Genetic analysis in ridge gourd [*Luffa acutangula* (Roxb.) L.] under hot arid conditions

B. R. Choudhary* and Suresh Kumar

Central Institute for Arid Horticulture, Bikaner (Rajasthan)-334 006

Abstract

The present investigation was conducted to determine variability, heritability, genetic advance and correlation of different yield and yield contributing characters of ridge gourd. The range of variation was higher in fruit length (3.66-26.93cm). The highest GCV (29.40) and PCV (32.29) was recorded in node at which first female flower appeared. The heritability estimate values in broad sense were higher for all the traits except number of branches/ plant, days to first female flower and days to first fruit harvest. The marketable fruit yield per plant had positive and significant correlation with fruit weight (0.786) and fruit length (0.448) at phenotypic level.

Key words: *Ridge gourd, variability, GCV, PCV, heritability, genetic advance, correlation.*

Introduction

Ridge gourd [*Luffa acutangula* (Roxb.) L.] is one of the important warm season vegetable crop which belong to cucurbitaceae family and grown in different parts of India. The immature fruits are consumed as vegetable and used in the preparation of chutneys and curries (Chandra, 1995). The fruits contain good amount of calcium, phosphorus, ascorbic acid, iron and fibre content (Aykroyd, 1963). Being a warm season vegetable crop, it has the ability to tolerate high temperature which ensures its adaptability for widespread cultivation throughout the tropics. Due to monoecious condition, it is a highly cross pollinated and had wide variability in quantitative characters (Richharia, 1948). Yield is polygenic which is highly influenced by environment and thus complicate the selection processes therefore, the knowledge of correlation is necessary for effective selection (Chowdhury *et al.*, 2002 and Choudhary *et al.*, 2008). The existence of wide genetic diversity in ridge gourd in arid region provides ample scope to screen the best genotypes for specific traits. Keeping in view, the present investigation was carried out with the objectives to determine variability, heritability, genetic advance and correlation among growth and yield traits in ridge gourd.

Material and Methods

The experimental material consisted of 20 diverse genotypes of ridge gourd and evaluated in Randomized Block Design with three replications at Research Farm, Central Institute for Arid Horticulture, Bikaner, Rajasthan during summer season of 2011 and 2012. The spacing maintained between rows was 2.5m and between plants 0.60m. Fertilization, drip irrigation, other cultural practices and need based plant protection measures were followed as per recommendation. The data were recorded on 12 qualitative characters on five randomly selected plants from each replication. The recorded data were pooled and statistically analyzed using INDOSTAT statistical package (Indostat Services, Hyderabad).

Results and Discussion

The analysis of variance showed highly significant mean sum of square estimates for all quantitative traits under study which indicate a wide range of variability exists in genotypes (Table 1).

Table 1 : Analysis of variance (mean sum of squares) for growth, flowering andyield traits of ridge gourd

S. No.	Characters	d.f.	Replication 2	Treatment 19	Error 38
1.	Number of branches/ plant		1.62	1.66**	0.64
2.	Vine length (m)		0.63	1.09**	0.26
3.	Internodal length (cm)		13.91	17.87**	4.35
4.	Days to 1st female flower		32.08	29.35*	12.65
5.	Node at which 1st female flower appeared		9.51	58.99**	3.79
6.	Ovary length (cm)		0.42	4.43**	0.87
7.	Fruit length (cm)		10.83	71.90**	4.41
8.	Fruit diameter (cm)		0.63	3.58**	0.47
9.	Days to 1st fruit harvest		6.85	14.16**	11.77
10.	Marketable fruits/ plant		0.69	95.65**	6.50
11.	Fruit weight (g)		148.38	1198.34**	46.74
12.	Marketable yield/ plant (kg)		0.10	0.42**	0.06

*and ** indicate significant at 5 and 1 per cent probability level, respectively.

