

## **Original Research Article**

“Effect of organic and inorganic fertilizers on growth, yield & quality of cucumber (*Cucumis Sativus* L.) under Protected Cultivation.”

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### **ABSTRACT**

The experiment was laid out in Randomized Randomized Block Design comprising of 10 treatments with three replications. The study revealed that the treatment T<sub>10</sub> (Recommended Dose of Fertilizer (RDF) 50% + Poultry manure 50%) performed best in terms of no. of leaves (107.62/plant), days to first flowering (36.94), days to harvest (62.33), fruit length (15.03 cm), fruit diameters (14.1 mm), number of fruits per plant (20.70), weight (162.40 g), yield per plot (3.26 kgKg), yield per 200 sq.m (571.52 kgKg) and Vitamin C (7.57 mg/100 g fresh fruit). However, treatment T<sub>7</sub> (25% RDF + 75% FYM) has maximum number days to fruit set (57.36) and treatment T<sub>4</sub> (RDF 50% + FYM 50%) had highest soluble solid (3.77 °Brix).

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**Keywords:** *protected cultivation, cucumber, vermicompost, poultry Manure, FYM and NPK*

### **INTRODUCTION**

Cucumber is considered as one of the major vegetable crops in the world and is considered as fourth most important crop after tomato, cabbage and onion. Protected cultivation of cucumber is gaining popularity in developing countries like India. Under protected cultivation, plants can be protected from insects and animals. Due to controlled system in the protected structure, climatic conditions *viz.* temperature, humidity and moisture can be controlled according to the plant's requirement. Protected cultivation of cucumber emphasizes the need for proper density of plants in order to boost up the production per unit area by utilizing the available space and nutrients applied. Cucumber requires large quantities of both macro and micro nutrients for required of the yields of cucumber.

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The use of organic and inorganic fertilizers has been recommended for sustenance of long term cropping in the tropics. Nitrogen, phosphate and potash nutrients are important and play a key role in the production of both quantity and quality level in cucumber. These nutrients are specific in function and must be supplied to the plant at the right time and in the right quantity (Agrawal, 2003). Nutrients from mineral fertilizers enhance the establishment of crops while those from mineralization of organic manures promoted yield when both fertilizers are combined (Natsheh and Mousa, 2014). However, at what levels of organic and inorganic fertilizer combinations are suitable for cucumber's growth and yield has not been studied. Thus, this study was conducted to find out the most suitable treatment of organic and inorganic fertilizers for it-higher growth, yield and quality of cucumber. And it is also focussed on to the -estimatione of the economic analysis of various treatments.

### **Materials and Methods**

#### **Site description**

The experiment was conducted in the Horticulture experimental field, Department of Horticulture, SHUATS, Prayagraj. Geographically Prayagraj is located at 25°45' North Latitude, 81°85' East Longitude and at an Altitude of 98m (322ft) above mean sea level. The experiment was conducted in winter season, September-December 2021.

### Experiment design, treatments and crop management

The experiment was laid out in Randomized complete Block Design comprising of 10 treatments with three replications on variety Varieties Cucumber F-555. ~~The treatments in each replication were allotted randomly.~~ Treatments were allocated randomly to each replication. T<sub>1</sub> - RDF (100%), T<sub>2</sub> - FYM (100%), T<sub>3</sub> - Vermicompost (100%), T<sub>4</sub> - Poultry manure (100%), T<sub>5</sub> - 25% RDF + 75% Poultry manure, T<sub>6</sub> - 25% RDF + 75% Vermicompost, T<sub>7</sub> - 25% RDF + 75% FYM, T<sub>8</sub> - 50% RDF + 50% FYM, T<sub>9</sub> - 50% RDF + 50% Vermicompost, T<sub>10</sub> - 50% RDF + 50% Poultry manure. Seeds were sown at a distance of 50×50 cm<sup>2</sup> in the plot of 1 sq. m. First Dose of NPK fertilizers (@ 80:50:50 kg/ha) was applied after 15 days of germination. While the remaining dose was applied 30 days after the first dose. All cultural practices *i.e.*, irrigation, hoeing and weeding were carried out throughout the growing season as recommended. Irrigation were provided as per crop required. Observation were recorded on number of leaves/~~Plants~~plants, days to first flowering, days to fruit set, days to first harvest, fruit length (cm), fruit diameter (mm), average fruit weight (g), number of fruits per plot, fruit yield per plot (kg), fruit yield (kg/200 m<sup>2</sup>), total Soluble Solid (TSS °Brix) and vitamin C content (mg/100 g).

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### Data analysis

Data were analysed by using ANOVA as per the standard procedure as of **Panse and Sukhatame (1985)**. A Probability value of  $p < 0.05$  was considered as statistically significant. For statistical analysis of data and chart, Microsoft was employed.

