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Assessing the Effect of Bio Stimulant on Growth, Yield and Quality of Tomato (*Solanum lycopersicum* L.)

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Authors' contributions

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

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ABSTRACT

The field experiment was carried out at Agriculture Research Station, Dr. P.D.K.V., Achalpur Dist. Amravati, Maharashtra, India during the *Rabi* season (September, 2024 to Feburary, 2025) to study the effects of different doses of biostimulant (Max-Size) on growth, yield and quality of tomato. The treatments were T_1 (Control or no spraying of Max-Size and no university recommended fertilizer dose), T_2 (Max-Size – 2.5 ml liter^{-1} of water and university fertilizer dose), T_3 (Max-Size - 5.0 ml liter^{-1} of water and university fertilizer dose), T_4 (Max-Size -7.5 ml liter^{-1} of water and university fertilizer dose) and T_5 (Only 300:150:150 NPK kg ha $^{-1}$). Analysis of variance clearly revealed the significant

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effects of biostimulant with different treatments in respect to growth, yield and quality parameters of tomato. The treatment T_4 (Max-Size– 7.5 ml liter^{-1} of water) showed the highest plant height (93.40 cm), stem girth (2.50 cm), less days to flower (22.00), less days to fruit (31.20), no. of fruits plant^{-1}(83.00), fruit length (5.20 cm), fruit diameter (6.70 cm), fruit weight (88.20 g), shelf life (16.40 days), yield plant^{-1} (1.45 kg) and yield q ha^{-1} (536.50 q ha^{-1}) followed by T_3 (Max-Size - 5 ml liter^{-1} of water) which were at par except shelf life of tomato. Therefore, considering low dose of application, treatment T_3 (Max-Size - 5.0 ml liter^{-1} of water) found best.

Keywords: Biostimulants; max-size; growth yield and quality; tomato.

1. INTRODUCTION

Tomato (*Solanum lycopersicum* L.) is one of the most popular and widely grown vegetable for its richness of vitamins, minerals, organic acids and micronutrients.

Maximum efforts have been made to increase the production by developing large number of high yielding varieties, hybrids, disease resistant varieties grown under protection condition by using different technologies. The excessive and over use of inorganic sources of plant nutrients cause health hazards due to its residual effects in all the plants parts. Ever increasing demand of quality produces from organic sources of biofertilizers, biopesticides and botanical pesticides, growth regulators; biostimulants etc. which do not have any residual effect appears to be most important new tool in increasing the crop yield. Though the tomato has high yield potential and also to address the production gap, different types of bio stimulants are now gaining popular for increasing yield and quality of crops by reducing the production cost to generate extra income. Foliar sprays of bio stimulants enhanced photosynthetic rate, canopy growth, photosynthesis, number of fruit plant^{-1} and fruit yield. Bio stimulants are environment-friendly promising natural products have potential to increase the use efficiency of natural resources even in biotic and abiotic stress conditions and also to reduce the input of agrochemicals. It can also increase the sustainability of agricultural and horticultural production systems as well as improve the quality and quantity of food for the ever-growing world's population (Shahrajabian, et al*.,* 2021).

Max-Size bio stimulant is a certified organic fertilizer for fruit and vegetable growth size rich in fish crude proteins (60 %), fish amino acids (35 %) and organic NPK (2-1-1) (https://yklaboratories.com/). Foliar application is recommended during flowering and different stages of fruiting to enhance quality of produce. It has beneficial effects for improve the sweetness, quality, keeping quality, size, length weigh and shelf life of fruit and vegetables (https://yklaboratories.com/).

Different studies revealed that the foliar application of bio stimulants on tomato plants promotes the vegetative growth, yield and quality. Considering above, the present experiment was framed to study the effects of different doses of bio stimulant Max-Size on growth, yield and quality of tomato.

