Acta Scientific Agriculture (ISSN: 2581-365X)

Volume 1 Issue 1 June 2017

Research Article

Genetic Variability of Bittergourd (*Momordica Charantia L.*) Genotypes in India

Resmi J* and Sreelathakumary I

Department of Olericulture, College of Agriculture, India

***Corresponding Author:** Resmi J, Department of Olericulture, College of Agriculture, Vellayani, Thiruvananthapuram-695522, Kerala, India.

Received: May 24, 2017; **Published:** June 19, 2017

Abstract

The analysis of variance revealed considerable genetic diversity among elite genotypes of M. charantia for aggregate effect of most of the characters studied. Among the genotypes evaluated, MC 9 was the earliest to emerge, MC 1 was the most vigorous registering the highest values for vine length and MC 20 for internodal length. Significantly maximum number of primary branches was recorded by MC 32 and was the earliest to harvest. Maximum fruit length, fruit girth, average fruit weight and yield per plant were recorded in MC 20. Highest number of fruits per plant was recorded in MC 10. MC 32 had higher number of seeds per fruit while MC 24 recorded higher seed weight. Minimum fruit fly infestation and mosaic incidence was observed in MC 33.

Keywords: Genetic Variability; Bittergourd; Momordica

Introduction

Bitter gourd or balsam pear (*Momordica charantia* L.) belonging to the family Cucurbitaceae is a popular vegetable in India, having considerable nutritional, economic and medicinal importance. The diverse visual characters (i.e., sex expression, growth habit, maturity, fruit shape, size, color, surface texture and bitterness) of bitter gourd in India provide for relatively broad diverse plant species.

The rich variability among bittergourd genotypes have many value-added characters and will bring fruits in its improvement. The information on varietal suitability and the extent of genetic variability will be useful for the crop improvement. It is therefore, desirable to evaluate and characterize the genetic resources of bittergourd for sustainable utilization.

Materials and Methods

The experimental material consisted of 33 morphologically distinct genotypes of bittergourd collected from different agro-climatic regions of India. The details of the genotypes and their sources are presented in Table 1. These were evaluated in randomized block design with two replications at the Department of Olericulture, College of Agriculture, Thiruvananthapuram. The crop received timely management practices as per package of practices recommendations of Kerala Agricultural University (KAU, 2007). Observations were recorded on four randomly selected plants of each genotype in each replication for eleven characters viz., days to seedling emergence, vine length (cm), internodal length (cm), number of primary branches, number of secondary branches, days to first male flower, days to first female flower, node to first male flower, node to first female flower, sex ratio, days to first fruit harvest, fruit length (cm), fruit girth (cm), fruits per plant, average fruit weight (g), yield per plant (kg), seeds per fruit, 100-seed weight (g), fruit fly infestation (%) and mosaic incidence. The data were analyzed statistically.

Results and Discussion

Analysis of variance showed significant differences among the genotypes for all the characters studied indicating inherent genetic variability in the materials taken up for the study except fruit fly infestation (%). The genotypes with high mean value can directly be used for adaptation or as parents in hybridization. The mean values of 33 genotypes for different characters are presented in Table 1.

In respect of vegetative characters, ample variability was observed as evident from the wide range obtained for days to seedling emergence, vine length and internodal length. Among the genotypes evaluated, MC 9 was the earliest to emerge (6.00), MC 1 was the most vigorous registering the highest values for vine length and MC 20 for internodal length. Ram., *et al*. [8]. observed wide range of variabil-

ity for days to germination in bottlegourd. The variation in vine length might be due to the specific genetic constitution, inherent character and vigour of different genotypes. Considerable variability was reported by Ram., *et al.* [9]. for vine length and Yadav., *et al*. [19]. for internodal length in bittergourd. Number of primary branches and secondary branches recorded a high range of variation as reported by Yadav., *et al.* [18]. in bittergourd.

