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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 Coordinated Research Project on Vegetable Crops, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (M.S.) with randomized block design with two replications during summer season, 2022. The evaluation of F_3 progenies of cross-1 Arka sumeet x Konkan harita and along with two parents of ridge gourd. The eighteen characters for variability studied that. The high GCV and high PCV observed characters number of branches per vine, fruit yield per vine, fruit yield per plot and fruit yield per ha indicating high variability available for these characters for further improvement and the high heritability coupled with high genetic advance as percent of mean was observed for the characters number of branches per vine, node number at which first female flower appeared, number of pickings, weight of fruit, number of fruits per vine, fruit yield per vine, fruit yield per plot and fruit yield per ha. Indicating that these characters were least influenced by the environmental effects and governed by additive gene action. Hence, better scope for improvement through selection.

Keywords: Variability, GCV, PCV, heritability, genetic advance as percent of mean

Introduction
Ridge gourd (*Luffa acutangula* L. Ruxb.) is one of the most important cucurbitaceous vegetable crop grown extensively throughout the tropical and sub-tropical regions of the world. It belongs to Cucurbitaceae family with 2n=26 chromosome number and widely cultivated in *kharif* and *summer* Season in India. Tender fruits of ridge gourd are popular and well-known culinary vegetable in India with good nutritive value and high yield potentials (Seshadri, 1986) [13]. Yield is a complex character and is largely influenced by the genotype-environment interaction and understanding of the mode of inheritance of such complex quantitative character is essential for formulating effective selection procedures in order to improve the yield and its related characters. High heritability accompanied by a high genetic advance, indicate the predominance of additive gene action, whereas high heritability accompanied by low genetic advance indicate the predominance of epistasis and dominant gene action (Panse and Khargonkar, 1957) [11]. High heritability along with high genetic advance is usually more useful in predicting gain under selection than the heritability estimates alone (Johnson *et al.* 1955) [6]. The genotypic and phenotypic coefficient of variation, heritability and genetic advance enable the breeders to study its genetic variability and potential progenies. Since, many economic traits are quantitative in nature and highly influenced by the environment, the progress of breeding is governed by the nature of genetic and non-genetic variations, it will be useful to partition the overall variability into its heritable and non-heritable components to know whether superiority of selection is inherited by the progenies.

Material and Methods
The experiment was conducted at All India Coordinated Research Project on Vegetable Crops), Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (M.S.) with randomized block design with two replications during summer season, 2022. The F_3 generation of five progenies in cross-1 Arka sumeet x Konkan harita. The crop received timely management practices as per recommended package of practices. The crop was maintained properly till last harvest and observations on yield as well as yield contributing characters was noted on F_3 progenies along with two parents. From cross-1 150 plants were studied and taken data from all the plants for eighteen characters *viz*., number of branches per vine, length of vine (m), days to appearance of first male flower, days to

appearance of first female flower, node number at which first male flower appeared and node number at which first female flower appeared, days to 50 percent flowering, sex ratio, days to first picking, number of pickings, days to last picking, length of fruit (cm), diameter of fruit (cm), weight of fruit (g), number of fruits per vine, fruit yield per vine (kg), fruit yield per plot (kg) and fruit yield (q/ha). Genotypic and phenotypic coefficient of variation were calculated as per the formula suggested by Burton and De Vane (1953) [2]. Heritability and expected genetic advance were calculated as per formula given by Johnson *et al*., (1955a) [7].

Results and Discussion

The results of variability, heritability and genetic advance are presented in the table 1. The phenotypic coefficient of variation (PCV) was higher than the respective genotypic coefficient of variation (GCV) for all the characters of generations of three crosses denoting environmental factors influencing their expression to some degree. Wide difference between PCV and GCV indicates the maximum role of environmental factors whereas, narrow difference between PCV and GCV suggested that these characters are least influenced by environment. Similar findings were observed by Kannan and Rajamanickam (2019) [9] and Gautham and Balamohan (2018) [5] in ridge gourd and Deepa *et al.* (2018) [3] in cucumber and Maurya *et al.* (2018) [10] and Alekar (2019) [1] in bitter gourd.

The high GCV and high PCV observed characters number of branches per vine, fruit yield per vine, fruit yield per plot and fruit yield per ha indicating high variability available for these characters for further improvement Similar findings were observed by Kannan and Rajamanickam (2019) [9] and Gautham and Balamohan (2018) [5] in ridge gourd and Deepa *et al.* (2018) [3] in cucumber. The moderate GCV and high PCV observed characters length of vine, node number at which first female flower appeared, sex ratio, number of pickings, weight of fruit and number of fruits per vine. It implies that moderate amount of variability is present in the population and further selection would be possible up to some extent. Whereas, low GCV and PCV characters days to appearance of first male flower, days to appearance of first female flower, node number at which first male flower appeared except PCV, days 50 percent flowering, days to first picking, days to last picking, length of fruit and diameter of fruit. This indicates limited scope for improvement of these traits due to low magnitude of variability and also it implies the population attained homozygosity for these traits and further selection will not alter them. Similar results were observed by Kanimozhi *et al.* (2015) [8] in wax gourd.

