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Genetic Variability and Path Analysis of underutilized Nutritive Vegetable Kankoda (*Momordica dioica* Roxb.)

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ABSTRACT: Kankoda (*Momordica dioica Roxb*.) is a Kharif vegetable crop. There is a very little research efforts on kankoda's improvement. Fifteen genotypes of Kankoda were studied to estimate genetic variability and path analysis. High GCV and PCV was observed for number of stems/ plant. Characters like number of stems/ plant, flesh thickness, 100 seed weight, leaf length, days to first female flower, days to first female flowering node, days to first male flower, fruit length and fruit yield/ plant having high heritability estimates associated with high genetic advance as % of mean suggesting additive genetic control. Number of stems/plant, days to first female flower, days to first female flowering node, number of fruits/ plant and 100 seed weight not only had direct effects on fruit yield/ plant but also had positive and significant association on it and regarded as the main determinants of fruit yield. The improvement in fruit yield can be effective if selection is based on these characters.

Keywords: Characters, cultivar, fruit yield, genotypes, Kankoda, path, variability.

I. INTRODUCTION

Kankoda (*Momordica dioica* Roxb.) belongs to the cucurbitaceous family with chromosome number 2n=28. The exact information about acreage and production data is not yet known in Chhattisgarh. However, it is estimated at having high green fruit yield 29.47 q/ha in Chhattisgarh state [10]. Kankoda is known as various local names like teasle gourd, kheksi, bhat karela, kantola, kartoli and kakrol.It is underutilized, potential, perennial, dioeciously and nutritious vegetable. The edible fruit per 100 g eaten part holds moisture 84.0 g, carbohydrate 7.6 g, protein 3.2 g, fat 0.9g, fiber 3.0 g and iron 4-7 mg, riboflavin 0.19 mg and niacin 0.05 mg. It is grown by tribal people of Chhattisgarh state in domestic garden and has high demand in the market due to high nutritive value. Fruits can be used to control blood sugar, blood pressure, ulcer, piles, sores and obstructions of liver, spleen, cough and other digestive disorders. Seeds are used to treat chest pain and to encourage urination. Leaves reduce fever, roots help in relieving headache, stone formation and migraine. Study of genetic variability, association among different traits and their direct and indirect effects on fruit yield have been done for the genetic improvement of its fruit yield through yield contributing traits.

II. MATERIALS AND METHODS

The experimental material comprised fifteen genotypes named IGSG 21-1 to IGSG 21-13 along with two national checks - Indira Kankoda-1 and C.G. Kankoda-2 which were collected from northern hill zone of Chhattisgarh. The experiment was conducted at Horticulture Research Farm, under All India Coordinated Project on Potential Crops (voluntary centre), IGKV, Raipur (C.G.). These populations were grown in randomized block design with three replications during Kharif season of 2021. Each genotype was planted in each plot with a spacing of 2m. × 2m. All packages of practices were adopted to raise healthy crop. Data were recorded on 10 plants from all replications (Table 1). Analysis of variance has done according to Singh and Chaudhary (1985) [7]. Path analysis was worked out as per method of Dewey and Lu (1959) [3].

III. RESULTS AND DISCUSSION

A. Genetic variability

Genetic variability for fruit yield and its components in kankoda is presented in Table 1. High estimates of GCV and PCV was observed for number of stems/ plant. Similar finding was reported by Prabhakar and Kushvaha (2017) [5]. 100 seed weight, days to first female flower, leaf length, fruit thickness, days to first flowering node showed moderate estimates of GCV with PCV. The present findings were contrary with the findings of Devi *et al.* (2020) [2] for 100 seed weight; Yadav (2018) [10] for days to first female flower, days to first female flowering node; and Chattopadhyay (2016) [1] for fruit thickness.

B. Heritability (bs) and Genetic advance as % of mean

High heritability coupled with high genetic advance as % of mean was found for number of stems/ plant, flesh thickness, 100 seed weight, leaf length, days to first

female flower, days to first female flowering node, days to first male flower, fruit length and fruit yield/plant which indicates high percentage of additive gene action. Hence, these characters should take into condition in the crop improvement programme. Similar results were also reported by Naike *et al.* (2004) [4] for number of stems/ pant; for 100 seed weight and days to first female flower [2]; for fruit yield/plant [6, 10, 2, 8] and for fruit length [1].

