Plant Archives Vol. 26, Supplement 2, 2026 pp. 1628-1631 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2026.v26.supplement-2.197

EFFECT OF DIFFERENT BIOSTIMULANT FORMULATIONS ON GROWTH, YIELD AND QUALITY OF TOMATO

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(Date of Receiving : 22-03-2026; Date of Revision : 26-04-2026; Date of Acceptance : 29-05-2026)

ABSTRACT

A field experiment was conduct at Horticulture Research Farm of Faculty of Agriculture, Kamla Nehru Institute of Physical & Social Sciences, Sultanpur, Uttar Pradesh during the rabi season of 2024-2025 to study the effect of different biostimulant formulations on the growth, yield and quality of tomato. Two tomato cultivars (Namdhari NS 585 and Kashi Adarsh) were treated against three biostimulant formulations (Beejamrit, Jeevamrit and Ghanjeevamrit) under natural farming. The experiment was laid out in factorial randomized block design with eight treatments and three replications. The results revealed that application of biostimulant formulations has influence on the growth, yield and quality attributes of tomato cultivars among the treatments. Data revealed that Namdhari NS 585 is superior in yield and yield attributing characters. Among all the biostimulant formulations jeevamrit performed better as compared to control and other formulations. Namdhari NS 585 treated with jeevamrit influence the yield and yield attributing traits i.e., number of primary branches, number of flowers per cluster, fruit equatorial diameter, average fruit weight, fruit yield per plot and fruit yield per hectare. Likewise, Kashi Adarsh treated with jeevamrit has major influence on biochemical parameters particularly on ascorbic acid, reducing sugar, non-reducing sugar, total sugar and fruit juice.
Keywords **:** Biostimulant, Natural Farming, Jeevamrit, Tomato.

Introduction

Tomato (*Lycopersicon esculentum* L.) is one of the most widely cultivated and economically important vegetable crop in the world. It is extremely important vegetable not only for international consumption but also as highest foreign exchange earner among the fruits and vegetables. Tomato occupies maximum area after potato and onion and a heavy feeder crop and its production and productivity is completely based on chemical fertilizers which has a negative impact on soil and environment. However, organic cultivation of tomato is promoted every year but availability of organic fertilizers in huge amount is not possible for crops which are grown in a vast area and if availability is possible then it cost heavily. Natural farming is another best option to cultivate tomato, without impacting soil and environment, and shift slowly by using the principles of natural farming. Biostimulant formulations like Beejamrit, Jeevamrit and Ghanjeevamrit are important pillars of natural farming as they enhance the soil microbial environment which in turn makes the soil living and increases the availability of several mineral nutrients required for the growth and development of a plant. We need to find a sustainable agriculture practices especially for crops grown on large scale that doesn't jeopardize our fight against hunger and poverty while also focuses on environment conservation for future (Dev *et al*, 2022).

Materials and Methods

A field experiment was conduct at Horticulture Research Farm of Faculty of Agriculture, Kamla Nehru Institute of Physical &Social Science, Sultanpur, Uttar Pradesh during rabi season of 2024- 2025 to study the effect of different biostimulant formulations on growth, yield and quality of tomato. The experiment was laid out in factorial randomized block design and replicated

thrice having two tomato cultivars (Namdhar NS 585 and Kashi Adarsh) as one factor and three biostimulant formulations; Beejamrit, Jeevamrit and Ghanjeevamrit alongwith control as another factor. Treatment combinations were: V1B0 Control (Namdhari585 + no application), V1B1 (Namdhari585 + Beejamrit), V1B2 (Namdhari NS 585 +Jeevamrit), V1B3 (Namdhari NS 585 + Ghanjeevamrit), V2B0 Control (Kashi Adarsh + no application), V2B1 (Kashi Adarsh + Beejamrit), V2B2 (Kashi Adarsh + Jeevamrit) and V2B3 (Kashi Adarsh + Ghanjeevamrit). Beejamrit (liquid) was applied as seedling treatment. Jeevamrit (liquid) are applied as plant treatment at 10 days interval. Ghanjeevamrit (dry form) applied in soil at 10 days interval. Tomato seeds were grown in nursery and transplanted in field after four weeks of sowing. Data were recorded on vegetative and yield parameters *viz.* plant height (cm) at 30,60 and 90 days, number of primary branches, days of first flowering, number of flowers per cluster, total number of flower clusters, fruit polar diameter (cm), fruit equatorial diameter (cm), average fruit weight (g), fruit yield per plot (kg), fruit yield per hectare (t/ha) and biochemical parameters *viz.* total soluble solids (^{o}Brix), total acidity (%), ascorbic acid (mg/100 ml), reducing sugar (%), non-reducing sugar (%), total sugar (%), fruit juice (%) and pomace (%).