*Corresponding author's e-mail: choudharybr71@gmail.com

The extent of variability among 20 genotypes was measured in terms of mean, range, genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability in broad sense (h^2), genetic advance (GA) and genetic advance as per cent of mean (Table 2). The range of variation was higher in fruit length (3.66-26.93cm) followed by node at which first female flower appeared (2.93-20.27) and fruit weight (18.25-112.16g). The minimum range of variability was recorded in days to first female flower (42.27-53.60). The highest GCV was recorded in node at which first female flower appeared (29.40) followed by number of marketable fruits per plant (25.48) and PCV was highest for node at which first female flower appeared (32.29) followed by ovary length (29.04). High magnitude of GCV is an indication of high genetic variability among the genotypes which provides ample

scope for improvement of these characters through simple selection. These findings are in close agreement with the results of Varalakshmi et al. (1995), Singh et al. (2002) and Choudhary et al. (2008). The heritability estimates in broad sense were higher for all the traits except number of branches/ plant, days to first female flower and days to first fruit harvest indicating substantial improvement can be made using standard selection criteria. Similar findings have also been reported by Varalakshmi et al. (1995), Karuppaiah et al. (2002) and Singh et al. (2002). High heritability along with high GA and high GA as per cent of mean was observed for node at which first female flower appeared, fruit length, marketable fruits/ plant and fruit weight, indicating the presence of additive gene action thus these characters could be used in selection on the basis of phenotypic performance.

Table 2: Mean, range, variability, heritability and genetic advance for growth, flowering and yield traits of ridge gourd

Characters	Mean	Range	GCV	PCV	h^2	Genetic advance (GA)	GA as % of mean
No. of Branches/ plant	4.53	3.47-6.33	12.88	21.86	34.71	0.71	15.63
Vine length (m)	3.50	2.16-4.69	15.05	20.87	51.98	0.78	22.35
Internodal length (cm)	14.08	6.47-16.85	15.08	21.13	50.91	3.12	22.16
Days to 1st female flower	48.60	42.27-53.60	4.85	8.78	30.56	2.69	5.53
Node at which 1st female flower appeared	14.59	2.93-20.27	29.40	32.29	82.91	8.04	55.14
Ovary length (cm)	4.92	1.53-8.27	22.20	29.04	58.43	1.72	34.95
Fruit length (cm)	20.85	3.67-26.93	22.74	24.88	83.60	8.93	42.84
Fruit diameter (cm)	4.70	3.47-7.10	21.67	26.13	68.78	1.74	37.02
Days to 1st fruit harvest	54.60	48.27-61.13	5.00	8.03	38.81	3.51	6.42
Marketable fruits/ plant	21.40	16.67-42.80	25.48	28.12	82.05	10.17	47.54
Fruit weight (g)	84.16	18.25-112.16	23.28	24.67	89.09	38.12	45.27
Marketable yield/ plant (kg)	1.72	0.77-2.21	19.94	24.76	64.86	0.57	33.09

In general the magnitude of genotypic correlation coefficients was higher than respective phenotypic correlation coefficients (Table 3) which establish inherent relationship among the characters as also shown by the findings of Chowdhury et al. (2002), Prasanna et al. (2002) and Hanumegowda et al. (2011). The marketable fruit yield per plant had positive and significant correlation with fruit weight (0.786) and fruit length (0.448) at phenotypic level. Days to first fruit harvest exhibited positive and highly significant correlation with days to first female

flower opening (0.850) and node at which first female flower appeared (0.469) at phenotypic level.

The traits like node at which first female flower appeared, fruit length, marketable fruits/ plant and fruit weight exhibited high heritability along with high GA and high GA as per cent of mean which could be improved through selection. Fruit weight and fruit length had positive and significant effect on yield per plant thus these traits could be utilized in selection of high yielding genotypes of ridge gourd.

Table 3: Genotypic (G) and phenotypic (P) correlation among growth, flowering and yield traits in ridge gourd

