Plant Archives Vol. 20 Supplement 1, 2020 pp. 2081-2085 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

STUDIES ON CHOICE OF TRAITS FOR FRUIT YIELD IMPROVEMENT THROUGH BREEDING IN BRINJAL (*SOLANUM MELONGENA* L.)

Sindhuja K.[1], S. Vinithra[1], N. Senthilkumar[1]*, P. Senthilkumar[1], S. T. Ponsiva[1], T. R. Barath Kumar[2] and S. Thirugnanakumar[1]

[1*]Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalainagar 608 002 (Tamil Nadu), India.
[2]Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar 608 002 (Tamil Nadu), India.

Abstract

The present study was undertaken with fifty six genotypes in brinjal to estimate genetic parameters such as genotypic coefficient variation (GCV), phenotypic coefficient variation (PCV), heritability and genetic advance (GA) along with correlation and path coefficient from data collected from fifty six genotypes. High GCV and PCV was observed for fruit yield per plant, average fruit weight, fruit length. High heritability coupled with high GA were observed for almost all the characters studied. Fruit yield per plant witnessed positive significant, phenotypic and genotypic association with days to 50 percent flowering, number of flowers per cluster, number of fruits per plant and average fruit weight. Path co-efficient analysis indicated that number of fruits per plant and average fruit weight exerted maximum positive direct effect which were equal to genotypic correlation co-efficients towards fruit yield per plant. Hence, selection and manipulation of any one of these traits is likely to improve the fruit yield per plant in brinjal. These two traits may be declared as choice of traits for yield improvement in brinjal through breeding.

Key words: GCV, PCV, Correlation, Path analysis, Brinjal.

Introduction

Brinjal is the important poor man vegetable. It is cultivated in marginal and sub marginal region by Peasants. It is rich in vitamins and minerals hence, referred as eggplant. Fruit yield in brinjal is determined by the complex action and interaction of many component traits. Hence, it is imperative to ascertain the causal basis of relationship existing between the dependent variables.

Correlation studies helps to know the relationship existing between yield and its components. Frey (1967) observed increased yield by indirect selection of its component characters. According to Jhonson *et al*., (1955), correlation between important and unimportant characters may reveal that some of the later traits are useful, as indicators of one or more important characters. Sawadogo *et al*., (2016) reported that fruit weight showed a positive association with fruit girth and thickness. Fifty per cent flowering registered positive correlations with plant height and fruit girth. Fruit number showed a negative association with fruit weight and diameter and days to 50 percent flowering. Path analysis is simply a standardized partial regression coefficient and such as, measures that direct influence of one variable upon another and permits the causation of the correlations.

***Author for correspondence :** E-mail: nsenthilsukant1975@gmail.com

Materials and Methods

Fifty six genotypes of brinjal maintained at Department of Genetics and Plant Breeding were utilized for the present inquiry. The experiment was carried out at Plant Breeding Farm, Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India, during 2018. The experiment was laid out in Randomized Block Design (RBD) with three replications, in two rows plots of 4.5 m length. A spacing of 60×45 cm was adopted. Observations were recorded on five randomly selected plants per entry per replication on twelve agronomic traits *viz.,* days to 50 percent flowering, plant height (cm),

number of branches per plant, number of flowers per cluster, number of fruits per cluster, days to first harvest, days to last harvest, number of fruits per plant, fruit length (cm), fruit girth (cm), average fruit weight (g), fruit yield per plant (g). Recommended agronomic practices and need based plant protection measures were judiciously followed. Multivariate analysis (D^2 statistic) as outlined by Mahalanobis' (1936) was adopted. Grouping of genotypes into different clusters was carried out by following Tocher's procedure (Rao, 1952). The relative contribution of different traits towards total genetic divergence, was calculated as per Singh and Choudhary (1985). The statistical analyses, was performed with Indo stat, licensed at NRRI, Cuttack, India. Genetic correlation co-efficients among the traits of interest were calculated as per the method suggested by Pearson (1902). Path co-efficient analysis suggested by Wright (1921) and Dewey and Lu (1959) was carried out to know the direct and indirect effects of the agronomic traits on fruit yield per plant.

Results and Discussion

The present investigation estimates the genetic parameters such as genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability and genetic advance (GA) as well as correlation and causation. The estimates of GCV, PCV, h^2 and GA are furnished in table 1. The estimates of genotypic and phenotypic correlation coefficients among twelve characters are presented in tables 2 and 3.