Results and Discussion

Result revealed that variety V1 (Namdhari NS 585) reflects higher values for plant height at 30 DAT (49.29 cm), 60 DAT (82.91 cm), number of primary branches (7.71), days to first flowering (26.25), number of flowers per cluster (5.08), fruit equatorial diameter (3.83 cm), average fruit weight (66.98 g), fruit yield per plot (6.86 kg) and fruit yield per hectare (34.53 t) while maximum plant height at 90 DAT (107.75 cm), total number of flower clusters (57.48) and fruit polar diameter (3.05 cm) was measured in V2 (Kashi Adarsh) (Table 1). Likewise, maximum TSS (3.33 ^{o}Brix), ascorbic acid (23.49 mg/100 ml), reducing sugar (3.30 %) non reducing sugar (0.16%), total sugar (3.39 %), fruit juice (51.63 %) and pomace (39.21 %) was recorded in V2 (Kashi Adarsh) while maximum titrable acidity (0.24%) was observed in V1 (Namdhari NS 585) (Table 2).

Among different biostimulant formulations B2 (Jeevamrit) is found superior for the vegetative parameters like plant height at 30 DAT (56.15 cm), 60 DAT (85.76 cm) and 90 DAT (111.15cm), number primary branches (8.20), minimum days to first flowering (23.16), number of flowers per cluster (5.85), total number of flower clusters (58.68), fruit equatorial diameter (4.08 cm), average fruit weight (71.43g) fruit yield per plot (7.47 kg) and fruit yield per hectare (37.36 t) while maximum fruit polar diameter (3.21 cm) was recorded in B1 (Beejamrit) (Table 1). This might be due to application of Jeevamrit which significantly boosted the levels of chlorophyll a, chlorophyll b, and carotenoids, resulting in enhanced photosynthetic efficiency (Uma Maheswari *et al.*, 2024). Application of Jeevamrit was found to increase yield of capsicum (Boraiah *et al*., 2017). The beneficial microorganisms present in 3.5 t/h Ghanjeevamrit + Jeevamrit 30% may have increased the organic matter decomposition which resulted in the easy uptake of available nutrients by the plants which led to better growth and increased number of branches per plant. These findings are in agreement with Adhikari *et al.* (2016) who revealed that the use of Ghanjeevamrit + jeevamrit advanced days to first harvest in capsicum. Similarly, there was a significant difference was analysed among bio formulations for biochemical parameters. Biostimulant formulation B2 (Jeevamrit) performed better for TSS (3.66 ^{o}Brix), titrable acidity (0.22 %), ascorbic acid (25.96 mg/100ml), reducing sugar (3.66 %), non-reducing sugar (0.18 %), total sugar (3.78 %), fruit juice (57.89 %) and pomace (44.38 %) (Table 2). The application of the Ghanjeevamrit and jeevamrit modified the nutrient uptake by the plants which led to increase in the ascorbic acid content. Another reason could be the increased efficacy of micro-organisms which led to secretion of various growth promoting substances that hastened the physiological processes like synthesis of carbohydrates and biochemical activities (Chattoo *et al.*, 1997)

The data represent that there is no significant difference was observed in interaction effect between two varieties and different biostimulant formulations on vegetative and yield attributes of tomato compared to control (Table 1). However, the data revealed that maximum plant height at 30, 60 and 90 days are (57.06), (88.80) and (114.41 cm), respectively, total number flower clusters (61.60) and minimum days to first flowering (22.66) were recorded in V2B2 (Kashi Adarsh applied with Jeevamrit) while maximum number of primary branches (8.33), number of flowers per cluster (6.86), fruit equatorial diameter (4.33 cm) average fruit weight (73.26 g), fruit yield per plot (7.67 kg) and fruit yield per hectare (38.36 t/ha) were recorded in V1B2 (Namdhari NS 585 treated with jeevamrit) and maximum fruit polar diameter (3.40 cm) in V1B1 (application of beejamrit in Namdhari NS 585). It may be due to the beneficial effects of jeevamrit which was attributed to huge quantity of microbial population and growth hormones which might have enhanced the soil biomass thereby

