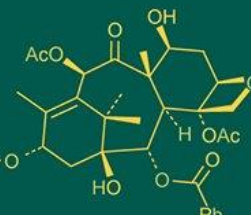
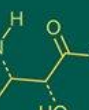
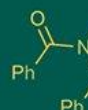


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Appraisal of eco-friendly fertilizers to supplement organic compost in cucumber (*Cucumis sativus* L.)

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Abstract

The increasing demand for sustainable agricultural practices has emphasized the role of eco-friendly fertilizers in improving crop productivity and soil health. The present investigation was carried out to appraise the effect of eco-friendly fertilizers in cucumber cultivation to supplement organic compost. The experiment was conducted at the Instructional cum Research Farm of K.D. College of Horticulture and Research Station, Jagdalpur, Bastar, Chhattisgarh, and was laid out in a randomized block design (RBD) comprising 10 treatments with three replications.

The treatments consisted of different combinations of organic composts, namely farmyard manure (FYM) and vermicompost, along with biofertilizers such as *Azotobacter*, *Azospirillum*, and phosphate-solubilizing bacteria (PSB). Observations were recorded on growth, yield, and quality parameters of cucumber. Significant variation was observed among treatments, indicating the effectiveness of integrated nutrient management practices. The combined application of organic compost and biofertilizers showed superior performance over individual treatments in enhancing crop productivity and improving soil health. The study concludes that eco-friendly fertilizers can effectively supplement organic compost, promote sustainable cucumber cultivation and reduce reliance on chemical fertilizers.

Keywords: Eco-friendly fertilizers, FYM, Vermicompost, RBD, Sustainable agriculture

Introduction

Cucumber (*Cucumis sativus* L.) is one of the most important vegetable crops belonging to the family Cucurbitaceae and is widely cultivated in tropical and subtropical regions of the world. It is believed to have originated in South Asia, particularly in India, and has been cultivated for over 3,000 years (1). Cucumber is an important salad crop valued for its nutritional content, refreshing taste, and high-water content. It is a rich source of vitamins and minerals and plays a significant role in human nutrition (2). Globally, cucumber is cultivated over a large area with substantial production, contributing significantly to the vegetable industry (3). In India, major cucumber-growing states include Uttar Pradesh, Madhya Pradesh, Karnataka, West Bengal, Bihar, and Chhattisgarh, where it is cultivated both in open field and protected conditions (4). Globally, cucumber cultivation occupies approximately 2.2-2.3 million hectares, with a relatively stable harvested area in recent years. The total global production reached about 97-98 million tonnes during 2023-2024, indicating the crop's significant contribution to the vegetable sector (5). In India, cucumber is cultivated over an estimated area of about 117 thousand hectares with a production of approximately 1,631 thousand tonnes, resulting in an average productivity of 13.94 t ha⁻¹ (6). In Chhattisgarh, agriculture is influenced by diverse agro-climatic conditions, and the state is divided into three major zones, namely Chhattisgarh Plains, Bastar Plateau, and Northern Hills, covering about 50%, 29%, and 21% of the geographical area, respectively (7). In the Bastar Plateau agro-climatic zone of Chhattisgarh, cucumber cultivation is predominantly concentrated in regions such as Jagdalpur, Bakawand, and Kondagaon, where favorable soil and climatic conditions support its growth and productivity (8).

Materials and Methods

The study involved evaluating 10 treatments in a Randomized Block Design (RBD) with three replications. Each experimental plot measured 13.5 m², with a plant spacing of 1.5 m × 0.9 m. The field experiment was conducted at the Instructional cum Research Farm of K.D. College of Horticulture and Research Station, Jagdalpur, during the rabi season of 2025-26.

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Experimental materials

The experimental materials consisted of cucumber (*Cucumis sativus* L.) grown under different combinations of organic composts and biofertilizers. The treatments included farmyard manure (FYM) and vermicompost in combination with biofertilizers such as *Azotobacter*, *Azospirillum*, and phosphate-solubilizing bacteria (PSB). The experiment comprised 10 treatment combinations laid out to evaluate their effect on growth, yield, quality parameters of cucumber.

