



Research Article

GENETIC VARIABILITY STUDIES IN LOCAL ECOTYPES OF *Momordica cymbalaria*

CHITTAPUR REKHA*¹ AND JAGADEESHA R.C.²

¹Department of Biotechnology and Crop Improvement, College of Horticulture, Bagalkot, 587104, Karnataka, India

²Department of Biotechnology and Crop Improvement, College of Horticulture, Bagalkot, 587104, Karnataka, India

*Corresponding Author: Email - rekha20@gmail.com

Received: June 21, 2018; Revised: June 26, 2018; Accepted: June 27, 2018; Published: June 30, 2018

Abstract- *Momordica cymbalaria* is one of the nutritious vegetable which is underexploited. In Kannada language it is known by the name Karchikai, in Tamil as Athalakai, in Telugu as Kasarakai and in Marathi as Kadavanchi. It is an underutilized vegetable crop of *cucurbitaceae* family. Fruits of this crop are small of 2-3cm in length green colour with high nutraceutical values. These fruits are used as vegetable crop in southern parts of India. Iron, Phosphorus, Calcium & Potassium content were high in fruits compared to other species. It also has an antiallergic, antidiabetic, antiulcer, antimicrobial and hypoglycemic, hypolipidemic, cardio protective, and hepatoprotective activity. Studies were lacking with respect to improvement aspects. This is the first characterization study conducted in this crop other than its nutraceutical values. Thirteen ecotypes of *Momordica cymbalaria* were collected from different areas of Karnataka to estimate the variability parameters. Experiment was conducted in Randomized Block Design in two replications. Observations were recorded for nine yield parameters and variability parameters were estimated. Highly significant differences were recorded for all traits except fruit length among the thirteen treatments. The mean and range values for nine quantitative traits disclose the presence of variability among the germplasm. High range value was reported for number of male & female flowers, fruits per plant and yield per plant which indicates the existence of variation in the collected germplasm. High GCV & PCV values indicates that these traits are less influenced by environmental factors. High Heritability coupled with high GAM was reported for all traits except fruit length which was reported as moderate. The present study confirms the presence of genetic variability among the germplasm from different locations.

Key words- *Momordica cymbalaria*, Underexploited, Characterization, Ecotypes, Variability, Heritability & Nutraceutical

Citation: Chittapur Rekha and Jagadeesha R.C. (2018) Genetic Variability Studies in Local ecotypes of *Momordica cymbalaria*. International Journal of Genetics, ISSN: 0975- 2862 & E-ISSN: 0975-9158, Volume 10, Issue 6, pp.-464-466.

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Academic Editor / Reviewer: Suleyman Cylek

Introduction

Cucurbitaceae is very wide genera which is having many cultivated and wild species. Only few of them are cultivated commercially. Some of these species are considered as under exploited crops. Among these *Momordica cymbalaria* is one of the nutritious vegetable which is underexploited. [1]. It is available in Karnataka, Andhra Pradesh, Tamil Nadu and Maharashtra states. In Karnataka it is known by the name Karchikai, in Tamil Nadu as Athalakai, in Andhra Pradesh as Kasarakai and in Maharashtra as Kadavanchi[2]. Fruits of this crop are small of 2-3cm in length green colour with high nutraceutical values and these fruits are used as vegetables. Studies have been reported on its nutraceutical values. It has an antiallergic, anti diabetic, anti ulcer, antimicrobial and hypoglycaemic, hypolipidemic, cardio protective and hepatoprotective activity [3]. The tubers and leaves of this crop are used for therapeutic uses as these contain flavonoids, steroids, tri terpenes, saponins [4]. Tubers also have been reported to contain sterols, cardiac glycosides and saponins [5]. Karchikai has higher amounts of carbohydrate(3.72%), protein (3.26%) fat (1.61%), fibre (5.63%) and ash (1.25%). The beta-carotene content of Karchikai was 224.9 lg/100g. It is also reported that higher amounts of iron and phosphorous of 130.00 and 5.50 mg/100 g, respectively present in Karchikai compared to other cucurbit species [6]. The calcium content is three times higher, potassium is two times higher and the ascorbic acid (Vitamin C) content is two times higher than that of Bitter gourd. This crop can be utilized as an alternative vegetable to meet the shortage of vitamin C consumption. Cultivation of this crop also broadens the genetic base of the existing germplasm of cultivated species.

