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Research Note

Genetic studies on variability for quantitative traits in finger millet (*Eluesine coracana* L. Gaertn)

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Abstract
In the present investigation, eighteen finger millet genotypes were raised in randomized block design to study about the genetic variability for quantitative traits. Phenotypic coefficient of variation was relatively high as compared to that of genotypic coefficient of variation for all the traits studied. The traits namely grain yield / plant and straw yield / plant depicts higher value for phenotypic and genotypic coefficient of variation which indicates the occurrence of broader variability for these characters. All the characters exhibited higher heritability except finger width which showed their genetic capability to transmit genes from parents to their offspring with least impact of environment. High heritability along with high genetic advance as percent of mean was recorded for number of fingers/ ear, finger length, ear head length, number of productive tillers, grain yield and straw yield showed that the additive gene action was predominant for these characters and favours effective selection. The present study revealed that there was significant variability is available in the experimental material and this might be effectively utilized for future crop improvement either through selection or *via* hybridization.

Keywords: Finger millet, Heritability, PCV, GCV and Genetic advance as per cent mean

Finger millet is mainly grown as rainfed crop because of its valued food grains and wider adaptable behaviour to various geographical regions in India. It is nutritionally superior to many cereals and is well known for its higher nutrients of calcium (344 mg/100 g), protein (7-10%), iron and other minerals. The total area under finger millet in India is 10.04 lakh hectares and the production is about 17.55 lakh tonnes with productivity of 1747 kg/ha. In Tamil Nadu, it is grown in an area of 0.84 lakh hectares with productivity of about 2.74 lakh tonnes and production of 3247 kg / hectare (India stat, 2019- 2020).

In India, the finger millet area has declined from 22.03 lakh hectares in late 1950s to 10.04 lakh hectares during 2019. The area of finger millet has been decreased due to replacement of finger millet by other crops. The increased demand for finger millet for food purpose due to their enriched nutrient content and decreased crop area has created an instantaneous necessity for genetic improvement of finger millet productivity (Parashuram *et al.,* 2011).

Yield being a complex quantitative trait and controlled by polygenes is extremely affected by environment. With regard to selection, considering the yield alone may lead to several misleading. Hence, knowledge on genetic variability is prerequisite before initiating a breeding programme. Selection of parents with higher extent of genetic variability forms the basis for success of hybridization and selection of better segregants. The genetic parameters that help in defining the traits having better correspondence between phenotypes and genotypes which forms the basis for effective selection. The variability observed for numerous characters can be

better compared with the support of genotypic co-efficient of variation and phenotypic co-efficient of variation. Hence, the present experiment has been carried out to measure the degree of variation for yield contributory traits in eighteen finger millet genotypes by studying the genetic parameters like phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability and genetic advance as percent of mean.

The present study was conducted at Regional Research Station, Paiyur during *Rabi* 2020-2021. Proper crop management practices was followed to raise a better crop. Evaluation of eighteen genotypes were carried out using Randomised Block Design with three replications.

Twenty rows of 4.5 meters length and 3 meters breadth with a spacing of 22.5 × 10 cm were raised in each plot. Biometrical observations were recorded on randomly five plants in each genotype in three replications on days to 50 per cent flowering, days to maturity, plant height, number of fingers/ear, finger length, finger width, ear head length, peduncle length, number of productive tillers / plant, thousand seed weight, grain yield/plant and straw yield/plant.

Analysis of variance was worked out by using the method given by Panse and Sukhatme (1967). The PCV and GCV were estimated by following the method given by Burton and Devane (1953). Heritability in broad sense was estimated as per Lush (1940) and characters were categorized as high, moderate and low heritability as per the way of Robinson *et al.* (1949). Genetic advance as percent of mean were calculated by using the method described by Johnson *et al*. (1955).

Analysis of variance imparted significant difference for all the twelve characters studied (**Table 1**). Mean, Range and variability parameters for twelve characters are presented in **Table 2**.

For all the twelve characters studied, the difference between the value of PCV and GCV was low which indicates the negligible contribution of environmental effect for the trait expression. Similar results were reported by Udamala *et al.* (2020). Greater value of PCV was recorded for grain yield/plant (29.15%) and straw yield/ plant (38.08%). The value of PCV was moderate for plant height (11.25%), number of fingers/ear (16.57%), finger length (18.22%), ear head length (19.36%) and number of productive tillers/plant (11.12%). Days to 50 per cent flowering (7.60%), days to maturity (5%), finger width (7.90%) and thousand seed weight (8.35%) recorded low PCV. Similar results were reported by Nandini, *et al.* 2010. Highest value of GCV was recorded for grain yield/ plant (27.19%) and straw yield / plant (36.19%). GCV was found moderate for number of fingers / ear (13.83%), finger length (17.40%), ear head length (18.77%) and number of productive tillers / plant (13.41%). Lower value of GCV was recorded for days to 50 per cent flowering (6.88%), days to maturity (4.54 %), plant height (8.89%), finger width (3.96%), peduncle length (9.29%) and thousand seed weight (7.33%). High PCV coupled with high GCV was recorded for grain yield / plant and straw yield / plant which depicts that these two characters were highly variable and paves way for enhancement of the characters by direct selection between the genotypes. The results were in line with the findings of Lule *et al.* (2012). Low PCV associated with low GCV was recorded for days to 50 per cent flowering, days to maturity, finger width and thousand seed weight which recorded a narrow range of variability with limited scope of selection and needs an improvement in base population for these characters. Similarly, the value of PCV and GCV was low for days to maturity which were found in the findings of Reddy *et al.* (2013).