sustaining the availability and uptake of applied as well as native soil nutrients which ultimately resulted in better growth and yield. Likewise, there is no significant difference were observed for biochemical parameters, however, data depicted in Table 2 shows that highest values for titrable acidity (0.27%), and pomace (46.18 %) were analysed in V1B2 (Namdhari NS 585 treated with jeevamrit) and maximum ascorbic acid (26.00 mg/100 ml) reducing sugar (3.66 %), non reducing sugar (0.19 %), total sugar (3.85 %) and fruit juice (62.57%) was recorded in V2B2 (Kashi Adarsh applied with Jeevamrit). However, maximum TSS (3.66 ^{o}Brix) was observed in V1B2 (Namdhari NS 585 treated with jeevamrit), V2B1 (Kashi Adarsh applied with Beejamrit) and V2B2 (Kashi Adarsh applied with Jeevamrit). Enhanced mobility of photosynthates from the source to the sink led to increase in the metabolism of carbohydrates might have resulted in higher total soluble solids, and sugar synthesis. This result was in conformity with the findings of Pal *et al.* (2015), Meena *et al.* (2014).

Conclusion

It can be concluded from the above experiment that all the biostimulant formulations particularly jeevamrit has influence, however not significant, on the growth, yield and biochemical attributes. Significant impact could be seen after long term adoption of natural farming practices. Future research must focus on modification in soil's biotic and abiotic health along with crop production and productivity.

Table 1: Effect of Different Biostimulant Formulations on Vegetative and Yield Parameters of Tomato Cultivars.

Treatments \ Parameters		Plant height (cm) at 30 days	Plant height (cm) at 60 days	Plant height (cm) at 90 days	Number of primary branches	Days to first flowering	Number of flowers per cluster	Total Number of flower clusters	Fruit Polar diameter (cm)	Fruit equatorial diameter (cm)	Fruit yield per plot	Fruit yield per ha (tons)
Varieties												
(V1) Namdhari NS 585		49.29	82.91	103.56	7.71	26.25	5.08	56.76	3.03	3.83	6.86	34.53
(V2) Kashi Adarsh		48.31	80.26	107.75	7.50	27.08	3.96	57.48	3.05	3.72	5.27	33.88
C.D		N/A	N/A	3.13	N/A	N/A	1.09	N/A	N/A	N/A	0.69	N/A
SE(d)		3.32	1.93	1.44	0.34	1.25	0.50	2.82	0.11	0.20	0.31	1.59
SE (m)		2.35	1.36	1.02	0.24	0.87	0.35	1.99	0.08	0.14	0.22	1.13
Bio formulations												
(B0) Control		35.90	78.93	94.73	6.80	30.66	3.33	48.76	2.68	2.93	5.94	29.43
(B1) Beejamrit		51.13	81.13	109.17	7.76	27.33	4.27	56.16	3.21	4.03	7.03	35.15
(B2) Jeevamrit		56.15	86.76	111.15	8.20	23.16	5.85	58.68	3.15	4.08	7.47	37.36
(B3) Ghanjeevamrit		52.03	79.53	107.58	7.66	26.33	4.63	56.70	3.13	4.06	6.86	34.38
C.D		10.19	5.92	4.42	N/A	N/A	1.54	N/A	0.35	0.62	0.97	4.89
SE (d)		4.70	2.73	2.04	0.48	1.73	0.17	3.99	0.16	0.28	0.45	2.26
SE (m)±		3.32	1.93	1.44	0.34	1.23	0.50	2.82	0.11	0.20	0.31	1.59
Interaction effect												
(V1) Namdhari (NS)585	(B0) Control	40.66	82.93	94.90	6.86	28.00	3.56	49.00	2.46	2.90	6.06	31.36
	(B1) Beejamrit	50.13	85.60	106.21	8.20	25.66	4.36	55.13	3.40	3.96	6.98	34.90
	(B2) Jeevamrit	55.23	84.73	107.88	8.33	23.66	6.86	56.13	3.20	4.33	7.67	38.36
	(B3) Ghanjeevamrit	51.13	78.40	105.56	7.46	27.66	5.53	53.86	3.06	4.13	7.10	35.50
V2 Kashi Adarsh	(B0) Control	31.13	74.93	94.56	6.73	33.33	3.10	48.23	2.90	2.96	5.83	27.50
	(B1) Beejamrit	52.13	76.66	112.13	7.33	29.00	4.18	57.20	3.03	3.83	7.08	35.40
	(B2) Jeevamrit	57.06	88.80	114.41	8.06	22.66	4.39	61.60	3.10	4.10	7.27	36.36
	(B3) Ghanjeevamrit	52.93	80.66	109.90	7.86	25.00	3.37	57.26	3.20	4.00	6.85	34.26
C.D		N/A	NA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SE (d)		6.65	3.86	2.89	0.69	2.46	1.00	5.64	0.22	0.40	0.63	3.19
SE (m)±		4.70	2.73	2.04	0.48	1.74	0.71	3.99	0.16	0.28	0.45	2.26

