

Evaluation of gynoecious cucumber (*Cucumis sativus*) hybrids production in naturally ventilated poly-house in mid-hill condition of Uttarakhand

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Abstract

Polyhouse farming, also known as protected cultivation is widely used to provide and maintain a controlled environment suitable for optimum crop production. This technology integrates market driven quality parameters with production system profits. In mid-hills of Uttarakhand, cucumber (*Cucumis sativus*) is very popular crop for production in naturally ventilated polyhouse, because, fruit yield and quality is poor in open field as well as shed net house due to low temperature. The early summer crop of cucumber is highly remunerative owing to high prevailing market price. In current study, efforts were made to select suitable polyhouse cucumber hybrids for early season harvest under hills of western Himalayas of Uttarakhand. Growth, yield and commercial quality traits of four commercial gynoecious and parthenocarpic (seedless) cucumber hybrids viz. Aviva, Infinity, Kafka and Kian were studied under naturally ventilated polyhouse condition during 2019. Among the hybrids evaluated for early summer production, Aviva was more precocious for fruit harvest (41 days after transplanting) followed by Kian and Infinity. The per plant fruit yield was highest in Aviva (5.68kg) followed by Infinity (5.07kg). The length of vine was found highest with Kafka (3.67cm) followed by Aviva. The number of leaves per vine was highest in Aviva followed by Kian. The horizontal and vertical width of leaves, thickness of fruit pericarp, weight of fruit and number of fruits per vine were also found to be highest in Aviva, followed by Infinity. Based on targeted characters for earliness and fruit yield of evaluated hybrids, it is concluded that Aviva followed by Kian (for earliness) and Infinity (for fruit yield), were highly suitable for the production under naturally ventilated polyhouse in hills of western Himalayas of Uttarakhand.

Key words: Environment, polyhouse, cucumber, gynoecious, parthenocarpic, hybrids

Introduction

In western Himalaya of Uttarakhand, protected cultivation has attained a great pace in recent years owing to its promise in providing protection to the crops from damages caused due to prevalence of weather aberrations which challenged the open field cultivation in hilly areas. In addition, it provides favourable micro-

climate to the plants for optimal growth and production that enables to extend growing season in either directions of normal growing period. Furthermore, even under normal growing season, vegetables grown under naturally ventilated polyhouse are superior in yield and quality as compared to those grown under open field conditions (Sharma *et al.*, 2005). However, special emphasis is to be laid for commercial exploitation of greenhouse for off season cultivation of selected vegetables such as parthenocarpic cucumber (*Cucumis sativus* L.), as this despite providing good

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yield and quality, is more remunerative (Yadav *et al.*, 2014).

Cucumber is one of the most important vegetable crops of the family cucurbitaceae. There is a constant demand throughout the year for cucumber, especially the smooth skinned seedless fruit because of its popular use in salad, sandwich, pizza and other preparations (Bisht *et al.*, 2011). In fact, gynoecious and parthenocarpic cucumber hybrids have revolutionized polyhouse farming throughout the world. However, the popularity to each hybrid has its own specificity depending on adaptability to particular growing conditions such as stability regarding pistillate flowering (More, 2002), and local market demands for specialized fruits. The precocity or earliness for fruit bearing and harvest is the desired characters for the early summer production that fetches high price. Additionally, the cultivar may have high yield potential and good commercial quality that related to consumers preference.

Due to huge investment is involved in polyhouse farming; farmers cannot afford wrong selection of cultivars, especially of very costly gynoecious and parthenocarpic cucumber hybrids. Therefore, before going for commercial cultivation of any parthenocarpic hybrids, it is imperative to assess the production potential based on growth, earliness, yield and quality for a particular location. Singh, D. K. (2012) have proposed that the cultivar selection to be based on certain parameters which include earliness, plant vigour, fruit yield and quality, besides consumers preference for fruits in local market. Hence, cultivars selection for specific agro-ecosystem is a pre-requisite, especially for the prevailing non-automated polyhouse of western hilly areas such as naturally ventilated polyhouse of which inside environment is greatly influenced by ambient ones.

The present study was conducted to identify the suitable cucumber hybrids for early season production, based on different vegetative and reproductive growth under naturally ventilated polyhouse of western Himalayas of Uttarakhand.

Materials and Methods

The experiment was conducted at Krishi Vigyan Kendra, Jakhdhar, Rudraprayag (30° N Latitude, 78° E Longitude and Altitude 1750 m above MSL) during 2017 in 100 m² naturally ventilated polyhouse covered with UV Stabilized polyethylene film (200µ). Four hybrid varieties of cucumber viz.

Aviva (IndoSem), Infinity (Nunhems), Kafka (Syngenta) and Kian (Nunhems), were evaluated in the naturally ventilated polyhouse condition during 11 April, 2018 to 14 September, 2018. The experiment was laid out in randomized block design with three replications.

The soil of the experimental area was sandy loam with 6.2 pH. At the time of land preparation, 10kg FYM per m² was mixed by tilling in the top (15cm) soil, one day before transplanting and all the recommended cultural practices were carried throughout the growing season. The daily mean temperature and relative humidity inside the polyhouse ranged from 14.5°C to 30°C and 26-68%, respectively during cropping season.

