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Impact of Growing Conditions on Growth, Flower Induction and Yield Traits of Cucumber (*Cucumis sativus* L.) Varieties

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ABSTRACT: An experiment was investigated at the Department of Vegetable Science, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Periyakulam, Tamil Nadu, India to assess the different varieties of cucumber varieties such as Heera, Japanese Long Green, K-75, Konkan Kakadi, Pant Khira-1 under open and protected environmental conditions. This experiment was laid out in Randomized Block Design with a factorial concept and comprised of three replications. The protected condition shows maximum vegetative growth at 30 days (31.88 cm) and 60 days (216.44 cm), early male (6th node) and female flowering (8.58 node) and it induces early fruiting (49.05 days), maximum fruit length (19.34 cm) and yield (4.2 kg/ha) shown over the open field conditions. Japanese Long Green showed maximum vegetative growth among all varieties in 30 days (27.68 cm) as well as at 60 days (207.5 cm), maximum fruit length (25.07 cm) and the maximum number of nodes per vine (37.45). Heerahybrid recorded early nodal position of male (3.35) and female flower (4.31), highest yield (3.13 kg/plant) among all the varieties. In interactions, maximum vine length in Japanese Long Green under protected conditions (282.5 cm) and early female flower observed in Heera under protected conditions (4.31), maximum yield (4.25 t/ha) was recorded in Heera under protected conditions. In open field conditions climate change is the major problem for the cultivation of cucumber but in protected conditions to regulate the microclimate surrounding the crop it induces yield.

Keywords: Cucumber varieties, Open condition, protected condition, microclimate, fruit length.

INTRODUCTION

Cucumber (*Cucumis sativus* L.) is a popular vegetable grown in both open and protected environmental conditions around the world. Cucumber is indigenous to northwest India and it has been grown for at least three thousand years. Its juice is frequently advised as a source of silicon for skin health. Cucumber is high in vitamins A, B, B5, C, and K, as well as minerals such as magnesium, potassium, copper, phosphorus, and manganese. Cucumbers having caffeic acid and ascorbic acid aid to minimize skin irritation and swelling. India has a tropical and subtropical climate, the predominance of high temperatures throughout the year makes it difficult to get better yields and excellent quality vegetables in open environmental conditions. Protected farming is a distinct and specialized type of agriculture in which the microclimate surrounding the plant is partially or completely regulated according to the needs of the plant species farmed (Mishra *et al*., 2010). The protected cultivation of cucumbers could be used to improve their vegetative growth, yield, quantity and quality (Singh *et al*., 2012; Ganesan, 2002). Seed crops produced in open fields particularly in Kharif, are heavily plagued with cucumber mosaic virus and some other insect pests, for which no reliable management technique is currently available.

Furthermore, changing climatic conditions, increased temperature and an increase in the incidence of insect pests and diseases drastically reduce seed yield and quality in the Kharif crop, and the relatively early onset of high temperature hampers the production of female flowers, fruit set, and fruit development in the Kharif crop. Due to its flexibility and high output under plastic house conditions, most farmers started growing hybrid cucumbers inaccessible regions during the off-season to earn remunerative returns. Even in naturally ventilated poly homes, yields are higher than in open fields (Srivastav and Singh, 1997; Gautam *et al*., 2008). Insect pest problems in protected farming are

considerably different from pest problems in open fields (Rani and Reddy *et al*., 1999) (Reddy and Kumar *et al*., 2006). Less light intensity gives rise to more female flowers whereas more light intensity causes more male flowers Growing seed crops in protected structures, such as poly houses, can help to relieve these issues by shielding the crop from various insect vectors and poor environmental conditions. As a result, the current study was designed to investigate growth behaviour, flowering and fruit development parameters in cucumbers during kharif under Tamil Nadu conditions.

MATERIALS AND METHODS

The present investigation was conducted at the western farm of the Department of Vegetable Science, Horticultural College and Research Institute (HC&RI), TNAU, Periyakulam in 2022 to evaluate the 5 varieties i.e., Heera, Japanese Long Green, K-75, Konkan Kakadi, Pant Khira-1, collected from various institutions/universities of Indian Council of Agricultural Research cultivated by TNAU recommended agronomical practices equipped with fertigation system. The spacing of 110 cm × 60 cm was maintained in raised beds with a single row system under polyhouse and open conditions. For both conditions, three replications were adopted for each variety in a Factorial Randomized Block Design (FRBD) with 2 factors (Growing conditions and Varieties). Based on soil and leaf studies, chemical fertilizers were applied. Soluble fertilizers were injected into irrigation water or sprayed on the leaves of plants to supplement micronutrient deficits (except for Iron which is used in the irrigation system). Ammonium sulphate, potassium sulphate (low solubility), superphosphate triple (poor solubility), magnesium sulphate, manganese sulphate, zinc sulphate, and Fe chelate were among the fertilizers used.