High heritability with moderate genetic advance as per cent of mean was showed for fruit diameter, single fruit weight and number of fruits/plant. These characters can be improved by intermating superior genotypes of segregating populations developed from combination breeding.

Table 1: Estimation of genetic variability for fruit yield and its components in Kankoda.

Characters	Mean	Min.	Max.	GCV (%)	PCV (%)	H2(bs) %	G.A.	G.A. as % of mean
Days to first male flower	36.30	32.33	41.66	11.02	11.68	89.06	7.84	21.42
Days to first female flower	46.13	41.66	49.66	13.81	15.56	78.77	11.64	25.23
Days to first female flowering node	49.40	44.66	63.00	11.69	12.23	91.37	12.12	24.53
Vine length(cm)	170.98	142.95	232.00	4.69	4.90	91.47	15.81	9.24
No. of stems/plant	7.02	3.80	8.70	20.10	22.47	73.89	4.68	66.60
Leaf length(cm)	7.83	7.36	8.37	12.70	14.04	81.81	1.85	23.62
Leaf width(cm)	7.18	6.07	7.60	3.93	4.40	80.00	0.52	7.24
Fruit length(cm)	4.68	4.34	4.89	11.89	13.84	73.80	0.98	20.94
Fruit diameter(cm)	8.39	7.64	9.06	8.17	8.99	82.45	1.28	15.25
Days to first fruit harvest	78.47	66.00	84.00	4.29	8.55	88.67	6.52	8.30
Days to last fruit harvest	125.60	108.00	138.50	1.91	2.22	74.67	4.29	3.41
Single fruit weight(g)	10.34	7.86	12.82	6.48	7.73	70.31	1.15	11.12
Flesh thickness(cm)	4.09	3.63	4.66	11.46	11.97	91.66	0.92	22.49
No. of fruits/ plant	139.98	115.00	195.00	5.58	5.60	99.36	16.06	11.47
No. of seeds/fruit	20.02	17.00	22.66	3.46	4.65	54.82	1.05	5.24
100 seed weight(g)	15.77	12.50	19.56	15.96	16.75	90.83	4.94	31.32
Fruit yield/plant (kg)	2.00	1.03	3.56	1.47	1.47	98.51	59.71	29.80

C. Correlation and Path analysis studies

The estimate of genotypic correlation with fruit yield / plant and direct and indirect effects of 17 fruit yield components on fruit yield are presented in Table 2. At genotypic level, fruit yield/plant had significant positive association with days to first female flower, days to first female flowering node, number of stems/plant, days to first fruit harvest, number of fruits/plant and 100 seed weight.

Path analysis was carried out by using genotypic correlation coefficient for quantitative characters. Days to first female flower, days to first female flowering node, number of stems/plant, fruit diameter, number of fruits/plant and 100 seed weight had positive direct effect on fruit yield/plant while, days to first fruit harvest had negative direct effect on fruit yield. Similar results were also confirmatory with the findings of Sandilya *et al.* (2020) [8] for number of stems/plant, days to first female flower, number of fruits/plant, 100 seed weight and fruit diameter; for number of fruits/plant on fruit yield/plant in kankoda [5]. Rest of the characters showed negative, non-significant and negligible indirect effects.

IV. CONCLUSION

An attempt was made to identify traits in kankoda based on different morphological characters. According in the present study significant amount of variability was observed for most of the traits. The significant genetic variability in any breeding material is a prerequisite as it does not only provide a basis for selection but also provide some valuable information regarding selection of diverse parent for use in hybridization programme. Occurrence of high heritability coupled with high genetic advance as % of mean for the characters indicates the direct selection could effectively be made for fruit yield improvement. Days to first female flower, days to first female flowering node, number of stems/ plant, number of fruits/plant and 100 seed weight not only had direct effects on fruit yield but also had positive and significant correlation on it. As a result, directed selection based on these traits will be extremely capable in increasing fruit yield in kankoda.

Table 2: Genotypic path coefficient for fruit yield and its components in Kankoda.

