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Studies on the impact of organic and inorganic fertilizer on growth, yield and quality of cucumber (*Cucumis sativus*) under Prayagraj Agro-climatic condition

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Abstract

The present experiment was carried out during June to September, 2018 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 150:75:75 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

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 (IIVR, 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.

Materials and Methods

The Experimental was conducted in Randomized Block Design (RBD) with 12 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 June to September 2018. Total number of treatments were Nine *viz.* T₀ (Control (Recommended dose of NPK 150:75:75 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%).

Climatic condition in the experimental site

The area of Prayagraj district comes under subtropical belt in the south east of Uttar 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 “Studies on the Impact of organic and inorganic fertilizer on Growth, Yield and Quality of Cucumber (*Cucumis sativus*) under Prayagraj Agro-climatic condition” was carried out during June to September 2018 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 bottle gourd.

The results of the experiment are summarized below

In terms of Plant Height, treatment T₈ (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (369.11 cm) Plant height, followed by T₇ (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) with (352.97 cm) where as minimum (311.29 cm) was recorded in treatment T₀ (Control).

In terms of Number of Leaves/plant, treatment T₈ (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (120.35) Number of Leaves/plant, followed by T₅ (Sheep Manure (75%) + NPK (25%)) with (116.56) where as minimum (102.27) was recorded in treatment T₀ (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 T₈ (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (3.52) Number of Branches/plant, followed by T₆ (Sheep Manure (50%) + NPK (50%)) with (3.45) where as minimum (2.79) was recorded in treatment T₀ (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 T₈ (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded minimum (30.92 days) for first flowering, followed by T₇ (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) with (31.55 days) where as maximum (36.15 days) was recorded in treatment T₀ (Control).

In terms of Days to 50% flowering, treatment T₈ (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded minimum (42.17 days) for 50% flowering, followed by T₇ (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) with (44.42 days) where as maximum (48.23 days) was recorded in treatment T₀ (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 T₈ (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded minimum (55.03 days) for first Harvest, followed by T₇ (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) with (56.62 days) where as maximum (62.92 days) was recorded in treatment T₀ (Control).

In terms of Fruit diameter, treatment T₈ (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (14.79 cm) Fruit diameter, followed by T₇ (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) with (14.03 cm) where as minimum (12.03 cm) was recorded in treatment T₀ (Control).

In terms of Fruit length, treatment T₈ (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (15.10 cm) Fruit length fertilizers followed by T₇ (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) with (14.56 cm) where as minimum (13.29 cm) was recorded in treatment T₀ (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)^[1] in okra.

In terms of Average fruit weight, treatment T₈ (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (195.48 g) Average fruit weight, followed by T₇ (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) with (173.53 g) where as minimum (138.19 g) was recorded in treatment T₀ (Control). The fruit weight was significantly effect by organic manures and NPK the Similar result has been obtained by Vadiraj *et al.* (1993)^[7] in cardamom and Sekhar and rajashree (2009)^[6] in tomato.

In terms of Number of fruits per plant, treatment T₈ (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (56.05) fruit per plant, fertilizers followed by T₇ (Vermicompost (50%) + Sheep Manure (25%) + NPK (25%)) with (48.11 fruit/plant) where as minimum (20.25) was recorded in treatment T₀ (Control). The Similar result were reported by the Sekhar and Rajashree, (2009)^[6] in tomato hybrid and Jose *et al.*, (1998)^[4] in Brinjal.

In terms of Fruit yield per Plot, treatment T₈ (Vermicompost (25%) + Sheep Manure (25%) + Neem Cake (25%) + NPK

(25%)) recorded maximum (11.14 kg) fruit yield per plot, followed by T₇ (Vermicompost (50%) +Sheep Manure (25%) + NPK (25%)) with (8.37 kg) where as minimum (3.04 kg) was recorded in treatment T₀ (Control).

In terms of Fruit yield q/ha, treatment T₈ (Vermicompost (25%) +Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (810.31 q) fruit yield/ha, followed by T₇ (Vermicompost (50%) +Sheep Manure (25%) + NPK (25%)) with (581.42 q/ha) where as minimum (211.87 q) was recorded in treatment T₀ (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 Total Soluble Solids, treatment T₈ (Vermicompost (25%) +Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (4.10 °Brix) Total Soluble Solids (°Brix), followed by T₇ (Vermicompost (50%) +Sheep

Manure (25%) + NPK (25%)) with (3.90 °Brix) where as minimum (3.22 °Brix) was recorded in treatment T₀ (Control). Increased in Total soluble solids content of fruits in treatments of organic manures, and NPK, previously also reported by Sekhar and Rajashree (2009) [6].

