

Performance of different hybrids of cucumber (*Cucumis sativus* L.) in terms of growth, yield and quality.

ABSTRACT

The present investigation was carried out at the Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, Uttar Pradesh during the *Rabi* season 2023 with a view to check performance of different hybrids of cucumber under Prayagraj agro climatic conditions. The experiment was laid in Randomized block design with 8 hybrids with 3 replications. Hybrids comprised of V₁ (Shruti); V₂ (Maria); V₃ (LHC 1395); V₄ (Radhe); V₅ (Indaram Jaya); V₆ (Niyamat) and V₇ (CCH-1). From the above experimental finding it was concluded that the hybrid Niyamat performed best in terms of growth parameters like vine length at harvest (182.62 cm), maximum number of leaves (15.93) in earliness in maturity (61.00 days for first fruit harvest). Hybrid CCH-1 performed best for yield parameters like highest number of fruits per plant (14.59 fruits), maximum fruit length (16.72 cm), fruit diameter (3.60 cm) and fruit yield per vine (2.60 kg/vine). It showed best performance for TSS (3.15 °Brix). Maximum Benefit cost ratio were recorded in Hybrid CCH-1 with 2.13.

Keywords: *Cucumis sativus*, hybrids, TSS, Benefit Cost ratio.

Introduction

The Cucurbitaceae, also called cucurbits or the gourd family, are a plant family consisting of about 965 species in around 95 genera, of which the most important to humans are: *Luffa* – the common name is also luffa, sometimes spelled loofah (when fully ripened, two species of this fibrous fruit are the source of the loofah scrubbing sponge). This family of plants is grown in temperate regions and the tropics; the earliest cultivated plants in the Old and New Worlds were those bearing edible fruits. When it comes to the quantity and proportion of plant species used as food for humans, the Cucurbitaceae family is among the largest. The Cucurbitaceae family comprises the largest group of summer vegetable crops, known as cucurbits. With the exception of coccinia and pointed gourds (Parval), which are dioecious, the majority of cucurbits are monoecious. There are also a number of andro-monoecious and hermaphrodite cultivars available for certain crops (melons). Fruit is botanically Pepo. Within the Cucurbitaceae family, cucumbers are widely grown creeping vine plants that produce fruits that are typically cylindrical and eaten as vegetables. Cucumbers are thought of as an annual plant. They come in three main varieties: slicing, pickling, and burpless/seedless. Within each of these varieties, numerous cultivars have been developed. Although the cucumber originated in South Asia, it is now grown on most continents due to the global trade in cucumber varieties. Although they are not closely

related, plants in the genera *Echinocystis* and *Marah* are referred to as "wild cucumbers" in North America. Grown throughout India, cucumber is a day-neutral, thermophilic, geitonogamy diploid crop. After watermelon, it is the second-most important crop among cucurbits. Bitterness in cucumber is due to 'cucurbitacin'. Most favourable temperature for cucumber is 18°C-24°C. It accounts to 12-13% of the total cucurbits' acreage. Botanically Cucumber is known as *Cucumis sativus* L. belongs to family Cucurbitaceae. It has chromosome number $2n=2x=14$ (Mckay, 1930). India is the birthplace of cucumber, which has a variety of morphological characteristics, including growth habit, fruit size, shape, thickness, number of spines, tenderness, and colour. Numerous landraces and local forms with a limited distribution have accumulated in various growing areas due to ongoing selection. Little is known about the genetic diversity of regional genotypes in India, despite the fact that cucumbers have a wide variety of morphological features (Lvet *et al.*, 2012). Cucumber is native to the foothills of the Himalayas of Nepal, where the wild, bitter-fruited form, *C. sativus* var. *Hardwickii*, can be found. They are the direct seed sown vegetables having hard seed coat, which need more time for germination and sometime exhibit uneven germination (Devi *et al.*, 2013). On the basis of flowering habit, cucumber has three types- "gynoecious" which produces only female flowers, "predominantly gynoecious" which also bears some male flowers and "monoecious" which produces both male and female flowers. The first two types produce fruits parthenocarpic and fruit development takes place without pollination whereas pollination is required by monoecious types for seed setting which is accomplished by honeybees (Mehdi *et al.*, 2012). Cucumber cultivars are usually classified on the basis of how they are used, fresh market (slicer) and pickling. In general, fruits of slicers are larger than pickling cultivars and they develop a darker and heavier skin with uniformly cylindrical shape (Bose *et al.*, 2002). This classification includes several fruit characteristics such as shape, colour, spine type (coarse or fine), spine colour (white or black), fruit length/diameter ratio, skin thickness, and surface (Rana, 2008).

