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RESEARCH ARTICLE

SCREENING OF CUCUMBER (*Cucumis sativus.* L) GENOTYPES FOR GROWTH, YIELD AND QUALITY PARAMETERS UNDER COIMBATORE CONDITIONS

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ABSTRACT

There is a wide genetic variability of cucumber in different parts of India. Performance evaluation of the different genotypes for growth and yield attributes is a prerequisite for any breeding programme. Hence, studies have been conducted at the Department of Vegetable Science, Horticultural College and Research Institute, TamilNadu Agricultural University, Coimbatore, TamilNadu, India from 2020 to 2023 to evaluate different genotypes collected from different parts of TamilNadu to find the suitability of cucumber for salad and slice (fruit) purpose. Fifteen genotypes collected from different sources were laid out in Randomized Block Design with two replications and the evaluation was conducted in five seasons. The performance of the crop was assessed on the basis of plant morphological and quality traits such as vine length(cm),node at which the first male flower appeared, node at which the first female flower appeared, number of male flowers/vine, number of female flowers/vine, sex ratio, number of fruits / vine, number of days taken for first harvest, fruit length (cm), fruit girth(cm), single fruit weight(g), fruit yield per vine (g),fruit colour, fruit texture and TSS and purpose for which it is recommended – snapmelon/cucumber.Among the genotypes evaluated, CBECS-37recorded the highest fruit yield of 620.07g (vine yield/ plant) followed by CBECS-25 (589.25g vine yield/ plant).The highest TSS content of 5.15^{0}Brix was observed in CBECS-5 followed by CBECS-12 with a TSS of 5.10^{0}Brix which can be used for slice purpose (fruit).

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INTRODUCTION

Cucumber (*Cucumis sativus* L.), is one of the important cucurbitaceous vegetables of commercial importance in Asia. It belongs to the family Cucurbitaceae and is believed to have originated in India. According to the reports of APEDA 2020-2021, India has exported 1,23,846 metric tonnes of cucumber and gherkins with a value of $ 114 million. In India cucumber is cultivated cultivated widely next to crops like tomato, cabbage and onion (Jamir M Sharma, 2014). It has culinary, medicinal and cosmetic uses (Mukherjee *et al*., 2013 and Muruganantham *et al*., 2016). The fruits are either consumed as a salad or as pickle. It is nutritionally rich, has crunchy texture and unique flavor and finds a place in a variety of dishes, particularly as a salad, soup and smoothie. It contains 90-95 % of water and hence it has diverse health benefits including weight loss, anti-inflammatry properties. It also cures constipation, hypertension, atherosclerosis, cancer, *etc*. (Oboh *et al*., 2017). Recent research in cucumber has confirmed the presence of kaempferol which is an important antidiabetic agent (Ibitoye *et al*., 2018). It primarily regulates hydration and is capable of soothing skin, aids digestion and reduces fat (Chakraborty and Rayalu, 2021). It is also commercially used in the preparation of cosmetic products (Fiume *et al*., 2014). The cucumber displays a broad range of adaptability to various climates, extending from tropical to semi-temperate regions. It thrives in warm weather but is highly susceptible to frost.

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In India it is cultivated from January to April and grows best at a temperature between 25 and 35°C and a rainfall of 20-30 cm. The incorporation of parthenocarpic cucumber hybrids/varieties into the Indian market by private seed companies has contributed to an upsurge in yield and efficiency for cucumber grown in controlled environments. However, the expenses associated with acquiring parthenocarpic cucumber seeds are notably high, necessitating farmers to procure seeds from these private companies each season repeatedly. Hence, the present study was undertaken to evaluate the performance of fifteen cucumber accessions for yield and quality traits under Coimbatore District in TamilNadu with an aim to select the genotypes which are suitable for salad consumption and to determine which genotypes are optimum for slicing or fruit utilization.

MATERIALS AND METHODS

The present investigation was undertaken at the Department of Vegetable Science, Horticultural College and Research Institute, TamilNadu Agricultural University, Coimbatore, TamilNadu, India from 2020 to 2023. A total of fifteen different genotypes, sourced from various origins (Table 1), were arranged in a Randomised Block Design with two replicates. The assessment took place across five different growing seasons, following the recommended agricultural practices outlined in the Crop Production Guide of Tamil Nadu. Biometric observations were taken from five randomly selected plants. Measurements were recorded for various traits including vine

length (cm), node at which the first male flower appeared, node at which the first female flower appeared, number of male flowers/vine, number of female flowers/vine, sex ratio, number of fruits / vine, number of days taken for first harvest, fruit length (cm), fruit girth (cm), single fruit weight (g), fruit yield per vine (g) and purpose for which it is recommended – snap melon /cucumber.

