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Variability studies in Valan kakri (*Cucumis sativus* var. *utilissimus* L.) germplasm

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ABSTRACT

Valan kakri is an underexploited vegetable and has great potential for genetic improvement through systematic approach. In this study, variability parameters were evaluated in 30 genotypes of Valan kakri collected from different villages across Udaipur during September 2019 and morphological studies were done at Rajasthan College of Agriculture, Udaipur. The genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) were highest for fruit length (34.48%, 35.43%) followed by fruit weight (61.64 % and 62.04). Estimates for heritability (Broad sense) ranged from 69.70% for seed cavity breadth to 99.24% for acidity of fruit. Traits like fruit length, fruit weight, seed cavity length, acidity of fruit, ascorbic acid content had high GCV, PCV and heritability along with high genetic advance as percentage of mean. Therefore, selection can be effective for these traits in crop improvement programme.

Key words : *Valan kakri, Cucumis sativus var. utilissimus L.) germplasm*

Introduction

Cucurbits belongs to the family Cucurbitaceae. Cucumber (*Cucumis sativus* L.) being an important member of cucurbitaceae, have immense nutritional, medicinal and economic potential.

Valan kakri, native of northern India, is an important member in the cucumber group. Valan kakri differs from the common cucumber with respect to size, length and keeping quality. The fruit provides a number of benefits like it helps in weight loss, rehydration as it produces low calories and more fiber content.

As Valan kakri is an underexploited crop, there is a need to explore its genetic diversity for crop improvement. Evaluation of genotypes for accessing the amount of genetic variability present in the existing species for the traits is pivotal for any successful plant breeding program. On the other hand, heritability gives proof that a trait's expression is under genetic control, and it also predicts a trait's breeding value (Ullah *et al.,* 2012).

Traits having high heritability coupled with high genetic advance provides the most effective condition for selection as it indicates that it is controlled by additive gene action (Tazeen *et al.,* 2009). The present investigation was carried out to estimate genetic variability and heritability in Valan kakri based on different morphological traits.

Materials and Methods

The present investigation was carried out at Department of Horticulture, Rajasthan College of Agriculture, MPUAT, Udaipur during 2019-2020. The material used for research work consists of thirty culti-

vars of Valan kakri procured from different local areas (Loyra, Iswa, Sri maliyo ki kariya, Chaukariya, Pai, Paba, Sandol Mata Jotana, Phalasiya, Awarda, Devla, Madar, Umarda, Rawaliya Khurd) of Udaipur district of Rajasthan. Observations on 15 morphological traits viz. were recorded and subjected to statistical analysis.

All the morphological data were analyzed by ANOVA using Completely Randomized Design. Genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), broad sense heritability, genetic advance and genetic gain were computed as per standard formulas.

Results and Discussion

The analysis of variance revealed highly significant differences among thirty genotypes for all fifteen characters, indicated that large variability existed among the cultivars and further analysis of genetic divergence is a must. The magnitude of variability present was evaluated in terms of range, SEm±, phenotypic variance (s2p), phenotypic coefficient of variation (PCV), genotypic (s2G) variance, genotypic coefficient of variation (GCV), heritability (broad sense) and genetic advance (GA) (Table 1).

Genetic Variability

The presence of genetic variability is pivotal for the successful conduct of any breeding programme. A reasonable variation in range for different traits was recorded in this study. Widest range was recorded for fruit weight (g) (532.67-1972.33) followed by number of seeds per fruit (233.33-391.33), flesh thickness (mm) (105.29-154.76), seed cavity length (cm) (9.03-41.87) and fruit length (cm) (11.30-47.47). The broadness of the range indicates the presence of sufficient magnitude of variability within the genotypes. Great variation with respect to various horticultural traits were also observed by Jat *et al.* (2014) in Valan kakri, Kumar (2006), Munshi *et al.* (2007), Kumar *et al.* (2008) in cucumber. Therefore, it provides a basis for improvement of different morphological traits through selection.

