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Studies on variability, heritability and genetic advance for yield and yield contributing characters in Ivy gourd (*Coccinia grandis* (Voigt.)

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Abstract
In order to determine the magnitude of variability, 18 genotypes of ivy gourd were evaluated at CHES, Bhubaneswar. Through analysis of variance, a high significant difference was found for almost all thirteen characters indicating a greater opportunity of exploit variability. Genotypic and phenotypic variances were highest for no. of fruit yield /plant and stem girth followed by leaf area and days of flowering. Phenotypic co- efficient of variation (PCV) and Genotypic co-efficient of variation (GCV) were maximum in case of no. of primary branches/plant and minimum for length of internode, respectively. Heritability was found very high for all characters except length of internode and fruit girth. The maximum genetic advance (% of mean) was observed in case of no. of fruit/ plants followed by leaf area and days of flowering. Genotypic coefficient of variation, heritability and predicted genetic gain were high for the characters no. of primary branches/plant, vine length and no. of fruit/ plants suggesting that additive gene action is responsible for expression of these characters.

Keywords: Genetic variability, heritability, GCV, PCV, ivy gourd

Introduction
Ivy gourd (*Coccinia grandis* (voigt.) Syn (indica) 2n=24,36 belong to the family cucurbitaceae also known as little gourd, small gourd (kundru or tendli) is so far a neglected and underutilized dioecious cucurbits, a semi perennial dioecious plant with small fruits widely grown in eastern western and southern state of india.
The genus *Coccinia* Wight & Arn. Has nearly 30 species confined to tropical Africa but only one species *Coccinia grandis* (L.) Voight (Syn. *Coccinia indica* Wight & Arn. Or *Cephalandra indica* Nand.) is cultivated extensively in India, Myanmar, Srilanka and Malaysia and called ivy gourd, which is a dioecious perennial and has a Sanskrit equivalent "bimba", taking it to pre-Christian era.

Material and Methods
The study was carried out at CHES, Bhubaneswar during summer season in a randomized block design with three replications to evaluate most promising genotypes with respect to growth and yield attributing parameters among the 18 genotypes of ivy gourd. Pits were dug at 30 cm*30cm*30cm spacing and plants were placed with 2m*2m spacing between plant to plant and row to row in experimental plot. In each plot six plants were accommodated. The crop was grown with standard package of practices. The observations were recorded on thirteen economic traits from five randomly selected competitive plants from each genotypes and replication. The data were subjected to analysis as per procedure described by Panse and Sukhatme (1954). The coefficient of phenotypic and genotypic variation were calculated according to Burton and De Vane (1953), heritability, genetic advance and genetic gain were calculated according to the formulae of Johnso.

Table 1: List of Cultivars/Genotypes include in the experiment

S. No.	Name of cultivars	Symbol used	Sl. No.	Name of cultivars	Symbol used
1.	CHIG-8	T1	10.	CHIG-27	T10
2.	CHIG-9	T2	11.	CHIG-28	T11
3.	CHIG-12	T3	12.	CHIG-29	T12
4.	CHIG-13	T4	13	CHIG-30	T13
5.	CHIG-14	T5	14	CHIG-31	T14
6.	CHIG-15	T6	15	CHIG-33	T15
7.	CHIG-17	T7	16	CHIG-37	T16
8.	CHIG-19	T8	17	INDIRA-5	T17
9.	CHIG-25	T9	18	INDIRA-35	T18
Source of collection: Healthy planting material of these cultivars/genotypes were obtained from various part of Orissa and two cultivars/genotypes were obtained from IGKVV, Raipur i.e. Indira 5 and Indira 35.					

Result and Discussion

Table 2 reveals the ANOVA for various biometrical traits in ivy gourd. The mean squares for genotypes were maximum in case of no. of fruit /plant and minimum for length of internode. The values indicate highly significant differences for all the characters under study, thereby suggesting existence of large amount of variations among the genotypes. As per the data among all the genotypes, CHIG-12 produced the highest no. of fruit/plant (1637.67) followed by Indira-5 (1499.33) and CHIG-15 had the lowest no. of fruit (557.67). CHIG-33 showed the maximum fruit weight (20.76g), fruit girth noted maximum in Indira 5 (2.61 cm) followed by CHIG33 (2.55cm). The maximum and minimum total fruit yield were observed in CHIG-12 (20.38 kg/plant) and CHIG-15 (5.40 kg/plant) respectively.

Analysis of variance of the various quantitative characters studied in ivy gourd indicated presence of differences among genotypes in respect of each trait. The large amount of variation existing in the collected germplasms revealed that considerable improvement can be made through selection with regards to all the characters *viz.*, vine length,stem girth, number of primary branches/plant, length of internode, leaf area, days of flowering, node number on which first flower appears, days of first harvesting, fruit weight, fruit length, fruit girth, number of fruits/plant and fruit yield. There was wide ranging of variation for all the traits, though not of the same magnitude,which may be attributed to the differential breeding backgrounds and geo-ecological disparities among the regions from which these cultivars have originated.

