



## Studies on vegetative and reproductive growth of cucumber under insect proof net house

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Cucumber (*Cucumis sativus*) belonging to the family cucurbitaceae is believed to have originated in India. Large variation of cucumber has been observed in different parts of the country. The fruit, used as a vegetable or salad, is rich in minerals, thiamine, niacin and vitamin C. Fruits consist about 80% edible portion which contains water, protein, fat, carbohydrates, fiber and ash. There are several approaches and methods to achieve the higher production in cucumber, viz. bringing additional area under vegetable crops, using hybrid seeds, use of improved agro-techniques etc. Another potential approach is perfection and promotion of protected cultivation of vegetables (Singh 1998). With the use of F<sub>1</sub> hybrids, crop productivity can be increased manifold within a short period. Hybrid cultivars require better production technology than common open pollinated cultivars, which is necessary for exploitation of their maximum potential. Undoubtedly, seeds of hybrid cultivars are expensive, but provide at least 2-3 times higher economic returns from their yield and quality as compared to open pollinated cultivars. Seed crop grown in open field especially in *kharif* is severely infested with cucumber mosaic virus and other insect pests; against which no reliable management measure is still available. Moreover, changing climatic conditions, increased temperature coupled with increased incidence of insect pests and diseases reduce the seed yield and quality drastically in *kharif* crop and also relatively early onset of high temperature hamper the production of female flower, fruit set and fruit development in *kharif*. Growing seed crop under protected structures like insect proof net house can overcome these problems by protecting the crop from various insect vectors and unfavorable climatic conditions. So, the present investigation was planned to study growth behavior, flowering and fruit setting, duration of pollination, fruit development parameters under insect proof net house

and open field conditions in cucumber during *kharif* under Delhi conditions.

An experiment was conducted during *kharif* 2013–14 at Centre for Protected Cultivation Technology (CPCT), IARI, New Delhi. Cucumber hybrid Pant Sankar Khira-1 was selected for the experiment. Nursery of both the parental lines of Pant Sankar Khira-1 was raised in plug tray with soilless media in a modern nursery at CPCT farm. The soilless media was prepared by properly mixing coco peat, vermiculite, and perlite in 3:1:1 ratio on volume basis and filled in the required plug trays. The seeds were sown and covered with a thick layer of vermiculite for better germination. The plug trays were kept in the germination room at 20°C. Water was applied through fine sprinkler boom uniformly in the trays. Humidity in media was maintained at 95-100% and irrigation was given as and when it was needed. Nutrients were applied in the form of N: P: K (1:1:1) @ 140 ppm once in a week. The 28 days old seedlings of both the parents were transplanted on raised beds under insect proof net house and open field conditions. Spacing kept was 1 m between lines and 0.6 m between plants. Same number of female (180) and male plants (60) were planted under insect proof net house and open field condition. The seeds of parental lines of the hybrid Pant Sankar Khira-1 were obtained from the Department of Vegetable Science, G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand. The experiment was conducted under two conditions, viz. insect proof net house and open field. The insect proof net house was made with UV stabilized white insect proof nylon net, with double door facility and having dimensions 60 m × 6 m × 2 m equipped with drip fertigation facilities. The male flowers in seed parent were pinched off regularly before the anthesis and the female flowers likely to be opened on next day were covered during evening (5-7 PM). On the next day, the male flowers were collected and pollination was carried out through hand pollination by rubbing the anthers gently over the stigmatic lobes. The pollinated flowers were covered and labeled over the peduncle. The pollination was performed in the morning between 6-10

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AM regularly up to 30 days. Thirty plants were randomly selected in seed and pollen parent under both the conditions for taking observations. Vine length and leaf nodes at 30 and 45 days after transplanting, days taken for the opening of first female (in seed parent) and first male flower (in pollen parent), female (in seed parent) and male flower per plant (in pollen parent), flowers pollinated per plant, fruit set per plant, mature fruits per plant, and incidence of virus and other major diseases were recorded. The quantitative data generated were analysed statistically for testing the heterogeneity of means adopting the 't-test' procedure. The probability was worked out at 5% and wherever t-value is non-significant, it is denoted by NS.

*Plant growth behaviour of seed parent:* Plant growth attributes of seed parent of Pant Sankar Khira-1 showed significant difference under two growing conditions, viz. insect proof net house and open field. Vine length and leaf nodes at 30 days after transplanting (94.94 and 17.74 respectively) were significantly more under insect proof net house in comparison to open field (66.94 and 16.05 respectively) (Table 1). Similar trend was observed for vine length and number of leaf nodes at 45 days after transplanting. The internodal length was recorded maximum in net house (11.13 cm) and lowest in open field condition (7.51). The average mean data indicated that days for induction of first lateral (18.48) was lowest in net house condition and highest in open field condition (23.33). Similar result was reported by Jaat *et al.* (2016) in bitter gourd and Singh *et al.* (2009) in parental lines of pumpkin (Pusa Hybrid-1). Flowering behaviour traits of parental lines showed highly significant difference between the growing conditions (Table 1). In insect proof net house, the opening of the first female flower in the seed parent took 39 days while under open field conditions, it took 44.15 days. Number of female flowers per plant up to 30 days after the appearance

of first flower was significantly higher in insect proof net house (25.42) as compared to open field (8.81). In insect proof net house, the opening of first male flower in pollen parent took 34.90 days but under open field conditions, it took 41.37 days. Number of male flowers per plant up to 30 days after the first male flower appearance was also significantly higher in insect proof net house (36.57) in comparison to open field conditions (18.16). The results are in conformity with Singh *et al.* (2006).

