Int.J.Curr.Microbiol.App.Sci (2022) *11*(02): 409-416

EXCELLENT PUBLISHERS

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 11 Number 02 (2022)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2022.1102.046

Studies on Genetic Variability in Early Generation Populations Derived from Commercial Hybrids of Ridge Gourd (*Luffa acutangla* L.)

E. P. Madhuri[1*], Shashikanth Evoor[1], V. D. Gasti[1], G. Raghavendra[2] and Bapurayagouda Patil[3]

[1]Department of Vegetable Science, [2]Department of BCI,
[3]Department of Seed Science and Technology, University of Horticultural Sciences, Bagalkot, India

**Corresponding author*

Keywords

Ridge gourd (*Luffa acutangula* L.), cucurbitaceae, tropical and subtropical regions

Article Info

Received:
05 January 2022
Accepted:
30 January 2022
Available Online:
10 February 2022

A B S T R A C T

Genetic variability in F_2 populations of two commercial hybrids i.e., Naga and NS-3 were studied for growth, earliness, yield and quality parameters in an un replicated trial at College of Horticulture, UHS, Bagalkot, during Jan-March 2018. The results revealed that PCV was higher than GCV for almost all the characters However, high heritability along with high genetic advance as per cent over mean was observed for the traits such as vine length at 60 DAP, node to first female flowering, node to first male flowering, average fruit weight, fruit length, TSS and Vit-C indicated that these characters are heritable to the next generation and can be improved by simple selection methods.

Introduction

Ridge gourd (*Luffa acutangula* L.) 2n=2x=26, belongs to the family cucurbitaceae is one of the important vegetable crop grown throughout the tropical and subtropical regions of the world (Bose and Som, 1986). There are many genotype(s)/cultivars of ridge gourd which were grown in different parts of the country having diverse characters. The variability among different genotypes arises either due to geographical separation or due to natural cross pollination. Before taking up any breeding programme in any crop species, a thorough knowledge of genetic variability existing in that particular crop for various characters is essential. The phenotypic expression of plant characters is mainly controlled by genetic makeup of the plant and the environment in which it is growing and the interaction between the genotypes and environment. Further, the genotype of the plant is governed by both heritable and non heritable components. Therefore, it has become necessary for partition of the observed phenotypic variability into its heritable and non-heritable components with suitable parameters such as phenotypic and genotypic coefficient of variation, heritability and genetic advance over per cent mean. Thus the exploitation of variability is of great importance and

is pre-requisite for any crop improvement. Considering the above facts the F_2 population has large variability, it provides ample scope for screening or selecting of best plants. Therefore, the present investigation was undertaken.

Materials and Methods

The experiment was carried out during the *rabi* season of 2017-2018 at College of Horticulture, UHS, Bagalkot. It is situated in Northern dry zone of Karnataka state at 16° 46' North latitude and 74° 59' East longitude and an altitude of 533.0 meters above the mean sea level. During the crop period *i.e.*, from January to March 2018 the rainfall received was low (138.20 mm). Similarly, the minimum and maximum temperature was higher as compared to average of last ten years. Two commercial hybrids i.e., Naga and NS-3 were selected in order to develop the experimental material required for the variability studies in F_2 generation. These two hybrids were planted (50 plants each) in the month of July 2017. Selfing of those two hybrids were done seperately in order to generate F_2populations. These F_2seeds were sown to study the variability on 6th Jan 2018 at field of Vegetable Science, College of Horticulture, Bagalkot. Seeds were treated with hot water (50°c for four hours) for better germination. Treated seeds were sown in portrays which were filled with coco peat and seedlings were transplanted to main field at 18 days after germination. The experiment was conducted by using un replicated trials. Two hundred plants each from two hybrids were maintained in this experiment.

