Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.5710

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (4):** 1322-1327 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Genetic variability, Heritability and Morphological Characterization in Bitter Gourd (*Momordica charatia* L.)

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Received: 1.08.2017 | Revised: 10.08.2017 | Accepted: 12.08.2017

ABSTRACT

Genetic variability and heritability were studied in 20 genotypes of bitter gourd (Momordica charantia L.) to determine the magnitude of variability in the population and to identify genotypically diverse and economically desirable genotypes for utilization in crop improvement. The experiment carried out following Randomizing block design with three replication results indicated that high phenotypic and genotypic coefficient of variation were recorded for yield per vine (71.68), weight of fruit (39.17), seed weight per fruit (37.25),length of fruit (34.16), number of seeds per fruit (32.70) and internodal distance per vine (27.15) while, moderate phenotypic and genotypic coefficient of variation were observed for number of fruits per vine (19.81), number of female flowers per vine (15.53)and days to marketable yield (5.05) indicating the extent of available genetic variability for these traits. High heritability along with high genetic advance observed for yield per vine (99.70), Weight of fruit (99.10), number of male flowers per plant(97.40),length of vine (96.00), number of seeds per fruit (91.80) and length of fruit (91.40)is indicative of additive gene action in control of these traits and phenotypic selection based on these traits in the segregating population is likely to yield desired individuals.

Key words: *Bitter gourd, Genetic advance, Genotypic & Phenotypic coefficient of variation, Heritability.*

INTRODUCTION

Bitter gourd (*Momordica charantia* L.) locally known as *Karela* is an important home garden vegetable. It is a fast growing warm seasonal climbing annual, native to South Asia. Bitter gourd is a tropical and subtropical vine of the Cucurbitaceae family. It is widely grown for edible fruit, which is among the bitter of all vegetables. Compared to other cucurbits, bitter gourd has relatively high nutritional value, in respect of iron and ascorbic acid contents[13]. Among all cucurbits vegetables bitter gourd contains the maximum amount of minerals and vitamins[7]. Genetic variability forms the basis for crop improvement. Genotypic and phenotypic coefficients of variation are useful in detecting the amount of variability present in the available genotypes.

Cite this article: Yadagiri, J., Gupta, N.K., Tembhire, D. and Verma, S., Genetic variability, heritability and morphological characterization in bitter gourd (*Momordica charatia* L.), *Int. J. Pure App. Biosci.* **5(4):** 1322-1327 (2017). doi: http://dx.doi.org/10.18782/2320-7051.5710

The main purpose of estimating heritability and the genetic parameters that compose the heritability and the genetic parameters that compose the heritability estimate is to compare the expected gains from selection based on alternative selection strategies[15]. Therefore, information on variability, heritability and genetic advance of plant characters and association among yield and quality characters are of vital importance in plant breeding programme. The present investigation thus aims at to assessing the variability by estimating phenotypic and GCV as well as heritability and genetic advance in bitter gourd (*Momordica charantia* L.) for future breeding programme.

MATERIALS AND METHODS

The experiment was conducted at College of Agriculture, Indore, RVSKVV, Gwalior (M.P.) India during the *kharif* season of 2012-13. The experimental materials of comprised 20 diverse genotypes (Table 1) of bitter gourd, which were collected from different parts of India. The experiment was laid down in Randomized Block Design (RBD) with three replications. The crop was managed as per recommended package of practices to raise the crop during *kharif* season. In each replication, seeds of each genotype were sown in 3m long rows at 1m distance between lines and 1 m between plants. Five plants of each genotype were randomly selected from each replication for recording horticultural traits. The mean data were subjected to statistical analysis of variance[10] coefficient of variation and heritability[2] & genetic advance in percent of mean[6], respectively.

RESULTS AND DISCUSSION

The analysis of variance revealed highly significant differences among 20 genotypes of bitter gourd for all the characters studied. Environment play an important role in expression of various characters as the PCV was found to be higher than the corresponding GCV. Maximum range was recorded for yield per vine (144.18 to 1294.10 kg) followed by number of male flower per plant (172.40 to 372.96) and length of vine (129.27 to 321.70 cm) indicating more variability in these traits which indicated a greater scope for selection among the existing genotype, whereas minimum range was observed for diameter of fruit (2.20 to 3.93 cm) (Table 2). High values of PCV as well as GCV were recorded for yield per vine, weight of fruit and length of fruit, seed weight per fruit, no. of seeds per fruit and Internodal distance per vine. The high magnitude of GCV further revealed the greater extend of variability presence in Table 1.