The field experiment was conducted under the favourable agro-climatic conditions of the Bastar Plateau at the Instructional cum Research Farm of K.D. College of Horticulture and Research Station, Jagdalpur. The crop was grown during the rabi season of 2025-26, with transplanting carried out in November and the experiment completed by early- February. The prevailing climatic conditions of the region provided a suitable environment for assessing the performance of different eco-friendly nutrient management practices. A detailed description of treatments is presented in table 1.

Morphological characterization

The cucumber crop was morphologically characterized based on standard descriptors and observations recorded at different growth stages. The vegetative parameters were recorded at 30 and 60 days after transplanting (DAT), while flowering, yield, and quality parameters were recorded at appropriate stages and at final harvest. The parameters recorded are as follows:

Growth characters: Vine length, number of branches (at final harvest), leaf area, day to first anthesis.

Yield characters: Number of fruits per vine, fruit weight, fruit length, fruit diameter

Quality characters: Total soluble solids (TSS) and moisture content (%).

Results and Discussion

Morphological characterization involves the use of standardized observations to systematically describe and evaluate the growth, yield, and quality traits of crop plants under different treatment conditions, thereby facilitating comparison and interpretation of experimental results. In the present investigation, cucumber (*Cucumis sativus* L.) was evaluated under 10 treatment combinations of eco-friendly fertilizers along with organic compost.

The study comprised a comprehensive set of morphological and agronomic traits, including plant growth attributes (Vine length, number of branches (at final harvest), leaf area, day to first anthesis), yield attributes (number of fruits per vine, fruit weight, fruit length and fruit diameter), as well as quality parameters such as total soluble solids (TSS) and moisture content (%).

Variation in growth characters

The results shown that the application of different treatment recorded the maximum vine length, number of branches,

leaf area in treatment T₁₀ [FYM (2 kgm⁻²) + Vermicompost (0.6 kgm⁻²) + *Azospirillum* + *Azotobacter* + PSB] and minimum days taken for first anthesis were recorded for treatment T₁ [Control] (shown in table 2). Present results are in conformity with the findings of Dawer *et al.*, (2019) ^[5] in cucumber, they concluded that maximum vine length (290.92 cm, 415.28 cm and 553.32 cm) at 30 DAS, 60 DAS and 90 DAS, respectively, were recorded under application of inorganic fertilizers.

Variation in yield characters

The results shown that the application of treatment T₁₀ [FYM (2 kgm⁻²) + Vermicompost (0.6 kgm⁻²) + *Azospirillum* + *Azotobacter* + PSB] recorded the maximum fruit weight (g), fruit length (cm), fruit volume (cc), fruit diameter (mm), yield per vine (kg), yield per square meter (kg) and number of fruits per vine (table 3). Findings of Dash *et al.* (2018) ^[4] was also in conformity as they reported greatest impact on fruit weight in cucumber with the application of treatment per ha [half recommended NPK + 10 tonnes of FYM + 2 tons of Vermicompost + Bio-fertilizer (4.0 kg *Azotobacter* + 4.0 kg PSB)].

Similar findings were also reported by Anjanappa *et al.*, (2012) ^[1] while working with cucumber, they observed that application of biofertilizers along with organic and inorganic inputs under protected conditions in cucumber (cv. Hassan Local) during two years of experimentation, resulted highest fruit yield per vine (2.47 kg and 2.55 kg) and total fruit yield per hectare (17.60 t/ha and 18.22 t/ha) during when 75% RDF + 75% FYM + *Azotobacter* + Phosphobacteria + Trichoderma.