Days to first male and female flower plays an important role in deciding the earliness or lateness of the crop. The early and late female flower appearance helps in occurrence of early or late flush of the crop. Days to first male and female flower showed wide range of variation among the genotypes. Similar results were also reported by Rao and Rao (2008) in ridgegourd. Node to first male and female flower also recorded wide range of variability. The variation in the character days to first male and female flowering might be due to intermodal length, number of nodes and vigour of the crop. Sex ratio in the present study ranged from 15.46 to 29.13. Considerable variation for the character was also reported by Thakur., *et al.* [15]. in bittergourd and Varalakshmi., *et al*. [16]. in ridgegourd.

Days to first fruit harvest recorded narrow range of variation. Most of the genotypes are harvested within 55 days. Among the genotypes, maximum fruit weight was observed in MC 20. Other genotypes with better fruit weight were MC 22, MC 2, MC 27 and MC 26. Both fruit length and fruit girth contributed to better fruit weight in high yielders. In the present study, fruit length ranged from 4.91 to 38.83 cm. Similarly, fruit girth also varied from 6.96 to 25.53 cm, suggesting ample variability and scope for improvement for fruit size in M. charantia. Fruits per plant and yield per plant exhibited high variability as reported by Katiyar ., *et al.* [3]. in bittergourd and Ram., *et al*. [8]. (2006) in Luffa. The variation in number of fruits per plant might be due to fruit set percentage, sex ratio and vine length. Among the genotypes evaluated, fruits per plant was maximum in MC 10 (MDU^{-1}, TNAU). Other genotypes with better fruit number were MC 2 (Co^{-1}, TNAU) and MC 25 (IC 470569, NBPGR, Thrissur). All these genotypes have green fruit skin colour. MC 27, MC 32, MC 21, MC 26 and MC 22 are genotypes with light green skin colour that had better fruit number. Significant variation in yield per plant might be attributed to fruit set percentage, sex-ratio, fruit length, number of fruits per plant, fruit weight and fruit girth. This finding was supported by Shrivastava and Srivastava, (1976); Singh., *et al*. [12,14-16]. in bittergourd.

Seeds per fruit and 100-seed weight exhibited a wide range of variation from 3.00 to 38.00 and 7.15 g to 25.90 g respectively. Similar results were reported for seeds per fruit by Varghese (1991) in snake gourd and for 100-seed weight by Mathew (1999) in bottlegourd. Varieties with high fruit seed weight and fruit seed number are preferred not only to increase crop production, but also to meet the needs of the seed industry and farmers.

One of the major obstacles in the cultivation of bittergourd is the attack of pest like fruitfly, Bactrocera cucurbitae. Fruit fly infestation percentage was less than 20 per cent for all the genotypes. Mosaic disease is a major constraint in cucurbit cultivation in Kerala. Significant differences were observed among the bittergourd genotypes for mosaic incidence, which clearly indicated that the level of resistance or susceptibility to the disease varied with the genotype. Out of the 33 genotypes evaluated, ten genotypes were highly resistant, ten genotypes were resistant, ten genotypes were moderately resistant and remaining three were susceptible to the disease. Screening for mosaic resistance was also done by Rajamony ., *et al.* [7]. in culinary melon, Arunachalam (2002) in bittergourd and Resmi [1-4,9]. in ashgourd.

Among the genotypes MC 20 (Priyanka, KAU) is the highest yielder followed by MC 26 (Thripunithara, Ernakulam), MC 10 (MDU^{-1}, TNAU), MC 22 (Chathamangalam, Kozhikode) and MC 27 (Charuplasseri, Palakkad). The high yield in MC 20 may be attributed to the high fruit length, fruit girth and average fruit weight. MC 26 was characterized by low sex ratio and earliness in male and female flowering and harvest. The genotype MC 10 got highest number of fruits per plant along with higher fruit length, average fruit weight and 100-seed weight. The genotypes MC 22 and MC 27, apart from being better for most of the fruit characters like fruit length, fruit girth, average fruit weight, seed number and 100-seed weight, they also registered high values for resistance against fruit fly and mosaic disease resulting in better yield. This confirms the fact that fruit yield is a complex trait and is the ultimate expression of many component characters.

