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Estimates of genetic components for growth and herbage yield of *colocasia* (*Colocasia esculenta* L.) genotypes at Konkan region

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Abstract
The study was carried out at the "All India Co-ordinated Research Project on Improvement of Tuber Crops", Central Experiment Station, Wakawali during kharif season of the year, 2016. The present study revealed that the significant differences for nine traits among genotypes of *colocasia* which indicated that the presence of low to moderate genotypic and phenotypic coefficients were observed for all the characters under study. Herbage yield per plant and leaf area showed moderate GCV and PCV respectively. Whereas, low GCV and PCV were recorded in the characters like petiole girth, plant height, number of leaves and leaf length. High heritability along with high genetic gain was observed for Plant Height, Petiole length, No. of leaves, Leaf area (cm^2), Leaf length, Leaf breadth, Yield /plant (g) indicating role of additive gene action for their inheritance and could be improved through selection.

Keywords: (genetic variability, genetic advance, heritability, genotypic coefficient of variation, *colocasia*, herbage yield plant)

Introduction
Colocasia (*Colocasia esculenta* L. Schott) also known as '*edode'* or '*arvi' is* a tropical tuber crop belongs to the monocotyledonous family 'Araceae' of the order Arales whose members are known as 'aroids' (Henry, 2001 and Van Wyk, 2005) [4]. *Colocasia* is believed to have originated in South Central Asia, perhaps in Eastern India or Malaysia (Sturlevant, 1919; Onwueme, 1978 and Watt, 1989) [9, 7, 11]. Globally *colocasia* is cultivated in an area of around 2.0 million ha with an annual production of 12.0 mt and average yield of 6.5 t ha^{-1} (FAO STAT, 2010) [3]. In the last 5 years (2008-2012), 88 per cent of the area and 78 per cent of the production is in Africa. The annual global per capita consumption of *colocasia* is 1 kg.
Colocasia is well adapted to shade and can withstand drought to a great extent. The crop is found to thrive well in acidic as well as alkaline soils. *Colocasia* is one of the tuber crops mainly grown for leafy vegetable under Konkan during *kharif* season. *Colocasia* is a rich source of starch and reasonably good source of major components of the diet *viz*., proteins, minerals and vitamins. All parts of the plant including corm, cormels, rhizome, stalk, leaves and flowers are edible and contain abundant starch (Bose *et al*. 2003) [1]. Among the essential amino acids (those cannot be synthesized in the human body), phenylalanine and leucine are relatively abundant in *colocasia*.
However, so far not much work towards development of high yielding suitable types has been done in this crop except few attempts of germplasm collection and their evaluation (Plucknett *et al*., 1970) [8]. Hence, it was felt necessary to undertake well planned research work to evaluate suitable genotypes of *colocasia* as a leafy vegetable under hot and humid climate of Konkan region.

Materials and Methods
The experiment was carried out during the period of June to November, 2016 (Kharif season crop) at "All India Co-ordinated Research Project on Improvement of Tuber Crops", Central Experiment Station, Wakawali falls under tropical humid zone with an average rainfall of 3000 mm is situated at an altitude of 242 m above MSL. The geographical situation is 17^0 48' N latitude and 73^0 78' E longitude. The experiment was laid out in Randomized Block Design with 16 treatments (genotypes) in 3 replications. Each plot was measured in 1.35 × 1.8 m consisted of three rows with 3 plants per row. Accordingly, 9 plants spaced at 60 × 45 cm^2

apart, were accommodated per plot. Observations were recorded from five randomly selected plants in each treatment and replication and their mean values were worked out**.** Observations on Herbage yield was recorded at 45, 60 and 75 days after planting. The data were analysed for coefficient of variation (Burton and De Vane, (1953) [2], heritability (Burton and De Vane, (1953) [2], genetic advance (Johnson *et al*., 1955) [5].

Result and Discussion

Mean values of the various characters under study for the 16 cultivars of taro shown in the table 1.

Analysis of variance (ANOVA)

Nine metrical characters for phenotypic expression of the *colocasia* were measured and tabulated for calculating analysis of variance. ANOVA for different metrical traits of *colocasia* cultivars have been exhibited in table 1. In all the cases df of replications and variety were 15 and 2 respectively. All the sixteen *colocasia* cultivars exhibited significant differences for all characters studied and the extent of variability and its critical differences at 5% level of probability were presented in table 1. Other components of variances viz. σ^2g, σ^2p, GCV, PCV, h^2 and genetic Advance (%) also presented in table 2.

