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Variability studies in ridge gourd (*Luffa acutangula* (L.) Roxb.)

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Abstract
A field experiment was conducted at All India Co-ordinated Research Project on Vegetable Crops, Odisha University of Agriculture and Technology, Bhubaneswar with sixteen genotypes of ridge gourd (*Luffa acutangula* (L.) Roxb.) in Randomized Block Design with three replications during spring and summer season,2020. The analysis of variance revealed highly significant differences among the mean sum of squares due to genotypes for different quantitative characters studied indicating the presence of variability among the genotypes. The high GCV and PCV were observed for number of fruit per plant, fruit yield per plant indicating high variability available in the germplasm for these characters for further improvement. High heritability coupled with high genetic advance as per cent of mean was observed for fruit length, fruit weight, node to first female flower, seed per fruit, vine length, fruit weight characters viz., indicating that these characters were least influenced by the environmental effects and governed by additive genes.

Keywords: Ridge gourd variability heritability genetic advance

Introduction
Ridge gourd [*Luffa acutangula* (L.) Roxb.], belongs to family-Cucurbitaceae, having chromosome number 2n=2x=26. It is a popular vegetable grown in tropical and subtropical countries, particularly in Asia and India and also in Africa. Though cultivated species of ridge gourd are monoecious in nature but different sex forms like androecious, gynoecious, gynomonoecious, andromonoecious and hermaphrodite plants are also seen (Choudhary *et al.* 2014) [1]. Ridge gourd is being commercially cultivated in Bihar and Uttar Pradesh in both summer and rainy seasons (Choudhary *et al.* 2011) [2]. Genetic variability is a prerequisite for the meaningful selection of the genotypes for the trait of interest, and heritability in conjunction with expected genetic advance determines its proper management and effective utilization of plant genetic resources depends on detailed understanding of their genetic variability (Anitha 1998) [3]. The failure to identify suitable and potential parents affects the success and genetic gains of the breeding programme, which is dependent on the extent of genetic variability present in the source genetic pool (Tyagi *et al.* 2018) [4]. The success of any crop improvement programme largely depends upon the nature and magnitude of genetic variability existing in the breeding material. The study on genetic variability and divergence illuminates information on genetic parameters.

Ridge gourd exhibits a wide range of diversity in fruit shape and size in India particularly northern-eastern parts (Choudhary *et al.* 2011) [5]. There is great morphological and genetic variability and wide environmental adaptation in nature in ridge gourd genotypes. The fruits vary widely in fruit shape, size, colour (varies from light green, green to dark green), and number of ridges per fruit (either 10 or 11) in ridge gourd and this is within or among the cultivars.

Materials and Methods
The experiment was conducted at the All India Coordinated Research Project on Vegetable Crops, Odisha University of Agriculture and Technology, Bhubaneswar during spring and summer season, 2020 with sixteen genotypes of Ridge gourd. The experiment was laid out in Randomized Block Design (RBD) with three replications. The field was located at latitude of 20^0 15'N and longitude of 85^0 52'E. In each replication, each entry was grown in a plot having four basins with 3 plants basin^{-1}.

From randomly selected 5 plants per each plot observations were recorded for seventeen characters viz., vine length(cm), number of primary branches, internodal length(cm), number of nodes, days to 50% flowering, node at which first female flower appear, sex ratio, days to first fruit set, days to first fruit harvest, number of fruit per plant, fruit length (cm), fruit girth (cm), fruit weight(g), fruit stalk length(cm), number of seeds per fruit, fruit yield plant^{-1} (kg) and fruit yield plot^{-1} (kg).

Results and Discussion

Results of analysis of variance are presented in Table 1 which revealed the nature and magnitude of variability for different quantitative characters to be significant indicating the existence of large amount of variation in the characters studied except number of primary branches, fruit girth and fruit stalk length indicating the presence of variability among the genotypes that are clearly observed among the ridge gourd genotypes. The mean sum of square for genotypes was maximum in case of vine length followed by fruit weight. The characters like yield plant^{-1}, number of primary branches, fruit girth, fruit stalk length exhibited minimum values for genotypic mean sum of squares.