Genetic variability: The estimates on genotypic coefficient of variation, phenotypic coefficient of variation, heritability and genetic advance as percent of mean for the traits under study are furnished in Table 2. The PCV was found higher than the GCV for most traits studied. The GCV obtained for various yield, yield attributing ranged from 2.78 to 71.68. The highest GCV was observed for yield per vine (71.79%) followed by weight of fruit (39.17), Seed weight per fruit (37.25), Length of fruit (34.16). while the GCV observed for intermodal distance per vine (27.15), length of vine (22.30), Number of fruits per vine (19.81) were moderate. The GCV waslow for days to marketable yield (5.05), days to 50% female flower initiation (04.85), crop duration (03.43) and days to 50% male flower initiation (02.78). The PCV observed was high for yield per vine (71.79%), and moderate PCV was observed for seed weight per fruit (40.74%), weight of fruit (39.35%), length of fruit (35.73%), number of seeds per fruit (34.15%), internodal distance per vine (29.38%). The PCV was low for days to 50% female flower initiation (8.36%), days to marketable yield (8.17%), days to 50% male flower initiation (7.73%), crop duration (5.28%).

Study of genotypic and phenotypic coefficient of variation indicated the extent of variability for different traits in bitter gourd and those results are in conformity to

the findings of [4, 5,11]. Higher phenotypic and genotypic coefficient of variation recorded for yield per vine, weight of fruit and length of fruit, seed weight per fruit, number of seeds per fruit and Internodal distance per vine indicates that, these genotypes exhibit much variation among themselves with respect to these characters offering more scope for selection. PCV and GCV recorded for no. of female flowers/plant, no. of fruits/vine, days 50 % female flower initiation, days to marketable yield and crop duration were low and was in agreement with the findings of Kundu et al[7] and Miah et al [9].

Heritability and genetic advance : High heritability coupled with low genetic advance, low heritability with high genetic advance or low heritability and low genetic advance offers less scope for selection, as they indicates the role of non- additive genetic effects. High heritability coupled with high genetic advance is indicative of greater proportion of additive genetic variance and consequence a high genetic gain expected from selection[13]. The characters having heritability with low genetic advances as percent of mean appeared to be controlled by non-additive gene action and selection for such characters may not be effective[13]. The genotypes recorded high heritability values for all the characters under study yield per vine (99.70), Weight of fruit (99.10), number of male flowers per vine (97.40), length of vine (96.00), number of seeds per fruit (91.80), length of fruit (91.40) had recorded high heritability value. Genetic advance as percent of mean ranged from 02.06% for days to 50% male flower initiation to 147.45% for yield per vine. High genetic advance was also recorded for weight of fruit (80.33%), seed weight per fruit (70.43), length of fruit (cm) (67.32). While moderate genetic advance was recorded for internodal distance per vine (51.63), length of vine (45.01), number of fruits per vine (34.60), number of male flower per plant (33.43). High genetic advance indicated that, additive genes govern these characters and selection will be rewarding for improvement of these traits. The above finding supports the results of Yadav[15]. The genetic advance recorded was low for days to marketable yield (06.43), days to 50% female flower initiation (05.79), crop duration (04.58) and days to 50% male flower initiation (02.06).

Table 1: mean performance of 16 genotypes as influenced by Morphology and Phenological characters o f bitter gourd