The plants were transplanted on the sides of the ridges. The observations were recorded for growth parameters such as vine length(cm) at 60 and 90 DAP, number of primary branches at 90 DAP and number of secondary branches at 60 and 90 DAP, earliness parameters such days to first male flowering, days to first female flowering, node of first female flowering, node of first male flowering and sex ratio (M:F), yield parameters such as number of fruits per vine, fruit length (cm), fruit weight (g), fruit diameter (cm), fruit yield per vine (kg), fruit yield per plot (kg), fruit yield / ha (t) and quality parameters such as TSS of fruit (^{0}Brix) and Vitamin C (mg/ 100g)(observations were mentioned in tables).

Results and Discussion

Genotypic and phenotypic variability studies in these two hybrids reported that there is higher PCV than compared to GCV for most of the traits studied. The results were discussed below

Growth parameters

The vine length showed moderate GCV and PCV (13.22 and 16.69% respectively) with high heritability (60.57%) along with high genetic advance as per cent of mean (21.20%) in the population of Naga. Similarly the population NS-3 also recorded, moderate GCV and PCV (16.01 and 18.84%) with high heritability (72.20%) along with high genetic advance as per cent of mean (28.03%).

These results indicated that the trait is controlled by both additive and non-additive gene actions hence, the recurrent selection can be practiced for its improvement. In segregating population of Naga number of primary branches exhibits high PCV (23.20%) with moderate GCV (15.19%) indicating more sensitiveness of this character to environmental factors.

It also exhibited moderate heritability (42.85%) with high genetic advance as per cent over mean (20.46%). Similar results were also noticed by Singh *et al.*, (2017) and Bhargava *et al.*, (2017) in ridge gourd, which indicates that this character was associated with additive gene action. In NS-3 hybrid segregating population, this trait revealed moderate GCV (14.70%) and high PCV (24.60%). Low heritability of about 34.28% was observed in this trait, along with moderate genetic advance as per cent over mean (17.35%). These results are in accordance with the results of Mohanty and Mishra (1999) and Mohanty (2000) in pumpkin (Table-1).

Earliness parameters

The estimates of GCV and PCV in both the segregating populations of Naga (8.55 and 9.76% respectively) and NS-3 (6.38 and 8.86% respectively) were low for days to 1st male flowering. High heritability (76.65%) was observed for this trait in the populations of Naga. These results are inline with the results of Bhargava *et al.,* (2017) in ridge gourd. Moderate genetic advance as per cent of mean (15.42%) was observed in this trait. Similar results were also observed by Singh *et al.,* (2017)in ridge gourd. However, moderate heritability (51.87%) along with low genetic advance as per cent of mean (9.47%) was observed in the population of NS-3. Tiwari *et al.,* (2018) also noticed similar results in his findings with ridge gourd. The earliness or lateness is dependent on the number of days taken for its first female flower and days to first harvest, earliness is desirable character.

The estimates of GCV and PCV in the populations of Naga (8.08 and 8.91% respectively) and NS-3 (6.27 and 8.16% respectively) were low for days to first female flowering. These results are in accordance with Hegade *et al.,* (2009), Singh *et al.,* (2017) in ridge gourd. Low GCV and moderate PCV observed for node to first male flowering, indicated narrow genetic base. Very high heritability (82.27%) along with moderate genetic advance as per cent of mean (15.11%) was observed for this trait in the population of Naga. Whereas NS-3 population exhibited moderate heritability (59.16%) along with low genetic advance as per cent of mean (9.94%). In NS-3 hybrid segregating population, node of 1st female flowering exhibited moderate GCV (19.87%) and high PCV (25.25%). These results are in line with the results of Dubey *et al.,* (2013) in ridge gourd. It also exhibited high heritability (61.94%) with high genetic advance as per cent over mean (32.22%).

