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Comparative study of different sources of nutrients suitable for organic off season cucumber production

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Abstract

Seed of cucumber (*Cucumis sativus* L.) were individually seeded in plastic trays filled with different substrates such as forest soil and compost. Plastic pots were covered by small poly tunnels. Plastic pots were removed during day and covered at night by white thin plastic sheet. Seedling were equally irrigated, but additional nutrient elements were not given for supplement till the second true leaves appeared. Later, 25-35 days old seedling was ready for transplanting. Seedlings were transplanted in main field. The field was prepared by 2-3 ploughing, planking and harrowing. Layout of field was done with 3 replications and 8 treatments. Treatments were arranged according to layout. Different sources of nutrients were used. After 4th week, the plant was stalked with rope and bamboo. All plots were periodically irrigated frequently. The data was taken at 56, 70, 90 days after sowing and recorded in Microsoft excel. The number of leaves, plant height, days to flowering, number of flower, number of fruit, diameter of fruit, length of fruit and yield were computed. DMRT test was done for mean comparison. All the Sources of variation was calculated. A significantly higher yield was found in vermicompost compared to farm yard manure, bokashi, goat manure, poultry manure, compost and jholmol. All treatments show significant result. But, vermicompost possess highest yield of cucumber. Other Sources of variation such as number of fruit, diameter of fruit and length of fruit, vermicompost show best performance. Compost show best performance in days to flowering and number of flower. But while the morphological differences were existed in all sources of nutrient. Low co-relation of yield of cucumber found in plant height, number of leaves, number of flower. High co-relation was found in those Sources of variation such as number of fruit, length of fruit diameter of fruit etc. the lowest performance was obtained in jholmol.

Keywords: nutrients suitable, organic off season cucumber production

1. Introduction

Cucumber (*Cucumis sativus* L.) is taken a crucial vegetable, salad crops and one among the foremost members of the Cucurbitaceae family (Lower and Edwards, 1986). Cucumber is considered to oldest vegetables cultivated by human with historical records back five 5000 years (Wehner and Guner, 2004) [18]. Cucumber bears cylindrical fruits. That are used for preparation vegetables, eaten in salads or sliced into stew in tropical and sub-tropical regions. Cucumbers contain regarding 92-95% water, it facilitates to keeping hydrous the body and help to eliminates toxins. It is a sources of vitamins, chemical element that is employed treating skin irritations and sunburn, facilitate in weight loss and digestion. It issued to cure polygenic disorder, reduces steroid alcohol and controls pressure level. Thus, the employment of external inputs within the type of yard manures has become necessary for higher yield. Several experiment have conducted that vermicompost help to accommodate plant growth control materials such as humus substance and plant growth hormones like auxins, gibberellins and cytokinins (Tomati *et al.*, 2010), that area unit quietly liable for increase in germination, growth and yield of crops, in response to Vermicompost applications (Atiyeh *et al.*, 2002) [1]. The employment of organic materials like composts, FYM have been wont to enhance the assembly of crop and yet as yield and organic fertilizer's use has been connected with improvement of soil structure, increase soil fertility and enhance soil microorganism population and its activity. It improves water holding capability and infiltration capability of the soil. The organic manures like vermicompost increase humus in soil, enhance microorganism activity and protein production, enhance the combination stability of soil particles, leading to food aeration of soil.

2. Literature review

According to Surthar (2009). Excellent plant growth along with highest yield was found in

garlic with the application of vermicompost. Zhao *et al.* (2017)^[9] Soil characteristics was improved due to application of vermicompost which brought notable change on the rhizosphere soil-fungal community as reported.

Azarmi *et al.*, (2010), Jandhagi *et al.*, (2020)^[11] and Putra *et al.* (2020)^[14] the number of leaves were also found to be more on the field applied with vermicompost.

Putra *et al.* (2020)^[14] reported that there was more number of male flowers (average 9 flowers per plant) and female flowers (2 flowers per plant on an average) when vermicompost was applied.

