EVALUATION OFADVANCE GENERATION BREEDING LINES OF BITTER GOURD FOR YIELD AND QUALITY TRAITS

Abstract

The present study was conducted at the College of Horticulture and Forestry, Punjab Agricultural University, Ludhiana during the summer season of 2021 and 2022. Plant material consisted of 49 advance breeding lines of bitter gourd including 2 checks namely Punjab-15 (local check) and Prachi (commercial check) in simplelatticedesignof7x7withtworeplications. Evaluation was done for different yield and quality traits. Among the test entries,range for marketable yield*per*plant varied from 476.61 to 2102.86 and it was highest in PAUBG-1521 (2102g/plant) followed by PAUBG-200, PAUBG-211, PAUBG-208 and PAUBG-1514 performed better over the checks and lowest in PAUBG-222 (476.02g/plant).Number of fruits*per*plant,fruit length, fruit weight, total soluble sugar, non-reducing sugar and momordicine content was highest in PAUBG-1521 (33.56), (14.23cm), (61.18g) (9.29 g/100g), (7.25 g/100g) and (50.21mg/100g) respectively.

Keywords: Bitter gourd, advance breeding lines, marketable yield, earliness, biochemical parameters.

Introduction

Bittergourd(*Momordicacharantia*L.)isapopularsummerseasonvegetablecropoffamilycucurbitaceae. It is commonly known as bitter melon, karela and balsam pear etc. It is believed to beoriginated in tropical Asia, particularly eastern India state. In India, the leading bittergourd producing states are UttarPradesh, Orissa,Maharashtra,AndhraPradesh, Tamilnadu,Kerala Gujarat,Rajasthan andPunjab.Thegenus*Momordica*derivesitsnamefromtheLatinword‘mordeo’(momordi = to bite) in allusion to the bitten appearance of the grooved margins of the seeds. Amongthecultivatedcucurbits,bittergourd(*Momordicacharantia*L.)isoneofthemostimportantvegetables grown throughout the country. It belongs to family–Cucurbitaceae, subfamily cucurbitodeae, tribe-JoliffeaeandsubtribeThalithaneae.Bittergourdbelongstogenus*Momordica*whichincludesapproximately 59 species (Schaefer and Renner 2010).

It is an ancient medicinal vegetable crop due to presence of different kinds of biochemicals whichact as antioxidant, antimicrobial, antidiabetic antiviral, anti-hepatotoxic and antiulcers (Welthinda*etal*1986).Bittertasteoffruitsandotherplant partsisduetothepresenceofmomordicinealkaloid. Thefruits of bittergourdpossesesantidiabetic properties due to the presence of hypoglycaemic substance “charantin” and ithelpsinreducingbloodsugar(Jeffrey1980andOkabe*etal*1982).

Fruit yield is the most important component in crop improvement and is directly influencedby the other yieldrelated variables. Desirable genotypes should be chosen based on yield as well as otheryieldrelatedcharacteristics.Informationontheyieldandyield-relatedcontributing factors is important for selection of the available genetic stocks in bittergourdcropdevelopment program(Chinthan*etal*2021).Thedevelopmentandselectionofmaterialforearliness, high yield and quality are important aspects to be addressed to strengthenthe breeding material of bittergourd for future use and for commercialization.Objective of present experiment was to study evaluation of bittergourd advance lines with desirable agronomic traits and important quality traits.

Materialsand methods

The experimental plant material comprised of 49 advance breeding lines of bitter gourd. Theselines wereevaluatedinasimplelatticedesignof7x7withtworeplicationsduringspringsummerseasonof2021and 2022.Seedsofeachbittergourdentrywillbesowninplugtraysfilledwiththemixtureofcocopeat,vermiculite andperliteintherationof 3:1:1 from last week of February to first week of March. Seedsofeachbittergourdentryweresowninplugtraysfilledwiththemixtureofcocopeat,vermiculiteandper liteintheratioof 3:1:1 in 3rd week of February. Ten plants of each entry per replicationweretransplantedin 4th week ofAprilonraisedbedsofwidth1.5matplanttoplantspacing 45 cm. The crop will be raised using recommended Package of Practices of Vegetables by PunjabAgriculturalUniversity,Ludhiana.

