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**Abhinav Singh**

Department of Horticulture,  
Naini Agricultural Institute,  
Sam Higginbottom University of  
Agriculture, Technology and  
Sciences, Prayagraj, Uttar  
Pradesh, India

**Dr. VM Prasad**

Professor, Department of  
Horticulture, Naini Agricultural  
Institute, Sam Higginbottom  
University of Agriculture,  
Technology and Sciences,  
Prayagraj, Uttar Pradesh, India

**Dr. Vijay Bahadur**

Department of Horticulture,  
Naini Agricultural Institute,  
Sam Higginbottom University of  
Agriculture, Technology and  
Sciences, Prayagraj, Uttar  
Pradesh, India

**Dr. Samir E Topno**

Department of Horticulture,  
Naini Agricultural Institute,  
Sam Higginbottom University of  
Agriculture, Technology and  
Sciences, Prayagraj, Uttar  
Pradesh, India

**Corresponding Author:**

**Abhinav Singh**

Department of Horticulture,  
Naini Agricultural Institute,  
Sam Higginbottom University of  
Agriculture, Technology and  
Sciences, Prayagraj, Uttar  
Pradesh, India

## Effect of organic and inorganic fertilizer on growth, yield and quality traits of cucumber (*Cucumis sativus*) under Prayagraj Agro-climatic condition

**Abhinav Singh, Dr. VM prasad, Dr. Vijay Bahadur and Dr. Samir E Topno**

### Abstract

The present experiment was carried out during September to November, 2020 in Research Field of Department of Horticulture, SHUATS, Prayagraj. The experiment was conducted in Randomized Block Design (RBD), with nine treatments, replicated thrice of organic and inorganic fertilizers. the treatments were T0 (Control (Recommended dose of NPK 100:80:100 kg/ha)), T1 (Neem Cake 75% + NPK 25%), T2 (Neem Cake 50% + NPK 50%), T3 (Vermicompost 75% + NPK 25%), T4 (Vermicompost 50% + NPK 50%), T5 (Sheep Manure 75% + NPK 25%), T6 (Sheep Manure 50% + NPK 50%), T7 (Vermicompost 50% + Sheep Manure 25% + NPK 25%) and T8 (Vermicompost 25% + Sheep Manure 25% + Neem Cake 25% + NPK 25%). From the present experimental findings it is found that the treatment T8 Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%) was found superior over other treatments in terms of growth, yield and Quality of Cucumber, followed by treatment T7 (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)), in terms of economics maximum Gross return, Net Return and Cost Benefit ratio was also recorded in treatment T8 and lowest readings was recorded in T3 (Vermicompost (75%) + NPK (25%)).

**Keywords:** Cucumber, neem cake, vermicompost, sheep manures and NPK

### Introduction

Agriculture plays a significant role in Indian Horticulture. India has predominantly an agriculture-based economy and will continue to be so for a pretty long time. With the ushering of green revolution, the production and productivity of crops has increased substantially and is almost stabilized. Since the Indian population depends mostly on agriculture mainly oil, vegetables, hence vegetables are the most important component of Indian vegetarian diet. As far as vegetable consumption per capita per day is concerned at present it is 225 g/capita/day in India, as to the standard nutritional requirement of which should not be less than 300 g/capita/day. Therefore, to fill this gap certain steps through the central government have been taken for increasing the production of vegetable crops. Also, a large number of high yielding varieties and hybrids have been developed by the ICAR and other private as well corporate sectors. Still the national average yield has not registered a significant jump as expected. One of the several reasons for this wide gap is that proper emphasis has not been given to the up gradation of production technology. Vegetable play an important role in the balance diet by providing not only energy but also supplying vital protective nutritive nutrients either mineral or vitamins. Thus, Vegetables are getting increasingly higher importance in India as well as in the world due to their relevance in achieving nutritional security from emerging nutritional problems in human beings. Today India is the second largest producer of Vegetable in worlds after china. In the year 2016, the total vegetable production of country was 169064 million tones from 10106 million hectares of land (HIVR, 2016).

The cucumber (*Cucumis sativus* L.) belongs to the cucurbitaceae family, normally, cucumber plants are monoecious – they produce both male and female flowers on the same plant. Male flowers appear on the main stem earlier and in much larger numbers than female flowers. Cucurbits are largest group of summer season vegetables and extensively grown in tropical, subtropical and milder zones of India. Among the vegetable crop, cucumber (*Cucumis sativus* L; 2 n = 14) is considered as one of the major vegetable crops in India and in the world. Cucumber is considered as fourth most important crop after tomato, cabbage and onion. It is warm season vegetable crops primarily grow for processing (pickling) or for fresh market

