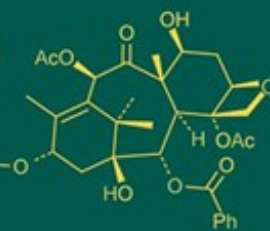
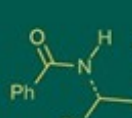
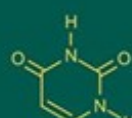
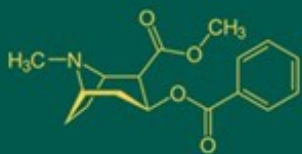


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Effect of integrated nutrient management on growth and yield attributes of Tomato (*Solanum lycopersicum* L.) under Chhattisgarh plains

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ABSTRACT

A field study evaluated the effect of Integrated Nutrient Management (INM) modules combining inorganic fertilizers, organic amendments, and bio-stimulants on the yield of tomato (*Solanum lycopersicum* L. cv. Arka Samrat) under the sub-humid agro-climatic conditions of the Chhattisgarh plains. The experiment was conducted during the Rabi season of 2025–26 at the College of Agriculture and Research Station, Kanpa, Mahasamund, Chhattisgarh, using a Randomized Block Design (RBD) with nine treatment combinations replicated thrice. Treatments comprised combinations of Recommended Dose of Fertilizers (RDF: 213:150:120 kg/ha NPK), Farmyard Manure (FYM @ 10 t/ha), Vermicompost (VC @ 4 t/ha), and foliar application of Seaweed Extract (D @ 3.0 ml/L). The application of 75% RDF + Vermicompost 4 t/ha + Seaweed Extract @ 3.0 ml/L (T₅) significantly enhanced yield parameters compared to 100% inorganic RDF (T₁) and sole organic/bio-stimulant regimes (T₉). Treatment T₅ recorded the highest fruit set (79.52%), fruit diameter (5.91 cm), average fruit weight (88.30 g), yield per plant (2.61 kg), marketable yield (60.92 kg/plot), and total yield (40.84 t/ha).

Keywords: Tomato, Integrated Nutrient Management, Vermicompost, Seaweed Extract, Arka Samrat, Yield attributes

Introduction

Tomato (*Solanum lycopersicum* L., $2n = 24$) is one of the most widely cultivated vegetable crops globally and holds a pivotal role in India's horticultural economy. Rich in essential minerals (K, Ca, Mg, P, Fe), organic acids (citric, malic), vitamins (A, B, C), and antioxidants like lycopene, tomatoes contribute significantly to human nutrition and income generation for smallholder farmers. In India, tomato is grown across approximately 854 thousand hectares with an annual production of 21.32 million tonnes. In the state of Chhattisgarh, tomato cultivation spans 60.34 thousand hectares with a total production of 1208.70 thousand tonnes. (Anonymous, 2024-25).

Despite high production potentials, the continuous and exclusive reliance on synthetic chemical fertilizers has led to adverse ecological consequences, including soil structure degradation, secondary nutrient deficiencies, reduced fertilizer-use efficiency, and ecological imbalances. Conversely, exclusive organic farming often fails to meet the immediate nutrient demands of high-yielding crop varieties. Integrated Nutrient Management (INM) addresses these limitations by optimizing the combined application of mineral fertilizers, organic manures (such as FYM and vermicompost), and biological/bio-stimulant inputs. This balanced approach maintains soil physical, chemical, and biological properties, enhances microbial nutrient cycling, and provides steady nutrient release throughout the crop cycle. (Purkayastha *et al.*, 1998; Kumar *et al.*, 2001).

While several studies have explored INM strategies across various agro-ecological zones, location-specific calibration is critical for regions like the Chhattisgarh plains, characterized by Vertisols ("Kanhra" soils) with neutral pH and distinct nutrient balances. This investigation evaluates the interactive effects of reduced inorganic fertilizer doses paired with vermicompost, farmyard manure, and seaweed biostimulants on tomato vegetative growth, phenological development, fruit yield, post-harvest quality, and economic efficiency.

Materials and methods**Experimental site and agro-climate**

The field experiment was conducted during the Rabi season of 2025–26 at the College of Agriculture and Research Station, Kanpa, Mahasamund, Chhattisgarh. The site falls under the Eastern Plateau and Hills Region. The climate is sub-humid, with an average annual rainfall of 1385 mm. Meteorological parameters recorded during the cropping period are presented in the experimental records.