S.No	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16
Jhalri	226.40	9.00	**10.83**	275.40	14.98	46.33	**74.67**	09.33	09.25	03.53	37.25	11.83	3.06	341.82	75.67	151.57
Mc-84	133.60	9.20	07.33	203.20	**12.14**	52.67	73.46	**09.20**	08.60	03.03	30.92	18.00	3.20	284.59	83.33	147.80
Long jhalri	256.20	12.73	05.70	**372.96**	22.22	48.33	68.33	17.67	13.38	**03.93**	**73.23**	**18.50**	**4.61**	**1294.10**	79.33	**162.48**
Mc-23	176.47	9.20	07.67	250.14	15.16	49.67	**59.67**	11.73	08.41	03.08	30.90	12.67	1.75	362.02	**69.67**	157.94
swasti	**129.27**	8.53	06.83	**172.40**	**28.84**	50.33	63.67	16.47	**05.73**	03.77	22.30	07.00	1.26	**144.18**	73.67	**133.72**
GY-323	188.80	09.20	05.60	238.00	15.03	48.30	63.70	11.70	09.30	02.75	26.35	06.50	1.73	342.45	73.90	147.90
Jhaldhar spl	**321.70**	**14.26**	**03.00**	232.20	14.16	49.67	70.67	**19.47**	**24.77**	02.68	56.10	08.47	1.45	109.63	80.67	158.25
PDM	189.10	09.25	05.85	239.00	15.10	48.50	63.90	12.20	09.40	02.80	27.00	07.10	1.63	342.68	74.50	148.00
Ns-1024	166.93	**06.53**	05.47	253.20	14.74	47.67	68.67	11.07	10.00	03.63	25.00	09.83	1.71	276.55	81.67	147.18
VRBT-1	189.40	09.52	06.00	240.40	15.40	48.50	64.50	12.40	09.65	02.83	27.15	07.40	1.85	285.15	74.80	148.15
White long	276.00	11.80	04.43	280.40	16.19	50.33	64.67	14.13	11.52	02.55	26.18	15.55	3.03	370.19	74.67	152.00
DVBTG-5	190.50	09.80	06.50	245.00	15.15	48.60	64.80	12.00	09.80	02.88	27.35	08.60	1.90	287.40	75.20	148.40
Green long	268.27	12.20	05.57	291.30	16.62	**55.67**	60.87	13.47	11.27	02.67	26.08	10.33	2.50	341.42	71.67	151.90
DRBS-36	192.15	10.30	06.90	245.00	15.70	49.50	65.00	11.90	11.90	02.90	28.40	09.30	2.00	288.70	76.10	148.55
PBIG-1	190.60	10.53	05.80	183.20	12.19	53.67	62.67	09.87	10.30	03.05	23.07	**06.00**	**1.08**	227.55	72.67	139.14
IC-505208	200.25	11.10	07.00	255.00	15.90	49.80	66.40	11.80	10.05	03.00	28.75	10.70	2.65	290.30	77.30	149.20
Muland local	226.67	09.27	09.43	260.90	14.18	**44.33**	60.00	12.87	09.53	**02.20**	**22.08**	10.33	1.60	284.17	70.00	148.63
VRBT-04	215.60	11.40	07.15	258.00	16.00	49.90	67.60	11.30	10.15	03.01	39.60	11.40	2.73	344.20	78.40	150.33
Chhuh type	188.67	11.67	10.57	236.40	16.30	47.67	69.67	10.73	08.63	02.73	26.73	12.97	3.42	286.49	**85.33**	145.62
VRBT-37	220.00	11.60	07.20	259.00	16.20	50.20	68.70	11.50	10.25	03.04	30.10	12.80	2.95	343.15	79.10	151.50
Mean	207.32	10.35	6.74	249.53	15.12	49.48	66.04	12.54	10.59	3.00	31.22	10.76	2.30	391.73	76.93	133.72
SEm+_	7.69	0.75	0.61	5.47	1.13	2.91	3.67	1.27	0.90	0.29	0.95	0.85	0.31	12.31	4.03	4.89
C.D(P=0.05)	22.75	2.21	1.80	16.18	3.34	8.61	10.86	3.75	2.66	0.85	2.81	2.51	0.91	36.43	11.92	14.47

X1- length of vine (cm); X2- Number of branches per vine; X3- Internodal distance per vine (cm); X4- Number of male flowers per plant; X5- Number of female flowers per plant; X6- Days to 50% male flower initiation; X7- Days to 50% female flower initiation; X8- Number of fruits per vine; X9- Length of fruit (cm); X10- Diameter of fruit (cm); X11- Weight of fruit (gm); X12- Number of seeds per fruit; X13-Seed weight per fruit(gm); X14- Yield per vine (kg); X15- Days to marketable yield; X16- Crop duration

Table 2: Estimates of genotypic and phenotypic coefficients of variation, heritability and genetic advance of various characters