Thirty days old seedlings, raised in 96 celled (size 2") propagation trays in Cocopeat : Sand : Garden soil (2:1:1) media inside at 45cm spacing in paired rows of 50cm on 90cm wide raised beds. Plants were trained to single stem vertically with plastic thread over trellis by regular pinching of side shoots. Plant growth and yield parameters were measured on five randomly selected plants from each hybrid variety in each replication. The observations pertaining to different parameter of growth and yield were recorded time to time, while the physical fruit parameters such as fruit length, fruit girth and fruit weight were measured during peak harvest. The mean data of each replication were analyzed statistically in a randomized block design with three replication according to Gomez and Gomez (1984).

Results and discussion

There was a significant variation for different growth parameters among gynoecious cucumber hybrids (Table 1). The plant growth attributes such as length of vine was highest in Kafka (3.67 cm), while lowest in Infinity (2.53 cm) and Kian (2.62 cm). Previous workers have also reported a significant variation in shoot growth and vine length (Singh *et al.* 2005, Chaudhari *et al.* 2016). The highest number of leaves/vine was counted in Aviva (34.98) followed by Kian (32.01). The size of leaves (horizontal and vertical leaf width), were also positively related and these were recorded highest in Aviva (horizontal leaf width 25.87 cm and vertical leaf width 21.57 cm, respectively), through it was statistically at par with Infinity (horizontal leaf width 23.61 cm and vertical leaf width 19.31 cm, respectively). In contrary, lowest leaf size together with lowest length of vine was in Kian (2.62 cm) and Kafka

Table 1 Evaluation of growth characteristics of gynoecious cucumber hybrids in naturally ventilated poly-house in mid-hill condition.

Name of hybrid Variety	Length of Vine (cm)	No. of leaves/ vine	Horizontal width of leaf (cm)	Vertical width of leaf (cm)	No. of days taken in first harvest
Aviva	3.48	34.98	25.87	21.57	41.07
Infinity	2.53	31.45	23.61	19.31	43.21
Kafka	3.67	30.40	22.16	17.98	46.40
Kian	2.62	32.01	22.05	18.41	42.93
SEm±	0.139	0.598	0.738	0.614	0.749
CD 5%	0.491	2.110	2.605	2.166	2.643

(3.67 cm) Table 1. The higher leaf surface may possibly help trapping of higher amount of incoming solar radiation that eventually lead to move active photosynthetic apparatus and net photosynthesis rate, and finally the better shoot and fruit yield in cucumber plants (Wehner *et al.* 2004).

Fruit precocity is one of the most important characters of cucurbitaceous vegetables grown in summer season production because early harvest fetches premium price (Kumar *et al.* 2017). Results from this study demonstrate a significant difference in days to first harvest among the cucumber hybrids (Table 2). The day to first fruit harvest ranged from 41.07 to 46.40 with being earliest in Aviva followed by Kian and Infinity, whereas Kafka was found to be delayed in fruit harvesting. Cucumber fruit yield significantly varied among the hybrids, which ranged from 4.19 kg to 5.68 kg per plant (Table 2). Previous studies have also shown a wide variation in fruit yield among the tested gynoecious cucumber hybrids, and variation in yield was likely due to genotypic make up of a particular hybrid that expressed in particular

environment (Singh *et al.* 2015 and Chaudhary *et al.* 2016).

According to Kumar *et al.* (2015), fruit yield is directly influenced by certain yield attributed traits including number of fruits and fruits weight; these may vary depending upon genetic potential of the hybrids and climatic conditions in which they are grown. The highest fruit yield was recorded in Aviva that was possibly ascribed to highest number of fruits, girth of fruit and weight of fruits. This finding is corroborated with the earlier studies on poly-house cucumber (Bisht *et al.* 2011 and Chaudhary *et al.* 2016). Furthermore, Bisht *et al.* (2011) pointed out that cucumber fruit yield /vine was the most important characters for the selection of hybrids. Panghal *et al.* (2016) reported that maximum number of fruit/vine was a result of profuse female flowering throughout the vegetative growth. The number of fruits per plant was highest in Aviva (5.68kg) followed by Infinity (5.07kg). Owing to its probably high genetic vigour, Aviva produced highest no. of leaves per plant, size of leaves

Table 2 Evaluation of yield and yield attributes characteristics of gynoecious cucumber hybrids in naturally ventilated poly-house in mid-hill condition.

Name of hybrid Variety	No. of days taken in first harvest	Length of Fruit (cm)	Diameter of fruit (cm)	Weight of fruit (gm)	No. of fruits/ vine	Fruit yield/ vine (kg)
Aviva	41.07	21.36	4.75	263.71	23.38	5.68
Infinity	43.21	18.50	4.07	213.40	21.40	5.07
Kafka	46.40	19.38	3.70	199.52	19.19	4.19
Kian	42.93	22.81	3.98	204.56	20.57	4.23
SEm±	0.749	0.877	0.118	5.738	0.348	0.179
CD 5%	2.643	3.094	0.416	20.241	1.227	0.632

(horizontal and vertical leaf width), diameter of fruit, number of days taken in first harvest, weight of fruit and number of fruits and fruit yield per vine. Among the evaluated seedless cucumber hybrid varieties Aviva followed by Kian for earliness and Infinity for fruit yield, was considered as suitable hybrids with regards of growth and yield traits under the naturally ventilated poly-house in the hills of western Himalayas of Uttarakhand.

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