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EFFECT OF ORGANIC MANURES AND INORGANIC FERTILIZERS ON PLANT GROWTH, YIELD AND FRUIT QUALITY OF CUCUMBER (*CUCUMIS SATIVUS* L.) C.V. NAZIA F₁

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ABSTRACT

Cucumber, scientifically known as *Cucumis sativus*, is a tropical vine that belongs to the Cucurbitaceae family. It is widely cultivated for its young tender fruits, which are consumed as a vegetable. Cucumber is a versatile vegetable that can be used in various culinary preparations, including stir-fries, curries, soups and stews. It has a mild, slightly sweet flavor. Therefore, the present investigation was carried out at the Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, Uttar Pradesh during the *Rabi* season 2022-2023 with a view to check performance of different treatments of organic manures and inorganic fertilizers in cucumber for its growth yield and quality. The experiment was laid in Randomized block design with 11 treatments and 3 replications. The data collected on different aspects were tabulated & analyzed statistically using the methods of analysis of variance & critical difference. The significant & non-significant differences observed have been analyzed critically within & between the treatment combinations. From the above experimental finding it was concluded that the treatment T₁₀ (FYM 25% + Vermicompost 25% + Goat manure 25% + NPK 25%) performed best in terms of growth parameters like vine length at 45 DAS (64.01 cm), earliness in maturity (63.87 days for first fruit harvest) and yield parameters like fruit length (14.88 cm), fruit diameter (3.87 cm), and fruit yield per plant (1.69 kg/plant). It also showed best performance for quality parameters also TSS (5.92°Brix) and vitamin C content (5.74 mg/100g). Maximum Benefit cost ratio were recorded in treatment T₁₀ (FYM 25% + Vermicompost 25% + Goat manure 25% + NPK 25%) with 2.06.

Key words : Cucumber, Goat manure, Farmyard manure, Vermicompost.

Introduction

Cucumber (*Cucumis sativus*) is a widely cultivated creeping vine plant in the *Cucurbitaceae* family that bears usually cylindrical fruits, which are used as vegetables. Considered an annual plant, there are three main varieties of cucumber — slicing, pickling, and burpless/ seedless — within which several cultivars have been created. The cucumber originates from South Asia, but now grows on most continents, as many different types of cucumber are traded on the global market. In North America, the term wild cucumber refers to plants in the genera *Echinocystis* and *Marah*, though the two are not closely related. Most cucumber cultivars are seeded and require

pollination. For this purpose, thousands of honey beehives are annually carried to cucumber fields just before bloom. Cucumbers may also be pollinated via bumblebees and several other bee species. Most cucumbers that require pollination are self-incompatible, thus requiring the pollen of another plant to form seeds and fruit. Some self-compatible cultivars exist that are related to the 'Lemon' cultivar. A few cultivars of cucumber are parthenocarpic, the blossoms of which create seedless fruit without pollination. Cucumber is a geitonogamy diploid, day neutral, thermophilic crop, which is grown in all the parts of India. It is the second most important cucurbit crop grown after Watermelon. 1st sequenced vegetable crop. Bitterness in

cucumber is due to 'cucurbitacin'. Most favourable temperature for cucumber is 18°C-24°C. It accounts to 12-13% of the total cucurbits' acreage. Botanically Cucumber is known as *Cucumis Sativus* L. belongs to family Cucurbitaceae. It is a diploid self-pollinated species with chromosome number $2n=2x=14$ (Mckay, 1930). Cucumber probably originated from Indo-Burma region of Hindustan centre (Vavilov, 1935). It is mainly cultivated in China, India, Turkey, Iran, and other parts of south-east Asia. Progenitor of cucumber is "*Cucumis hardwickii*". Economic sex ratio is 15:1. The area under Cucumber production in India accounts to 94 million ha with production of 1608.29 million tonnes in year 2020-21 (Source: NHB, Ministry of Agriculture & Farmers Welfare, Government of India, 2021-22). Fertilizers play a crucial role in crop production by providing essential nutrients to plants, which they need for healthy growth, development, and maximum yield. Fertilizers supply nutrients such as nitrogen, phosphorus and potassium, as well as micronutrients such as iron, zinc and copper, that are necessary for a balanced diet for plants. They improve soil fertility, promote root development, enhance plant resistance to pests and diseases and increase crop yield and quality. However, the application of fertilizers must be done in the right amount, at the right time, and in the right way, to avoid negative environmental impacts and ensure sustainable crop production. Sharma *et al.* (2018) investigated the effect of inorganic fertilizers on the growth and yield of cucumber plants. The researchers applied different combinations of nitrogen (N), phosphorus (P) and potassium (K) fertilizers and measured various growth parameters and yield components.

