

Genetic Variability, Interrelationships and Path Analysis for Yield Attributes in Eggplant

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Abstract The phenotypic and genotypic variances, heritability, genetic advances, correlation and path coefficient, were estimated for yield and related traits in 72 eggplant genotypes. The highest GCV was recorded in fruit shape, followed by average fruit weight. High heritability in the broad sense accompanied by moderate to high genetic gain and GCV was observed for number of fruit/plant followed by yield/ha which could be improved by selection in early generations. The high genetic advance was observed for yield/plant, indicating the prevalence of additive gene action for inheritance of these traits. Correlation and path coefficient (genotypic and phenotypic) revealed that number of fruit/plant and average fruit weight had maximum direct effect resulted significantly posi-

tive correlation with yield/plant. These traits play a major role and must be considered in selection program for the improvement of the yield potential of eggplant.

Keywords Genetic variability, Correlation, Path analysis, Eggplant.

Introduction

Eggplant was first cultivated in India which is regarded as the primary center of origin/diversity. It has ayurvedic medicinal properties because it is a good source of vitamins A, C and minerals. To overcome such situation; genetically stable genotypes having high yield potential are urgently needed. It is, therefore, necessary to estimate relative amounts of genetic and nongenetic variability exhibited by different characters using suitable parameters. Besides estimating the nature and magnitude of the correlation coefficient, path coefficient and genetic association between yield and yield traits, the traits that contributed to yield and are suitable to identify by variability and association analysis between yield and its attributes. In such case, path coefficient analysis is an important technique for partitioning the correlation coefficient into direct and indirect effect of independent variables on the dependent variable. It is, therefore, genetic variability as well as correlation and path coefficient may be important tools for the breeder to enhancing the production and productivity of the eggplant. It is of considerable importance in selec-

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Table 1. Estimation of genetic parameters for morphological traits in eggplant cultivar.

Sl. No.	Characters	Range	Grand mean	Coefficient of variability			Genetic advance
				Genotypic	Phenotypic	Heritability	
1	Days to 50% flowering	48.59–71.71	59.19	6.06	8.31	53.30	5.40
2	Days to first harvesting	60.74–82.30	75.49	5.53	8.12	46.30	5.86
3	Number of branches	5.00–14.33	8.45	24.72	31.21	62.70	3.41
4	Plant height	56.00–145.67	84.60	15.83	18.14	76.20	24.09
5	Fruit length	5.98–22.01	14.00	28.00	32.33	75.00	6.99
6	Fruit diameter	2.46–10.30	5.38	27.01	30.48	78.50	2.66
7	Fruit shape	28.63–176.50	73.47	36.59	40.29	82.50	50.66
8	Average fruit weight	50.00–310.00	151.49	36.46	37.84	82.90	109.60
9	Number of fruits/plant	2.00–28.40	8.79	31.28	38.51	66.00	4.60
10	Yield/ha	119.70–536.90	270.10	21.39	21.81	86.20	116.75

tion for elite genotype as well as exploitation of heterosis breeding program. The present study was conducted to assess genetic variability, heritability and path coefficient analysis yield and its component characters to provide necessary information that could be useful in eggplant improvement programs aimed at improving yield.

Materials and Methods

The experimental material comprised of 72 diverse genotypes of eggplant were sown in randomized block design with three replications during *kharif* of 2009 at Experimental farm, Indian Institute of Vegetable Research, Varanasi. East genotype was grown in single rows of 7.0 m length with spacing 0.70×0.25 m respectively. All the recommended agronomic practices were followed to raise a healthy crop. The observations were recorded on ten randomly selected plants from the plot in each replication on different morphological traits. Genetic parameters of variability viz., coefficient of variance, heritability, genetic advance, variance and correlation coefficient (phenotypic and genotypic) were estimated using the formula and all the data (path co-efficient) were analysed using Windostat.