In case of phenotypic variance, the heritable portion is the heritability which is a good index which gives the information of transmission of characters from parents to off spring (Falconer, 1996). High heritability was recorded for all the twelve characters *viz.,* days to 50 per cent flowering (82.13%), days to maturity (82.13%), plant height (62.53%), number of fingers / ear (69.64%), finger length (91.21%), ear head length (94 %), peduncle length (69.76%), number of productive tillers / plant (64.10%), thousand seed weight (77.17%), grain yield / plant (86.96

Table 1. Analysis of variance for twelve traits in eighteen genotypes of Finger millet

Source of variation	D.F.	Days to 50 per cent flowering	Days to maturity	Plant height (cm)	Number of fingers/ Ear	Finger length (cm)	Finger width (cm)
Replication	2	2.7222	2.7222	62.7049	0.0730	0.0054	0.0137
Genotypes	17	58.5196**	58.5196**	142.8449**	3.1173**	4.2479**	0.0111*
Error	34	3.9575	3.9575	23.7850	0.3956	0.1323	0.0056
S.Ed		1.6243	1.6243	3.9800	0.5135	0.2969	0.0609
CD at 5%		3.2648	3.2648	8.0000	1.0322	0.5969	0.1223
CD at 1%		4.3531	4.3531	10.6700	1.3733	0.7958	0.1631
C.V %		3.21	2.12	6.88	9.13	5.40	6.84

Table 1. Continued

Source of variation	D.F.	Ear head length (cm)	Peduncle length (cm)	Number of productive tillers / plant	Thousand seed weight (g)	Grain yield / plant (g)	Straw yield / plant (g)
Replication	2	0.0065	4.2071	1.7011	0.0282	9.1810	17.0883
Genotypes	17	7.5757**	31.722**	3.0632**	0.1319**	172.3947**	288.3137**
Error	34	0.1577	4.0048	0.4819	0.0118	8.2044	9.9752
S.Ed		0.3243	1.6340	0.5668	0.0888	2.3387	2.5788
CD at 5%		0.6518	3.2843	1.1393	0.1786	4.7008	5.1834
CD at 1%		0.8690	4.3791	1.5190	0.2381	6.2677	6.9112
C.V %		4.74	6.11	10.03	3.98	10.52	11.86

Table 2. Genetic variability parameters for yield and yield ascribing traits of Finger millet

Characters	Mean	Range	Minimum	Maximum	PCV (%)	GCV (%)	h2 (%)	GAM (%)
Days to 50 per cent flowering	61.94	15.00	56.00	71.00	7.60	6.88	82.13	12.85
Days to maturity	93.94	15.00	88.00	103.00	5.01	4.54	82.13	8.47
Plant height (cm)	70.84	24.45	63.11	87.56	11.25	8.89	62.53	14.49
Number of fingers/ Ear	6.89	4.12	5.44	9.56	16.57	13.83	69.64	23.77
Finger length (cm)	6.73	4.68	5.00	9.68	18.22	17.40	91.21	34.23
Finger width(cm)	1.09	0.22	0.97	1.19	7.90	3.96	25.04	4.08
Ear head length (cm)	8.38	5.03	6.70	11.73	19.36	18.77	94.00	37.50
Peduncle length (cm)	32.74	11.67	27.37	39.04	11.12	9.29	69.76	15.98
Number of productive tillers / plant	6.92	3.63	5.15	8.78	16.75	13.41	64.10	22.12
Thousand seed weight (g)	2.73	0.77	2.36	3.13	8.35	7.33	77.18	13.27
Grain yield / plant (g)	27.21	32.12	18.11	50.22	29.15	27.19	86.96	52.22
Straw yield / plant (g)	26.62	42.45	15.37	57.82	38.08	36.19	90.29	70.83

%) and straw yield / plant (90.29%) except for finger width. Similar results of high heritability for all the traits studied was reported by Ganapathy *et al.* (2011). Finger width recorded low heritability of 25.04 per cent. The value of genetic advance as per cent of mean was found high for number of fingers / ear (23.77%), finger length (34.23%), ear head length (37.50%), number of productive tillers / plant (22.12%), grain yield / plant (52.22%) and straw yield / plant (70.83%). The value of genetic advance as per cent of mean was found moderate for days to 50 per cent flowering (12.85%), plant height (14.49%) and peduncle length (15.98%). Low genetic advance as per cent of mean was observed for days to maturity (8.47%) and finger width (4.07%). Genetic gain can be predicted with the help of heritability and genetic advance. Combination of high heritability with high genetic advance as percent of mean was recorded for number of fingers / ear, finger length, ear head length, number of productive tillers / plant, grain yield / plant and straw yield / plant. Similar results were reported for ear head length by Singamsetti *et al.* (2018), for number of productive tillers / plant as well as finger length by Mahanthesha *et al.* (2017), for straw yield / plant by Devaliya *et al.* (2018). These characters would be subjected to direct selection due to the presence of additive gene action.

In the experimental material, sufficient amount of variability was observed as a result of moderate to high PCV, GCV with high heritability associated with high genetic advance as per cent of mean were observed for number of fingers / ear, finger length, ear head length, number of productive tillers / plant, grain yield / plant and straw yield / plant. Characters with high heritability coupled with high genetic advance indicated the presence of additive gene action and less influence of environment which reveals that the selection based on these characters favours the improvement of yield, whereas the traits *viz.*, days to maturity and finger width indicates the presence of non-additive gene action with little scope for further improvement through individual plant selection.

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