Materials and Methods

Location and layout of the experimental site

Prayagraj falls in central plain sub-zone of Agro-climatic zone V (Source: Perspective and Strategic Plan (SPSP) for IWMP of Uttar Pradesh, Department of Land Development and Water Resources, Government of U.P.). Naini is situated between the parallels of 20° 33' 40" to 21° .50' N latitude and 73° 27' 58" and 73° 56' 36" E longitude. The climate of this area is tropical characterized by fairly hot summer, moderately cold winter with humid and warm monsoon. The rainfall of this region is heavy and normally received from June to September. Most of the precipitation is received through south -west advancing monsoon, concentrating in the months of July and August. In the present investigation the design used for analysis of variables was Randomized Block Design (RBD) comprising 11 treatments replicated thrice each

enlisted.

T₀ Control (RDF 100%), T₁ FYM 75%+NPK 25%, T₂ FYM 50%+NPK 50%, T₃ FYM 25% + NPK75%, T₄ Vermicompost 75%+NPK 25%, T₅ Vermicompost 50%+NPK 50%, T₆ Vermicompost 25% + NPK75%, T₇ Goat manure 75%+NPK 25%, T₈ Goat manure 50%+NPK 50%, T₉ Goat manure 25% + NPK75%, T₁₀ FYM 25% + Vermicompost 25% +Goat manure 25% + NPK 25%.

Observation recorded

1. Growth parameters
 - a) Vine length
 - b) Number of Leaves per plant
2. Yield Parameters
 - a) Fruit yield per plant
 - b) Fruit yield per hectare
3. Quality parameters
 - a) Total soluble Solid
 - b) Vitamin C content (mg/100g)

Results and Discussion

Growth parameter

Vine length

The results pertaining to the performance of different treatment of organic manures and inorganic fertilizers in cucumber for vine length are presented. The data pertaining to vine length at 15 DAS significantly varied among different treatments. Among the different treatments maximum vine length (4.98 cm) was observed with T₁₀ (FYM 25% + Vermicompost 25% +Goat manure 25% + NPK 25%) followed by T₈ (Goat manure 50% + NPK 50%) with 4.61 cm. Minimum vine length (3.29 cm) was observed T₀ (Control). The data pertaining to vine length at 30 DAS significantly varied among different treatments. Among the different treatments maximum vine length (18.94 cm) was observed with T₁₀ (FYM 25% + Vermicompost 25% +Goat manure 25% + NPK 25%) and T₈ (Goat manure 50% + NPK 50%) was at par for vine length with 18.82 cm. Minimum vine length (12.71 cm) was observed T₀ (Control). The data pertaining to vine length at 45 DAS significantly varied among different treatments. Among the different treatments maximum vine length (64.01 cm) was observed with T₁₀ (FYM 25% + Vermicompost 25% +Goat manure 25% + NPK 25%) followed by T₈ (Goat manure 50% + NPK 50%) with 63.68 cm. Minimum vine length (39.42 cm) was observed T₀ (Control). The improved vine length in the treatment involving 25% FYM, 25% Vermicompost,

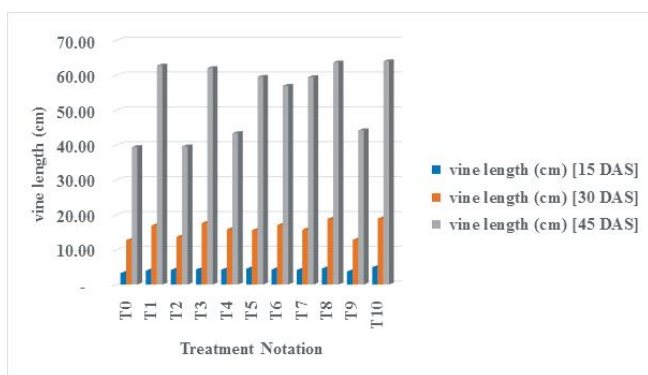


Fig. 1 : Performance of different treatments of organic manures and inorganic fertilizers combinations for vine length of cucumber.

