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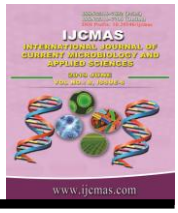

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Study on Plant Geometry, Cultivar and Fertilizer Doses on Growth and Yield of Parthenocarpic Cucumber under Protected Condition

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A B S T R A C T

The present investigation was conducted 2017-18 and 2018-19 carried out at Vegetable Research Farm SHUATS, Prayagraj, Allahabad U.P. with three replications. In this way the experiments were comprising of total twenty seven treatment combinations of three cultivars namely, Pant Parthenocarpic Cucumber -2 (V_1)' Pant Parthenocarpic Cucumber -3 (V_2) and Hilton (V_3); three plant geometry i.e. 60 x 30 cm (P_1), 60 x 40 cm (P_2) and *60* x *50* cm (P_3) and three NPK, fertilizers doses like, 20:10:22 Kg/1000m^2 (D_1), 25:15:27 Kg/1000m^2 (D_2) and 30:20:32 Kg/1000m^2 (D_3). The fertilizers dose applies at twice a week. Similar treatments were applied during both the year. The results revealed that all the treatments and their combinations had significantly influenced the growth, and yield of fruits during both the year of experimentation. Among the different cultivars used in the study, Pant Parthenocarpic Cucumber -3 (V_2) were found statistically superior to enhance vine length (2.73 m), stem girth (0.80 cm) leaf area (412.34 cm^2), Internodal distance (8.38 cm) minimum days required to first flower bud initiation (42.14 DAS), minimum days required to first fruit harvest (55.42 DAS), which ultimately gave maximum yield per vine (2.82 kg per plant) during pooled data respectively. Further, among the various spacing treatments, spacing (P_3) i.e. 60 x 50 cm was found to be significantly superior with respect to vegetative growth and yield per plant of fruits except yield per sq. meter in both the year Significantly higher yield per sq. meter was recorded in spacing P_1 (60 x30 cm) and least in P_3 (60 x50 cm) during both the year. In case of dose fertilizer application, the application of fertilizers through manually apply the root zone of plant was found superior to maximum fertilizers apply compared to minimum fertilizers apply during both the year Maximum number of fruits per vine, average fruit weight (g), yield per vine (kg) and yield per sq. meter (kg) were recorded in both the year maximum fertilizers apply in D_3. Therefore, it is recommended that cucumber should be grown at a spacing of 60 x 50 cm along with D_3 NPK dose using cultivars (Pant Parthenocarpic Cucumber -3) during the both the year for sustaining higher fruit yield cucumber under polyhouse condition. Whereas, on the basis of benefit cost ratio, it could be recommended that cucumber cultivar 'Pant Parthenocarpic Cucumber -3' should be grown at a spacing of 60 x 50 cm along with the maximum NPK dose of fertilizers apply during both the year for attaining the maximum production of cucumber polyhouse condition.

Introduction

Cucumber (*Cucumis sativus* L.) is one of the most important vegetable crops of the cucurbitaceace family and having a chromosome number, 2n = 14. As a vegetable crop parthenocarpic cucumber has great economic importance. The immature fruit of cucumber are use as salad and for making pickles, pahari rayata and brined on commercial scale (Bairagi *et al.,* 2013). The global production of cucumber is 71.36 million tons (FAOSTAT 2014) and commercially cultivated in countries like China, India, Turkey, Iran, Japan, Europe and United States. In the world more than 55 countries adopted protected cultivation technology; China has the largest area of 2.7 mha under protected cultivation Kacira (2011). The total area of protected cultivation in India is approx 30,000 ha. Contributes 0.23% of the total area under the horticulture crop cultivation in India at and of 11th five year plan (Shweta *et al.,* 2014). The total area of cucumber growing In India 78,000 hectares with an annual production of 11.42 lakh MT (National Horticulture Board 2016-17). The main areas of cucumber cultivation are river beds of Yamuna, Ganges and Narmada in North and Kaveri, Krishna and Godavari in South (Singh 1998).