The datawerecollectedon the anthesis of first male flower, anthesis of first female flower, node at which first male flower appear, node at which first female flower appear, anthesis of 50*per cent* female flower, anthesis of 50*per cent* male flower, internodal length, fruit weight, fruit length, fruit breadth, number of fruits per plant, vine length, marketable yield/plant, number of seeds*per*fruit, 100 seed weight. moisture content, total soluble sugar, reducing sugar, non-reducing sugar, vitamin c content, carotene content, momordicine content andphenols. The data were analysed by SAS open data analysis software.

Results and discussion

Days to first male flower the range was 53.17 to 61.34 days in genotypes PAUBG-93 and PAUBG-370 respectively. Days to first female flower the range was 60.50 to 75.86 days in genotypes PAUBG-400 and Punjab Kareli-1 respectively. Similarly**,** Saranyadevi *et al* (2017) recorded that the days to first male flower after transplantingthe range was20.66 to 30.21 days in genotypes MC-18 and MC-1 respectively. Similar findings were communicated by Priyadarshini *et al* (2018) recorded that the days to first female flower the range was 38.83 to 60.50 days in genotypes MCM-11and MCM-18 respectively.

PAUBG-336 (60.50) reportedminimum days to anthesis of 50*per cent* male flower followed by PAUBG-265 (61.50) and PAUBG-366 (74.50) took the maximum days to anthesis of 50*per cent*

male flower followed by PAUBG-370 (73.25). Genotypes PAUBG-400 (64.75) were the minimumdays to anthesis of 50*per cent* female flower followed by PAUBG-394 (65) and maximum days was PAUBG-210 (78.75) followed by Punjab Kareli-1 (77.75). Similarly**,** Adarsh *et al* (2019) recorded that the days to 50% flowering highest in the genotype Konkan tara (54.02) and minimum in Pusa Aushadhi (38.12).

Genotype PAUBG-218 (1.56) flowered on the lowest node and PAUBG-265 (7.0) flowered on the highest node. The highest node to first female flower was in PAUBG-265 (11.52) followed by PAUBG-210 (10.64) with the lowest node to first female flower on PAUBG-128 (4.45) followed by PAUBG-239 (4.47).Similar observation where node number 1st pistillate flower (10.21days) was observed early in Pusa Aushadhi bitter gourd variety (Adarsh *et al* 2019).

The maximum internodal length was in PAUBG-400 (11.46 cm) followed by PAUBG-390 (11.12 cm) and the minimum internodal length in Punjab-14 (4.40 cm) followed by PAUBG-239 (4.50 cm). Similarly, results were recorded to Thakur *et al* (2018) where the longest internodal length was in genotypes Charu (10.16 cm) followed by Arushi91 (9.41 cm) while the shortest internodes were in Solan Hara (7.75 cm) followed by Punjab-14 (7.96 cm).

The average individual fruit weight was maximum in variety PAUBG-1521 (61.18g) and minimum in line PAUBG-281 (25.80g). Similar trends were observed to Priyadarshini *et al* 2018 where the highest individual fruit weight was noted in MCM -21 (9.37 g) followed by MCM-19 (9.08 g) and the lowest was MCM-20 (3.19 g).

In case of fruit length was maximum in PAUBG-1521 (14.23cm) followed by Punjab kareli-1 (13.07 cm) and minimum in the genotypes PAUBG-281 (5.46 cm). The results are in-line with Priyadarshini *et al* 2018 reporting that the longest fruit was noted in MCM-17 (8.22 cm) followed by MCM-19 (5.51 cm) fruit length in bitter gourd.

Fruit breadth was maximum in line PAUBG-331 (4.84cm) followed by PAUBG-218 (4.40 cm) and minimum in line Punjab Kareli-1 (1.62 cm) followed by PAUBG-344 (2.74 cm). Triveni *et al* (2022) recorded similar results in bitter gourd where maximum fruit width was observed in IC 113875 (5.82 cm), while the minimum was recorded in IC 85626 (4.21 cm).

