



Effect of Different Organic Manures on Growth, Yield and Quality of Cucumber (*Cucumis sativus* L.) c.v. (Harsh) under Prayagraj Agro Climate Condition

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

A field experiment on cucumber (*Cucumis sativus* L.) c.v. (Harsh) under Prayagraj agro climate condition" was conducted Prayagraj agro climate condition" was conducted in a Randomized Block Design with three replications during the *Summer* season, 2021 at Horticultural Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj with a view to determine the effect of organic manures application on cucumber variety Harsh for its growth, quality and yield and to work out the economics of various treatments. Under this experiment, overall 10 treatment combinations were taken viz. T0 (Control), T1 (Farm Yard Manure 75% + Poultry manure 25%), T2(Farm Yard Manure 75% + Vermicompost 25%), T3(Farm Yard Manure 25% + Poultry manure 75%), T4(Poultry manure 75% + Vermicompost 25%), T5(Vermicompost 75% + Farm Yard Manure 25%), T6(Vermicompost 75% + Poultry manure 25%), T7(Farm Yard Manure 50% + Poultry manure 50%), T8(Vermicompost 50% + Poultry manure 50%) and T9 (Farm Yard Manure 50% + Vermicompost 50%).From the present investigation it was concluded that T8 (Poultry manure 50% + Vermicompost 50%) was found to be best among all treatment in terms of growth, yield and quality of cucumber i.e. T.S.S. The highest net return was found from T8 (Polutry manure 50% + vermicompost 50%) with ₹ 1,56,775 and the B:C ratio that is 1.92.

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1. 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.

Botanically Cucumber is known as *Cucumis Sativus*L. belongs to family *Cucurbitaceae*. It is a diploid self-pollinated species with chromosome number $2n=2x=14$ [1]. Cucumber probably originated from India [2]. 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 107 million ha with production of 1658 million tonnes in year 2018-19. (Source: [3]. Haryana ranks first in area and production of Cucumber in year 2018-19 followed by Madhya Pradesh and Karnataka. The production of Cucumber in Uttar Pradesh is 81.47 million tonnes for year 2018-19. The cucumber is used as salad, pickles and also as cooked vegetable. It has many uses in ayurvedic medicines. According to 'Unani' medicines, the oil from its seed is god for the brain and the body. Cucumber has 96.3 g water, magnesium 11 mg, sodium 10.2 mg, Vitamin C 7 mg, 2.5g Carbohydrates, Oxalic acid 15 mg, Calcium 10 mg, Sulphur 17 mg, Potassium 50 mg and many other nutrients out of 100 g of edible portion [4].

Cucumber is well adapted crop for warm-season crop and it does not withstand even light frost. The crop performs well in temperature range between 18°C- 24°C and soil having pH ranging between 5.5-6.7irrespective of its kind from sandy to heavy clay soil. It is grown as sole crop in India in *Zaid* season. It is well suited to hot and warm climate with annual rainfall of 60-75 cm. However, cucumber cannot withstand water logging. It is a short duration cucurbit crop, grown in all parts of India, well adapted crop for many diversified cropping systems. It is considered as quality dietary food due to its

excellent digestibility and rich water content (96.3 g/100 g). Cucumber is a dependable laxative for those who suffer constipation. The juice of cucumber is a valuable food in the treatment of hyper acidity, gastric and duodenal ulcers.

Farmyard manure or FYM refers to the decomposed mixture of dung and urine of farm animals along with litter and left over material from roughages or fodder fed to the cattle. On an average well decomposed farmyard manure contains 0.5 per cent N, 0.2 per cent P₂O₅ and .0.5 per cent K₂O. Urine, which is wasted, contains one per cent nitrogen and 1.35 per cent potassium.The excreta of birds ferment very quickly. If left exposed, 50 percent of its nitrogen is lost within 30 days. Poultry manure contains higher nitrogen and phosphorus compared to other bulky organic manures. The average nutrient content is 3.03 per cent N; 2.63 per cent P₂O₅ and 1.4 per cent K₂O. Vermicompost is the product of the decomposition process using various species of worms, usually red wigglers, white worms, and other earthworms, to create a mixture of decomposing vegetable or food waste, bedding materials, and vermicast. This process is called vermicomposting, while the rearing of worms for this purpose is called vermiculture [5].

