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Genetic Variability, Heritability and Genetic Advance for Grain Yield and its Components in Finger millet [*Eleusine coracana* (L.) Gaertn.]

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ABSTRACT

An investigation was carried out on finger millet to assess the variability, heritability and genetic advance for eleven characters viz., plant height, days to 50% flowering, days to maturity, number of productive tillers per plant, fingers per ear, finger length, ear weight per plant, 1000-seed weight, seed protein content, seed calcium content and seed yield per plant in 40 genotypes. The results revealed that high PCV and GCV were recorded for seed yield per plant, ear weight per plant, productive tillers per plant and seed protein content. High heritability accompanied with high genetic advance was recorded for all the 11 characters under study indicating the predominance of additive gene action and hence direct phenotypic selection is useful with respect to these traits.

Key words : Finger millet,Genetic advance, Heritability, Variability.

Finger millet (*Eleusine coracana* Gaertn.) is one of the important food crops and largely grown in southern states of India. It is the most important small millet cultivated in more than 25 countries in Africa and Asia. In India, it is cultivated on 1.3 M ha, with a production of 1.59 Mt and a productivity of 1.7 t ha^{-1} while in Andhra Pradesh it is grown in an area of 41,000 ha with a production of 45,000 t and a productivity of 1.19 t ha^{-1} (Ministry of Agriculture, 2013). Ragi is commonly famous as "Nutritious millet" as the grains are nutritionally superior to many cereals. It contains protein (7-10%), calcium (344 mg/100 g), iron and other minerals. It is also rich in phosphorus (283 mg/100 g) and potassium (408 mg/100 g). The carbohydrates present in finger millet have the unique property of slower digestibility. The success of any breeding programme depends upon the quantum of genetic variability present in the population. Wider range of genetic variability helps in selecting desired genotypes. In addition to the genetic variability, knowledge on heritability and genetic advance helps in choosing the suitable breeding strategy. Therefore, it is necessary to have knowledge of genetic variability, heritability and expected genetic advance present in the available genotypes.

MATERIAL AND METHODS

Forty genotypes were evaluated during *kharif* 2013 at Agricultural College Farm, Bapatla in a Randomized Block Design with three replications. Observations were recorded on ten randomly chosen plants for nine quantitative characters *viz*., plant height, number of productive tillers per plant, fingers per ear, finger length, ear weight per plant, 1000-seed weight, seed protein content, seed calcium content and seed yield per plant. The data on days to 50% flowering and days to maturity were recorded on plot basis. The data were subjected to statistical analysis and genetic parameters such as Phenotypic coefficient of variation (PCV) and Genotypic coefficient of variation (GCV) as per Burton (1952), heritability in broad sense and expected genetic advance as percent of mean were worked out as per Johnson *et al.* (1955) and Hanson (1963).

RESULTS AND DISCUSSION

The analysis of variance revealed significant differences among all the 40 genotypes for all the characters studied, indicating a high degree of variability in the material (Table 1). In the present study, the variation was also estimated character wise in terms of Phenotypic and genotypic coefficients of variation (Table 2). The genotypic coefficients of variation for all the characters studied were lesser than the phenotypic coefficients of variation indicating the influence of environment on expression of these traits. Highest PCV and GCV (32.75 and 27.21) was exhibited by seed yield per plant, whereas lowest PCV and GCV was recorded by 1000-seed weight (9.51 and 9.24). These results were in accordance with the

Table 1. Analysis of variance for seed yield and yield component characters in finger millet [*Eleusine coracana* (L.) Gaertn.]

