The Pharma Innovation Journal 2022; 11(6): 2165-2167

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(6): 2165-2167

www.thepharmajournal.com
Received: 08-03-2022
Accepted: 22-05-2022

To study the nature of gene action, heritability and correlation among the different characters of bitter gourd (*Momordica charantia* L.)

PK Pawar and MN Bhalekar

PK Pawar
Ph.D., Scholar, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar, Maharashtra, India

MN Bhalekar
Senior Vegetable Breeder, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar, Maharashtra, India

Corresponding Author:
PK Pawar
Ph.D., Scholar, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar, Maharashtra, India

Abstracts
The investigation entitled "Genetic Studies in Bitter Gourd (*Momordica charantia* L.)" was undertaken during summer 2020 and *kharif* 2020 by following genetic studies to obtain information on gene effects, heterosis, general and specific combining ability and heritability for various quantitative characters. The additive and additive x dominance effects were equally important in some combination for most of the characters. Dominance x dominance gene effects were greater magnitude followed by additive x additive and additive x dominance for node at which first female flower appeared, days required for first harvest of fruit, fruit length, fruit weight, respectively in both summer and *kharif* season. High percentage of heritability was observed in the most of the characters like vine length, days required for initiation of male and female flowering, number of female flowers per vine, node at which first female flower appeared, days required for first harvest of fruits, yield per vine, weight of fruit, length of fruit, diameter of fruit, weight of seed per fruit, downey mildew, powdery mildew, fruit fly and leaf miner. It indicated that, most likely the heritability is due to additive gene effects and selection may be effective.

Keywords: Gene action, heritability, Correlation, Bitter gourd

Introduction

Bitter gourd (*Momordica charantia* L.) is one of the major cucurbitaceous vegetables grown throughout India belonging to the family cucurbitaceae, genus Momordica. It is a large genus with many species of annual and perennial climbers of which *Momordica charantia* L. is widely cultivated. It has been identified as one of the promising vegetables for export by Agricultural Processed products for Export and Development Authority (APEDA) (Thangamani *et al*., 2011) [7]. Karela as commonly known in Hindi is an important pharmanutritical vegetable crop grown for its flushy fruits in tropical and subtropical regions. The green fruits are superior as regards to nutritive value and can very well be compared with any other vegetable. Among the cucurbits, it is considered a prized vegetable because of its pharmaceutical and high nutritive value especially ascorbic acid and iron (Behera, 2004) [1]. Bitter gourd has been used for centuries in the ancient traditional medicine of India, China, Africa, and Latin America as its extract possess antioxidant, antimicrobial, antiviral, antihepatotoxic, antiulcerogenic properties and also has the ability to lower blood sugar (Raman and Lau, 1996) [6].

Bitter gourd shows a lot of variability in yield and yield contributing components. For developing a suitable and efficient breeding programme, information regarding the nature and magnitude of genetic variation that exist in the crop but relatively less attention has been paid towards the improvement of existing germplasm available in different parts of the country. Information about heritability and correlation of experimental breeding materials is imperative to a breeding programme aiming to develop hybrids and composite varieties having high yield and quality

In the present investigation, considering the importance of gene action and heritability studies in the improvement of crop, a (diverse characters) with the following objectives.

Material and Methods

a. Experimental details

1. Eight genetically diverse parents of bitter gourd have been collected from the germplasm maintained at AICRP on vegetable crops, Department of Horticulture, MPKV., Rahuri. These parents will be utilized in the present investigation to obtain 28 F_1s by way of diallel mating system without reciprocal during *kharif* 2019.

2. The experimental material and one commercial hybrid constituting 28 F_1s and 8 parents will be evaluated in randomized block design with two replications during summer 2020 and *kharif* 2020.

b. Treatment details

The experimental material consists of eight parents, 28 F_1 hybrids and one standard check. The complete sets of 37 genotypes were evaluated in randomized block design replicated twice during Summer-2020 and *Kharif* 2020. There were 10 vines per replication. Row-to-row and plant-to-plant spacing were maintained at 1.5m and 1m, respectively.

Observations recorded

Five plants per genotype in each replication were randomly selected for recording Length of vine (m), Days to 1st male and female flower, Days to 50 per cent flowering, Number of female flowers, Days required for first harvest, Length of pedicel (cm), Length of fruit (cm), Girth of fruit (cm), Number of fruits per vine, Colour of fruit, Fruit shape, Prickliness of the fruit, Number of seeds/fruit, Weight of fruit (g), Yield per vine (kg, Yield per plot (kg), Yield per hector, Pest: Fruit fly, leaf miner. Disease: Powdery mildew, Downey mildew.

