

## Original Research Article

### EFFECT OF ORGANIC AND INORGANIC FERTILIZERS ON GROWTH, YIELD AND QUALITY OF BITTER GOURD (*Momordicacharantia L.*) UNDER PRAYAGRAJ AGRO-CLIMATIC CONDITIONS

#### ABSTRACT

An experiment entitled **Effect of organic and inorganic fertilizers on growth, yield and quality of bitter gourd (*Momordicacharantia L.*) under Prayagraj agroclimatic conditions** was conducted at Horticultural Research Field, Department of Horticulture, Naini agricultural institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (UP) during 2021 kharif season. The experiment was conducted in Randomized Block Design (RBD) with ten treatments replicated thrice which **was** incorporated with organic manures (FYM, vermicompost, poultry manure) and inorganic fertilizers (NPK) to assess the growth, yield and quality of bitter gourd. The results of the experiment revealed that the treatment T<sub>8</sub> (50% RDN through chemical fertilizers + 50% through vermicompost) was found to be best treatment combination in terms of **vine length** (312.44 cm), days to first female flower appearance (40), node to which first female flower appearance (19), days taken to first harvest (56), average fruit weight (107.35 g), average fruit length (15.72 cm), number of fruits per plant (20), average fruit yield per plant (2.16 kg), average fruit yield per hectare (17.96 t/ha), TSS (4.33°Brix). Significantly the highest gross return (Rs.305320/ha), net returns (Rs.207903/ha) and **B:C ratio** (3.1) **was** also recorded under the treatment T<sub>8</sub> (50% RDN through chemical fertilizers + 50% through vermicompost) while average fruit diameter (7.84 cm) was recorded in the treatment T<sub>2</sub> (100:50:50 NPK +10 tonnes vermicompost).

**Key words:** Bitter gourd, FYM, Vermicompost, Poultry manure, growth, quality, yield.

#### 1. INTRODUCTION

Bittergourd (*Momordicacharantia L.*) is a popular vegetable crop that is grown all over the world. It is cultivated for food as well as a medicinal constituent in many tropical nations. It includes more than 60 phytochemicals with therapeutic characteristics and effective against approximately 30 human diseases, such as cancer, diabetes, and AIDS (Baschet *et al.*, 2003). Fruits are rich in vitamin C (88 mg/g). It has antioxidant, antibacterial, antiviral, antihepatotoxic, and antiulcerogenic qualities, as well as the capacity to reduce blood sugar levels (Behera, 2011). It is in high demand in both the domestic and foreign markets for fresh vegetables because of its hypoglycemic properties. Andhra Pradesh, followed by Odisha, Bihar, Chattisgarh, and Madhya Pradesh are the leading states which **grows** the crop. It is grown during the rainy season as well as the spring and summer seasons. Fruits come in a variety of forms, sizes, colours, and bitterness. Manure and fertilizer applications work well for bitter gourd. Constant over dosage of fertilizers affects natural soil ecology and has a negative impact on nutrient availability and soil microflora, which are crucial for crop productivity (Prasad *et al.*, 2009). Usage of organic manures not only supplies nutrients but

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also adds organic matter to soil. Hence combined use of organic and mineral fertilizers in adequate quantity increases crop yield more than used individually. Organic inputs such as FYM, Vermicompost, Poultry manure has a great potential in improving soil productivity and crop yield through enhancement in soil physical, chemical and microbial properties and inorganic fertilizers activates the availability and intake of essential nutrients like N,P,K immediately by plants. The experiment entitled **Effect of organic and inorganic fertilizers on growth, yield and quality of bitter gourd (*Momordica charantia* L.) under Prayagraj agro-climatic conditions** was conducted to check out the effect of different combinations of organic and inorganic source of nutrients on growth, yield, quality of bitter gourd and economics of treatments under the conditions of Prayagraj.

