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Character association and yield components studies in Ivy gourd (*Coccinia grandis* L. Vogt.)

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Abstract

Estimates of phenotypic and genotypic correlations for the various combinations of yield and its components are presented. Eighteen genotype of Ivy gourd were assessed for correlation analysis for yield and its attributes. The differences among genotypes were statistically significant for all the thirteen quantitative characters. Correlation studies among the fruits indicated that number of fruits/plant had high significant positive association with fruit yield at both phenotypic and genotypic levels followed by stem girth, number of fruits/plant, number of primary branches, leaf area, vine length, days of first harvesting and fruit weight had high to moderate direct effect on yield which indicated their better prospects for further crop improvement.

Keywords: Phenotypic, estimates, Ivy, *Coccinia grandis* L. Vogt.

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 material taken consisted of eighteen cultivars/genotypes of ivy gourd (*Coccinia grandis*) as listed in table. These were grown under field conditions.

Table 1: The material taken consisted of eighteen cultivars/genotypes of ivy gourd

S.NO	Name of cultivars	Symbol used
1	CHIG-8	T1
2	CHIG-9	T2
3	CHIG-12	T3
4	CHIG-13	T4
5	CHIG-14	T5
6	CHIG-15	T6
7	CHIG-17	T7
8	CHIG-19	T8
9	CHIG-25	T9
10	CHIG-27	T10
11	CHIG-28	T11
12	CHIG-29	T12
13	CHIG-30	T13
14	CHIG-31	T14
15	CHIG-33	T15
16	CHIG-37	T16
17	INDIRA-5	T17
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.

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Result and Discussion

The present experiment was carried out to gather genetic information on yield and its attributes for launching an efficient breeding programme in Ivy gourd. 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) ^[14] suggested that correlation studies are helpful in choosing superior genotypes from their phenotypic expression.

From the data, it is clear that the genotypic correlation coefficients had higher values for most of the characters than those phenotypic correlation coefficients indicating a strong inherent association between the various characters studied. The phenotypic expression of correlation for different quantitative traits under study was lessened by the influence of environment. Fruit yield showed a positive significant correlation with number of fruits/plant at phenotypic and genotypic level. It had also a low to high positive correlation with node number on which first flower appears, number of primary branches/plant, fruit weight, leaf area, stem girth, fruit girth, vine length at both levels. The low correlation may be due to the low size of sample. Fruit yield in Ivy gourd positively correlated with mentioned character have been reported by Chhonkar *et al.*, (1979) ^[4], More *et al.* (1987) ^[11], Sarkar *et al.* (1990) ^[15], Narayan *et al.*, (1996) ^[12], Sarnaik *et al.* (1999) ^[16], Bhave *et al.* (2003) ^[3], Fageria *et al.* (2004) ^[5], Singh (2004) ^[17], Bharathi *et al.* (2005) ^[2], Maheshwari *et al.* (2006) ^[9], Kumar *et al.* (2007) ^[8], Rai *et al.* (2008), Kumar (2008) ^[7], Mehta *et al.* (2009) ^[10].

Fruit yield exhibited high significant negative association with days to first harvesting at genotypic level and it is non-significant at both levels for the character like length of internode, fruit length and days of flowering. Significant negative correlation of yield with length and days of flowering. significant negative correlation of yield with length of internode and fruit length also reported by Bharathi *et al.* (2005) ^[2].

Significant genotypic correlation among the yields components indicated that they were closely inter-related. The association of pod yield with number of fruits/plant had higher values at genotypic level than that of phenotypic which suggests that correlation of these two traits is highly affected by the conditions external to them and genetic association might be swamped under different set of environmental conditions.

There is strong significant positive correlation of vine length with stem girth and fruit yield at both phenotypic & genetic level. Its correlation with number of primary branches/plant, length of internodes, days of flowering, node number on which first flower appears, days of first harvesting and fruit length showed negative correlation at both levels. This observation indicated that number of fruits/plant and fruit

yield was highly correlated with vine length by Bhave *et al.* (2003) ^[3]; Maheshwari *et al.* (2006) ^[9].