Number of fruits*per*plant was highest in PAUBG-1521 (33.56) followed by PAUBG-200 (32.94) and minimum in genotype PAUBG-301 (8.01).Similar results were observed as Priyadarshini *et al* (2018) where the genotypes MCM-23 (89.67) was found to greatest number of fruits.

Marketable yield/plant was maximum in PAUBG-1521 (2102g) followed by PAUBG-200 (2092) and minimum in PAUBG-222 (476.61g). Similar results were recorded by Thakur *et al* (2018) where the highest fruit yield/per plant was in ‘Prachi’ followed by ‘Preeti’; the lowest fruit yield/plant was in ‘Solan Hara’ followed by ‘Charu’. Fruit yield per plant in bitter gourd ranges from 0.57-2.68 kg.

Vine length was maximum in Punjab-15 (436.63cm) followed by PAUBG-394 (435.71 cm) and minimum in Punjab-14 (216.58cm) followed by PAUBG-93 (250.83 cm). Similarly, Adarsh *et al*

(2019) recorded that vine Length was observed highest in bitter kathi (294 cm).

The maximum number of seeds were observed in line PAUBG-226 (39.42) followed byPAUBG-213 (35) and minimum in genotype PAUBG-204 (6.85) followed by PAUBG-128 (7.95). Priyadarshini *et al* (2018) showed that similar results were found among the thirty genotypes, with the highest number of seeds*per*fruit being observed in MCM-22 (13.80) followed by MCM-11 (12.27), MCM-17 (11.80) in bitter gourd.

Hundred seed weight was recorded maximum in PAUBG-358 (24.99g) followed by PAUBG-353 (22.37g) and minimum in PAUBG-581 (9.45g) followed by PAUBG-238 (13.55g). The similar results were noticed to Priyadarshini *et al* (2018) where the highest 100 seed weight was observed in MCM-21 (13.17) followed by MCM-22 (12.71), MCM-23 (12.01) in bittergourd.

The maximum moisture content was observed in line PAUBG-120 (93.18) followed by PAUBG-209 (92.93) and minimum in genotype PAUBG-344 (86.44) followed by PAUBG-366 (86.66). Similar results were recorded by Sidhu *et al* (2017) where the maximum mean was observed in line PBBG-31 (96.05) and minimum in genotype WBBG-6 (88.54) with an overall mean of (91.71).

The total soluble sugars were maximum in the genotypes PAUBG-1521 (9.29) followed by PAUBG-353 (8.07) and minimum in PAUBG-127 (1.00) followed by PAUBG-128 (1.19). Similar results were recorded by Adarsh *et al* (2019).

The reducing sugar was maximum in the genotypes PAUBG-208 (3.76) followed by PAUBG-120 (3.47) and minimum in PAUBG-200 (0.44) followed by PAUBG-222 (0.69). Similar results were recorded to Sidhu *et al* (2017) where the treatment mean ranged from 0.575 for PBBG-10 to 2.4 for PBBG-9 variety.

Non-reducing sugar was lowest in the genotype PAUBG-226 (0.22) followed by Punjab-15 (0.30) and PAUBG-1521 showed highest mean of (7.51) followed by PAUBG-353 (6.85). Similar results were recorded by Sidhu *et al* (2017) where the genotype PBBG-1 showed lowest mean value of 0.6 in the genotype PBBG-7 and PBBG-6 showed highest mean value of 2.35 and the grand mean was 1.60.

The Total phenol was maximum in genotype PAUBG-93 (1.98) followed by PAUBG-353 (1.92) and minimum in PAUBG-390 (0.71). Similar results were noted by Adarsh *et al* (2019) where total phenol was highest in the genotype BRBTW (9.17mg/100g) and lowest total phenol was observed in Jhalari (1.31 mg/100g).