Table 1 : Performance of different treatments of organic manures and inorganic fertilizers combinations for vine length and number of leaves per plant of cucumber.

Notation	Treatment details	Vine length (cm)	No of leaves per plant
		45 DAS	45 DAS
T ₀	Control (RDF 100%)	39.42	10.34
T ₁	FYM 75%+NPK 25%	62.78	11.73
T ₂	FYM 50%+NPK 50%	39.64	12.01
T ₃	FYM 25% + NPK75%	62.07	14.31
T ₄	Vermicompost 75%+NPK 25%	43.43	12.79
T ₅	Vermicompost 50%+NPK 50%	59.57	14.33
T ₆	Vermicompost 25% + NPK75%	56.98	11.14
T ₇	Goat manure 75%+NPK 25%	59.49	11.23
T ₈	Goat manure 50%+NPK 50%	63.68	16.55
T ₉	Goat manure 25% + NPK75%	44.25	10.73
T ₁₀	FYM 25% + Vermicompost 25% +Goat manure 25% + NPK 25%	64.01	16.62
'F' Test		S	S
SE (m±)		0.34	0.01
C.D. at 5%		1.02	0.04
CV.		1.09	0.16

25% Goat manure and 25% NPK for cucumber cultivation can be attributed to a synergistic effect of organic and inorganic components. FYM and Vermicompost enhance soil structure and nutrient retention, Goat manure adds slow-release nutrients and NPK provides balanced growth elements. This comprehensive approach optimizes soil health, nutrient availability and plant growth, leading to robust vine development compared to treatments with fewer beneficial inputs. Similar findings were reported by Ikeh *et al.* (2012), Singh *et al.* (2019) in cucumber.

Number of leaves per plant

The data pertaining to number of leaves per plant at 15 DAS significantly varied among different treatments. Among the different treatments maximum number of leaves per plant (3.29 leaves) was observed with T₁₀ (FYM 25% + Vermicompost 25% +Goat manure 25% + NPK 25%) while T₈ (Goat manure 50% + NPK 50%) was at par with 3.24 leaves. Minimum number of leaves per plant (2.55 leaves) was observed T₀ (Control). The data pertaining to number of leaves per plant at 30 DAS significantly varied among different treatments. Among the different treatments maximum number of leaves per plant (5.47 leaves) was observed with T₁₀ (FYM 25% +

Vermicompost 25% +Goat manure 25% + NPK 25%) and T₈ (Goat manure 50% + NPK 50%) was at par for number of leaves per plant with 5.36 leaves. Minimum number of leaves per plant (3.66 leaves) was observed T₀ (Control).

The data pertaining to number of leaves per plant at 45 DAS significantly varied among different treatments. Among the different treatments maximum number of leaves per plant (16.62 leaves) was observed with T₁₀ (FYM 25% + Vermicompost 25% +Goat manure 25% + NPK 25%) followed by T₈ (Goat manure 50% + NPK 50%) with 16.55 leaves. Minimum number of leaves per plant (10.34 leaves) was observed T₀ (Control). The treatment combination of 25% Farm Yard Manure (FYM), 25% Vermicompost, 25% Goat Manure, and 25% NPK fertilizer demonstrates increased cucumber growth due to its balanced nutrient profile. FYM and Vermicompost enhance soil structure and microbial activity, promoting nutrient availability. Goat manure enriches soil with organic matter and micronutrients. NPK provides essential macronutrients. This synergistic blend optimally caters to cucumber’s diverse needs throughout its growth stages, fostering vigorous development, higher yields, and disease resistance. The combination’s comprehensive nourishment surpasses other treatments, highlighting its efficacy in facilitating superior cucumber cultivation. Similar findings were reported by Hamdi *et al.* (2017), Ghayal *et al.* (2018) in cucumber.

growth stages, fostering vigorous development, higher yields, and disease resistance. The combination’s comprehensive nourishment surpasses other treatments, highlighting its efficacy in facilitating superior cucumber cultivation. Similar findings were reported by Hamdi *et al.* (2017), Ghayal *et al.* (2018) in cucumber.

