anac *et al*. (1995) who observed that foliar application of potassium significantly affects quality in tomato. However, cavity diameter and number of locules per fruit did not show any significant difference between treatments (Table 1).

Maximum TSS (4.33°Brix) and fruit firmness (3.81 kg/cm^2) were observed with the treatment combination

Table 1 : Effect of water soluble fertilizer on pericarp thickness, cavity diameter and number of locules in tomato var. Vaibhav

Treatments	Pericarp thickness (mm)	Number of locules/plant	Cavity diameter (cm)
T_1 :Control	6.25	2.48	2.40
T_2 :RDF	6.30	2.63	2.52
T_3 :RDF + Water spray	6.40	2.64	2.52
T_4 :RDF + NPK (11: 36: 24) at 1 %	6.51	2.60	2.54
T_5 :RDF + NPK (11: 36: 24) at 1.5 %	6.54	2.72	2.56
T_6 :RDF + NPK (11: 36: 24) at 2 %	6.79	2.72	2.57
T_7 :RDF + NPK (8: 16: 39) at 1 %	6.63	2.60	2.58
T_8 :RDF + NPK (8: 16: 39) at 1.5 %	6.86	2.69	2.59
T_9 :RDF + NPK (8: 16: 39) at 2 %	7.14	2.62	2.59
T_{10} :RDF + NPK (11: 36: 24) at 1 % + NPK (8: 16: 39) at 1 %	7.17	2.97	2.63
T_{11} :RDF + NPK (11: 36: 24) at 1 % + NPK (8: 16: 39) at 1 %	7.20	2.70	2.68
T_{12} :RDF + NPK (11: 36: 24) at 2 % + NPK (8: 16: 39) at 2%	7.36	2.84	2.67
S.E. ±	0.18	-	-
C.D. (P=0.05)	0.52	-	-

of both starter and booster at 2 per cent along with RDF (Table 2). Lower value (0.51) with regard to titrable acidity was recorded with 1.5 per cent application of both starter and booster along with RDF. The positive influence of potassium increases the larger uptake of nitrogen, greater synthesis of carbohydrates, vitamins and their translocation to the fruits and sink is responsible for increasing the TSS content, firmness and titrable acidity of the fruit. Similar findings of increased TSS, firmness and titrable acidity due to treatment combinations of micro and macro nutrient foliar applications were recorded by Itoo and Manivannan (2004); Das and Patro (1995) and Bose and Tripathi (1996). The present result is also supported by the reports of Bhatt and Srivastava (2005); Selvi and Perumal (1997) in tomato.

Significant results were Dandagi *et al.* (2011a and b) in soybean and Khyadagi *et al*. (2012) in chilli recorded with respect to physiological loss in weight and shelf-life due to the application of both starter and booster at 2 per cent along with RDF (Table 3). These results are in agreement with the findings of Batra *et al.* (2006) who reported a positive effect on shelf-life in tomato due to foliar sprays of magnesium sulphate and ferrous sulphate. Significantly less physiological loss in weight and an increased shelf-life obtained due to the application of potassium in water soluble form at all the growth stages of the crop. It may also due to the increased pericarp thickness in the above treatment due to the 2 per cent foliar spray of starter and booster along with

Table 2 : Effect of water soluble fertilizer on fruit firmness, titrable acidity and TSS in tomato var. Vaibhav

Treatments	Fruit firmness (kg cm^2)	Titrable acidity (%)	TSS (°Brix)
T_1 : Control	2.96	0.59	3.42
T_2 : RDF	3.14	0.58	3.50
T_3 : RDF + Water spray	3.16	0.58	3.78
T_4 : RDF + NPK (11: 36: 24) at 1 %	3.26	0.58	3.82
T_5 : RDF + NPK (11: 36: 24) at 1.5 %	3.32	0.56	3.88
T_6 : RDF + NPK (11: 36: 24) at 2 %	3.41	0.54	3.91
T_7 : RDF + NPK (8: 16: 39) at 1 %	3.35	0.55	3.88
T_8 : RDF + NPK (8: 16: 39) at 1.5 %	3.44	0.54	3.94
T_9 : RDF + NPK (8: 16: 39) at 2 %	3.50	0.53	4.01
T_{10} : RDF + NPK (11: 36: 24) at 1 % + NPK (8: 16: 39) at 1 %	3.55	0.52	4.13
T_{11} : RDF + NPK (11: 36: 24) at 1 % + NPK (8: 16: 39) at 1 %	3.55	0.51	4.15
T_{12} : RDF + NPK (11: 36: 24) at 2 % + NPK (8: 16: 39) at 2%	3.81	0.52	4.33
S.E. ±	0.02	0.01	0.09
C.D. (P=0.05)	0.06	0.02	0.28

Table 3: Effect of water soluble fertilizer on shelf-life and physiological loss in weight in tomato var. Vaibhav

Treatments	Shelf-life (days)	Physiological loss in weight (%)
T_1 : Control	8.13	41.35
T_2 : RDF	9.03	39.31
T_3 : RDF + Water spray	9.82	38.53
T_4 : RDF + NPK (11: 36: 24) at 1 %	10.31	36.51
T_5 : RDF + NPK (11: 36: 24) at 1.5 %	11.55	35.91
T_6 : RDF + NPK (11: 36: 24) at 2 %	12.25	33.00
T_7 : RDF + NPK (8: 16: 39) at 1 %	11.80	34.92
T_8 : RDF + NPK (8: 16: 39) at 1.5 %	12.97	31.64
T_9 : RDF + NPK (8: 16: 39) at 2 %	13.48	31.37
T_{10} : RDF + NPK (11: 36: 24) at 1 % + NPK (8: 16: 39) at 1 %	13.75	30.28
T_{11} : RDF + NPK (11: 36: 24) at 1 % + NPK (8: 16: 39) at 1 %	13.91	30.22
T_{12} : RDF + NPK (11: 36: 24) at 2 % + NPK (8: 16: 39) at 2%	14.12	28.68
S.E. ±	0.19	0.65
C.D. (P=0.05)	0.57	1.93

RDF.

Among the various concentrations of water soluble fertilizers used, the application of three foliar sprays water soluble fertilizer (NPK 11:36:24) along with three sprays of water soluble fertilizer (NPK 8:16:39) and RDF recorded significant increase in qualitative attributes like pericarp thickness, fruit firmness, titrable acidity, TSS and shelf-life and it significantly reduced the physiological loss in weight. Thus, application of three foliar sprays water soluble fertilizer (NPK 11:36:24) along with three sprays of water soluble fertilizer (NPK 8:16:39) and RDF was found to be highly beneficial for maximising the quality of tomato var. Vaibhav.

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