Naturally Ventilated Poly House (NVPH). The saw-toothed structured poly house had various facilities like a double door, exhausted fan and cooling pad system, fogging system, shade net, and fertigation system.

Open environmental condition. In open conditions without any environmental control system but same agronomic practices followed, such as dimensions of the plot, date of sowing, training, fertigation, and intercultural operations.

RESULTS AND DISCUSSION

Tables 1 and 2 show the data on the performance of various cucumber varieties in two different habitats in terms of plant development characteristics, flowering, and fruit characters under the naturally ventilated poly house as well as in open field conditions. The statistical analysis showed substantial variations between the growth conditions and different varieties.

Vegetative growth parameters. Vegetative growth characteristics such as vine length at 30 DAS, vine length at 60 DAS, and number of nodes per vine were recorded for different varieties of cucumber under open and protected conditions. From Table 1, it was concluded that significantly maximum vine length at 30 DAS (31.88 cm), vine length at 60 DAS (216.14 cm) and number of nodes per vine (28.24) were recorded under protected conditions and minimum recorded under open field conditions. This might be attributed to increased photosynthesis and respiration as a result of the protected house beneficial microclimate. This is consistent with the findings of Kumarand Arumugam (2010) and Priya *et al.* (2002) on vegetables produced in poly houses, as well as Ryelski (1985) and El-Aidy *et al*. (1989) on sweet pepper cultivated in shade net houses. In between varieties, Japanese Long Green showed maximum vine length at 60 DAS (207.50 cm), a number of nodes per vine (37.45), followed by Heera (267.80 cm, 28.22 cm) respectively. The vine length at 30 DAS was significantly maximum recorded in the Heera variety (28.98 cm) on par with Japanese Long Green (27.68 cm), whereas among the interactions Japanese long green under protected conditions showed maximum vine length at 30 DAS (46.55 cm), vine length at 60 DAS (44.13 cm), number of nodes per vine was recorded in Japanese Long Green under open field conditions (37.45). The outcome of these characters was in accordance with Chaudhari *et al*. (2016); Dahal *et al.* (2020).

Reproductive parameters. Table 2 revealed the significantly maximum nodal position of the first male and female flower recorded under open conditions (8.11, 10.78) respectively, and the early nodal stage of the male (6.00) and female flower (8.58) shown under protected conditions. The results conform with Singh *et al*. (2004). In varieties, early nodal position of male (3.35) and female flowers (5.25) was noticed in the Heera hybrid. Among the interactions, the early (3.19) nodal position of the first male flower was recorded in Japanese Long Green under protected conditions and the early (4.31) female flower nodal position was recorded in Heera under protected conditions and late nodal position of male (10.45) and female flower (13.2) seen in Pant Khira-1 under open conditions. The differences in the first emergence of female flower could have been due to internodal length, number of internodes, genetic nature, environmental factors and vigour of the crop. Rawat *et al*. (2014); Patel *et al*. (2013) reported such variations among various cucumber cultivars for the nodal position of first pistillate flower and staminate flowers.

Days to first picking. Days to first picking significantly maximum (57.89 days) was recorded under open field conditions over the protected conditions (49.05 days), this might be owing to a build-up of photosynthates, which stimulated the early commencement of flowers. Rui *et al*. (1989) discovered similar results in capsicum. Heera hybrid took minimum (43.86 days) days for first picking and the maximum days taken for first picking in Konkan Kakadi (62.17 days) variety. In interactions, Japanese Long Green variety under protected conditions took less (38.12) days for first picking and more (65.79) days took in Konkan Kakadi under open field conditions. Similar findings were reported by Kumar *et al.* (2013); Kumar *et al*. (2019).

Days to the last picking. Fig. 1 shows that protected conditions (91.92 days) took maximum days for last harvest compared to the open field conditions (88.01 days), whereas varieties K-75 (93.7 days) had the maximum days for last picking and minimum days taken in Heera hybrid (82.86 days). In individual interactions, maximum days were shown in Japanese Long Green under protected grown conditions (94.22 days), and minimum days were reported in Heera hybrid under open field conditions (80.45 days) for days to last picking. The present findings are in agreement with those reported by Cardoso and Silva (2003); Afangideh and Uyoh (2007).