The standard error of mean [Sem(±)] value was estimated to be highest for the character of leaf area (7.63), followed by herbage yield per plant (4.608), leaf length (1.365) and leaf breadth (1.191). Whereas, the lowest value of standard error of mean was recorded in number of leaves per plant (0.107).

Generally, phenotypic coefficient of variation was higher than genotypic coefficient of variation for all characters under study indicating the influence of environment on the development of characters (Table 2.). Low to moderate genotypic and phenotypic coefficients were observed for all the characters under study. Yield per plant showed moderate GCV and PCV respectively (17.22 and 17.69), leaf area (cm^2) 75 DAP (17.03 and 17.18) and whereas, low GCV and PCV were recorded in the characters like petiole girth (cm) (9.99 and 11.36), plant height (cm) (9.19 and 9.25) number of leaves (8.93 and 10.48) leaf length (cm) (8.03, 9.41). Close resemblance between PCV and GCV suggest that environment plays very important role in expression of different traits.

Heritability estimates observed for most of the characters ranged from 12.78 (1st leaf emergence) to 98.72% (Plant height). High heritability estimates indicate the presence of large number of additive factors and hence these traits may be improved by selection.

Genetic advance as percent mean was ranged low 1.47% (1st leaf emergence) to high 34.79% (leaf area) for all the characters under study. High heritability along with high genetic gain was observed for Plant Height, Petiole length, No. of leaves, Leaf area (cm^2), Leaf length, Leaf breadth, Yield /plant (g) indicating role of additive gene action for their inheritance and could be improved through selection. The results are in consonance with Manvendra Singh (2017) [6], Mainak Bhattacharjee (2014), Solomon Fantaw (2014), KK PAUL, (2011).

The value of GCV and PCV found to be low variability, GCV alone did not determine the amount of variation. But GCV along with heritability give clear indication of improvement (Johnson *et al*, 1955) [5]. So, heritability is an important component for selection because high heritability indicates superiority of genotypes. Hence, characters viz. Plant height, petiole length, number of leaves, leaf area (cm^2), leaf length, leaf breadth, yield /plant are considered as important yield components for the selected *colocasia* cultivars which can be effectively used in a breeding programme.

Table 1: Analysis of variance (mean sum of squares) for growth and yield parameters in *Colocasia*

S. No.	Source of variation/ Characters	Replication	Treatments (Genotypes)	S. Em±	CD (5%)	Error
1.	1st leaf emergence	1.42	0.26	0.25	0.71	3.700
2.	Leaf area (cm^2)	441.38	30556.62	7.63	22.02	174.43
3.	Plant Height (cm)	0.064	67.14	0.31	0.89	0.289
4.	Petiole length (cm)	6.241	56.459	0.818	2.362	2.006
5.	Petiole girth (cm)	0.186	1.122	0.183	0.528	0.100
6.	No. of leaves /plant	0.0058	0.308	0.107	0.309	0.0342
7.	Leaf Length (cm)	2.287	50.319	1.365	3.942	5.59
8.	Leaf breadth (cm)	0.054	26.857	1.191	3.439	4.26
9.	Herbage yield /plant (g)	36.511	3513.59	4.608	13.309	63.70

* Significant at 5% NS: Non-significant DAP: Days after Planting

Table 2: Estimates of mean, range, components of variance, heritability and genetic advance for growth and yield in *Colocasia*

S. No	Character	Mean	Range	GV	PV	GCV (%)	PCV (%)	h^2	GA	GAM
1.	1st leaf emergence	8.24	7.53 - 8.73	0.027	0.21	1.99	5.57	12.78	0.12	1.47
2.	Plant Height (cm)	51.38	60.34-45.82	22.28	22.57	9.19	9.25	98.72	9.66	18.81
3.	Petiole length (cm)	50.72	57.55-43.14	18.15	20.16	8.40	8.852	90.01	8.32	16.42
4.	Petiole girth (cm)	5.84	7.129-4.844	0.341	0.441	9.99	11.36	77.29	1.06	18.10
5	No. of leaves	3.383	4.20- 3.07	0.091	0.126	8.93	10.48	72.72	0.53	15.69
6.	Leaf area (cm^2)	590.66	747.28- 464.06	10127.82	10301.82	17.03	17.18	98.31	205.54	34.79
7.	Leaf length (cm)	48.09	55.86- 40.03	14.91	20.50	8.03	9.41	72.73	6.78	14.10
8.	Leaf breadth (cm)	35.87	42.50- 31.52	7.53	11.78	7.65	9.57	63.91	4.52	12.60
9.	Yield /plant (g)	196.83	276.92- 158.56	1149.96	1213.66	17.22	17.69	94.75	67.99	34.54

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