Two aspects are most important for understanding the breeding principles *i.e.*1. selection can not create variability but acts only on the existing variability and 2. Selection can act effectively only on heritable difference (Allard,1960). Therefore, first and foremost requirement for selection is to ascertain whether genetic variability of these characters present in the population,is at significant level or not. From the observations, it is clear that there exists a wide range of phenotypic variation indicating large phenotypic variability for quantitative traits in Ivy gourds.

The genotypic variances are obtained by deducting the environmental variances from their respective phenotypic variances. The larger genotypic variance of the characters can be attributed to its additive components and additive x additive type interactions instead of dominance and epistatic components and usually favours an effective selection as these are easily fixable. From the analysis of phenotypic and genotypic coefficient of variation shown in table 8 reveals that phenotypic coefficient of variation was greater than genotypic coefficient of variation for all the quantitative characters studied and this indicates that the phenotypic coefficient of variation. Further, the differences between the values of these two parameters for all the characters were found comparatively less which concludes that all the traits show high resistance to the environmental influence (Panse, 1957) [7].

In the present experiment it is noted that number of primary branches/plant, fruit yield, number of fruits/plant, vine length, node number on which first flower appear and stem girth had high and moderately high GCV which indicated the range the genetic variability in a character also helps in the comparison of the genetic variability present in the various other characters. Thus, if a genotypic variability is higher for a character which is governed by additive gene than the character can be improved by selection. The rest of the traits offer little scope for selection due to their low genetic coefficient of variation. Bharathi *et al*., (2008) [2]. Also recorded high genotypic coefficient of variation for fruit yield/plant in Ivy gourd.

The study of genotypic coefficient of variation along with the heritability estimate is essential to obtain best picture of heritable variation (Burton, 1952). The heritability is one of much interest to the plant breeder primarily as an important parameter of selection for a particular character and as an index of transmissibility. Characters not influenced by environment are highly heritable and that may influence the selection procedure used by plant breeder (Pohelman and Borthakur, 1972) [8].

High heritability is broad sense was recorded for almost all the character. Vine length (99.97%), fruit yield (99.44%), number of fruits/plant (99.41%), days of flowering (99.33%), leaf area (98.30%), node number on which first flower appears (97.84%), days of first harvesting (96.39%), fruit weight (93.19%) showed relatively higher heritability estimates than the other characters. Similar findings for yield /plant, number of fruits/plant and fruit weight by More *et al.* (1987) [6]; for fruit weight, fruit volume and number of fruit/plant in spine gourd for fruit yield /plant, number of fruits/plant and days of flowering by Rai *et al.*(2008) [9]; by Bharathi *et al.* (2008) [2] in Ivy gourd are in agreement with the present findings. High heritability values predicted as highly heritable traits and environment plays a relatively a limited role in bringing out the observed phenotypic variability. Comparing the heritability estimates with genotypic coefficient of variation, in the present study, it is observed that high values were obtained for both the parameters in case of number of primary branches/plant, fruit yield, number of fruits/plant, days of first harvesting and other quantitative traits also showing high heritability with low genotypic coefficient of variation, suggested that whatever variation is there can be inherited, nevertheless selection for such characters are of less importance. Though the study of heritability estimates is of great importance yet their scope is limited since their estimation in broad sense are prone to changes in environment and the materials. The heritability estimates in conjunction with the genetic advance, would give the best picture of genetic progress to be expected from the selection than heritability alone (Jhonson *et al.*,1955) [4].

From the results of the present experiment it is clear that the genetic advance as percentage of mean is high for number of primary branches/plant, fruit yield, number of fruits/plant, vine length, node number on which first flower appears, leaf area and days of flowering where as other characters show lower values More *et al*.,(1999), for fruit yield/plant,number of fruit/plant by Rai *et al*.,(2008) [9]; for fruit yield/plant by Bharathi *et al*., (2008) [2]; Kumar, (2008) for first female flower anthesis, number of primary branches/plant, number of fruits/plant, fruit length and fruit diameter.