Between stem girth and leaf area there was a strong positive association with phenotypic & genotypic levels. Most of the characters like days of flowering, node number on which flower appears, fruit weight, fruit length, number of fruits/plant and fruit yield showed positive correlation with stem girth which indicated its more importance for selection. Number of primary branches/plant also exhibited positive significant correlation with node number on which first flower appears at phenotypic & genotypic levels. And most of the quantitative characters showed positive correlation with number of primary branches studied in Ivy gourd except leaf area, days of flowering and days of first harvesting where it was negative correlated. This indicated that number of primary branches had low correlation with yield. Length of internodes showed significant negative correlation with fruit weight & fruit length at genotypic level. Also most of quantitative characters showed negative correlation and its positive correlation exhibited only for fruit girth & number of fruits/plant in Ivy gourd. Sarnaik *et al.* (1999) ^[16] observed positive correlation of length of internodes with yield at genotypic level. Internodal length showed significant negative association with number of fruits/plant by Bharathi *et al.* (2005) ^[2]. This observation indicated that genotypes with short internodes were important to get more number of fruits/plant there by yield/plant.

Leaf area recorded significant positive correlation with fruit length and positive correlation showed with most of the quantitative characters in Ivy gourd except fruit length. Here the leaf area showed more correlation with yield.

There is strong significant positive correlation of days of flowering with days of first harvesting. But its correlation with node number on which first flowers appears was negatively significant correlated at phenotypic & genotypic level. Where as other characters showed negative association except fruit weight & fruit length. This observation indicated that early flowering will produce more number of fruit which can also mature early. In accordance with present investigation, Bhave *et al.* (2003) ^[3], Bharathi *et al.* (2005) ^[2], Maheshwari *et al.* (2006) ^[9] reported the significant positive correlation of days maturity with days of flowering in Ivy gourd.

Negative positive association recorded between node number on which first flower appears and days of first harvesting at genotypic levels. Where as fruit weight & fruit length showed non-significant negative association and other characters showed positive association in Ivy gourd.

However negative significant association was observed with node at which first female flower appear, selection of these characters improving yield/vine by Maheshwari *et al.* (2006) ^[9]. Days of first harvesting recorded strong significant negative correlation with number of fruits/plant and fruit yield and other characters recorded positive correlation in Ivy gourd.

There was strong positive correlation of number of fruits/plant with yield at genotypic & phenotypic levels. Thus plant having more number of fruits will result with lighter and less number of fruits/plant was reported by Sarnaik *et al.* (1999) ^[16], Fageria *et al.* (2004) ^[5], Bharathi *et al.* (2005) ^[2], Kumar *et al.* (2007) ^[8], Rai *et al.* (2008) ^[13].

Length of fruit recorded negative significant correlation with fruit girth at genotypic levels. This indicating that fruits having more length will result in lighter and less girth in Ivy gourd.

Weight of fruit recorded strong positive correlation with fruit girth at genotypic level and rest of the characters like fruit length, number of fruit yield show positive correlation at phenotypic & genotypic levels. This indicated that fruit with more girth & weight will get more yields. Similarly More *et al.* (1987) [11], Sarkar *et al.* (1990) [15], Narayan *et al.* (1996) [12], reported positive correlation of yield /plant with fruit weight.

There was positive correlation of number of fruits/plant with fruit girth at genotypic & phenotypic levels. Thus, plant having more number of fruits will result more girth.

From the above discussion, it can be concluded that simultaneous improvement of fruit yield and number of fruits/plan, fruit yield and girth of fruits; fruit yield & weight of fruits; length of fruit & weight of fruits; days of flowering & number of fruits /plant and fruit weight of fruit & girth of fruit can be made if selection is to be made for any one of the correlated characters.

Results of correlation study indicated that number of fruits/plant, fruit girth, fruit weight, days of flowering, vine length, fruit length, stem girth were important components of fruit yield in Ivy gourd. The fruits/plant showed high positive significant correlation with yield at both phenotypic & genotypic levels in ivy gourd.

Correlation coefficients which measure the association between any two traits may not give true and comprehensive picture of a rather complex situation. The association between two characters which are measured do not exist by themselves alone but are parts of complicated pathways in which other traits are also interwoven. The indirect association becomes complex and important due to more number of variables in the correlation study. In such a situation a path coefficient analysis devised by Wright (1921) [18] provides better knowledge as it reveals direct and indirect causes of association and permits a critical examination of the specific forces acting to produce a given correlation and measures the relative importance of each causal factor.