(slicing). The fruit of cucumber is said to have cooling effect, prevent constipation and check jaundice and indigestion. It contains 96.3 g water, 0.4g protein, 0.1g fat, 0.3 g minerals, 0.4 g fibre, 2.5g carbohydrate, 13 kcal energy, 10 mg calcium 25mg Phosphorus 1.5 mg iron 0.3 mg Thiamine 0.2 mg Niacin 7 mg Vitamin C per 100 g edible portion (Gopalan *et al.*, 1982) [3]. It is one of the most important crops grown under green house. So, keeping in views the above points an experiment was conducted “Effect of organic and inorganic fertilizer on growth, yield and quality traits of cucumber (*Cucumis sativus*) under Prayagraj Agro-climatic condition.” was carried out at the research plot of the Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during Rabi season 2019-20 session with the following objectives Consequence development of organic and inorganic fertilizer on the cucumber plant height, yield quality traits properties in the prayagraj climate condition.

### Materials and Methods

The Experimental was conducted in Randomized Block Design (RBD) with 9 treatments of Micronutrients and NPK with three replications in the Research field, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during September to November 2020. Total number of treatments were Nine viz. T<sub>0</sub> (Control (Recommended dose of NPK 100:80:100 kg/ha)), T<sub>1</sub> (Neem Cake 75% + NPK 25% T<sub>2</sub> (Neem Cake 50% + NPK 50%), T<sub>3</sub> (Vermicompost 75% + NPK25%), T<sub>4</sub> (Vermicompost 50% + NPK 50%), T<sub>5</sub> (Sheep Manure 75% + NPK 25%), T<sub>6</sub> (Sheep Manure 50% + NPK 50%), T<sub>7</sub> (Vermicompost 50% + Sheep Manure 25% + NPK 25%) and T<sub>8</sub> (Vermicompost 25% + Sheep Manure 25% + Neem Cake 25% + NPK 25%).

### Climatic condition in the experimental site

The area of Prayagraj district comes under subtropical belt in the south east of Utter Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46 °C- 48 °C and seldom falls as low as 4 °C- 5°C. The relative humidity ranges between 20 to 94%. The average rainfall in this area is around 1013.4 mm annually. However, occasional precipitation is also not uncommon during winter months.

### Results and Discussion

The present investigation entitled “Effect of organic and inorganic fertilizer on Growth, Yield and Quality traits of Cucumber (*Cucumis sativus*) under Prayagraj Agro climatic condition” was carried out during September to November 2020 in Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) India. The results of the present investigation, regarding the impact of organic and inorganic fertilizer on growth, yield and quality of Cucumber, have been discussed and interpreted in the light of previous research work done in India and abroad. The experiment was conducted in Randomized block design with 9 treatments, three replications and one variety of cucumber.

The results of the experiment are summarized below In terms of Plant Height, treatment T<sub>8</sub> (Vermicompost (25%) +Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (370.00 cm) Plant height, followed by T<sub>7</sub>

(Vermicompost (50%) +Sheep Manure (25%) + NPK (25%)) with (353.13 cm) where as minimum (314.87 cm) was recorded in treatment T<sub>0</sub>(Control).

In terms of Number of Leaves/plant, treatment T<sub>8</sub> (Vermicompost (25%) +Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (119.84) Number of Leaves/plant, followed by T<sub>6</sub> (Sheep Manure (50%) + NPK (50%)) with (115.85) where as minimum (104.73) was recorded in treatment T<sub>0</sub> (Control). This is clearly indicated that integrated use of nutrient helpful in cell elongation of leaves use to development of cell and rapid cell division and cell elongation in meristematic region of plant due to production of plant growth substance and this may be due to abundant supply of plant nutrients and nitrogen which led in the growth of Cucumber. Similar findings of Mujahid *et al.* (2010) [5] in lettuce and Bano and Kale (1987) [2] in brinjal and radish were also observed.

In terms of Number of Branches, treatment T<sub>8</sub> (Vermicompost (25%) +Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (3.51) Number of Branches/plant, followed by T<sub>6</sub> (Sheep Manure (50%) + NPK (50%)) with (3.51) where as minimum (2.80) was recorded in treatment T<sub>0</sub> (Control). The increase in number of branches per plant in best treatment is due to different treatment combination of organic and inorganic fertilizers. Which is due to incorporation of organic manure. With nitrogen fertilizer or recommended dose of inorganic fertilizer the Similar findings has been reported by Mujahid *et al.* (2010) [5] and Vadiraj *et al.* (1993) [7] in brinjal and Bano and Kale. (1987) [2] noticed that the application of vermicompost along with chemical fertilizer number of branch.

In terms of Days for first flowering, treatment T<sub>8</sub> (Vermicompost (25%) +Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded minimum (31.24 days) for first flowering, followed by T<sub>7</sub> (Vermicompost (50%) +Sheep Manure (25%) + NPK (25%)) with (31.33 days) where as maximum (34.00 days) was recorded in treatment T<sub>0</sub> (Control).