Fruit length (cm). Fig. 1 shows that Protected conditions (19.34 cm) obtained maximum fruit length and minimum fruit length was noted under open field conditions (18.03 cm), and Japanese Long Green (25.04 cm) had longest fruit and minimum fruit length recorded in the K-75 variety (15.88 cm). Among all the interactions, Japanese Long Green under protected (26.94 cm) obtained the longest fruit and the shortes fruit was noted in K-75 under open field conditions (15.67 cm). The difference in fruit length could have been due to the genetic nature of the variety, environmental factors, and vigour of the crop. Similar findings are reported by Hossain *et al*. (2010); Yadav *et al.* (2012); Patel *et al*. (2013); Kaddi *et al*. (2014).

Yield per plant (kg/plant). Fig. 2 shows that protected conditions (3.02 kg) obtained maximum yield and open conditions (1.45 kg) was noticed as the lowest yield, among all the varieties Heera hybrid (3.13 kg) had the maximum yield, followed by the Japanese Long Green (2.98 kg/ha) and minimum yield was noticed under Konkan Kakadi (1.31 kg/ha). In individual interactions, maximum yield was noted in the Heera hybrid under protected conditions (4.25 kg/ha) and the lowest yield was noticed in Konkan Kakadi under open field conditions (0.9 kg/ha). These findings back up previous research of Afangideh and Uyoh (2007); Soleimani *et al*. (2009).

Table 1: Vegetative growth parameters of various cucumber varieties under open and protected conditions.

Varieties	Vine length at 30 DAS (cm)			Vine length at 60 DAS (cm)			Number of nodes per vine		
	Open	Protected	Mean	Open	Protected	Mean	Open	Protected	Mean
Heera	14.9	43.0	**28.9**	169.1	267.8	**180.9**	23.7	32.7	**28.2**
Japanese Long Green	8.8	46.5	**27.6**	132.4	282.5	**207.5**	44.1	30.7	**37.4**
K-75	13.2	24.2	**18.7**	132.0	165.8	**148.9**	20.7	25.6	**23.1**
Konkan Kakadi	13.9	15.7	**14.8**	140.6	171.6	**156.1**	19.4	26.9	**23.2**
Pant Khira-1	19.0	29.8	**24.4**	179.2	192.9	**186.0**	29.1	25.1	**27.1**
Mean	**13.9**	**31.8**	**22.9**	**135.6**	**216.1**	**175.9**	**27.4**	**28.2**	**27.8**
Factor	C	V	C×V	C	V	C×V	C	V	C×V
CD (0.05%)	0.47	0.75	1.06	4.30	6.81	9.63	0.55	0.88	1.24
SE(d)	0.22	0.35	0.50	2.03	3.21	4.54	0.26	0.41	0.59
SE(m)	0.15	0.25	0.35	1.43	2.27	3.21	0.18	0.29	0.41

Table 2: Effect of growing conditions on flowering and days to first picking attributes of cucumber varieties.

Varieties	Nodal position of first male flowers			Nodal position of first female flowers			Days to first picking		
	Open	Protected	**Mean**	Open	Protected	**Mean**	Open	Protected	**Mean**
Heera	3.41	3.29	**3.35**	6.19	4.31	**5.25**	47.85	39.88	**43.86**
Japanese Long Green	8.69	3.19	**5.93**	10.74	5.20	**7.96**	54.75	38.12	**46.43**
K-75	8.92	7.95	**8.43**	11.07	10.77	**10.91**	61.28	53.62	**57.44**
Konkan Kakadi	9.11	8.11	**8.60**	12.70	11.35	**12.02**	65.79	58.56	**62.17**
Pant Khira-1	10.45	7.50	**8.97**	13.20	11.32	**12.26**	59.82	55.1	**57.45**
Mean	**8.11**	**6.00**	**7.05**	**10.78**	**8.58**	**9.68**	**57.89**	**49.05**	**53.47**
Factor	C	V	C×V	C	V	C×V	C	V	C×V
CD (0.05%)	0.11	0.18	0.25	0.19	0.31	0.44	1.36	2.16	3.05
SE(d)	0.05	0.08	0.12	0.09	0.14	0.20	0.64	1.02	1.44
SE(m)	0.03	0.06	0.08	0.06	0.10	0.14	0.45	0.72	1.02

