International Journal of Plant & Soil Science

34(21): 335-342, 2022; Article no.IJPSS.89575
ISSN: 2320-7035

Effect of Foliar Application of Micronutrients on Growth, Yield and Quality of Tomato (*Solanum lycopersicum* L.) cv. Arka Samrat

Himanshu [a*], V. M. Prasad [a], Deepanshu [a] and Akhilesh Kushwaha [a]

[a] Department of Horticulture, Faculty of Agriculture Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, (U.P.), India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJPSS/2022/v34i2131269

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/89575

Original Research Article

Received 05 May 2022
Accepted 11 July 2022
Published 13 July 2022

ABSTRACT

The field experiment was carried out with title "Effect of foliar application of micronutrients on growth, yield and quality of tomato (*Solanum lycopersicum* L.) cv. Arka Samrat" at the Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, Uttar Pradesh during the *Rabi*-2021-22 with a view to determine the effect of foliar application of micronutrients on tomato variety 'Arka Samrat' for its growth, quality and yield and to work out the economics of various treatments. Under this experiment, overall 8 treatment was taken T_1 Control (water spray), T_2 $FeSO_4$ @ 0.2% spray, T_3 $Ca(NO_3)_2$ @ 0.2% spray, T_4 H_3BO_3@0.1% spray, T_5 $ZnSO_4$ @ 0.2% spray, T_6 $FeSO_4$ @ 0.2% + $Ca(NO_3)_2$ @ 0.2% + H_3BO_3 @ 0.1% + $ZnSO_4$ @ 0.2% spray, T_7 $Ca(NO_3)_2$ @ 0.2% + $ZnSO_4$ @ 0.2% spray, T_8 $Ca(NO_3)_2$ @ 0.2% + H_3BO_3@0.1% spray. From the above experimental finding it may be concluded that the treatment T_6 ($FeSO_4$ @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + $ZnSO_4$ @ 0.2%) was found to be best in the terms of growth Yield and quality of tomato. While, the maximum Plant height (167.85 cm), highest No. of leaves per plant (204.33), Minimum Days to 50% flowering (37.33 DAS), Maximum No. of flower per cluster (5.12), Maximum No. of fruit per plant (60.33) and maximum Fruit set per cluster (5.06), Maximum fruit weight (94.22 g), Maximum average yield per plant (5.68 kg), Maximum average yield per plot (34.10), Maximum average yield per hectare (189.43t/ha), Maximum Total soluble solid (5.23), Maximum Ascorbic Acid (26.11).

**Corresponding author: E-mail: 20mshvs041@shiats.edu.in;*

Keywords: Foliar application; micronutrients; H_3BO_3.

1. INTRODUCTION

Tomato, botanically known as *Solanum lycopersicum* L. or *Lycopersicon esculentum* Mill. It is one of the most popular and widely grown vegetable crops throughout the world and is treated as "protective food" universally. It is rich source of vitamins, proteins and minerals and holds a glorious position among vegetable after the potato and sweet potato. Tomato is known as the poor man's apple (orange) in India & love apple in England. Tomato is used as soup, salad, pickles, ketchup, puree, sauces, tomato paste, juice and other products. The pulp and juice of tomato fruit are digestible and a mild aperients, a promoter of gastric secretion and a blood purifier.

Tomatoes are a horticulture crop belongs to the family *Solanaceae* bearing chromosome number 2n=2X=24 [1]. It originated in South America [2]. The tomato plants typically grow to 1–3 meters (3–10 ft) in height and have a weak stem that often sprawls over the ground and vines over other plants. Flowers are generally borne in clusters of 4 to 8 but small-fruited types may have 30 to 50 flowers per cluster. Tomatoes plants are dicots, and grow as a series of branching stems, with a terminal bud at the tip that does the actual growing. Tomato plays a major role in human nutrition, fruit contain 93.1% water, 1.9% protein, 0.3 g fat, 0.7% fibre, 3.6% carbohydrates, 23 calorie, 320 I.U vitamin A, 0.07 mg vitamin B1, 0.01 mg vitamin B2, 31 mg vitamin C, 20 mg calcium, 36 mg phosphorus and 0.8 mg iron. Tomato has valuable vitamins and cholesterol. Approximately 20–50 mg of lycopene per 100g of fruit weight can be obtained from tomatoes. Tomato is a warm-season crop. The best fruit colour and quality are obtained at a temperature range of 21-24°C. Tomato is one of the most versatile crops in the world because of its fast and wide climate adaption and it is universally treated as protective food. Tomato contributes to a healthy, well- balanced diet. They are rich in minerals, vitamins, essential amino acids, sugars, dietary fibres and it has many other uses tomato seed contains 24% oil and used as a salad oil and in the manufacture of margarine [3-7].