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## 3. RESULTS AND DISCUSSION

### Growth Parameters:-

**Number of leaves per plant.** The maximum number of leaves per plant (107.62) was recorded in T<sub>10</sub> (RDF 50% + Poultry manure 50%). The organic manure applied in the form of RDF and organic manure showed improvement on the soil physical and chemical properties supplying adequate amount of nutrients to the plants which have promoted the maximum vegetable growth. Similar findings have also reported by **Vishal et al., (2017)** and **Mary et al., (2022)**.

**Number days to first flowering.** The minimum number of days to first flowering (36.94) was found to be in T<sub>2</sub> (RDF 50% + Poultry manure 50%) Similar findings have also reported by **Bindiya et al., (2006)**. Availability of higher level of NPK level slightly reduced the days taken for flowering. Similar findings have also been reported by **Bindiya et al., (2006)**.

**Number days to fruit set.** The minimum number days to fruit set (49.73) was found to be in T<sub>1</sub> (100% RDF). Similar findings have also been reported by **Jilani et al., (2009)**. Deficiency of major nutrients stunted the plant growth, resulting more time to fruit set. Fertilizers high in nitrogen caused the plants to produce more fruit set and increased level of NPK had decreased the days taken to fruit setting. Similar findings have also been reported by **Jilani et al., (2009)**.

**Fruit length (cm).** The maximum fruit length (15.03) was recorded in treatment T10 (50% RDF + 25% Poultry Manure). Due to more availability and release of nutrients by poultry manure through the growing period of the cucumber plants and since auxin accelerates the physiological activities, it resulted in the increase of fruit length with PM+NPK. Similar findings have also been reported by Williams *et al.*, (2022) and Nweke *et al.*, (2014).

**Fruit Diameter (mm).** The maximum fruit diameters (14.1) was recorded in treatment T10 (50% RDF + 25% Poultry Manure). Similar findings have also reported by Vishal *et al.*, (2017) and Saikia *et al.*, (2001).

**Average Fruit weight (g).** The maximum average weight (162.40) was recorded in treatment T10 (50% RDF + 25% Poultry Manure. Dauda *et al.*, (2020) noted that high poultry manure level which is rich source of nitrogen, phosphorous, magnesium and calcium increased fertility of soil lead to increase in the fruit weight. Similar findings have also reported by Oke *et al.*, (2020).

**Days to First Harvest.** The minimum number day to first harvest (62.33) was found to be in T10 (RDF 50% + Poultry manure 50%). Early harvesting is due to the better translocation of nutrients to the aerial parts. Similar findings have also reported by Bindiya *et al.*, (2006).

**Table 1: Effect of organic and inorganic fertilizer on growth, yield & quality of cucumber (*Cucumis Sativus L.*) under Protected Cultivation.**

Treatments combinations	Number of Leaves	Days to first flowering	Days to fruit set	Fruit length (cm)	Fruit diameter (cm)	Average Fruit weight (g)	Days to First Harvest
T <sub>1</sub> -100% RDF	94.97	38.17	49.73	13.55	13.62	150.51	66.67
T <sub>2</sub> -100% FYM	91.03	41.33	54.30	13.08	12.81	138.96	71.67
T <sub>3</sub> -100% Vermicompost	102.34	38.5	54.26	13.45	13.43	155.84	64.67
T <sub>4</sub> -100% Poultry	93.71	37.51	55.33	13.33	13.54	148.26	68.67
T <sub>5</sub> - 25% RDF + 75% Poultry manure	101.41	39.25	51.97	13.26	13.63	161.41	64
T <sub>6</sub> - 25% RDF + 75% vermicompost	92.40	38.04	55.96	13.37	13.37	159.51	67.33
T <sub>7</sub> - 25% RDF + 75% FYM	95	38.19	57.36	13.51	13.38	157.58	70.67
T <sub>8</sub> -50% RDF + 50% FYM	98.95	38.59	53.74	13.3	13.47	154.72	64.33
T <sub>9</sub> - 50% RDF+50% Vermicompost	94.97	38.69	55.04	14.15	13.67	139.43	66.33
T <sub>10</sub> -50% RDF + 50% Poultry manure	107.62	36.94	51.44	15.03	14.1	162.40	62.33
<b>F-Test</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>S.Ed.(±)</b>	<b>4.59</b>	<b>1.04</b>	<b>8.18</b>	<b>0.21</b>	<b>0.26</b>	<b>6.74</b>	<b>2.59</b>
<b>C.D at 5%</b>	<b>9.63</b>	<b>2.19</b>	<b>17.18</b>	<b>0.44</b>	<b>0.56</b>	<b>14.15</b>	<b>5.44</b>

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**Table 2: Effect of organic and inorganic fertilizer on growth, yield & quality of cucumber (*Cucumis Sativus L.*) under Protected Cultivation.**

