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RESEARCH ARTICLE

Genetic variability and character association in finger millet [*Eleusine coracana* (L.) Gaertn]

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SUMMARY

Forty-one genotypes of finger millet were assessed for genetic variability, heritability and character association for 12 important traits. High genotypic co-efficient of variation (GCV) and phenotypic co-efficient of variation (PCV) was observed for productive tillers/plant followed by grain yield/plant and iron content. High estimates of heritability (83.40 - 99.30%) was obtained for all the characters studied except protein content (70.40%). Productive tillers/plant, seed yield/plant and iron content exhibited high heritability coupled with high genetic advance as per cent of mean, indicating that these characters are governed by additive gene effects. Hence, selection for these traits would be more effective. High heritability accompanied by low genetic advance as per cent of mean observed for harvest index, it may be due to non-additive gene effects. Correlation analysis revealed that grain yield/plant was positively and significantly correlated with productive tillers/plant, plant height, finger length and number of fingers/main ear head at both genotypic and phenotypic levels, indicating that grain yield would be improved through these characters.

Key Words : Genetic variability, Correlation, Finger millet

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Finger millet is an important small grain crop grown well in dry lands with high temperature, low fertility and poor management by resource poor farmers. After sorghum and pearl millet, finger millet is third in area and production in India among millets. Considering its importance in food and fodder security, adequate information on genetic variability and interrelationship between yield and its contributing characters is essential in finger millet for improving yield. Information on nature and magnitude of variability present in a population due to genetic and non-genetic causes is an important prerequisite for systemic breeding programmes to improve yielding potential of the crop. It is well established fact that the progress in crop improvement depends on the degree of variability in the desired characters in the base materials like germplasm collection. In formulating selection programme for yield improvement in any crop, knowledge of relationship of yield and its contributing traits would of great value. Therefore, present study was undertaken to study the extent of variability and character association in 41 genotypes of finger millet.

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MATERIAL AND METHODS

Forty-one genotypes of finger millet were grown in randomized block design with three replications at Post Graduate research Farm, College of Agriculture, Kolhapur during *Kharif*-2011. Each genotype was represented by a single row of 3 m length with a spacing of 22.5 cm between rows and 10 cm between plants within the rows. The plant to plant distance was maintained by thinning at 20 days after sowing. All the recommended agronomic practices and need based plant protection measures were adopted. At different growth stages the data were recorded on five randomly selected plants of each genotype in each replication and average values/ plant were worked out for 12 characters *viz*., days to 50% flowering, days to physiological maturity, productive tillers/ plant, plant height, finger length, number of fingers/main ear head, main ear head spread, 1000 grain weight, harvest index, iron content, protein content and grain yield/plant. The analysis of variance was done as suggested by Panse and Sukhatme (1967). The phenotypic and genotypic co-efficients of variability (PCV and GCV) were computed according to the method suggested by Burton (1952). Heritability estimates (h^2) and genetic advance (GA) as per cent of means were categorized as suggested by Johnson *et al.* (1955). The phenotypic and genotypic correlations between yield and its contributing traits were estimated as per the method described by Singh and Chaudhary (1977).

RESULTS AND DISCUSSION

The analysis of variance showed significant differences for all the characters under study, indicating the adequate variability. The estimates of mean, range, GCV and PCV, heritability and genetic advance as per cent of mean are presented in Table 1.

Phenotypic co-efficient of variation ranged from 6.62% for harvest index to 29.20% for productive tillers/plant. Genotypic co-efficient of variation followed the same trend as that of PCV. The co-efficient of variation at phenotypic (PCV) and genotypic (GCV) levels were high for productive tillers/plant, grain yield/plant and iron content, whereas, moderate for the traits *viz*., days to 50% flowering, plant height, finger length, number of fingers/main ear head, main ear head spread, 1000 grain weight and protein content. Low PCV and GCV were observed for the traits days to physiological maturity and harvest index. The similar results of high PCV and GCV were reported by Abraham *et al.* (1989) for productive tillers/plant and grain yield/plant and by John (2006) and Ganapathy *et al.* (2011) for productive tillers/plant.