The general mean results indicated wide variation ranging from Yield plant^{-1} (1.57Kg) to plant height (291.20 cm). The range was highest in case of plant height (182.00 cm – 456.00 cm) and lowest range was observed in Yield plant^{-1} (1.06 Kg-2.83 Kg).

Results from table 2 indicated that the genotypic variance ranged from 0.112 for Yield plant^{-1} to 2096.13 for vine length. The phenotypic variance ranged from 0.148 for yieldplant^{-1} to 3422.56 for vine length. A wide range of variability was observed for vine length, fruit yield plot^{-1}, number of fruits per plant, days to 50% flowering, fruit weight. Similar to the present findings, investigations carried out earlier also revealed wide variations for various characters (Kumar *et al.* 2013) [6] and (Karthik et *al.* 2017) [7].

Table 1: Analysis of variance (mean sum of squares) for 17 characters of 16 genotypes of ridge gourd

Sl. No.	Character	Mean sum of squares		
		Replication	Genotype	Error
1	Vine length	6505.150	7614.840**	1326.440
2	Number of primary branch	0.196	0.667	0.103
3	Internodal length	0.422	4.761**	0.709
4	Number of nodes	2.816	16.199**	5.777
5	Days to 50% flowering	4.188	39.639**	4.676
6	Node to first female flower	11.564	14.381**	0.636
7	Sex ratio	1.793	8.933**	1.784
8	Days to first fruit set	7.146	33.054**	4.879
9	Days to first fruit Harvest	9.021	40.988**	6.288
10	Number of fruit per plant	7.085	28.297**	2.505
11	Fruit length	3.310	41.294**	1.121
12	Fruit girth	0.713	2.445	0.387
13	Fruit weight	133.947	938.451**	51.518
14	Fruit stalk length	0.064	2.532	0.269
15	Seed per fruit	20.096	85.986**	9.262
16	Yield plot-1	6.469	10.150**	1.879
17	Yield plant-1	0.144	0.374**	0.035

The study of data in table 2 revealed that the phenotypic coefficient of variation (PCV) was higher than genotypic coefficient of variation (GCV) for all the 17 characters taken and the magnitude of differences between PCV and GCV were observed to be narrow for all the studied characters except except vine length and number of primary branches which indicates lesser influence of environment in the expression of these characters and selection of these traits based on phenotype would be effective. Similar findings were also reported by (Tyegi *et al.* 2018) [8] PCV was highest (25.24) for number of fruit per plant followed by fruit yield plant^{-1} (24.41). PCV was lowest for fruit girth (8.39) followed by internodal length (8.66) and number of nodes (8.85), sex ratio (9.04), days to first fruit set (9.23), days to first fruit harvest (9.26) in ascending order. The characters like seed per fruit (10.48), days to 50% flowering (10.67), fruit stalk length (11.41) and fruit weight (15.30), node to first female flower (16.59), yield plot^{-1} (18.23), fruit length (18.77) exhibited moderate values for PCV (10-20%). Relatively higher PCV (>20%) was observed in rest of the characters.

Relatively higher value of GCV was found for characters like number of fruit plant^{-1} (22.21) followed by fruit yield plant^{-1} (21.29) and fruit length (18.03). Moderate values were obtained in 10 characters. Number of nodes (5.42) exhibited the lowest value followed by fruit girth (6.71), sex ratio (6.83) and internodal length (7.01) in ascending order.