In the present investigation, high heritability (bs) estimates observed for all studied yield and yield contributing characters. Results were on par with the findings of Doddamani *et al*. (2018) [4] in cucumber and Kannan and Rajamanickam (2019) [9] in ridge gourd. And the high heritability coupled with high genetic advance as percent of mean was observed for the characters number of branches per vine, node number at which first female flower appeared, number of pickings, weight of fruit, number of fruits per vine, fruit yield per vine, fruit yield per plot and fruit yield per ha. Indicating that these characters were least influenced by the environmental effects and governed by additive gene action. Hence, better scope for improvement through selection. Similar findings were observed by Sharma and Sengupta (2012) [14] in bottle gourd and Gautham and Balamohan (2018) [5] in ridge gourd. Whereas, the characters length of vine, sex ratio, days to first picking and length of fruit exhibited high heritability coupled with moderate genetic advance as percent of mean. And the high heritability coupled with low genetic advance as percent of mean was observed for the characters days to appearance first male flower, days to appearance first female flower, node number at which first male flower, days to 50 percent flowering, days to first picking, diameter of fruit. These results were revealed that, presence of certain degree of non-additive gene effect and selection may not effective. Similar findings were observed by Pathak *et al.* (2014) [12] and Maurya *et al.* (2018) [10] in bitter gourd.

Table 1: Mean, range, GCV, PCV, ECV, heritability, genetic advance and percent mean of genetic advance of two parents and F_3 population of cross Arka sumeet X Konkan harita C_1: (P_3XP_4)

Sr. No	Character	Mean		Range	GCV (%)	PCV (%)	ECV (%)	h^2 bs (%)	GA	GAM (%)
1	No. of branches per vine	2 Parents	F_3 Progeny	3.60-6.37	20.29	21.16	6.03	91.90	2.15	40.06
		3.95	5.96							
2	Length of vine (m)	3.19	3.60	3.03-3.97	9.68	10.41	3.85	86.30	0.64	18.52
3	Days to appearance first male flower	41.10	39.31	37.53-41.50	3.51	3.63	0.92	93.50	2.78	6.99
4	Days to appearance first female flower	47.40	45.42	44.33-47.70	2.72	2.76	0.46	97.20	2.54	5.53
5	Node no. at which first male flower appeared	3.40	2.87	2.67-3.50	6.43	11.84	9.59	29.50	0.21	7.18
6	Node no. at which first female flower appeared	14.10	12.07	10.36-14.50	13.58	13.93	3.11	95.00	3.45	27.27
7	Days to 50% flowering	53.85	52.42	51.20-54.00	1.98	2.16	0.85	84.30	1.98	3.76
8	Sex ratio	20.32	18.07	16.47-21.91	10.23	11.27	4.74	82.30	3.57	19.12
9	Days to first picking	57.65	55.51	54.60-57.70	2.42	2.53	0.72	91.90	2.69	4.79
10	No. of pickings	14.02	18.14	13.40-19.25	12.62	12.77	1.95	97.70	4.36	25.70
11	Days to last picking	100.15	111.51	98.70-113.90	5.43	5.45	0.44	99.30	12.07	11.15
12	Length of fruit (cm)	23.50	24.25	21.10-27.80	9.14	9.67	3.15	89.40	4.28	17.81
13	Diameter of fruit (cm)	1.95	2.04	1.94-2.10	2.73	3.25	1.76	70.70	0.09	4.74
14	Weight of fruit (g)	118.55	140.71	118.50-161.70	12.31	12.54	2.36	96.50	33.8	24.92
15	No. of fruits per vine	15.90	21.57	15.70-24.76	17.61	17.75	2.26	98.40	7.18	35.98
16	Fruit yield per vine (kg)	1.89	3.05	1.86-3.78	27.78	27.82	1.55	99.70	1.55	57.14
17	Fruit yield /plot (kg)	9.42	15.25	9.30-18.91	27.77	27.81	1.52	99.70	7.76	57.12
18	Fruit yield (q/ha)	125.69	203.42	124.10-252.23	27.76	27.80	1.51	99.70	103.48	57.10

Conclusion

The high GCV and high PCV observed characters number of branches per vine, fruit yield per vine, fruit yield per plot and fruit yield per ha. Which indicates wide range of variation and selection based on these characters provide ample scope for desirable plant types. high heritability coupled with high genetic advance as percent of mean was observed for the characters number of branches per vine, node number at which first female flower appeared, number of pickings, weight of fruit, number of fruits per vine, fruit yield per vine, fruit yield per plot and fruit yield per ha. Indicating that these characters were least influenced by the environmental effects and governed by additive gene action. Hence, better scope for improvement through selection.

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