*Int.J.Curr.Microbiol.App.Sci* (2018) *7*(8): 1520-1524

*International Journal of Current Microbiology and Applied Sciences*
***ISSN: 2319-7706* Volume 7 Number 08 (2018)**
Journal homepage: http://www.ijcmas.com

**Original Research Article** https://doi.org/10.20546/ijcmas.2018.708.173

# Genetic Divergence Studied in Ridge Gourd (*Luffa acutangula* (L.) Roxb.)

**N.D. Ramesh*, Praveen Choyal, Radhelal Dewangan, Pushpa S. Gudadinni and Priyanka P. Ligade**

*Department of Horticulture, SHUATS, Allahabad (U.P.), India*

**Corresponding author*

**Keywords**

Divergence, Ridge gourd, Inter and intra cluster distance, Cluster mean, Mahalonobis $D^2$

**Article Info**

***Accepted:***
10 July 2018
***Available Online:***
10 August 2018

**A B S T R A C T**

Studies were carried out to assess the genetic divergence among 14 ridge gourd genotypes using mahalanobis $D^2$. For genetic divergence fourteen varieties were grouped into four clusters. Maximum varieties (7) were included in cluster IV and minimum (1) in cluster I. The maximum inter-cluster distance was observed between cluster II and cluster IV (8506.65) followed by cluster II and III (4428.51) and cluster I and cluster III (1659.88) showed minimum inter cluster distance. The varieties with specific characters can be utilized for hybridization programme.

## Introduction

Ridge gourd [*Luffa acutangula* (L.) Roxb.], popularly known as Kalitori and also called as angled gourd, angled loofah, Chinese okra, silky gourd and ribbed gourd. Ridge gourd belongs to genus *Luffa* of *Cucurbitaceae* family and has chromosome number 2n = 26. The genus derives its name from the product "loofah" which is used in bathing sponges, scrubber pads, door mats, pillows, matteressa and also for cleaning utensils. It contains a gelatinous compound called 'luffein'' and has medicinal importance. Tender fruits are green in colour, which are used in soups and curries or as a cooked vegetable. Fruit contain edible protein (82%), moisture 92.5g, protein 0.5g, fat 0.5g, carbohydrate 3.4g, energy 17 k cal, calcium 18mg, vitamin C 5mg, riboflavin 0.01mg, phosphorous 26mg, iron 0.5mg and carotene 33µg (Sheshadri and Parthasarthy, 1980) per 100 g of edible portion. Genetic diversity is an important factor and also a pre-requisite in any hybridization programme. The available genetic diversity which is essential for any crop improvement programme. The inclusion of diverse parents in hybridization programme serves the purpose of producing desirable recombinants. Multivariate analysis by means of Mahalanobi's $D^2$ statistic is a powerful tool in quantifying the degree of divergence at genotypic level. The grouping of genotypes based on $D^2$ analysis will be useful in choosing suitable parental lines for heterosis breeding. The $D^2$ statistics is found to be an effective tool among the various

techniques available for genetic differentiation among population (Rao, 1960).

## Materials and Methods

The experiment was carried out at the Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences Allahabad. The varieties were grown in a randomized block design with three replicates, keep row to row distance of 1.2 m. and plant to plant distance of 0.90 m. Five competitive plants were selected at randomly tagged from each plot to record observation on various characters. The average value of each character was calculated on the basis of five plants for each genotype in every replication.

## Results and Discussion

Fourteen varieties of ridge gourd taken for multivariate analysis differed significantly with regard to the characters under study and displayed marked divergence, when taking all 18 characters together. Similar finding were reported by Sing *et al.,* (2002) and Karuppiah *et al.,* (2005) in ridge gourd.

Kadam and Kale *et al.,* (1987), Sahni *et al.,* (1987), Rao *et al.,* (2002) Singh *et al.,* (2002) and Hegade *et al.,* (2009) in ridge gourd. Based on $D^2$ statistics of Mahalanobis[20] and also by the use of non- hierarchical Euclidean cluster analysis, fourteen varieties were grouped into four highly divergent clusters based on similarity in traits (Table 4). Cluster IV was the largest cluster having (7) varieties followed by cluster II and III (3) respectively, cluster I (1) of each cluster (Table 4).