*Pollination and fruit setting in seed parent:* Number of flowers pollinated in seed parent showed highly significant difference between the growing conditions as it was 11.06 in insect proof net house and 6.99 in open field (Table 2). A highly significant difference was obtained for fruit set per plant (seven days after pollination) between the growing conditions. In insect proof net house, it was 5.71 while under open field it was only 2.84. Similar pattern was also observed for matured fruits per plant in insect proof net house (2.52) as compared to open field crop (1.65). The finding was conformity with Vishwanath *et al.* (2008) who reported that the methods of pollination for hybrid seed production of pumpkin during rainy season.

*Incidence of major insect and pest:* Significant difference was noticed in virus, white fly and leaf minor incidence. Incidence of cucumber mosaic virus was negligible under insect proof net house (0%) as compared to open field conditions (56.86%). The incidence of white fly was lower under insect proof net house (17.4) than open field conditions (56.26). The occurrence of leaf minor was significantly lower under insect proof net house (1.57) than open field condition (18.11). Similar result was obtained by Singh *et al.* (2005).

## SUMMARY

A study was carried out at CPCT, IARI, New Delhi

Table 1 Effect of growing conditions on growth and flowering behaviour of cucumber during *kharif* 2013 and 2014

Growth condition	Vine length at 30 DAS (cm)	Number of leaf nodes at 30 DAS	Vine length at 45 DAS (cm)	Number of leaf nodes at 45 DAS	Inter nodal length (cm)	Days taken for induction of first lateral	Days to opening of first male flower in pollen parent	Days to opening of first female flower in seed parent
Net house	94.94	17.74	178.67	26.45	11.13	18.48	34.90	39.00
Open	66.94	16.05	136.04	23.88	7.51	23.33	41.37	44.15
CD at 5%	5.58	2.89	9.63	4.05	1.70	2.40	4.06	3.87
SE (d)	2.53	0.98	4.37	1.75	0.77	1.09	1.84	1.75

Table 2 Effect of growing conditions on flowering behaviour and insect-pest incidence in cucumber (Pant Shankar Khira-1) during *kharif* 2013 and 2014

Growth condition	No. of male flowers/plant in pollen parent	No. of female flowers/plant in seed parent	No. of flowers pollinated	No. of fruits set/plant	No. of fruits developed to maturity	% Incidence of virus	% Incidence of white fly	% Incidence of leaf miner
Net House	36.57	25.42	11.06	5.71	2.52	0.00	1.74	1.57
Open	18.16	8.81	6.99	2.84	1.65	58.86	56.26	18.11
CD at 5%	3.81	3.19	2.49	1.36	0.65	4.89	4.90	3.56
SE (d)	1.73	1.44	1.13	0.62	0.29	2.22	2.22	1.61

during *kharif* 2013–14 to evaluate the vegetative growth and insect-pest incidence on cucumber under insect proof net house. Significantly higher vine length (94.94 and 178.67 respectively) and number of leaf nod (17.74 and 26.45 respectively) at 30 and 45 days after transplanting, were recorded in seed parent and pollen parent under insect proof net house in comparison to open field. Time taken to opening of first female and male flower in seed parent and pollen parent (39.0 and 34.90 respectively) was significantly lower under insect proof net house. Production of female and male flowers (36.57 and 25.42) was significantly higher under insect proof net house compared to open field crop. Fruit set and matured fruit (5.71 and 2.52) per plant was significantly higher under insect proof net house than open field (2.84 and 1.65 respectively). Incidence of cucumber mosaic virus was negligible under insect proof net house (0%) as compared to open field conditions (56.86%). Therefore, it can be concluded that for growing virus free seed crop and attaining better fruit growth, flowering, fruit setting and mature fruit per plant, hybrid seed production of cucumber should be undertaken in insect proof net house.

#### REFERENCES

- Jat G S, Singh B, Tomar B S, Singh J, Ram H and Kumar M. 2016. Seed yield and quality as influenced by growing conditions in hybrid seed production of bitter gourd (*Momordica charantia* L.) cv.pusa hybrid-1. *Journal of Applied and Natural Science* **8**(4): 2111–15.
- Singh B. 1998. Vegetable production under protected conditions: Problems and Prospects. Indian Society of Vegetable Science Souvenir: Silver Jubilee, National Symposium December 12-14, 1998, Varanasi, U P, India, pp 90.
- Singh B, Tomar B S and Thakur S. 2009. Quality seed production of parental lines of pumpkin under insect proof net house paper presented in 4<sup>th</sup> International Cucurbitaceae Symposium held at HUNAN, China, September 21-26, 2009.
- Singh B, Kumar M and Singh A. 2005. Nylon mesh screen reduce incidence of leaf curl virus and improve the yield in sweet pepper. *Journal of Vegetable Science* **12**(1): 65–70.
- Singh B, Kumar M and Sirohi N P S. 2007. Protected cultivation of cucurbits under low-cost protected structures: a sustainable technology for peri-urban areas of northern India. *Acta-Horticulturae* **731**: 267–72.
- Singh B and Sirohi N P S. 2006. Protected cultivation of vegetables in India: Problems and future prospects. *Acta-Horticulturae* **710**: 339–42.
- Vishwanath R Y, Tomar B S and Singh B 2008. Studies on methods of pollination for hybrid seed production of pumpkin (*Cucurbita moschata* Poir.). *Seed Research* **36**(2): 214–17.