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Experimental design and treatment allocations

The experiment was laid out in a Randomized Block Design (RBD) with 9 treatments and 3 replications using the high-yielding tomato variety **Arka Samrat**. Net plot size was 3.0m × 3.0m (9.0m²) with a spacing of 60cm × 45cm.

- T_1 : 100% RDF (only NPK 213:150:120 kg/ha) control
- T_2 : 75% RDF + FYM 10 t/ha
- T_3 : 75% RDF + FYM 10 t/ha + Seaweed Extract (D) @ 3.0 ml/L
- T_4 : 75% RDF + Vermicompost 4 t/ha
- T_5 : 75% RDF + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/L
- T_6 : 50% RDF + FYM 10 t/ha + Vermicompost 4 t/ha
- T_7 : 50% RDF + FYM 10 t/ha + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/L
- T_8 : 100% RDF + Seaweed Extract (D) @ 3.0 ml/L
- T_9 : FYM 10 t/ha + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/L

Crop management

Seedlings were raised in protrays filled with cocopeat, sown on November 6, 2025, and transplanted on December 3, 2025. Organic manures (FYM and Vermicompost) were incorporated into the designated plots 30 days prior to transplanting. Half of the total Nitrogen along with 100% Phosphorus and Potassium were applied basally at transplanting via Urea, DAP, and MOP. The remaining half of Nitrogen was top-dressed at 40 DAT following earthing-up. Seaweed extract foliar sprays were applied per schedule.

Observations

The observations were recorded on 25 characters under yield attributing traits in tomato *i.e.* Fruit set percentage, Fruit diameter, Fruit weight per plant, Fruit Yield per hectare, Fruit length, Total Number of fruits per plant, Time of maturity, Average fruit weight, Marketable yield, Unmarketable yield.

Result and discussion

The highest fruit set percentage (79.52%) was recorded in treatment T_5 (75% RDF + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water), which was found to be significantly superior to all other treatments. In contrast, the lowest fruit set percentage (59.91%) was observed under treatment T_9 (FYM 10 t/ha + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water).

The highest fruit weight per plant (kg) (2.61) was obtained in the treatment T_5 (75% RDF + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water). The minimum fruit weight (1.70) per plant was observed under the treatment T_9 (FYM 10 t/ha + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water). The maximum fruit yield per hectare (40.84 t/ha) was recorded under treatment T_5 (75% RDF + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water), which was significantly superior to all other treatments. The minimum fruit yield (32.42 t/ha) was recorded in treatment T_9 (FYM 10 t/ha + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water).

The highest fruit length (9.44 cm) was recorded in treatment T_5 (75% RDF + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water), which was found to be significantly superior to all other treatments. On the other hand, the lowest fruit length (5.71 cm) was observed under T_9 (FYM 10 t/ha + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water).

T_5 (75% RDF + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water) recorded the highest total number of fruits per plant (41.45), which was found to be significantly superior to all other treatments. In contrast, the lowest total number of fruits per plant (26.46) was recorded under T_9 (FYM 10 t/ha + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water).

The maximum average fruit weight (88.30 g) was recorded in treatment T_5 (75% RDF + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water). The minimum fruit weight (60.25) was observed in treatment T_9 (FYM 10 t/ha + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water).

The treatments, T_5 (75% RDF + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water) recorded the highest marketable yield (62.92 kg plot⁻¹), which was found to be significantly superior to all other treatments. In contrast, the lowest marketable yield (40.85 kg plot⁻¹) was observed under treatment T_9 (FYM 10 t/ha + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water).

Conclusion

The highest gross returns (Rs. 612600 Rs./ha) and net return (446435.5 Rs/ha) was recorded under treatment T_5 (75% RDF + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water) followed by T_4 (75% RDF + Vermicompost 4 t/ha) which were approximately similar trend in gross and net return.

The minimum gross return (Rs. 486300 Rs/ha) and lowest net return (Rs.229143 Rs/ha) was recorded under treatment T_9 (FYM 10 t/ha + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water).