In terms of Vitamin C, treatment T₈ (Vermicompost (25%) +Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) recorded maximum (8.36 mg) Vitamin C, fertilizers followed by T₇ (Vermicompost (50%) +Sheep Manure (25%) + NPK (25%)) with (7.82 mg) where as minimum (4.44 mg) was recorded in treatment T₀ (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) [4] in Bottle gourd.

In terms of Economics, Maximum gross returns, net returns and benefit: cost ratio was observed in the treatment T₈ (Vermicompost (25%) +Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)) followed by T₇ (Vermicompost (50%) +Sheep Manure (25%) + NPK (25%)) and minimum was recorded in treatment T₃ (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)
T ₀	Control (Recommended dose of NPK (150:75:75 kg/ha))	311.29	102.27	2.79	36.15	48.23	62.92	12.03	13.29
T ₁	Neem Cake (75%) + NPK (25%)	330.38	106.73	2.93	33.25	47.07	61.54	13.12	13.52
T ₂	Neem Cake (50%) + NPK (50%)	334.54	107.48	3.22	32.62	46.12	61.93	13.19	13.78
T ₃	Vermicompost (75%) + NPK (25%)	342.04	111.67	2.81	33.49	45.14	61.06	13.14	13.53
T ₄	Vermicompost (50%) + NPK (50%)	343.27	114.75	3.36	32.17	47.55	60.49	13.65	13.78
T ₅	Sheep Manure (75%) + NPK (25%)	329.53	116.56	3.41	34.41	45.16	57.44	13.52	14.12
T ₆	Sheep Manure (50%) + NPK (50%)	344.26	115.32	3.45	32.31	44.79	58.17	13.96	14.37
T ₇	Vermicompost (50%) +Sheep Manure (25%) + NPK (25%)	352.97	114.72	3.24	31.55	44.42	56.62	14.03	14.56
T ₈	Vermicompost (25%) +Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)	369.11	120.35	3.52	30.92	42.17	55.03	14.79	15.10
F-Test		S	S	S	S	S	S	S	S
SE(d)		1.950	2.497	0.018	0.381	0.438	0.576	0.127	0.350
C.V.		0.703	2.726	0.691	1.414	1.176	1.186	1.156	3.062
C.D. at 5%		4.168	5.339	0.038	0.814	0.937	1.231	0.272	0.749

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
T ₀	Control (Recommended dose of NPK (150:75:75 kg/ha))	138.19	20.25	3.05	211.87	3.22	4.44	1:2.38
T ₁	Neem Cake (75%) + NPK (25%)	160.83	25.34	4.18	280.06	3.32	5.65	1:3.08
T ₂	Neem Cake (50%) + NPK (50%)	165.58	28.03	5.01	340.44	3.46	6.18	1:3.77
T ₃	Vermicompost (75%) + NPK (25%)	138.21	27.67	3.52	244.94	3.62	6.92	1:2.01
T ₄	Vermicompost (50%) + NPK (50%)	151.27	36.03	5.42	380.92	3.79	7.61	1:3.44
T ₅	Sheep Manure (75%) + NPK (25%)	165.70	31.10	5.35	370.18	3.39	6.47	1:3.37
T ₆	Sheep Manure (50%) + NPK (50%)	171.19	38.83	6.67	471.62	3.50	7.02	1:4.59
T ₇	Vermicompost (50%) +Sheep Manure (25%) + NPK (25%)	173.53	48.11	8.37	581.42	3.90	7.82	1:4.94
T ₈	Vermicompost (25%) +Sheep Manure (25%) + Neem Cake (25%) + NPK (25%)	195.48	56.05	11.14	810.31	4.10	8.36	1:7.55
F-Test		S	S	S	S	S	S	
SE(d)		1.499	0.746	0.107	1.142	0.022	0.301	
C.V.		1.132	2.639	2.244	0.341	0.755	5.493	
C.D. at 5%		3.205	1.594	0.229	2.442	0.047	0.644	

Conclusion

From the present experimental findings it is concluded 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%)).

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