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Evaluation of bio-efficacy and phytotoxicity of SV size builder on tomato (*Solanum lycopersicum* L.)

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Abstract
A field experiment was conducted to evaluate the bio-efficacy and phytotoxicity of the biostimulant SV SIZE BUILDER on tomato (*Solanum lycopersicum* L.) cv. Arka Rakshak. The product was applied once as a soil drench at 40 days after transplanting (DAT) at rates of 2.5, 5.0, 7.5 and 10.0 L acre^{-1}, alongside control (water drench), recommended dose of fertilizers (RDF) alone and RDF with recommended micronutrients. Application of SV SIZE BUILDER significantly improved morphological parameters (plant height, leaf area, leaf area index), physiological parameters (chlorophyll content) and yield attributes (fruit length, fruit diameter, fruit weight, fruit yield per plant and per hectare). The highest yield (61.75 t ha^{-1}) was recorded with 10.0 L acre^{-1}, representing a 13.43% increase over control (54.44 t ha^{-1}). No phytotoxicity symptoms were observed at any dose. SV SIZE BUILDER proved safe and effective in enhancing growth, yield and nutrient use efficiency in tomato.

Keywords: Biostimulant, SV size builder, tomato, bio-efficacy, phytotoxicity, yield, chlorophyll content and *Solanum lycopersicum*

Introduction
Tomato (*Solanum lycopersicum* L.) is one of the most important solanaceous vegetable crops grown worldwide due to its wide adaptability and versatility in fresh and processed food products. It is a significant source of income for small and marginal farmers and provides essential nutrients, including vitamins, minerals and antioxidants such as vitamin C and carotenoids. Tomato production faces several constraints, including high fertilizer costs, improper nutrient management leading to deficiencies (e.g., blossom end rot), declining soil health due to intensive cultivation and residue removal and susceptibility to pests and diseases. These factors increase cultivation costs and reduce yield, quality, shelf life and nutritional value.

Biostimulants have emerged as a sustainable solution to mitigate these challenges by enhancing nutrient efficiency, stimulating plant growth and improving tolerance to biotic and abiotic stresses. They contain substances such as humic acids, phytohormones, seaweed extracts and plant growth-promoting microbes that, even at low concentrations, promote vital plant processes and improve yield and quality (du Jardin, 2015) [2]. Previous studies have reported positive effects of biostimulants on tomato growth, yield and stress tolerance (Anbukkarasi *et al*., 2012; Sani *et al*., 2022; Elsadek, 2015) [1, 6, 3]. The present study was conducted to evaluate the bio-efficacy, phytotoxicity and impact on yield and quality of a novel biostimulant, SV SIZE BUILDER, applied as a single soil drench in tomato.

Materials and Methods
A field experiment was conducted from December 2023 to May 2024 at Zonal Agricultural and Horticultural Research Station (ZAHRS), Navile, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga, Karnataka, India (13°58′ N latitude, 75°34′ E longitude, 650 m altitude; Agro-climatic Zone VII, Southern Transitional Zone).

Soil characteristics

The experimental soil was sandy loam (Typic Haplustalf), slightly acidic, with normal electrical conductivity, medium organic carbon, low available nitrogen and phosphorus, medium available potassium, sufficient exchangeable calcium and magnesium, medium available sulphur, high iron, copper and manganese and low zinc (Table.1).

Table 1: Soil characteristics of the experimental site

Sl. No.	Particulars	Values	
I. Physical properties: Mechanical analysis			
Soil separates in percent			
1.	Sand	82.8 %	
2.	Silt	8.3 %	
3.	Clay	8.9 %	
4.	Soil texture	Red Sandy loam	
II. Chemical properties			
1.	Soil pH	6.25	Slightly Acidic
2.	EC (dSm^{-1}at 25ºC)	0.17	Normal
3.	Organic Carbon (g kg^{-1})	3.62	Medium
4.	Available Nitrogen (kg ha^{-1})	219.52	Low
5.	Available Phosphorus (kg ha^{-1})	80.54	Low
6.	Available Potassium (kg ha^{-1})	225.79	Medium
7	Exchangeable Calcium[cmol(p^{+}) kg^{-1}]	1.80	Sufficient
8	Exchangeable Magnesium [cmol(p^{+}) kg^{-1}]	0.92	Sufficient
9	Available Sulphur (ppm)	17.1	Medium
10	Zinc (ppm)	1.44	Low
11	Iron (ppm)	14.48	High
12	Copper (ppm)	0.84	High
13	Manganese (ppm)	8.27	High

Climatic conditions: During the cropping period, total rainfall was 288.8 mm (higher than the 30-year average of 163.9 mm), with warmer days and cooler nights compared to normal Table 2a & Table 2b.