Source of variations	d.f.	Plant height (cm)	Days to 50% flowering	Days to maturity	Productive tillers per plant	Fingers per ear	Finger length (cm)	Ear weight per plant (g)	1000-Seed weight (g)	Seed protein content (%)	Seed calcium content (mg/100g)	Seed yield per plant (g)
		Mean sum of squares										
Replications	2	29.01	8.93	6.00	0.40	0.006	0.20	11.67	0.005	0.03	10.43	7.47
Treatments	39	508.75**	184.18**	321.43**	1.79**	2.22**	4.65**	53.44**	0.40**	8.57**	9941.62**	51.19**
Error	78	37.54	1.95	1.26	0.17	0.04	0.71	3.08	0.007	0.004	12.58	6.64

** Significant at 1% level * Significant at 5% level

Table 2. Estimates of variability, heritability and genetic advance as per cent of mean for seed yield and yield components in finger millet [*Eleusine coracana* (L.) Gaertn.].

S. No.	Character	Mean	Range		Coefficient of variation		Heritability (broad sense)	Genetic advance as per cent of mean
			Minimum	Maximum	PCV (%)	GCV (%)		
1.	Plant height (cm)	105.02	78.90	138.20	13.28	11.93	80.70	28.30
2.	Days to 50% flowering	70.03	54.00	84.00	11.30	11.12	96.80	28.91
3.	Days to maturity	103.05	88.00	122.33	10.08	10.02	98.80	26.30
4.	Productive tillers per plant	3.65	2.20	5.40	23.18	20.10	75.20	46.03
5.	Fingers per ear	5.73	3.73	7.60	15.27	14.86	94.70	38.20
6.	Finger length (cm)	6.87	4.89	9.44	20.72	16.67	64.70	35.41
7.	Ear weight per plant (g)	19.11	10.52	27.71	23.32	21.43	84.40	52.02
8.	1000-seed weight (g)	3.91	3.24	4.80	9.51	9.24	94.40	23.73
9.	Seed protein content (%)	8.36	5.70	13.65	20.22	20.20	99.80	53.29
10.	Seed calcium content (mg/100g)	331.31	234.00	478.66	17.39	17.36	99.60	45.75
11.	Seed yield per plant (g)	14.15	7.30	22.75	32.75	27.21	69.00	59.72

PCV = Phenotypic coefficient of variation GCV = Genotypic coefficient of variation

findings of Dhamdhere *et al.* (2011) for seed yield per plant, Priyadharshini *et al.* (2011) for 1000-seed weight. Moderate PCV and GCV was recorded for seed calcium content, fingers per ear, plant height, days to 50% flowering and days to maturity. High PCV coupled with moderate GCV was observed for finger length. These results indicate that there is considerable amount of variability for majority of the characters studied.

The estimates of heritability and genetic advance as per cent of mean were high for all the 11 characters under study indicating the predominance of additive gene action and hence direct phenotypic selection is useful with respect to these traits. Similar results were obtained by Karad and Patil (2013) for plant height, Priyadharshini *et al.*(2011) and Karad and Patil (2013) for days to 50% flowering, Wolie *et al.* (2013) and Srilakshmi (2013) for days to maturity, Ganapathy *et al.* (2011) and Srilakshmi (2013) for productive tillers per plant, Wolie *et al.* (2013) for fingers per ear, Srilakshmi (2013) for finger length, Dagnachew *et al*. (2012) and Srilakshmi (2013) for ear weight per plant, Dagnachew *et al*. (2012) for 1000-seed weight, Priyadharshini *et al.* (2011) and Karad and Patil (2013) for seed protein content, Srilakshmi (2013) for seed calcium content, Priyadharshini *et al.* (2011) for seed yield per plant.

The maximum value for heritability was recorded by seed protein content (99.80%) and minimum was recorded by finger length (64.70%). Heritability estimates along with expected genetic advance are more helpful in predicting the gain under selection than heritability estimates alone. The maximum value for genetic advance as per cent of mean was recorded by seed yield per plant (59.72) and minimum was recorded by 1000-seed weight (23.73).

Characters like seed yield per plant, ear weight per plant, productive tillers per plant and seed protein content showed highest PCV and GCV. Whereas characters like seed protein content, seed calcium content, days to maturity and days to 50% flowering showed high variability along with high genetic advance as percent of mean.

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