## 2. MATERIALS AND METHODS

The experiment was conducted at Horticultural Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology And Sciences, Prayagraj (U.P) during 2021 Kharif season in India. The texture of soil is sandy loam in nature and pH of soil is slightly towards alkalinity. The size of plot was 2.4m × 1.8m with a spacing of 1.2m × 0.9m. The experiment was laid out in Randomized Block Design (RBD) having 3 replications with 10 treatments. Details of treatments are T<sub>0</sub>-100:50:50 NPK+20 tonnes FYM (Control), T<sub>1</sub>-100% RDN through chemical fertilizers, T<sub>2</sub>-100:50:50 NPK +10 tonnes Vermicompost, T<sub>3</sub>-100:50:50 NPK+3.3 tonnes Poultry Manure, T<sub>4</sub>-75% RDN through Chemical fertilizers +25% RDN through FYM, T<sub>5</sub>-75% RDN through Chemical fertilizers +25% through Vermicompost, T<sub>6</sub>-75% RDN through Chemical fertilizers + 25% through Poultry manure, T<sub>7</sub>-50% RDN through Chemical fertilizers + 50% through FYM, T<sub>8</sub>-50% RDN through Chemical fertilizers + 50% through Vermicompost, T<sub>9</sub>-50% RDN through Chemical fertilizers +50% through Poultry manure. Required amount of fertilizers and organic manures are applied in soil according to treatment wise just one day before sowing. Half of nitrogen as urea and full dose of phosphorus (P<sub>2</sub>O<sub>5</sub>) as SSP, potash (K<sub>2</sub>O) as murate of potash, Vermicompost, FYM and Poultry manure applied in each pit before the sowing of seeds. Remaining dose of nitrogen as urea was applied as two split doses, at an interval of 25 and 50 days after two true leaf stage.

## 3. RESULTS AND DISCUSSIONS

### 3.1 Germination Parameter

The early germination was recorded for the treatment T<sub>2</sub>(100:50:50 NPK +10tvermicompost) 8 to 9 days. The days taken for germination can be affected by various environmental factors such as the difference between day and night temperature, soil moisture, light, pH of the soil in bittergourd.

### 3.2 Growth Parameters

**Comment [L9]:** The noun phrase **soil** seems to be missing a determiner before it. Consider adding an article.

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**Comment [L12]:** The noun phrase **organic and inorganic source** seems to be missing a determiner before it. Consider adding an article.

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The statistical data on growth parameters are recorded in table 1. The maximum vine length (312.44 cm), days taken to first female flower appearance (40 days), the number of nodes (19) to first female flower appearance was recorded for treatment T<sub>8</sub> (50% RDN through Chemical fertilizers +50% through Vermicompost). Increase in vine length may be due to the use of large concentration of inorganic fertilizers through inorganic sources. A sufficient supply of nitrogen to vines resulted in the release of amino acids, which are protein polymers, which boosted the rate of cell division in apical shoots and accelerated meristematic activity, resulting in enhanced vegetative characteristics in the vines (Khargaet al., 2019). The earliness in days taken to first female flower appearance (40 days), the number of nodes (19) to first female might be due to the fact that plants in the presence of organic and inorganic nutrients along with vermicompost increases the plant physiological and morphological functions that results in plants to complete vegetative growth faster and plants enter into reproductive phase which causes female flower production to be earlier and appear at lesser node number (Sangeeta et al., 2018).