Geno-type no.	Days to seedling emergence	Vine length (cm)	Inter-nodal length (cm)	Number of primary branches	Number of secondary branches	Days to first male flower	Days to first female flower	Node to first male flower	Node to first female flower	Sex ratio
MC 1	8.25	620.00	3.55	18.00	26.25	41.25	46.25	14.50	12.25	23.14
MC 2	8.25	360.00	2.13	16.75	35.75	38.75	43.75	16.75	16.25	17.69
MC 3	6.50	303.75	4.50	12.25	26.75	35.75	40.75	7.00	12.75	23.18
MC 4	6.75	290.00	5.27	8.75	26.50	37.75	39.50	12.25	19.25	16.68
MC 5	10.25	452.50	4.48	14.00	17.25	41.75	42.00	17.75	19.00	21.79
MC 6	9.25	378.75	2.23	14.75	19.75	37.75	41.00	12.25	17.00	24.68
MC 7	9.25	463.75	3.70	11.00	16.75	36.50	40.00	10.75	13.75	22.38
MC 8	11.50	155.00	3.45	13.25	18.50	35.75	37.50	16.75	17.75	21.41
MC 9	6.00	295.00	4.60	7.75	15.25	41.75	43.50	16.25	18.50	18.81
MC 10	11.75	572.50	3.28	21.00	26.50	51.00	54.50	17.75	20.00	17.19
MC 11	6.75	182.50	3.55	8.50	21.50	36.50	40.25	11.00	15.50	20.11
MC 12	9.50	334.75	2.85	20.50	39.50	39.00	43.50	16.25	22.75	15.94
MC 13	9.00	438.75	2.93	21.50	42.50	42.00	45.75	14.00	21.25	25.74
MC 14	8.00	251.25	2.28	9.75	16.00	44.75	45.25	12.75	14.75	29.13
MC 15	7.75	500.00	3.70	13.25	24.25	36.25	39.50	12.25	16.00	15.46
MC 16	10.50	335.00	2.30	16.25	27.00	44.50	36.00	20.75	24.25	25.12
MC 17	9.50	103.75	2.23	9.50	15.50	41.50	44.00	19.50	22.50	21.97
MC 18	9.00	408.75	2.80	21.00	43.75	41.00	45.00	16.25	24.50	21.62
MC 19	9.75	362.50	3.75	14.25	20.25	41.75	48.00	22.00	28.00	20.90
MC 20	7.75	468.75	5.58	13.25	19.50	44.25	51.00	16.50	23.25	17.17
MC 21	9.25	212.50	2.55	21.00	33.00	36.50	42.50	15.00	19.50	21.69
MC 22	8.00	438.75	2.50	27.50	49.00	38.50	43.50	10.75	13.50	16.43
MC 23	9.00	295.00	1.60	12.25	20.75	44.50	55.70	21.00	29.25	25.99
MC 24	10.00	437.50	3.38	29.25	56.75	46.75	57.25	20.25	25.50	23.66
MC 25	11.50	338.75	2.45	17.00	27.50	40.50	43.50	20.75	22.00	16.49
MC 26	12.75	326.25	3.03	24.25	47.00	39.50	45.25	10.25	13.50	17.85
MC 27	8.25	346.25	2.90	20.75	32.00	40.25	41.25	13.25	13.25	18.71
MC 28	8.50	166.25	2.15	11.25	21.00	41.00	47.25	16.00	18.50	17.01
MC 29	7.25	195.00	1.83	20.00	30.25	31.50	36.25	11.50	14.50	19.92
MC 30	11.75	216.25	2.53	24.00	38.25	39.00	41.50	18.25	26.25	19.78
MC 31	10.00	197.50	3.65	20.50	31.00	37.00	45.50	19.50	22.00	20.73
MC 32	8.50	321.00	1.78	29.50	48.50	40.75	42.75	10.75	12.75	21.63
MC 33	8.00	103.75	1.25	9.00	18.50	41.00	52.75	18.50	20.50	21.28
Mean	9.03	329.45	3.05	16.71	28.86	40.19	44.30	15.42	19.09	20.64
F ratio	5.68**	32.79**	9.37**	7.29**	11.59**	5.87 **	6.56**	6.88**	6.54**	17.44**
CD	1.98	1.42	0.98	6.57	9.57	4.47	6.15	4.19	5.38	2.31

Table 1: Mean value of biometric characters in M. charantia.