According to Putra *et al.* (2020)^[14] the production of fruits in cucumber was highest with vermicompost since the number of flowers were also highest. He also reported that Leaf number, plant height, number of flower, weight of fruits and length of the fruits were highest.

(Hai-Tao Zhao *et al.* 2012) The highest yield was obtained from plant in the vermicompost treatment and yield in the other treatment were followed by other inorganic compound fertilizer. Vermicompost effect amendment as a basal fertilizer dose on soil properties and cucumber yield and quality of fruit under continuous cropping condition in greenhouse.

(Glenda sallaku 2009) The vermicompost enhance in growth and development of cucumber influence of vermicompost on plant growth characteristics of cucumber (*Cucumis sativus* L.) seedlings under saline conditions.

3. Methodology of the study

The study entitled “Comparative study of different sources of nutrients suitable for organic off season cucumber production” was conducted in the farmer field at Rama University Kanpur Uttar Pradesh, India. Geographically, it is located at Latitude of 26.569 N and Longitude of 80.214 E in a sub-tropical zone of India. It ranges from 126 m above sea level.

The climatic condition of Kanpur is warm humid and temperate. The summers have much more rainfall as compare to winter. The climate of Kanpur is fall under tropical climate. The average annual temperature of Kanpur is 25.3 °C -77.5 °F. The experiment was carried out in a Randomized Block Design (RBD) with 8 treatments. The treatments are replicated into three times in field. The field is laterally designed with east west site. The total length of field was 31m and breadth was 11m. The plot size is 3m length and 3 m wide. The spacing between row and plant was maintain

100cm*100 cm. The distance between replication and plots were maintain 1m each. There were 3 row in each plots and 3 plant were planting in plots. The treatments were FYM @ 30 t/ha, Vermicompost @ 15 t/ha, Goat manure @15 t/ ha, Poultry manure @15 t/ha, Chemical fertilizer @ 210:180:120 kg NPK/ha, Jholmol @15000 liter/ha each spray total 4 spray, Compost @10ton/ha and Control condition.

3.1 Details of experiment observation

Five representative plants sample from a plot was taken for recording various characteristics plant height (cm), number of leaves per plant, number of flowers per plant, number fruits per plant, fruit length, fruit diameter, and fruits weight per plant. Measuring tape was used to measure plant height. Fruits weight was determined by using electronic weight balance. Total number of fruits, total number of leaves was performed by visual counting.

3.2 Statistical analysis

- Data recorded: MS – Excel
- Processed to fit into R-studio and Gen Stat. and analysis was conducted using R 3.5.3. (R core team, 2019-03-11) and agricolae version 1.3.0 package.
- ANOVA test, mean difference (by DMRT test) and correlation comparison analysis were done.

4. Result and Discussion

4.1 Yield of cucumber in response to different sources nutrients

Mean yield at 56 days after sowing was 4.41 kg per plant with standard deviation of 0.027, at 70 days after sowing was 6.78 kg per plant with standard deviation of 0.027 and mean yield at 90 days after sowing was 6.05 kg per plant with standard deviation of 0.026. Average yield of cucumber per plant was ranged from 0.5 to 1.67. This finding lies in between the finding of Shakya, *et al.*, (2006) where they found per plant yield ranging from 0.15 to 4.69 Kg per plant. In 1st harvest highest yield was found with 15 t/ha vermicompost which was statistically similar with 30 t/ha FYM, 15 t/ha goat manure, 15 t/ha poultry manure, control, 10 t/ha compost and chemical fertilizer’s combination. Lowest yield in 1st harvest was found with Jholmol which was statistically dissimilar with all other combinations of nutrients. Similar result was found in research done by Putra *et al.* (2020)^[14]. Yield was found significant because calculated value was low than tabulated value at 56, 70, 90 days after sowing.

