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Short communication

Studies on genetic variability in ivy gourd [*Coccinia grandis* (L.) Voigt.]

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ABSTRACT

An experiment was conducted to study the genetic variability in ivy gourd [*Coccinia grandis* (L.) Voigt.] genotypes collected from different parts of Assam and other North Eastern states (Arunachal Pradesh, Tripura and Nagaland) during the summer seasons of 2013 and 2014. The experiment was laid out in Randomized Block Design with three replications at the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat. Genetic variability in terms of PCV and GCV were high for yield per plant (27.56 and 23.87%, respectively). High heritability in broad sense combined with high genetic advance was recorded for number of fruits per plant (94.39 and 38.57%) followed by fruit weight (93.36 and 32.61%), which were indicative of preponderance of additive and additive × additive type of gene interaction. The desirable additive genes for these traits could be accumulated and fixed in the population through phenotypic selection, thereby genetically improving the ivy gourd genotypes.

Key words: Genetic advance, genotype variability, heritability, ivy gourd.

Ivy gourd, *Coccinia grandis* (L.) Voigt. [Syn. *C. indica* Wight and Arn., *C. cordifolia* (L.) Cogn.] belongs to the family Cucurbitaceae and is known by various names like *kundru*, *tondli*, little gourd, scarlet gourd and *kunduli*. It is a semi-perennial crop of 4-5 years, yielding fruits in summer and rainy seasons. Ivy gourd is an underexploited cucurbit. The North Eastern Region is considered to be the richest reservoir of genetic variability of large number of horticultural crops including ivy gourd (Yadav *et al*., 9). In recent time, ivy gourd is gaining the status of an important vegetable crop in Assam because of increasing consumer awareness about it's significant nutraceutical value. Practically, very little crop improvement work has been attempted on this crop. Success in crop improvement generally depends on the magnitude of genetic variability, heritability and genetic advance for different characters. The existence of variability is essential for resistance to biotic and abiotic factors as well as for wide adaptability.

The present experiment was conducted during the summer seasons of 2013 and 2014 in Randomized Block Design with three replications at the Experimental Farm, Department of Horticulture, AAU, Jorhat. The experimental material comprised of 22 ivy gourd genotypes collected from farmers of different parts of Assam and other North Eastern states (Arunachal Pradesh, Nagaland and Tripura). Planting was done on 25th February, 2013 at a spacing of 2 m × 2 m. All the recommended package of practices was followed. The data for each character was subjected to analysis of variance and the partitioning of variance was done according to method given by Fisher (5). Genotypic and phenotypic coefficients of variation were calculated by formulae suggested by Burton (3). Heritability in broad sense was calculated by formula given by Burton and De Vane (4). Expected genetic advance was computed following formula suggested by Allard (1). The analysis of variance presented in the Table 1 revealed the presence of significant variation among the 22 genotypes.

The highest estimate of PCV was recorded by fruit yield per plant (27.56%). Moderate estimates were recorded for number of primary branches (19.89%), number of fruits per plant (19.83%), fruit length (18.29%) and fruit weight (16.95%). Similarly, the highest estimate of genotypic coefficient of variation (GCV) was recorded for fruit yield per plant (23.87%) followed by number of fruits per plant (19.27%). The traits like number of primary branches, fruit length and fruit weight exhibited moderate estimates of GCV (Table 2). Variability results due to differences either in the genetic constitution of the individuals in a population or in the environment where they are grown. Fisher (5) partitioned the total phenotypic variance into genotypic variance and environmental variance. Selection is effective only when there is a significant genetic variability among the individuals in a population and presence of genetic variability is the prerequisite for the success of plant breeding programme in any crop including ivy gourd.

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Table 1. Analysis of variance for different traits in ivy gourd genotypes.

Source of variation	d.f.	Mean squares										
		No. of primary branches	Petiole length (cm)	Node No. at which first female flower appears	Days to 50% flowering	Days to first fruit harvest	Peduncle length (cm)	Fruit length (cm)	Fruit width (cm)	No. of fruits per plant	Fruit wt. (g)	Fruit yield/ plant (kg)
Replication	2	0.565	0.074	0.092	61.671	1.007	0.0011	3.104	0.037	331.82	41.595	2.796
Year	1	4.697	0.018	12.426	306.068	93.340	0.0008	0.033	0.005	9810.93	0.067	5.535
Interaction	2	0.002	0.002	0.051	33.841	0.022	0.0003	0.283	0.001	593.46	19.340	1.203
Total	5	1.166	0.034	2.542	99.418	19.080	0.0007	1.361	0.016	2332.30	24.387	2.706
Genotype	21	5.909**	0.727**	3.279**	33.074	3.351**	0.1634*	6.096**	0.157*	14796.64**	97.902**	11.982**
Error	105	0.282	0.040	0.201	25.111	0.827	0.0127	0.342	0.014	145.01	1.146	0.630

*,**Significant at P = 0.05 and 0.01, respectively

Table 2. Estimates of genetic variance and other related parameters for various characters.

