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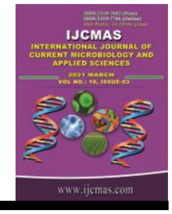

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Genetic Variability for Different Quantitative Character in Colocasia [*Colocasia esculenta var. antiquorum*.]

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An experiment was conducted with 9 colocasia [*Colocasia esculenta* var. *antiquorom* Schott.] genotypes to evaluate the estimate of genetic variability for different characters. The experiment was conducted using a Randomized Complete Block Design with three replications. The genetic parameters between yield and yield contributing characters of different colocasia genotypes were studied. Analysis of variance showed significant variation among the genotypes for all tested characters. The highest total yield was recorded in Indira Arvi-1 (29.54 t/ha.), which was followed by TTr 17-1 and TTr 17-12 (25.31 t/ha and 18.27 t/ha, respectively). Corm weight showed the highest genotypic and phenotypic variance (71.52 and 72.41 %) whereas no. of leaves showed the lowest ones (14.95 and 18.72 %). High value of heritability observed for all the characters except no of leaves per plant. Genetic advance as percent of mean reported highest for total yield, yield per plant, cormels weight and plant height. The genotypes exhibited a wide range of variability for all the traits studied.

Introduction

Colocasia [*Colocasia esculenta* var. *antiquorom* Schott.] is one of the most popular and extensively consumed tuber crops grown worldwide due to its acclimatization to a wide variety of environments. It is also known as Taro and Arvi belongs to the family Araceae. It is native of South-east- Asia. It is grown throughout the tropics for its edible corms and leaves and is believed to be one of the earliest cultivated tuber crops in the world (Kuruvilla and Singh 1981). Food and Agriculture Organization (FAO) reported that taro production has doubled over the past decade (FAOSTAT 2000) and is now the fifth most-consumed root vegetable worldwide.

Success of plant breeding depends upon the nature and magnitude of variability present in the different genotype. Furthermore the assessment of heritable and non heritable components of total unviability will have immense value in the choice of suitable breeding procedure. Corm yield is a quantitative character, which is influenced by a number of yield contributing characters. Selection for corm and cormel yield, the complex interrelationship between the yield contributing characters usually shows a complex chain of interrelating relationship. In Chhattisgarh, colocasia is grown in both rainy and summer season. It is one of the most important tuber crop of Chhattisgarh. However, the yield of colocasia in Chhattisgarh is not satisfactory enough in comparison with other colocasia growing states. In spite of tremendous potentialities aroids are running in vulnerable condition without being properly and scientifically evaluated. Hence, the present study was planned to evaluate genetic parameter for corm yield and yield contributing characters to find out and establish suitable selection criteria for higher corm yield through study of variability. The main objectives were to estimate the variation through in depth study on gross morphological characters, the phenotypic and genotypic variability present in different characters, contributing to yield per plant and to estimates of heritability and genetic advance for yield per plant and its components.

Materials and Methods

The study was carried out during the *kharif*, 2020-21 under All India Coordinate Research Project on Tuber Crops at S. G. College of Agriculture and Research station, IGKV, Jagdalpur, Chhattisgarh. The experimental material comprised of nine genotypes (TTr 17-1, TTr 17-2, TTr 17-3, TTr 17-5, TTr 17-8, TTr 17-12, TTr 17-13, Sree Rashmi and Indira Arvi-1) of colocasia and the experiment was laid out in a randomized block design with three replications at the spacing of 60 cm between rows and 45 cm between plants to plant. A plot size of 3m x 3m was kept for each genotype. All the recommended cultural practices were taken to grow a healthy crop. Data were recorded on five randomly selected plants for seven characters *viz.*, plant height (cm), no of leaves per plant, no of cormel, weight of corm (g), weight of cormels (g), yield per plant (g) and total yield (corm + cormel) (t/ha). The data were subjected to statistical and biometrical analysis (Singh and Chaudhary, 1985). The coefficient of variation for different characters was estimated by formula as suggested by Burton (1952). The estimates of genotypic and phenotypic coefficient of variance were classified as low (less than 10 %), moderate (10 to 20%) and high (more than 20 %) as suggested by Sivasubramanium and Madhavamenon (1973). The expected genetic advance was calculated by the formula given by Johnson *et al.,* (1955). Heritability in broad sense (h2 bs) was calculated as per the formula suggested by Burton and De Vane (1953).