2. MATERIALS AND METHODS

The field experiment of the present investigation was conducted during the *Rabi* season (September, 2024 to Feburary, 2025) at Agriculture Research Station, Dr. P.D.K.V., Achalpur Dist. Amravati, Maharashtra, India situated at 21^0 18' N latitude and 77^0 30' to 77^0 35' E longitude with an altitude of 375 m above the mean sea level with average rainfall of 814.42 mm (49 RD) following Randomized Complete Block Design with four replications along with five treatments *viz.* T_1 (Control or no spraying of Max-Size and no university recommended fertilizer dose), T_2 (Max-Size – 2.5 ml liter^{-1} of water and university fertilizer dose), T_3 (Max-Size - 5.0 ml liter^{-1} of water and university fertilizer dose), T_4 (Max-Size -7.5 ml liter^{-1} of water and university fertilizer dose) and T_5 (Only 300:150:150 NPK kg ha $^{-1}$) on a gross plot size of 3.60 × 3.60 m^{2}and 1.80 x 3.00 m^2 net plot size with the spacing of 90×30 cm^2 to study the effects of different doses of biostimulant (Max-Size) for growth yield and quality of tomato. The investigation site soil status was pH: 7.62, EC: 0.21 (dSm-1), organic carbon: 0.69 %, available nitrogen: 250.88 kg ha^{-1}, available phosphorus: 16.80 kg ha^{-1} and available potassium: 441.28 kg ha^{-1}. One month old seedlings of SW 1508 (F_1 Hybrid) variety of tomato were transplanted in the field. One spray of biostimulant (Max-Size) was applied at 40 days after transplanting (DAT). The standard

packages of practices were followed for management of the crops. Five plants were randomly selected from each plot to record the observations in respect of growth and yield characters. The data were then analysed statistically (Panse and Sukhatme, 1985).

3. RESULTS AND DISCUSSION

The analyses of variance revealed the significant differences of the treatments for all the characters under the study which amply justified the influences of different doses of biostimulant Max-size in tomato. The effects of various treatments on the important parameters of tomato are presented in the Table 1 discussed hereunder.

The Max-Size treatments had significant influence on growth, yield and quality of tomato as compared to control.

3.1 Growth Characters

Treatment T_4 (Max-Size– 7.5 ml liter^{-1} of water) was recorded significantly highest number of plant height (93.40 cm) and stem girth (2.50 cm). Whereas they are at par with T_3 (Max-Size - 5 ml liter^{-1} of water) treatment to plant height and stem girth.

Similar findings were also reported by Soltys, et al*.* (2012). It is clearly indicated from above fact that biostimulants with various treatments have significant positive role on growth characters specially on plant height due to the presence of different growth promoting substances like fish crude proteins (60 %), fish amino acids (35 %) and organic NPK (2-1-1) which promotes stem elongation by enhancing the cell elongation rate and meristematic activity of growing tip of the plants. All the growth characters have strong positive correlations with flowers and fruits production in plants with the increases of source.

Gudapati, et al*.* (2023) observed that, plant height (71.5, 69.5 cm) was significantly increased by the application of Folicist @ 3.0 ml liter^{-1} and Tata Bahar @ 2.5 ml liter^{-1} compared to other treatments and control.

3.2 Yield and Quality Characters

The earliness in terms of flowering and fruiting is desirable for consumers' point of view and to fetch early market price. Data on days to first flowering and days to first fruiting presented in Table 1 and showed that treatment T_4 (Max-Size – 7.5 ml liter^{-1} of water) needed less number of days to flower and fruit (22.00 and 31.20 days respectively) followed by T_3 which was statistically at par. Whereas, control treatment showed highest number of days to flower and fruits.Stimulating effects of biostimulants enhanced the flowering due to the early completion of vegetative growth of the plants also reported by Ziosi, et al*.* (2012) concluded that biostimulant namely FOLICIST enhanced plant metabolism leading to improved flowering and fruit set of tomato, melon, and cherry. Maach, et al*.* (2021) observed the improving effects of flowering and fruit quality by foliar application of two biostimulants formulation namely Tecamin Flower (TF) and Tecamin Brix (TB). Ruban, et al. (2019) reported the positive effect of biostimulants to days taken for 50% flowering.

Data on yield and quality parameters *viz*. number of fruit plant^{-1}, fruit length (cm), fruit diameter (cm), fruit weight (g), shelf life (days), yield plant^{-1} (kg) and yield q ha^{-1} presented in Table 1 and showed that treatment T_4 (Max-Size – 7.5 ml liter^{-1} of water) exhibited the highest number of fruit plant^{-1}, fruit length (cm), fruit diameter (cm), fruit weight (g), shelf life (days), yield plant^{-1} (kg) and yield q ha^{-1} (83.00, 5.20 cm, 6.70 cm, 88.20 g, 16.40 days, 1.45 kg and 536.50 q ha^{-1} respectively) followed by T_3 (Max-Size - 5 ml liter^{-1} of water) (79.00, 5.00 cm, 6.30 cm, 84.30 g, 15.30 days, 1.30 kg and 481.00 q ha^{-1} respectively) which were statistically identical except shelf life of tomato. Whereas, T_1 (control) treatment showed lowest number of fruit plant^{-1}, fruit length, fruit diameter, fruit weight, shelf life, yield plant^{-1} and yield ha^{-1}. No phytotoxicity was observed with applied concentration as per treatment and also no virus disease reported during trial.