Trait		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1.	G	-	0.328**	0.402**	0.016	0.539**	-0.260*	0.105	0.011	0.237	-0.184	0.084	0.051
	P	-	-0.010	-0.100	0.074	0.150	-0.029	0.024	0.050	0.152	-0.048	0.069	0.092
2.	G		-	-0.062	-0.504**	-0.055	-0.309*	-0.228	0.403*	-0.268*	0.195	-0.348**	-0.299*
	P		-	-0.036	-0.196	-0.041	-0.094	-0.076	0.214	-0.175	0.046	-0.219	-0.221
3.	G			-	0.330**	0.450**	0.432**	0.525**	0.570**	0.408**	-0.645**	0.559**	0.617**
	P			-	0.026	0.426**	0.090	0.419**	0.233	0.042	-0.360**	0.439**	0.487**
4.	G				-	0.826**	0.214	0.434**	-0.348**	0.943**	-0.188	0.495**	0.586**
	P				-	0.381**	0.216	0.254*	-0.071	0.850**	-0.040	0.187	0.248
5.	G					-	0.541**	0.731**	0.101	0.795**	-0.620**	0.730**	0.606**
	P					-	0.252*	0.630**	0.010	0.469**	-0.511**	0.606**	0.422**
6.	G						-	0.828**	-0.108	0.494**	-0.814**	0.887**	0.611**
	P						-	0.555**	0.063	0.250*	-0.567**	0.665**	0.412**
7.	G							-	0.209	0.510**	-0.853**	0.824**	0.617**
	P							-	0.156	0.288*	-0.704**	0.697**	0.443**
8.	G								-	-0.289*	0.029	0.055	0.236
	P								-	-0.173	0.067	0.013	0.194
9.	G									-	-0.536**	0.613**	0.655**
	P									-	-0.155	0.157	0.226
10.	G										-	-0.781**	-0.447**
	P										-	-0.645**	-0.139
11.	G											-	0.656**
	P											-	0.766**
12.	G												-
	P												-

Critical r value = 0.3 25 at 1 per cent and 0.250 at 5 per cent.
*and ** indicate significant at 5 and 1 per cent probability level, respectively.

1. Number of branches/ plant	5. Node at which 1st female appeared	9. Days to 1st fruit harvest
2. Vine length (m)	6. Ovary length (cm)	10. Marketable fruits/ plant
3. Internodal length (cm)	7. Fruit length (cm)	11. Fruit weight (g)
4. Days to 1st female flower	8. Fruit diameter (cm)	12. Marketable yield/ plant (kg)

References

Aykroyd, W. R. 1963. The nutritive value of Indian foods and the planning of satisfactory diets. ICMR Special Report Series, No. 42.

Chandra, U. 1995. Distribution, domestication and genetic diversity of *Luffa* gourd in Indian sub-continent. *Indian J. Pl. Genet. Resour.*, 8: 189-196.

Choudhary, B.R., Pandey, S., Bhardwaj, D.R., Yadav, D.S. and Rai, M. 2008. Component analysis for qualitative traits in ridgegourd (*Luffa acutangula* (Roxb.) L.). *Veg. Sci.*, 35(2): 144-147.

Chowdhury, D. and Sharma, K.C. 2002. Studies on variability, heritability, genetic advance and correlations in ridge gourd [*Luffa acutangula* (Roxb.)L.]. *Hort. J.*, 15(3): 53-58.

Hanumegowda, K., Shirol, A.M., Mulge, R., Shantappa, T. and Prasadkumar. 2012. Correlation co-efficient studies in ridge gourd [*Luffa acutangula* (L.) Roxb.] *Karnataka J. Agric. Sci.*, 25(1): 160-162.

Karuppaiah, P., Kavitha, R. and Senthilkumar, P. 2002. Studies on variability, heritability and genetic advance in ridge gourd. *Indian J. Hort.*, 59(3): 307-312.

Prasanna, S.C., Krishnappa, K.S. and Reddy, N.S. 2002. Correlation and path coefficient analysis studies in ridge gourd. *Curr. Res.*, 31(9/10): 150-152.

Richharia, R.H. 1948. Sex inheritance of *Luffa acutangula*. *Curr. Sci.*, 17: 358.

Singh, R.P., Mohan, J. and Singh, D. 2002. Studies on genetic variability and heritability in ridge gourd (*Luffa acutangula* L.). *Agric. Sci. Digest*, 22(4): 279-280.

Varalakshmi, B., Rao, P.V. and Reddy, Y.N. 1995. Genetic variability and heritability in ridge gourd (*Luffa acutangula*). *Indian J. Agric. Sci.*, 65(8): 606-610.