### 3.2 Yield Parameters

The statistical data on yield parameters are recorded in table 2. The days taken to first fruit harvest (56 days), number of fruits per plant (20), fruit length (15.72 cm) was recorded for treatment T<sub>8</sub> (50% RDN through Chemical fertilizers +50% through Vermicompost). Treated plants are physiologically active and translocates food to developing fruits which results in early maturity and early harvest. Increase in number of female flowers per vine resulted in increase in number of fruits per plant which could be attributed to photosynthetic activity and accumulation of carbohydrate which enabled the growth and development of female flowers. The increase in fruit length might be due to the availability of nutrients especially N has been better sink and transported by auxillary branches to the fruits that leads to healthier fruits with better length. (Ahmed et al., 2007). Average fruit weight (107.35 gm), fruit yield per plant (2.16 kg), fruit yield per hectare (17.96 t) was recorded for treatment T<sub>8</sub> (50% RDN through Chemical fertilizers +50% through Vermicompost). This might be due to the optimal dose of NPK, which enhanced photosynthetic mobility from the source to the sink as regulated by growth hormone, and NPK uptake. This findings are agreement with findings of (Jilani et al., 2009). While the fruit diameter (7.84 cm) of bitter gourd was recorded for treatment T<sub>2</sub>. The fruit diameter might increase due to increase in N through nitrogenous fertilizers. Significantly maximum TSS (4.33°Brix) of bitter gourd was recorded in treatment T<sub>8</sub> (50% RDN through Chemical fertilizers + 50% through Vermicompost). This might be because vermicompost released nutrients into the soil and created a favourable environment in the plant root zone, resulting in increased nutrient absorption or uptake of major and minor nutrients, which could have been linked to TSS levels in fruits. These findings are similar to findings of (Sreenivaset al., 2000). The maximum B:C ratio (3.1) was also recorded maximum under the treatment T<sub>8</sub> which is shown in table 3.

## 4. CONCLUSION

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Based on the results of the present investigation entitled **Effect of organic and inorganic fertilizers on growth, yield and quality of bitter gourd (*Momordica charantia* L.) in Prayagraj agroclimatic condition**, it was concluded that treatment T<sub>8</sub> (50% RDN through Chemical fertilizers + 50% through vermicompost) was superior in terms of vine length, days to first female flower appearance, nodes to which first female flower appearance, days taken to first harvest, fruit weight, fruit length, number of fruits per plant, fruit yield per plant, yield per hectare, TSS and B:C ratio while treatment T<sub>2</sub> (100:50:50 NPK + 10 tonnes Vermicompost) was found superior in terms of fruit diameter.

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**Table 1: Effect of organic and inorganic fertilizers on growth of bitter gourd (*Momordicacharantia*L.)**

Treatments	Days to germination	Vine length (cm)				Number of days to first female flower appearance	Node to which first female flower appears
		20 days	40 days	60 days	Last harvest		
T <sub>0</sub>	8.1	51.63	81.56	152.81	212.56	50.67	24.11
T <sub>1</sub>	8.6	53.13	82.64	151.78	230.00	47.33	22.00
T <sub>2</sub>	8.0	56.17	87.64	156.78	277.78	45.44	23.11
T <sub>3</sub>	8.9	53.64	82.84	153.82	248.67	53.00	22.67
T <sub>4</sub>	8.6	55.31	83.87	154.41	243.67	49.44	25.00
T <sub>5</sub>	9.2	54.12	83.32	153.09	267.67	50.11	25.11
T <sub>6</sub>	8.3	55.67	85.57	153.93	254.78	50.67	26.11
T <sub>7</sub>	9.3	51.63	79.30	149.91	225.67	50.78	21.11
T <sub>8</sub>	8.8	59.79	92.43	162.27	312.44	40.67	19.44
T <sub>9</sub>	8.3	58.00	90.20	159.81	297.33	43.00	20.78
<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>SE(d) ±</b>	<b>0.29</b>	<b>0.67</b>	<b>0.90</b>	<b>1.06</b>	<b>2.29</b>	<b>0.07</b>	<b>0.88</b>
<b>CD<sub>0.05</sub></b>	<b>0.61</b>	<b>1.42</b>	<b>1.89</b>	<b>2.22</b>	<b>4.81</b>	<b>0.14</b>	<b>1.84</b>
<b>CV</b>	<b>4.11</b>	<b>1.50</b>	<b>1.30</b>	<b>0.83</b>	<b>1.09</b>	<b>0.17</b>	<b>4.68</b>