Table 1: Mean yield of Cucumber at 56, 70, 90 DAS in Response to Different sources of Nutrients

Nutrients Combination	Range (kg/ plant)	Mean yield at 56 DAS	Mean yield at 70 DAS	Mean yield at 90 DAS
Vermicompost 15t/ha	0.5-1.67	0.586	0.8805333	0.791
FYM 30t/ha	0.5-1.67	0.5718	0.8698667	0.77340001
Goat manure 15t/ha	0.5-1.67	0.5644	0.8602667	0.7694
Poultry manure 15t/ha	0.5-1.67	0.5613333	0.8597333	0.7663333
Bokashi 15t/ha	0.5-1.67	0.5580667	0.8584667	0.7630667
Control condition	0.5-1.67	0.5437333	0.8397333	0.7476
Compost 10t/ha	0.5-1.67	0.542	0.8335333	0.747
Jholmol 15000 ltr/ha	0.5-1.67	0.4898667	0.7860667	0.6948667
Mean Total yield		4.41703	6.7877997	6.0525
Standard deviation		0.027052	0.02748	0.02681
CV%		0.6124	0.4048	0.4429

In 2nd harvest highest yield was found with 15 t/ha vermicompost which was statistically similar with 30 t/ha FYM, 15 t/ha goat manure, 15 t/ha poultry manure, control,

10 t/ha compost and chemical fertilizer’s combination. Lowest yield in 2nd harvest was found with Jholmol which was statistically similar with control, and 10 t/ha compost. In

3rd harvest highest yield was found with 15 t/ha vermicompost which was statistically similar with 30 t/ha FYM, 15 t/ha goat manure, 15 t/ha poultry manure, control, 10 t/ha compost and chemical fertilizer's combination. Lowest yield in 3rd harvest was found with Jholmol which was statistically similar with control, and 10 t/ha compost. The coefficient of variation at 56, 70, 90 DAS are 0.6124, 0.4048 and 0.4429 respectively. This value states that, there is low variation in yield, which mean extremely significance result. Production of cucumber also high in research done by Glenda Sallaku (2009).

4.2 Number of fruit of cucumber at 56, 70, 90 DAS in response to different sources of nutrient

Number of fruit of cucumber in response to different sources of nutrients is shown in below table 2. Mean yield at 56 days after sowing was 3.433333 per plant with standard deviation

of 0.358, at 70 days after sowing mean no of fruit was 4.3416 per plant with standard deviation of 0.3536 and mean no of fruit at 90 days after sowing was 3.45833 per plant with standard deviation of 0.2569. Average number of fruit of cucumber per plant was ranged from 2 to 6. This finding lies in between the finding of Shakya, *et al.*, (2006) where they found per plant yield ranging from 2 to 6 per plant. In 56 days after sowing, highest number of fruit was found with 15 t/ha vermicompost which was statistically similar with 15 t/ha goat manure, 30 t/ha FYM 15 t/ha poultry manure, chemical fertilizers, control condition and 10 t/ha compost combination. Bokashi 15t/ha, Control condition, Compost 10t/ha and Jholmol 15000 were statically similar. Lowest number of fruit in 56 DAS was found with Jholmol which was statistically dissimilar with Vermicompost 15t/ha, Goat manure 15t/ha, FYM 30t/ha and Poultry manure 15t/ha.

Table 2: Mean number of fruit of Cucumber at 56, 70, 90 DAS in Response to Different sources of Nutrients

Nutrients Combination	Range	Mean no of fruit at 56 DAS	Mean no of fruit at 70 DAS	Mean no of fruit at 90 DAS
Vermicompost 15t/ha	2-6	3.933333	4.800000	3.800000
Goat manure 15t/ha	2-6	3.666667	4.600000	3.666667
FYM 30t/ha	2-6	3.600000	4.533333	3.666667
Poultry manure 15t/ha	2-6	3.533333	4.400000	3.533333
Bokashi 15t/ha	2-6	3.466667	4.400000	3.533333
Control condition	2-6	3.333333	4.266667	3.266667
Compost 10t/ha	2-6	3.200000	4.200000	3.200000
Jholmol 15000 ltr/ha	2-6	2.733333	3.533333	3.000000
Mean total yield		3.433333	4.3416	3.45833
Standard deviation		0.358	0.3536	0.2569
CV%		10.42	8.14	7.42