The line PAUBG-229 showed highest content of total carotene (1.99mg/100g) followed by PAUBG-222 (1.49mg/100g) and lowest was observed in variety PAUBG-215 (0.14mg/100g). Behera and Kaur (2006) obtained similar results where DBTG-8 had the highest total carotenoids content (3.2mg), followed by DBTG-9 (3.0mg), DBTG-101 (2.9mg), DBTG-6 (2.8mg), DBTG-4 (2.7mg),

and DBTG-2 (2.7mg) (2.6mg).

The line PAUBG-1521 recorded maximum momordicine content (50.21 mg/100g) followed by PAUBG-208 (48.48 mg/100g) and minimum was observed PAUBG-353 (14.43 mg/100g). Similar results were also recorded by Sathish *et al* (2020) where the maximum momordicine content (1.98 mg-g-1) was recorded in progeny P1 × P4 while minimum in P2 × P4 (1.87 mg-g-1).

The Vitamin C content was highest in PAUBG-1514 (130.95mg/100g) followed by PAUBG-213 (125.44 mg/100g) and was lowest in PAUBG-331 (30.94mg/100g). Similar results have been noted by Behera and Kaur (2006) where the highest amount of ascorbic acid was found in genotype DBTG-3 (122.07 mg) followed by DBTG-8 (120.53 mg) and lowest was DBTG-5 (92.15).

Table 1: Mean performance of genotypes for different agronomic and quality traits based on pooled data of 2021 and 2022

Genotypes	Anthesis of 1st ♂ flower	Anthesis of 1st♀ flower	Anthesis of 50% ♂ flower	Anthesis of 50% ♀ flower	Node at which 1st♂ flower appears	Node at which 1st♀ flower appears	Internodal length (cm)	Fruit weight (g)	Fruit length (cm)	Fruit bredth (cm)	Number of fruits/ plants	Marketable yield/ plant (g)	Vine length (cm)	Number of seeds/ plants	Hundred seed weight (g)	Moisture (g/100g)	Total soluble sugar (g/100g)	Reducing sugar (g/100g)	Non reducing sugar (g/100g)	Total phenol (mg/100g)	Momordicine (mg/100g)	Carotene (mg/100g)	Vitamin C (mg/100g)
PAUBG-93	53.17	67.29	68.25	70.86	2.51	7.67	5.24	37.04	9.73	3.48	26.86	1032.01	250.83	8.69	18.29	88.36	3.30	0.94	2.51	1.98	22.35	0.22	64.91
PAUBG-120	58.83	65.84	63.75	68.00	2.91	7.91	5.85	37.6	8.53	4.20	26.52	1034.77	347.09	12.41	19.53	93.18	1.20	3.47	2.27	1.36	30.06	0.34	94.93