India ranks second in Tomato production producing 30.26% of the world's Tomato production first being China and followed by Turkey ranking third in the world [8]. The area under Tomato production in India accounts for 46.72 thousand ha with a production of 34.29 million tonnes in year 2019-20. Andhra Pradesh ranks first in area and production of Tomatoes in the years 2019-20 followed by Madhya Pradesh and Karnataka. In Uttar Pradesh area under production is 0.20 lakhs hectares while production is estimated to be 5.29 million tonnes for the years 2019-20 [9].

1.1 Role of Fertilizer and Micronutrients on Crop Plants

High productive ability of tomato puts tremendous pressure on soil for removal of nutrients. As such liberal application of nutrients is need to meet the nutritional requirements of the corps, however, wake of energy crisis, harmful effect on soil health and ever increasing prices of chemical fertilizer becomes problem before the producers. Therefore, a dire need have been felt to apply fertilizers in more and more amount to fulfil the requirements of crop as well as to nourish the health and fertility status of soil, but should be applied in appropriate doses to reduce imparity of soil [10,11].

Tomato is one of the most important crop and it has a rich economic importance. Micronutrients promote to produce of higher yield and increase harvest quality, maximizing a plant's genetic potential and the presence of micronutrients impacts on root development, fruit setting, plant vigour and health [12-15]. Micronutrients are fundamental for balanced nutrition and a tremendous tool to help farmers in increasing crop yield and quality. This experiment was conducted to help in understanding the "Effect of foliar application of micronutrients on growth, yield and quality of tomato (*Solanum lycopersicum* L.) cv. Arka Samrat.

2. MATERIALS AND METHODS

The area of the Prayagraj district comes under the subtropical belt in the south east of Utter Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46^{o}C-48^{o}C and seldom falls as low as 4^{o}C- 5^{o}C. The relative humidity ranges between 20 to 94%. The average rainfall in this area is around 1013.4 mm annually. However, occasional precipitation is also not uncommon during the winter months.

The experiment was conducted in Randomized Block Design with 8 treatment and three

replications. The treatments were T_0 Control (water spray), T_1 $FeSO_4$ @ 0.2% spray, T_2 $Ca(NO_3)_2$ @ 0.2% spray, T_3 H_3BO_3@0.1% spray, T_4 $ZnSO_4$ @ 0.2% spray, T_5 $FeSO_4$ @ 0.2% + $Ca(NO_3)_2$ @ 0.2% + H_3BO_3 @ 0.1% + $ZnSO_4$ @ 0.2% spray, T_6 $Ca(NO_3)_2$ @ 0.2% + $ZnSO_4$ @ 0.2% spray, T_7 $Ca(NO_3)_2$ @ 0.2% + H_3BO_3@0.1% spray.

3. RESULTS AND DISCUSSION

3.1 Plant Height at 30 DAT

The height of plant significantly varied among different treatment combinations. The maximum plant height (41.98 cm) at 30 DAT was observed with treatment T_6 ($FeSO_4$ @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + $ZnSO_4$ @ 0.2%) followed by T_8 (Calcium nitrate @ 0.2% + H_3BO_3@0.1%) with 37.73 cm. Minimum plant height (28.15 cm) was observed in T1 (control), while the remaining treatments are moderate in their growth habit.

3.2 Plant Height at 60 DAT

The height of plant significantly varied among different treatment combinations. The maximum plant height (91.32 cm) at 60 DAT was observed with treatment T_6 ($FeSO_4$ @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + $ZnSO_4$ @ 0.2%) followed by T_8 ($Ca(NO_3)_2$ @ 0.2% + H_3BO_3@0.1%) with 86.96 cm. Minimum plant height (77.68 cm) was observed in T1 (control), while the remaining treatments are moderate in their growth habit.