Variation in quality characters

The results shown that highest value of TSS was recorded from treatment T₁₀ [FYM (2 kgm⁻²) + Vermicompost (0.6 kgm⁻²) + *Azospirillum* + *Azotobacter* + PSB] shown in table 4, which may be due to the better supply of nutrients in the form of organic manures. Singh *et al.* (2017) ^[18] in cucumber also claimed maximum TSS (4.10 0Brix) from application of treatment having FYM 25% + poultry manure 25% + vermicompost 25% + NPK 25%, highest total soluble solids (4.11 0Brix) were also seen by Mohan *et al.* (2016) ^[12] while working with cucumber under polyhouse condition by applying organic and inorganic fertilizers along with biofertilizers. The results revealed that the moisture content of fruit was found non-significant, although maximum moisture content of fruit was recorded with treatment T₁₀ [FYM (2 kgm⁻²) + Vermicompost (0.6 kgm⁻²) + *Azospirillum* + *Azotobacter* + PSB], Anjanappa *et al.* (2012) ^[1] also reported non-significant effect of integrated nutrient on moisture content in cucumber under protected condition. Similarly, chlorophyll content of leaf and fruit skin were also found non-significant, although it was maximum for treatment T₁₀ [FYM (2 kgm⁻²) + Vermicompost (0.6 kgm⁻²) + *Azospirillum* + *Azotobacter* + PSB], Mohammed (2017) also observed non-significant effects of various treatments on chlorophyll content of leaves.

Table 1: Treatment details

	Treatments
T ₁	Control
T ₂	FYM (2 kgm ⁻²)
T ₃	Vermicompost (0.6 kgm ⁻²)
T ₄	FYM (1 kgm ⁻²) + Vermicompost (0.3 kgm ⁻²)
T ₅	FYM (2 kgm ⁻²) + Azotobacter + PSB
T ₆	Vermicompost (0.6 kgm ⁻²) + Azotobacter +PSB
T ₇	FYM (1 kgm ⁻²) + Vermicompost (0.3 kgm ⁻²) + Azotobacter +PSB
T ₈	FYM (2 kgm ⁻²) + Azospirillum + Azotobacter +PSB
T ₉	Vermicompost (0.6 kgm ⁻²) +Azospirillum + Azotobacter +PSB
T ₁₀	FYM (1 kgm ⁻²) + Vermicompost (0.3 kgm ⁻²) +Azospirillum + Azotobacter +PSB

All biofertilizers applied @ 0.4 mL/m²

Table 2: Variation in growth characters of cucumber

	Treatments	30 DAT (cm)	60 DAT (cm)	No. of branches (at final harvest)	Leaf area (cm ²)	Day to first flowering
T ₁	Control	68.36	165.12	3.18	267.85	30.26
T ₂	FYM (2 kgm ⁻²)	79.12	179.20	4.28	316.4	26.43
T ₃	Vermicompost (0.6 kgm ⁻²)	81.75	182.17	4.54	328.8	24.89
T ₄	FYM (1 kgm ⁻²) + Vermicompost (0.3 kgm ⁻²)	83.32	189.85	4.76	339.2	23.57
T ₅	FYM (2 kgm ⁻²) + Azotobacter + PSB	84.93	196.62	5.59	351.6	22.33
T ₆	Vermicompost (0.6 kgm ⁻²) + Azotobacter +PSB	89.32	201.08	5.02	363.95	21.14
T ₇	FYM (1 kgm ⁻²) + Vermicompost (0.3 kgm ⁻²) + Azotobacter +PSB	93.22	207.22	6.44	369.92	20.86
T ₈	FYM (2 kgm ⁻²) + Azospirillum + Azotobacter +PSB	97.45	211.62	7.18	379.36	19.12
T ₉	Vermicompost (0.6 kgm ⁻²) +Azospirillum + Azotobacter +PSB	105.42	218.12	7.65	405.21	18.53
T ₁₀	FYM (1 kgm ⁻²) + Vermicompost (0.3 kgm ⁻²) +Azospirillum + Azotobacter +PSB	112.20	224.15	8.96	437.82	17.27
	SE(m)	4.93	10.97	0.38	16.28	1.58
	CD (P=0.05)	14.61	32.49	1.13	48.22	4.69
	CV (%)	9.54	9.62	11.49	7.92	12.22

