

Study of correlation and path analysis in F₂ population of finger millet

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SUMMARY

Correlation and path analysis studies were carried out in F₂ generation of the seven crosses of finger millet (ragi) (*Eleusine coracana* Gaertn.) namely Indaf 5 X L 264 (Cross I), L 5 X IE 2936 (Cross II), GPU 26 X IE 2712 (Cross III), GPU 26 X GE 1409 (Cross IV), Indaf 5 X GE 1409 (Cross V), L 5 X IE 2656 (Cross VI) and L 5 X IE 2686 (Cross VII) for grain yield and its component traits. These F₂ populations of finger millet were evaluated at Zonal Agricultural Research Station, V.C. Farm, Mandya, Karnataka, India during 2008-09. The result revealed that Grain yield has strong positive correlation with weight of main ear, 1000 seed weight and total tillers per plant. Productive tillers and plant height exhibited moderate positive correlation. Weight of main ear 1000 seed weight showed positive direct effect on grain yield of main ear.

Key words : Correlation, Path analysis, Finger millet

Finger millet (*Eleusine coracana* (L.) Gaertn.) subspecies *coracana* belongs to family Graminae. The cultivated *E. coracana* is a tetraploid (2n = 36); has morphological similarities to both *E. indica* (L.) Gaertn. (2n = 18) and *Eleusine africana* O. Byrne (2n = 36). Finger millet is an important food crop in Africa and South Asia. It is a hardy crop that can be grown in diverse environments from almost at sea level in South India to high lands of Himalayas. It has dual importance as a source of food grain as well as straw. Finger millet is very nutritious with good quality protein, minerals, dietary fibers, phytochemicals and vitamins.

It is the richest source of calcium providing 8 – 10 times more than that of rice or wheat. Finger millet carbohydrate has unique property of slower digestibility and regarded as food for long sustenance (Barbeau and Hillu, 1993). Selection for yield on the basis of *per se* performance alone may not be as effective as that based on the component characters associated with it, which is biometrically determined by correlation coefficient and path analysis (Mahudeswaran and Murugesan, 1973).

Character like yield is having complex in nature, so direct selection is not possible. Therefore, the knowledge of association is useful to the breeders for the improvement among the yield attributing characters considerably affect the methods of selection (Mishra *et al.*, 1980). Phenotypic correlation reflects the observed relationship while genotypic correlation underlines the true relationship among the characters. Knowledge of interrelationship between yield and its components is obvious for efficient selection of desirable segregants in plant breeding (Anantharaju and Meenakshiganesan, 2005). Unlike the correlation coefficient values which measure the extent of relationship, path coefficient analyses help in partitioning of the correlation coefficient into direct and indirect effects through other components (Wright, 1921). Correlation coefficient values which measure the extent of relationship, path coefficient measure the magnitude of direct and indirect effects of characters on complex dependent character like yield and thus enable the breeders to judge the best about the important component characters during selection (Dewey and Lu, 1959). Present investigation was carried in this direction with the utilization of seven crosses of finger millet to assess the yield attributing characters towards the yield of ragi by using corelation and path analysis studies.

MATERIALS AND METHODS

The experimental material for the present investigation comprised of F₂ generation of seven crosses of finger millet *viz.*, Indaf 5 X L 264, L 5 X IE 2936, GPU 26 X IE 2712, GPU 26 X GE 1409, Indaf 5 X GE 1409, L 5 X IE 2656, and L 5 X IE 2656, obtained from ragi breeder (AICSMIP), V.C.Farm, Mandya. The F₂ seeds of all the

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seven crosses of ragi were first sown in nursery bed and 21 days old healthy seedlings were used for transplanting in the main field under irrigated condition during *Khariif*, 2008 with single seedling per hill at a spacing of 22.5 cm between rows and 10 cm between plants within the row.

The experiment in the main field was laid out in randomized complete block design with two blocks. Crop was raised as per the recommended package of practices. Observations recorded on days to 50 per cent flowering, plant height (cm), total number of tillers, productive tillers per plant, number of fingers per ear, finger length of main ear (cm), ear weight (g), 1000 seed weight (g) and total grain yield per plant (g).