Table 1. List of genotypes used with their sources

S.No	Genotypes	Source
1	CBECS-4	Sathyamangalam
2	CBECS-5	Paravai
3	CBECS-6	Amaravathi
4	CBECS-7	Piraittur
5	CBECS-10	Rasipuram
6	CBECS-12	Melmaravakadu
7	CBECS-19	Namanasamuthiram
8	CBECS-21	Orathanadu
9	CBECS-23	Pattukottai
10	CBECS-25	Kallakurichi
11	CBECS-28	Kodavasal
12	CBECS-31	Periyakollapatti
13	CBECS-32	Sankakiri
14	CBECS-35	Musuri
15	CBECS-37	Nammakal

Statistical analysis

The Analysis of Variance (ANOVA) of the yield and yield contributing characters was made using the R software version 4.2.1 (R core team, 2021) and the means of the treatments were tested significant at the 5% probability level and highly significant at the 1% probability level.

RESULTS AND DISCUSSION

The results showed that there were significant differences among the genotypes for the different traits studied. The mean performance of the different cucumber genotypes for growth attributes have been given in Table 2.

Vine length: The mean vine length in the present study varied between 325.50 and 225.50cm. The vine length was the highest (325.50cm) in CBECS-35 followed by CBECS-4 with 306.50 cm. The lowest vine length of 225.50 cm was recorded in CBECS-32.The variability in vine length may be due to the inherent genetic behaviour of the genotypes used in the experiment. Apart from the genetic makeup of different genotypes, interaction effect of environment with genotypes, hormonal factors and vigour of the crop would have contributed to the difference. The better the vine growth the better is the yield in cucumber. Similar observations were recorded by Shukla *et al*. 2010 ,Veena *et al*. 2012 and Pradeep Rathod *et al*., 2021.

Node at which the first male and female flower appeared: In the present study, the earliest node at which first male flower appeared was the first node in most of the genotypes evaluated.The genotypes, CBECS-25, CBECS-32 and CBECS-37 recorded the earliest node (third node) at which the first female flower were produced. Almost similar values for this character was observed in different accessions of cucumber evaluated by Kumar*et al*. 2013, Kumar *et al*. 2017. The variation in the number of days taken for initiation of first female flower might be due to genetic behaviour of the genotypes evaluated. In a study conducted by Adinde. J. O. *et al*., 2016early onset of female flowers resulted in early harvest and better yield.

Number of male and female flowers per vine: The highest number of male flowers per vine (45) was recorded inCBECS-5, CBECS-7 and CBECS-19 while the lowest (27.50) was seen in CBECS-6. The number of female flowers was the highest (6.30) in the genotypes CBECS-7, CBECS-19, CBECS-31 and CBECS-32 while it was the lowest (3.75) in CBECS-6.This variability may be due to inherent genetic potential of the genotypes used in the study. The variations in the number of male and female flowers per vine could be attributed possibly due to difference in the length of the internodes, number of internodes, environmental factor, hormonal factor and crop vigour. The findings are in confirmation with the findings of Choubey *et al*., 2023.

Sex Ratio: The ratio of male and female flowers is greatly influenced by the environmental factors. At higher temperature more number of male flowers is produced whereas at lower temperature more number of female flowers is produced. A lesser number of male flowers may lead to improper fertilization. Not only does the temperature influence the sex ratio, the genotypes also play a vital role indeciding the sex ratio. In this experiment, there were significant differences in the ratio of male and female flowers among the different genotypes assessed. The highest male to female ratio (9.6:1.1) was observed in CBECS-21 and the lowest male to female flower ratio 4.2:1.1 was recorded in CBECS-23.

Number of fruits per vine: The number of fruits produced in a plant is determined by the plant height, sex ratio, node at which the first female flower is produced and the crop duration. In the present investigation, the number of fruits per vine ranged from three to five. The maximum number of fruits per vine (5.70) was observed in CBECS-31 while the lowest number (3.25) was recorded in CBECS-6 and CBECS-21. This could be attributed to the genetic factors more than the environment conditions. Gangadhar *et al*., 2019 have reported that the yield and yield contributing characters are decided by the genetic potential. The different genotypes used in the present study showed significant differences for yield and quality traits as tabulated in Table 3.

Days to first harvest: In the present investigation, the genotype, CBECS-23 was the earliest to mature (51.95 days) while the genotype, CBECS-5 took more number of days (67.20) to come to harvest. The results obtained are in corroboration with the findings of Kumar *et al*. 2017. Similar values have been obtained by Pal, *et al*., 2017; Khan *et al*., 2015 and Choubey *et al*., 2023.