3.3 Plant Height at 90 DAT

The height of plant significantly varied among different treatment combinations. The maximum plant height (167.85 cm) at 90 DAT was observed with treatment T_6 ($FeSO_4$ @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + $ZnSO_4$ @ 0.2%) followed by T_8 ($Ca(NO_3)_2$ @ 0.2% + H_3BO_3@0.1%) with 155.41 cm. Minimum plant height (141.11 cm) was observed in T1 (control), while the remaining treatments are moderate in their growth habit.

3.4 Number of Leaves per Plant at 30 DAT

It is evident that the number of leaves per plant was influenced by different treatments at all successive stages of growth. There was significant difference between the treatments at 30 days after planting among the treatments applied, T_6 ($FeSO_4$ @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + $ZnSO_4$ @ 0.2%) with 96.33 increase significantly better Number of leaves per plant followed by T_8 ($Ca(NO_3)_2$ @ 0.2% + H_3BO_3@0.1%) with 91.67 whereas the minimum score was observed in treatment T1 (Control) with 76.67.

3.5 Number of Leaves per Plant at 60 DAT

It is evident that the number of leaves per plant was influenced by different treatments at all successive stages of growth. There was significant difference between the treatments at 60 days after planting among the treatments applied, T_6 ($FeSO_4$ @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + $ZnSO_4$ @ 0.2%) with 144.67 increase significantly better Number of leaves per plant followed by T_8 (Calcium nitrate @ 0.2% + H_3BO_3@0.1%) with 136.67 whereas the minimum score was observed in treatment T_1 (Control) with 129.33.

3.6 Number of Leaves per Plant at 90 DAT

It is evident that the number of leaves per plant was influenced by different treatments at all successive stages of growth. There was significant difference between the treatments at 90 days after planting among the treatments applied, T_6 ($FeSO_4$ @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + $ZnSO_4$ @ 0.2%) with 204.33 increase significantly better Number of leaves per plant followed by T_8 ($Ca(NO_3)_2$ @ 0.2% + H_3BO_3@0.1%) with 200.67 whereas the minimum score was observed in treatment T_1 (Control) with (192.67).

The minimum Days to 50% flowering T_6 ($FeSO_4$ @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + $ZnSO_4$ @ 0.2%) with 37.33 days, followed by T_8 ($Ca(NO_3)_2$ @ 0.2% + H_3BO_3 @0.1%) with 38.33 days whereas maximum Days to 50% flowering 44.67 days was recorded in control.

At harvest time maximum number of flower per cluster 5.12 was recorded in T_6 (Fe SO_4 @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + Zn SO_4 @ 0.2%) followed by 4.84 T_8 ($Ca(NO_3)_2$ @ 0.2% + H3BO_3@0.1%) whereas minimum fruits per cluster 3.92 were found in T_1 (control).

The maximum number of fruits per plants (60.33) were recorded in treatment T_6 (Fe SO_4 @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + Zn SO_4 @

0.2%) followed by T_8 ($Ca(NO_3)_2$ @ 0.2% + H_3BO_3@0.1%) i.e., 57.67 and the lowest number of fruit per plant (50.33) were observed in T_1 (Control).

The maximum number of fruits per plants (5.06) were recorded in treatment T_6 (Fe SO_4 @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H3BO_3 @ 0.1% + Zn SO_4 @ 0.2%) followed by T_8 ($Ca(NO_3)_2$ @ 0.2% + H_3BO_3@0.1%) i.e., 4.61 and the lowest fruit set per cluster (3.90) were observed in T_1 (Control).

The maximum fruits weight (94.22 g) were recorded in treatment T_6 (Fe SO_4 @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + Zn SO_4 @ 0.2%) followed by T_8 ($Ca(NO_3)_2$ @ 0.2% + H_3BO_3@0.1%) i.e., 87.94g and the lowest fruits weight (64.74g) were observed in T_1 (Control).

The maximum average yield per plant (5.68 kg) were recorded in treatment T_6 (Fe SO_4 @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + Zn SO_4 @ 0.2%) followed by T_8 ($Ca(NO_3)_2$ @ 0.2% + H_3BO_3@0.1%) i.e., 5.07 kg and the lowest average yield per plant (3.26 kg) were observed in T_1 (Control).