Statistical analysis

The data collected during the investigation were statistically analyzed by the methods suggested by Panse and Sukhatme (1985) [5] for analysis of variance, heterosis was estimated by Turner, 1953 and Hays *et al*. (1955), Combining ability was worked out as per Method-2 of Model-I suggested by Griffing (1956) [3], Gene action was estimated as suggested by Griffing (1956) [3], Heritability was calculated by following Falconer (1981) [2], Correlation was calculated by Pearsons (1930).

Result and Discussion

Heritability

Estimated narrow sense heritability for length of vine was (0.406%) insummer and (0.523%) in *kharif* season and for days to 1st female flower it was (0.328%) and (0.360%) in summer and *kharif* season respectively. Heritability for days to male flower in summer (0.320%) and in *kharif* (0.335%) and for days to 50% flowering was (0.534%) and (0.443%) in summer and *kharif* season respectively. For number of female flowers in summer (0.574%) and in *kharif* (0.600%), in respect of days required for first harvest, the heritability was in summer (0.534%) and (0.443%) in *kharif* season, for length of pedicel it was (0.230%) and (0.189%) in summer and *kharif* seasons, respectively. The heritability was observed for length of fruit in summer and *kharif* seasons was (0.574%) and (0.635%), for girth of fruit in summer (0.495%) and in *kharif* (0.393%) and for number of fruits per vine it was (0.579%) in summer and (0.474%) in *kharif* season. In respect of the number of seeds per fruit heritability was (0.693%) and (0.650%) in summer and *kharif*. For weight of fruit in summer (0.507%) and in *kharif* (0.533%). For Yield per vine (kg), yield per plot (kg) and yield per hector (q/ha) itwas (0.636%) and (0.609%) both in summer and *kharif* seasons respectively.

Table 1: Estimation of narrow sense heritability for different characters

Sr. No.	Characters	Season	Heritability h^2(ns)%
1.	Length of vine (m)	Summer	0.406
		Kharif	0.523
2.	Days to 1st female flower	Summer	0.328
		Kharif	0.360
3.	Days to male flower	Summer	0.320
		Kharif	0.335
4.	Days to 50 per cent flowering	Summer	0.534
		Kharif	0.443
5.	Number of female flowers	Summer	0.574
		Kharif	0.600
6.	Days required for first harvest	Summer	0.534
		Kharif	0.443
7.	Length of pedicel (cm)	Summer	0.230
		Kharif	0.189
8.	Length of fruit (cm)	Summer	0.574
		Kharif	0.635
9.	Girth of fruit (cm)	Summer	0.495
		Kharif	0.393
10.	Number of fruits per vine	Summer	0.579
		Kharif	0.474
11.	Number of seeds/fruit	Summer	0.693
		Kharif	0.650
12.	Weight of fruit (g)	Summer	0.507
		Kharif	0.533
13.	Yield per vine (kg)	Summer	0.636
		Kharif	0.609
14.	Yield per plot (kg)	Summer	0.636
		Kharif	0.609
15.	Yield per hector (Q)	Summer	0.636
		Kharif	0.609

Gene action

The ratio of the components of specific combining ability variance and components of general combining ability variance was lower than unity, which indicated preponderance of non- additive gene action for all traits. The magnitude of σ2gca / σ2sca for length of vine (0.479, -0.983), days to 1st female flower (0.652, 0.438), days to male flower (1.126, 0.514), days to 50% flowering (0.678, 0.629), Number of female flowers (0.635, 0.878), days required for first harvest of fruit (0.678, 0.629), length of pedicel (0.150, 0.129), length of fruit (0.825, 1.067), girth of fruit (2.200, 0.924), number of fruits per vine (0.872, 0.680), number of seeds per fruit (1.261, 0.985), weight of fruit (0.567, 0.675), Yield per vine (kg) (0.967, 0.856), Yield per plot (0.968, 854) and yield per hector (q/ha) (0.968, 0.854) both have same magnitude, respectively during both summer and *kharif* seasons.

