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EVALUATION OF BITTER GOURD (*MOMORDICA CHARANTIA* L.) GENOTYPES FOR GROWTH, YIELD AND QUALITY TRAITS

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ABSTRACT

Bitter gourd is most popular vegetable in terms of nutritive and medicinal value among cucurbits, it is gaining popularity due to its high market demand. The present investigation in order to evaluate the performance of seventy-five genotypes of bitter gourd (*Momordica charantia* L.) for different growth, yield and quality component traits was carried out at Vegetable Block, College of Horticulture, Bagalkot during 2022-23 summer season. The experiment with 75 genotypes was laid out in randomized complete block design with two replications. Analysis of variance revealed that the genotypes differed significantly for all the growth, yield and quality parameters in the bitter gourd. Among the genotypes studied, Preethi was found superior with fruit yield per vine (1.82 kg), fruit yield per plot (15.24 kg), fruit yield per hectare (12.58 t/ha) and followed by IC-450520 has performed better for fruit yield per vine (1.54 kg), fruit yield per plot (14.23 kg), fruit yield per hectare (11.84 t/ha). The genotype IC-599421 recorded significantly best performance with respect to earliness parameters like days to first female flowering (38.05), days to 50% flowering (39.80) and days to first fruit harvest (47.80). The better performance was observed for yield attributing traits like fruit length (26.34) in Kashi Pratishta, number of fruits (24.41) in IC-450520, average fruit weight (123.03) in MC-11 and highest ascorbic acid content (139.16) was found in IC-68335. In the current study superior genotypes identified for yield parameters namely Preethi, MC-7, IC-470520, IC-470550, IC-470556, IC-50516, MC-9 and IC-50526. Therefore, these genotypes with high yield may be employed directly in breeding programmes to create cultivars of bitter gourd that have high yielding capacity.

Keywords **:** *Momordica charantia*, *growth, Yield, Quality, Breeding*

Introduction

Bitter gourd (*Momordica charantia* L.), 2n=22, is an annual, climber vine and economically important tropical and subtropical vegetable crop belonging to the subfamily Cucurbitoideae and family Cucurbitaceae, which has 125 genera and 960 species. It is monoecious and highly cross pollinated due to a high degree of heterozygosity. It used as a vegetable and reported to have medicinal properties. Momordicin in the fruit is responsible for the bitter taste. Across the globe, plants from this botanical family enjoy widespread popularity as food, whether consumed raw or cooked. Notably, the fruits produced by members of this family hold significant economic value, with various parts of the plants utilized for nutritional, therapeutic, and ethnoveterinary purposes. Among these cucurbitaceous plants, bitter gourd stands out for its exceptional nutritive content, providing

essential vitamins (A and C) and minerals (phosphorus, magnesium, iron, zinc, and manganese), alongside its array of medicinal properties. It is low in calories (17%) and a source of vitamins (B1, B2 and B3), vitamin C (34%); ripe fruit are rich in Vitamin A. It contains 4.0 to 10.5 of carbohydrate, 1.5 to 2.0% protein, water (83-92%), Fat (0.2-1.0%), Minerals (0.5-1.0%) and 0.8 to 1.7 of fibers . It is reported to have hypoglycemic properties, can act as a laxative, and is easily digested and has great demand in international market among fresh vegetables.

Bitter gourd is grown in tropical and subtropical regions of the world and widely cultivated in India, China, Sri Lanka, Thailand, Philippines, Japan, Australia, Malaysia, Africa and South America (Singh, 1990). Among the vegetables grown in India, bitter gourd occupies an area of 1.13 lakh hectares with the annual production of 14.33 lakh metric tonnes and productivity of 12.68 t/ha. In India, bitter gourd is mainly cultivated in the states of Karnataka, Chhattisgarh, Madhya Pradesh, Andhra Pradesh, Telangana, Odisha, Maharashtra, Tamil Nadu and Kerala. The total area and production of bitter gourd is 2,480 hectares and 23,310 metric tonnes with a productivity of 9.3 t/ha in Karnataka (Anon., 2021).

The name "Momordica" is derived from a Latin word, which means “to bite”, referring to the ridged edges of its seed which appears as if it has been chewed. It is believed to be originated from Tropical Asia particularly Eastern India and South China. As it has been originated from old world tropics and disseminated over new world tropics, where it firstly arrived in Brazil through the slave traders of Africa and later on spread in Central America. The wild species *Momordica charantia* var. *abbreviata,* a native of Asia, is reported to be the progenitor of domesticated bitter gourd. Bitter melon is largely distributed in China, Indo-Burman (center of origin), India, Malaysia, tropical Africa, North and South America.

Fruit yield is the most important component in crop improvement and is directly influenced by the other yield related variables. Desirable genotypes should be chosen based on yield as well as other yield related characteristics. Information on the yield and yield-related contributing factors is important for selection of the available genetic stocks in bitter gourd crop development programme. The development and selection of material for earliness, high yield and quality are important aspects to be addressed to strengthen the breeding material of bitter gourd for future use and for commercialization.