In the segregating population of Naga node at 1stmale flowering exhibited high GCV and PCV (28.13 and 32.31%), heritability (75.78%) and genetic advance as per cent over mean (50.45%) for this trait. This indicated the predominance of the additive component for these traits and showing the effectiveness of direct selection in improving this trait. Node at first male flowering in NS-3 population exhibited moderate GCV (16.52%) and high PCV (28.56%). However, it recorded low heritability of about 33.46% with moderate genetic advance as per cent over mean (19.68%). These results were inline with the results of Tiwari *et al.,* (2018) in ridge gourd. In the segregating population of Naga sex ratio exhibited moderate GCV (11.54%) and high PCV (20.42%) with low heritability (31.95%) and genetic advance as per cent over mean (13.44%). Similar results were also noticed by Tiwari *et al.,* (2018) in ridge gourd. In NS-3 segregating population, this trait exhibited low GCV (8.26%), heritability (15.29%) with genetic advance as per cent over mean (6.66%). Manoj *et al.,* (2018) also observed similar results in ridge gourd. Low heritability implies there was very high temperature during flowering season, hence there were alterations in the sex ratio of plants. Hence, there was more error variance was occurred, due to this less heritability observed for this trait (Table-2).

Yield and quality parameters

Yield is the complex of many yield contributing characters like number of fruits and average fruit weight etc. In the population of Naga, number of fruits per vine exhibited moderate GCV (14.97%), heritability (43.91%) and genetic advance as per cent over mean (20.44%) along with high PCV (22.60%). The segregating population of NS-3 also exhibited moderate GCV and PCV (12.02 and 18.61% respectively) and heritability of about 41.71% with low genetic advance as per cent over mean (15.99%) for this trait. These results are same as that of Tiwari *et al.,* (2018) in ridge gourd. Moderate GCV was found in both the generations indicated presence of less variability for this trait. The estimates of GCV and PCV were moderate in the population of Naga (15.32and 18.11% respectively) with high heritability (71.57%) along with high genetic advance as per cent of mean (26.70%) for average fruit weight.

Table.1 Estimates of mean, range, components of variance, heritability and genetic advance for growth parameters in two F_2 populations of ridge gourd

Sl.No	Character	F_2 population	Mean	Range	GV	PV	GCV	PCV	h^2 (%)	GA	GAM
Growth parameters											
1	Vine length at 60DAP(cm)	Naga	177.75	125.00-258.00	552.88	912.69	13.22	16.69	60.57	37.69	21.20
		NS-3	189.61	110.00-269.00	922.28	1277.24	16.01	18.84	72.20	53.16	28.03
2	Vine length at 90DAP(cm)	Naga	280.40	221.00-349.00	302.08	797.89	6.19	10.07	37.85	22.02	7.85
		NS-3	292.04	159.00-394.00	1145.33	1394.82	11.58	12.78	82.11	63.17	21.63
3	Number of primary branches at 90DAP	Naga	3.42	2.00-5.00	0.27	0.63	15.19	23.20	42.85	0.70	20.46
		NS-3	3.40	2.00-5.00	0.25	0.70	14.70	24.60	34.28	0.59	17.35
4	Number of secondary branches at 60DAP	Naga	9.91	5.00-13.00	1.39	2.63	11.89	16.36	52.85	1.76	17.81
		NS-3	10.10	8.00-14.00	0.77	2.93	8.68	16.94	26.27	0.92	9.16
5	Number of secondary branches at 90DAP	Naga	14.12	12.00-18.00	0.58	2.94	5.39	12.14	19.72	0.69	4.92
		NS-3	14.37	11.00-20.00	0.49	3.58	4.87	13.16	13.68	0.53	3.70

Table.2 Estimates of mean, range, components of variance, heritability and genetic advance for earliness parameters in two F_2 populations of ridge gourd

Sl.No	Character	F_2 population	Mean	Range	GV	PV	GCV	PCV	h^2 (%)	GA	GAM
Earliness parameters											
1	Days to 1st male flowering	Naga	39.59	35-48	11.46	14.95	8.55	9.76	76.65	6.10	15.42
		NS-3	39.02	34-47	6.21	11.97	6.38	8.86	51.87	3.69	9.47
2	Days to 1st female flowering	Naga	42.62	37-51	11.88	14.44	8.08	8.91	82.27	6.44	15.11
		NS-3	42.06	38-52	6.97	11.78	6.27	8.16	59.16	4.18	9.94
3	Node of 1st female flowering	Naga	14.33	7-22	8.32	13.08	20.12	25.23	63.60	4.73	33.06
		NS-3	13.48	8-22	7.18	11.59	19.87	25.25	61.94	4.34	32.22
4	Node of 1st male flowering	Naga	8.53	4-16	5.76	7.60	28.13	32.31	75.78	4.30	50.45
		NS-3	7.96	4-15	1.73	5.17	16.52	28.56	33.46	1.56	19.68
5	Sex ratio	Naga	24.79	15-35	8.19	25.63	11.54	20.42	31.95	3.33	13.44
		NS-3	24.57	14-36	4.12	26.93	8.26	21.12	15.29	1.63	6.66