Characters	1. Days to first male flower	2. Days to first female flower	3. Days to first female flowering node	4. Vine length	5. No. of stems/plant	6. Leaf length	7. Leaf width	8. Fruit length	9. Fruit diameter	10. Days to first fruit harvest	11. Days to last fruit harvest	12. Single fruit weight	13. Flesh thickness	14. No. of fruits/ plant	15. No. of seeds/ fruit	16. 100 seed weight	Correlated with Fruit yield/ plant (r)
1.	**0.449**	-0.297	0.183	0.036	0.048	-0.005	0.022	-0.008	-0.004	0.014	0.004	-0.052	0.102	-0.033	-0.012	-0.238	0.125
2.	0.346	**0.386**	0.218	0.042	0.009	-0.003	0.024	-0.002	-0.005	0.072	0.002	0.008	0.020	-0.003	-0.014	-0.053	0.267**
3.	0.307	-0.313	**0.268**	0.055	0.004	-0.004	0.025	-0.006	-0.006	-0.004	0.078	-0.017	0.025	0.040	-0.020	-0.024	0.279**
4.	0.111	-0.110	0.099	**0.149**	-0.005	0.001	0.019	-0.003	-0.004	-0.023	0.006	0.044	0.052	-0.057	0.003	-0.086	0.157
5.	0.086	0.001	-0.004	0.003	**0.254**	0.003	-0.002	0.003	-0.006	-0.038	0.044	-0.098	0.064	0.060	0.042	0.125	0.331**
6.	-0.089	-0.089	0.065	0.007	-0.032	**0.023**	-0.051	0.007	0.005	0.033	0.020	0.023	-0.025	0.033	-0.001	0.136	0.114
7.	-0.090	0.089	-0.059	0.025	-0.005	0.010	**-0.113**	-0.002	0.006	0.027	-0.039	0.056	-0.028	0.079	0.003	0.196	0.149
8.	-0.018	0.038	-0.076	-0.022	-0.046	0.008	0.010	**0.021**	-0.004	-0.042	0.031	-0.093	0.013	0.015	0.019	-0.042	-0.103
9.	0.002	-0.027	0.014	0.012	-0.022	-0.001	0.010	0.001	**-0.074**	0.030	-0.005	-0.049	0.010	0.089	-0.012	0.106	0.086
10.	-0.020	0.086	-0.065	0.010	-0.030	-0.002	0.009	-0.002	0.006	**-0.322**	0.134	0.056	0.030	-0.068	-0.010	-0.069	0.258**
11.	0.009	-0.003	-0.020	0.004	-0.048	0.002	0.019	0.002	0.001	-0.186	**0.232**	0.063	0.035	-0.055	-0.018	-0.092	-0.054
12.	0.084	0.011	-0.023	0.022	-0.088	-0.001	0.022	0.006	-0.013	0.064	-0.052	**0.282**	0.049	0.036	0.029	0.096	-0.085
13.	0.193	-0.033	0.045	0.032	-0.068	-0.002	0.013	0.001	0.003	-0.014	0.035	-0.058	**0.238**	-0.042	-0.023	-0.243	0.043
14.	-0.053	0.004	-0.019	-0.030	-0.055	0.002	-0.031	0.001	-0.023	0.078	-0.045	0.036	-0.036	**0.280**	0.013	0.261	0.311**
15.	0.052	0.050	-0.059	0.004	-0.099	-0.003	-0.003	0.003	0.008	0.031	-0.040	-0.075	-0.051	0.035	**0.109**	0.064	-0.073
16.	0.157	-0.030	0.052	0.018	0.047	-0.004	0.032	0.001	0.011	0.033	0.031	0.039	-0.085	-0.107	-0.010	**0.680**	0.387**

Residual effect- 0.534

V. FUTURE SCOPE

While selecting and breeding method for kankoda genotypes, one should take care of the traits that determine significant fruit production as evidenced by variability, correlation and path analyses. An ideotype of kankoda may be developed which will have more number of fruits/plant with high seed weight. Experiment should be repeated over locations in order to see the stability of gene effects and variances. Desirable characters should be included in breeding programme in order to combine desirable genes in single genotypes.

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