Journal of Experimental Agriculture International

Volume 46, Issue 8, Page 190-196, 2024; Article no.JEAI.119632
ISSN: 2457-0591
(Past name: American Journal of Experimental Agriculture, Past ISSN: 2231-0606)

Assessment of Bitter Gourd Genotypes for Yield and Yield Attributing Traits

Tejaswini R [a*], Kavita Kandpal [a], Varsha H D [a], Pooja Rajendra Dhange [a], Chandan Manjunath Gunaga [a] and T.S. Manjunatha Swamy [a]

[a] Department of Horticulture, University of Agricultural Sciences, GKVK, Bengaluru-65, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/jeai/2024/v46i82695

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/119632

Original Research Article

Received: 07/05/2024
Accepted: 11/07/2024
Published: 20/07/2024

ABSTRACT

The present study was undertaken at the Department of Horticulture, University of Agricultural Sciences, GKVK Bengaluru, during the *Rabi* season of 2022 using a Randomized Complete Block Design (RCBD) with three replications to evaluate eighteen bitter gourd genotypes, including the check Pusa Hybrid 6, for various yield and yield attributing traits, highlighting significant variations among them. The analysis of variance revealed significant differences among the genotypes for the studied traits. Genotype Pusa Purvi produced the maximum number of fruits per vine (46.67), whereas, Pusa Rasdar produced the least number of fruits (12.33) per vine. The longest fruits were recorded in Pant Karela 4 (24 cm) followed by Phule Green Gold (19.37 cm) and Priya (19 cm), whereas, the smallest fruits were found in Pusa Purvi (5.07 cm). The genotype Pusa Rasdar exhibited the maximum fruit diameter (6.53 cm) and highest fruit weight (148.14 g), while Pusa Purvi exhibited the minimum diameter (2.72 cm). The genotype Konkan Tara (1.96 kg) followed by

**Corresponding author: E-mail: tejaswini012000@gmail.com;*

Cite as: *R, Tejaswini, Kavita Kandpal, Varsha H D, Pooja Rajendra Dhange, Chandan Manjunath Gunaga, and T.S. Manjunatha Swamy. 2024. "Assessment of Bitter Gourd Genotypes for Yield and Yield Attributing Traits". Journal of Experimental Agriculture International 46 (8):190-96. https://doi.org/10.9734/jeai/2024/v46i82695.*

Pusa Rasdar (1.79 kg) and Priya (1.60 kg) exhibited the maximum fruit yield per vine. These genotypes may be selected as parents in further breeding programme to improve the crop in terms of yield traits.

Keywords: Bitter gourd; variability; evaluation; yield; traits.

1. INTRODUCTION

Bitter gourd (*Momordica charantia* L.) holds a prominent position as a cucurbitaceous vegetable cultivated throughout India during the warm season for its tender fruits, which is commonly called as Balsam pear or bitter cucumber or bitter melon (English), Hagalakayi (Kannada), Karela (Hindi) etc. The genus *Momordica* encompasses several other species including *M. balsamina, M. cochinchinesis, M. dioca, M. denudate, M. macrocarpa, M. subangulata and M. tuberosa.* Bitter gourd is diploid having chromosome number 2n=22 and has its origin in the Indo-Burma region [1-4].

Leading countries in bitter gourd production include India, Indonesia, Malaysia, China and Tropical Africa. Major bitter gourd cultivating states in India are Madhya Pradesh, Chhattisgarh, Tamil Nadu, Andhra Pradesh, Odisha and Bihar. Its cultivation is widespread in India's tropical and sub-tropical regions, with a total area of 109.51 thousand hectares, production of 1375.82 thousand tonnes and a productivity of 12.56 MT [5].

Bitter gourd is known for its various health benefits, including its reported wormicidal effect and its role as a laxative and digestion stimulant. The bitter taste of bitter gourd is attributed to certain compounds, including the cucurbitacin-like alkaloid momordicine and triterpene glycosides such as momordicoside K and L [6,7]. The antidiabetic properties of bitter gourd have garnered significant attention in recent years. Extensive research over the past decade has revealed the presence of a hypoglycemic compound called "charantin" [8]. In terms of vitamins, it is a source of 126.0 mg of vitamin A and 96.0 mg of vitamin C [9].