Table 1. Effect of integrated nutrient management on yield parameters

Treatment detail	Fruit set percentage	Fruit weight per plant (kg)	Fruit Yield per hectare (t/ha)	Fruit length (cm)	Total Number of fruits per plant	Average fruit weight (g)	Marketable yield (kg/plot)
100% RDF (only NPK 213:150:120 kg/ha) control	69.65	2.11	34.66	7.66	34.50	78.16	54.15
75% RDF + FYM 10t/ha	65.97	2.08	34.05	7.50	32.45	68.88	53.58
75% RDF + FYM 10t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water	68.25	2.14	36.32	7.60	35.82	78.86	54.39
75% RDF + Vermicompost 4t/ha	78.94	2.50	39.28	8.34	41.14	87.90	58.49
75% RDF + Vermicompost 4t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water	79.52	2.61	40.84	9.44	41.45	88.30	60.92
50% RDF + FYM 10t/ha + Vermicompost 4t/ha	63.46	1.97	32.91	6.12	30.29	65.14	50.58

(continued on next page)

Treatment detail	Fruit set percentage	Fruit weight per plant (kg)	Fruit Yield per hectare (t/ha)	Fruit length (cm)	Total Number of fruits per plant	Average fruit weight (g)	Marketable yield (kg/plot)
50% RDF + FYM 10t/ha + Vermicompost 4t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water	65.97	2.01	34.02	6.20	31.47	65.90	50.87
100% RDF + Seaweed Extract (D) @ 3.0 ml/litre of water	72.56	2.31	36.63	8.09	37.39	86.00	56.10
FYM 10t/ha + Vermicompost 4t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water	59.91	1.70	32.42	5.71	26.46	60.25	40.85
SEm±	1.64	0.16	0.87	0.59	2.27	2.74	3.39
CD (0.05)	4.94	0.36	6.24	1.79	6.83	8.24	5.31

On the basis of above findings, treatment T_5 (75% RDF + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water) stand first in position and T_4 (75% RDF + Vermicompost 4 t/ha) stand in second order of preference. Therefore, it may be concluded that treatment T_5 (75% RDF + Vermicompost 4 t/ha + Seaweed Extract (D) @ 3.0 ml/litre of water) may be prefer for integrated nutrient management in tomato. Farmers recommended to adopt T_5 under similar agro-climatic conditions for obtaining better yield from tomato cultivation.

References

- Acharya P, Sharma L, Subedi S. Growth, yield and economics of tomato (*Solanum lycopersicum* L.) as influenced by integrated nutrient management practices. *Journal of Horticultural Sciences*. 2025;20(1):45-52.
- Chaurasiya PC, Kumar V. Growth and yield attributes of tomato (*Solanum lycopersicum* L.) under integrated nutrient management in Chhattisgarh plains. *Journal of Plant Development Sciences*. 2023;15(4):185-191.
- Chopra S, Singh R, Kumar A. Effect of agro-residue vermicompost and mineral fertilizers on soil health and crop productivity of tomato cv. Arka Rakshak. *International Journal of Recycling of Organic Waste in Agriculture*. 2017;6(3):201-209.
- Chumyani T, Kanaujia SP, Singh VB. Integrated nutrient management in tomato cv. Punjab Chuhara under Nagaland foot-hill conditions. *Journal of Crop and Weed*. 2012;8(2):145-147.
- Gourkhede PH, Patil VD, Shinde SE. Long-term impact of organic nutrient sources on tomato fruit yield and chemical properties of soil. *Journal of Organic Agriculture*. 2026;18(1):55-63.
- Khan A, Mohammad W, Shah SM. Integrated application of compost and mineral NPK for enhancing tomato productivity and soil fertility. *Journal of Soil Science and Plant Nutrition*. 2017;17(4):980-992.
- Kumar R, Verma SK, Sharma P. Sustainable tomato production through integrated nutrient management under central plain zone of India. *Indian Journal of Horticulture*. 2017;74(3):381-386.
- Mengistu T, Gebrekidan H, Kibret K. Comparative evaluation of vermicompost and inorganic fertilizers on tomato growth, yield, and nitrogen use efficiency. *Agronomy Journal*. 2017;109(5):2134-2143.
- Murmu K, Swain DK, Ghosh BC. Yield and quality performance of tomato under organic and conventional nutrient management in acid lateritic soil. *International Journal of Vegetable Science*. 2012;18(3):241-254.
- Prativa KC, Bhattarai BP. Effect of integrated nutrient management on the growth and yield of tomato (*Lycopersicon esculentum* Mill.). *Nepal Journal of Science and Technology*. 2012;13(2):1-8.
- Saini P, Kumar S, Singh R. Productivity and economics of tomato (*Solanum lycopersicum* L.) under integrated nutrient management practices. *Journal of Pharmacognosy and Phytochemistry*. 2022;11(2):312-316.
- Singh B, Kumar A, Sharma S. Productivity of winter tomato under high-dose organic manures vs mineral fertilization. *Indian Journal of Agricultural Sciences*. 2020;90(4):741-745.

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