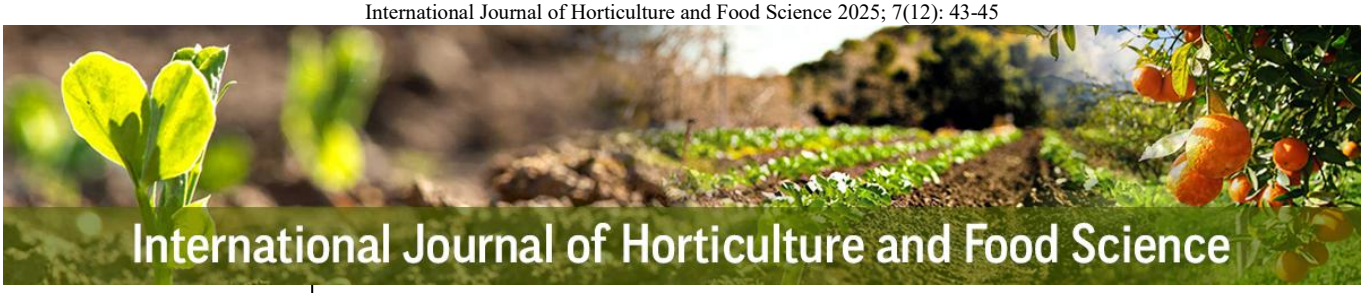

E-ISSN: 2663-1067
P-ISSN: 2663-1075
NAAS Rating (2025): 4.74
www.hortijournal.com
IJHFS 2025; 7(12): 43-45
Received: 02-10-2025
Accepted: 07-11-2025

Bhoopendra Singh
Krishi Vigyan Kendra (ICAR-CRRI) Koderma, Jharkhand, India

Chanchila Kumari
Krishi Vigyan Kendra (ICAR-CRRI) Koderma, Jharkhand, India

AK Rai
Krishi Vigyan Kendra (ICAR-CRRI) Koderma, Jharkhand, India

Manish Kumar
Krishi Vigyan Kendra (ICAR-CRRI) Koderma, Jharkhand, India

Vinay Kumar
Krishi Vigyan Kendra (ICAR-CRRI) Koderma, Jharkhand, India

Corresponding Author:
Bhoopendra Singh
Krishi Vigyan Kendra (ICAR-CRRI) Koderma, Jharkhand, India

Influence of plant spacing, cultivar selection, and fertilizer levels on growth and yield of parthenocarpic cucumber (*Cucumis sativus* L.)

Bhoopendra Singh, Chanchila Kumari, AK Rai, Manish Kumar and Vinay Kumar

DOI: https://www.doi.org/10.33545/26631067.2025.v7.i12a.436

Abstract
The study was conducted during 2017-2019 at the Vegetable Research Farm, SHUATS, Prayagraj, with three replications. It included 27 treatment combinations of three cucumber cultivars (Pant Parthenocarpic Cucumber-2, Pant Parthenocarpic Cucumber-3, and Hilton), three plant spacings (60×30, 60×40, 60×50 cm), and three NPK doses (20:10:22, 25:15:27, 30:20:32 kg/1000 m²), applied twice weekly. Results showed that all treatments significantly affected growth and yield. Pant Parthenocarpic Cucumber-3 exhibited superior vegetative growth, early flowering and fruiting, and highest yield per vine (2.82 kg). Wider spacing (60×50 cm) improved growth and yield per plant, while closer spacing (60×30 cm) produced higher yield per square meter. Maximum NPK dose (D3) gave the highest number of fruits, fruit weight, and overall yield.It is recommended to grow Pant Parthenocarpic Cucumber-3 at 60×50 cm spacing with D3 fertilizer under polyhouse conditions for optimal yield and benefit-cost efficiency.