Intensive use of only chemical fertilizers to achieve high production has created various problems. Continuous application of heavy doses of chemical fertilizers without organic manures has led to deterioration of soil health in terms of physical and chemical properties of soil, decrease in soil microbial activities, and also reduction in soil humus [6]. Intensive cultivation and improper fertilizer use leads to deficiency of nutrients, thus resulting in lower yield of crops. Therefore, the use of farm input in the form of organic manure has become necessary. Number of investigations were undertaken to study the effect of different chemical fertilizers on cucumber in different soils; on the other hand, the use of organic nutrient sources such as FYM, poultry manures, vermicompost etc. remains as alternative choice for the production of residue free wholesome produce, and to maintain soil health. The information on holistic approach with suitable combination of organic manure and inorganic fertilizers on growth and yield and quality of cucumber in soil of eastern region of Uttar Pradesh is very meager.Total

soluble solids are solids that are dissolved within a substance. A common total soluble solid is sugar. Amount of solids dissolved is measured by a scale called Brix scale. The Brix scale Measures % Of Total Soluble Solids in a Substance (per 100 gram).

The content (which solids are dissolved) of solids dissolved, is determined by refractive index. This is measured using a refractometer and is referred to as the degrees Brix. It's one of the methods to identify the naturally ripened from artificially ripened fruits.

2. MATERIALS AND METHODS

The experiment was conducted in Randomized Block Design comprising 10 treatments with three replications during Summer 2021-22 at Horticultural Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj.. The unit plot size was 2.25 m². The plants were planted with a spacing of 1.5 m between the rows and 90 cm between the plants. There were ten plants in each plot. The observations were recorded on randomly selected five plants on characters. In general, soil properties of experimental site showed a typical alluvial soil of eastern region of

Uttar Pradesh. Soil was sandy loam in texture, slightly acidic in reaction and having low electrical conductivity, very high in organic carbon, low in available nitrogen, low in available phosphorus and moderately high in available potassium given in Tables 1 and 2. Weeding and plant protection measure were followed as and when needed. Observations were recorded at different stages of growth periods. The data were statistically analyzed by the method suggested by Fisher and Yates [7].

3. RESULTS AND DISCUSSION

In the present investigation an attempt has been made to study the effect of different organic treatment combinations on growth and yield of cucumber (*Cucumis sativus* L.) in Prayagraj climatic zone. The results obtained are presented in relevant Tables as follows:

A) Growth Parameters

Growth parameters comprised of percentage of seed germination, vine length (30, 45, 60 DAS), number of branches per plant, days to first emergence of male and female flower and node at first male and female flowers. The data for these characters observed has been listed out in Tables 3, 4 and 5.

Table 1. Physical and chemical properties of soil at Horticulture Research field (SHUATS)

S. No.	Particulars	Mechanical Properties
1	Sand	48.15
2	Silt	21.34
3	Clay	30.51
4	Textural class	Sandy loam

Table 2. Chemical composition of the soil

S. No.	Ingredients	Quantity	Methods used
1	Soil pH	6.9	Digital pH meter (M. L Jackson)
2	Organic carbon (%)	0.358	Wet method (Walkely and Black' 1965)
3	Available Nitrogen (N)	212.56 kg/ha	Alkaline permanganate method (Subaiah & Asijal 1956)
4	Available Phosphorus (P)	14.59 kg/ha	Calorimetric method (Olson et al., 1954)
5	Available Potash (K)	225.1 kg/ha	Flame Photometric method (Peru et al. 1973)

Source: Soil analysis was done by KVK (Krishi Vigyan Kendra, Prayagraj, U.P.)