Treatments and experimental design

The experiment was laid out in a randomized block design with three replications and seven treatments:

- T_1: Control (water drench)
- T_2: SV SIZE BUILDER @ 2.5 L $acre^{-1}$
- T_3: SV SIZE BUILDER @ 5.0 L $acre^{-1}$
- T_4: SV SIZE BUILDER @ 7.5 L $acre^{-1}$
- T_5: SV SIZE BUILDER @ 10.0 L $acre^{-1}$
- T_6: RDF + recommended micronutrients
- T_7: RDF alone

SV SIZE BUILDER was applied once as soil drench at 40 days after transplanting (DAT). Recommended dose of fertilizers (RDF: 250:250:250 kg ha^{-1} N:P_2O_5: K_2O) and farmyard manure (25 t ha^{-1}) were applied uniformly to all plots.

Table 2a: Meteorological data from December 2023 to May 2024 (crop growth period) comprising monthly normal (30 years average), actual and deviation from the normal at ZAHRS, Shivamogga

Month	Total rainfall (mm)			Number of rainy days (days)			Maximum temperature (ºC)			Minimum temperature (ºC)		
	N	A	D	N	A	D	N	A	D	N	A	D
December - 23	10.5	0.0	-10.5	1	0	-1.0	30.0	30.8	0.8	17.7	17.6	-0.1
January - 24	1.9	10.0	8.1	0	2	2.0	31.2	31.4	0.2	16.8	15.1	-1.7
February - 24	1.6	0.0	-1.6	0	0	0.0	33.4	34.6	1.2	17.5	16.4	-1.1
March - 24	11.2	0.0	-11.2	0	0	0.0	35.7	36.1	0.4	20.7	18.1	-2.6
April - 24	55.8	51.8	-4.0	3	2	-1.0	36.3	37.3	1.0	22.1	20.7	-1.4
May - 24	82.9	227.0	144.1	4	9	5.0	34.6	34.2	-0.4	22.6	22.4	-0.2
Total	163.9	288.8	124.9	8	13	5.0	----	-----	----	----	----	----

N - Normal meteorological data (1993-2023) A - Actual meteorological data (Cropping Period) D-Deviation from the Normal (A-N)

Table 2b: Meteorological data from December 2023 to May 2024 (crop growth period) comprising monthly normal (30 years average), actual and deviation from the normal at ZAHRS, Shivamogga

Month	Relative humidity (%)			Wind speed (km hr^{-1})			Sunshine hours (hr day^{-1})			Evaporation (mm/day)		
	N	A	D	N	A	D	N	A	D	N	A	D
December - 23	64	74	10.0	4.3	4.0	-0.3	8.2	7.4	-0.8	5.0	4.5	-0.5
January - 24	60	67	7.0	3.9	4.5	0.6	8.9	9.6	0.7	5.1	5.3	0.2
February - 24	57	54	-3.0	4.7	3.8	-0.9	9.0	9.8	0.8	5.7	6.1	0.4
March - 24	54	52	-2.0	4.8	4.2	-0.6	6.8	8.6	1.8	6.4	6.9	0.5
April - 24	60	51	-9.0	5.7	4.9	-0.8	8.1	8.9	0.8	6.4	7.6	1.2
May - 24	66	65	-1.0	6.4	5.8	-0.6	7.3	6.9	-0.4	5.7	4.8	-0.9
Total	----	----	----	----	----	----	----	-----	----	----	----	----

N - Normal meteorological data (1993-2023) A - Actual meteorological data (Cropping Period) D-Deviation from the Normal (A-N)

Crop management
Twenty-five to thirty-day-old seedlings of tomato hybrid Arka Rakshak (triple disease-resistant to leaf curl virus, bacterial wilt and early blight; fruit weight 90-100 g; yield potential 75-80 t ha^{-1}) were transplanted at 90 × 60 cm spacing. Standard cultural practices including Intercultivation, staking, irrigation (twice weekly), weed control and plant protection (against serpentine leaf miner, whiteflies, powdery mildew and blossom end rot) were followed uniformly.

Observations and analytical methods
Morphological parameters (plant height, number of branches, leaf area, leaf area index), physiological parameters (chlorophyll a, b and total content using DMSO method, yield components (days to 50% flowering, flowers per cluster, fruit dimensions, fruit weight, number of fruits per plant, yield per plant/plot/hectare) and phytotoxicity (visual symptoms on 0-10 scale at 1, 3, 5, 7 and 10 days after application) were recorded using standard procedures. Soil samples were analysed before transplanting and after harvest.

Statistical analysis
Data were subjected to analysis of variance and treatment means compared at P = 0.05 (Gomez and Gomez, 1984) [4].