S N	Character	Range		Grand mean	Genotypic coefficient of variance	Phenotypic coefficient of variance	Heritability percent	Genetic advance (K=2.06)	Genetic Advance percent
		Max	Min						
1	Length of vine	321.70	129.27	207.32	22.30	22.76	96.00	93.32	45.01
2	No. of branches/vine	14.26	6.53	10.35	16.16	18.45	76.70	03.02	29.17
3	Internodal distance/vine	10.83	3.00	06.74	27.15	29.38	85.40	03.48	51.63
4	No. of male flower/plant	372.96	172.40	249.53	16.45	16.66	97.40	83.43	33.43
5	No.of femaleflower/plant	28.84	12.14	15.12	15.53	18.05	74.00	04.16	27.51
6	Days to 50% male flower initiation	55.67	44.33	49.48	2.78	07.73	13.00	01.02	02.06
7	Days to 50% female flower initiation	74.67	59.67	66.04	4.85	08.36	33.70	03.83	05.79
8	No. of fruits / vine	19.47	9.33	12.54	19.81	23.39	71.80	04.34	34.60
9	Length of fruit (cm)	24.77	5.73	10.59	34.16	35.73	91.40	07.13	67.32
10	Diameter of fruit (cm)	3.93	2.20	03.00	12.35	17.18	51.70	00.55	18.33
11	Weight of fruit (gm)	73.23	22.08	31.22	39.17	39.35	99.10	25.08	80.33
12	No. of seeds / fruit	18.50	6.00	10.76	32.70	34.13	91.80	06.95	64.59
13	Seed weight /fruit	4.61	1.08	02.30	37.25	40.74	83.60	01.62	70.43
14	Yield / vine	1294.10	144.18	391.73	71.68	71.79	99.70	577.63	147.45
15	Days to marketable yield	85.33	69.67	76.93	5.05	08.17	38.30	04.95	6.43
16	Crop duration	162.48	133.72	149.41	3.43	05.28	42.10	06.85	4.58

Acknowledgment

We are thankful to Department to Horticulture, RVSKVV Indore for providing of seed material for research.

REFERENCES

1. Arvind Kumar, B., Kumar Mukesh, P. and Naresh, R. K., Genetic variability, heritability and genetic advance study for yield and its components in bottlegourd (*Lagenaria siceraria*). *Progressive Horticulture.* **43** (2) **:** 268-270 (2011)
2. Burton, G.W. and Devane, E.N., Estimating heritability in fall fescus from replicated clonal material. *Agron. J*. **45 :** 478-481(1953).
3. Burton, G.W., Quantitative inheritance in grasses. *Proc.6th Inc. Grasita Cong*. **1:** 273-283. (1952).
4. Dey, S.S., Behera, T.K., Munshi, A.D. and Bhatia, R., Genetic variability, genetic advance and heritability in bitter gourd (*Momodica charantia* L). *Indian Agriculturist*. **53** (1/2)**:**7-12 (2009).
5. Islam, M.R., Hossain, M.S., Bhuiyan, M.S.R., Hasan, G.N. and Syed, A., Genetic variability and path-coefficient analysis of bittergourd (*Momodica charantia* L) . *I n t e r national Journal of Sustainable Agriculture.* **1 (3):** 53-57. (2009).
6. Johnson, H.W., Robinson, H.W. and Comstock, R.E., Estimates of genetic and environmental variability in soybean. *Agron. J*. **47:** 314-18 (1955).
7. Kundu , B. C., Hossain, M. M., Mian, M. A., Khaleque. and Mian, I. H., Genetic divergence in bitter gourd (*Momodica charantia* L). *J. Asiat. Soc. Bangladesh Sci*. **38 (2):** 125-134 (2012).
8. Kutty, M. S. and Dharmatti, P. R., Genetic variability studies in bitter gourd (*Momodica charantia* L). *Karnataka J. Hortic.* **1(1):** 11-15 (2004).
9. Miah, M. A., Rahman, M. M., Uddin, M. S., Rahman, A. K. M. M., and Ullah, M. H., Genetic association in bitter gourd (*Momodica charantia* L.). *Bangla. J. Sci. Techol.* **2:** 21-25 (2000).
10. Panse, V. G. and Sukhatme, P. V., Genetics of quantitative chara- cters in relation to plant breeding. *Indian J. Genet*. **28 :** 225-29 (1985).
11. Rajput, J. C., Paranjape, S. P. and Jamadagui, B. M., Variability, Heritability and scope of improvement for yield components in bitter gourd (*Momodica charantia* L). *Annual Agricultural Research*. **17 (1):** 90-93 (1996).
12. Sharma, A. and Sengupta, S. K., Genetic diversity, heritability and morphological characterization in bottle gourd (*Lagenaria siceraria* (Mol.) Stand). **8(4):** 1361-1365 (2013).
13. Singh, H. N., Srivastava, J. P. and Prasad, R., Genetic variability and correlation studies in bitter gourd *Momodica charantia* L). *Indian Journal of Agricultural Sciences*. **47 (12):** 604-607 (1997).
14. Sureja, A. K., Sirohi, P. S., Patel, V. B. and Mahure, H. R., Estimation of genetic parameters in Ashgourd (*Benincasa hispada*). *Indian Journal of Horticulture*. **67:** 170-173 (2010).
15. Yadav Murlee., Pande, T. K., Singh, D. B. and Singh, G. K., Genetic variability, correlation coefficient and path analysis in bitter gourd. *Indian J. Hort.* **70 (1):** 144-149 (2013).