From a comparative study of genotypic coefficient of variation, heritability estimates and genetic gain, it was observed that in general, characters like number of primary branches/plant, fruit yield, number of fruits/plant, vine length and node number on which first flower appears recorded higher estimates for the aforesaid parameters which may be ascribed to additive gene effects (Johnson *et al.*,1955 and Panse *et al*., 1957) [4, 7] and selection for these characters will be proved to be useful. The genotypic coefficient of variation and genetic advance for number of primary branches/plant were high, showed moderately high respectively. But heritability was low for fruit girth, high in case for vine length relatively which may be due to non additive gene effects

indicating that little improvement will be possible, if selection for this trait is practised. Other character showed low GCV and GA indicating that selection for these characters would not be effective and ascribed to dominance or epistatic gene action. High heritability value accompanied with low genetic advance for characters was probably due to non- additive gene effect involving dominance deviation and epistatic influence (Bharathi *et al*., 2006) [3].

Yield of fruit in Ivy gourd being the complex characters, is ultimate effect of interaction of several yield components which are highly influenced by the environment. Of these various components, a few of which directly and positively associated with yield, often prove to be useful indicators in selection. Therefore the knowledge of association between yield and its attributes is of great significance. Griffing (1952) suggested that correlation responses are chiefly due to pleiotropic manifestation of one gene complex, whose primary function is to control the balance between the competitive abilities of two opposing tendencies in growth. After estimating variability, heritability and genetic advance in the present material,it is worth while to study the inter-relationship of these quantitative traits and their correlation coefficient at phenotypic and genotypic levels. Robinson (1966) [4] suggested that correlation studies are helpful in choosing superior genotypes from their phenotypic expression.

Table 2: Analysis of variance for thirteen quantitative characters in Ivy gourd genotypes (Mean Squares)

S. No.	Characters	Replication	Genotypes	Error	C.V.(%)
1	Vine Length (m)	0.034	7.269**	0.005	1.01
2	Stem Girth (cm)	0.025	0.302**	0.002	6.68
3	Number of primary branches/plant	0.025	21.986**	0.055	3.10
4	Length of inter node (cm)	0.096	0.662**	0.12	4.25
5	Leaf Area (cm Square)	0.199	116.599**	0.667	1.79
6	Days of flowering	0.074	101.889**	0.23	1.12
7	Node No on which first flower appears	0.254	22.584**	0.165	2.66
8	Days of first harvesting	1.227	42.247**	0.521	1.42
9	Fruit Weight (g)	0.193	15.887**	0.343	3.77
10	Fruit Length (cm)	0.023	1.346**	0.051	3.94
11	Fruit girth (cm)	0.019	0.175**	0.033	8.18
12	Number of fruits/plant	1134	306053.9**	608.471	2.49
13	Fruit yield (Kg/plant)	0.031	49.430**	0.093	2.57

*Significant at 5% level, **Significant at 1% level.

Table 3: Range, mean, phenotypic variance, genotypic variance for quantitative characters in genotypes of Ivy gourd

S. No.	Characters	Range	Mean	Phenotypic variance	Genotypic variance
1	Vine Length (m)	4.99-11.63	7.04	2.43	2.42
2	Stem Girth (cm)	1.37-2.43	1.82	0.11	9.57
3	Number of primary branches/plant	3.20-12.90	7.55	7.37	7.31
4	Length of inter node (cm)	7.26-9.30	8.16	0.30	0.18
5	Leaf Area (cm Square)	30.60-54.51	45.74	39.31	38.64
6	Days of flowering	29.56-53.60	42.74	34.11	33.89
7	Node No on which first flower appears	7.29-19.93	15.26	7.67	7.47
8	Days of first harvesting	43.65-55.27	50.57	14.43	13.91
9	Fruit Weight (g)	12.17-20.76	15.55	5.52	5.18
10	Fruit Length (cm)	4.07-6.64	5.7	0.48	0.43
11	Fruit girth (cm)	1.77-2.61	2.21	8.00	4.74
12	Number of fruits/plant	557.67-1637.67	989.37	102424.00	101815.10
13	Fruit yield (Kg/plant)	5.40-20.38	11.96	16.55	16.45

Table 4: PCV, GCV, Heritability (h Square) and genetic advance (GA) for quantitative characters in genotypes of Ivy gourd.

SL. No.	Characters	PCV %	GCV %	h Square %	GA	GA* %
1	Vine Length (m)	22.12	22.1	99.97	3.2	45.48
2	Stem Girth (cm)	18.26	17	86.62	0.59	32.58
3	Number of primary branches/plant	35.96	35.83	99.26	5.55	73.53
4	Length of inter node (cm)	6.72	5.21	59.99	0.68	8.31
5	Leaf Area (cm Square)	13.71	13.59	98.3	12.7	27.56
6	Days of flowering	13.67	13.62	99.33	11.95	27.96
7	Node No on which first flower appears	18.11	17.91	97.84	5.57	36.49
8	Days of first harvesting	7.49	7.35	96.39	7.54	14.86
9	Fruit Weight (g)	15.11	14.67	93.79	4.54	29.2
10	Fruit Length (cm)	12.18	11.53	89.53	1.28	22.47
11	Fruit girth (cm)	12.82	9.86	59.24	0.35	15.64
12	Number of fruits/plant	32.25	32.25	99.41	655.36	66.24
13	Fruit yield (Kg/plant)	34.02	33.92	99.44	8.33	69.68