PAUBG-127	60.78	65.78	66.50	66.25	2.40	7.20	5.92	49.68	8.87	2.78	12.54	656.58	254.58	23.35	17.00	88.35	1.00	1.90	0.92	1.42	28.86	0.44	84.02
PAUBG-128	63.33	66.95	66.75	70.25	1.97	4.45	5.32	58.64	11.5	3.94	12.3	715.60	257.92	7.95	19.12	89.76	1.19	2.61	1.41	1.66	25.38	0.80	95.47
PAUBG-200	66.00	71.67	72.75	73.00	2.58	7.65	7.92	60.25	9.99	4.13	32.94	2092.37	318.42	34.29	21.61	91.70	5.63	0.44	5.16	0.96	15.54	0.60	89.21
PAUBG-204	57.17	65.06	64.50	70.25	4.47	8.44	7.93	59.59	10.82	3.54	11.85	758.87	334.37	6.85	17.57	91.41	1.28	2.60	1.31	1.20	18.75	0.43	59.02
PAUBG-208	62.83	68.14	68.00	71.25	2.96	7.92	5.82	48.84	9.22	3.80	31.54	1675.58	370.13	21.60	20.48	90.60	1.30	3.76	2.46	1.16	48.48	0.41	84.68
PAUBG-209	61.33	65.39	68.25	72.00	3.96	10.37	5.92	50.33	8.33	3.55	26.7	1378.54	339.38	20.17	18.64	92.93	1.20	2.74	1.55	1.49	36.30	0.33	78.64
PAUBG-210	67.50	74.82	71.00	78.75	1.82	10.64	6.02	44.07	8.99	3.82	20.7	904.22	291.38	20.91	19.26	89.18	7.38	1.54	5.84	1.75	15.69	0.55	36.33
PAUBG-211	65.50	66.84	73.00	73.50	3.99	6.69	4.89	60.51	11.22	3.66	26.98	1786.27	246.25	23.46	17.73	89.03	4.76	1.43	3.30	1.31	17.92	0.22	120.35
PAUBG-213	65.17	67.31	66.50	72.25	2.55	5.64	5.39	59.75	10.71	3.76	16.45	1030.34	315.08	35.00	16.83	89.04	3.53	1.44	2.06	1.34	32.91	0.60	125.44
PAUBG-215	68.00	71.15	67.25	75.75	2.36	8.79	5.18	56.78	10.65	3.77	17.41	801.23	326.88	33.98	19.45	88.44	2.14	2.29	0.51	1.30	14.46	0.14	105.63
PAUBG-218	64.84	67.81	70.75	73.00	1.56	9.02	6.94	58.26	10.48	4.40	23.21	1348.28	371.47	25.34	16.50	90.46	2.58	2.21	0.56	1.42	15.72	0.42	100.89
PAUBG-219	66.17	73.30	69.25	76.00	2.98	8.57	5.15	60.16	11.68	3.30	17.65	973.12	373.60	15.72	17.69	88.15	1.64	3.18	1.54	1.50	18.48	0.17	116.07
PAUBG-222	58.50	65.28	62.00	69.75	2.42	7.78	5.76	49.59	10.35	3.73	10.75	476.61	311.46	10.20	19.46	90.12	1.80	0.69	1.11	1.14	30.12	1.49	57.49
PAUBG-226	64.83	65.83	64.50	71.75	1.89	9.25	8.39	48.46	12.43	3.83	19.54	1156.87	309.25	39.42	21.41	91.74	1.95	2.05	0.22	1.12	19.29	0.17	60.78