Inspite of the potential economic and medicinal importance of the crop due attention has not been given towards a need-based crop improvement programme. There is a prime need for its improvement and to develop varieties or hybrids suited to specific agro-ecological conditions. However the yield potential of bitter gourd in India is very low due to poor yielding varieties and high incidence of pests and diseases. The main objective is to develop high yielding varieties with greater fruit number and weight, uniform thick cylindrical fruits free from bitterness, high female: male sex ratio, earliness and resistance to pest and diseases. Therefore, the present study was aimed at comparison of different diverse bitter gourd genotypes to screen for growth, yield and quality parameters.

Material and Methods

The present experiment was conducted at Vegetable Block, College of Horticulture Bagalkot, University of Horticultural Sciences Bagalkot during summer season 2022-23. To evaluate the performance of seventy five bitter gourd genotypes collected for various yield and yield attributing traits under field condition with two replications in randomized complete block design. The bitter gourd seeds were planted during second week of January, 2023. The (UHSB POP, 2018) recommended dose of fertilizer i.e. nitrogen 100 Kg, phosphorus 50 Kg and potassium 50 Kg per hectare was applied. Half nitrogen was applied at the time of planting and remaining was applied in two splits i.e., at 30 and 60 DAP. Five plants were randomly selected per accession and observations recorded on different growth and yield parameters. The study on analysis of variance and mean performance of genotypes was carried out for different growth, yield and quality parameters.

Results and Discussion

Analysis of variance

Analysis of variance calculated for both quantitative and qualitative traits including growth, yield attributing traits and quality parameters of seventy-five bitter gourd genotypes. For twenty characteristics, the results a significant (P=0.05 and P=0.01) difference between genotypes (Table 1). This suggested the presence of substantial amount of genetic variation among the genotypes that could be exploited in selection for desirable traits in bitter gourd.

Per se performance of genotypes for growth characters

The yield factor mainly depends on traits like number of fruits per vine and average weight of the

individual fruit. The morphological features like growth and earliness parameters influence the contribution to fruit yield per vine in bitter gourd. (Table 2)

The genotypes Kashi Pratishta (4.05 m) recorded significantly higher vine length followed by PVIG-2 (3.95 m) and IC-689245 (77.89 cm) and the lower plant height was recorded in Ranebennur Local (1.43 m) followed by IC-68306, MC-3 and IC-44419 were found with the vine length of about 1.65m recorded at the final harvest. The variation in vine length might be due to combined effect of genetic inheritance of strain, soil condition and environmental factors highly influences the growth of bitter gourd vine. Similar results have also been reported by Sagar *et al.* (2024), Singh *et al.* (2024), Prakash *et al.* (2021) and Thakur *et al.* (2018) in bitter gourd. The 75 genotypes evaluated during growth period, the genotype IC-68314 (11.19) recorded significantly more number of branches per vine followed by Kashi Pratishta (10.90) and MC-3 (10.81). The lower number of branches per vine was recorded in IC-68310 (5.97) genotype followed by IC-467681 (6.23), Ranebennur Local (6.58) and IC-45351 (6.78). The number of branches per vine is highly influences by the genetic inheritance of strain, environmental factors in plant, because the branches arise near the node's factors conforming to Rajbhar *et al.* (2024), Singh *et al.* (2024), Prakash *et al.* (2021) and Mounica *et al.* (2021) in bitter gourd.

Minimum number of nodes bearing first male and female flower is an important character of any cucurbitaceous crops in order to determine the earliness of the crop harvest. In present study the first male flower appears at (4.75 nodes) in IC-45350 showed minimum number of nodes followed by IC-418486 (5.13 nodes) and IC-68309 (5.18 nodes). The maximum nodes were appeared in IC-85635 (13.56 nodes) followed by UHSB-025 (12.91 nodes) and IC-467681-1 (11.47 nodes). For minimum number of nodes bearing first female flower, IC-45351 takes (12.65 nodes) followed by MC-11 (12.86), IC- 85633 (13.15 nodes) and IC-264699 (14.17 nodes) and maximum nodes were found in IC-541218 (23.73 nodes) followed by IC-85643 (22.45), IC-505629 (22.00 nodes) and IC-68294 (21.84 nodes). The differences in nodes bearing first male and female flower depends on specific strain characters environmental and soil condition also influences these characteristics of crop plant.

Days to opening of first female flower is directly associated with the days to first fruit harvest, so that it is an important character of the crop. In bitter gourd, the MC-8 takes minimum days (32.38 days) to opening of first male flower, followed by IC-599421 (33.80 days), IC-85633 (33.99 days) and IC-450520 was found to be maximum days (49.96 days) to opening of first male flower followed by UHSBP-215 (49.82 days), IC-427694 (48.76 days) and UHSBP-015 (48.50 days).Whereas in the case of first female flower appearances IC-599421 takes (38.05 days) minimum days followed by MC-8 (38.89 days),) IC-85633 (40.62 days) and maximum days taken by IC-541218 (59.52 days) followed by UHSBP-015 (58.64 days), IC-68294 (55.82 days) and IC-505632 (55.61 days) for first female flower appearances. The variation in these characters is due to genetic features of plants, hormonal activities, environmental factors.