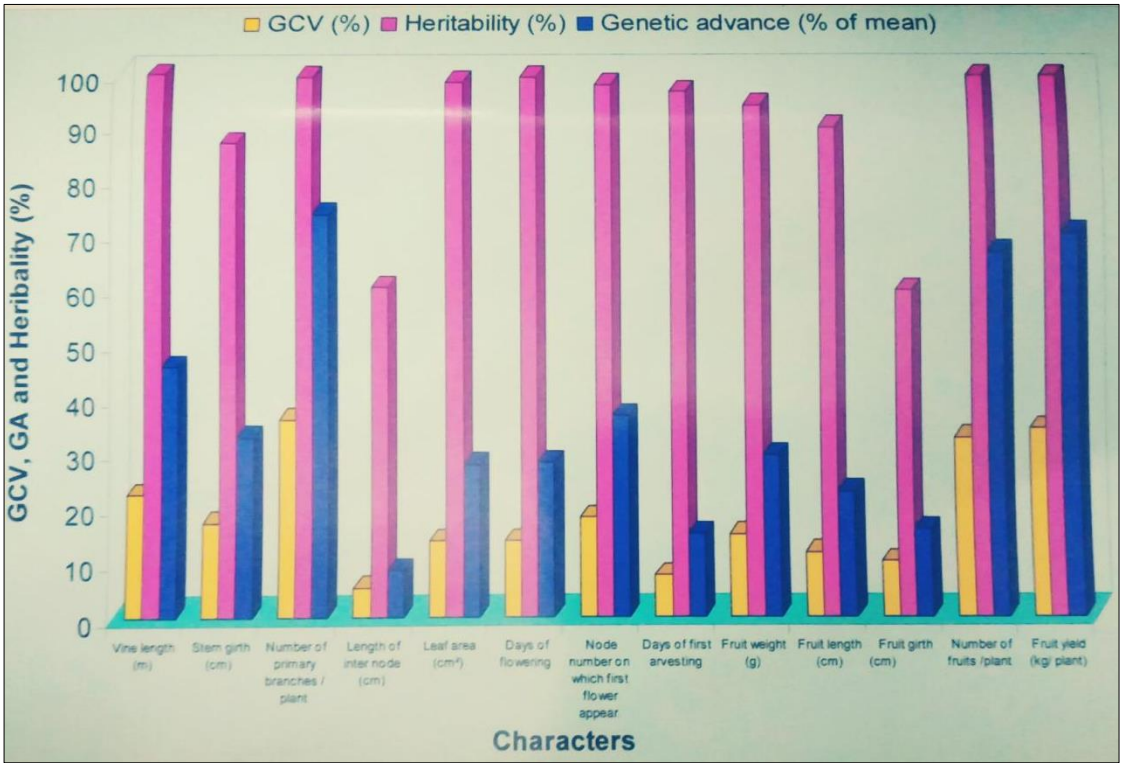

Fig 1: Genotypic coefficient of variance (GCV) Genetic advance (GA) and heritability (h^2) of quantitative characters in ivy gourd

References

1. Allard RW. Principles of plant breeding. John villey and sons. New York, London, 1960.
2. Bharathi LK, Naik G, Nath Vishal. selection indicies for parthenocapic clones of ivy gourd (*Coccinia grandis*). Indian journal of agricultutre sciences. 2008; 78(10):905-8.
3. Bharathi LK, Naik G, Singh HS, Dora DK. Studies on genetic variability in spine gourd. Indian journal of horticulture. 2006; 63(1):96-7.
4. Johnson HW, Robinson HF, Comstock RE. estimates of genetic and environment variability in soyabean. Agron. J. 1955; 47:314-18.
5. Kumar S, Sing R, Pal AK. Genetic variability, heritability, genetic advance, correlation cofficient and path analysis in bottle gourd. Indian journal Hort. 2008; 64(2):163-168.
6. More TA, Mishra JP, Seshadri VS, Doshi SP, Sharma JC. association of fruit shape with flesh area and flesh proportion in muskmelon. Ann. Agri. Res. 1987; 8(2):237-242.
7. Panse VG, Sukhatma PV. Genetic and quantitative characters in relation to plant breeding. Indian journal of Genetic and plant breeding, 1957.
8. Pohelman JM, Borthakur DN. Breeding Asian field crops. Oxford and IBH publishing Co, 1972.
9. Rai M. vegetable sector: Growing with the nation. Agriculture year book; Agriculture today, 2008, 66-67.