* Significant at 5 % ** Significant at 1%.

Genotype No.	Days to first fruit harvest	Fruit length (cm)	Fruit girth (cm)	Fruits per plant	Average fruit weight (g)	Yield per plant (kg)	Seeds per fruit	100-seed weight (g)	Fruit fly Infestation (%)	Mosaic Incidence (V.I.)
MC 1	55.50	25.02	17.07	14.25	166.67	1.78	16.00	18.95	11.73	58.00
MC 2	58.50	23.62	15.54	31.75	236.34	4.89	22.50	17.45	4.22	40.50
MC 3	64.25	20.17	19.95	10.50	207.15	0.99	21.00	16.15	6.68	42.50
MC 4	68.00	29.18	20.08	21.00	219.05	3.09	20.00	23.75	5.77	35.00
MC 5	61.00	17.65	18.85	13.50	123.30	1.14	17.00	18.00	4.74	38.50
MC 6	51.00	17.94	11.99	23.75	109.09	2.77	24.00	20.60	2.78	47.50
MC 7	53.00	19.40	15.80	11.50	161.83	1.26	19.00	13.30	4.86	61.00
MC 8	48.00	17.80	16.37	13.75	155.50	1.36	12.50	16.65	4.56	39.00
MC 9	49.00	17.40	16.35	17.50	141.80	1.57	9.50	19.55	4.52	46.00
MC 10	56.50	33.66	8.48	34.25	183.05	4.41	16.00	25.10	4.57	38.00
MC 11	64.00	10.83	11.00	8.75	51.88	0.67	19.00	16.85	6.25	60.50
MC 12	46.90	21.52	19.55	14.50	210.70	3.08	21.00	22.05	3.14	35.00
MC 13	46.50	21.00	19.60	14.75	168.67	1.55	14.50	16.45	6.56	33.00
MC 14	52.00	17.30	15.55	13.75	128.66	1.64	13.50	18.90	4.58	39.00
MC 15	46.50	27.04	10.35	22.50	159.72	2.81	28.50	16.85	8.89	60.00
MC 16	47.00	12.95	14.75	11.75	182.50	1.32	11.50	16.25	3.16	36.50
MC 17	53.50	13.40	13.63	14.00	47.84	1.59	14.50	12.10	5.13	65.00
MC 18	55.34	20.89	14.46	9.00	140.21	0.61	25.00	23.45	8.35	37.00
MC 19	55.50	16.45	16.30	26.25	99.70	1.63	18.00	22.40	2.77	41.50
MC 20	59.55	38.83	25.53	14.75	578.75	5.89	33.00	21.60	8.75	41.00
MC 21	45.50	24.50	13.40	22.75	131.25	1.71	15.00	17.60	7.59	20.50
MC 22	50.30	27.03	19.98	21.75	262.83	4.21	23.00	17.45	5.42	19.50
MC 23	58.00	11.77	15.30	12.50	120.42	1.40	13.00	23.40	5.19	17.00
MC 24	64.50	23.40	13.83	11.75	180.30	1.84	38.00	16.95	7.22	14.00
MC 25	47.50	11.38	14.08	30.25	42.75	1.09	11.00	17.50	2.49	45.00
MC 26	46.50	28.88	14.88	22.25	234.50	4.52	25.00	22.40	4.43	16.00
MC 27	51.00	23.29	20.59	26.25	235.74	4.18	26.50	20.40	5.39	20.50
MC 28	54.00	19.10	14.70	13.25	152.08	1.36	20.50	8.70	5.31	54.00
MC 29	60.50	18.65	18.03	23.00	102.41	1.47	12.00	18.90	4.65	16.00
MC 30	52.00	16.05	14.72	16.25	95.38	0.99	15.50	17.50	8.22	62.50
MC 31	46.00	15.99	14.31	29.75	104.00	1.65	16.00	15.40	5.77	15.50
MC 32	43.50	21.50	16.44	23.75	130.25	1.01	15.50	25.90	3.01	13.00
MC 33	61.50	4.91	6.96	16.50	4.26	0.06	3.00	7.15	1.58	10.00
Mean	53.71	20.26	15.71	18.54	159.65	2.11	18.48	18.35	5.49	36.91
F ratio	6.90**	11.71 **	6.11**	6.35**	52.86**	24.63**	34.36**	10.02**	1.49	9.01**
CD	7.37	5.79	4.33	8.01	38.32	0.82	3.45	3.85	5.21	15.76

Table 2: Continued.