In cucurbitaceous crops number of female flowers plays an important role in total yield. Flowers number is highly affected by genetic behavior of crop, environmental factors (temperature, day length, light intensity etc.) and soil condition like, high fertile soils give high number of male flower comparison to low fertile soils. Combined effect of soil and environmental condition is highly influencing the number of both male and female flowers in this crop. The maximum female flowers were found in Phule Green Gold (62.11) followed by Pant Karela-1 (58.48) and Preethi (57.32). whereas minimum number of female flowers was produced in Bagalkot Local-4 (20.13) followed by UHSBP-415 (21.23), IC-418486 (22.34) and IC-264699 (22.48). The number of female flowers positively and directly related to total yield of crop. With respect to maximum male flowers were found in IC-599421 (232.62) followed by Pant Karela-1 (224.34) and Preethi (210.23), whereas the minimum of male flowers was produced in Kashi Mayuri (132.43) followed by IC-264699 (139.34), IC-470550 (140.55) and MC-10 (142.46). Singh *et al.* (2024), Mounica *et al.* (2021), Prakash *et al.* (2021) and Moharana *et al.* (2015) have also reported similar findings in bitter gourd.

The IC-599421 takes minimum days (39.80 days) to complete 50% flowering followed by MC-8 (40.20 days), IC-68275 (41.50 days) and IC-541218 was found to be maximum days (62.80 days) to complete 50% flowering followed by UHSBP-025 (61.40 days), UHSBP-215 (60.20 days) and IC-68294 (59.80 days). Minimum days to first fruit harvest is directly correlated to first opening of female flower in plant, the IC-599421 showed minimum (47.80 days) to first fruit harvest followed by MC-8 (49.80 days) and IC-68275 (50.40 days). IC-68294 (68.80 days) had taken very much time to first fruit harvesting followed by UHSBP-215 (68.40 days), UHSBP-025 (67.40 days) and IC-470550 (67.20 days). The variation in days to

first fruit to harvesting might have been due to varietal genetic factor, environmental factor, hormonal factor and vigour of the crop. Rajbhar *et al.* (2024), Sagar *et al.* (2024), Singh *et al.* (2024), Mounica *et al.* (2021), Prakash *et al.* (2021) and Thakur *et al.* (2018) have also reported similar findings in bitter gourd.

Per se performance of genotypes for yield and quality characters

The yield parameters are presented in table 3, which indicated that the characters like number of fruits per vine, average fruit weight, etc., plays an important role in total yield prediction. The morphological features influence the contribution of these yield attributing characters to yield. In the present study we considered fruit yield per vine, per plot and per hectare were considered.

The variation in fruit length and diameter is due to genetic behavior of crops and variable in different changing climatic conditions. The fruit yield is also influenced by the length and diameter of fruit of bitter gourd. Highest fruit length was recorded in Kashi Pratishta (26.34 cm) followed by IC-44419 (22.66 cm) and UHSB-025 (22.58 cm). The lowest fruit length was observed in MC-8 (5.60 cm) followed by MC-2 (6.24 cm), PVIG-2 (10.20 mm) and UHSB-415 (10.68 cm). Significantly maximum fruit diameter was found in Ranebennur Local (49.48 mm) followed Hirkani (46.33 mm) and IC-470943 (46.24 mm). The minimum fruit diameter was recorded in MC-8 (16.34 mm) followed by MC-2 (19.22 mm), TCR-332 IC-505639 (20.00 mm) and Mrutyeenjaya Green (20.81 mm).

The highest number of fruits per vine was recorded in IC-450520 (24.41) followed by Pant Karela -1 (23.49) and Phule Green Gold (23.30). The lowest number of fruits per vine was recorded in IC-68294 (10.40) followed by IC-44419 (10.44), IC-68314 (10.75) and IC-44413 (11.18). The number of fruits per vine is one of the major factors for deciding the yield of the crop. The variation in number of fruits per vine might have been due to number of female flowers, fruit set, genetic nature and their response to varying environmental conditions. Significantly maximum average fruit weight was found in MC-11 (123.03 g) followed MC-7 (112.18 g) and Preethi (103.62 g). The minimum fruit weight was recorded in PVIG-2 (11.18 g) followed by MC-2 (11.26 g), MC-8 (14.45 g) and TCR-332 IC-505639 (28.70 g). Variation in number of fruits per vine and average fruit weight was also reported by Sagar *et al.* (2024), Singh *et al.* (2024), Mounica *et al.* (2021), Prakash *et al.* (2021) and Thakur *et al.* (2018) in bitter gourd.

The maximum fruit yield per vine was recorded in Preethi (1.82 kg) followed by MC-7 (1.64 kg) and IC-450520 (1.54 kg). The lowest fruit yield/vine were found in MC-2 (0.23 kg). The fruit length, fruit weight, fruit diameter, number of fruits and fruit yield per vine, significantly increase the fruit yield per plot, Preethi (15.24 kg) found to be superior over other genotypes, followed by IC-450520 (14.23 kg) and IC-50516 (13.20 kg). The minimum fruit yield per plot was recorded in MC-2 (2.18 kg). The highest fruit yield per hectare was found in Preethi (12.58 t/ha) followed by IC-450520 (11.84 t/ha) and MC-7 (11.12 t/ha). The minimum fruit yield per hectare were recorded in MC-2 (1.74 t/ha). The variation is fruit yield/ vine, fruit yield/ plot and fruit yield/hectare might be due to sex ratio, fruit set percentage, fruit length, fruit diameter, crop vigour, genetic nature of strains, environmental and soil condition.