Keywords: Cucumber, parthenocarpic, growth, yield, polyhouse, cultivar, plant geometry, dose of fertilizers

Introduction
Cucumber (*Cucumis sativus* L.) is an important vegetable crop, and parthenocarpic varieties, which set fruit without pollination, are especially valuable in greenhouse cultivation. Growth and yield of cucumber are strongly influenced by plant spacing, cultivar choice, and fertilizer management. Proper spacing ensures adequate light, air circulation, and nutrient availability, while suitable cultivar selection improves adaptability, disease resistance, and fruit quality. Balanced fertilization supports vegetative growth and fruit development, whereas under or over-application can reduce yield. Understanding the combined effects of these factors is essential for optimizing the growth and productivity of parthenocarpic cucumber. There is a constant demand throughout the year for cucumber, especially the smooth skinned seedless fruit because of its popular use in salad dish, sandwich, pizza and other preparations. Furthermore, even under normal growing season, vegetables grown under greenhouse are superior in yield and quality as compared to those grown under open field conditions. The precocity or earliness for fruit bearing and harvest is the desired characters for early summer production that fetches high price. Additionally, the cultivar may have high yield potential and good commercial quality that relates to consumers preference. The present study was undertaken to identify a suitable cucumber cultivar, standardize of dose of fertilizers and plant geometry for winter production, based on fruit quality attributes, under greenhouse condition of river basin of the Ganga and Yamuna at prayagraj, Allahabad of India.

Materials and Methods
The experiment was carried out during 2017-18 and 2018-19 in a 500 m² greenhouse covered with UV-stabilized polyethylene film (200 µ) at the Vegetable Research Farm, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology & Science, Prayagraj, Allahabad (U.P.). Three commercial parthenocarpic cucumber hybrids, namely Pant Parthenocarpic Cucumber-2 (PPCU-2), Pant Parthenocarpic Cucumber-3(PPCU-3), and Hilton, were evaluated under greenhouse conditions from November to

March in both 2017-18 and 2018-19. The experiment was laid out in a Randomized Block Design (RBD) with three replications, and each experimental unit consisted of six plants. During the cropping season, the daily mean temperature inside the greenhouse ranged from 18 to 30 °C, while relative humidity varied between 60 and 85%. The greenhouse soil was characterized by a pH of 7.18, organic carbon content of 0.60%, total nitrogen of 290.26 kg ha^{-1}, available phosphorus of 25.25 kg ha^{-1}, and available potassium of 157.62 kg ha^{-1}. The soil texture comprised 60% sand, 26% silt, and 14% clay, with a bulk density of 1.33 Mg m^{-3}, particle density of 2.45 Mg m^{-3}, percentage pore space of 49.33%, and a water-holding capacity of 43.50%.

Results and Discussion

The results indicate that different cultivars had a significant effect on plant height, stem girth, leaf area, and internodal distance of cucumber under polyhouse conditions. The highest values for plant height (2.73 m), stem girth (0.80 cm), leaf area (412.34 cm²), and internodal distance (41.14 cm) were recorded in the cultivar PPC-3. Regarding plant spacing, wider spacing (60 × 50 cm) resulted in greater plant height (2.74 m), stem girth (0.79 cm), leaf area (411.56 cm²), and internodal distance (8.33 cm) compared to closer spacing (60 × 30 cm). This is likely due to the increased availability of space for plant growth. A significant linear increase in main vine length, stem girth, leaf area, and internodal distance was observed with increasing spacing. Similarly, the effect of fertilizer dosage on plant height, stem girth, leaf area, and internodal distance showed that all these traits were significantly influenced by the amount of fertilizer applied. The data clearly indicated that the cultivar PPC-3 (V2) exhibited significantly greater plant height, stem girth, leaf area, and internodal distance (3.04 m, 0.85 cm, 422.60 cm², and 8.11 cm, respectively) under spacing S3 (60 × 50 cm) compared to S1 (60 × 30 cm) along with the highest fertilizer dose (D3). This variation in cucumber performance during the winter season may be attributed to varietal characteristics. The results also showed that the cultivars, plant spacing, and fertilizer doses, along with their interactions, significantly influenced the number of days to first flower bud initiation. The minimum days (42.13 DAS) were recorded in cultivar V2 (Pant Parthenocarpic Cucumber-2) under spacing P3 (41.06 DAS), which was comparable to P2 and P1 (42.04 and 44.31 DAS, respectively) and D3 fertigation (42.11 DAS). Similarly, the minimum days to first fruit harvest (55.42 DAS) were observed in cultivar PPC-3 under spacing P3 (56.07 DAS) with the maximum fertilizer dose, D3 (55.71 DAS) (Table 4.11). Regarding fruit production, the interaction of cultivars, plant geometry, and fertilizer dose showed that the highest number of fruits per plant (21.89), lowest unmarketable fruits (1.46), and maximum fruit weight (116.41 g) were recorded in cultivar PPC-3. This may be due to greater fruit set and enhanced photosynthesis resulting from longer vine length and larger leaf area. Plant spacing significantly influenced fruit number and average fruit weight (Tables 4.13-4.22). Maximum fruits per vine (21.24) and highest average fruit weight (118.45 g) were obtained in spacing P3 (60 × 50 cm), while the lowest values were observed in P1 (60 × 30 cm). The pooled analysis confirmed that P3 allowed better plant growth due to more available space. Similarly, the highest number of fruits per plant (21.58) and fruit weight (117.96 g) were obtained with the maximum fertilizer dose, D3 (30:20:32 kg), compared to the minimum dose, D1. The interaction of cultivars, spacing, and fertilizer dose had a significant effect on both fruit number per vine and average fruit weight (Table 1). The maximum yield per plant (2.82 kg) was recorded in cultivar PPC-3, followed by Hilton (2.73 kg per plant), which was statistically similar to PPC-2 (2.58 kg per plant). All three cultivars significantly affected yield per plant. Spacing P3 (60 × 50 cm) produced the highest yield per plant (2.81 kg) compared to P1 (60 × 30 cm, 2.61 kg). This indicates that yield increases with wider spacing between plants within a row. Fertilizer dose also significantly affected cucumber yield, with the highest yield (2.85 kg per plant) achieved when 150:90:90 kg NPK per hectare was applied through fertigation. The interaction of cultivars, spacing, and fertilizer dose significantly influenced yield per vine, with a maximum yield of 3.20 kg per vine (Table 1).