Table.3 Estimates of mean, range, components of variance, heritability and genetic advance for yield and quality parameters in two F_2 populations of ridge gourd

Sl.No	Character	F_2 population	Mean	Range	GV	PV	GCV (%)	PCV (%)	h^2 (%)	GA	GAM (%)
Yield parameters											
1	Number of fruits per vine	NAGA	11.27	5.00-16.00	2.85	6.49	14.97	22.60	43.91	2.30	20.44
		NS-3	10.05	5.00-15.00	1.46	3.50	12.02	18.61	41.71	1.60	15.99
2	Average fruit weight (g)	NAGA	109.16	60.00-159.63	279.86	391.02	15.32	18.11	71.57	29.15	26.70
		NS-3	115.49	60.00-165.00	414.14	524.05	17.62	19.82	79.02	37.26	32.26
3	Fruit length(cm)	NAGA	22.92	14.00-32.50	3.36	15.17	7.99	16.99	22.14	1.77	7.75
		NS-3	22.90	13.40-31.00	12.43	15.64	15.39	17.26	79.47	6.47	28.27
4	Fruit diameter(cm)	NAGA	2.88	2.00-4.20	0.07	0.18	9.18	14.73	38.88	0.33	11.77
		NS-3	2.85	2.00-3.80	0.05	0.17	7.84	14.46	29.41	0.24	8.736
5	Fruit yield per vine (kg)	NAGA	1.14	0.25-2.12	0.03	0.11	15.19	29.09	27.27	0.18	16.31
		NS-3	1.10	0.30-2.20	0.05	0.12	20.32	31.40	41.66	0.29	27.00
Quality parameters											
1	TSS(°Brix)	NAGA	3.70	2.00-4.58	0.33	0.35	15.52	15.98	94.28	1.14	30.81
		NS-3	3.54	2.00-4.80	0.40	0.49	17.86	19.77	81.63	0.99	27.96
2	Vit-C (mg/100g)	NAGA	2.93	1.34-4.36	0.20	0.27	15.26	17.73	74.07	0.79	26.93
		NS-3	2.84	2.00-4.54	0.20	0.28	15.74	18.63	71.42	0.77	27.11

Similarly NS-3 population also exhibited moderate GCV and PCV (17.62 and 19.82 %), high heritability (79.02%) along with high genetic advance as per cent of mean (32.26%) for this trait. Which indicates additive gene action operating for this trait and direct selection can be done to improve this trait.

The estimates of GCV was found to be low in the population of Naga (9.18%) for fruit diameter with moderate PCV of (14.73%) with low heritability (38.88%) indicated that there is a less scope for further improvement.

Genetic advance as per cent of mean was also found to be moderate (11.77%). These results are in conformity with the findings of Singh *et al.,* (2017) and Tiwari *et al.,* (2018) in ridge gourd. The NS-3 derived population also exhibited low GCV (7.84%) with moderate PCV (14.46%) for this trait along with low heritability (29.47%) and genetic advance as per cent of mean (8.74%). Singh *et al.,* (2017) and Tiwari *et al.,* (2018) also observed similar results in ridge gourd. Fruit yield per vine exhibited moderate GCV (15.19%) with high PCV (29.09%) in Naga hybrid population along with low heritability (27.27%) and moderate genetic advance as per cent of mean. In the population of NS-3. This trait exhibited high GCV and PCV (20.32 and 31.40% respectively) implies there is variability for further improvement. Scope for selection. Moderate heritability (41.66%) along with high genetic advance as per cent of mean (27.00%) was observed for this trait. This indicated that follow simple selection method for further improvement of this trait.