The crop is not commercially grown as seeds of this crop are not available in the market. This is because of hard seed coat seeds are having low germination efficiency. Tubers remain dormant in winter and they start germinating from the first onset of monsoon. Farmers are collecting the fruits from waste lands and from their fields during *kharif* and Rabi season only. AS this crop is in great demand in northern parts of Karnataka fruits fetch a very high market price. In the past importance was not given on improvement aspects. At present because of its nutritional aspects and popularity crop improvement programme has been initiated. The first approach is to assess the presence of variability in the local collections. With this background in the present study tubers have been collected from 13 different locations and evaluated for variability parameters to confirm whether the germplasm are genetically similar or different from one another. This is the first study in this crop related to characterization of local collections. These collections were evaluated and concluded that there are significant differences among the ecotypes.

MATERIALS & METHODS:

Tubers of *Momordica cymbalaria* for the present study have been collected from the thirteen different locations surrounding the Hungund taluk of Karnataka. Samples from one location are considered as one genotype. The experiment is conducted in *kharif* 2016 in Randomised Block Design in two replications at College of Horticulture, Udyanagiri, Bagalkot. Tubers were planted in 90 X 75cm spacing which is in practice for cucurbits. Observations were recorded at appropriate stage of the crop.

Table-1 Analysis of variance for nine quantitative traits in *Momordica cymbalaria*

Source of Variation	DF	Mean Sum of squares								
		PH	NMF	NFF	MF	FF	VP	FL	FP	YP
Replication	1	91.406	0.615*	0.419	11.982	88.615	0.37	0.098	350.191*	94.77**
Treatment	12	411.766**	0.449*	1.07**	684.42**	949.12**	1.121**	0.145	1078.212**	188.4**
Error	12	33.257	0.115	0.091	19.7	31.94	0.095	0.102	14.414	3.984

**Significant at 1% probability

Table-2 Genetic Variability parameters for Yield parameters in *Momordica cymbalaria*

Traits	Mean+ SE	MIN	MAX	GCV	PCV	H ² BS	GA (5%)	GAM (5%)
PH (cm)	49.01 + 4.07	32.40	83.50	28.05	30.42	85.05	26.14	53.34
NMF	1.84 + 0.240	1.00	2.50	22.11	28.76	59.09	0.64	35.01
NFF	3.7 + 0.213	2.40	5.0	18.90	20.59	84.27	1.33	35.75
MF	49.87 + 3.13	28.50	101.50	36.55	37.61	94.40	36.49	73.16
FF	33.69 + 3.99	19.00	94.50	63.55	65.73	93.48	42.66	126.60
VP	2.91 + 0.217	1.80	4.25	24.54	26.70	84.44	1.35	46.46
FL (cm)	1.79 + 0.22	1.25	2.30	8.18	19.59	17.46	0.13	7.05
FP	23.81 + 4.11	8.35	82.50	95.98	99.30	93.42	43.59	191.10
YP(gm)	12.56 + 1.41	4.40	37.75	76.41	78.05	95.85	19.37	154.12

PH	Plant height	FF	Number of male flowers
NMF	Node number of first male flower	VP	Number of vines per plant
NFF	Node number of first female flower	FL	Fruit length
MF	Number of male flowers	FP	Number of fruits per plant
		YP	Yield per plant

Observations were recorded from five randomly selected plants from each genotype. Plant height at harvest, number of branches per tuber, node number at which first female flower appear, node number at which first male flower appear, number of fruits per tuber, fruit length, and Fruit weight per tuber. GCV and PCV were calculated according to Burton & Devane, 1953[7], GAM was calculated according to Johnson *et al.* (1955) [8] and heritability broad sense as per Hanson, *et al.* (1956)[9] or Robinson, *et al.*(1949)[10].

