Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(5): 1545-1546
Received: 04-07-2019
Accepted: 06-08-2019

GM Malve
Ph.D. Scholar, Department of Horticulture, PGI, MPKV, Rahuri, Maharashtra, India

NS Titirmare
M.Sc. student, Department of Soil Science and Agricultural Chemistry, College of Agriculture, Latur, Maharashtra, India

RS Karangami
Ph. D. Scholar, Department of Agricultural Extension and Communication , PGI, MPKV, Rahuri, Maharashtra, India

Corresponding Author:
GM Malve
Ph.D. Scholar, Department of Horticulture, PGI, MPKV, Rahuri, Maharashtra, India

Gene action for growth, yield and quality traits in bitter gourd (*Momordica charantia* L.)

GM Malve, NS Titirmare and RS Karangami

Abstract
The present investigation was carried out in two different seasons with aim to find out the gene action for inheritance of growth, yield and quality traits in bitter gourd. The present study was comprised of 21 crosses developed through 7x7 half diallel mating design using 7 parents namely, Phule green gold (P1), Preethi (P2), Arka harit (P3), Co-white long (P4), DVBTG-7 (P5), Hirkani (P6), Konkan tara (P7), at Instructional-Cum-Research Farm, Dept. of Horticulture, College of Agricuilture, Latur (M.H.) India during kharif 2015. The experiments were laid out in RBD with two replications having each experimental unit of single row with spacing of 1.5 × 0.5m. The observations were recorded on parents and F_1's for fifteen quantitative traits viz Number of nodes per vine, Inter nodal length (cm), number of female flowers, number of male flowers, Sex ratio, days required for first harvest, vine length (cm), number of branches per vine, fruit length (cm), fruit diameter (cm), fruit weight (g), number of fruits per vine, fruit yield per vine (kg), Fruit yield per ha (q).

Keywords: Bitter gourd, gene action, quality attributes fruit yield and half diallel mating

Introduction

Bitter gourd (*Momordica charantia* L.) is commonly known as karela, grown in tropical and subtropical parts of the world. Though, the bitter gourd is native of Indo-burma, it is a prized vegetable of india. It is the important member of Cucurbitaceae having higher chromosome number of 2n=22 and diploidy in nature. Being an cross pollinated crop, bitter gourd have monoecious sex form. The favourable characters of hybrids like production stability, suitability to high input agriculture, uniform growth and maturity shifted the focus towards heterosis breeding, leading to the release of the new potential hybrids. Most of the cucurbits including bitter gourd are usually produced in relatively small quantities for local consumption and so do not enter production statistics in a significant way. Nevertheless, they are important items in the diets of many people because one or more species are element of nearly every vegetable garden both home and commercial (Whitaker and Bemis, 1979) [5]. The existing varieties/land races have emerged mostly through selection from a wide variability available in this crop. The improvement of this crop thus, is mainly achieved through selection and perpetuation of better types. The overwhelming importance of F_1 hybrids in different crop plants for the improvement of yield has long been emphasized by the early workers. Owing to the existence of wide variability, monoecious nature, conspicuous and convenient flowers and quite a large number of seeds per fruit, the bitter gourd can serve as the most potent material for the manifestation of heterosis and its commercial exploitation. The successful exploitation of hybrid vigour is determined by two main conditions: first, the parental lines should be available, which would be capable of combining so well to produce hybrids excelling not only better parents of the good hybrids but also the best variety of the locality; second, the technique to be employed for hybrid seed production should be simple and easy enough so that the cost of seed production is reasonably low. Bitter gourd being monoecious in sex expression can profitably be used for production of F_1 hybrids at cheaper rates. The present investigation was initiated with a view to find out suitable combination which give superior F_1 hybrids with high yields and other quality attributes and good consumer's acceptability. Keeping these objective in view, light varieties of bitter gourd with diverse characters were selected to constitute diallel set (excluding reciprocals) to study the extent of heterosis and genetic architecture of yield.

Material and Methods

The experimental material for this study comprised seven genotypes which were selected based on the diversity for various traits. From seven genotypes twenty one crosses were obtained in diallel fashion (without reciprocals).

The selected parental lines i. e. Phule green gold (P1), Preethi (P2), Arka harit (P3), Co-white long (P4), DVBTG-7 (P5), Hirkani (P6), Konkan tara (P7). The inbred lines of seven genotypes were selected for the purpose of crossing programme and sown in crossing block at Instructional-Cum-Research Farm. Department of Horticulture, College of Agriculture, Latur. Recommended dose of fertilizers and plant protection measures were taken up. The female and male flowers due to open next morning were bagged separately in the evening. Next day, the females were hand pollinated in the morning after anthesis with pollens collected from male flowers previously bagged, and repeating it in the next morning to ensure good fruit set. The parents were also selfed simultaneously to obtain pure seeds of each variety. The pedicel of each pollinated flower was tied with label bearing the information of female and male parents and date of crossing for identification. Crossing was made in diallel fashion. The experiments were laid out in RBD with two replications having each experimental unit of single row with spacing of 1.5 × 0.5m. The observations were recorded on parents and F_1's for fifteen quantitative traits viz Number of nodes per vine, Inter nodal length (cm), number of female flowers, number of male flowers, Sex ratio, days required for first harvest, vine length (cm), number of branches per vine, fruit length (cm), fruit diameter (cm), fruit weight (g), number of fruits per vine, fruit yield per vine (kg), Fruit yield per ha (q).