Materials and Methods

The present investigation was conducted during 2017-2019 at the Vegetable Research Farm, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology & Science, Prayagraj, Allahabad (U.P.) during the year 2017-18 and 2018-2019. The experimental situated in the river basin of the Ganga and Yamuna. It is situated at 28^0.87' N latitude 81^0.15' E longitude with an altitude of 98 m above the mean sea level. Average annual rainfall is 1013.4 mm The polyhouse was covered with ultra violet stabilized low density polyethylene sheet having 200 micron thickness. The experiment was comprising of total twenty seven treatment combinations of three level of spacing *viz*. 60×30 cm (P1), 60×40 cm (P2) and 60×50 cm (P3), three cultivar viz. Pant Parthenocarpic Cucumber -2 (V1), Pant Parthenocarpic Cucumber -3 (V2)and Hilton (V3) with three dose of fertilizers level *viz*. D1 20:10:22 kg/1000 sq.m, D2 25:15:27 kg /1000 sq.m and D3 30:20:32 kg/1000 sq.m. The experiment was laid out following factorial randomized block design (Factorial RBD) with three replications. Observations were recorded for ten different characteristics related to vegetative growth and yield attributing traits. The economics of different treatments were determined on the basis of prevailing market price of inputs and produce. The data recorded for various characters were subjected to statistical analysis using analysis of variance (ANOVA) under factorial RBD.

Results and Discussion

The result, it has been revealed that the effect of cultivars a significant influence on plant height, stem girth, leaf area and Internodal distance of cucumber under polyhouse condition. Maximum plant height (2.73 m), stem girth (0.80 cm), leaf area (412.34 cm^2), and Internodal distance (41.14 cm) was measured in Pant Parthenocarpic Cucumber -3. However, polyhouse environment favourable condition the growth of the lines by modifying the natural environment and micro climatic conditions surrounding the plants Plant geometry significantly affected the plant height, stem girth, leaf area and Internodal distance of cucumber. Plants at wider spacing (60 x 50 cm) gave maximum plant height (2.74 m), stem girth (0.79 cm), leaf area (411.56 cm^2), and Internodal distance (8.33 cm) than closer spacing (60 x30 cm). This may be due to the availability of more space for the plants. Significant linear

increase of main vine length, stem girth, leaf area and Internodal distance was reported with increased spacing. The results obtained on effect of dose of fertilizer application on plant height, stem girth, leaf area and Internodal distance of cucumber indicated that all the characters were significantly.

A perusal of data presented in clearly indicated that the cultivar PPC-3 (V_2) exhibited significantly higher plant height, stem girth, leaf area, Internodal distance (3.04 m, 0.85 cm, 422.60 cm^2 and 8.11cm), respectively in spacing S_3 (60x50 cm) as compared to S_1 (60x30 cm) along with the D_3 maximum dose of fertilizers application. This difference in varietal performance of cucumber during winter season may be due to varietal characteristics. The data presented clearly showed that effect of cultivars, spacing and dose of fertilizer along with their interaction effects had significantly influenced the minimum days to first flower bud initiation (42.13 DAS) was reported in cultivar V_2 (Pant parthenocarpic cucumber -2), spacing P_3 (41.06 DAS) which was found at par with spacing P_2 and P_1 (42.04 and 44.31 DAS respectively) and with Fertigation minimum days required to first flower bud initiation D_3, (42.11 DAS). Minimum number of days required to first fruit harvest (55.42 DAS) was observed in cultivar Pant Parthenocarpic Cucumber -3, in spacing P_3 (60 x 50 cm) with 56.07 days and 55.71 days through maximum dose of fertilizers, D_3 30:20:32 Kg (Table 4.11). However, the interaction effects of cultivars, plant geometry and dose of fertilizer application, among different cultivars, maximum number of fruits per plant (21.89), minimum number of unmarketable fruits per plants (1.46) and highest fruit weight (116.41 g) was obtained in cultivar Pant Parthenocarpic Cucumber -3.