Table 3: Variation in yield characters of cucumber fruit

	Treatments	Number of fruits per vine	Fruit length (cm)	Fruit weight (g)	Fruit diameter (mm)
T ₁	Control	4.29	10.42	84.1	23.14
T ₂	FYM (2 kgm ⁻²)	5.48	12.37	98.76	24.39
T ₃	Vermicompost (0.6 kgm ⁻²)	6.05	12.75	104.23	25.29
T ₄	FYM (1 kgm ⁻²) + Vermicompost (0.3 kgm ⁻²)	6.57	13.30	112.48	26.74
T ₅	FYM (2 kgm ⁻²) + Azotobacter + PSB	7.21	14.03	120.14	28.48
T ₆	Vermicompost (0.6 kgm ⁻²) + Azotobacter +PSB	7.92	14.61	125.61	29.93
T ₇	FYM (1 kgm ⁻²) + Vermicompost (0.3 kgm ⁻²) + Azotobacter +PSB	8.97	15.25	132.34	30.85
T ₈	FYM (2 kgm ⁻²) + Azospirillum + Azotobacter +PSB	9.6	15.91	138.22	32.65
T ₉	Vermicompost (0.6 kgm ⁻²) +Azospirillum + Azotobacter +PSB	10.87	16.17	140.85	33.84
T ₁₀	FYM (1 kgm ⁻²) + Vermicompost (0.3 kgm ⁻²) +Azospirillum + zotobacter +PSB	13.36	18.07	148.43	35.03
	SE(m)	0.52	0.76	5.05	1.51
	CD (P=0.05)	1.53	2.27	14.96	4.48
	CV (%)	11.12	9.27	7.26	9.03

Table 4: Moisture content% and TSS% of cucumber

	Treatments	Moisture content %	TSS%
T ₁	Control	91.96	2.53
T ₂	FYM (2 kgm ⁻²)	92.43	2.82
T ₃	Vermicompost (0.6 kgm ⁻²)	92.81	2.96
T ₄	FYM (1 kgm ⁻²) + Vermicompost (0.3 kgm ⁻²)	93.28	3.14
T ₅	FYM (2 kgm ⁻²) + Azotobacter + PSB	93.64	3.37
T ₆	Vermicompost (0.6 kgm ⁻²) + Azotobacter +PSB	94.12	3.48
T ₇	FYM (1 kgm ⁻²) + Vermicompost (0.3 kgm ⁻²) + Azotobacter +PSB	94.57	3.62
T ₈	FYM (2 kgm ⁻²) + Azospirillum + Azotobacter +PSB	95.03	3.84
T ₉	Vermicompost (0.6 kgm ⁻²) +Azospirillum + Azotobacter +PSB	94.97	3.91
T ₁₀	FYM (1 kgm ⁻²) + Vermicompost (0.3 kgm ⁻²) +Azospirillum + Azotobacter +PSB	95.90	4.16
	SE(m)	1.45	0.09
	CD (P=0.05)	4.30	0.26
	CV (%)	2.68	4.48

Conclusion

It may be concluded that among the different treatments evaluated, the application of T_{10} [FYM (1 kgm^{-2}) + Vermicompost (0.3 kgm^{-2}) + *Azospirillum* + *Azotobacter* + PSB] proved to be the most effective treatment. The treatment recorded the highest values for growth parameters such as vine length, leaf area and number of branches, yield parameters such as fruit weight, fruit length, fruit diameter, number of fruits per plant and fruit yield, as well as quality parameters including total soluble solids (TSS) and moisture content. The earliest flowering was observed in T_{10} [Vermicompost]. The superior performance of T_{10} may be attributed to the combined effect of FYM and vermicompost in improving soil physical, chemical and biological properties, along with the beneficial action of biofertilizers (*Azotobacter*, *Azospirillum* and PSB) in enhancing nutrient availability, nitrogen fixation, phosphorus solubilization and production of plant growth-promoting substances. These factors collectively promoted better vegetative growth,

flowering, yield and fruit quality of cucumber under open-field conditions.

Novelty Statement

The present investigation focuses on the appraisal of eco-friendly fertilizers in cucumber cultivation to supplement organic compost under Bastar Plateau conditions. The study evaluates the combined effect of organic composts and biofertilizers on growth, yield, quality, which has received limited attention under the agro-climatic conditions of Chhattisgarh. The integration of farmyard manure (FYM), vermicompost, and biofertilizers such as *Azotobacter*, *Azospirillum*, and phosphate-solubilizing bacteria (PSB) provides a sustainable approach to nutrient management. The findings of this study will help in identifying effective eco-friendly fertilizer combinations for enhancing productivity and improving soil health, and may serve as a basis for developing sustainable nutrient management practices in cucumber cultivation.