Thus formation of cluster with different varieties indicates diversity among varieties. The grouping of varieties into different constellation did not follow any specific pattern and was found independent of their geographic region. The intra cluster distance ranged from 0 to (1090.56).The maximum intra-cluster distance was found in cluster III (1090.56) followed by cluster IV (1008.74), cluster I (553.66), the clusters II was monogenotypic and recorded the least value (0.00) (Table 1). The maximum inter-cluster distance of was observed among the II and IV cluster (8506.64) indicating large genetic difference among varieties of these two cluster. Followed by cluster II and cluster III ($D^2$=4428.51), cluster I and cluster IV ($D^2$=3645.38), cluster I and cluster II ($D^2$=2937.78), cluster III and cluster IV ($D^2$=2709.42), minimum inter cluster distance of (1659.88) was observed between I and III cluster indicating significantly lesser genetic difference among the varieties of these two cluster. Maximum inter-cluster distance is indicative that varieties falling in these clusters had wide diversity and can be used for hybridization programme to get better recombinants in the segregating generations. Low level of intra-cluster distance was indicative of narrow genetic variation within the cluster (Table 2). The results are in conformity with the findings of Kale *et al.,* (2002), Quamruzzaman *et al.,* (2008) and Singh *et al.,* (2008). Mean performance of different clusters (Table 3) Cluster I comprised one varieties identified and registered maximum performance for days to last harvest (89.28 days). Cluster II comprised three varieties identified and registered maximum mean value for days to first harvest (53.00 days), whereas low mean performance for days to first male flower (33.00 days), days to 50% flowering (39.00 days), sex ratio (5.54%), vine length at 90 days (151.67 cm), days to last harvest (88.00 days), fruit length (14.73 cm), flesh thickness (2.39 cm), rind thickness (2.45 mm), fruit set percent (46.17%), fruit diameter (32.60 cm), no. of fruits per plant (8.67), average fruit weight (81.67 g), fruit yield per plant (0.708 kg), fruit yield per ha (68.03 q).

**Table.1** Distribution of 14 Ridge gourd varieties into different clusters

| Sr. No. | No. of varieties included | Varieties |
|---|---|---|
| I | 1 | Neelagang local |
| II | 3 | Jaipur long, Pusanasder, Co-2, |
| III | 3 | Arka sujata, Arka sumeet, Dharidan local |
| IV | 7 | Mallapur local, Anjali, Rekha, Solani-s, NRG-9, Deepti, Barsath local |

**Table.2** Intra (Diagonal) and Inter-Cluster Distance ($D^2$) in ridge gourd varieties

| Euclidean²: Cluster Distances : Ward | | | | |
|---|---|---|---|---|
| | 1 Cluster | 2 Cluster | 3 Cluster | 4 Cluster |
| I Cluster | 553.663 | 2937.782 | 1659.884 | 3645.386 |
| II Cluster | | 0 | 4428.518 | 8506.646 |
| III Cluster | | | 1090.561 | 2709.428 |
| IV Cluster | | | | 1008.742 |

**Table.3** Cluster mean value for different characters in ridge gourd

| Characters | Cluster I | Cluster II | Cluster III | Cluster IV | Mean |
|---|---|---|---|---|---|
| Days to first male flowering | 39.44 | 33.00 | 40.42 | 35.44 | 38.41 |
| Days to first female flowering | 43.56 | 38.00 | 45.33 | 37.78 | 42.43 |
| Days to 50% flowering | 43.33 | 39.00 | 44.00 | 39.33 | 42.36 |
| Node to first male flower | 4.31 | 4.03 | 4.63 | 3.39 | 4.18 |
| Node to first female flower | 18.01 | 14.00 | 19.26 | 10.32 | 16.43 |
| Sex ratio | 17.68 | 5.54 | 17.30 | 20.44 | 17.30 |
| Vine length cm at 90 days | 409.89 | 151.67 | 404.25 | 446.33 | 397.64 |
| Days to first harvest | 50.33 | 53.00 | 52.67 | 48.00 | 50.69 |
| Days to last harvest | 89.28 | 88.00 | 88.75 | 88.00 | 88.76 |
| Fruit length (cm) | 23.79 | 14.73 | 27.97 | 31.73 | 26.04 |
| Flesh thickness (cm) | 3.10 | 2.39 | 3.61 | 3.55 | 3.29 |
| Rind thickness (mm) | 3.37 | 2.45 | 3.79 | 4.24 | 3.61 |
| Fruit set % | 53.78 | 46.17 | 53.79 | 65.55 | 55.76 |
| Fruit diameter (cm) | 39.28 | 32.60 | 66.35 | 69.67 | 53.05 |
| No.of fruits per plant | 12.22 | 8.67 | 11.67 | 18.89 | 13.24 |
| Average fruit weight (g) | 166.67 | 81.67 | 229.75 | 239.44 | 194.21 |
| Fruit yield per plant (kg) | 2.03 | 0.708 | 2.67 | 4.52 | 2.65 |
| Fruit yield (q) per hector | 195.10 | 68.03 | 256.80 | 434.40 | 254.93 |

**Table.4** Contribution% towards Divergence in ridge gourd parameters

| Source | Times Ranked first | Contribution % |
|---|---|---|
| 1 Days to Taken 1st Male Fl | 0.000 | 0.01 |
| 2 Days to Taken 1st Female | 0.000 | 0.01 |
| 3 Days to 50% Flowering | 0.000 | 0.01 |
| 4 Node to First Male Flower | 0.000 | 0.01 |
| 5 Node to First Female Flow | 2.000 | 2.20 |
| 6 Sex Ratio | 2.000 | 2.20 |
| 7 Vine Length cm At 90 Days | 0.000 | 0.01 |
| 8 Days to 1st harvest | 0.000 | 0.01 |
| 9 Days to Last harvest | 0.000 | 0.01 |
| 10 Fruit Length cm | 8.000 | 8.79 |
| 11 Flesh Thickness cm | 1.000 | 1.10 |
| 12 Rind Thickness mm | 1.000 | 1.10 |
| 13 Fruit Set % | 0.000 | 0.01 |
| 14 Fruit Diameter | 6.000 | 6.59 |
| 15 Fruits/ Plant | 0.000 | 0.01 |
| 16 Average Fruit Weight (g) | 0.000 | 0.01 |
| 17 Fruit Yield/ Plant (kg) | 35.000 | 38.46 |
| 18 Fruit Yield Q/ha | 32.000 | 35.16 |