MATERIALS AND METHODS

The experiment was carried out at the Horticultural Research Farm, specifically located within the Department of Horticulture at the Naini Agricultural Institute. This institute is affiliated with Sam Higginbottom University of Agriculture, Technology and Science (SHUATS) in Prayagraj. The experimental field is located on the left side of Allahabad- Rewa Road, in close proximity to the Yamuna River, at a distance of approximately 8 km from Allahabad city. The experimental site is located at a latitude of 25.57° N and a longitude of 81.51° E. The meteorological data for the cropping seasons. In the present investigation the design used for analysis of variables were Randomized Block Design (RBD) comprising seven genotypes replicated thrice each enlisted.

Vine length (cm)

Vine length was measured from ground level to the last tip of main stem of the plant of five randomly selected plants at 15, 30, 45 DAS and harvest stage.

Number of leaves per vine

Number of leaves per vine was counted and recorded in individual plants from each replication and hybrid sown at 15, 30, 45 DAS.

T.S.S. (°Brix)

The percentage of total soluble solids of the fruit was determined with the help of Portable Hand Refractometer. The sample of juice for this purpose was taken from the strained juice. The observed value of T.S.S. was recorded from the scale of the instrument (0-32 range).

Vitamin C content (mg/100g of fruits pulp)

Vitamin C content or Ascorbic acid content in the pulp was estimated by using 2, 6 dichlorophenol indophenol dye as reported by Ranganna (1986) as follows:

RESULTS AND DISCUSSION

Vine length

The performance of various cucumber hybrids for vine length is reported in Table 1. In the current study, it was discovered that the hybrid had significant differences statistically noted. The hybrid Radhe had the longest vines (3.63 cm) measured at 15 DAS, while hybrid Niyamat had the second longest vine (3.46 cm). In hybrid, Shruti shortest vine length of 2.90 cm was noted at 15 DAS. The hybrid Maria had the longest vines (19.67 cm) measured at 30 DAS, while hybrid Radhe had the second longest vine (19.40 cm). In hybrid, Indaram Jaya shortest vine length of 16.93 cm was noted at 30 DAS. The hybrid LHC-1395 had the longest vines (65.74 cm) measured at 45 DAS, while hybrid Shruti had the second longest vine (63.80 cm). In hybrid, Radhe shortest vine length of 51.40 cm was noted at 45 DAS. The hybrid Niyamat had the longest vines (182.62 cm) measured at harvest stage, while hybrid CCH-1 had the second longest vine (157.85 cm). In hybrid, Radhe shortest vine length of 143.76 cm was noted at harvest stage. The hybrid Niyamat of cucumber likely exhibits better vine length compared to other genotypes due to a combination of genetic factors and environmental conditions. Genetic traits within the Niyamat hybrid may include alleles promoting vigorous vine growth, such as genes regulating internode elongation, branching patterns, and hormone signalling pathways. These genetic characteristics contribute to the development of longer vines during the growth stages. The significance of better vine length in the Niyamat hybrid lies in its potential to maximize space utilization, light interception, and ultimately, yield. Longer vines provide more surface area for photosynthesis, leading to increased biomass production and fruit yield. Moreover, extended vines may enhance canopy coverage, reducing weed competition and improving fruit quality by shielding fruits from direct sunlight. Therefore, the genetic predisposition of the Niyamat hybrid for better vine length presents a valuable trait with significant implications for maximizing productivity and profitability in cucumber cultivation. Research on cucumber (Shah *et al.*, 2017; Rathore *et al.*, 2017; Bhagwat *et al.*, 2018 and Sadiq *et al.*, 2019) reported similar results.

Table 1 Performance of different hybrids of cucumber for vine length.