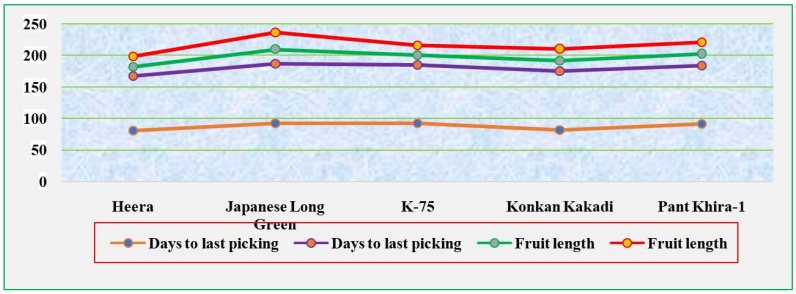

Fig. 1. Mean values of last picking and fruit length of different cucumber varieties under open and protected conditions.

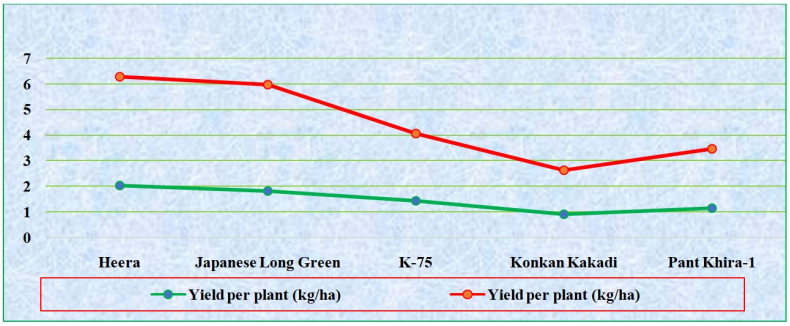

Fig. 2. Fruit yield attributes of various cucumber varieties under open and protected conditions.

CONCLUSION

Protected conditions provide a favorable environment and microclimate for growth and development, and the physiological functioning of cucumber plants inside a Naturally ventilated polyhouse as compared to the open condition. The results of the study revealed cucumbers grown under polyhouse showed maximum vegetative growth, early flower induction, and high yield than those grown under open growing conditions. Therefore, the cultivation of cucumber can be advocated under polyhouse so that it can catch early market that would ultimately fetch a good price in the local markets as well as the export purpose and thus improve the socio-economic status of the farmer. Therefore, it can be recommended that among the two growing conditions, a naturally ventilated poly house is the best to provide a more favorable microclimate for cucumber cultivation. Cucumber hybrid Heera produced significantly maximum fruit yield as compared to all varieties. From the overall of the present study, it may be suggested and concluded that for successful investigation of cucumber Heera hybrid under protected conditions is an ideal.

FUTURE SCOPE

As such, all varieties have specific characteristics in growth and development, and phonologically. The results indicate Heera variety given good yield and it is useful for crop improvement and further study

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Conflict of interest. None.

REFERENCES

Afangideh, U., & Uyoh, E. A. (2007). Genetic variability and correlation studies in some varieties of cucumber (*Cucumis sativus* L.). *Jordan Journal of Agricultural Sciences*, *3*(4), 376-384.

Cardoso, A. I. I., & Silva, N. D. (2003). Evaluation of japanese cucumber hybrids under protected cultivation in two sowing dates. *Horticultura Brasileira*, *21*, 171-176.

Chaudhari, V. I., Kumar, S. A. N. J. E. E. V., & Tank, R. V. (2016). Evaluation of greenhouse cucumbers for various horticultural traits under naturally ventilated polyhouse. *Advances in Life Sciences*, *5*(8), 3320-7.

Dahal, J., Pandey, U., Rana, M., Tiwari, S., & Shrestha, S. (2020). Evaluation of Cucumber (*Cucumis sativus* L.) varieties for quality traits and yield. *Ministry of Agriculture and Livestock Development Singhdurbar, Kathmandu*.

El-Aidy, F., Afry, M., & Ibrahiem, F. (1989). *The influence of shade nets on the growth and yield of sweet pepper* (No. RESEARCH). AVRDC.

Ganesan, M. (2002). Effect of poly-greenhouse models on plant growth and yield of tomato (*Lycopersicon esculentum*). *Indian Journal of Agricultural Science*, *72*(10), 586-588.

Gautam, I. P., Upadhya, K. P., Chaudhary, J. N., Khan, A. H., Timilsina, C. K., & RARS, L. (2008). Evaluation of cucumber genotypes for open field and plastic house in the Western Hills of Nepal. *Agricultural RESEA agricultural research for poverty RCH for poverty alleviation and livelihood enhancement*, *27*, 182.