The maximum flesh thickness was recorded in Hirakani (33.02 mm) followed by Preethi (28.65 mm) and IC-44418 (28.35 mm). The lowest flesh thickness was found in MC-2 (5.16 mm) followed by MC-8 (5.30 mm) and Mrutyeenjaya Green (7.10 mm). The maximum cavity size was recorded in Ranebennur Local (24.54 mm) found to be superior over other genotypes, followed by by Hirakani (22.91 mm) and IC-470943 (22.72 mm). The lowest cavity size was recorded in MC-8 (8.14 mm) followed by MC-2 (9.85 mm) and TCR-332 IC-505639 (9.97 mm). The highest ascorbic acid content was found in IC-68335 (139 mg/100g) followed by MC-9 (138.33 mg/100g) and IC-68310 (137.54 mg/100g). The minimum ascorbic acid content was recorded in IC-68275 (34.12 mg/100g) followed by IC-599421 (34.36 mg/100g) and MC-2 (39.88 mg/100g).

The genotypes had seen higher yield as a result of increased number of fruits per vine, average fruit weight, or both, as evidenced by a positive relationship between these attributes. Genetic makeup is linked to variety yielding potential because yield is a complex attribute regulated by polygenes. The genetic makeup of the crop and the influence of environmental factors are the main causes of variation in plant height. The parameters like days to first male and female flowering, days to first fruit harvest, are the indicators of earliness. Similar results were also reported by Sagar *et al.* (2024), Singh *et al.* (2024), Mounica *et al.* (2021), Prakash *et al.* (2021), Thakur *et al.* (2018), Singh *et al.* (2016) and Moharana *et al.* (2015) in bitter gourd.

Conclusion

Among the 75 evaluated genotypes, Preethi, MC-7, IC-470520, IC-470550, IC-470556, IC-50516, MC-9 and IC-50526 demonstrated significantly superior performance in terms of the number of fruits per vine, average fruit weight and total fruit yield compared to the other genotypes. Additionally, IC-499521, MC-8 and IC-85633 exhibited outstanding performance for earliness traits, including days to first male and female flowering, days to 50% flowering and days to first fruit harvest. The study revealed substantial genetic diversity within the germplasm for traits related to earliness and yield. Genotypes with a higher number of female flowers hold potential for the development of high-yielding gynoecious lines. The observed wide variation among the genotypes in growth, earliness, yield and quality parameters provides a robust basis for selecting promising candidates for the development of new high-yielding bitter gourd hybrids.

Table 1: Analysis of variance (mean sum of squares) for growth, yield and quality parameters in bitter gourd genotypes

Particulars	Parameters	Replication	Treatments	Error	S.Em	CD	
						1%	5%
Growth parameters	Vine length (m)	0.08	0.58**	0.02	0.11	0.41	0.31
	Number of branches	0.04	3.11**	0.05	0.16	0.60	0.45
	Node to first male flowering	0.01	5.61**	0.05	0.16	0.59	0.44
	Node to first female flowering	0.22	12.06**	0.19	0.31	1.16	0.88
	Days to first male flowering	0.06	33.14**	1.02	0.71	2.67	2.01
	Days to first female flowering	0.01	40.00**	1.16	0.76	2.85	2.15
	Number of male flowers	20.70	802.34**	23.51	3.43	12.82	9.66
	Number of female flowers	0.05	148.91**	0.81	0.64	2.38	1.79
	Days to 50% flowering	0.47	49.35**	1.55	0.88	3.29	2.48
	Sex ratio	0.01	1.42**	0.02	0.11	0.39	0.30
	Days to first fruit harvest	2.09	49.23**	2.61	1.14	4.27	3.22
Yield parameters	Fruit length (cm)	0.22	23.30**	0.15	0.28	1.03	0.78
	Fruit diameter (mm)	2.01	75.23**	3.17	1.26	4.71	3.55
	Number of fruits per vine	0.72	20.69**	0.89	0.67	2.50	1.88
	Average fruit weight (g)	5.14	857.51**	14.24	2.67	9.98	7.52
	Fruit yield per vine (kg)	0.01	0.18**	0.01	0.04	0.13	0.10
	Fruit yield per plot (kg)	0.01	14.48**	0.19	0.31	1.16	0.87
	Fruit yield per hectare (kg)	0.08	10.04**	0.03	0.12	0.43	0.33
Quality parameters	Flesh Thickness (mm)	0.18	62.11**	0.14	0.27	1.00	0.76
	Cavity Size (mm)	0.01	18.26**	0.20	0.32	1.19	0.90
	Ascorbic acid content	9.59	1127.01**	4.43	1.49	5.57	4.19