Bitter gourd, with its monoecious nature and high degree of heterozygosity, primarily undergoes cross-pollination. Its medicinal and nutritional value have increased its commercial significance, leading to consistent consumer demand throughout the year. Given its wide variability, monoecious nature, conspicuous and accessible flower architecture for crossbreeding, and high seed production per fruit, bitter gourd can serve as a potent material for exploiting heterosis on a commercial scale [10]. Therefore, the objectives of the study were to evaluate the bitter gourd genotypes for their yield and yield attributing traits to identify the best genotypes that can be utilized for further breeding programme.

2. MATERIALS AND METHODS

The experiment was conducted in the eastern dry zone of Karnataka at the Department of Horticulture, University of Agricultural Sciences, Bangalore. The experimental site was located at 12^{o} 58’ North latitude and 77^{o} 35’ East longitude with an altitude of 830 m above Mean Sea Level (MSL). The experimental site majorly consisted of red sandy loam soil with pH of 6.56 and the average rainfall in this area is 679.1 to 888.9 mm. Eighteen genotypes including check Pusa Hybrid 6 collected from various sources (Table 1) for the experiment were evaluated during the *Rabi* season of 2022 using a Randomized Complete Block Design (RCBD) with three replications. Bitter gourd seeds which were pre-soaked for about 12 hrs were sowed in beds at a spacing of 2.0 x 2.0 meters under open field condition by adopting recommended package of practices (Plate 1). Data recorded on five randomly selected plants from each genotype for yield traits *viz.*, fruit length (cm), fruit diameter (cm), average fruit weight (g), number of fruits per vine and yield per vine were statistically analysed by following the method given by Panse and Sukhatme [11].

3. RESULTS AND DISCUSION

The mean values for all genotypes, including the check Pusa Hybrid 6, across yield attributing traits are summarized in Table 2. Significant variations were observed among the genotypes for all the traits studied (Plate 2). Genotype Pant Karela 4 (24.00 cm) exhibited the longest fruits, followed by Phule Green Gold (19.37 cm), Priya (19.00 cm), and Pusa Do Mausami (18.43 cm), all surpassing the check Pusa Hybrid 6 (18.33 cm). Conversely, Pusa Purvi (5.07 cm) produced the smallest fruits among the evaluated

genotypes. As the length of the fruit increases, the total yield is also expected to increase in a positive direction. Similar findings were reported by Ullah et al. [12] Ranjan et al. [13] in cucumber and Hossain et al. (2016), Yadav et al. [14] in bitter gourd.

The maximum fruit diameter was recorded in Pusa Rasdar (6.53 cm), followed by Konkan Tara (5.24 cm) and Pusa Vishesh (4.68 cm), with percentage reductions over the control of 43.20%, 14.19%, and 2.63%, respectively. Whereas, Pusa Purvi (2.72 cm) exhibited the minimum fruit diameter with a reduction of -40.35% over the control. These findings align closely with those reported by Rani [10] and Khan et al. [15] in bitter gourd.

Among the genotypes evaluated for average fruit weight, Pusa Rasdar succeeded in achieving a maximum fruit weight (148.14 g) which was significantly higher than all the other genotypes. Additionally, average fruit weight was observed in Pant Karela 4 (79.93 g), Konkan Tara (74.70 g), Phule Green Gold (70.42 g), Priya (66.69 g), and Konkan Karali (68.83 g). The genotypes such as Punjab 14 (66.10 g), Hirkani (64.62 g), CO 1 (65.00 g), Preethi (65.00 g), Pusa Vishesh (60.00 g), and Pant Karela 1 (58.00 g) were on par with the control Pusa Hybrid 6 (61.40 g). In contrast Pusa Purvi (15.33 g) exhibited the smallest fruit weight, with a substantial reduction of -75.03% compared to the control. The significant variations in fruit weight might have been due to fruit length, fruit width and number of fruits per vine. Similar findings are reported by Mallikarjunarao et al. [16] in bitter gourd.