Fig 1: Phenotypic variation in fruit length among different treatment combinations of cucumber



Fig 2: Preparation of organic compost (FYM) enriched with biofertilizers for experimental treatments



Fig 3: Measurement of fruit weight of cucumber using a weighing balance

References

1. Anjanappa M, Kumara BS, Indiresk KM. Growth, yield and quality attributes of cucumber (cv. Hassan Local) as influenced by integrated nutrient management grown under protected condition. Mysore J Agric Sci. 2012;46:32-37.
2. Anuja S, Poovizhi KK. Effect of soil and foliar application of organic nutrients on yield and quality of cucumber cv. Long Green. Vegetable Sci. 2010;37:91-93.
3. Anuja S, Poovizhi KK. Effect of organic nutrients on yield and yield attributes of cucumber (*Cucumis sativus* L.) cv. Long Green. Vegetable Sci. 2009;36:163-166.
4. Dash SK, Sahu GS, Das S, Sarkar S, Tripathy L, Pradhan SR, Patnaik A. Yield improvement in cucumber through integrated nutrient management practices in coastal plain zone of Odisha. Int J Curr Microbiol Appl Sci. 2018;7:2480-2488.
5. Dawer A, Dhakad RK, Mishra DK, Jamod R. Studies of different levels of nitrogen on growth and yield of

- parthenocarpic cucumber (*Cucumis sativus* L.) under protected cultivation. J Pharmacogn Phytochem. 2019;8:3485-3488.
6. Duhan PK. Cost benefit analysis of tomato production in protected and open farm. Int J Adv Res Manage Soc Sci. 2016;5:140-148.
 7. Dynes RA. Earthworm: Technology information to enable the development of earthworm production. A report for the Rural Industries Research and Development Corporation. Canberra: Australian Government; 2003. p. 33.
 8. Food and Agriculture Organization. FAOSTAT statistical database: crops and livestock products. Rome: FAO; 2023.
 9. Food and Agriculture Organization of the United Nations. FAOSTAT statistical database: crops and livestock products. Rome: FAO; 2024.
 10. Government of Chhattisgarh. Agro-climatic zonal classification report of Chhattisgarh: agro-ecological regions, climate characteristics and crop suitability. Raipur: Department of Agriculture, Government of Chhattisgarh; 2020.
 11. Ministry of Agriculture & Farmers Welfare. Horticulture statistics at a glance. New Delhi: Government of India; 2023.
 12. Mohan L, Singh BK, Singh AK, Moharana DP, Kumar H, Mahapatra AS. Effect of integrated nutrient management on growth and yield attributes of cucumber (*Cucumis sativus* L.) cv. Swarna Ageti under polyhouse conditions. Bioscan. 2016;12:305-308.
 13. National Horticulture Board. Indian horticulture database 2020: area and production of horticultural crops. Gurgaon: Ministry of Agriculture & Farmers Welfare, Government of India; 2020.
 14. National Horticulture Board. Indian horticulture database 2020: comprehensive statistics on area, production and productivity of horticultural crops in India. Gurgaon: Ministry of Agriculture & Farmers Welfare, Government of India; 2020.
 15. Renner SS, Schaefer H, Kocyan A. Phylogenetics of Cucurbitaceae and the origin of cultivated cucumber. New Phytol. 2007.
 16. Renuka B, Ravishankar C. Effect of organic manures on growth and yield of tomato. South Indian Hortic. 2001;49:216-217.
 17. Richards LA. Diagnosis and improvement of saline and alkaline soils. USDA Handbook No. 60. New Delhi: Oxford and IBH Publishing Company; 1986.
 18. Singh KP, Singh B, Sahu PK, Shrey R, Sahu S. Adoption and integration of low-cost irrigation with mulching technology for vegetable production in Bastar. Jagdalpur: College of Horticulture and Research Station; 2020. p. 1-22.