In terms of Days to 50% flowering, treatment T<sub>8</sub> (Vermicompost (25%) +Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded minimum (43.33 days) for 50% flowering, followed by T<sub>7</sub> (Vermicompost (50%) +Sheep Manure (25%) + NPK (25%)) with (44.43 days) where as maximum (48.23 days) was recorded in treatment T<sub>0</sub> (Control). The decreased in the number of days taken for appearance of first flower and 50% flowering in best treatment of organic and inorganic fertilizers in Cucumber is due to combined effect of the organic manures and Chemical fertilizers. The Similar results were also obtained by Bano and Kale (1987) [2] in the cucurbits.

In terms of Days to first Harvest, treatment T<sub>8</sub> (Vermicompost (25%) +Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded minimum (56.00 days) for first Harvest, followed by T<sub>7</sub> (Vermicompost (50%) +Sheep Manure (25%) + NPK (25%)) with (57.00 days) where as maximum (62.67 days) was recorded in treatment T<sub>0</sub> (Control).

In terms of Fruit diameter, treatment T<sub>6</sub> (Sheep Manure (50%) + NPK (50%)) recorded maximum (14.80 cm) Fruit diameter, followed by T<sub>8</sub> (Vermicompost (25%) +Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) with (14.07cm) where as minimum (12.10 cm) was recorded in treatment T<sub>0</sub> (Control).

In terms of Fruit length, treatment T<sub>8</sub> (Vermicompost (25%) +Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (15.03 cm) Fruit length fertilizers

followed by T<sub>7</sub> (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) with (14.80 cm) where as minimum (13.27 cm) was recorded in treatment T<sub>0</sub> (Control). The integrated use of Organic manures along with N.P.K. significantly influenced the length – diameter ratio of fruit. The results are conformity with findings of Abusaleh (1992)<sup>[1]</sup> in okra.

In terms of Average fruit weight, treatment T<sub>8</sub> (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (198.93 g) Average fruit weight, followed by T<sub>7</sub> (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) with (175.30 g) where as minimum (139.13 g) was recorded in treatment T<sub>0</sub> (Control). The fruit weight was significantly effect by organic manures and NPK the Similar result has been obtained by Vadiraj *et al.* (1993)<sup>[7]</sup> in cardamom and Sekhar and rajashree (2009)<sup>[6]</sup> in tomato.

In terms of Number of fruits per plant, treatment T<sub>8</sub> (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (62.07) fruit per plant, fertilizers followed by T<sub>7</sub> (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) with (51.20 fruit/plant) where as minimum (23.66) was recorded in treatment T<sub>0</sub> (Control). The Similar result were reported by the Sekhar and Rajashree, (2009)<sup>[6]</sup> in tomato hybrid and Jose *et al.*, (1998)<sup>[4]</sup> in Brinjal. In terms of Fruit yield per Plot treatment T<sub>8</sub> (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (11.87 kg) fruit yield per plot, followed by T<sub>7</sub> (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) with (8.625 kg) where as minimum (3.12 kg) was recorded in treatment T<sub>0</sub> (Control).

In terms of Fruit yield q/ha, treatment T<sub>8</sub> (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (824.30 q) fruit yield/ha, followed by T<sub>7</sub> (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) with (598.95 q/ha) where as minimum (211.66 q) was

recorded in treatment T<sub>0</sub> (Control). This is clearly indicated that integrated use of nutrient helpful in cell elongation of leaves use to development of cell and rapid cell division and cell elongation in meristematic region of plant due to production of plant growth substance and this may be due to abundant supply of plant nutrients and nitrogen which led in the growth of Cucumber. Similar findings of Mujahid *et al.* (2010)<sup>[5]</sup> in lettuce and Bano and Kale (1987)<sup>[2]</sup> in brinjal and radish were also observed.

In terms of Total Soluble Solids, treatment T<sub>8</sub> (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (4.10 °Brix) Total Soluble Solids (°Brix), followed by T<sub>7</sub> (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) with (3.90 °Brix) where as minimum (3.25 °Brix) was recorded in treatment T<sub>0</sub> (Control). Increased in Total soluble solids content of fruits in treatments of organic manures, and NPK, previously also reported by Sekhar and Rajashree (2009)<sup>[6]</sup>.

In terms of Vitamin C, treatment T<sub>8</sub> (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (8.39 mg) Vitamin C, fertilizers followed by T<sub>7</sub> (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) with (7.85 mg) where as minimum (5.16 mg) was recorded in treatment T<sub>0</sub> (Control). These were significantly increase fruit yield and Quality parameters of the fruit due to the different treatment combination. These results are conformity with the findings has been by Jose (1988)<sup>[4]</sup> in Bottle gourd.