RESULTS AND DISCUSSION

The results obtained from the present investigation have been discussed in the following sub heads :

Correlation studies:

Grain yield of main ear was found to be strongly and positively associated with weight of main ear and test weight in all the seven crosses studied (Table 1 and 2). Plant height, total tillers per plant and productive tillers per plant had positive relationship with grain yield in all cross except cross VI and VII. Days to fifty per cent of flowering had positive relationship with grain yield of main ear in the cross V and it was non significant in the remaining crosses. Number of fingers and finger length had a positive association with grain yield of main ear in the cross II, V, VI and VII which confirm the earlier reports of Setty *et al.* (1974) and Appadurai *et al.* (1977).

Path analysis:

Path-coefficient analysis is simply a standardized partial regression coefficient, which splits the correlation coefficient into the measures of direct and indirect effects (Singh and Narayanan, 1993).

Table 1 : Genotypic direct and indirect effects of different quantitative traits in F₂ generation of finger millet. Crosses (Indaf 5 X L 264) and (GPU 26 X IE 1409)

Character	Days to fifty per cent flowering	Plant height (Cm)	Total tillers per plant	Productive tillers per plant	Finger number per main ear	Finger length (cm)	Weight of main ear(g)	Grain yield per ear	1000 seed weight (g)
Indaf 5 X L 264									
Days to 50% flowering	0.24011	0.03855	-2.79236	2.48251	-0.00252	0.06112	-0.43219	0.14393	-0.261
Plant height(cm)	0.22472	0.37437	0.97485	-1.39885	-0.00128	0.29496	-0.23208	-0.05332	0.183
Total tillers/plant	0.09018	-0.04364	-8.36247	8.34018	0.06962	-0.09714	0.08528	0.09817	0.180
Productive tillers/plant	0.08104	-0.06241	-8.31225	8.39058	0.00205	-0.11127	0.09106	0.08163	0.160
Finger number/main ear	0.05325	0.04224	1.18908	-1.51722	-0.01136	0.02336	0.1352	0.15816	0.073
Finger length (cm)	0.03783	0.18813	1.8783	-2.40646	-0.00068	0.38796	0.45512	-0.14893	0.391
Weight of main ear(g)	-0.06718	-0.05625	-0.29928	0.49462	-0.00099	-0.1143	1.54472	-0.50304	0.998
1000 seed weight(g)	-0.03651	0.02109	0.21353	0.369	0.0019	-0.06104	0.82088	-0.94662	0.382
GPU 26 X IE 1409									
Days to 50% flowering	0.01133	-0.01973	-0.54903	0.42915	0.00168	-0.02031	0.01184	0.20248	0.067
Plant height(cm)	-0.00293	0.0764	0.29561	-0.19309	-0.00025	0.06193	0.04149	-0.06026	0.218
Total tillers/plant	-0.00361	0.00867	1.72374	-1.66145	0.00089	0.00689	0.06331	0.09374	0.232
Productive tillers/plant	-0.00291	0.00983	1.71399	-1.67091	0.00298	0.00989	0.0085	0.09856	0.169
Finger number/main ear	-0.00664	0.00665	0.5344	-0.39692	-0.00287	0.01655	0.06695	-0.20104	0.017
Finger length (cm)	-0.00557	0.00357	0.28768	-0.23429	-0.00115	0.04126	0.07209	-0.1332	0.030
Weight of main ear(g)	0.00013	0.00083	0.10304	-0.00962	-0.00018	0.00281	1.05904	-0.14981	1.006
1000 seed weight(g)	-0.00631	0.01267	0.44461	-0.20486	0.00159	0.01512	0.43654	-0.36344	0.335
Indaf 5 X L 264					GPU 26 X IE 1409				
Residual	0.383397				0.05712				

Table 2 : Genotypic direct and indirect effects of different quantitative traits in F₂ generation of Indaf 5 X IE 1409 and GPU 26 X IE 2712