Table 2 : Performance of different treatments of organic manures and inorganic fertilizers combinations for earliness and yield parameter of cucumber.

Treatment	Days to first male flowering	Days to first female flowering	Male female flower ratio	Avg. fruit weight (g)	Avg. fruit diameter (cm)	Days to first harvest [DAS]	Fruit yield per plant (kg/plant)	Fruit yield per ha. (t/ha)
T ₀	44.56	55.66	1.91	137.96	2.98	75.26	1.22	9.08
T ₁	34.59	43.89	1.51	152.26	3.48	65.29	1.32	12.21
T ₂	42.65	47.89	1.90	151.31	3.27	66.76	1.43	11.48
T ₃	43.32	54.16	2.12	160.18	3.42	70.43	1.54	10.72
T ₄	40.06	51.43	2.50	161.57	3.45	64.16	1.38	12.24
T ₅	39.97	55.13	2.16	152.65	3.29	68.27	1.57	13.39
T ₆	35.16	47.57	2.47	152.41	3.46	67.27	1.38	11.82
T ₇	38.27	43.87	2.21	160.38	3.04	66.73	1.62	12.35
T ₈	33.89	40.53	2.01	167.32	3.72	64.67	1.65	13.55
T ₉	37.75	44.43	1.90	153.16	3.16	66.73	1.39	11.74
T ₁₀	33.33	39.53	1.62	213.66	3.87	63.87	1.69	15.56
'F' Test	S	S	S	S	S	S	S	S
SE (m±)	0.97	0.98	0.20	1.37	0.22	0.85	0.03	0.43
C.D. at 5%	2.86	2.89	0.62	4.05	0.65	2.51	0.08	1.28
CV.	4.27	3.54	7.39	1.53	10.98	2.19	3.27	6.18

Yield parameters

Fruit yield per plant

The results pertaining to the performance of different treatment of organic manures and inorganic fertilizers in cucumber for fruit yield per plant are presented. The different treatments maximum fruit yield per plant (1.69 kg/plant) was observed with T₁₀ (FYM 25% + Vermicompost 25% + Goat manure 25% + NPK 25%) T₈ (Goat manure 50% + NPK 50%) was at par with 1.65 kg/plant. Minimum fruit yield per plant (1.22 kg/plant) was observed T₀ (Control).

Fruit yield per hectare

The results pertaining to the performance of different treatment of organic manures and inorganic fertilizers in cucumber for fruit yield per hectare are presented. The different treatments maximum fruit yield per hectare (15.56 t/ha) was observed with T₁₀ (FYM 25% + Vermicompost 25% + Goat manure 25% + NPK 25%) T₈ (Goat manure 50% + NPK 50%) was at par with 13.55 t/ha. Minimum fruit yield per hectare (9.08 t/ha) was observed T₀ (Control).

Quality parameters

Total Soluble solid

The results pertaining to the performance of different treatment of organic manures and inorganic fertilizers in cucumber for Total Soluble Solid are presented in Table 3.

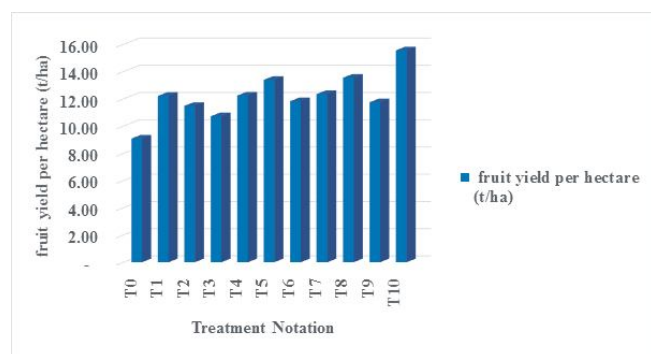
The data pertaining to Total Soluble Solid significantly varied among different treatments. Among the different treatments maximum Total Soluble Solid (5.92 °Brix) was observed with T₁₀ (FYM 25% + Vermicompost 25% + Goat manure 25% + NPK 25%) T₈ (Goat manure 50% + NPK 50%) was at par with 5.90 °Brix. Minimum Total Soluble Solid (4.51 °Brix) was observed T₀ (Control). The FYM 25% + Vermicompost 25% + Goat manure 25% + NPK 25% treatment yields higher Total Soluble Solids (TSS) values in cucumbers due to its balanced nutrient blend. Farmyard Manure and Vermicompost enhance soil structure and nutrient absorption, contributing to increased sugar accumulation. Goat manure enriches soil with essential micronutrients that enhance fruit quality. The NPK fertilizer provides key nutrients for metabolic processes that influence TSS. This combined mixture ensures consistent and optimal nourishment, leading to improved sugar synthesis and accumulation in cucumbers. Compared to alternative methods, this treatment effectively enhances fruit sweetness, resulting in higher TSS values and better flavour profile. The findings were reported similarly earlier by Naseer *et al.* (2020), Tahir *et al.* (2019), Singh *et al.* (2021) in cucumber.