Table 3. Effect of organic treatment combination on seed germination, days to first male and female flower emergence

Treatment Notation	Treatment Combination	Seed Germination (%)	Days to first male flower emergence	Days to first female flower emergence
T0	Control	79.17	34.00	42.33
T1	FYM (75%) + Poultry manure (25%)	70.83	34.67	43.00
T2	FYM (75%) + Vermicompost (25%)	79.17	34.33	42.67
T3	Poultry manure (75%) + FYM (25%)	72.92	35.00	43.33
T4	Poultry manure (75%) Vermicompost (25%)	91.67	33.33	41.67
T5	Vermicompost (75%) + FYM (25%)	75.00	35.67	44.00
T6	Vermicompost (75%) + Poultry manure (25%)	66.67	33.67	42.00
T7	FYM (50%) + Poultry manure (50%)	75.00	31.67	40.00
T8	Poultry manure (50%) + vermicompost (50%)	95.83	33.33	41.67
T9	Vermicompost (50%) + FYM (50%)	79.17	34.33	42.67
	Mean	78.54	34.00	42.33
	'F' Test	S	S	S
	C.V.	0.29	0.21	0.48
	S.E. (m)	0.18	0.05	0.17
	C.D. at 5%	0.39	0.12	0.37

Table 4. Effect of organic manure treatment combinations on vine length (cm) at 30, 45 and 60 DAS

Treatment Notation	Treatment Combination	30 DAS	45 DAS	60 DAS
T0	Control	21.99	97.09	155.17
T1	FYM (75%) + Poultry manure (25%)	26.48	101.96	160.41
T2	FYM (75%) + Vermicompost (25%)	23.02	98.16	156.34
T3	Poultry manure (75%) + FYM (25%)	27.88	103.07	161.44
T4	Poultry manure (75%) Vermicompost (25%)	26.22	101.77	159.53
T5	Vermicompost (75%) + FYM (25%)	25.09	94.99	158.22
T6	Vermicompost (75%) + Poultry manure (25%)	29.02	98.80	162.19
T7	FYM (50%) + Poultry manure (50%)	28.76	98.53	161.77
T8	Poultry manure (50%) + vermicompost (50%)	29.28	99.54	162.99
T9	Vermicompost (50%) + FYM (50%)	25.00	95.13	158.40
	Mean	26.27	98.90	159.64
	'F' Test	S	S	S
	C.V.	0.24	0.11	0.08
	S.E. (d)	0.05	0.09	0.10
	C.D. at 5%	2.43	2.46	2.48

Table 5. Effect of organic treatment combinations on node at first male and female flower and number of branches per plant

Treatment Notation	Treatment Combination	Node at first male flower	Node at first female flower	Number of branches per plant
T0	Control	3.78	6.67	4.22
T1	FYM (75%) + Poultry manure (25%)	3.89	6.33	4.56
T2	FYM (75%) + Vermicompost (25%)	3.44	6.00	4.22
T3	Poultry manure (75%) + FYM (25%)	3.78	6.33	4.33
T4	Poultry manure (75%) Vermicompost (25%)	3.89	6.22	4.44
T5	Vermicompost (75%) + FYM (25%)	4.11	6.78	5.33
T6	Vermicompost (75%) + Poultry manure (25%)	3.56	6.22	4.89
T7	FYM (50%) + Poultry manure (50%)	3.67	6.56	4.44
T8	Poultry manure (50%) + vermicompost (50%)	3.44	6.67	5.56
T9	Vermicompost (50%) + FYM (50%)	3.56	6.11	4.56
	Mean	3.71	6.38	4.65
	'F' Test	S	S	S
	C.V.	1.86	0.39	0.17
	S.E. (m)	0.05	0.02	0.03
	C.D. at 5%	0.11	0.04	0.01

1. Percentage of seed germination

The maximum value of percent of seed germination was observed for T4 (Poultry manure 75% + Vermicompost 25%) with value 91.67% followed by T8 (Poultry manure 50% + vermicompost 50%) with value of 95.83%. Minimum value of percent of seed germination was observed for T6 (Vermicompost 75% + Poultry manure 25%) with value of 66.67%.