Table 2: *Per se* performance for growth parameters in bitter gourd genotypes

Sl. No.	Genotypes	VL	NB	NFMF	NFFF	DFMF	DFFF	NMF	NFF	D50%F	DFFH
1.	IC45351	2.44	6.78	8.45	12.65	38.26	43.12	167.35	29.12	45.60	51.20
2.	IC44424	2.41	7.41	6.40	14.93	39.70	44.65	156.73	26.76	48.20	56.80
3.	IC856501	2.43	8.45	7.95	15.63	36.24	41.65	187.23	34.67	44.20	53.60
4.	IC44426	2.55	9.76	5.87	16.03	35.91	40.65	191.23	38.92	43.60	55.80
5.	IC467681	1.72	6.23	11.37	17.90	41.01	47.34	168.29	31.74	50.20	58.80
6.	IC4705542	2.47	7.02	6.81	17.55	38.94	42.87	180.28	42.46	45.20	52.20
7.	IC68306	1.65	7.23	7.41	17.81	40.33	46.55	182.45	39.12	48.80	55.20
8.	IC50516	2.46	8.45	7.79	17.16	38.09	44.00	192.23	46.32	46.00	51.60
9.	IC50526	1.93	8.52	7.53	15.99	37.20	42.86	186.48	40.23	44.80	50.60
10.	IC68275	1.74	9.24	6.67	17.55	35.50	40.83	172.90	37.23	41.50	50.40
11.	Dharug Local	2.38	9.52	6.56	16.68	42.90	49.21	176.34	29.23	51.40	58.40
12.	MC-3	1.65	10.81	6.97	15.36	42.83	43.17	179.23	32.12	45.20	53.20
13.	IC68314	2.49	11.19	6.87	17.76	41.38	47.94	184.67	36.73	49.80	55.40
14.	IC45350	2.52	9.56	4.75	20.23	40.64	47.52	182.46	45.32	50.60	61.20
15.	IC85626	1.74	10.23	8.95	15.37	37.51	42.28	196.23	41.23	44.40	54.80
16.	IC85633	2.33	7.99	6.52	13.15	33.99	40.62	192.39	39.12	43.60	52.40