Table 2: Phenotypic correlation coefficient (rp) among different characters in Ivy gourd

SN.	Characters	correlation	Stem girth(cm)	No. Of primary branches/plant	Length of internode (cm)	Leaf area (cm ²)	Days of flowering	Node no on which first flower appears	Days of first harvesting	Fruit weight (g)	Fruit length (cm)	Fruit girth (cm)	no. of fruits/plant	Fruit yield (kg/plant)
1	Vine length (cm)		0.5515**	-0.2872	-0.0930	-0.2694	-0.1367	-0.0683	-0.2728	0.3652	-0.0637	0.2449	0.3932	0.4773*
2	Stem girth (cm)			-0.0547	-0.1871	0.6979**	-0.0078	0.0191	-0.2749	0.1938	0.2848	-0.0396	0.1593	0.0691
3	No. of primary branches/plant				0.2455	-0.0328	-0.2365	0.5240**	-0.1881	0.0662	0.0700	0.1292	0	0.1839
4	Length of internode (cm)					-0.2994	-0.2415	0.0073	-0.0803	-0.3602	-0.2758	0.0107	0.0542	-0.0660
5	Leaf area (cm ²)						0.0302	0.1532	-0.2978	0.2323	0.4483	0.0795	0.1096	0.2218
6	Days of flowering							-0.5681**	0.6255**	0.0706	0.2231	-0.2045	-0.3061	-0.3538
7	Node no on which first flower appears								-0.4441	0.0068	-0.1732	0.1807	0.3644	0.1679
8	Days of first harvesting									0.0567	0.1199	-0.2423	-0.6219**	-0.5082
9	Fruit weight (g)										0.1267	0.5088*	0.0278	0.2123
10	Fruit length (cm)											-0.3845	-0.3568	-0.1484
11	Fruit girth (cm)												0.2601	0.2445
12	no. of fruits/plant													0.8632**

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

Table 3: Genotypic correlation coefficient (rg) among different characters in Ivy gourd

SN.	Characters	correlation	Stem girth(cm)	No. Of primary branches/plant	Length of internode (cm)	Leaf area (cm ²)	Days of flowering	Node no on which first flower appears	Days of first harvesting	Fruit weight (g)	Fruit length (cm)	Fruit girth (cm)	no. of fruits/plant	Fruit yield (kg/plant)
1	Vine length (cm)		0.5926*	-0.2889	-0.1295	0.2727	-0.1279	-0.0702	-0.2782	0.3771	-0.0668	0.3150	0.3942	0.4790*
2	Stem girth (cm)			-0.0595	-0.2418	0.7551**	0.0021	0.0289	-0.3060	0.2078	0.3003	0.0199	0.1682	0.2914
3	No. Of primary branches/plant				0.3065	-0.0332	-0.2370	0.5325*	-0.1918	0.0657	0.0704	0.1850	0.2750	0.1857
4	Length of internode (cm)					-0.3694	-0.2989	0.0043	-0.0937	0.2239*	0.4667*	0.0985	0.0589	-0.0891
5	Leaf area (cm ²)						0.0285	0.1539	-0.3009	0.2371	0.4738*	0.0738	0.1109	0.2247
6	Days of flowering							-0.5762*	0.6382*	0.0793	0.2418	-0.2687	-0.3099	-0.3570
7	Node no on which first flower appears								-0.4566**	-0.0009	-0.1696	0.2103	0.3684	0.1682
8	Days of first harvesting									0.0661	0.1383	-0.3193	-0.6405**	-0.5208*
9	Fruit weight (g)										0.0966	0.7384**	0.0256	0.2165
10	Fruit length (cm)											-0.4881*	-0.3767	-0.1605
11	Fruit girth (cm)												0.3290	0.3155
12	no. of fruits/plant													0.8659**

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

Conclusion

Phenotypic and genotypic correlation among the various quantitative characters indicated that number of fruits/plant and fruit yield, stem girth and leaf area, days of flowering and days of first harvesting, fruit weight and fruit girth, vine length & stem girth, number of primary branches/plant and node number on which first flower appears, vine length and

fruit yield are positively and significantly correlated with each other and simultaneous improvement can be made if selection is performed for any one of the correlated characters. Some others combination of variables showing negatively significant association were days of first harvesting and number of fruits/plant; days of flowering & node number on which first flower appear; days of first harvesting & fruit

yield, respectively. Low positive correlations between different variables though not significant were observed because the size of the sample was small.

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