Francesca, et al*.* (2020) found number of fruit increased up to 105.3% with the application of bio stimulants in tomato. Csizinszky, et al*.* (2009) reported that the application of Seaweed-based 'SOAR' bio stimulants, on fresh market tomato cultivars 'Florida 47' increases the marketable yield of fruit by producing the higher number of fruits rather than heavier weight fruit^{-1}. Hernandez, et al*.* (2016) observed the effect of chitosan (CH) and 2,4-epibrasinolide (BRs) in tomato increase the number of fruits which has relation to increase the yield.

Table 1. Effect max-size bio stimulant on growth, yield and quality characters of tomato

Treatment	Treatment specification	Plant height (cm)	Stem girth (cm)	Days to first flowering	Days to first fruiting	No of fruits per plant	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Shelf life (days)	Yield plant^{-1} (kg)	Yield ha^{-1} (q)
T_1	No application of fertilizer and No spraying of Max-Size	58.30	1.90	32.00	46.00	38.00	3.90	4.70	43.00	12.00	0.55	203.50
T_2	Max-Size - 2.5 ml per liter of water and university fertilizer dose	82.50	2.33	26.00	35.60	73.00	4.70	6.20	76.60	13.70	1.10	407.00
T_3	Max-Size - 5.0 ml per liter of water and university fertilizer dose	89.20	2.40	23.00	34.80	79.00	5.00	6.30	84.30	15.30	1.30	481.00
T_4	Max-Size - 7.5 ml per liter of water and university fertilizer dose	93.40	2.50	22.00	31.20	83.00	5.20	6.70	88.20	16.40	1.45	536.50
T_5	Only 300:150:150 NPK kg ha^{-1}	76.10	2.00	26.30	41.20	49.00	4.30	5.40	56.20	13.10	0.95	351.50
	SE (M) ±	2.50	0.08	0.90	0.70	2.27	0.20	0.27	2.08	0.24	0.06	23.82
	CD @ 5%	7.72	0.24	2.78	2.16	6.99	0.61	0.82	6.40	0.74	0.20	73.40
	CV %	6.27	6.88	6.99	3.70	7.04	8.51	9.06	5.96	3.42	12.0	12.04

As the higher fruit weight has direct contribution to the total yield, it indicated that the bio stimulants influences the fruit weight might be due to higher accumulation of photosynthates in fruits. An agreement with other findings reported by Rajasekar, et al. (2021), Caruso, et al. (2019) and Katsenios, et al. (2021) in different bio stimulants other than investigated two.

Effect of bio stimulants on yield plant^{-1} also reported by other researchers like Sharma and Chauhan (2019) and observed that the application of triacontanol @ 1.5 ml liter^{-1} in tomato recorded 3.79 kg fruit yield plant^{-1} and Katsenios, et al. (2021) also observed increased 51.94 % yield plant^{-1} with the use of *Bacillus licheniformis* compared to that of control.

Previous report of Mandour, et al. (2017) also supported the fact of positive effect of biostimulants which influenced the total yield of fruits.

Gudapati, et al. (2023) reported significant increase in terms of number of fruits/plant (42 and 39), fruit weight (105 and 101 g), yield/plant (5.8 and 5.6 kg) by foliar application of Folicist @ 3 ml liter^{-1} closely followed by Tata Bahar @ 2.5 ml liter^{-1} and Daiwik (5.4 kg) and the lowest values were observed in control (3.8 kg).