Sl. No.	Genotypes	VL	NB	NFMF	NFFF	DFMF	DFFF	NMF	NFF	D50%F	DFFH
17.	IC68310	2.02	5.97	6.61	16.51	41.25	45.67	189.23	35.12	49.20	58.20
18.	IC85628	1.85	7.72	10.52	19.24	41.68	47.07	198.23	33.23	48.80	56.80
19.	IC68309	2.62	7.79	5.18	21.13	41.76	45.87	195.23	34.43	48.20	60.80
20.	MC-7	1.89	10.00	8.50	15.23	39.62	43.73	178.35	31.23	46.20	53.40
21.	MC-8	2.14	9.84	6.46	16.54	32.38	38.89	202.34	47.54	40.20	49.80
22.	MC-9	2.04	8.69	5.24	15.97	40.90	44.40	188.29	36.72	46.60	53.80
23.	IC44423	1.72	9.51	7.39	15.32	42.77	45.90	158.34	27.34	47.80	54.80
24.	Green Long	3.05	10.61	6.40	16.27	39.05	47.90	177.54	31.65	49.80	58.40
25.	IC44419	1.65	10.46	7.08	14.74	41.70	52.37	168.34	29.45	56.20	64.60
26.	IC44413	2.89	9.63	7.49	21.44	41.45	52.33	159.39	24.23	55.60	63.33
27.	IC470565	2.06	8.46	8.95	17.10	37.57	45.26	155.29	28.34	48.40	58.80
28.	UHSBP-415	2.40	9.03	5.89	18.86	40.26	45.80	148.23	21.23	49.20	57.80
29.	IC599421	2.83	8.82	7.11	20.72	33.80	38.05	232.62	46.98	39.80	47.80
30.	IC418486	2.16	8.51	5.13	21.77	44.36	45.81	146.28	22.34	57.80	63.40
31.	IC85643	1.93	7.79	8.25	22.45	46.50	53.57	162.83	26.31	57.20	64.80
32.	IC85635	2.22	6.82	13.56	18.63	42.44	48.52	183.56	37.38	51.40	59.40
33.	IC65972	2.44	9.14	5.64	16.73	36.75	44.67	188.27	39.12	46.80	55.60
34.	IC113875	2.95	7.79	5.79	15.18	37.23	41.71	179.56	36.12	41.60	51.80
35.	IC45346	3.01	9.81	9.12	14.69	39.15	43.43	165.92	33.81	45.20	53.60
36.	IC33275	2.10	10.31	7.32	14.77	34.93	50.96	172.34	34.29	53.40	63.80
37.	IC44418	2.93	7.18	6.78	17.93	42.86	50.40	178.23	36.23	53.00	65.20
38.	BGK Local 4	2.37	7.56	7.07	18.91	43.18	48.16	143.45	20.13	51.60	58.60
39.	MC-5	2.47	7.62	8.36	15.78	41.92	43.62	146.67	25.29	45.40	54.80
40.	MC-2	2.56	8.74	7.09	16.81	46.65	51.67	164.23	29.34	55.20	63.80
41.	PVIG-2	3.95	7.88	5.41	17.16	45.52	50.78	148.28	25.23	54.80	62.80
42.	IC505632	2.84	9.89	7.25	15.88	47.90	55.61	148.43	23.12	57.80	65.80
43.	Pant Karela 1	3.10	9.79	7.31	14.67	38.41	44.61	224.34	58.48	48.20	62.20
44.	Hirkani	3.46	7.93	7.90	16.72	42.52	46.46	161.68	46.23	50.40	61.40
45.	IC68335	2.92	9.31	7.06	14.63	46.21	51.07	158.89	34.67	53.60	65.40
46.	Pant karela 2	2.72	7.45	8.93	18.34	46.99	50.91	206.46	46.12	54.20	63.80
47.	MC-11	2.98	8.50	7.67	12.86	44.01	47.57	163.87	38.12	51.60	59.80
48.	Phule Green Gold	2.72	10.00	7.49	14.62	39.26	44.73	192.48	62.11	48.80	56.80
49.	Kashi Mayuri	3.59	10.70	8.82	17.16	45.64	46.78	132.43	52.38	50.40	58.60
50.	Preethi	2.74	7.17	8.35	16.10	39.91	46.48	210.23	57.32	46.60	60.40
51.	Kashi Pratishta	4.05	10.90	7.74	19.79	44.29	47.29	204.28	43.22	51.20	60.20
52.	Ranebennur Local 2	1.43	6.58	8.41	15.75	44.20	50.87	152.11	32.11	54.20	63.20
53.	Katali Vaibhav	2.82	9.66	6.91	14.75	45.90	52.38	184.35	36.12	54.20	65.80
54.	IC68294	2.05	8.98	8.01	21.84	45.04	52.42	166.34	30.62	54.00	61.40
55.	IC68295	2.27	9.06	7.48	16.75	42.45	46.50	168.56	30.62	48.60	56.80
56.	IC68232	2.41	8.68	7.77	16.01	42.23	47.26	160.45	28.34	50.40	60.20
57.	IC470943	2.19	9.64	7.73	14.44	46.96	50.59	176.23	34.22	52.00	58.20
58.	IC505629	2.97	10.71	8.07	22.00	44.92	47.18	172.83	33.84	51.00	62.20
59.	IC427694	2.24	9.28	10.80	17.59	48.76	52.34	145.78	25.23	55.60	62.40
60.	IC467681	2.38	8.95	11.47	16.95	39.46	43.95	154.39	29.34	47.60	56.80
61.	Mrutyeenjaya Green	2.47	7.44	9.99	15.25	43.96	50.74	155.33	30.11	54.60	62.80
62.	TCR-75 IC50527	2.05	7.13	10.80	14.95	47.05	52.38	150.22	28.58	56.40	66.80
63.	Davanagere Local	2.45	7.45	9.95	20.11	42.21	47.87	162.52	25.38	51.80	63.40
64.	IC450520	2.74	7.40	6.57	21.61	49.96	54.54	194.23	40.12	57.40	65.60
65.	UHSBP-215	2.31	8.05	7.85	18.18	49.82	55.36	161.23	28.34	60.20	68.40
66.	IC505623	3.07	8.34	7.44	17.56	44.13	49.03	177.23	29.24	51.60	58.80
67.	IC264699-3	2.76	7.73	6.03	14.17	46.95	47.59	168.29	27.24	49.80	63.20
68.	TCR-332 IC 505639	2.22	8.75	8.84	15.35	41.87	48.00	172.37	27.39	51.00	58.40
69.	UHSB-025	2.06	9.89	12.91	20.87	48.50	58.64	186.29	36.46	61.40	67.40

Sl. No.	Genotypes	VL	NB	NFMF	NFFF	DFMF	DFFF	NMF	NFF	D50%F	DFFH
70.	IC68294	3.91	9.36	8.14	18.31	47.49	55.82	178.23	38.45	59.80	68.80
71.	TCR-505 IC622910	2.50	7.85	7.52	16.88	35.53	41.95	170.58	34.82	46.00	55.40
72.	IC541218	2.49	8.38	7.36	23.73	42.09	59.52	167.92	34.23	62.80	60.80
73.	IC264699 - 2	3.10	8.17	8.10	21.10	44.73	47.15	139.34	22.48	50.40	58.40
74.	MC-10	2.51	6.97	7.86	16.91	44.52	49.88	142.46	26.34	53.60	60.40
75.	IC470550	2.39	10.37	7.18	15.20	47.81	52.33	140.55	25.68	55.60	67.20
	Mean	2.48	8.67	7.75	17.18	41.97	47.57	173.05	34.41	50.47	59.13
	S. E±m	0.11	0.16	0.16	0.31	0.71	0.76	3.43	0/64	0.88	1.14
	CD at 5%	0.31	0.45	0.44	0.88	2.01	2.15	9.66	1.79	2.88	3.22
	CD at 1%	0.41	0.60	0.59	1.16	2.67	2.85	12.82	2.38	3.29	4.27

VL - Vine length (m) NB – Number of branches NFMF - Node to first male flowering
NFFF - Node to first female flowering DFMF – Days to first male flowering DFFF – Days to first female flowering
NMF- Number of male flowers NFF- Number of female flowers D50%F-Days to 50% flowering
DFFH- Days to first fruit harvest

Table 3: *Per se* performance for yield and quality parameters in bitter gourd genotypes