2. Vine length (cm) [30, 45 and 60 DAS]

The maximum Vine length (29.28 cm) at 30 DAS was observed with treatment T8 (Poultry manure 50% + Vermicompost 50%) followed by T6 (Vermicompost 75% + Poultry manure 25%) with 29.02 cm. Minimum Vine length (21.09 cm) was observed in T0 (control), while the remaining treatments were moderate in their growth habit. The maximum Vine length (101.96 cm) at 45 DAS was observed with treatment T3 (FYM 25% + Poultry manure 75%) followed by T1 (Vermicompost 75% + FYM 25%) with 101.96 cm. Minimum Vine length (94.99 cm) was observed in T5 (Vermicompost 75% + FYM

25%), while the remaining treatments were moderate in their growth habit. The maximum Vine length (162.99 cm) at 60 DAS was observed in treatment T8 (Poultry manure 50% + Vermicompost 50%) followed by T6 (Vermicompost 75% + Poultry manure 25%) with 162.19 cm. Minimum Vine length (155.17 cm) was observed in T0 (control), while the remaining treatments were moderate in their growth habit. The application of organic manures might have improved the soil physical and chemical properties and leading to the adequate supply of nutrients to the plants which might have promoted the maximum vegetative growth while the minimum plant growth was due to non-availability of nutrients. Similar findings were reported by Ikeh et al. [8]; Hamdi et al. [9]; Ghayal et al. [10] and Tahir et al. [11] in cucumber.

3. Days to first male and female flower emergence

Among the application of organic manure the minimum days to first male flower emergence was seen in T7 (FYM 50% + Poultry manure

50%) with 31.67 days, followed by T8 (Poultry manure 50% + Vermicompost 50%) with 33.33 days whereas maximum days to first male flower emergence 35.67 days was recorded in T5 (Vermicompost 75% + FYM 25%). Among the application of organic manure the minimum days to first female flower emergence was seen in T7 (FYM 50% + Poultry manure 50%) with 40.00 days, followed by T8 (Poultry manure 50% + Vermicompost 50%) with 41.67 days whereas maximum days to first female flower emergence 44.00 days was recorded in T5 (Vermicompost 75% + FYM 25%). Similar results have also been reported by Kaur and Kaur [12]; Tahir et al. [11]; Jagraj et al. [13] and Singh et al. [14] in cucumber.

4. Node at first male and female flower emergence

Among the application of organic manure the maximum node at first male flower emergence was seen in T5 (Vermicompost 75% + FYM 25%) at 4.11 node, followed by T4 (Poultry manure 75% + Vermicompost 25%) with 3.89 node whereas minimum node at first male flower emergence 3.44 node was recorded in T4 (FYM 75% + Vermicompost 25%). Among the application of organic manure the maximum node at first female flower emergence was seen in T5 (Vermicompost 75% + FYM 25%) at 6.78 node, followed by T8 (Poultry manure 50% + Vermicompost 50%) with 6.67 node whereas minimum node at first female flower emergence 6.00 node was recorded in T4 (FYM 75% + Vermicompost 25%).

5. Number of branches per plant

It was also found that T8 (Poultry manure 50% + Vermicompost 50%) with maximum value i.e. 5.56 branches per plant followed by T6 (Vermicompost 75% + Poultry manure 25%) with 4.89 branches per plant whereas the minimum score was observed in treatment T2 (FYM 75% + Vermicompost 25%) with 4.22. It was noticed that number of branches per plant increased with increasing vine length successively with the increasing levels of nutrient. Combination of organic manures also recorded maximum vine length and number of branches also which helped the plants in better photosynthesis to attain vigour. The findings of the present investigation are in conformity with the reports of Ikeh et al. [8]; Hamdi et al. [9]; Ghayal et al. [10];

Tahir et al. [11] and Singh et al. [14] in cucumber.