Genotypes	Anthesis of 1st ♂ flower	Anthesis of 1st♀ flower	Anthesis of 50% ♂ flower	Anthesis of 50% ♀ flower	Node at which 1st♂ flower appears	Node at which 1st ♀ flower appears	Internodal length (cm)	Fruit weight (g)	Fruit length (cm)	Fruit bredth (cm)	Number of fruits/ plants	Marketable yield/ plant (g)	Vine length (cm)	Number of seeds/ plants	Hundred seed weight (g)	Moisture (g/100g)	Total soluble sugar (g/100g)	Reducing sugar (g/100g)	Non reducing sugar (g/100g)	Total phenol (mg/100g)	Momordicine (mg/100g)	Carotene (mg/100g)	Vitamin C (mg/100g)
PAUBG-227	60.34	65.70	63.38	68.75	2.00	5.98	9.50	48.54	9.25	4.18	15.65	750.32	371.76	8.20	19.91	91.10	4.78	1.38	3.45	1.12	14.73	0.32	114.77
PAUBG-229	65.50	67.25	63.50	71.75	3.64	8.78	7.76	34.49	9.03	3.93	15.7	573.64	264.58	17.86	21.36	89.87	1.98	1.08	0.89	1.23	15.30	1.91	111.79
PAUBG-236	64.83	68.06	66.25	72.50	2.89	8.51	7.58	42.02	8.79	3.56	23.1	950.72	372.54	9.39	17.96	92.79	2.39	1.43	0.99	1.02	24.00	0.95	38.38
PAUBG-238	57.83	63.00	62.50	69.00	2.75	5.63	8.15	36.45	6.78	3.77	27.69	942.72	365.16	30.92	13.55	89.14	5.18	1.25	3.91	1.10	24.20	0.34	83.01
PAUBG-239	56.67	60.86	61.75	66.75	2.96	4.47	4.50	30.54	7.95	3.75	30.24	1082.78	323.33	8.95	21.16	90.41	1.83	0.86	0.93	1.14	21.00	0.75	76.93
PAUBG-265	57.50	67.95	70.25	67.25	7.00	11.52	5.59	33.43	9.52	3.90	14.25	480.15	260.25	25.67	20.66	88.56	2.90	1.64	1.26	1.28	29.25	0.71	112.46
PAUBG-281	59.50	66.14	68.50	69.50	2.00	7.31	4.71	25.8	5.46	3.19	29.85	776.11	396.62	15.06	17.98	87.06	7.22	1.36	5.88	1.23	27.99	0.41	113.02
PAUBG-282	61.33	67.75	66.75	66.75	2.36	9.77	6.48	36.77	7.02	4.07	20.54	776.73	404.04	8.31	17.50	90.96	2.31	1.36	0.95	1.28	31.89	0.41	41.71
PAUBG-301	64.67	66.70	66.50	72.75	3.31	8.09	8.28	60.15	13.68	4.30	8	578.69	285.58	29.68	15.97	87.82	1.76	1.23	0.51	1.29	18.84	0.46	89.25
PAUBG-321	60.83	66.49	65.75	68.25	3.42	6.85	8.75	52.42	10.29	3.30	10.19	539.40	259.58	21.46	17.50	91.25	2.31	1.19	1.09	1.16	21.60	0.42	74.14
PAUBG-331	62.67	67.23	65.75	70.50	2.14	4.55	8.53	60.12	11.34	4.84	16.25	1204.10	322.63	22.29	17.94	92.07	1.84	1.17	0.70	1.32	16.77	1.12	30.94
PAUBG-336	56.83	64.37	60.50	68.75	2.61	7.95	5.12	53.29	8.94	3.44	14.8	785.80	361.55	23.37	20.05	90.34	1.49	1.39	0.59	1.56	18.84	1.13	114.56
PAUBG-337	58.50	67.36	67.50	70.50	2.33	6.73	8.81	61.14	8.37	3.63	19	1202.53	267.08	9.23	18.76	87.25	2.80	1.15	1.65	1.21	41.61	0.36	96.14
PAUBG-338	60.00	68.25	69.75	68.25	3.37	6.50	6.49	58.51	9.89	3.91	25.84	1381.98	392.66	12.70	13.87	87.96	4.11	1.23	2.88	1.58	30.57	0.45	110.98
PAUBG-341	63.17	64.56	63.25	69.25	4.20	8.78	6.95	42.39	12.06	3.44	30.24	1341.90	425.17	11.14	20.31	88.24	4.39	1.09	3.20	1.50	44.07	0.29	119.11
PAUBG-344	64.33	68.14	68.50	74.00	2.79	5.83	7.48	38.6	9.89	2.74	21.81	850.54	386.21	14.01	18.83	86.44	7.43	1.37	6.09	1.71	34.86	0.27	103.87
PAUBG-351	66.34	71.34	68.75	77.00	3.00	6.28	10.87	39.36	11.83	3.19	15.6	600.79	399.24	24.25	20.86	90.34	6.06	1.05	5.10	1.52	27.00	0.22	95.68
PAUBG-	67.33	69.68	69.50	77.75	3.55	5.27	6.28	54.37	10.95	3.73	18.16	886.89	407.75	25.92	22.37	88.79	8.07	1.66	6.85	1.92	14.43	0.71	87.77