4. CONCLUSION

The result indicated that, among the various treatments, tomato responded significantly to application of Max-Size bio stimulant. The growth, yield and quality parameters of tomato were conspicuously higher with application of Max-Size bio stimulant as compared to control. Treatment T_4 (Max-Size–7.5 ml liter^{-1} of water) showed higher values but at par with T_3 (Max-Size - 5.0 ml liter^{-1} of water) treatment. Therefore, considering low dose of application, treatment T_3 (Max-Size - 5.0 ml liter^{-1} of water) found best.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author (s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

Caruso, G., De Pascale, S., Cozzolino, E., Cuciniello, A., Cenvinzo, V., Bonini, P., Rouphael, Y., 2019. Yield and nutritional quality of VesuvianPiennolo tomato PDO as affected by farming system and biostimulant application. *Agronomy* 9(9), 505.

Csizinszky, A.A., 2009. Yield response of fresh market tomato cultivars to'soar'biostimulants in consecutive seasons. In proceedings of the 36th annual meeting of the Plant Growth Regulation Society of America, Asheville, North Carolina, USA, 2–6 August 2009, 75–83.

Francesca, S., Arena, C., Hay Mele, B., Schettini, C., Ambrosino, P., Barone, A., Rigano, M.M., 2020. The use of a plant based biostimulant improves plant performances and fruit quality in tomato plants grown at elevated temperatures. *Agronomy* 10(3), 363.

Gudapati Ashoka Chakravarthy, K. Krishna Mohan, D. Saritha, T. Chandrashekhar and Godasu Pradeep Kumar (2023). Effect of Bio-stimulants on Growth, Development and Yield of Tomato (Lycopersicon esculentum L.). Biological Forum – An International Journal, 15(2): 1086-1089.

Hernandez, V., Hellan, P., Fenoll, J., Cava, J., Garrido, I., Molina, M.V., Flores, P., 2016. The use of biostimulants can mitigate the effect of high temperature on productivity and quality of tomato. In VIII International Postharvest Symposium: Enhancing Supply Chain and Consumer Benefits-Ethical and Technological Issues 1194, 85–90.

Katsenios, N., Andreou, V., Sparangis, P., Djordjevic, N., Giannoglou, M., Chanioti, S., Efthimiadou, A., 2021. Evaluation of plant growth promoting bacteria strains on growth, yield and quality of industrial tomato. Microorganisms 9(10), 2099.

Maach, M., Boudouasar, K., Akodad, M., Skalli, A., Moumen, A., Baghour, M., 2021.

Application of biostimulants improves yield and fruit quality in tomato. International Journal of Vegetable Science 27(3), 288–293.

Mandour, M.A., 2017. Effect of irrigation water quantity and some biostimulants on water relationship, water use efficiency and productivity of tomato grown in plastic house. Zagazig Journal of Agricultural Research 44(1), 145–157.

Panse, V.G and P. V. Sukhatme. 1985. Statistical methods for agricultural workers. ICAR. New Delhi.

Rajasekar, R., Ravichandran, L., Babu Rajendra Prasad, V., Sakthivel, N., 2021. Response of organic biostimulants and silicon to growth, yield and quality of tomato under soil salinity conditions. International Journal of Plant & Soil Science 33(23), 41–54. DOI: 10.9734/ijpss/2021/ v33i2330717.

Ruban, S., Priya, M.R., Barathan, G., Suresh Kumar, S.M., 2019. Effect of foliar application of biostimulants on growth and yield of brinjal (*Solanum melongena* L.). Plant Archives 19 (2), 2126–2128.

Shahrajabian, M.H., Chaski, C., Polyzos, N., Petropoulos, S.A., 2021. Biostimulants application: A low input cropping management tool for sustainable farming of vegetables. Biomolecules 11(5), 698.

Sharma, D., Chauhan, A., 2019. Effect of plant growth regulators on yield and quality of tomato (*Solanum lycopersicum* L.) under mid-hill conditions of Himachal Pradesh. International Journal of Bio-resource and Stress Management 10(3), 215–218.

Soltys, D., Rudzińska-Langwald, A., Gniazdowska, A., Wiśniewska, A., Bogatek, R., 2012. Inhibition of tomato (*Solanum lycopersicum* L.) root growth by cyanamide is due to altered cell division, phytohormone balance and expansin gene expression. Planta 236(5), 1629–1638.

Ziosi, V., Zandoli, R., Vitali, F., Di Nardo, A., 2012. Folicist®, a biostimulant based on acetyl-thioproline, folic acid and plant extracts, improves seed germination and radicle extension. In I World Congress on the Use of Biostimulants in Agriculture 1009, 79–82.

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