B) Yield Parameters

Yield parameters comprised of number of fruits per plant, fruit length, fruit diameter, fruit yield per plant, fruit yield per plot, fruit yield per hectare and T.S.S. The data for these characters observed has been listed out in Tables 6 and 7.

1. Number of fruits per plant

The maximum number of fruits per plants 26.56 were recorded in treatment T8 (Poultry manure 50% + Vermicompost 50%) followed by T9 (Vermicompost 50% + FYM 50%) i.e., 23.33 and the lowest fruits per plant 15.78 were observed in T1 (FYM 75% + Poultry manure 25%). Maximum number of fruits per plant increase of T8 (Poultry manure 50% + Vermicompost 50%) might be due to increased number of flowers which might have formed into fruits due to adequate availability of major and minor nutrients during its growth and development. Similar conclusions have also been reported by Ikeh et al. [8]; Hamdi et al. [9]; Singh et al. [15]; Ghayal et al. [10]; Tahir et al. [11] and Singh et al. [14] in cucumber.

2. Average fruit yield per plant, per plot and per hectare

The maximum fruit yield per plant 6.12 kg/plant were recorded in treatment T8 (Poultry manure 50% + Vermicompost 50%) followed by T7 (FYM 50% + Poultry manure 50%) i.e., 5.51 kg/plant and the lowest fruit yield per plant (3.69 kg/plant) was observed in T5 (Vermicompost 75% + FYM 25%). The maximum fruit yield per plot 39.77 kg/plot were recorded in treatment T8 (Poultry manure 50% + Vermicompost 50%) followed by T7 (FYM 50% + Poultry manure 50%) i.e., 35.65 kg/plot and the lowest fruit yield per plot (23.77 kg/plot) was observed in T5 (Vermicompost 75% + FYM 25%). The maximum fruit yield per hectare 15.90 t/ha were recorded in treatment T8 (Poultry manure 50% + Vermicompost 50%) followed by T7 (FYM 50% + Poultry manure 50%) i.e., 14.31 t/ha and the lowest fruit yield per hectare (10.11 t/ha) was observed in T5 (Vermicompost 75% + FYM 25%). Organic manures play an important role in improving productivity and quality of fruit. Doses of Poultry manure, FYM and vermi-compost increased the

vigour of plants, assimilating area, size of fruit, thereby resulting into higher weight of fruit. These results were in close conformity with the findings of Ikeh et al. [8]; Hamdi et al. [9]; Singh et al. [15]; Ghayal et al. [10]; Tahir et al. [11] and Singh et al. [14] in cucumber.

3. Average fruit length and diameter

The maximum fruit length 18.34 cm were recorded in treatment T8 (Poultry manure 50% + Vermicompost 50%) followed by T9 (Vermicompost 50% + FYM 50%) i.e., 17.94 cm and the lowest fruit length (16.42 cm) were observed in T5 (Vermicompost 75% + FYM 25%). The maximum fruit diameter 7.29cm were recorded in treatment T0 (control) followed by T8 (Poultry manure 50% + Vermicompost 50%)i.e., 6.80 cm and the lowest fruit diameter (5.67 cm) were observed in T7(FYM 50% + Poultry manure

50%). These results are in close conformity with the findings of Ikeh et al. [8]; Hamdi et al. [9]; Singh et al. [15]; Ghayal et al. [10]; Kaur and Kaur [12]; Tahir et al. [11] and Singh et al. [14] in cucumber.

4. T.S.S.

The maximum T.S.S. (5.77 °Brix) was observed in treatment T8 (Poultry manure 50% + vermicompost 50%) followed by T5 (Vermicompost 75% + FYM 25%) with 5.70 °Brix. The minimum T.S.S. (5.15 °Brix) was noticed in treatment T4 (Poultry manure 75% + Vermicompost 25%). These results are in close conformity with the findings of Ikeh et al. [8]; Hamdi et al. [9]; Singh et al. [15]; Ghayal et al. [10]; Kaur and Kaur [12]; Tahir et al. [11]; Jagraj et al. [13]; Nasser et al. [16] and Singh et al. [14] in cucumber.