GCV represents the heritable components of total variation. So, it is an important parameter for comparing variability of different characters among the sixteen genotypes of ridge gourd. The highest genetic coefficient of variation was observed for number of fruit per plant (22.21) followed by fruit yield plant^{-1} (21.29) and fruit length (18.03) which indicated maximum variability existing in the genotypes that provides better scope for genetic improvement in the character through effective simple selection. The high GCV for yield plant^{-1} and number of fruits plant^{-1} were also reported by (Khan *et al.* 2016) [9]. Lowest GCV were observed for number of nodes (5.42) followed by fruit girth (6.71), sex ratio (6.83), intermodal length (7.01) which reveals that the extent of response of these traits for selection would be less than that of other traits. High GCV alone is not sufficient for determination of heritable variation. So, GCV along with heritability would give the best view of the advance to be expected by selection.

Table 2: Genetic parameter for seventeen characters in ridge gourd genotypes

Sl. No.	Characters	General mean	Range	GV	PV	PCV	GCV	Heritability (b.s.) (%)	GA (at 5% level)	GAM
1.	Vine length (cm)	291.20	182.00-456.00	2096.13	3422.56	20.09	15.72	61.24	73.80	25.34
2.	Number of primary branch	2.53	1.61-3.71	0.18	0.29	21.25	17.08	64.56	0.71	28.27
3.	Internodal length(cm)	16.56	13.42-19.08	1.35	2.05	8.66	7.01	65.57	1.93	11.70
4.	Number of Nodes	34.33	26.48-40.38	3.47	9.25	8.85	5.42	37.55	2.35	6.85
5.	Days to 50% flowering	37.87	30.00-46.00	12.75	22.04	10.67	9.01	71.36	5.94	15.68
6.	Node to female flower	13.76	9.64-18.46	4.58	5.21	16.59	15.55	87.81	4.13	30.02
7.	Sex ratio	22.57	17.61-26.90	2.38	4.16	9.04	6.83	57.18	2.40	10.65
8.	Days to first fruit set	40.89	31.00-50.00	5.28	14.57	9.23	7.49	65.81	5.12	12.52
9.	Days to first Harvest	45.60	37.00-56.00	10.40	18.75	9.26	7.45	64.78	5.63	12.36
10.	Number of fruit per plant	13.20	6.90-20.33	8.59	11.10	25.24	22.21	77.44	5.31	40.26
11.	Fruit length(cm)	20.28	16.00-30.68	13.39	14.51	18.77	18.03	92.27	7.24	35.69
12.	Fruit girth(cm)	12.34	10.02-14.02	0.68	1.07	8.39	6.71	63.96	1.36	11.06
13.	Fruit weight(gm)	121.71	86.33-168.29	295.64	347.16	15.30	14.12	85.16	32.68	26.85
14.	Fruit stalk length(cm)	8.86	7.62-10.81	0.75	1.02	11.41	9.80	73.70	1.53	17.33
15	Seed per fruit	56.32	44.73-69.68	25.57	34.83	10.48	8.97	73.41	8.92	15.84
16	Yield plot^{-1}(Kg)	11.80	8.01-13.58	2.75	4.63	18.23	14.06	59.46	2.63	22.34
17	Yield plant^{-1}(Kg)	1.57	1.06-2.83	0.11	0.14	24.41	21.29	76.08	0.60	38.26

In the present experiment, the highest estimates of heritability in broad sense was observed for 92.27% in fruit length followed by node to first female flower (87.81%), fruit weight (85.16%), number of fruit plant^{-1}, Yield plant^{-1}, fruit stalk length, seed per fruit, days to 50% flowering, days to first fruit set, internodal length, days to first fruit harvest, number of primary branches, fruit girth, plant height indicating that these characters are less affected by environment. Moderate heritability was recorded for yield plot^{-1}, sex ratio, number of nodes indicating high influence of environment.