In 70 Days after sowing, highest number of fruit was found with 15 t/ha vermicompost which was statistically similar with 15 t/ha goat manure, 30 t/ha FYM, 15 t/ha poultry manure, chemical fertilizer, control condition and 10 t/ha compost combination. Bokashi 15t/ha, Control condition, Compost 10t/ha and Jholmol 15000 were statically similar. Lowest number of fruit in 70 Days after sowing was found with Jholmol which was statistically dissimilar with Vermicompost 15t/ha, Goat manure 15t/ha, FYM 30t/ha and Poultry manure 15t/ha. In 90 Days after sowing, highest number of fruit was found with 15 t/ha vermicompost which was statistically similar with 15 t/ha goat manure, 30 t/ha FYM 15 t/ha poultry manure, chemical fertilizer, control condition and 10 t/ha compost combination. Bokashi 15t/ha, Control condition, Compost 10t/ha and Jholmol 15000 were statically similar. Lowest number of fruit in 90 Days after sowing was found with Jholmol which was statistically dissimilar with Vermicompost 15t/ha, Goat manure 15t/ha, FYM 30t/ha and Poultry manure. The coefficient of variation at 56, 70, 90 DAS are 0.6124, 0.4048 and 0.4429 respectively. This value states that, there is low variation in yield, which mean extremely significance result. No of flower of cucumber also high in research done by Azarmi *et al.* 2008 [2].

4.3 Fruit length of cucumber at 56, 70, 90 DAS in response to different sources of nutrient

F-test was found significant at 14 error degree of freedom. Mean fruit length of cucumber at 56 days after sowing was 19.20166 cm per plant with standard deviation of .05797, at 70 days after sowing was 24.835 cm per plant with standard deviation of 0.601 and mean fruit length at 90 days after sowing was 22.3259 cm per plant with standard deviation of 0.579. Average fruit length of cucumber per plant was ranged from 18 to 29 cm. This finding lies in between the finding of

Shakya, *et al.*, (2006) where they found per plant yield ranging from 18 to 29cm per plant. In 1st harvest, fruit length of cucumber in response to vermicompost (@ 15t/ha) was 19.85333 cm, Bokashi 15t/ha was 19.69333 cm, FYM (@30t/ha) was 19.57333 cm, goat manure (@15t/ha) was 19.45333 cm, poultry manure (@15t/ha) was 19.30667 cm, control condition was 19.14000, compost (@10t/ha) was 18.58667 cm and Jholmol (@15000 ltr/ha) was 18.00667 cm. 1st harvest, highest diameter of fruit was found with 15 t/ha vermicompost which was statistically similar with chemical fertilizer 210:180: 120 kg NPK/ha, 30 t/ha FYM, 15 t/ha goat manure, 15 t/ha poultry manure, control condition and 10 t/ha compost. Control condition and Compost 10t/ha are statically similar. Lowest fruit diameter in 1st harvest, fruit length was found with Jholmol which was statistically dissimilar with Vermicompost 15t/ha, Bokashi 15t/ha, FYM 30t/ha, Goat manure 15t/ha and Poultry manure 15t/ha.

In 2nd harvest, fruit length of cucumber in response to vermicompost (@ 15t/ha) was 25.46667 cm, Bokashi 15t/ha) was 25.3533 cm, FYM (@30t/ha) was 25.33333 cm, goat manure (@15t/ha) was 25.04667 cm, poultry manure (@15t/ha) was 24.88667 cm, control condition was 24.70667, compost (@10t/ha) was 24.34667 cm and Jholmol (@15000 ltr/ha) was 23.5400 cm. 2nd harvest, highest length of fruit was found with 15 t/ha vermicompost which was statistically similar with chemical fertilizer 210:180: 120 kg NPK/ha, 30 t/ha FYM, 15 t/ha goat manure, 15 t/ha poultry manure, control condition and 10 t/ha compost. Control condition and Compost 10t/ha are statically similar. Lowest fruit diameter in 1st harvest, fruit length was found with Jholmol which was statistically dissimilar with Vermicompost 15t/ha, Bokashi 15t/ha, FYM 30t/ha, Goat manure 15t/ha and Poultry manure 15t/ha.