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353																							
PAUBG-358	64.84	65.21	63.75	70.00	3.91	7.31	6.19	57.31	12.3	3.67	20.05	1276.71	392.67	27.66	24.99	89.63	6.79	0.92	5.87	1.59	35.10	0.62	92.28
PAUBG-366	69.50	73.59	74.50	78.75	3.59	9.06	10.68	50.63	9.47	3.61	16.4	821.48	304.21	12.50	20.71	86.66	5.86	1.26	4.62	1.67	26.13	1.05	83.64
PAUBG-370	70.17	72.06	73.25	77.75	3.31	5.51	6.96	46.97	8.25	3.63	16.8	807.54	310.17	23.34	19.85	92.66	7.43	1.14	6.25	1.59	28.38	0.62	113.05
PAUBG-375	67.67	70.08	71.00	73.75	3.26	6.47	7.24	45.33	7.21	3.49	19.6	862.70	288.54	21.15	18.69	88.78	4.74	1.24	3.53	1.62	16.42	0.79	113.54
PAUBG-390	57.00	62.31	60.75	70.50	3.20	6.98	11.12	60.64	10.05	3.32	19.05	1047.09	275.17	23.18	15.78	90.80	5.49	1.07	4.42	0.71	22.86	0.32	65.77
PAUBG-394	62.50	64.05	67.00	65.00	3.76	8.12	6.33	56.79	9.18	3.42	24.1	1371.48	435.71	27.80	18.16	90.68	4.56	1.38	3.18	1.57	26.88	0.55	36.06
PAUBG-400	58.84	61.50	64.25	64.75	3.28	8.44	11.46	34.8	9.14	3.87	20.1	719.96	329.54	14.90	15.82	88.74	6.08	1.65	4.50	0.91	24.78	0.44	101.75
PAUBG-407	55.50	64.36	64.00	70.00	3.50	8.64	5.82	39.83	11.04	3.97	21.15	832.20	292.50	12.64	20.95	88.37	7.77	1.53	6.24	1.56	19.50	0.36	92.46
PAUBG-581	58.83	63.90	65.00	70.50	3.57	7.78	6.21	43.7	7.39	2.94	24.85	1069.57	357.29	16.67	9.45	90.73	4.87	1.52	3.36	1.25	32.73	0.65	50.92
PAUBG-1514	57.50	62.55	62.50	71.50	3.25	8.71	6.11	53.8	11.02	3.92	26.16	1382.03	333.84	16.32	19.49	92.35	6.13	1.77	4.37	1.63	37.94	1.03	130.95
PAUBG-1521	61.00	67.25	66.00	70.75	2.91	10.56	10.53	61.18	14.23	3.04	33.56	2102.86	320.08	22.71	17.88	89.29	9.29	1.82	7.51	0.73	50.21	0.75	113.61
Punjab-14	59.67	70.59	62.50	74.00	3.92	8.42	4.40	42.34	7.98	3.50	24.75	993.78	216.58	9.68	15.80	89.71	1.90	2.34	0.58	1.08	35.90	0.26	60.64
Punjab-15	69.67	71.92	70.50	76.75	2.11	8.64	10.31	57.41	10.26	3.71	20.06	1181.98	436.63	13.92	16.93	89.86	1.89	1.59	0.30	1.19	30.03	0.26	82.10
Punjab kareli-1	61.79	75.86	73.50	77.75	5.13	9.11	8.00	44.31	13.07	1.62	26.58	1159.47	247.67	9.68	17.56	89.75	3.69	1.79	1.38	1.73	35.89	0.45	111.75
Prachi	63.84	66.83	67.50	72.25	3.46	7.65	8.56	48.29	8.41	4.28	27.22	1032.83	354.38	22.55	16.53	87.66	7.85	1.04	6.81	1.73	40.29	0.64	113.71
CD (5%)	5.21	6.73	5.67	4.93	0.45	1.51	0.70	4.50	1.58	0.54	2.73	128.23	52.82	2.28	1.93	2.34	0.47	0.13	0.18	0.10	2.12	0.051	6.79
CD (1%)	6.96	9.00	7.58	6.60	0.61	2.02	0.93	6.05	2.11	0.73	3.65	171.40	70.61	3.05	2.58	3.13	0.63	0.18	0.24	0.13	2.84	0.068	9.07

Conclusion

Bitter gourd (*Momordica charantia* L.) is one of the important members among the cultivated cucurbits. The present investigation was undertaken to evaluate 49 advance generation breeding lines of bittergourd for horticultural and biochemical traits. The genotypes viz. PAUBG-1521 followed by PAUBG-200, PAUBG-211, PAUBG-208 and PAUBG-1514 performed better over the checks (Punjab-15 and hybrid Prachi) in terms of marketable fruit yield. It can be concluded that, as a wide range of variation for almost all the economically important traits was present in this crop, so there is a vast scope for improvement through different breeding procedure.

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