The GCV was higher (44.98) for fruit yield per plant followed by average fruit weight (39.15) and fruit length (37.44). The PCV was also higher for fruit yield per plant (45.04) followed by fruit length (37.59) and average fruit weight (39.17). There was a close correspondence between GCV and PCV, indicating the lesser influence of the environment. Almost all the characters showed least ECV.

The heritability estimates were always higher for all the trait of interest. The genetic advance as percentage over mean was higher for number of branches per plant, number of flowers per cluster, number of fruits per cluster, number of fruits per plant, fruit length, fruit girth, average fruit weight, fruit yield per plant. High heritability estimates coupled with high genetic advance were recorded for the traits *viz.,* fruit yield per plant, average fruit weight, fruit length, number of fruits per cluster, number of branches per plant, number of fruits per plant, number of fruits per cluster, fruit girth. It indicated that the above mentioned traits were under the influence of additive gene action. Hence, simple selection for these traits would be rewarding. On the contrary, the trait *viz.,* plant height at maturity, days to first harvest and days to last harvest, were endowed with high heritability estimates but with low genetic advance indicating that, traits were under the influence of non-additive gene action. Hence, immediate selection will not be rewarding.

The phenotypic and genotypic correlation coefficients were computed among the twelve characters and are presented in table 2. In general, genotypic correlation coefficients, were higher than the corresponding phenotypic correlation, suggesting the strong inherent relationship in different pairs of characters in brinjal genotypes. The most important trait, total fruit yield per plant exhibited positive significant, phenotypic and genotypic association with days to 50 percent flowering (0.251), number of flowers per cluster (0.318), number of fruits per plant (0.534) and average fruit weight (0.848), total fruit yield per plant, days to last harvest was found to be negatively significant.

Highly significant and positive correlation of fruit yield per plant with number of fruits per plant, fruit weight, fruit length and plant height observed at genotypic and phenotypic levels, indicated the mutual association of these traits. It could be suggested from correlation estimates that fruit yield could be improved through manipulation of either of these characters (Nasit *et al.,* 2010).

At phenotypic level, fruit yield per plant found to be significantly and positively correlated with days to 50 percent flowering (0.251), number of flowers per cluster (0.310), number of fruits per plant (0.535), average fruit

Table 1: Genetic variability for twelve traits of brinjal genotypes.

Variability parameters / Traits	GCV (%)	PCV (%)	ECV (%)	h^2 (BS) (%)	GA as % of mean
Days to 50 percent flowering	4.81	6.40	4.22	56.48	7.45
Plant height at maturity (cm)	6.02	6.45	2.32	87.00	11.57
Number of branches per plant	25.64	26.85	7.98	91.16	50.43
Number of flowers per cluster	20.56	21.10	4.75	95.02	41.27
Number of fruits per cluster	25.67	26.35	5.97	95.00	51.50
Days to first harvest	4.28	4.52	1.46	89.60	8.35
Days to last harvest	5.67	5.70	0.63	98.76	11.60
Number of fruits per plant	23.75	23.84	2.10	99.22	48.73
Fruit length (cm)	37.44	37.59	3.34	99.21	76.82
Fruit girth (cm)	19.15	20.81	5.82	92.16	39.51
Average fruit weight (g)	39.15	39.17	1.37	99..8.8	80.60
Fruit yield per plant (g)	44.98	45.04	2.53	99.68	92.50

Table 2: Phenotypic (P) and Genotypic (G) correlation co-efficient among fruit yield and its component traits in brinjal