Fruit length (cm): The fruit length of the different genotypes expressed significant differences. The highest fruit length (21.35cm) was recorded in the genotype, CBECS-37 and the lowest fruit length (11.70 cm) was observed in CBECS-4. The significant variations in fruit length might be due to the genetic differences, plant vigour and conducive environmental conditions which would have enhanced availability of all essential elements and plant growth hormones like auxins for the plant growth. The longer the fruits the better is the yield. This is in confirmation with the results obtained by Golabadi e*t al.* 2012, Kumar *et al*. 2017 and Pradeep Rathod *et al*., 2021.

Fruit girth (cm): The fruit girth was the highest (14.30cm) in the genotype CBECS-12 and the lowest fruit girth (7.90cm) was registered in CBECS-31. The significant variations in fruit girth might be due to the genetic variation. Generally, fruit girth has a positive correlation with the yield, however, when the fruit girth is higher there is a tendency of separation of placenta leading to increased formation of cavity in the fruits reducing the quality of the fruits. Similar findings were reported by Shukla *et al*. 2010, Kumar *et al*. 2017, Choubey *et al*., 2023.

Single fruit weight (g): In the present study, maximum single fruit weight (164.95g) was observed in CBECS-21 while the minimum fruit weight (67.40g) was recorded in CBECS-31. The total fresh fruit weight per plant and the yield per hectare are contributed by the number of fruits per plant, fruit length and girth. Kumar *et al.* 2017 have reported similar findings in cucumber.

Fruit yield per vine (g): Yield per vine varied significantly in all the genotypes and it ranged from 367.75 to 620.07g. Among the genotypes evaluated, CBECS-37recorded the highest fruit yield per vine of 620.07 g followed by 592.24 g in CBECS-25.

Table 2. Mean performance of cucumber genotypes for growth parameters

S.No	Genotypes	Source	Vine length (cm)	Node at which first male flower appeared	Node at which first female flower appeared	No of male flowers/vine	No of female flowers/vine	Sex ratio	No of fruits / vine
1	CBECS-4	Sathyamangalam	306.50	1.70	4.7	35.50	4.85	7.3:1.2	3.70
2	CBECS-5	Paravai	274.50	1.30	5.2	45.00	5.15	8.7:1.0	4.85
3	CBECS-6	Amaravathi	269.50	1.45	3.5	27.50	3.75	7.4:1.1	3.25
4	CBECS-7	Piraittur	257.50	1.35	5.3	45.50	6.20	7.5:1.1	4.70
5	CBECS-10	Rasipuram	263.00	1.30	5.25	33.50	5.30	6.4:1.1	4.50
6	CBECS-12	Melmaravakadu	249.00	1.60	4.2	34.50	5.70	6.3:1.2	4.55
7	CBECS-19	Namanasamuthiram	259.00	1.45	5.0	45.00	6.30	7.1:1.2	5.15
8	CBECS-21	Orathanadu	239.50	2.85	3.5	35.50	3.70	9.6:1.1	3.25
9	CBECS-23	Pattukottai	256.50	1.35	5.2	22.00	5.20	4.2:1.1	4.20
10	CBECS-25	Kallakurichi	277.00	1.30	3.3	41.50	4.70	9.0:1.1	4.20
11	CBECS-28	Kodavasal	281.00	1.35	4.15	37.00	4.65	8.0:1.0	4.40
12	CBECS-31	Periyakollapatti	255.00	1.25	4.25	42.00	6.35	6.5:1.1	5.70
13	CBECS-32	Sankakiri	225.50	1.25	3.2	35.00	6.00	5.8:1.0	5.50
14	CBECS-35	Musuri	325.50	1.15	3.15	40.50	5.50	7.5:1.0	5.00
15	CBECS-37	Nammakal	268.50	2.20	3.35	31.50	5.70	5.4:1.1	5.30
	CD (0.05%)		13.47	0.43	0.26	2.02	0.26	0.015	0.27
	CV		2.35	13.30	2.87	2.57	2.26	20.1	2.78
	SED		6.28	0.20	0.12	0.94	0.12	0.7	0.13