The phenotypic variance of various characters studied consists of heritable (genotypic variance) and non-heritable (environmental variance) components. Higher value of PCV than GCV indicates the major influence of environment in the traits' expression. Gaikwad *et al.* (2011) and Ogbonna and Ubi (2005) also found the similar result. Higher values of

Table 1. Variability, heritability, genetic advance and genetic gain of different characters in Valan kakri

Characters	Mean ± SE	Range	Env. Variance	Genotypic variance	Phenotypic variance	GCV	PCV	ECV	Heritability % (Broad sense)	Genetic advance	Genetic Gain (%)
Fruit length (cm)	29.57±1.06	11.30-47.47	3.36	103.97	107.33	34.48	35.03	6.20	96.87	20.67	69.90
Fruit diameter (cm)	13.40±0.22	10.90-16.05	0.14	1.98	2.12	10.52	10.88	2.79	93.41	2.80	20.94
Fruit Weight (g)	1209.17±51.02	532.67-1972.33	7809.93	288782.76	296592.69	44.44	45.03	7.30	97.37	1092.34	90.33
Flesh Thickness (mm)	128.75±2.14	105.29-154.76	13.80	194.44	208.24	10.83	11.20	2.88	93.37	27.75	21.56
Rind Thickness (mm)	2.65±0.03	1.20-3.90	0.0035	0.36	0.37	22.72	22.83	2.23	99.05	1.23	46.59
No. of seeds per fruit	330.77±4.33	233.33-391.33	56.31	2722.15	2778.47	15.77	15.93	2.26	97.97	106.38	32.16
Seed cavity length (cm)	23.44±0.78	9.03-41.86	1.82	80.85	82.68	38.35	38.78	5.76	97.79	18.31	78.13
Seed cavity breadth (cm)	3.55±0.24	2.56-5.16	0.17	0.40	0.58	17.95	21.50	11.83	69.70	1.09	30.87
Seed Length (mm)	12.03±0.54	7.67-18.63	0.86	7.03	7.90	22.05	23.36	7.73	89.06	5.15	42.87
Seed Breadth (mm)	3.79±0.19	2.83-4.9	0.11	0.29	0.40	14.43	16.89	8.78	72.96	0.96	25.39
100 Seed Weight (g)	1.94±0.17	0.94-3.46	0.08	0.59	0.68	39.76	42.55	15.16	87.30	1.48	76.53
TSS (° Brix)	6.83±0.13	5.23-8.37	0.04	0.63	0.68	11.63	12.07	3.25	92.75	1.57	23.07
Acidity of fruit (%)	0.42±0.004	0.29-0.75	0.0001	0.01	0.01	26.94	27.04	1.87	99.24	0.23	55.29
Ascorbic acid content (mg/100 g)	9.64±0.20	5.65-14.36	0.12	5.50	5.62	24.32	24.59	3.63	97.82	4.77	49.56
Dry matter content (g)	5.12±0.30	0.83-8.67	0.27	2.37	2.64	30.12	31.79	10.16	89.78	3.00	58.79

genotypic as well as phenotypic coefficient of variation were recorded for fruit weight (44.44% and 45.03 %), 100 seed weight (39.76% and 42.55%), seed cavity length (38.35% and 38.78%), fruit length (34.48% and 35.43%). A higher value of PCV provides of a greater scope of selection for the trait being considered (Khan *et al.,* 2009).

In the present study, highest GCV was obtained for fruit weight (44.44%), 100 seed weight (39.76%), seed cavity length (38.35%) and fruit length (34.48%). High GCV facilitates selection as it shows the presence of exploitable genetic variability for the traits (Yadav *et al.,* 2009). The environmental coefficient of variation (ECV) ranged from 2.23% obtained for rind thickness to 15.16% for 100 seed weight. The result shows that the values of PCV is greater than GCV but the difference is not broad. So, it can be concluded that environment has less effect on PCV. Hence, selection based on PCV is practicable. The results were in agreement to 11 Veena *et al.* (2012) in cucumber.

Heritability and Genetic advance

Highest heritability was found for the traits like acidity of fruit (99.24%) followed by rind thickness (99.05%) and ascorbic acid content (98.49%). Moderate heritability was recorded for seed cavity breadth (69.70%). It can be seen that these traits are governed by additive gene effect. Veena *et al.* (2012) also found high heritability in cucumber for fruit length, fruit breadth, seed cavity breadth, seed cavity length, number of seeds per fruit and 100 seed weight.

In the current study high value genetic advance coupled with high heritability was exhibited by traits like fruit length, fruit weight, seed cavity length, 100 seed weight and acidity of fruit.

Conclusion

The results revealed that great amount of genetic variability is present in various accessions of Valan kakri which can be exploited in crop improvement program. Traits namely fruit length, fruit weight, seed cavity length and acidity of fruit having high GCV, PCV and heritability along with high genetic advance as percentage of mean can be used effectively in selection process of crop improvement program.

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