Sl. No.	Genotypes	Yield parameters							Quality parameters		
		FL	FD	NFV	AFW	FYPV	FYPP	FYPH	FT	CS	AAC
1.	IC45351	15.26	31.38	15.86	69.33	0.91	8.42	7.06	10.72	15.69	97.21
2.	IC44424	17.38	22.63	12.42	56.81	0.65	6.07	5.08	9.61	11.36	52.13
3.	IC856501	12.98	29.57	16.66	53.21	0.84	8.14	6.65	14.39	14.78	86.03
4.	IC44426	15.09	32.10	16.24	69.30	0.94	8.70	7.36	18.52	16.34	87.36
5.	IC467681	15.35	29.05	17.62	58.98	0.85	7.74	6.58	16.71	14.34	60.20
6.	IC4705542	13.05	33.10	21.23	58.43	1.18	11.01	9.17	18.28	16.42	51.18
7.	IC68306	17.33	31.94	13.28	94.13	1.07	9.96	8.3	23.37	16.00	50.93
8.	IC50516	16.80	34.27	21.92	70.56	1.43	13.20	11.04	21.35	17.09	92.60
9.	IC50526	15.11	33.24	18.63	72.19	1.36	12.43	10.57	23.63	16.79	42.86
10.	IC68275	12.85	34.38	12.39	71.56	0.76	7.05	5.9	22.43	16.97	34.12
11.	Dharug Local	17.82	29.66	16.25	75.50	0.95	8.65	7.21	15.40	14.27	50.67
12.	MC-3	14.09	27.08	15.57	56.41	0.84	7.79	6.5	13.94	14.41	68.45
13.	IC68314	13.14	32.17	10.75	46.27	0.48	4.44	3.74	17.23	16.10	52.74
14.	IC45350	17.40	35.09	16.39	86.71	0.95	8.73	7.27	22.92	17.76	86.73
15.	IC85626	13.35	32.47	15.73	64.31	0.93	8.62	7.19	17.89	16.54	77.80
16.	IC85633	19.49	30.35	14.60	77.62	0.96	8.92	7.32	21.36	15.11	85.97
17.	IC68310	11.26	31.78	15.20	44.06	0.68	6.27	5.26	24.64	16.10	137.54
18.	IC85628	11.64	28.88	14.15	61.48	0.75	6.96	5.81	13.59	14.15	95.17
19.	IC68309	16.82	36.76	17.53	85.46	1.10	10.21	8.57	24.57	17.96	133.34
20.	MC-7	22.07	35.26	16.00	112.18	1.64	13.13	11.12	25.72	17.97	78.26
21.	MC-8	5.60	16.34	20.77	14.45	0.32	2.96	2.45	5.30	8.14	85.11
22.	MC-9	13.40	28.70	22.40	60.41	1.37	12.59	10.51	13.44	14.49	138.33
23.	IC44423	16.04	28.25	12.99	53.13	0.69	6.30	5.29	14.06	14.50	94.59
24.	Green Long	19.53	25.74	18.36	59.71	1.10	10.15	8.53	12.61	12.89	94.98
25.	IC44419	22.66	32.44	10.44	96.41	1.00	9.27	7.65	18.39	16.02	68.14
26.	IC44413	15.58	32.42	11.18	60.21	0.72	6.66	5.51	14.27	16.54	103.32
27.	IC470565	18.06	27.85	16.99	52.62	0.91	8.63	7.20	13.57	13.54	77.51
28.	UHSBP-415	10.68	26.71	13.73	40.82	0.56	5.12	4.26	12.49	13.16	68.50
29.	IC599421	14.58	38.34	20.47	70.09	1.27	11.88	9.80	25.34	18.98	34.36
30.	IC418486	13.36	38.93	20.09	76.55	1.04	9.73	8.09	16.13	19.73	102.71
31.	IC85643	15.10	31.21	16.02	82.76	1.07	9.86	8.20	14.74	15.75	75.96
32.	IC85635	19.06	27.32	14.69	59.18	0.72	6.71	5.48	14.33	13.73	42.39
33.	IC65972	11.36	29.05	15.77	42.51	0.81	7.52	6.23	15.47	14.21	51.47
34.	IC113875	15.54	30.19	16.20	47.66	0.83	7.90	6.43	16.63	15.29	68.96
35.	IC45346	12.46	31.35	18.21	67.50	1.03	9.62	7.90	17.71	15.68	85.70
36.	IC33275	17.04	33.34	22.20	45.53	0.89	8.30	6.88	23.94	16.62	44.24
37.	IC44418	12.00	42.58	20.20	81.58	1.12	10.60	8.61	28.35	21.27	52.43