The heritability was high for all the character *viz*., days to 50% flowering, days to physiological maturity, productive tillers/plant, plant height, finger length, number of fingers/ main ear-head, main ear-head spread, 1000 grain weight, harvest index, iron content and grain yield/plant except protein content. The maximum value was recorded by days to physiological maturity (99.30%) and the minimum was recorded by the trait protein content (70.40%). Ganapathy *et al.* (2011) also reported such high heritability for the traits *viz*., days to 50% flowering, days to maturity, productive tillers/ plant, plant height and grain yield/plant. Heritability is the heritable portion of phenotypic variance. It is a good index of the transmission of characters from parents to their offsprings (Folconar, 1981). The estimates of heritability help the plant breeder in selection of elite genotypes from divergent population. But heritability itself does not provide any indication towards the amount of genetic progress that would result in selecting best individual; rather it depends upon the amount of genetic advance. In the set of 41 genotypes, except harvest index all the traits expressed moderate to high genetic advance as per cent of mean. Similar trend was obtained in finger millet by Ganapathy *et al.* (2011). The highest genetic advance as per cent of mean was expressed by the trait productive tillers/plant (57.12%) followed by seed yield/plant (52.09%) and Iron content (37.36%), while the lowest (11.37%) was expressed by the trait harvest index.

Relationship of heritability and genetic advance also gives an idea about the type of gene action. In the present investigation, high heritability coupled with high genetic advance was observed for productive tillers/plant, seed yield/ plant and iron content, which indicates the predominance of additive gene effects in controlling these traits. Similar results regarding heritability and genetic advance for productive

Table 1 : Variability parameters for different characters in 41 genotypes of finger millet

Characters	Range	General mean	GCV (%)	PCV (%)	Heritability (bs) %	Genetic advance	GA as % of mean
Days to 50% flowering	68.67-116.67	89.78	13.87	13.95	98.90	25.52	28.43
Days to physiological maturity	98.00-141.67	121.20	9.99	10.03	99.30	24.86	20.51
Productive tillers/plant	0.80-2.40	1.44	28.45	29.20	94.90	0.82	57.12
Plant height (cm)	83.13-132.50	112.60	12.27	12.33	99.10	28.33	25.16
Finger length (cm)	4.80-7.66	5.80	11.31	11.71	93.40	1.31	22.52
No. of fingers / main ear head	4.84-7.71	5.89	11.93	12.54	90.50	1.38	23.39
Main ear head spread (cm)	2.89-5.16	4.00	14.09	14.70	92.00	1.12	27.85
1000 grain weight (g)	2.23-3.93	3.04	13.30	13.65	95.00	0.81	26.71
Harvest index (%)	32.04-39.45	35.17	6.04	6.62	83.40	4.00	11.37
Iron content (%)	3.7-7.5	5.3	22.02	22.33	97.24	2.00	37.76
Protein content (%)	5.67-8.86	7.51	11.06	13.19	70.40	1.44	19.13
Grain yield / plant (g)	4.40-12.27	7.34	25.62	25.96	97.40	3.83	52.09

GCV = Genotypic coefficient of variation, PCV = Phenotypic coefficient of variation, bs = Broad sense and GA = Genetic advance.

Table 2 : Genotypic (above diagonal) and phenotypic (below diagonal) correlation coefficients amongst 12 characters in finger millet

Characters	Days to 50% flowering	Days to physiological maturity	Productive tillers/plant	Plant height (cm)	Finger length (cm)	No. of fingers / main ear head	Main ear head spread (cm)	1000 grain weight (g)	Harvest index (%)	Iron content (%)	Protein content (%)	Grain yield / plant (g)
Days to 50% flowering	**1.00**	0.951**	0.067	0.198	0.150	0.178	0.095	-0.071	0.278	-0.027	-0.121	0.189
Days to physiological maturity	0.944**	**1.00**	-0.075	0.178	-0.001	0.099	-0.029	-0.067	0.244	-0.034	-0.141	0.052
Productive tillers/plant	0.061	-0.069	**1.00**	0.407**	0.731**	0.475**	0.238	-0.148	0.055	0.083	0.029	0.929**
Plant height (cm)	0.197	0.178	0.395**	**1.00**	0.164	0.343*	0.208	0.064	0.275	-0.202	-0.086	0.514**
Finger length (cm)	0.139	-0.010	0.695**	0.153	**1.00**	0.419**	0.213	-0.099	-0.029	0.074	0.117	0.662**
No. of fingers / main ear head	0.164	0.094	0.489**	0.322*	0.398**	**1.00**	0.001	0.110	0.204	-0.324*	-0.082	0.588**
Main ear head spread (cm)	0.092	-0.031	0.228	0.197	0.210	0.016	**1.00**	0.135	0.211	-0.010	-0.061	0.205
1000 grain weight (g)	-0.071	-0.063	-0.134	0.056	-0.086	0.109	0.127	**1.00**	-0.057	-0.345*	0.049	0.040
Harvest index (%)	0.252	0.216	0.053	0.256	-0.013	0.187	0.186	-0.054	**1.00**	-0.155	0.025	0.052
Iron content (%)	-0.027	-0.033	0.081	-0.202	0.071	-0.305*	-0.009	-0.335	-0.146	**1.00**	0.341*	-0.071
Protein content (%)	-0.105	-0.132	0.031	-0.080	0.099	-0.042	-0.021	0.055	0.080	0.333*	**1.00**	0.009
Grain yield / plant (g)	0.184	0.054	0.908**	0.507**	0.632**	0.558**	0.192	0.037	0.043	-0.070	0.008	**1.00**