Results and Discussion

The analysis of variance of all the characters under study is presented in Table 1. This analysis of variance revealed that mean sum of squares due to genotypes was highly significant for all characters. This is an indication of existence of sufficient variability among the genotypes for total yield and its components traits. Significant mean sum of squares due to total yield (corm + cormel) and attributing characters revealed existence of considerable variability in material studied for improvement for various traits. These findings are in general agreement with the findings of Cheema *et al.,* (2007) and Paul *et al.,* (2011).

The mean performance and genetic variability was estimated and presented in Table 2 and 3. The highest total yield (corm + cormel) was recorded in genotype Indira Arvi-1 (29.54 t/ha.) followed by TTr 17-1 (25.31 t/ha) and TTr 17-12 (18.27 t/ha). Maximum plant height was recorded in Indira Arvi -1 (105.66 cm) followed TTr 17-1 (52.10 cm) and TTr 17-12 (48.30 cm). Maximum number of leaves per plant was recorded in Indira Arvi 1 (9.84) followed TTr 17-1 (6.50). Maximum no. of cormel per plant, weight of cormel and weight of corm recorded in Indira Arvi-1 (14.73, 539.96 g & 257.7 g) followed by TTr 17-1 (14.33, 486.42 g & 196.89 g). A wide range of variation was recorded for plant height, corm weight, cormel weight and total yield, which indicated that there is better scope for selection for the improvement of these characters. Pandey *et al.*, 1996 observed wide range of variability among 31 genotypes for yield/plant, weight of mother cormels and weight of cormel. These findings are in close proximity with the results of Cheema *et al.*, (2007) who reported variability for no of leaves per plant, no of cormels per plant, corm weight and yield per plant. Similar finding were also reported by Solanki *et al.*, (2003), Mukherjee *et al.*, (2003) and Singh *et al.*, (2003).

Table.1 Analysis of variance for corm yield and its component characters in colocasia

S. No.	Character (df)	Mean sums of square		
		Replication (2)	Treatment (8)	Error (16)
01	plant height (cm)	6.93	1274.99**	**215.42**
02	No of leaves per plant	0.16	4.86**	**0.77**
03	No of cormels	0.05	41.50**	**1.26**
04	weight of corm	47.53	21936.62**	**181.25**
05	weight of cormels	374.84	56780.70**	**1419.07**
06	yield per plant (g)	165.22	123579.05**	**2045.02**
07	**total yield (t/ha)**	**0.225**	**169.48**	**2.8**

*: Significant at 5%, **: significant at 1%

Table.2 Mean performance for corm yield and its components in colocasia

Characters	plant height (cm)	No of leaves per plant	No of cormels	weight of corm	weight of cormels	yield per plant (g)	Total yield (t/ha)
TTr 17-1	52.10	**6.50**	14.33	196.89	486.42	683.31	25.31
TTr 17-2	41.11	6.61	11.89	45.77	363.55	409.33	15.16
TTr 17-3	43.87	5.78	13.78	87.11	279.77	366.88	13.59
TTr 17-5	45.37	9.12	12.89	85.55	321.33	406.88	15.07
TTr 17-8	**38.67**	8.17	5.44	52.97	109.34	162.31	6.01
TTr 17-12	48.30	8.55	5.33	234.2	259.11	493.30	18.27
TTr 17-13	43.00	7.66	9.33	50.66	271.55	322.21	11.93
Sree rashmi	45.67	8.05	8.01	60.74	174.38	235.12	8.71
Indira Arvi-1	**105.66**	**9.84**	14.73	257.7	539.96	797.66	29.54
Mean (x)	**51.52**	**7.81**	**10.64**	**119.07**	**311.71**	**430.78**	**15.95**
SEm±	**2.12**	**0.48**	**0.65**	**7.77**	**21.75**	**26.11**	**0.97**
CD (p=0.05)	**6.35**	**1.42**	**1.94**	**23.23**	**65.01**	**78.05**	**2.89**
CV (%)	**7.14**	**10.57**	**10.57**	**11.31**	**12.09**	**10.49**	**10.52**