The maximum average yield per plot (34.10 kg/plot) were recorded in treatment T_6 (Fe SO_4 @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + Zn SO_4 @ 0.2%) followed by T_8 ($Ca(NO_3)_2$ @ 0.2% + H3BO3@0.1%) i.e., 30.42 kg/plot and the lowest average yield per plot (19.55 kg/plot) were observed in T_1 (Control).

The maximum average yield per hectare (189.43 t/ha) were recorded in treatment T_6 (Fe SO_4 @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + Zn SO_4 @ 0.2%) followed by T_8 (Calcium nitrate @ 0.2% + H_3BO_3@0.1%) i.e., 169.01 t/ha and the lowest average yield per hectare (108.63 t/ha) were observed in T1 (Control).

The maximum TSS (5.23 0Brix) was observed in treatment T_6 (Fe SO_4 @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + Zn SO_4 @ 0.2%) followed by T_8 ($Ca(NO_3)_2$ @ 0.2% + H_3BO_3@0.1%) with 4.80 0Brix respectively. The minimum TSS (3.83 0Brix) was noticed in treatment T_1 (Control).

The maximum Ascorbic acid (mg/100 g) (26.11mg) was observed in treatment T_6 (Fe SO_4 @ 0.2% + $(CaNO_3)_{-2}$ @ 0.2%+ H_3BO_3 @ 0.1% + Zn SO_4 @ 0.2%) followed by T_8 (Calcium nitrate @ 0.2% + H3BO_3@0.1%) with 24.30 mg respectively. The minimum Ascorbic acid (17.38 mg) was noticed in treatment T_1 (Control).

4. DISCUSSION

The foliar application of micronutrients might have improved the soil's physical and chemical properties and led to an adequate supply of nutrients to the plants which might have promoted the maximum vegetative growth while the minimum plant growth was due to non-availability of nutrients. Similar findings were reported by Sivaiah et al*.* (2013); Meena et al*.* [16]; Kumar et al*.* [17]; Singh et al*.* [18] and Swetha et al*.* (2018) in tomato.

Integration of organic fertilizers and biofertilizers favoured vigorous growth and synthesized more cytokinins in plants, which might have helped to the translocation of cytokinins as well as more quantity of available phosphorus through the xylem vessels and their accumulation in the axillary buds that would have favoured the plant to enter into reproductive phase [19]. Similar results have also been reported by Singh and Tiwari (2013), Dixit et al*.* [20] and Singh et al., [18].

Nutrients play an important role in improving the productivity and quality of Tomato. The added dose of nitrogen, phosphorus and other essential nutrients increased the vigour of plants, assimilating area and size of fruit, thereby resulting in a higher weight of fruit. These results are in close conformity with the findings of Ali et al*.* [21]; Haleema et al*.* [22]; Satyamurthy et al*.* (2017); Pandiyan et al*.* [23]; Singh et al*.* [18] and Shnain et al*.* [24] as reported in tomato.

Added dose of nitrogen, phosphorus and other essential nutrients increased the vigor of plants, assimilating area, size of fruit, thereby resulting in a higher weight of fruit. These results are in close conformity with the findings of Kazemi (2013); Saravaiya et al*.* (2014); Ali et al*.* [21]; Haleema et al*.* [22]; Satyamurthy et al*.* (2017); Pandiyan et al*.* [23]; Singh et al*.* [18] and Shnain et al*.* [24].

Table 1. Effect of foliar application of micronutrients on plant height, no. of leaves per plant, days to 50 % flowering, number of flowers per cluster, number of fruit per plant