Table 3: Mean fruit length of Cucumber at 56, 70, 90 DAS in Response to Different dosages of Nutrients

Nutrients Combination	Range	Mean fruit length at 56 DAS	Mean fruit length at 70 DAS	Mean fruit length at 90 DAS
Vermicompost 15t/ha	18-29	19.85333	25.46667	22.95333
Bokashi 15t/ha	18-29	19.69333	25.35333	22.80067
FYM 30t/ha	18-29	19.57333	25.33333	22.79333
Goat manure 15t/ha	18-29	19.45333	25.04667	22.55333
Poultry manure 15t/ha	18-29	19.30667	24.88667	22.37333
Control condition	18-29	19.1400	24.70667	22.24667
Compost 10t/ha	18-29	18.58667	24.34667	21.78000
Jholmol 15000 ltr/ha	18-29	18.00667	23.54000	21.10667
Mean Total yield		19.20166	24.835	22.3259
Standard deviation		0.5797	0.601	0.579
CV%		3.01	2.41	2.63

In 3rd harvest, highest length of fruit was found with 15 t/ha vermicompost which was statistically similar with chemical fertilizer 210:180: 120 kg NPK/ha, 30 t/ha FYM, 15 t/ha goat manure, 15 t/ha poultry manure, control condition and 10 t/ha compost. Control condition and Compost 10t/ha are statically similar. Lowest fruit diameter in 3rd harvest, fruit diameter was found with Jholmol which was statistically dissimilar with Vermicompost 15t/ha, Bokashi 15t/ha, FYM 30t/ha, Goat manure 15t/ha and Poultry manure 15t/ha. The coefficient of variation at 56, 70, 90 DAS are 0.6124, 0.4048 and 0.4429 respectively. This value states that, there is low variation in yield, which mean extremely significance result. Fruit length of cucumber also high in research done by Azarmi *et al.* 2008 [4].

5. Summary and Conclusion

Effect of different sources of nutrients for organic off season cucumber production was evaluated. The yield was recorded maximum in vermicompost (0.869 kg/plant), minimum data was recorded (0.786 kg/plant) in Jholmol at 70 days after sowing. Coefficient of variation was found 0.408% which is extremely significance. The number of fruit was recorded maximum (4.8) on vermicompost at 70 DAS, whereas minimum number of fruit was recorded (2.73330) on Jholmol at 56 DAS. Coefficient of variation was recorded 10.42%, 8.14% and 7.42% which means there is highly significance. Fruit length was recorded maximum (25.467cm) on vermicompost at 70 DAS. Minimum fruit length was recorded (18.0067cm) on Jholmol at 56 DAS. Similar result was found in Edwards CA *et al.* 1998 [6].

The uses of vermicompost results maximum yield among all sources of nutrient in cucumber. Vermicompost is also useful for growth and development of yield attributing character such as plant height, number of fruit, fruit diameter and fruit length. Compost show maximum in number of flower. FYM result maximum number of leaves. Use of vermicompost (15t/ha) is found best for organic offseason cucumber production. Also, highest yield was obtaining in 70 days after sowing. The lowest performance is seen in Jholmol (15000ltr/ha). The coefficient of determination of all Sources of variation are below 10%, which means the result are highly significance. From the above research, it can be concluded that use of Vermicompost @ 15 ton/ha may be helpful for increasing the yield of cucumber without harming the environment organically. Similar Result was found research done by Sanni *et al.*, (2015) [16].

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