RESULTS & DISCUSSION

Analysis of variability is the important objective in this crop since, studies have not been reported in this crop. Characterization of germplasm based on morphological traits is the pre requisite in this crop which can distinguish each individual plant [11]. In the present study characterization is done for nine different yield parameters which are either directly or indirectly associated with the yield trait. Analysis of variance for the yield parameters [Table-1] revealed that the mean sum of squares were highly significant for all the parameters except fruit length. This indicates that the germplasms of different locations have variations which are due to its genetic constitution. Ample scope is present for improvement in future breeding programmes. There is no significant difference among the germplasm with respect to fruit length indicating that least differences are present among the germplasm with respect to fruit length. Length of fruits is almost same in the different germplasm which varies from 1.25- 2.3cm. The presence of significant differences among the various traits except fruit length which indicates that the tubers collected from different locations are having variations with respect to the different traits and also the presence of variation among the germplasm.. Confirmation is also done based on the variability parameters. Estimates of variability parameters of nine quantitative traits for 13 germplasm are presented in [Table-2]. Genotypic Coefficient of variance, Phenotypic Coefficient of Variance and Heritability determines the components of heritable variation and genetic advance is desirable to select heritable variation. The mean values and range values disclose the presence of variability among the germplasm. High range value was reported for number of male (28.50-101.50) & female flowers (19.0-94.50), fruits per plant (8.35-82.50) and yield per plant (4.40- 37.75) which indicates the existence of variation in the collected germplasm [12]. GCV was high for all traits except fruit length and node number at which first female flower appears which was moderate. PCV was also high for all traits except fruit length which was moderate[13]. High GCV and PCV values indicates that these traits are less influenced by environmental factors. These traits can be used as selection criteria in improvement programmes. Fruit length and node number at which the

first female flower appears are having moderate values indicating the influence of environmental factors on the expression of these traits. GCV component was maximum for Fruits per plant (95.98) followed by Fruit yield per plant (76.41) and female flower per plant (63.55) which are the yield components. Similar findings reported by Dey *et al.* 2006 [14] and Radha Rani *et al.* 2015[15]. There is a least difference between the PCV and GCV for all traits except fruit length which indicates that the environmental effect is negligible and these values are due to gene action. High Heritability coupled with High GAM was reported for all traits except fruit length which was reported as moderate [13]. This indicates that it is due to additive gene action and these traits can be used as selection criteria for future breeding programmes. High heritability was reported for number of fruits per plant (97.36) followed by fruit yield per plant (95.85), number of male flowers (94.40), number of female flowers (93.48). High heritability was reported for all traits except FL (17.46) realizing the heritability of phenotypic performance. Similar findings were reported by Ram *et al.* 2004[16] and Bharati *et al.* 2006[17]. Because of high GAM values selection can be practiced in these collections to develop an improved variety. Moderate GAM coupled with moderate heritability is due to nonadditive gene action and selection may not be useful in breeding programmes. Since significant differences were reported for all the traits the present study confirms that the collected germplasm are different from one another. Significant differences were also reported between the replications indicating that the tubers collected from same location are also different from one another this is due to the presence of monoecious flowers promoting cross pollination. This indicated that the tubers of the same location may be genetically different. These results have to be further confirmed by one more season and also by using molecular markers for assessing the diversity among the germplasm. The present research finding is the base for future breeding programmes.

Application of research: The present research finding is essential for characterization of local collections of *Momordica cymbalaria*

Research Category: Staff inhouse project sanctioned under Crop Improvement programmes

Abbreviations:

GCV: Genotypic coefficient of variation

PCV: Phenotypic coefficient of variation

Acknowledgement / Funding: Author thankful to University of Horticultural Sciences, Bagalkot, Karnataka 587104, India.

***Research Guide or Chairperson of research: Dr R.C. Jagadeesha**

University: University of Horticultural Sciences, Bagalkot, Karnataka 587104

Research project name or number: Proposal sanctioned under staff inhouse projects entitled "Genetic Studies in *Momordica cymbalaria*"

Author Contributions: All author equally contributed

Author statement: All authors read, reviewed, agree and approved the final manuscript

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

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