The estimates of GCV and PCV was found to be moderate for TSS in the population of Naga (15.52 to 15.98%) with high heritability (94.28%) along with high genetic advance as per cent of mean (30.81%). Similarly the estimates of GCV and PCV was found to be moderate in the population of NS-3 (17.86 to 19.77%) also. This trait exhibited very high heritability (81.63%) along with high genetic advance as per cent of mean (27.96%). These results are similar as that of Singh *et al.,* (2017), Gayen and Hossain (2006) in ridge gourd. This indicated that this trait is governed by additive gene action.

The Vit-C in the population of Naga had moderate GCV and PCV (15.26 and 17.73%) along with high heritability (74.07%) and genetic advance as per cent of mean (26.93%).The population of NS-3, also exhibited moderate GCV and PCV (15.74 to 18.63%) with high heritability (71.42%) and genetic advance as per cent of mean (27.11%). Gayan and Hossain (2006) also observed similar findings with their research work in ridge gourd, these results indicated to go for simple selection for improvement of this trait.

References

Bhargava, A. K., Singh, V. B., Kumar, P. and Meena, R. K., 2017. Efficiency of selection based on genetic variability in ridge gourd [*Luffa acutangula* L. (Roxb.)]. *J.Pharmacognosy and Phytochem,*6(4): 1651-1655.

Bose, T. K. and Som, M. G., 1986.Vegetable crops in India. Nayaprokash, Bidhausarani, Calculta. India pp.107-114.

Dubey, R. K., Singh, V. and Upadhyay, G., 2013. Genetic variability and inter-relationship among some ridge gourd *(Luffa acutangula* L.) accessions under foot hills of Arunachal Pradesh. *J.Prog. Hort*, 45(1): 191-197.

Gayen, N. and Hossain, M., 2006. Study of heritability and genetic advance in bottle gourd [*Langenaria siceraria* (Mol.) Stand.]. *J. Intracad,*10(4): 463-466.

Hegade, V. C., Pradeep Kumar, T. and George, T. E., 2009.Variability and genetic diversity studies in ridge gourd (*Luffa acutangula* (Roxb) L.). *In Proc.of the 21st Kerala Sci. Conf*, pp. 37-39.

Manoj, Y. B., Lakshmana, D., Ganapathi, M. and Chandana, B. C., 2018, Studies on character association and genetic variability for important traits in ridge gourd (*Luffa acutangula* L.). *Green Farming*, 9 (2): 244-

247.

Mohanty, B. K. and Mishra, R. S., 1999.Heterosis for yield and yield components in pumpkin (*Cucurbita moschata* Duch. Ex. Poir). *The Indian J. Genet.and Plant Breed*, 59(4): 505-510.

Mohanty, B. K., 2000.Combining ability for yield and its components in pumpkin. *Indian J. Gente. and Plnt breed*, 60(3): 373-379.

Singh, V., Rana, D. K. and Shah, K. N., 2017. Genetic variability, heritability and genetic advance in some strains of bitter gourd (*Momordica charantia* L.) under subtropical conditions of garhwal Himalaya. *Plant. Archives*,17(1): 564-568.

Tiwari, N. K., Pandey, A. K., Singh, U. N. and Singh, V. B., 2018. Genetic variability, heritability in narrow sense & genetic advance percent of mean in bitter gourd (*Momordica charantia* L.*). J. Pharmacognosy and Phytochem*, 7(2):2608-2610.

How to cite this article:

Madhuri, E. P., Shashikanth Evoor, V. D. Gasti, G. Raghavendra and Bapurayagouda Patil. 2022. Studies on Genetic Variability in Early Generation Populations Derived from Commercial Hybrids of Ridge Gourd (*Luffa acutangla* L.). *Int.J.Curr.Microbiol.App.Sci.* 11(02): 409-416.
doi: https://doi.org/10.20546/ijcmas.2022.1102.046