The highest number of fruits per vine was observed in Pusa Purvi (46.67) followed by Konkan Tara (26.33) and Priya (24.33) whereas, the lowest was recorded in Pusa Rasdar (12.33). The results revealed that the genotypes with a smaller average fruit weight recorded highest number of fruits per vine and the variation in number of fruits per vine might be due to fruit set percentage, sex ratio and vine length.

The fruit yield per vine ranged from 0.62 kg to 1.96 kg, with an average of 1.15 kg per vine across the genotypes. Konkan Tara exhibited the highest yield per vine (1.96 kg), followed by Pusa Rasdar (1.79 kg), Priya (1.60 kg), and Punjab 14 (1.54 kg). Genotypes such as Hirkani (1.26 kg), Konkan Karali (1.35 kg) and Pant Karela 4 (1.29 kg) showed yields per vine similar to that of control Pusa Hybrid 6 (1.26 kg). In contrast, Pusa Hybrid 5 recorded the lowest yield per vine (0.62 kg). The significant variation in yield per vine might be due to fruit set percentage, sex-ratio, fruit length, number of fruits per vine, fruit weight and fruit width. These findings were supported by Yadav et al. [17] in bitter gourd.

Yield components such as fruit length, fruit diameter, fruit weight and number of fruits per vine are critical factors that significantly influence the total fruit yield per vine in bitter gourd. The evaluated bitter gourd genotypes

Table 1. List of genotypes along with their source of collection

Sl. No.	Genotypes	Source of collection
1	Punjab 14	NSC, New Delhi
2	Hirkani	MPKV, Rahuri
3	Pusa Rasdar	IARI, New Delhi
4	Pusa Purvi	IARI, New Delhi
5	Priya	KAU, Thrissur
6	Konkan Tara	KKV, Dapoli
7	Konkan Karali	KKV, Dapoli
8	Pant Karela 3	GBPUAT, Pantnagar
9	Pant Karela 4	GBPUAT, Pantnagar
10	CO 1	TNAU, Coimbatore
11	Preethi	KAU, Thrissur
12	Phule Green Gold	MPKV, Rahuri
13	Pusa Do Mausami	IARI, New Delhi
14	Pusa Vishesh	IARI, New Delhi
15	Pant Karela 1	GBPUAT, Pantnagar
16	Pusa Hybrid 4	IARI, New Delhi
17	Pusa Hybrid 5	IARI, New Delhi
18	Pusa Hybrid 6 (Check)	IARI, New Delhi

Plate 1. General view of the experiment plot

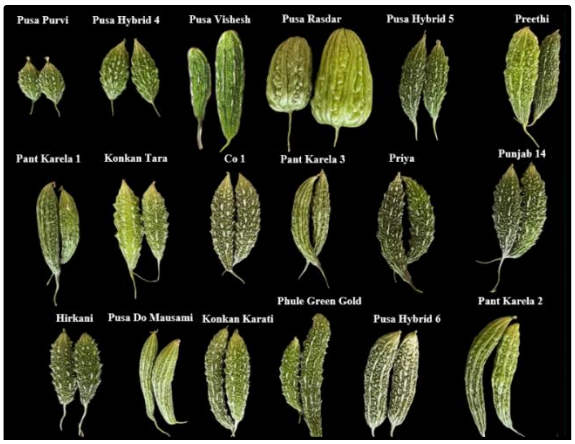

Plate 2. Phenotypic variability among bitter gourd genotypes

Table 2. Mean performance of bitter gourd genotypes for yield and yield attributing traits