Hybrid Notation	Hybrid details	Vine length (cm)			
		15 DAS	30 DAS	45 DAS	Harvest
V ₁	Shruti	2.90	18.18	63.80	108.89
V ₂	Maria	3.24	19.67	58.45	152.43
V ₃	LHC 1395	3.43	18.87	65.74	153.45
V ₄	Radhe	3.63	19.40	51.40	143.76
V ₅	Indaram Jaya	3.33	16.93	60.33	155.24
V ₆	Niyamat	3.46	17.47	60.47	182.62
V ₇	CCH-1	3.33	17.07	63.67	157.85
'F' Test		S	S	S	S
SE d (±)		0.24	1.19	3.79	3.24
CD_{0.05}		0.53	2.60	8.25	7.06
CV.		9.00	8.02	7.66	2.63

Number of leaves per vine

It was found in the current study that there were statistically significant differences among hybrids of cucumber for number of leaves per vine. With 2.87 leaves, the hybrid Niyamat had the maximum number of leaves per vine overall; Radhe and Indaram Jaya had the second-highest number of leaves, with 2.80 leaves per vine. The lowest number of leaves per vine (2.40) was observed in hybrid Shruti observed at 15 DAS. With 5.40 leaves, the hybrid Niyamat had the maximum number of leaves per vine followed by hybrid Shruti with 4.87 leaves per vine. The lowest number of leaves per vine (4.13) was observed in hybrid CCH-1 observed at 30 DAS. With 15.93 leaves, the hybrid Niyamat had the maximum number of leaves per vine; Indaram Jaya had the second-highest number of leaves, with 14.20 leaves per vine. The lowest number of leaves per vine (11.00) was observed in Shruti observed at 45 DAS. The hybrid Niyamat of cucumber likely achieves the highest number of leaves per vine compared to other genotypes due to its specific genetic makeup and favourable environmental conditions. Genetic factors within the Niyamat hybrid may include alleles that promote prolific leaf growth, such as genes regulating leaf initiation, expansion, and retention. These genetic characteristics result in the development of a greater number of leaves on each vine during the growth stages. The significance of the highest number of leaves per vine in the Niyamat hybrid lies in its potential to enhance photosynthetic efficiency and overall plant vigour. More leaves mean more surface area for photosynthesis, leading to increased carbohydrate production and nutrient assimilation. This can result in improved plant growth, higher fruit yield, and better fruit quality. Additionally, a dense canopy of leaves may help suppress weed growth and conserve soil moisture, contributing to more sustainable and efficient cucumber cultivation practices. Therefore, the genetic predisposition of the Niyamat hybrid for the highest number of leaves per vine presents a valuable trait with significant implications for maximizing productivity and yield in cucumber cultivation. Research on cucumber (Patel

et al., 2013; Shah *et al.*, 2016; Pal *et al.*, 2017; Bhagwat *et al.*, 2018) reported similar results.

Table 2 Performance of different hybrids of cucumber for number of leaves per vine.

Hybrid Notation	Hybrid details	Number of leaves per vine		
		15 DAS	30 DAS	45 DAS
V ₁	Shruti	2.40	4.87	11.00
V ₂	Maria	2.67	4.73	13.40
V ₃	LHC 1395	2.43	4.50	11.80
V ₄	Radhe	2.80	4.53	13.47
V ₅	Indaram Jaya	2.80	4.53	14.20
V ₆	Niyamat	2.87	5.40	15.93
V ₇	CCH-1	2.13	4.13	12.87
'F' Test		S	S	S
SE d (±)		0.15	0.32	0.86
CD_{0.05}		0.32	0.70	1.88
CV.		6.99	8.48	7.99

TSS

The results of comparing the various hybrids of cucumbers for TSS, The current study's findings demonstrated that hybrids differed statistically significantly in terms of TSS. The highest TSS (3.15 °Brix) was displayed by the hybrid CCH-1, which was comparable to Indaram Jaya's 3.02 °Brix. In hybrid Shruti, the lowest TSS (2.03 °Brix) was recorded. Hybrid CCH-1 of cucumber likely exhibits better Total Soluble Solids (TSS) content compared to other hybrids due to its specific genetic makeup and environmental conditions. Genetic factors within CCH-1 may include alleles that regulate sugar metabolism, transport, and accumulation in fruits, leading to higher TSS levels. The significance lies in improved fruit quality and consumer appeal. Higher TSS content indicates sweeter fruits with enhanced flavour and nutritional value, increasing consumer satisfaction and demand. Additionally, fruits with better TSS may command premium prices in the market, enhancing profitability for growers. Therefore, CCH-1's genetic predisposition for better TSS presents a valuable trait with significant economic implications in cucumber cultivation. The findings were earlier reported in studies on cucumber by Patel *et al.*, 2013; Rathore *et al.*, 2017; Pal *et al.*, 2017; Sadiq *et al.*, 2019.