Table.1 Study of cultivars, spacing and dose of fertilizer application of parthenocarpic cucumber under polyhouse condition during winter season 2017-19 pooled

Treatment	Plant height (m)	Stem girth (cm)	Leaf area (cm^2)	Internodal distance (cm)	Days to first flower bud initiate (DAS)	Days of first fruits picking (DAS)	Number of fruit per plant	Fruit weight (g)	Fruits yield per plants (Kg)	Yield per square meter (Kg)
Cultivar										
V_1 , PPC-2	2.69	0.77	406.14	8.47	42.32	57.35	19.78	116.11	2.58	12.86
V_2 , PPC -3	2.73	0.80	412.34	8.38	42.14	55.42	21.89	116.41	2.82	13.46
V_3, Hilton	2.73	0.78	408.02	8.34	42.95	57.13	20.43	116.27	2.73	12.93
Dose of Fertilizers kg/1000 sq.m										
D_1, 20:10:22	2.68	0.76	406.55	8.51	42.63	57.22	19.91	114.39	2.56	12.89
D_2, 25:15:27	2.70	0.78	407.68	8.41	42.67	56.97	20.62	116.44	2.73	13.03
D3, 30:20:32	2.78	0.81	412.27	8.27	42.11	55.71	21.58	117.96	2.85	13.33
Plant geometry in cm.										
P_1, 60 X 30	2.68	0.78	406.18	8.48	44.31	57.27	20.18	113.42	2.61	14.57
P_2, 60 X 40	2.74	0.78	408.76	8.39	42.04	56.56	20.69	116.92	2.71	13.77
P_3, 60X 50	2.73	0.79	411.56	8.33	41.06	56.07	21.24	118.45	2.81	10.91
F – test	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
S. Ed. (±)	**0.002**	**0.002**	**0.04**	**0.020**	**0.103**	**0.071**	**0.058**	**0.021**	**0.014**	**0.034**
CD at 5%	**0.003**	**0.004**	**0.09**	**0.041**	**0.209**	**0.144**	**0.118**	**0.042**	**0.028**	**0.068**

*PPC-Pant Parthenocarpic Cucumber

This might be due to more fruit set, more photosynthesis as it produced more vine length and leaf area during the processes. Number of fruits per vine and average fruit weight were significantly influenced by plant geometry (Table 4.13 to 4.22). Maximum number of fruits per vine (21.24), and highest average fruit weight (118.45 g) was reported in 60 x 50 cm spacing (P_3) as compared to lowest in P_1 (60 x 30 cm). The pooled analysis recorded P_3 as having significantly higher number of fruits per plant and average fruit weight this may be due to the availability of more space for the plants growth. The results obtained in present investigation revealed that the dose of fertilizer application had a significant influence on number of fruits per vine, and average weight of fruit (Table-1). Higher number of fruits per plant (21.58), and maximum average fruit weight (117.96 g) was obtained in D_3 maximum dose of fertilizers (30:20:32 Kg) as compared to that in D_1 minimum dose of fertilizers application. Interaction effect of cultivars, spacing and dose of fertilizer application on number of fruits per vine, and maximum average fruit weight were found to have a significant effect (Table 1). Maximum yield per plant (2.82 kg) was noticed in cultivar (V_2) Pant Parthenocarpic Cucumber -3, followed by (2.73 kg per plant) in Hilton which was found significantly at par with (2.58 kg per plant) cultivar Pant Parthenocarpic Cucumber -2. All the three cultivars had significant effect on yield per plant of parthenocarpic cucumber. Maximum yield per plant (2.81 kg) was observed in spacing P_3 (60 x50 cm) as compared to 2.61 kg per plant in P_1 (60x30 cm). It is concluded that total yield significantly increased as the spacing between plants within rows was increased. Dose of fertilizer application was found to have a significant effect on yield per plant of cucumber. Higher yield (2.85 kg per plant). recorded maximum yield per plant (kg) and yield per ha (t) in cucumber hybrid when 150:90:90 kg NPK per hectare was applied through fertigation. Interaction of cultivars, spacing and dose of fertilizer had significant influence on yield per vine of cucumber (Table-1). Maximum yield per vine (3.20 kg per vine).

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