Results and Discussion

All the traits exhibited highly significant difference

among treatments which indicated wide spectrum of genetic variability among the cultivars. It reveals that the selection of superior cultivars for development of new varieties may be helpful. The GCV of various traits varied from 5.53 to 36.50 (fruit shape). The minimum magnitudinal differences in GCV and PCV coupled with low ECV for all the traits studied implied that the traits are mostly governed by genetic factors with little role of environment in the phenotypic expression of these characters. High values of heritability estimates were obtained in yield/plant (86.20) because it indicates the effectiveness of selection on the basis of phenotypic performance. Although GCV is indicative of the presence of a high degree of genetic variation, the amount of heritable portion can only be determined with the help of heritability estimates and genetic gain (Table 1) [1]. The expected genetic advance ranged from 2.66 (fruit diameter) to 116.75 (yield/ha) and it may be mentioned here that mostly characters were largely governed by additive gene and therefore to selection based on phenotypic performance is likely to yield beneficial results in improving characters. High heritability accompanied with high genetic advance in case of yield/plant, average fruit weight, and fruit-shape indicate that these are simply inherited traits and most likely the heritability is due to additive gene effects and selection may be effective in early generations for these traits. However, fruit diameter, fruit length and number of fruit/plant had high heritability coupled with low genetic advance indicates non-additive gene effects.

Table 2. Phenotypic (P) and genotypic (G) correlation coefficient among different morphological traits in eggplant. *, ** Significant at $P=0.05$ and 0.01 level, respectively.

Characters		Days to first harvesting	Number of branches	Plant height (cm)	Fruit length (cm)	Fruit dia (cm)	Fruit shape (cm)	Number of fruit/plants	Average fruit weight (g)	Yield plant (kg)
Days to 50% flowering	G	0.607**	0.06	-0.108	0.042*	0.192**	0.173*	-0.04	-0.047	-0.089
	P	0.518**	0.113	0.008	0.015	0.082	0.08	-0.038	-0.049	-0.054
Days to first harvesting	G		0.128	0.056	0.064	-0.031	0.041	-0.247**	0.151	-0.016
	P		0.131	0.018	0.006	-0.015	-0.006	-0.168	0.073	0.003
Number of branches	G			0.435**	0.286**	-0.025	0.218*	0.012	0.190*	0.228**
	P			0.360**	0.179*	-0.033	0.149	0.019	0.145	0.180*
Plant height (cm)	G				0.223**	-0.106	0.097	-0.033	-0.484**	0.230**
	P				0.178*	-0.107	0.089	-0.026	0.331**	0.210*
Fruit length (cm)	G					-0.231	0.543**	0.227**	-0.053	-0.027
	P					0.337**	0.537**	0.213*	0.036	-0.006
Fruit dia (cm)	G						0.677**	0.378**	-0.109	0.102
	P						0.648**	0.322**	-0.116	0.08
Fruit shape (cm)	G							0.465**	-0.086	0.092
	P							0.425**	-0.037	0.085
Number of fruits/plants	G								-0.08	0.325**
	P								-0.037	0.302**
Average fruit weight (g)	G									0.292**
	P									0.263**

Genotypic correlations were higher in magnitude than the phenotypic indicating strong inherent relationship among the characters except the few which could be due to the modifying effects in the environ-

ment studied (Table 2). Genotypic correlation provides a measure of genotypic association among different traits and helps in identifying the traits in selection. The number of branches/plant had significant and

Table 3. Phenotypic (P) and genotypic (G) path coefficient analysis showing direct (bold) and indirect effects of different characters in eggplant. *, ** Significant at $p=0.05$ and 0.01 level, respectively; Residual effect= 0.07 (P), 0.01 (G).