Character	Days to fifty per cent flowering	Plant height (cm)	Total tillers per plant	Productive tillers per Plant	Finger number per main ear	Finger length (cm)	Weight of main ear (g)	Grain yield per ear	1000 seed weight (g)	
Indaf 5 X IE 1409										
Days to 50% flowering	0.00553	0.00254	0.03329	-0.04398	0.00312	0.00088	0.35838	0.00048	0.360	
Plant height(cm)	0.00229	-0.00614	-0.01651	0.00816	0.00101	0.0006	0.31494	-0.00072	0.303	
Total tillers/plant	0.00091	0.0005	0.20167	0.19982	0.00107	0.00182	-0.20462	0.00544	0.206	
Productive tillers/plant	0.0012	0.00025	0.19931	0.20219	0.00113	0.00167	-0.23601	0.00112	0.171	
Finger number/main ear	-0.00365	0.00132	0.04546	-0.04852	-0.00473	0.0013	0.36224	0.00214	0.356	
Finger length (cm)	0.00036	-0.00028	0.02732	-0.02514	-0.00046	0.01346	0.12157	-0.00084	0.136	
Weight of main ear(g)	-0.00197	0.00193	0.0612	-0.06768	-0.00171	0.00163	1.00378	0.00088	0.998	
1000 seed weight(g)	-0.00061	0.00102	-0.02065	-0.00577	-0.00234	-0.00261	0.20449	0.00433	0.178	
GPU 26 X IE 2712										
Days to 50% flowering	0.04236	-0.006	-0.028	0.02638	-0.03171	0.01241	0.01426	-0.02539	0.004	
Plant height(cm)	-0.00465	0.05466	0.0255	0.0441	0.00594	0.03037	0.02325	-0.00896	0.170	
Total tillers/plant	0.00479	0.00563	0.24741	0.31611	0.00161	-0.0079	-0.05033	-0.07567	0.441	
Productive tillers/plant	0.0025	0.00755	0.21509	0.3091	0.00116	-0.03065	-0.03634	-0.07515	0.393	
Finger number/main ear	-0.01234	0.00298	-0.00367	0.00926	0.10883	-0.0068	-0.01599	-0.14141	-0.059	
Finger length (cm)	-0.00468	0.01476	-0.01738	0.03022	0.00658	-0.11245	-0.01133	0.06654	-0.028	
Weight of main ear(g)	0.00074	0.00155	0.01516	-0.01412	-0.00212	0.00155	0.82109	0.11735	0.941	
1000 seed weight(g)	-0.00388	-0.00177	0.06759	-0.08658	-0.05556	-0.02701	0.34787	0.27697	0.518	
	Indaf 5X IE 1409					GPU 26 X IE 2712				
	Residual 0.05132					Residual 0.28536				

In this investigation the result of path analysis in the F₂ generation of the seven crosses showed that Productive tillers exhibited moderate to high and positive direct effect on grain yield of main ear in cross I, II, III and V whereas it was low to high in cross VI, VII and IV. This was earlier reported by Chaudhari and Acharya (1969). Weight of main ear exhibited direct positive effect with high magnitude in all the crosses, and its indirect effect through other characters was very low Shanthakumar (1988). Ear weight, plant height, productive tillers and finger length were the major components contributing for the grain yield in finger millet (Gowda, 1996). Total tillers per plant, and test weight through ear weight had contributed to grain yield. From this study it can be summarized that genotypic path coefficient analysis revealed high positive direct

effect of weight of main ear, 1000 seed weight and accounts maximum to make up the total grain yield compared to other strongly associated yield attributing traits. Other traits like total number of tillers per plant and productive tillers exerted variable positive or negative direct or indirect effect through other traits and thus, respectively intensified or reduced the total intrinsic association towards yield. Whereas, finger number registered negligible positive direct and indirect effect. Low residual effect of all the crosses studied revealed the sufficiency of the characters selected to define the total grain yield. The present study also brought out the positive direct contribution of days to fifty per cent of flowering in Indaf 5X L 264 and L 5X IE 2936 and number of fingers in L 5 X IE 2936 towards grain yield.

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