Table 6. Effect of organic treatment combinations on number of fruits per plant, fruit length, fruit diameter and T.S.S.

Treatment Notation	Treatment Combination	Number of fruits per plant	Fruit diameter (cm)	Fruit Length (cm)	T.S.S.
T0	Control	18.11	7.29	17.67	5.42
T1	FYM (75%) + Poultry manure (25%)	15.78	6.35	17.73	5.35
T2	FYM (75%) + Vermicompost (25%)	17.67	6.79	16.78	5.42
T3	Poultry manure (75%)+ FYM (25%)	21.00	6.11	17.00	5.30
T4	Poultry manure (75%) Vermicompost (25%)	20.89	6.63	16.75	5.15
T5	Vermicompost (75%) + FYM (25%)	23.33	5.69	16.42	5.70
T6	Vermicompost (75%) + Poultry manure (25%)	20.78	6.35	17.56	5.47
T7	FYM (50%) + Poultry manure (50%)	22.67	5.67	17.15	5.27
T8	Poultry manure (50%) + vermicompost (50%)	26.56	6.80	18.34	5.77
T9	Vermicompost (50%) + FYM (50%)	23.33	6.32	17.94	5.35
	Mean	23.33	6.40	17.33	5.42
	'F' Test	S	S	S	S
	C.V.	0.18	0.14	0.06	1.32
	S.E. (m)	0.03	0.08	0.01	0.28
	C.D. at 5%	0.06	0.02	0.02	0.58

Table 7. Effect of organic treatment combinations on Fruit yield per plant, fruit yield per plot and fruit yield per hectare

Treatment Notation	Treatment Combination	Fruit yield per plant (Kg/plant)	Fruit yield per hectare (t/ha)	Fruit yield per plot (Kg)
T0	Control	3.88	10.32	24.31
T1	FYM (75%) + Poultry manure (25%)	3.60	9.62	22.46
T2	FYM (75%) + Vermicompost (25%)	3.84	10.22	24.03
T3	Poultry manure (75%) + FYM (25%)	4.51	11.97	28.60
T4	Poultry manure (75%) Vermicompost (25%)	4.79	12.68	30.44
T5	Vermicompost (75%) + FYM (25%)	3.69	10.11	23.77
T6	Vermicompost (75%) + Poultry manure (25%)	5.10	13.26	32.92
T7	FYM (50%) + Poultry manure (50%)	5.51	14.31	35.65
T8	Poultry manure (50%) + vermicompost (50%)	6.12	15.90	39.77
T9	Vermicompost (50%) + FYM (50%)	5.45	14.16	35.28
	Mean	4.65	12.25	29.72
	'F' Test	S	S	S
	C.V.	1.98	1.87	0.66
	S.E. (m)	0.07	0.18	0.16
	C.D. at 5%	0.16	0.39	0.33

C) Economic Parameter

Maximum gross returns, net returns and benefit cost ratio was observed in the treatment T8 (Poultry manure 50% + Vermicompost 50%) and recorded the best treatment among all the other treatments. As the economics is the need of the farmers while taking decision regarding the adoption of the techniques and scientific knowledge hence, T8 (Poultry manure 50% + Vermicompost 50%) gave the highest gross return, net return, and cost benefit is due to higher productivity and higher quality of fruits, which increase the market value of the fruits.

4. CONCLUSION

From the present investigation it was concluded that T8 (Poultry manure 50% + Vermicompost 50%) was found to be best among all treatment in terms of growth, yield and quality of cucumber i.e. T.S.S. The highest net return was found from T8 (Poultry manure 50% + vermicompost 50%) with ₹ 1,56,775 and the B:C ratio that is 1.92.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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