* Significant at 5 % ** Significant at 1%.

Bibliography

1. Arunachalam P. "Breeding for resistance to distortion mosaic virus in bittergourd". Ph.D. *Thesis, Kerala Agricultural University Thrissur* (2002).

2. Indiresh BT. "Studies on genotypic and phenotypic variability in bittergourd (Momordica charantia L.). Thesis Abstr., *University of Agricultural Science, Bangalore*". 8 (1982): 52.

3. Katiyar RS., *et al.* "Genetics of bittergourd (Momordica charantia L.)". *Indian Journal of Agricultheral Science* 66 (1982): 551-552.

4. KAU. "Package of Practices Recommendations – Crops. Directorate of Extension". *Kerala Agricultural University, Thrissur* (2007).

5. Maneesh KS., *et al.* "Genetic architecture and association analysis in bitter gourd (Momordica charantia L.) landraces". *Bioscan (Supplement on Genetics and Plant Breeding)* 9.2(2014): 707-711.

6. Mathew A. "Genetic variability in bottlegourd (Lagenaria siceraria (Mol.) Standl.) in relation to yield and yield attributes. M.Sc. (Ag.) Thesis, *Kerala Agricultural University, Thrissur*" (1999).

7. Rajamony L., *et al.* "Reaction of muskmelon collection to cucumber green mottle mosaic virus". *Journal of Phytopathology* 129 (1990): 237-244.

8. Ram D., *et al.* "Characterization and evaluation of winter fruited bottlegourd (Lagenaria siceraria (Mol.) Standl.)". *Acta Hort* 752 (2007): 231-237.

9. Ram D., *et al*. "Genetic variability and character association analysis in Luffa sp". *Indian Journal of Horticulture* 63 (2006): 294-297.

10. Rao BN and Rao PV. "Sex reversion in ridgegourd (Luffa acutangula (Roxb.) L.)". *International Journal of Tropical Agricultural* 26 (2006): 181-184.

11. Reddy BS., *et al.* "Studies on the performance of bittergourd genotypes". *Abberivated Journal List - Indian Science* 4 (2000): 103-108.

12. Resmi J. "Characterization of landraces of ashgourd (Benincasa hispida (Thunb.) Cogn.), M.Sc. (Ag.). thesis, *Kerala Agricultural University, Thrissur*". (2004).

13. Shrivastava VK and Srivastava LC. "Genetic parameter, correlation and path coefficient analysis in bittergourd (Momordica cha-rantia L.)". *Indian Journal of Horticulture* 33 (2004):66-70.

14. Singh HN., *et al.* "Genetic variability and correlation studies in bittergourd". *Indian Journal of Agricultheral Science* 47 (1977): 406-407.

15. Thakur JC., *et al.* "Genetic variability and heritability for quantitative traits and fruit fly infestation in bittergourd". *Punjab Agricultural University Journal of Research* 31 (1944): 161-166.

16. Varalakshmi., *et al*. "Genetic variability and heritability in ridgegourd (Luffa acutangula)". *Indian Journal of Agricultheral Science* 65 (1995): 608-610.

17. Varghese P. "Heterosis in snakegourd (Trichosanthes anguina L.). M.Sc. (Ag.) thesis, *Kerala Agricultural University, Thrissur*". (1991).

18. Yadav M., *et al*. "Genetic variability of different genotypes of bittergourd (Momordica charantia L.)". *The Allahabad Farmer* 2 (2004): 70-76.

19. Yadav M., *et al.* "Genetic variability in bittergourd (Momordica charantia L.)". *Journal of Horticultural Science* 3 (2008): 35-38.

Volume 1 Issue 1 June 2017