Results and Discussion

The estimates of gca variance (σ^2gca) and sca variaces (σ^2sca), σ^2gca/σ^2sca ratios, gene action, are given in table 1. The perusal of Table 1. Revealed that, the sca variances were greater than gca variances for all the characters. The dominance variance (σ^2D) was greater than additive variance (σ^2A) for all the characters. As shown in table, the ratio of gca to sca variance is less than unity so, all the characters studied showed non-additive type of gene action. Yield is polygenically controlled trait, involving complicated expression of the character. The knowledge of the gene action involved is prerequisite to selection of best suitable breeding methodology and ultimately, the improvement of concerned crop in terms of yield and yield contributing characters. Three types of gene actions viz., additive, dominance and epistasis determine the expression of a character. The predominance of additive gene action suggests the use of selection methodologies for crop improvement. While, dominance and epistasis gene actions are related with allelic and non allelic gene interactions. In such cases, the exploitation of heterosis or development of composite varieties would be effective. Therefore, the study of gene action provides the useful guidelines to the breeder for adoption of suitable breeding methodology. The gca (σ^2gca) and sca (σ^2sca) variances, σ^2gca/ σ^2sca ratios, heritability [h^2 (ns)] and gene action estimates (Table 1.) revealed that, σ2gca/ σ2sca ratio was less than unity for all the characters suggesting non- additive gene action. The earlier workers viz., Lawande (1987) [2], Celine and Sirohi (1998) [1], Rajeshwari and Natarajan (1999) [4] and Matoria and Khandelwal (1999) [3] also reported the predominant role of dominance gene action in the inheritance of major yield and yield contributing characters. The predominance of non-additive gene action suggests the feasibility of exploitation of heterosis in bitter gourd.

Table 1: Estimation of genetic variance component and heritability in various characters in 7x7 half diallel of bitter gourd.

Crosses	Length of vine (cm)	Number of branches per vine	Number of nodes per vine	Inter nodal length (cm)	Days to 50 percent flowering	Days required for first harvest
σ^2 gca	57.02	0.38	0.60	0.95	0.32	0.22
σ^2 sca	1511.43	4.06	7.27	6.11	10.65	8.06
σ^2 A	114.04	0.76	1.20	1.90	0.65	0.465
σ^2 D	1511.43	4.06	7.27	6.11	10.65	8.06
h^2 (n.s.) %	0.055	0.14	0.12	0.21	0.04	0.03
σ^2gca/ σ^2sca	0.037	0.09	0.08	0.15	0.03	0.02

Crosses	Length of fruit (cm)	Diameter of fruit (cm)	Weight of fruit (g)	Number of fruits per vine	Fruit yield per vine (kg)	Fruit yield per hectare (q)
σ^2 gca	0.45	0.002	-0.44	2.67	0.011	69.97
σ^2 sca	13.51	0.048	19.76	94.74	0.69	2659.34
σ^2 A	0.84	0.005	-0.89	5.35	0.023	139.94
σ^2 D	13.51	0.048	19.76	94.74	0.69	2659.34
h^2 (n.s.) %	0.055	0.079	-0.033	0.050	0.03	0.04
σ^2gca/ σ^2sca	0.031	0.060	-0.022	0.028	0.01	0.02

Acknowledgement

The authors thankful to the Department of Horticulture, College of Agriculture, Latur , Maharashtra for providing all the inputs and facilities to carry out this study.

References

1. Celine VA, Sirohi PS. Inheritance of quantitative fruit characters and vine length in bitter gourd (*Momordica charantia* L.). Veg. Sci. 1998; 25(1):14-17.
2. Lawande KE. Heterosis breeding in bitter gourd. Ph. D. Thesis submitted to Mahatma Phule Krishi Vidyapeeth, Rahuri (Maharashtra), 1987.
3. Matoria GR, Khandelwal RC. Combining ability and stability studies in bitter gourd (*Momordica charantia* L.), 1999.
4. Rajeshwari KS, Natrajan S. Studies on heterosis for growth, yield and quality parameters in bitter gourd (*Momordica charantia* L.) South Indian Hort. 1999; 47(1-6):208-209.
5. Whitaker TW, Bemis WP. Cucurbits. In Evaluation of Crop Plants (Ed. N. W. Simmonds). Group Ltd., London, 1979.