In terms of Economics, Maximum gross returns, net returns and benefit: cost ratio was observed in the treatment T<sub>8</sub> (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) followed by T<sub>7</sub> (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) and minimum was recorded in treatment T<sub>3</sub> (Vermicompost (75%) + NPK (25%)).

**Table 1:** Effects of Organic and inorganic fertilizers on Plant Height (cm), Number of Leaves/plant, Number of branches/plant, Days to first flowering, Days to 50% flowering, Days to first harvest, Fruit diameter (cm), and Fruit length (cm) of Cucumber.

Treatment Symbols	Treatment Combinations	Plant height (cm) at harvest	Number of leaves/ Plant	Number of branches/ plant	Days to first Flowering	Days to 50% Flowering	Days to first harvest	Fruit diameter (cm)	Fruit length (cm)
T0	Control (Recommended dose of NPK (100:80:100 kg/ha))	314.87	104.73	2.80	34.00	47.59	62.67	12.10	13.27
T1	Neem Cake (75%) + NPK (25%)	332.80	108.60	3.00	33.63	47.10	61.67	13.10	13.53
T2	Neem Cake (50%) + NPK (50%)	337.07	108.07	3.23	33.00	47.33	62.00	13.22	13.67
T3	Vermicompost (75%) + NPK (25%)	343.67	110.07	2.83	33.33	47.00	61.33	13.18	13.55
T4	Vermicompost (50%) + NPK (50%)	344.47	114.93	3.38	32.33	45.00	60.00	13.68	13.80
T5	Sheep Manure (75%) + NPK (25%)	330.07	115.13	3.43	33.33	45.53	57.66	13.53	14.13
T6	Sheep Manure (50%) + NPK (50%)	345.20	115.80	3.48	31.43	44.76	58.00	14.80	14.43
T7	Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)	353.13	114.80	3.20	31.33	44.43	57.00	13.57	14.80
T8	Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)	370.00	119.84	3.51	31.24	43.33	56.00	14.07	15.03
F-Test		S	S	S	S	S	S	S	S
SE(d)		1.88	1.41	0.14	0.82	1.08	1.37	0.45	0.27
C.V.		0.05	0.04	0.09	0.03	0.03	0.04	0.05	0.04
C.D. at 5%		3.99	3.00	0.30	1.74	2.29	2.90	0.95	0.58

**Table 2:** Effects of organic and inorganic fertilizers on Average fruit weight (g), Number of fruit/plant, Fruit yield per plot (kg), Fruit Yield q/ha, Total Soluble Solids (°Brix.), Vitamin C (mg/100g) and Cost Benefit Ratio of Cucumber.

Treatment Symbols	Treatment Combinations	Average Fruit weight (g)	Number of fruit per plant	Fruit yield per plot (kg)	Fruit yield q/ha	Total Soluble Solids (°Brix)	Vitamin C (mg)	Benefit cost ratio
T0	Control (Recommended dose of NPK (100:80:100 kg/ha))	139.13	23.66	3.12	216.66	3.25	5.16	1:1.25

T1	Neem Cake (75%) + NPK (25%)	162.13	28.01	4.25	295.13	3.31	5.67	1:20
T2	Neem Cake (50%) + NPK (50%)	168.53	31.33	5.08	352.77	3.48	6.21	1:2.5
T3	Vermicompost (75%) + NPK (25%)	140.33	29.50	3.60	280.00	3.60	6.93	1:1.1
T4	Vermicompost (50%) + NPK (50%)	153.27	38.10	5.57	386.80	3.81	7.66	1:20
T5	Sheep Manure (75%) + NPK (25%)	168.40	33.30	5.42	376.38	3.40	6.50	1:2.1
T6	Sheep Manure (50%) + NPK (50%)	172.40	41.85	7.04	488.88	3.53	7.02	1:3.33
T7	Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)	175.3	51.20	8.625	598.95	3.90	7.85	1:3.70
T8	Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)	198.93	62.67	11.870	824.30	4.10	8.39	1:6.25
F-Test		<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	
SE(d)		2.17	2.46	0.42	3.34	0.23	0.45	
C.V.		0.11	0.33	0.45	0.44	0.08	0.15	
C.D. at 5%		4.61	5.42	0.88	7.07	0.49	0.95	

### Conclusion

From the present experimental findings it is concluded that the treatment T<sub>8</sub> Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%) was found superior over other treatments in terms of growth, yield and Quality of Cucumber, followed by treatment T<sub>7</sub> (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)), in terms of economics maximum Gross return, Net Return and Cost Benefit ratio was also recorded in treatment T<sub>8</sub> and lowest readings was recorded in T<sub>3</sub> (Vermicompost (75%) + NPK (25%).

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