Table 2: Estimation of general combining ability and specific combining ability variance and gene actions

Sr. No.	Characters	Season	σ^2gca	σ^2sca	σ^2gca/ σ^2sca	Gene action.
1.	Length of vine (m)	Summer	0.302	0.630	0.479	Non-Additive
		Kharif	0.297	-0.302	-0.983	Additive
2.	Days to 1st female flower	Summer	1.777	2.725	0.652	Non-Additive
		Kharif	1.557	3.553	0.438	Non-Additive
3.	Days to male flower	Summer	1.105	0.981	1.126	Additive
		Kharif	0.988	1.920	0.514	Non-Additive
4.	Days to 50 per cent flowering	Summer	2.491	3.670	0.678	Non-Additive
		Kharif	0.930	1.477	0.629	Non-Additive
5.	Number of female flowers	Summer	12.073	14.444	0.835	Non-Additive
		Kharif	11.408	12.982	0.878	Non-Additive
6.	Days required for first harvest	Summer	2.491	3.670	0.678	Non-Additive
		Kharif	0.930	1.477	0.629	Non-Additive
7.	Length of pedicel (cm)	Summer	0.095	0.634	0.150	Non-Additive
		Kharif	0.076	0.591	0.129	Non-Additive
8.	Length of fruit (cm)	Summer	2.043	2.473	0.825	Non-Additive
		Kharif	2.566	2.404	1.067	Additive
9.	Girth of fruit (cm)	Summer	0.879	0.933	2.200	Additive
		Kharif	0.445	0.482	0.924	Non-Additive
10.	Number of fruits per vine	Summer	12.191	13.972	0.872	Non-Additive
		Kharif	9.377	13.781	0.680	Non-Additive
11.	Number of seeds/fruit	Summer	8.290	6.571	1.261	Additive
		Kharif	7.848	7.961	0.985	Non-Additive
12.	Weight of fruit (g)	Summer	19.704	34.707	0.567	Non-Additive
		Kharif	16.829	24.918	0.675	Non-Additive
13.	Yield per vine (kg)	Summer	0.079	0.081	0.967	Non-Additive
		Kharif	0.067	0.078	0.856	Non-Additive
14.	Yield per plot (kg)	Summer	1.984	2.048	0.968	Non-Additive
		Kharif	1.672	1.956	0.854	Non-Additive
15.	Yield per hector (Q)	Summer	352.724	364.231	0.968	Non-Additive
		Kharif	297.331	347.901	0.854	Non-Additive

Correlation

In the present investigation fifteen characters have been studied, looking to relevance of these characters, the analysis for correlation coefficient in length of vine (cm), days to 1st female flower, days to male flower, days to 50% flowering, number of female flowers, days required for first harvest, length of pedicel (cm), length of fruit (cm), girth of fruit (cm), number of fruits/vine, number of seeds/fruits, weight of fruit (g), Yield per vine (kg), Yield per plot (kg), yield per hector (q/ha) were considered as independent variable in the association analysis.

Association analysis based on fruit yield per ha.

The fruit yield per hectare had significant correlation with length of vine (cm), number of nodes per vine, number of female flowers, length of fruit(cm), weight of fruit (g), number of fruits per vine, weight of fruits per vine (kg), weight of fruits per plot (kg).

Conclusion

The estimates of components of specific combining ability variance were higher than components of general combining ability variance which indicated that the preponderance of non-additive gene action for all the traits under study.

Additive genetic variance is lower in magnitude than dominance variance over both the seasons for all the characters which indicated that the preponderance of dominance variance (non-additive gene action).

The all characters studied displayed heritability were low in narrow sense, except the traits *viz*., number of nodes per vine, number of female flowers and length of fruit in both kharif and summer seasons while, days to 50% flowering and number of fruits per vine in kharif season, weight of fruits per vine, weight of fruits per plot and fruit yield (q/ha) in summer season showed medium narrow sense heritability and number of fruits per vine in summer season showed high narrow sense heritability but low additive variance. It showed that there is preponderance of non-additive gene action and considered heterosis breeding might be useful for further exploitation.

References

1. Behera TK. Heterosis in bitter gourd. P K Singh, SK Dasgupta, and S K Thpathi (eds.), Hybrid vegetable development Haworth Press, New York, 2004, 217-221.
2. Falconer DS. Introduction of Quantitative Gnetics. 2nd edition. Longman Group UK Ltd., England, 1981, 340.
3. Griffing B. Concept of general and specific combining ability in relation to diallel crossing system. Aust. J Biol. Sci. 1956;9:463-493.
4. Hayes H. Development of the heterosis concept. In 'Heterosis' Gowen J.W. (ed) Hafner Publishing New York (1964 Chapter 3), 1964.
5. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers, 4th Edn., ICAR, New Delhi, 1985.
6. Raman A, Lau C. Antidiabetic properties and phytochemistry of *Momordica charantia* L. (Cucurbitaceae). Phytomedicine. 1985, 1996;2:349-362.
7. Thangamani C, Pugalendhi L, Sumathi T, Kavitha C. Evaluation of F1 hybrids in bitter gourd (*Momordica charantia* L.) for yield and quality. J Horti. Sci. 2011;6(2):105-108.