Sl. No.	Genotypes	Fruit length (cm)	Percent reduction over control	Fruit Diameter (cm)	Percent reduction over control
1	Punjab 14	14.60	-20.35	3.97	-12.94
2	Hirkani	14.00	-23.62	4.31	-5.48
3	Pusa Rasdar	13.50	-26.35	6.53	43.20
4	Pusa Purvi	5.07	-72.34	2.72	-40.35
5	Priya	19.00	3.66	4.16	-8.77
6	Konkan Tara	15.83	-13.64	5.24	14.91
7	Konkan Karali	12.83	-30.01	2.74	-39.91
8	Pant Karela 3	17.33	-5.46	3.26	-28.51
9	Pant Karela 4	24.00	30.93	3.26	-28.51
10	CO 1	10.33	-43.64	3.24	-28.95
11	Preethi	13.17	-28.15	3.97	-12.94
12	Phule Green Gold	19.37	5.67	3.98	-12.72
13	Pusa Do Mausami	18.43	0.55	3.01	-33.99
14	Pusa Vishesh	16.43	-10.37	4.68	2.63
15	Pant Karela 1	15.34	-16.31	3.53	-22.59
16	Pusa Hybrid 4	8.52	-53.52	3.62	-20.61
17	Pusa Hybrid 5	11.52	-37.15	4.20	-7.89
18	Pusa Hybrid 6 (Check)	18.33	0.00	4.56	0.00
	C.V	3.72	-	2.98	-
	SE(m)	0.32	-	0.07	-
	C.D @ 5%	0.92	-	0.20	-

Table 2 (Contd.). Mean performance of bitter gourd genotypes for yield and yield attributing traits

Sl. No.	Genotypes	Average fruit weight (g)	Percent reduction over control	No. of fruits per vine	Percent reduction over control	Yield per vine (kg)	Percent reduction over control
1	Punjab 14	66.10	7.65	23.33	14.76	1.54	22.22
2	Hirkani	64.62	5.24	19.33	-4.92	1.26	0.00
3	Pusa Rasdar	148.14	141.27	12.33	-39.35	1.79	42.06
4	Pusa Purvi	15.33	-75.03	46.67	129.56	0.70	-44.44
5	Priya	66.69	8.62	24.33	19.68	1.60	26.98
6	Konkan Tara	74.70	21.66	26.33	29.51	1.96	55.56
7	Konkan Karali	68.83	12.10	19.67	-3.25	1.35	7.14
8	Pant Karela 3	55.82	-9.09	16.33	-19.68	0.91	-27.78
9	Pant Karela 4	79.93	30.18	16.33	-19.68	1.29	2.38
10	CO 1	65.00	5.86	15.67	-22.92	1.00	-20.63
11	Preethi	65.00	5.86	14.67	-27.84	0.94	-25.40
12	Phule Green Gold	70.42	14.69	15.33	-24.59	1.05	-16.67
13	Pusa Do Mausami	57.50	-6.35	16.00	-21.30	0.94	-25.40
14	Pusa Vishesh	60.00	-2.28	13.67	-32.76	0.82	-34.92
15	Pant Karela 1	58.00	-5.54	14.33	-29.51	0.80	-36.51
16	Pusa Hybrid 4	40.20	-34.53	22.67	11.51	0.91	-27.78
17	Pusa Hybrid 5	45.70	-25.57	13.67	-32.76	0.62	-50.79
18	Pusa Hybrid 6 (Check)	61.40	0.00	20.33	0.00	1.26	0.00
	C.V	4.91	-	5.08	-	4.12	-
	SE(m)	1.83	-	0.57	-	0.03	-
	C.D @ 5%	5.26	-	1.64	-	0.08	-

showed significant phenotypic variability for fruit weight, fruit length, fruit diameter, number of fruits per vine and yield per vine. The variations in yield and yield-related traits among genotypes can be attributed to their distinct morphological and physiological features, which influence the distribution of carbohydrates from the source to the sink, resulting in differing yields.