Results and Discussion
Morphological parameters: SV SIZE BUILDER significantly increased plant height, leaf area and leaf area index (LAI) at later stages (Table 4). At 80 DAT, highest plant height (98.7 cm), leaf area (6845 cm^2) and LAI (1.268) were recorded with 10.0 L $acre^{-1}$. These enhancements are attributed to stimulated cell division and expansion by biostimulant components (Anbukkarasi *et al*., 2012) [1].

Physiological parameters
Chlorophyll a, b and total contents were significantly higher at 80 DAT (Table 5), with maximum total chlorophyll (2.471 mg g^{-1} fresh weight) at 10.0 L $acre^{-1}$, indicating improved nitrogen assimilation and photosynthetic efficiency (Sani *et al*., 2022) [6].

Yield and yield components
Days to 50% flowering and flowers per cluster were non-significant, though slight improvements were observed in treated plots. Fruit length, diameter and weight were significantly higher with SV SIZE BUILDER. Highest fruit yield per hectare (61.75 t ha^{-1}) was obtained with 10.0 L $acre^{-1}$ (13.43% over control), followed by 7.5 L $acre^{-1}$ (60.06 t ha^{-1}) and 5.0 L $acre^{-1}$ (58.65 t ha^{-1}) (Table 6). Yield increases are linked to enhanced photosynthate translocation and sink strength (Murtić *et al*., 2018; Elsadek, 2015) [5, 3].

Soil properties after harvest
No adverse changes in soil chemical properties were observed (Table 7). Slight nutrient declines in treated plots indicate improved nutrient uptake efficiency.

Table 4: Morphological parameters as influenced by application of SV SIZE BUILDER (soil drenching) at 40 DAT^+ on tomato

Treatment & Dosage	Plant height (cm)			Number of Branches (number)			Leaf area (cm^2)			LAI		
	30*	50**	80**	30	50	80	30	50	80	30	50	80
	Days after transplanting											
T_1: SV SIZE BUILDER @ 2.5 L $acre^{-1}$	37.3	67.1	89.0	6.3	18.7	21.7	638	3808	6538	0.118	0.705	1.211
T_2: SV SIZE BUILDER @ 5.0 L $acre^{-1}$	39.6	72.5	98.7	6.7	19.0	22.3	672	3947	6784	0.124	0.731	1.256
T_3: SV SIZE BUILDER @ 7.5 L $acre^{-1}$	36.2	69.4	95.6	6.0	19.0	21.7	565	3921	6692	0.105	0.726	1.239
T_4: SV SIZE BUILDER@ 10.0 L $acre^{-1}$	36.9	68.9	93.2	6.3	18.7	22.7	615	3830	6845	0.114	0.709	1.268
T_5: Untreated control	38.3	68.3	87.5	6.3	17.7	20.3	597	3653	6374	0.111	0.676	1.180
S. Em. ±	1.26	1.9	2.74	0.23	0.48	0.82	38.5	72.8	105.3	0.006	0.017	0.026
C.D. (5%)	NS	NS	7.92	NS	NS	NS	NS	210.4	304.3	NS	0.049	0.075

DAT^+ - Days after transplanting 30* - Before treatment imposition 50** - 10 days after application 80***- 40 days after application

Table 5: Physiological parameters as influenced by application of SV SIZE BUILDER (soil drenching) at 40 DAT^+ on tomato

Treatment & Dosage	30 DAT*			50 DAT**			80 DAT**		
	Chl 'a'	Chl 'b'	Total Chl	Chl 'a'	Chl 'b'	Total Chl	Chl 'a'	Chl 'b'	Total Chl
	($mg^{-1}g$ leaf fr.wt.)								
T_1: SV SIZE BUILDER@ 2.5 L $acre^{-1}$	1.142	0.415	1.557	1.397	0.504	1.901	1.580	0.609	2.189
T_2: SV SIZE BUILDER@ 5.0 L $acre^{-1}$	1.088	0.376	1.464	1.383	0.484	1.867	1.654	0.646	2.300
T_3: SV SIZE BUILDER@ 7.5 L $acre^{-1}$	1.127	0.425	1.552	1.415	0.509	1.924	1.720	0.689	2.409
T_4: SV SIZE BUILDER@ 10.0 L $acre^{-1}$	1.115	0.403	1.518	1.406	0.510	1.916	1.757	0.714	2.471
T_5: Untreated control	1.109	0.395	1.504	1.354	0.458	1.812	1.445	0.568	2.013
S. Em. ±	0.020	0.017	0.034	0.021	0.019	0.042	0.062	0.026	0.091
C.D. (5%)	NS	NS	NS	NS	NS	NS	0.179	0.075	0.263

DAT^+ - Days after transplanting 30* - before treatment imposition 50** - 10 days after application 80*** - 40 days after application