Cluster III comprised three varieties identified and recorded maximum mean performance for days to first male flower (40.42 days), days to first female flower (45.33), days to 50% flowering (44.00 days), node to first male flower (4.63), node to first female flower (19.26), flesh thickness (3.61 cm).

Cluster IV comprised seven varieties identified and registered maximum performance for sex ratio (20.44%), vine length at 90 days (446.33 cm), fruit length (31.73 cm), rind thickness (4.24 mm), fruit set percent (65.55%), fruit diameter (69.67 cm), no. of fruits per plant (18.89), average fruit weight (239.44 g), fruit yield per plant (4.52 kg), fruit yield per ha (434.40), whereas low mean for days to first female flowering (37.78 days), node to first male flower (3.39), node to first female flower (10.32), days to first harvest (48.00 days), days to last harvest (88.00 days). Per cent contribution of eighteen characters to total genetic diversity is presented in (Table 4). The characters namely, Among 18 characters studied, the most important character contributing maximum to the manifestation of genetic divergence was fruit yield/ plant (38.46 %) followed by other main responsible traits like fruit yield q/ha (35.16 %), contributed to moderate to the manifestation of genetic divergence fruit length (8.79 %), fruit diameter (6.59 %), node to first female flowering and sex ratio (2.20 %), flesh thickness and rind thickness (1.10 %) low contribution towards genetic divergence.

While days to taken 1st Male flowering, days to taken 1st female flowering, days to 50% flowering, node to first male flower, vine length cm at 90 days, days to 1st harvest, days to last harvest, no. of fruits/ plant and average fruit weight (0.01%), respectively, had negligible contribution.

## References


Hegade, V. C., Pradeepkumar, T. and George, T. E. Variability and genetic diversity studies in ridge gourd (*Luffa acutangula* (Roxb) L.) Proceedings of the 21st Kerala Science Congress, Kerala State Council for Science Technology and Environment, Kollam, pp 37-39 (2009).

Kadam, P. Y. and Kale, P. N. Genetic variability in ridge gourd. *J. Maharashtra Agric. Univ*., 12: 242-243 (1987).

Kale VS, Patil BR, Bindu S, Paithankar DH. Genetic divergence in pumpkin (*Cucurbita moschata*). *J Soils and Crops*. 12:213-216 (2002).

Karuppaiah, P., Kavita, R. and Kumar, P.S. Correlation and analysis in ridge gourd (*Luffa acutangula* L.). *Crop Res.* Hisar, 29: 490-494 (2005).

Mahalanobis, P. C. On the generalized distance in statistics. *Proc. Nat. Inst. Sci. India*, 2: 49-55 (1936).

Quamruzzaman AKM, Rahman MH, Islam MN, Rahman SML, Sarker BC. Genetic diversity in land races of ridge gourd. *Bangladesh Res. Publication J*. 1:5-12 (2008).

Rao, B. N., Rao, P. V. and Reddy, B. M. M., Correlation and path analysis in the segregating population of ridge gourd (*Luffa acutangula* (Roxb.) L.) *Crop Res*., 20(2): 338-342 (2002).

Sahni, G. P., Singh, R. K. and Saha, B. C., Genotypic and phenotypic variability in ridge gourd. *Indian J. Agric Sci*., 57(9): 666-668 (1987).

Sheshadri, V.S. and Parthasarthy, U.A. Cucurbits in vegetable crops In: Bose, T.K., Kabir, J., Maity, T.K., Parthasarthy, V.A. and Som, M.G. (eds.) *veg. crops*, pp. 496-497. (1980)

Singh DK, Maurya SK, Jaiswal HR, Singh A. Studies on genetic variability and genetic divergence analysis in ridge gourd [*Luffa acutangula* (Roxb.) L.]. *Prog. Hort*. 40:149-154 (2008).

Singh, R.P., Mohan, J. and Singh, Dharmendra. Studies on genetic variability and heritability in ridge gourd. *Agri. Sci. Dig*., 22: 4, 279-280 (2002).


**How to cite this article:**

Ramesh, N.D., Praveen Choyal, Radhelal Dewangan, Pushpa S. Gudadinni and Priyanka P. Ligade. 2018. Genetic Divergence Studied in Ridge Gourd (*Luffa acutangula* (L.) Roxb.). *Int.J.Curr.Microbiol.App.Sci.* 7(08): 1520-1524. doi: https://doi.org/10.20546/ijcmas.2018.708.173