S. No.	Characters	Type of corre-lation	Plant height at maturity (cm)	Number of branches per plant (cm)	Number of flowers per cluster	Number of fruits per cluster	Days to first harvest	Days to last harvest	Number of fruits per plant	Fruit length (cm)	Fruit girth (cm)	Average fruit weight (g)	Fruit yield per plant
1.	Days to 50 percent flowering	(P)	-0.112	0.156	0.138	-0.012	-0.117	0.024	0.307*	0.172	0.216	0.148	0.251*
		(G)	-0.173	0.217	0.202	-0.046	-0.211	0.024	0.409**	0.220	0.276*	0.202	0.336**
2.	Plant height at maturity	(P)		-0.264*	-0.135	-0.017	0.004	0.028	0.117	-0.060	-0.127	-0.035	0.081
		(G)		-0.293*	0.142	-0.018	-0.001	0.036	0.128	-0.060	-0.134	-0.030	0.088
3.	Number of branches per plant	(P)			0.205	0.008	-0.192	0.071	-0.109	0.187	0.065	0.035	-0.032
		(G)			0.197	-0.003	-0.203	0.077	-0.117	0.196	0.057	0.035	-0.037
4.	Number of flowers per cluster	(P)				0.417**	0.136	0.025	0.280*	0.035	-0.047	0.185	0.310*
		(G)				0.435**	0.154	0.032	0.288*	0.040	-0.061	0.188	0.318*
5.	Number of fruits per cluster	(P)					0.117	0.145	0.036	0.040	0.140	0.052	0.080
		(G)					0.135	0.148	0.034	0.042	0.149	0.054	0.078
6.	Days to first harvest	(P)						0.115	-0.100	0.193	-0.195	-0.022	-0.062
		(G)						0.113	-0.106	0.203	-0.210	-0.020	-0.063
7.	Days to last harvest	(P)							-0.223	-0.168	0.028	-0.142	-0.247
		(G)							-0.225	0.169	0.031	-0.144	-0.250*
8.	Number of fruits per plant	(P)								0.075	0.047	0.049	0.535**
		(G)								0.076	0.046	0.050	0.534**
9.	Fruit length (cm)	(P)									0.311*	0.078	0.111
		(G)									0.328**	0.078	0.111
10.	Fruit girth	(P)										0.031	0.042
		(G)										0.032	0.041
11.	Average fruit weight	(P)											0.847**
		(G)											0.848**
12.	Fruit yield per plant	(P)											
		(G)											

P - Phenotype correlation co-efficient G - Genotype correlation co-efficient*, ** - Significant at 5% and 1% level respectively.

Table 3: Direct and indirect effects of various characters on fruit yield per plant as partition by path analysis in brinjal.

S. No.	Characters	Days to 50 percent flowering	Plant height at maturity (cm)	Numbre of branches per plant (cm)	Number of flowers per cluster	Number of fruits per cluster	Days to first harvest	Days to last harvest	Number of fruit per plant	Fruit length (cm)	Fruit girth (cm)	Average fruit weight (g)	Genotypic correlation with yield
1.	Days to 50 percent flowering	-0.03414	-0.00897	0.00070	0.00802	0.00019	0.00136	0.00045	0.19766	0.00323	0.00186	0.16554	0.336**
2.	Plant height at maturity	0.00591	0.05180	-0.00094	-0.00563	0.00007	0.00001	0.00068	0.06199	-0.00089	-0.00090	-0.02459	0.888
3.	Number of branches per plant	-0.00742	-0.01519	0.00320	0.00783	0.00001	0.00131	0.00147	-0.05668	0.00288	0.00038	0.02840	-0.037
4.	Number of flowers per cluster	-0.00690	-0.00734	0.00063	0.03973	-0.00176	-0.00100	0.00060	0.13909	0.00058	-0.00041	0.15448	0.318*
5.	Number of fruits per cluster	0.000157	-0.00094	-0.00001	0.01728	-0.00405	-0.00087	0.00283	0.01654	0.00062	0.00101	0.04412	0.078
6.	Days to first harvest	0.00720	-0.00007	-0.00065	0.00613	-0.00055	-0.00645	0.00216	-.05134	0.00297	-0.00141	-0.01641	-0.063
7.	Days to last harvest	0.00081	-0.00184	0.00025	-0.00126	0.00060	-0.00073	0.01908	-0.10851	-0.00248	0.00021	-0.11784	0.250*
8.	Number of fruits per plant	-0.01398	0.00665	-0.00038	0.00145	-0.00014	0.00069	0.00429	0.48282	0.00112	0.00031	0.04070	0.534**
9.	Fruit length	-0.00752	-0.00313	0.00063	0.00157	-0.00017	-0.00131	0.00323	0.03683	0.01466	0.00221	0.06422	0.111
10.	Fruit girth	-0.00942	-0.00692	0.00018	-0.00244	-0.00060	0.00135	0.00058	0.02205	0.00480	0.00674	0.02632	0.041
11.	Average fruit weight	-0.00689	-0.00155	0.00011	0.00748	-0.00022	0.00013	0.00274	0.02395	0.00115	0.00022	0.82071	0.848**

Residual effect = .087 *, ** - Significant at 5 percent and 1 percent level respectively.

weight (0.847).