Table.3 Genetic parameters for yield and its attributing characters in Colocasia

S.No.	Characters	Mean	Range		Coefficient of variation (%)		Heritability (h^2 %)	GA as percent of mean
			Min[m]	Max[m]	GCV	PCV		
01	Plant height (cm)	51.53	38.67	105.66	39.83	40.46	96.89	80.77
02	No of leaves per plant	7.81	9.84	6.5	14.95	18.72	63.75	24.59
03	No of cormels	10.64	5.33	14.33	34.43	36.01	91.39	67.8
04	weight of corm	119.07	45.77	257.7	71.52	72.41	97.56	45.52
05	weight of cormels	311.71	109.34	539.96	43.46	46.11	92.82	86.25
06	yield per plant (g)	430.78	162.31	797.78	46.72	47.88	95.09	93.91
07	total yield (t/ha)	15.95	6.01	29.54	47.12	48.02	96.19	94.64

Maximum values for genotypic (71.52 %) and phenotypic (72.41 %) coefficient of variation was observed for weight of corms followed by total yield (47.12 and 48.02 %, respectively) and yield per plant (46.72 and 47.88 %, respectively). The least genotypic and phenotypic coefficient of variation was observed for no of leaves per plant (14.95 & 18.72 %). Phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (GCV) for all the traits indicating that environmental factors were influencing their expression. Wide difference between phenotypic and genotypic coefficient of variations indicated their sensitiveness to environmental fluctuations whereas narrow difference showed less environmental interference on the expression of these traits. The traits which showed high phenotypic and genotypic coefficient of variations are of economic importance and there is scope for improvement of these traits through selection. These characters implied their relative resistance to environmental variation. These findings are in consonance with Mukherjee *et al.,* (2003), Cheema *et al.,* (2017), Devi and Singh (2019).

Heritability and Genetic advance

In present investigation, heritability estimates in broad sense are depicted in Table 3. High estimates for heritability was exhibited by all the characters except no of leaves per plant. Weight of corm (97.56%), plant height (96.89%), total yield (96.19%), yield per plant (95.09%), weight of cormels (92.82%), no of cormels (91.39%) showed high heritability except number of leaves per plant (63.75%) which showed moderate estimates of heritability.

Characters showed high value heritability, demonstrated that they were least influenced by environmental changes and selection based on phenotypic performance would be reliable. Similar results were also reported by Pandey *et al.,* (1996), Singh *et al.,* (1993) and Paul *et al.,* (2011).

On the other hand, high heritability coupled with high genetic advance was observed for all the characters except no of leaves per plant. Weight of corm (97.56% & 45.52%), plant height (96.89% & 80.77%), total yield (96.19% & 94.64%), yield per plant (95.09% & 93.9%), weight of cormels (92.82% & 86.25), no of cormels (91.39% & 67.8%) exhibited high heritability with high genetic advance and indicating that most likely the heritability is due to additive gene effects and selection may be effective. Therefore, selection based on phenotypic performance of these traits would be effective to select desirable plant type. Pandey *et al.,* 1996 observed high heritability coupled with high genetic advance for weight of mother cormels, weight of cormels and yield per plant.

Similar result was also reported by Paul *et al.*, (2011) who observed high heritability with moderate to high genetic advance for Plant height, petiole length, leaf length, each stolon weight, total stolon weight, stolon length and corm length. Number of leaves per plant showed moderate heritability (63.75%) with high value of genetic advance (24.59%) so the characters who showed moderate to low heritability estimates coupled with moderate to low genetic advance as percentage mean indicated the role of non additive genetic variance in their expression.

The study revealed sufficient genetic variability for quantitative traits among the varieties, which can be exploited for varietal improvement and can be further used as a source material to develop promising varieties in colocasia.

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