Hossain, M. F., Rabbani, M. G., Hakim, M. A., Amanullah, A. S. M., & Ahsanullah, A. S. M. (2010). Study on variability character association and yield performance of cucumber (*Cucumis sativus* L.). *Bangladesh Res. Pub. J*, *4*(3), 297-311.

Kaddi, G., Tomar, B. S., Singh, B., & Kumar, S. A. N. J. A. Y. (2014). Effect of growing conditions on seed yield and quality of cucumber (*Cucumis sativus*) hybrid. *Indian Journal of Agricultural Sciences*, *84*(5), 624-627.

Kumar, P., Khapte, P. S., Saxena, A., & Kumar, P. (2019). Evaluation of gynoecious cucumber (*Cucumis sativus*) hybrids for early-summer greenhouse production in western Indian arid plains. ICAR.

Kumar, S., Kumar, D., Kumar, R., Thakur, K. S., & Dogra, B. S. (2013). Estimation of genetic variability and divergence for fruit yield and quality traits in cucumber (*Cucumis sativus* L.) in North-Western Himalayas. *Universal Journal of Plant Science*, *1*(2), 27-36.

Kumar, S. R., & Arumugam, T. (2010). Performance of vegetables under naturally ventilated polyhouse condition. *Mysore Journal of Agricultural Sciences*, *44*(4), 770-776.

Mishra, G. P., Singh, N., Kumar, H., & Singh, S. B. (2010). Protected Cultivation for Food and Nutritional Security at Ladakh. *Defence Science Journal*, *60*(2).

Patel, J. K., Vijay, B., Devi, S., Prasad, V. M., & Rangare, S. B. (2013). Performance of cucumber (Cucumis sativus L.) hybrids in agro-climatic conditions of Allahabad. *HortFlora Research Spectrum*, *2*(1), 50-55

Priya, N., Vijayakumar, M., Veeraragavathatham, D., Jeyakumar, P., & Chezhiyan, N. (2002). Effect of seasons and growth environments on paprika (*Capsicum annuum* var. longum) growth and yield. *South Indian Horticulture*, *50*(4/6), 463-471.

Rani, J. B., & Reddy, E. J. G. (1999). Efficacy of selected insecticides against thrips Scirtothrips dorsalis Hood on rose in polyhouse. *Pest Manag. Hort. Ecosyst*, *7*(1), 54-58.

Rawat, M., Maurya, S. K., Singh, P. K., & Maurya, R. J. (2014). Screening of improved cultivars of cucumber in naturally ventilated polyhouse under tarai condition of Uttrakhand. *Journal of Hill Agriculture*, *5*(1), 72-75.

Reddy, S. G., & Kumar, N. K. (2006). A comparison of management of thrips, *Scirtothrips dorsalis* hood on sweet pepper grown under protected and open field cultivation. *Pest Management In Horticultural Ecosystems*, *12*(1), 45-54.

Rui, R. L., Nie, Y. Q., & Tong, H. Y. (1989). Protective effect of plastic film coverage on photosynthesis of capsicum in summer. *Jiangsu Agric. Sci.*, *8*, 30-31.

Rylski, I. (1985, December). Improvement of pepper fruit quality and timing of harvest by shading under high solar radiation conditions. In *Symposium on Protected Cultivation of Solanacea in Mild Winter Climates 191* (pp. 221-228).

Singh, A. K., Balraj, S., Sindhu, S. S., Singh, J. P., & Naved, S. (2012). Study of protected v/s open field conditions on insect-pest incidence to minimize insecticide application for quality production of high value horticultural crops. *International Journal of Plant Protection*, *5*(1), 75-80.

Singh, B., & Sirohi, N. P. S. (2004, June). Protected cultivation of vegetables in India: problems and future prospects. In *International Symposium on Greenhouses, Environmental Controls and In-house Mechanization for Crop Production in the Tropics 710* (pp. 339-342).

Soleimani, A., Ahmadikhah, A., & Soleimani, S. (2009). Performance of different greenhouse cucumber cultivars (*Cucumis sativus* L.) in southern Iran. *African Journal of Biotechnology*, *8*(17).

Srivastava, B. K., & Singh, M. P. (1997). Boosting off season production of vegetable in low cost polyhouse. In *Proceedings, 3rd Agricultural Science Congress* (pp. 12-15).

Yadav, Y. C., Sanjay, K., & Raghvendra, S. (2012). Studies on genetic variability, heritability and genetic advance in cucumber (*Cucumis sativus* L.). *Hort Flora Research Spectrum*, *1*(1), 34-37.

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