* and ** indicate significance of values at P=0.05 and 0.01, respectively

tillers/plant and seed yield/plant were obtained in finger millet by Anantharaja and Meenakshi Ganesan (2006) and Ganapathy *et al.* (2011). Rest of the characters except harvest index expressed high heritability coupled with moderate genetic advance, indicating greater role of additive and non-additive gene effects and selection might be postponed to later generations to harness the non-additive gene action. High level of heritability provides a good promise to plant breeders for the direct selection of quantitative traits on the phenotypic performance. Therefore, these characters can be improved very easily and a high genetic gain from phenotypic selection will be effective for future breeding programmes.

Correlation co-efficient analysis at phenotypic and genotypic levels provides information on nature and extent of relationship among characters. Grain yield is a complex trait controlled by many genes. Selection of genotypes or parents based on grain yield alone often misleading. Hence, the knowledge about relationship between yield and its contributing characters is needed for an efficient selection strategy. In the present study, grain yield/plant showed highly significant and positive correlation with productive tillers/ plant, finger length, number of fingers/main ear head and plant height at both phenotypic and genotypic levels (Table 2). These relationships are similar to the results reported by Bedis *et al.* (2006) and Ganapathy *et al.* (2011). Correlations among plant height, finger length and number of fingers/main ear head were positive and highly significant at both the levels except between finger length and plant height. The association between days to 50% flowering and days to physiological maturity was positive and highly significant, while protein content and iron content were positively and significantly correlated at both the levels. The correlations of iron content with number of fingers/main ear head and 1000 grain weight were significantly negative. Therefore, it can be concluded that more emphasis needs to be given on productive tillers/ plant, finger length, number of fingers/main ear head and plant height while selecting for grain yield improvement in finger millet.

REFERENCES

Abraham, M. J., Gupta, A.S. and Sharma, B.K. (1989). Genetic variability and character association of yield and its components in finger millet in an acidic soil of Meghalaya. *Indian J. Agric. Sci*., **59**(9): 579-581.

Anantharaja, P. and Meenakshi Ganesan, N. (2006) . Genetic variability in finger millet [*Eleusine coracana* (L.) Gaertn.]. *Internat. J. Tropical Agric.,* **24**(1-2): 269-274.

Bedis, M.R., Patil, H.S., Jangle, G.D. and Patil, V.S. (2006). Correlation and path analysis in finger millet (*Eleusine coracana* Gaertn.). *Crop Res.*, **31**(2): 261-266.

Burton, G.W. (1952). Quantitative inheritance in pearl millet. *Agron. J.,* **43** : 409-417.

Folconar, D. (1981). Stability parameters for comparing varieties. *Crop Sci*., **6** : 36-40.

Ganapathy, S., Nirmalakumari, A. and Muthiah, A.R. (2011). Genetic variability and interrelationship analyses for economic traits in finger millet germplasm. *World J. Agric. Sci.*, **7**(2): 185-188.

John, K. (2006). Variability and correlation studies in quantitative traits of finger millet (*Eleusine coracana* Gaertn.). *Agric. Sci. Digest*, **26**(3): 166-169.

Johnson, H.W., Robinson, H.F. and Comstock, R.E. (1955). Genotypic and phenotypic correlation in soybean and their implication in selection. *Agron. J.*, **47** : 477-483.

Panse, V.G. and Sukhatme, P.V. (1967). *Statistical methods for agricultural workers*. ICAR, New Delhi. 359 pp.

Singh, R.K. and Chaudhary, B.D. (1977). Variance and covariance analysis. "*Biometrical methods in quantitative genetic analysis*". Kalyani Publishers, New Delhi. pp.39-68.