Trait	Mean	Genotypic variance (s^2_g)	Phenotypic variance (s^2_p)	Coefficient of variation		Broad sense heritability h^2_{bs} (%)	Genetic advance, as % of mean
				Genotypic GCV (%)	Phenotypic PCV (%)		
No. of primary branches	5.55	0.937	1.220	17.44	19.89	76.85	31.50
Petiole length (cm)	3.62	0.114	0.155	9.33	10.88	73.61	16.51
Node No. at which first female flower appears	6.16	0.513	0.714	11.62	13.71	71.80	20.29
Days to 50% flowering	63.99	1.327	26.438	1.80	8.04	5.02	0.83
Days to first fruit harvest	71.40	0.420	1.248	0.90	1.56	33.69	1.09
Peduncle length (cm)	2.07	0.025	0.037	7.65	9.39	66.41	12.85
Fruit length (cm)	6.23	0.959	1.301	15.70	18.29	73.66	27.76
Fruit width (cm)	2.69	0.024	0.038	5.72	7.24	62.54	9.33
No. of fruits per plant	256.39	2441.938	2586.952	19.27	19.83	94.39	38.57
Fruit weight (g)	24.50	16.126	17.272	16.38	16.95	93.36	32.61
Yield per plant (kg)	5.76	1.892	2.522	23.87	27.56	75.02	42.59

The analysis of variance revealed the existence of significant differences for fruit yield and other characters indicating the scope of selection for development of desirable types. The GCV provides a measure to compare the genetic variability present in various quantitative traits. In the present study, the estimates of PCV were higher in various quantitative traits. In the present study, the estimates of PCV were higher than those of GCV for all the characters indicating environmental influence on these characters. Similar results were also obtained by Khan *et al.* (7) in pointed gourd and Basumatary (2) in spine gourd. The GCV estimates had close agreement with PCV estimates for most of the characters, exception being days to 50% flowering, indicating that these characters were mostly governed by genetic factors. GCV cannot provide a clear picture of the genetic gain to be achieved from selection unless the heritable fraction of the variation is known (Burton, 3), indicating the importance of heritability estimation. Heritability in broad sense provides a basis for making selection based on phenotypic performance of the individual.

In the present study, the estimates of heritability in broad sense varied from 5.02 per cent for days to 50% flowering to 94.39% for number of fruits per plant. High h^2_{bs} estimates were recorded for number of fruits per plant, fruit weight, fruit yield per plant, fruit length, number of primary branches, petiole length, node number at which 1st female flower appears, peduncle length and fruit width. The estimate was moderate for days to 1st fruit harvest and low for days to 50% flowering. High heritability implicated high magnitude of heritable portion of variation that could be exploited in the selection of superior genotypes on the basis of phenotypic performance. High heritability estimate was reported for number of fruits per plant in sponge gourd (Kumar *et al.*, 8). Heritability in conjunction with genetic advance is more useful than heritability alone in predicting the resultant effects for selecting the best genotype for a given trait (Johnson *et al.*, 6). The genetic advance reveals the magnitude of improvement that could be made in a particular character by selecting a certain portion of the population in a desired direction. The genetic advance (GA) calculated as per cent of mean was the highest for fruit yield per plant (42.59%) followed by number of fruits per plant (38.57%), fruit weight (32.61%) and number of primary branches (31.50%). All these estimates were found to be high.

High heritability combined with high genetic advance is desirable for the selection-based genetic improvement of a character. In the present study, high heritability coupled with high genetic advance was observed for number of fruits per plant, fruit weight, fruit length, number of primary branches and fruit yield per plant, which were indicative of preponderance of additive and additive × additive type of gene interaction. The desirable additive genes for these characters could be accumulated and fixed in the population through phenotypic selection, thereby genetically improving the ivy gourd genotypes.

REFERENCES

1. Allard, R.W. 1960. *Principles of Plant Breeding*, John Wiley and Sons, New York.
2. Basumatary, P. 2011. Evaluation and characterization of spine gourd (*Momordica dioica* Roxb.) germplasm of Assam. M.Sc. thesis, Assam Agricultural University, Jorhat.
3. Burton, G.W. 1952. Quantitative inheritance in grasses. *Proc. 6th Int. Grassland Congr.*, **1**: 277-83.
4. Burton, G.W. and De Vane, E.M. 1953. Estimating heritability in tall fescue (*Festueca arundinaceae*) from replicated clonal material. *Agron. J.* **45**: 478-85.
5. Fisher, R.A. 1918. The correlation between relatives on the supposition of Mendelian inheritance. *Trans R. Soc. Edinburgh*, **52**: 399-433.
6. Johnson, H.W., Robinson, H.F. and Comstock, R.E. 1955. Genetic and environmental variability in soybean. *Agron. J.* **47**: 314-17.
7. Khan, A.S.M.M.R., Kabir, M.Y. and Alam, M.M. 2009. Variability, correlation and path analysis of yield and yield components of pointed gourd. *J. Agric. Rural Dev.* **7**: 93-98.
8. Kumar, R., Munshi, A.D., Behera, T.K., Kumar, R. and Sureja, A.K. 2012. Estimates of genetic components of variation in sponge gourd (*Luffa cylindrica* Roem.).*Veg. Sci*. **39**: 214-17.
9. Yadav, R.K., Deka, B.C. and Sanwal, S.K. 2009. Genetic resources of vegetable crops of North Eastern Himalayan Region. *ENVIS Bulletin* : *Himalayan Ecology*, **17**.

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