At genotypic level, fruit yield per plant recorded significant and positive correlation with days to 50 percent flowering (0.336), number of flowers per cluster (0.318), number of fruits per plant (0.534), average fruit weight (0.848). Fruit yield per plant exhibited significant and negative correlation with days to last harvest (-0.250).

Days to 50 percent flowering had appreciable significant and positive correlation with number of fruits per plant (0.409), followed by fruit girth (0.276) at genotypic level and number of fruits per plant (0.307) at phenotypic level. Negative significant correlation was observed between days to 50 percent flowering and number of branches per plant (-0.293). Whereas, at phenotypic level it had negative significant association with plant height at maturity (-0.264). Number of flowers per cluster showed significant and positive correlation with number of fruits per cluster (0.435) and number of fruits per plant (0.288) at genotypic level, number of fruits per cluster (0.417) and number of fruits per plant (0.280) at phenotypic level. Fruit length evinced significant and positive correlation with fruit girth at genotypic (0.328) and phenotypic level (0.328).

Path analysis furnishing direct and indirect effects for the observed agronomical characters on fruit yield per plant were worked out and the results are presented in table 3. The casual basis of the genetic correlation coefficients among the genetically associated traits was elucidated with the aid of path analysis, suggested by Dewey and Lu (1959).

Days to 50 percent flowering, plant height at maturity, number of branches per plant, number of flowers per cluster, number of fruits per cluster, days to first harvest, days to last harvest, fruit length, fruit girth exerted negligible direct effects towards fruit yield per plant. Interestingly, number of fruits per plant (0.4828) and average fruit weight (0.82071) exerted maximum positive direct effect towards fruit yield per plant, which were more or less equal to the genetic correlation coefficients (0.534, 0.848, respectively). Hence, they may be declared as choice of traits for fruit yield improvement in brinjal.

Days to 50 percent flowering exerted maximum positive indirect effect towards fruit yield per plant, through number of fruits per plant and average fruit weight.

All the other traits should negligible effects. Plant height at maturity evinced negligible effects towards fruit yield per plant. The same is true for number of branches per plant. Number of flowers per cluster exerted positive indirect effect towards fruit yield per plant through number

of fruits per plant and average fruit weight. Number of fruits per cluster and days to first harvest as well as days to last harvest witnessed negligible effects towards fruit yield per plant. Number of fruits per plant also exerted negligible indirect effect towards fruit yield per plant. The same trend was observed with fruit girth. Average fruit weight also exerted negligible indirect effects towards fruit yield per plant.

References

Bansal, S. and A.K. Mehta (2008). Phenotypic correlation and path coefficient analysis of some quantitative traits in eggplant. *Indian. J. Trop. Biodiversity.,* **16(2):** 185-190.

Dewey and Lu (1959). Correlation and causation. *J. Agric. Res.,* **20:** 257-87.

Frey, K.J. (1984). Breeding approaches for increasing cereal crop yields. In cereal production: In cereal production (Gallagher, E. J. ed) Buttersworth, London, 47-69.

Jhonson, H.W., F. Robinson and R.E. Comstock (1955). Genotypic and phenotypic correlation in soybean and their implications selection. *Agron. J.,* **6:** 477-485.

Nasit, M.B., L.K. Dhaduk, J.H. Vachhani and J.J. Savaliya (2010). Variability, heritability and genetic advance in okra (*Abelmoschus esculentus* (L.) Moench). *Asian J. Hort.,* **4(2):** 415-417.

Pearson, K. (1902). Biometric method in quantitative genetic analysis. Kalyani Publication, New Delhi.

Rao, C.R. (1952). Advanced statistical methods in biometric research. Johan Wiley and Sons. *Am. J. Phy. Anthropol.,* **12(2):** 390.

Sawadogo, B., P. Bationo-Kando, N. Sawadogo, Z. Kiebre, M. Kiebre, K.R. Nanema, R.E. Traore, M. Sawadogo and J.D. Zongo (2016). Variation, correlation and heritability of interest characters for selection of African egg plant. *Afr. Crop. Sci. J.*, **24(2):** 213-221.

Singh, R.K. Choudhary and B.D. Chowdhary (1985). Biometrical genetics in quantitative genetic analysis. Kalyani Publishers, New Delhi.