Charactes		Days to 50% flowering	Days to first harvesting	Number of branches	Plant height (cm)	Fruit length (cm)	Fruit dia (cm)	Fruit shape (cm)	Number of fruits/plants	Average fruit weight (g)	Yield/ plant (kg)
Days to 50% flowering	G	-0.083	0.052	0.011	-0.009	-0.029	-0.118	0.113	-0.017	-0.009	-0.089
	P	-0.077	0.036	0.014	0.001	-0.003	-0.005	0.005	-0.013	-0.01	-0.054
Days to first harvesting	G	-0.05	0.085	0.023	0.005	-0.044	0.019	0.027	-0.109	0.028	-0.016
	P	-0.04	0.069	0.016	0.002	-0.001	0.001	0.00	-0.059	0.016	0.003
Number of branches	G	0.005	0.011	0.183	0.037	-0.197	0.015	0.143	0.005	0.036	0.228*
	P	-0.009	0.009	0.122	0.041	-0.031	0.002	0.008	0.007	0.031	0.180*
Plant height (cm)	G	-0.009	0.005	0.08	0.084	-0.154	0.065	0.064	-0.014	0.091	0.230*
	P	-0.001	0.001	0.044	0.115	-0.031	0.007	0.005	0.009	0.07	0.210*
Fruit length (cm)	G	-0.003	0.005	0.052	0.019	-0.689	0.142	0.356	0.100	-0.01	-0.027
	P	-0.001	0.000	0.022	0.020	-0.175	0.015	0.03	0.075	0.008	-0.006
Fruit dia (cm)	G	-0.016	-0.003	-0.005	-0.009	0.159	-0.616	-0.444	0.167	-0.02	0.102
	P	-0.006	-0.001	-0.004	-0.012	0.042	-0.064	0.037	0.113	-0.025	0.08
Fruit shape (cm)	G	-0.014	0.004	0.040	0.008	-0.374	-0.417	0.656	0.206	-0.016	0.092
	P	-0.006	0.000	0.018	0.010	-0.094	-0.041	0.057	0.15	-0.008	0.085
Number of fruits/plants	G	0.003	-0.021	0.002	-0.003	-0.157	-0.233	0.305	0.442	-0.015	0.325*
	P	0.003	-0.012	0.002	-0.003	-0.037	-0.02	0.024	0.352	-0.008	0.302**
Average fruit weight (g)	G	0.004	0.013	0.035	0.041	-0.037	0.067	-0.056	0.036	0.189	0.292*
	P	0.004	0.005	0.018	0.038	-0.006	0.007	-0.002	-0.013	0.212	0.263**

strongly positive association with plant height, fruit length, fruit shape, average fruit weight and yield/plant in both genotypic and phenotypic levels. It indicated that these characters are useful for taking them as the basis of selection for high yield [2].

Thus, providing that these attributes were more influencing the yield in eggplant and they can serve as important traits for improvement of yield/plant. The character yield/plant was found to be significantly and positively correlated with plant height, average fruit weight, number of branches/plant and fruits/plant. The results of correlation revealed that yield/plant, branches/plant, fruit/plant, average fruit weight and plant height were the most important attributes and may contribute considerably towards higher yield, but yield is a complex trait which is influenced by its various components directly and indirectly via other traits, which creates a complex situation at the selected time [3]. The path coefficient analysis (Table 3) provides a more realistic evidence of the interrelationship, as it considers direct and indirect effects of the variables by partitioning the correlation coefficients. Coefficient analysis showed that fruit shape (0.650 and 0.057) had the maximum positive direct effect. The highly significant and positive correlation of number of fruits/plant had found in yield/plant due to their maximum direct and indirect effect via fruit

shape respectively. Average fruit weight showed positive direct effect and their genotypic correlation with yield was significant [4].

From the present investigations here concluded that the estimation of genetic variability, correlation and path analysis, are more useful for identification of superior cultivars for yield and yield traits. The cultivars HARB-4, IBN-4, SB-1, PPL Nepal, and Local collection on the basis of *per se* performance were found high yielder in all cultivars. These cultivars may be used to breeding programs for development of high yielding varieties.

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