In forecasting selection response, heritability estimates combined with genetic advance are more informative than heritability alone. The amount of genetic gain projected during a selection process is referred to as genetic advance. For majority of the traits, strong heritability was combined with high genetic advance as a % of mean with the fruit length, fruit weight, 50% flowering, seed per fruit, vine length except internodal length, fruit girth, fruit stalk length. Similar findings were also reported by (Kumar *et al.* 2013) [10]. These characters had also high GCV which indicated that these characters were least influenced by environmental effects and were governed by additive genes and selection on the phenotypic performance will be rewarding for improvement of such traits. These results are i n accordance with the findings of (Devi *et al.*2017) [11] and (Radharani *et al*. 2015) [12] High heritability and moderate GA as per cent mean values were observed for fruit stalk length,50% flowering, internodal length, fruit girth, days to first fruit harvest, days to first fruit set, number of fruit per plant which indicates the influence of non-additive gene action and considerable influence of environment on the expression of this trait and genetic improvement of this trait would be effective on a moderate scale. Fruit yield per plot, sex ratio, Number of node recorded moderate heritability accompanied by low GA which indicates that these characters are highly influenced by environment and selection of these traits will be less effective. Similar trend was observed by (Sampath *et al.* 2019) [13].

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References

1. Choudhary BR, Pandey S, Singh PK, Pandey V. Genetic diversity analysis for quantitative traits in hermaphrodite ridge gourd [*Luffa acutangula* (Roxb.) L.]. Indian Journal of Horticulture. 2014;71(2):284-287.
2. Choudhary BR, Pandey S, Singh PK, Singh R. Genetic divergence in hermaphrodite ridge gourd (*Luffa acutangula*). Vegetable Science. 2011;38(1):68-72.
3. Anitha CA. Variability in Ridge gourd, M.Sc. thesis, Kerala Agricultural University, Kerala, 1998.
4. Tyagi N, Singh VB, Maurya PK. Studies on Genetic Variability, Heritability and Genetic Advance in Bitter Gourd (*Momordica charantia* L.) for Yield and Yield Contributing Traits. International Journal of Current Microbiology and applied Sciences. 2018;7(3):1788-1794.
5. Choudhary BR, Pandey S, Singh PK, Singh R. Genetic divergence in hermaphrodite ridge gourd (*Luffa acutangula*). Vegetable Science. 2011;38(1):68-72.
6. Kumar R, Ameta KD, Dubey RB, Pareek S. Genetic variability, correlation and path analysis in sponge gourd (*Luffa cylindrica* (Roem.) L). African Journal of Biotechnology, 2013, 12(6).
7. Karthik D, Varalakshmi B, Kumar G, Lakshmipathi N. Genetic Variability Studies of Ridge Gourd Advanced Inbred Lines (*Luffa acutangula* (L.) Roxb.), International Journal of Pure and applied Bioscience. 2017;5(6):1223-1228.
8. Tyagi N, Singh VB, Maurya PK. Studies on Genetic Variability, Heritability and Genetic Advance in Bitter Gourd (*Momordica charantia* L.) for Yield and Yield Contributing Traits. International Journal of Current Microbiology and applied Sciences. 2018;7(3):1788-1794.
9. Khan ASMMR, Chaki AK. Variability, heritability, character association, path analysis and morphological diversity in snake gourd. Agriculture and Natural Resources. 2016;50(6):483-489.
10. Kumar R, Ameta KD, Dubey RB, Pareek S. Genetic variability, correlation and path analysis in sponge gourd (*Luffa cylindrica* (Roem.) L). African Journal of

Biotechnology, 2013, 12(6).
11. Devi ND, Mariappan S. Genetic Variability, heritability, Correlation and Path Analysis diversity in Snake gourd (*Trichosanthes anguina* L.), Electronic Journal of Plant Breeding. 2017;8(2):566-571.
12. Radha Rani K, Raju CS, Reddy KR. Variability, correlation and path analysis studies in bitter gourd (*Momordica charantia* L.). Agricultural Science Digest-A Research Journal. 2015;35(2):106.
13. Sampath S, Arumugam A, Nageswari K, Paramasivam V, Sakthivel K. Genetic Diversity of ash gourd (*Benincasa hispida* (Thunb) Cogn.) genotypes. Journal of Pharmacognosy and Phytochemistry. 2019;8(6):1513-1517.