Table 1: Effects of Fertilizer Dose and Plant Spacing on Growth and Fruit Quality of Parthenocarpic Cucumber

Treatment	Plant height (m)	Stem girth (cm)	Leaf area (cm²)	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

References

1. AVRDC. Vegetable production. Shanhua, Tainan, Taiwan: AVRDC; 1999. p. 182.
2. Bairagi SK, Singh DK, Ram HH. Analysis of combining ability in cucumber (*Cucumis sativus* L.) through half diallel mating system. Annals of Horticulture. 2013;6(2):308-314.
3. FAOSTAT. Major crops - by countries/regions, rankings; cucumber and gherkins, world. Food and Agriculture Organization; 2014.
4. Lal M, Kanwar HS, Kanwar R. Impact of spacing and training on seed yield of capsicum (*Capsicum annuum* L.) under protected condition. International Journal of Farm Science. 2014;4(3):42-48.
5. National Horticulture Board. NHB database. Department of Agriculture and Co-operation, Government of India; 2014.
6. Sharma MK. Effect of different growing media and fertigation levels on production of cucumber (*Cucumis sativus*) under protected conditions in the hills. Indian Journal of Agricultural Sciences. 2009;79(11):853-856.
7. Shweta S, Bhatia K, Malik M. Protected farming. Popular Kheti. 2014;2(1):January-March.
8. Singh B. Protected cultivation of vegetable crops. Ludhiana: Kalyani Publishers; 2005. p. 74-84.
9. Singh B, Kumar M. Techno-economic feasibility of Israeli and indigenously designed naturally ventilated greenhouses for year-round cucumber cultivation. Acta Horticulturae. 2006;710:535-538.
10. Singh DN, Chhonkar VS. Effect of nitrogen, phosphorus, potassium and spacings on growth and yield of muskmelon (*Cucumis melo* L.). Indian Journal of Horticulture. 1986;43(3-4):265-269.
11. Kapuriya VK, Ameta KD, Teli SK, Chittora A, Gathala S, Yadav S, *et al*. Effect of spacing and training on growth and yield of polyhouse grown cucumber (*Cucumis sativus* L.). International Journal of Current Microbiology and Applied Sciences. 2017;6(8):299-304.
12. Yadav AR, *et al*. Effect of dates of planting and spacing on growth and yield characteristics of ginger (*Zingiber officinale* Ros.) var. IISR Mahima. Journal of Spices and Aromatic Crops. 2013;22(2):209-214.