Table 3. Performance of different hybrids of cucumber for TSS and Vitamin C content (mg).

Hybrid Not	Hybrid detail	TSS (°Brix)	Vitamin C content (r
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V ₁	Shruti	2.03	4.27
V ₂	Maria	2.37	4.25
V ₃	LHC 1395	2.26	4.50
V ₄	Radhe	2.93	5.36
V ₅	Indaram Jaya	3.02	5.13
V ₆	Niyamat	2.70	5.21
V ₇	CCH-1	3.15	4.94
'F' Test		S	S
SE d (±)		0.17	0.33
CD_{0.05}		0.37	0.72
CV.		7.98	8.38

Vitamin C content

Table 3. reports the results of comparing the various hybrids of cucumbers for vitamin C content, The current study's findings demonstrated that hybrids differed statistically significantly in terms of vitamin C content. The highest vitamin C content (5.36 mg) was displayed by the hybrid Radhe, which was comparable to hybrid Niyamat's 5.21 mg. In hybrid Maria, the lowest vitamin C content (4.25 mg) was recorded. Cucumber hybrid Radhe probably has higher vitamin C content than other hybrids because of its unique genetic composition and growing environment. Radhe might have alleles that improve the biosynthetic processes that produce and accumulate vitamin C in fruits. Improved nutritional value and benefits to consumer health are the main reasons for the significance. Improved fruit quality is indicated by a higher vitamin C content, which increases demand and customer satisfaction. Furthermore, fruits with higher vitamin C content enhance immune system support and balance, potentially improving consumers' health. Consequently, Radhe's genetic tendency towards higher vitamin C content offers a useful characteristic with important consequences for consumer health and competitiveness in the market. The results were previously published in studies on cucumber by **Patel et al., 2013; Rathore et al., 2017; Pal et al., 2017; Sadiq et al., 2019; Harshitha and Shyamamma, 2021.**

Table 4. Performance of different hybrids on BC Ratio of Cucumber

Sl No.	Hybrids	Fruit yield (q/ha)	Cost of Cultivation (INR/ha)	Gross Return (INR/ha)	Net Return (INR/ha)	Benefit Cost Ratio
V ₁	Shruti	81.22	1,16,242	1,62,433	46,191	1.40
V ₂	Maria	96.72	1,16,242	1,93,433	77,191	1.66
V ₃	LHC 1395	93.34	1,16,242	1,86,687	70,445	1.61
V ₄	Radhe	97.24	1,16,242	1,94,480	78,238	1.67
V ₅	Indaram Jaya	112.94	1,16,242	2,25,887	1,09,645	1.94
V ₆	Niyamat	102.34	1,16,242	2,04,687	88,445	1.76
V ₇	CCH-1	123.52	1,16,242	2,47,040	1,30,798	2.13

Economics of different hybrids:

Economics of all hybrids were calculated according to the expenditure occurred from then raising till harvesting of fruits viz. Cost of cultivation, gross return, net return, and benefit: cost ratio has been worked out and presented in table 4. Maximum gross returns were recorded in hybrid CCH-1 with Rs. 247040 followed by hybrid Indaram Jaya with Rs. 225887 and the minimum (Rs. 162433) was recorded in hybrid Shruti. Maximum net returns were recorded in hybrid CCH-1 with Rs. 130,798 followed by hybrid Indaram Jaya with Rs. 109645 and the minimum (Rs. 46191) was recorded in hybrid Shruti. Maximum BC ratio were recorded in hybrid CCH-1 with 2.13 followed by hybrid Indaram Jayawith 1.94 and the minimum (1.40) was recorded in hybrid Shruti.

Conclusion

From the above experimental finding it concluded that the hybrid Niyamat performed best in terms of growth parameters like vine length at harvest (182.62 cm), maximum number of leaves (15.93) in earliness in maturity (61.00 days for first fruit harvest). Hybrid CCH-1 performed best for yield parameters like highest number of fruits per plant (14.59 fruits), maximum fruit length (16.72 cm), fruit diameter (3.60 cm) and fruit yield per vine (2.60 kg/vine). It showed best performance for TSS (3.15 °Brix). Maximum Benefit cost ratio were recorded in Hybrid CCH-1 with 2.13.

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