**Table 2: Effect of organic and inorganic fertilizers on yield and quality of bitter gourd (*Momordicacharantia*L.)**

Treatments	Days to first harvest	No of fruits per plant	Average fruit length (cm)	Average fruit diameter (cm)	Average fruit weight (gm)	Fruit yield per plant (kg)	Fruit yield per hectare (t/ha)	TSS ( <sup>o</sup> Brix)
T <sub>0</sub>	64.9	11.33	14.06	6.49	88.35	1.00	8.30	4.02
T <sub>1</sub>	66.3	12.33	10.61	5.86	93.51	1.15	9.58	2.97
T <sub>2</sub>	67.7	17.11	11.54	7.84	101.75	1.74	14.52	4.08
T <sub>3</sub>	63.1	14.89	11.26	7.46	97.73	1.46	12.10	3.30
T <sub>4</sub>	70.3	13.22	12.29	6.63	94.95	1.26	10.47	3.50
T <sub>5</sub>	67.0	15.78	13.14	7.12	100.19	1.58	13.16	3.93
T <sub>6</sub>	63.9	15.00	12.54	6.96	99.21	1.49	12.41	3.86
T <sub>7</sub>	63.0	11.56	10.97	6.29	89.69	1.04	8.63	3.10
T <sub>8</sub>	56.8	20.11	15.72	6.49	107.35	2.16	17.96	4.33
T <sub>9</sub>	58.2	19.11	14.59	6.83	105.40	2.01	16.77	3.73
<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</b>
<b>SEd (±)</b>	<b>1.96</b>	<b>0.61</b>	<b>0.19</b>	<b>0.18</b>	<b>1.02</b>	<b>0.06</b>	<b>0.47</b>	<b>0.07</b>
<b>CD<sub>0.05</sub></b>	<b>3.74</b>	<b>1.27</b>	<b>0.40</b>	<b>0.37</b>	<b>2.15</b>	<b>0.12</b>	<b>0.99</b>	<b>0.14</b>
<b>CV</b>	<b>4.12</b>	<b>4.93</b>	<b>1.85</b>	<b>3.16</b>	<b>1.28</b>	<b>4.62</b>	<b>4.65</b>	<b>2.27</b>

**Table 3 :Effect of organic and inorganic fertilizers on economics of treatment**

<b>Treatments</b>	<b>Treatment Combination</b>	<b>Total cost of cultivation Rs/ha</b>	<b>Gross Returns Rs/ha</b>	<b>Net Returns/ha</b>	<b>B:C Ratio</b>
<b>T<sub>0</sub></b>	100:50:50 NPK+20 tonnes FYM (Control)	113295	141100	27805	1.2
<b>T<sub>1</sub></b>	100% RDN through chemical fertilizers	73295	162860	89565	2.2
<b>T<sub>2</sub></b>	100:50:50 NPK +10 tonnes Vermicompost	113295	246840	133545	2.1
<b>T<sub>3</sub></b>	100:50:50 NPK+3.3 tonnes Poultry Manure	116195	205700	89505	1.7
<b>T<sub>4</sub></b>	75% RDN through Chemical fertilizers +25% RDN through FYM	82856	177990	95134	2.1
<b>T<sub>5</sub></b>	75% RDN through Chemical fertilizers +25% through Vermicompost	82856	223720	140864	2.7
<b>T<sub>6</sub></b>	75% RDN through Chemical fertilizers + 25% through Poultry manure	83581	210970	127389	2.5
<b>T<sub>7</sub></b>	50% RDN through Chemical fertilizers + 50% through FYM	92417	146710	54293	1.5
<b>T<sub>8</sub></b>	50% RDN through Chemical fertilizers + 50% through Vermicompost	97417	305320	207903	3.1
<b>T<sub>9</sub></b>	50% RDN through Chemical fertilizers +50% through Poultry manure	93867	285090	191223	3.0



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