Sl. No.	Genotypes	Yield parameters							Quality parameters		
		FL	FD	NFV	AFW	FYPV	FYPP	FYPH	FT	CS	AAC
38.	BGK Local 4	18.62	25.26	16.72	76.00	1.01	9.37	7.79	18.37	12.90	87.41
39.	MC-5	13.60	25.60	18.21	44.59	0.80	7.41	6.18	12.33	12.91	86.02
40.	MC-2	6.24	19.22	17.19	11.58	0.23	2.18	1.74	5.16	9.85	39.88
41.	PVIG-2	10.20	35.87	15.60	11.26	0.31	2.80	2.37	23.82	17.37	51.09
42.	IC505632	14.38	29.91	13.85	66.13	0.92	8.54	7.09	18.83	14.92	54.74
43.	Pant Karela 1	12.34	35.81	23.49	61.95	1.17	10.87	9.03	18.44	17.79	80.30
44.	Hirkani	12.58	46.33	17.88	63.51	0.95	8.83	7.32	33.02	22.91	95.30
45.	IC68335	13.10	35.25	15.80	77.72	0.87	8.10	6.61	21.98	17.57	139.16
46.	Pant karela 2	11.64	36.50	13.20	53.53	0.74	6.89	5.71	23.88	18.05	95.16
47.	MC-11	20.72	37.36	14.56	123.03	1.26	12.15	9.64	25.12	18.78	67.38
48.	Phule Green Gold	15.60	37.41	23.30	80.40	1.41	13.11	10.82	16.66	18.63	71.23
49.	Kashi Mayuri	14.64	30.65	14.44	54.80	0.78	7.33	6.01	14.23	15.45	85.92
50.	Preethi	17.44	42.76	20.20	103.62	1.82	15.24	12.58	28.65	21.17	84.85
51.	Kashi Pratishta	26.34	41.78	18.42	38.78	0.75	6.66	5.52	27.31	20.78	66.37
52.	Ranebennur Local 2	17.96	49.48	13.19	74.48	0.99	9.16	7.54	16.91	24.54	44.40
53.	Katali Vaibhav	13.63	32.61	16.56	70.60	1.15	10.66	8.93	12.44	16.09	55.41
54.	IC68294	13.92	35.57	15.87	53.74	0.85	7.88	6.51	17.23	17.53	59.38
55.	IC68295	13.52	36.53	11.22	77.95	0.86	8.04	6.65	20.20	17.98	67.39
56.	IC68232	12.00	33.46	12.22	47.11	0.56	5.21	4.27	22.64	16.78	87.15
57.	IC470943	12.34	46.24	12.40	87.18	0.82	7.63	6.35	13.06	22.72	59.58
58.	IC505629	14.18	39.50	11.47	60.38	0.68	6.36	5.23	12.57	19.72	47.82
59.	IC427694	14.54	31.33	14.80	78.66	0.74	6.88	5.63	12.42	15.78	64.54
60.	IC467681	14.83	34.83	15.01	73.90	0.82	7.64	6.24	21.87	17.39	91.79
61.	Mrutyeenjaya Green	15.88	20.81	16.84	32.14	0.56	5.07	4.20	7.10	10.18	54.70
62.	TCR-75 IC50527	14.12	24.90	15.23	48.91	0.74	6.85	5.51	13.57	12.40	84.21
63.	Davanagere Local	15.67	31.20	18.80	48.80	0.92	8.56	7.06	18.98	15.61	55.39
64.	IC450520	18.84	31.60	24.41	99.36	1.54	14.23	11.84	16.42	15.80	54.28
65.	UHSBP-215	19.68	36.20	16.33	71.54	1.26	11.35	9.31	20.48	18.20	66.72
66.	IC505623	15.34	28.40	19.41	56.87	1.11	10.32	8.62	14.64	14.16	81.80
67.	IC264699-3	17.66	24.60	19.24	61.93	1.22	11.35	9.35	20.44	12.35	93.67
68.	TCR-332 IC 505639	14.40	20.00	14.81	28.70	0.43	3.97	3.23	8.53	9.97	54.96
69.	UHSB-025	22.58	41.35	12.78	51.58	0.73	6.63	5.60	12.39	20.73	85.83
70.	IC68294	15.12	29.64	10.40	57.30	0.60	5.51	4.63	19.91	15.08	82.01
71.	TCR-505 IC622910	12.12	30.61	15.41	54.99	0.84	7.75	6.48	19.41	15.26	76.27
72.	IC541218	14.32	29.49	17.80	40.75	0.71	6.64	5.46	22.93	14.55	71.82
73.	IC264699 - 2	18.02	26.25	16.01	70.46	1.12	10.46	8.67	14.88	13.13	109.97
74.	MC-10	13.76	35.41	14.81	86.06	1.26	11.83	9.94	23.55	17.79	55.69
75.	IC470550	14.26	38.60	17.20	80.07	1.46	13.56	11.25	23.42	19.30	50.57
	Mean	15.15	32.37	16.32	63.68	0.93	8.58	7.11	17.96	16.12	74.27
	S. E±m	0.28	1.26	0.67	2.67	0.04	0.31	0.12	0.27	0.32	1.49
	CD at 5%	0.78	3.55	1.88	7.52	0.10	0.87	0.33	0.76	0.90	4.19
	CD at 1%	1.03	4.71	2.50	9.98	0.13	1.16	0.43	1.00	1.19	5.57

FL - Fruit length (cm) FD -Fruit diameter (mm) NFV- Number of fruits per vine AFW- Average fruit weight
FYPV- Fruit yield per vine FYPP- Fruit yield per plot FYPV- Fruit yield per hectare FT- Flesh Thickness
CS- Cavity size AAC- Ascorbic acid content

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