Table 3. Mean performance of cucumber genotypes for yield parameters

S. No.	Genotypes	Source	Days to first harvest	Fruit length (cm)	Fruit girth (cm)	Single Fruit weight(g)	Fruit Yield per vine(g)	TSS (^{0}Brix)	Snapmelon/ cucumber
1	CBECS-4	Sathyamangalam	56.60	11.70	13.30	133.80	505.46	4.20	Snapmelon
2	CBECS-5	Paravai	67.20	13.90	12.65	98.55	490.53	5.15	Snapmelon
3	CBECS-6	Amaravathi	55.80	15.10	12.85	137.40	445.57	4.40	cucumber
4	CBECS-7	Piraittur	54.70	20.50	11.95	122.80	589.25	4.00	Snapmelon
5	CBECS-10	Rasipuram	62.30	18.20	13.40	125.95	582.33	4.30	cucumber
6	CBECS-12	Melmaravakadu	62.75	12.15	14.30	125.25	571.72	5.10	cucumber
7	CBECS-19	Namanasamuthiram	55.45	15.50	8.80	76.85	391.92	5.05	cucumber
8	CBECS-21	Orathanadu	57.25	21.75	11.85	164.95	535.76	3.60	cucumber
9	CBECS-23	Pattukottai	51.95	14.50	8.70	132.80	575.81	3.50	Snapmelon
10	CBECS-25	Kallakurichi	52.20	13.75	12.15	143.75	592.24	4.70	cucumber
11	CBECS-28	Kodavasal	52.50	14.70	11.10	87.75	367.75	3.20	cucumber
12	CBECS-31	Periyakollapatti	57.30	13.00	7.90	67.40	376.50	3.70	Snapmelon
13	CBECS-32	Sankakiri	57.25	14.55	9.95	103.25	541.03	3.50	Snapmelon
14	CBECS-35	Musuri	56.00	19.15	13.35	113.70	570.00	3.25	cucumber
15	CBECS-37	Nammakal	63.15	21.35	11.20	122.80	620.07	4.30	Snapmelon
	CD (0.05%)		2.31	0.27		3.24	16.38	0.27	-
	CV		1.88	3.00	-	1.29	1.48	3.00	-
	SED		1.08	0.12	-	1.51	7.64	0.12	-

Table 4. Mean performance of cucumber genotypes for quality parameters

S.No.	Genotypes	Source	Fruit color (unripe)	Fruit colour (ripe)	Purpose for which suited	Fruit texture
1	CBECS-4	Sathyamangalam	Green	Light yellow	salad	Soft
2	CBECS-5	Paravai	Light green	Yellow	Slice	Soft
3	CBECS-6	Amaravathi	Green	Yellowish Green	Slice	Rough
4	CBECS-7	Piraittur	Green	Green	salad	Soft
5	CBECS-10	Rasipuram	Green	Yellow	salad	Soft
6	CBECS-12	Melmaravakadu	Green	Yellow	salad	Rough
7	CBECS-19	Namanasamuthiram	Green	Yellow	salad	Soft
8	CBECS-21	Orathanadu	Light green	Light yellow	salad	Soft
9	CBECS-23	Pattukottai	Green	Yellow	salad	Rough
10	CBECS-25	Kallakurichi	Light green	Yellow	Slice	Rough
11	CBECS-28	Kodavasal	Green	Yellow	Salad	Soft
12	CBECS-31	Periyakollapatti	Green	Yellow	Slice	Rough
13	CBECS-32	Sankakiri	Light green	Yellow	salad	Soft
14	CBECS-35	Musuri	Green	Yellow	Slice	Soft
15	CBECS-37	Nammakal	Light green	Yellow	salad	Soft

The lowest fruit yield per vine was registered in the genotype, CBECS-28 with 367.75g.The fruit yield per vine is contributed by the genetic and environment factors and also by the number of days to first flowering, node at which the first female flower appears, variation in sex ratio, fruit set percentage and number of fruits per plant. Similar findings were also reported earlier by Kumar *et al*. 2013, Kumar *et al*. 2017, Pradeep Rathod *et al*., 2021, Choubey *et al*., 2023.

Total soluble solids (^{0} brix): Among the genotypes studied, CBECS-5 recorded the highest TSS content of 5.15(^{0} brix) followed by CBECS-12 and CBECS-19 with 5.10 and 5.05 respectively while the lowest TSS content of 3.20^0 brix was registered inCBECS-28.The genotypes with higher TSS content may be recommended for fruit/slice purpose. Kumar *et al*. 2016and Choubey *et al*., 2023observed similar TSS content in a study involving cucumber genotypes.

CONCLUSION

From the present investigation, it can be concluded that the genotype CBECS-31 with the maximum number of fruits per vine and the genotype, CBECS-37 which recorded the highest fruit yield per vine and the genotypes, CBECS-25, CBECS-32 and CBECS-37 which showed the earliest node for the development of first female flower are suitable for salad purpose.The genotype, CBECS-5 which recorded the highest TSS content is suitable for slice (fruit) purpose. Further selection can be carried out in these genotypes or these may be utilized for further breeding programmes for exploitation of hybrid vigour in cucumber.

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