Table 6: Days to 50 percent flowering, flowers per cluster, yield and yield components as influenced by application of SV SIZE BUILDER (soil drenching) at 40 DAT^+ on tomato

Treatment & Dosage	Days to 50 percent flowering	Flowers per cluster	Fruit length	Fruit diameter	Fruit weight	Fruits per plant	Fruit yield per plant	Net plot yield	Fruit yield
	days	number	(mm)	(mm)	(gm)	(number)	(kg)	(kg)	(t ha^{-1})
T_1: SV SIZE BUILDER @ 2.5 L $acre^{-1}$	39.0	3.3	48.4	43.0	98.5	49.3	4.66	48.90	56.60
T_2: SV SIZE BUILDER @ 5.0 L $acre^{-1}$	39.7	3.7	51.5	44.3	100.4	47.8	4.62	50.67	58.65
T_3: SV SIZE BUILDER @ 7.5 L $acre^{-1}$	38.3	3.7	53.7	44.5	103.2	47.5	4.77	51.89	60.06
T_4: SV SIZE BUILDER @ 10.0 L $acre^{-1}$	40.0	3.7	55.4	45.8	105.3	48.7	4.98	53.35	61.75
T_5: Untreated control	38.7	3.3	46.2	41.7	93.7	50.5	4.53	47.04	54.44
S. Em. ±	0.55	0.15	1.73	1.12	1.57	1.08	0.04	1.07	1.35
C.D. (5%)	NS	NS	5.35	3.24	4.54	NS	0.12	3.09	3.95

DAT^+ - Days after transplanting

Table 7: Effect of application of SV SIZE BUILDER (soil drenching) at 40 DAT^+ on soil chemical properties and nutrient status after crop harvest

Sl. No.	Particulars	Initial	Final
1.	Soil pH	6.25	6.33
2.	EC (dSm^{-1}at 25°C)	0.17	0.14
3.	Organic Carbon (g kg^{-1})	3.62	3.60
4.	Available Nitrogen (kg ha^{-1})	219.52	200.60
5.	Available Phosphorus (kg ha^{-1})	80.54	73.14
6.	Available Potassium (kg ha^{-1})	225.79	197.88
7	Exchangeable Calcium[cmol(p^+) kg^{-1}]	1.80	1.58
8	Exchangeable Magnesium [cmol(p^+) kg^{-1}]	0.92	0.85
9	Available Sulphur (ppm)	17.1	16.0
10	Zinc (ppm)	1.44	1.26
11	Iron (ppm)	14.48	12.62
12	Copper (ppm)	0.84	0.75
13	Manganese (ppm)	8.27	7.92

DAT^+ - Days after transplanting

Phytotoxicity

No phytotoxicity symptoms (chlorosis, necrosis, wilting, epinasty/hyponasty, scorching) were observed at any dose (score = 0), confirming safety.

Conclusion

Single soil drench application of SV SIZE BUILDER at 40 DAT significantly enhanced morphological, physiological and yield parameters of tomato without phytotoxicity. The highest dose (10.0 L $acre^{-1}$) gave maximum yield (61.75 t ha^{-1}). The product improved nutrient use efficiency and is recommended as a safe biostimulant complement to RDF for sustainable tomato production.

Competing Interests

The authors declare no competing interests.

Authors' Contributions

RNS and GM designed the study, performed statistical analysis, wrote the protocol and first draft. KSM and SJK managed field and laboratory analyses. JKA and NBK managed literature searches. All authors read and approved the final manuscript.

Ethical Approval

Not applicable.

References

1. Anbukkarasi V, Prabu M, Paramaguru P, Sridhar M. Effect of nutrients and biostimulants on growth, yield and quality of tomato (*Solanum lycopersicum*). Asian J Hortic. 2012;7(1):1-5.
2. du Jardin P. Plant biostimulants: definition, concept, main categories and regulation. Sci Hortic. 2015;196:3-14.
3. Elsadek MA. Effect of biostimulants on growth and yield of tomato (*Lycopersicon esculentum* Mill.) under salinity conditions [master's thesis]. Cairo (Egypt): Faculty of Agriculture, Al-Azhar University; 2015.
4. Gomez KA, Gomez AA. Statistical procedures for agricultural research. New York: John Wiley & Sons; 1984.
5. Murtić S, Ilić ZS, Kevrešan Ž. Biostimulant prevents yield loss and reduces oxidative damage in tomato plants grown on reduced NPK nutrition. PLoS One. 2018;13(8):e0201526.
6. Sani MNH, Islam MN, Uddain J, Subramaniam S. Synergistic effect of microbial and nonmicrobial biostimulants on growth, yield and nutritional quality of organic tomato. Front Plant Sci. 2022;13:862108.