Treatments combinations	Number of fruit per plot	Fruits Yield/plot (kgKg)	Fruit Yield (kg/200m <sup>2</sup> )	Total Soluble Solid (°Brix)	Vitamin C content (mg/100g)
T <sub>1</sub> -100% RDF	18.03	2.71	474.89	3.29	5.42
T <sub>2</sub> -100% FYM	14.88	2.06	361.29	3.27	5.23
T <sub>3</sub> -100% Vermicompost	16.43	2.56	448.08	3.3	5.69
T <sub>4</sub> -100% Poultry	16.98	2.51	439.97	3.47	5.79
T <sub>5</sub> - 25% RDF + 75% Poultry manure	17.71	2.85	499.93	3.61	7.17
T <sub>6</sub> - 25% RDF + 75% vermicompost	18.32	2.92	511.38	3.43	6.22
T <sub>7</sub> - 25% RDF + 75% FYM	19.09	2.94	515.97	3.33	5.91
T <sub>8</sub> - 50% RDF + 50% FYM	19.43	2.88	505.19	3.77	6.14
T <sub>9</sub> - 50% RDF + 50% Vermicompost	18.90	2.64	462.62	3.49	6.2
T <sub>10</sub> - 50% RDF + 50% Poultry manure	20.70	3.26	571.52	3.73	7.57
<b>F-Test</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>S.Ed.(±)</b>	<b>1.14</b>	<b>0.11</b>	<b>19.90</b>	<b>0.10</b>	<b>0.37</b>
<b>C.D at 5%</b>	<b>2.40</b>	<b>0.24</b>	<b>41.80</b>	<b>0.22</b>	<b>0.78</b>

**Yield parameters:**

**Number of fruit per plot.** The maximum number of fruits per plant (20.70) was recorded in treatment T<sub>10</sub> (50% RDF + 50% Poultry Manure). Nitrogen fertilizers application which is a structural element of chloroplast and accumulation of chlorophyll in leaves. The amount of chlorophyll depends on photosynthesis activity and primary production (Curran et al., 1990).

**Fruits Yield/plot (kgKg).** The maximum number of fruits per plot (3.26) was recorded in treatment T<sub>10</sub> (50% RDF + 50% Poultry Manure). The highest yield per plant was corresponding to more number of fruits per plants and average fruits weight with application of required amount of fertilizers.

**Fruit Yield (kgKg/200m<sup>2</sup>).** The maximum fruits yield (571.52) was recorded in treatment T<sub>10</sub> (50% RDF + 50% Poultry Manure). Due to the increased yield per plot which increased total yield per 200m<sup>2</sup>.

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**Total Soluble Solid (°Brix).** The maximum total soluble solid (3.77) was recorded in treatment T<sub>8</sub> (50% RDF + 50% FYM). Inadequate supply of organic and inorganic fertilizer deteriorates the quality of fruits and lower the amount of TSS. Similar findings have also reported by Singh *et al.*, (2017).

**Vitamin C content (Ascorbic acid).** The maximum Vitamin C (7.57) was recorded in treatment T<sub>10</sub> (50% RDF + 25% Poultry Manure). Similar findings have also reported by Vishal *et al.*, (2017).

**Table 3: Effect of organic and inorganic fertilizer on growth, yield & quality of cucumber (*Cucumis Sativus* L.) under Protected Cultivation on economics of different Treatment and Cost Benefit Ratio.**

Treatment	Total cost of cultivation/ha.	Yield kg/200m <sup>2</sup>	Gross return @Rs. 30/kg (Rs./200m <sup>2</sup> .)	Net return (Rs/ha)	Cost Benefit ratio
T <sub>1</sub>	3,585.86	474.89	14,246.7	10,660.84	2.97:1
T <sub>2</sub>	4,016	361.29	10,838.7	6,822.9	1.69:1
T <sub>3</sub>	3,916	448.08	13,442.4	9,526.4	2.43:1
T <sub>4</sub>	3,876	439.97	13,199.1	9,323.1	2.40:1
T <sub>5</sub>	3803.46	499.93	14,997.9	11,194.4	2.94:1
T <sub>6</sub>	3,893.46	511.38	15,341.4	11,447.94	2.94:1
T <sub>7</sub>	3,908.46	515.97	15,479.1	11,571.1	2.96:1
T <sub>8</sub>	4,800.93	505.19	15,155.7	10,353.77	2.15:1
T <sub>9</sub>	3,750.39	462.62	13,878.6	10,128.21	2.70:1
T <sub>10</sub>	3,730.39	571.52	17,145.6	13,415.21	3.59:1

### CONCLUSION

On the basis of present investigation, it is concluded that the treatment T<sub>10</sub> (50% RDF + 50% Poultry Manure) was found to be the most suitable over all the other treatments in relation to growth and yield of Cucumber. Similarly, the treatment T<sub>10</sub> (50% RDF + 50%

Poultry Manure) recorded maximum gross return, net return and highest benefit cost ratio (3.59).

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