Notation	Treatment	Plant height			No. of leaves per plant			Days to 50 % flowering	Number of flowers per cluster	Number of fruit per plant
		30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT			
T_1	Control	28.15	77.68	141.11	76.67	129.33	192.67	44.67	3.92	50.33
T_2	$FeSO_4$ @ 0.2%	29.80	78.99	145.17	80.67	130.33	194.33	43.67	4.39	51.67
T_3	$Ca(NO_3)_2$ @ 0.2%	31.54	81.75	145.51	83.00	130.67	195.00	42.33	4.33	53.33
T_4	$H3BO_3$@ 0.1%	33.25	83.43	150.03	85.33	132.33	197.00	40.00	4.56	54.67
T_5	$ZnSO_4$ @ 0.2%	34.54	85.66	151.72	87.00	132.33	197.33	39.33	4.39	55.67
T_6	$FeSO_4$ @ 0.2% + $(CaNO_3)_2$ @ 0.2%+ H_3BO_3 @ 0.1% + $Znso_4$ @ 0.2%)	41.98	91.32	167.85	96.33	144.67	204.33	37.33	5.12	60.33
T_7	$CaNO_3$@ 0.2% + $ZnSO_4$@0.2%	35.70	86.89	153.97	89.67	133.33	199.00	39.00	4.84	54.00
T_8	$CaNO_3$@ 0.2% + H_3BO_3@0.1%	37.73	86.96	155.41	91.67	136.67	200.67	38.33	4.55	57.67
	'F' test	S	S	S	S	S	S	S	S	S
	C.V.	1.50	0.45	0.95	1.82	2.09	0.70	3.15	5.40	2.09
	C.D. at 5%	0.90	0.67	2.54	2.77	4.95	2.44	2.26	0.43	2.02
	SE.d(±)	0.42	0.31	1.18	1.28	2.29	1.13	1.05	0.20	0.93

Table 2. Effect of foliar application of micronutrients on fruit set per cluster, average fruit weight, average yield per plant, average yield per hectare, total soluble solid, ascorbic acid

Notation	Treatment	Fruit set per cluster	Average fruit (g)weight	Average Yield kg/per plant	Average Yield kg/per plot	Average Yield per t/hectare	Total soluble solid	Ascorbic Acid
T_1	Control	3.90	64.74	3.26	19.55	108.63	3.83	17.38
T_2	$FeSO_4$ @ 0.2%	4.17	71.26	3.68	22.09	122.71	4.20	18.29
T_3	$Ca(NO_3)_2$ @ 0.2%	4.30	75.57	4.03	24.18	134.34	4.25	19.27
T_4	H_3BO_3@ 0.1%	4.44	78.17	4.27	25.64	142.43	4.28	21.28
T_5	$ZnSO_4$ @ 0.2%	4.33	83.25	4.64	27.80	154.47	4.44	22.23
T_6	$Feso_4$ @ 0.2% + $(CaNO_3)_2$ @ 0.2%+ H_3BO_3 @ 0.1% + $Znso_4$ @ 0.2%)	5.06	94.22	5.68	34.10	189.43	5.23	26.11
T_7	$CaNO_3$@ 0.2% + $ZnSO_4$@0.2%	4.44	85.80	4.63	27.80	154.44	4.78	24.21
T_8	$CaNO_3$@ 0.2% + $H3BO_3$@0.1%	4.61	87.94	5.07	30.42	169.01	4.80	24.30
	'F' test	S	S	S	S	S	S	S
	C.V.	4.09	0.81	1.76	1.80	1.79	3.30	1.95
	C.D. at 5%	0.32	1.14	0.14	0.84	4.66	0.26	0.74
	SE. (d)	0.15	0.53	0.06	0.39	2.15	0.12	0.34