Table 2: Effect of Different Biostimulant Formulations on Biochemical Attributes of Tomato Cultivars.

Treatment / **Parameter**	**Average fruit weight (g)**	**TSS (^{o}Brix)**	**Titrable Acidity (%)**	**Ascorbic acid (mg/100 ml)**	**Reducing sugar (%)**	**Non reducing sugar (%)**	**Total sugar (%)**	**Fruit juice (%)**	**Pomace (%)**
Varieties									
(V1) Namdhari NS 585	66.98	2.91	0.24	22.91	3.11	0.14	3.31	50.97	38.69
(V2) Kashiadarsh	64.96	3.33	0.13	23.49	3.30	0.16	3.39	51.63	39.21
C.D	N/A	N/A	0.08	N/A	N/A	N/A	N/A	N/A	N/A

SE(d)		3.40	0.22	0.03	1.06	0.22	0.02	0.22	3.99	1.70
SE (m)		2.40	0.16	0.02	0.76	0.15	0.01	0.15	2.82	1.20
Bio formulations										
(B0)Control		58.80	2.50	0.14	19.66	2.60	0.12	2.72	44.13	36.11
(B1)Beejamrit		66.30	3.33	0.19	23.76	3.36	0.15	3.53	48.61	37.64
(B2)Jeevamrit		71.43	3.66	0.22	25.96	3.66	0.18	3.78	57.89	44.38
(B3)Ghanjeevamrit		67.36	3.00	0.18	23.41	3.21	0.15	3.37	54.95	37.71
C.D		N/A	0.70	N/A	3.29	0.67	N/A	0.68	N/A	5.21
SE (d)		4.81	0.32	0.05	1.52	0.31	0.03	0.31	5.65	2.41
SE (m)±		3.40	0.22	0.04	1.07	0.22	0.02	0.22	3.55	1.70
Interaction effect										
(V1)Namdhari (NS)585	(B0) Control	59.80	2.33	0.17	20.13	2.56	0.10	2.67	44.26	34.16
	(B1) Beejamrit	65.73	3.00	0.27	24.00	3.30	0.13	3.56	53.60	37.05
	(B2) Jeevamrit	73.26	3.66	0.27	25.95	3.33	0.18	3.71	56.55	46.18
	(B3) Ghanjeevamrit	69.13	2.66	0.23	21.60	3.16	0.16	3.32	49.48	37.36
V2KashiAdarsh	(B0) Control	57.80	2.66	0.17	19.20	2.63	0.14	2.77	44.00	37.95
	(B1) Beejamrit	66.86	3.66	0.10	23.53	3.33	0.17	3.50	43.61	38.24
	(B2) Jeevamrit	69.60	3.66	0.12	26.00	3.66	0.19	3.85	62.57	42.58
	(B3)Ghanjeevamrit	65.60	3.33	0.12	25.23	3.26	0.15	3.42	59.70	38.07
C.D		N/A	N/A	N/A`	N/A`	N/A	N/A	N/A	N/A	N/A
SE (d)		6.80	0.45	0.08	2.15	0.43	0.05	0.44	8.15	3.40
SE (m)±		4.81	0.32	0.05	1.52	0.31	0.03	0.31	5.76	2.41

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