4. CONCLUSION

Identifying genotypes that excel in yield attributing components is crucial for future breeding programs and enhancing bitter gourd production. Genotypes like Konkan Tara, Pusa Rasdar, Priya, Phule Green Gold and Pant Karela 4 showed superior traits such as larger fruit length, fruit diameter and higher yields, making them promising for cultivation. Conversely, Pusa Purvi, despite its smaller fruit size, produced the highest number of fruits per vine, indicating potential balance between fruit size and yield quantity. These findings contribute to the understanding of bitter gourd genetics and offer insights for breeding programs aimed at developing varieties with improved agronomic traits suited to diverse agricultural conditions.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ankitha MO, Bindu MR, Bhaskar Reddy S, Anand S. Divergence Analysis of Bitter Gourd Genotypes for Yield and Yield Attributes". International Journal of Plant & Soil Science. 2023;35 (13):95-101. Available:https://doi.org/10.9734/ijpss/2023/v35i132992.
2. Bhati, Sachin, Satya Prakash, Vipin Kumar, Bijendra Singh, Manoj Kumar Singh, LK. Gangwar, Deepak Kumar, Vishal Gangwar, and Avdhesh Kumar. Genetic Variability, Heritability and Genetic Advance for Yield and Yield Contributing Characters in Bitter Gourd (*Momordica charantia* L.) Genotypes. International Journal of Environment and Climate Change. 2023;13 (9):1867-75. Available:https://doi.org/10.9734/ijecc/2023/v13i92418.
3. Mallikarjuna KN, Tomar BS, Mangal M, Singh N, Singh D, Kumar S, Jat GS. Qualitative and quantitative genetic variations in bitter gourd (*Momordica charantia* L.). Genetic Resources and Crop Evolution. 2024;1-19.
4. Hazra P, Hazra S, Acharya B, Dutta S, Saha S, Mahapatra P, Ghosh SK. Diversity of nutrient and nutraceutical contents in the fruits and its relationship to morphological traits in bitter gourd (*Momordica charantia* L.). Scientia Horticulturae. 2022;305: 111414.
5. Anonymous, Indiastatagri; 2022. Available:www.indiastatagri.com/data/agriculture/bittergourd/data-year/all-years
6. Jeffrey C. A review of the cucurbitaceae. The Botanical Journal of the Linnean Society. 1980;81(3):233-247.
7. Okabe H, Miyahara Y, Yamauchi T. Studies on the constituents of Momordica charantia L. IV. Characterization of the new cucurbitacin glycosides of the immature fruits. (2) Structures of the bitter glycosides, momordicosides KL. Chemical and Pharmaceutical Bulletin. 1982;30 (12):4334-4340.
8. Yeh GY, Eisenberg DM, Kaptchuk TJ, Phillips RS. Systematic review of herbs and dietary supplements for glycemic control in diabetes. Diabetes Care. 2003; 26(4):1277-1294.
9. Gopalan C, Rama Sastri BV, Balalsubramanian SC. Nutritive value of Indian foods. 2nd Ed. Hyderabad. National Institute of Nutrition, IGMR; 1993.
10. Rani KR. Performance of bitter gourd genotypes for yield and earliness. Annals of Plant and Soil Research. 2014;16 (4):330-333.
11. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. Statistical methods for agricultural workers. 1954: 347.
12. Ullah MZ, Hasan MJ, Chowdhury AZMKA, Saki AI, Rahman AHMA. Genetic variability and correlation in exotic cucumber (*Cucumis sativus* L.) varieties. Bangladesh Journal of Plant Breeding and Genetics. 2012;25(1):17-23.
13. Ranjan P, Gangopadhyay KK, Bag MK, Roy A, Srivastava R, Bhardwaj R, Dutta M.

Evaluation of cucumber (*Cucumis sativus* L.) germplasm for agronomic traits and disease resistance and estimation of genetic variability. Indian Journal of Agricultural Sciences. 2015;85:234–239.

14. Yadav M, Singh DB, Chaudhary R, Singh D. Genetic variability in bitter gourd *(Momordica charantia* L.). Journal of Horticultural Sciences. 2008;3(1):35-38.
15. Khan MH, Bhuiyan SR, Saha KC, Bhuyin MR, Ali ASMY. Variability, correlation and path co-efficient analysis of bitter gourd (*Momordica charantia* L.). Bangladesh Journal of Agricultural Research. 2015;40 (4):607-618,
16. Mallikarjunarao K, Pradhan R, Hari Ram KB. Varietal Evaluation of Bitter Gourd (*Momordica charantia* L.) In Paralakhemundi, Gajapati District. Indian Journal of Natural Sciences. 2020;10(60): 24152-24155.
17. Yadav M, Chaudhary R, Chandra A, Mehta AK. Genetic variability of different genotypes of bitter gourd (*Momordica charantia* L.). The Allahabad Farmer. 2004;2:70-76.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/119632