4. CONCLUSION

From the above experimental finding it is concluded that the treatment T6 (Fe SO4 @ 0.2% + (CaNO3)-2 @ 0.2%+ H3BO3 @ 0.1% + ZnSO4 @ 0.2%) was found to be the best in the terms of growth parameters, Yield parameters and quality parameters of Tomato.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Karpechenko GD. Chromosomes of Beetroot. Bulletin Application of Botany. 1925;14:143-148.
2. Vavilov NI. The study of the immunity of plants to infectious diseases. The study of the immunity of plants to infectious diseases; 1935.
3. Anonymous. Horticultural Statistics at a Glance, Horticulture statistics division department of agriculture, cooperation & farmers welfare ministry of agriculture & farmers welfare government of India; 2015.
4. Basavarajeshwari CP, Hosamani RM, Ajjappalavara PS, Naik BH, Smitha RP, Ukkund KC. Effect of foliar application of micronutrients on growth and yield components of tomato (*Lycopersicon esculentum* Mill.). Karnataka Journal of Agricultural Sciences. 2008;21(3):428-430.
5. De Candolle A. Origin of cultivated plants. Hafner Publication Co., New York, (Reprint of 2nd edition; 1959).
6. Directorate of Economics and Statistics, (2020-21) Ministry of Agriculture & Farmers Welfare (DAC & FW), Government of India; 2020-21).
7. Fisher RA, Yates F. Statistical tables for biological, agricultural and medical research. Oliver and Boyd, London. 1963; 143.
8. FAOSTAT; 2020. Available:www.fao.org/faostat/en/data/CC. Food Supply- Crops Primary Equivalent. Visited on 15/12/2021.
9. NHB; 2013. nhb.gov.in/statistics/2013-14. Area and Production of Horticulture Crops- All India. Visited on 08/12/2021.
10. Francis FJ. Encyclopedia of Food Science and Technology. John Wiley and Sons Inc; 2000.
11. Frankel OH, Brown AHD, Burdon JJ. The Conservation of Plant Biodiversity. 2nd ed. Cambridge: Cambridge University Press. 1998;56-78.
12. Gopalan BV, Sastri Rama SC, Balasubramanian KP. Nutritive value of Indian foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India; 2004.
13. Habibullah SN, Saravaiya YN, Tandel SK, Patel BN, Golakiya PD. Effect of foliar application of micronutrients on growth and yield of tomato under protected culture. Trends in Biosciences. 2017;10(14):2491-2495.
14. Kumar NM, Ajay KP, Amin MB. Growth and yield of solanaceous vegetables in response to application of micronutrients – A review. International Journal of Innovative Science, Engineering & Technology. 2017;3(2):611-626.
15. Reddy GPD, Reddy PSR, Chandramohan GR, Thanuja SG. Effect of foliar application of micronutrients on growth and yield parameters in tomato (*Solanum lycopersicon* L.). International Journal Pure Applied Bio-sciences. 2018;6(2):929-934.
16. Meena EC, Maji SJ, Meena K, Govind R, Kumawat KR, Meena SK, Sodh K. Improvement of growth, yield and quality of tomato (*Solanum lycopersicum* L.) cv. Azad T-6 with foliar application of zinc and boron. International Journal of Bio-resource and Stress Management. 2015; 6(5):598-601.
17. Kumar NS, Ahirwar K, Khare AK, Mishra US, Singh D, Jatav R. Effect of micronutrients and bio-fertilizers on yield and yield attributes of tomato. International Journal of Agriculture Sciences. 2016; 8(38):1780-1782.
18. Singh R, Upadhyay AK, Chandra P, Singh DP. Sodium chloride incites reactive oxygen species in green algae Chlorococcum humicola and Chlorella vulgaris: implication on lipid synthesis, mineral nutrients and antioxidant system. Bioresource technology. 2018;270:489-97.
19. Dange SR, Patel RL, Patel SI, Patel KK. Assessment of losses in yield due to powdery mildew disease in mustard under north Gujarat conditions. Journal of Mycology and Plant Pathology. 2002;32(2): 249-50.
20. Dixit A, Dhananjay S, Tinku KS, Pappu LB. Effect of foliar application of some macro and micronutrients on growth and yield of

tomato (*Solanum lycopersicum* L.) cv. Arka Rakshak. International Journal of Current Microbiology and Applied Science. 2018;6: 197-203.

21. Ali MR, Mehraj H, Jamal Uddin AFM. Effects of foliar application of zinc and boron on growth and yield of summer tomato. Journal of Biological and Agricultural Research. 2015;06(01):512 - 517.
22. Haleema B, Abdur R, Hussain AS. Effect of calcium, boron and zinc foliar application on growth and fruit production of tomato. Sarhad Journal of Agriculture. 2017;30(1): 19-30.
23. Pandiyan R, Sathyamurthy VA, Pugalenthi L. Effect of foliar application of micronutrients on growth, and quality of tomato. International Journal of Trend in Scientific Research and Development. 2018;2(4):1988-1992.
24. Shnain FA, Salih AR. Design of Optical Fibers and Calculate their Guided Modes Properties at 1550 nm. In Journal of Physics: Conference Series. 2021;1879(3): 032079). IOP Publishing.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/89575