Vitamin C content (mg/100g)

The results pertaining to the performance of different treatment of organic manures and inorganic fertilizers in cucumber for vitamin C content are presented in Table 3.

Table 3 : Performance of different treatments of organic manures and inorganic fertilizers combinations for TSS and vitamin C content (mg/100g) in cucumber.

Treatment Notation	Treatment details	TSS [°Brix]	Vitamin C content (mg/100g)
T ₀	Control (RDF 100%)	4.51	4.52
T ₁	FYM 75%+NPK 25%	4.72	4.75
T ₂	FYM 50%+NPK 50%	5.22	4.69
T ₃	FYM 25% + NPK 75%	5.18	5.35
T ₄	Vermicompost 75%+NPK 25%	5.45	5.60
T ₅	Vermicompost 50%+NPK 50%	5.51	5.20
T ₆	Vermicompost 25% + NPK 75%	5.22	4.60
T ₇	Goat manure 75%+NPK 25%	5.22	5.74
T ₈	Goat manure 50%+NPK 50%	5.90	5.67
T ₉	Goat manure 25% + NPK 75%	5.76	5.22
T ₁₀	FYM 25% + Vermicompost 25% +Goat manure 25% + NPK 25%	5.92	5.74
'F' Test		S	S
SE (m±)		0.28	0.21
C.D. at 5%		0.83	0.61
CV.		9.18	6.85

**Fig. 2 :** Performance of different treatments of organic manures and inorganic fertilizers combinations for fruit yield per hectare in cucumber.

The data pertaining to Vitamin C content significantly varied among different treatments. Among the different treatments maximum Vitamin C content (5.74 mg) was observed with T₁₀ (FYM 25% + Vermicompost 25% +Goat manure 25% + NPK 25%) T₈ (Goat manure 50% + NPK 50%) was at par with 5.67 mg. Minimum Vitamin C content (4.52 mg) was observed T₀ (Control). The FYM 25% + Vermicompost 25% + Goat manure 25% + NPK 25% treatment cultivates cucumbers with higher vitamin C content due to its nutrient-rich synergy. Farmyard Manure and Vermicompost bolster soil health, enhancing nutrient uptake and plant vitality. Goat manure enriches soil with essential micronutrients that foster vitamin production. The NPK fertilizer supplies key

elements for metabolic pathways involved in vitamin C synthesis. This harmonious blend ensures continuous and optimal nourishment, resulting in heightened vitamin C accumulation in cucumbers. In comparison to alternative methods, this treatment effectively boosts vitamin C levels, enhancing fruit nutritional value and offering health-conscious consumers an improved dietary option. The findings were in accordance with earlier reports of Singh *et al.* (2019), Naseer *et al.* (2020), Tahir *et al.* (2019), Singh *et al.* (2021) in cucumber.

Conclusion

From the above experimental finding, it was concluded that the treatment T₁₀ (FYM 25% + Vermicompost 25% +Goat manure 25% + NPK 25%) performed best in terms of growth parameters like vine length at 45 DAS (64.01 cm), earliness in maturity (63.87 days for first fruit harvest) and yield parameters like fruit length (14.88 cm), fruit diameter (3.87 cm) and fruit yield per plant (1.69 kg/plant). It also showed best performance for quality parameters also TSS (5.92°Brix) and Vitamin C content (5.74 mg/100g). Maximum Benefit cost ratio were recorded in treatment T₁₀ (FYM 25% + Vermicompost 25% +Goat manure 25% + NPK 25%) with 2.06.

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