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Character Association and Path Coefficient Studies on Yield and Yield Contributing Traits in Finger Millet [*Eleusine coracana* (L.) Gaertn.]

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ABSTRACT

Correlation studies involving forty three genotypes of finger millet indicated that productive tillers per plant, 1000-seed weight, fingers per ear, finger length, ear weight per plant and plant height were significant and positively associated with seed yield per plant. The path analysis revealed that productive tillers per plant had maximum direct effect on seed yield per plant followed by 1000-seed weight, fingers per ear and ear weight per plant. Considering the nature and magnitude of character associations and their direct and indirect effects, it can be inferred that productive tillers per plant, 1000-seed weight, fingers per ear and ear weight per plant could serve as important traits in selecting high yielding genotypes in finger millet.

Key words: Correlation, Finger millet, Path analysis.

The correlation studies are of considerable importance in any selection programme as they provide degree and direction of relationship between two or more component traits. Correlation analysis provides information about yield components and thus helps in the selection of superior genotypes from diverse genetic populations. However, direct selection based on correlations may not be effective when there are many characters influencing one another. It is necessary to split the total correlation coefficient into direct and indirect effects on a given character. Correlation in combination with path coefficient analysis gives a better insight into cause and effect relationship between different pairs of characters.

MATERIAL AND METHODS

The present investigation was conducted during *kharif* 2012 at Agricultural College Farm, Bapatla, Guntur District, Andhra Pradesh, India. Geographically the experimental farm is situated at an altitude of 5.4 m above mean sea level, 15^0 54' N latitude and 80^0 90' E longitude. This region has a typical subtropical climate with extremes of temperature during winter and summer season, 35^0C and 48^0C respectively. The study comprised of forty three diverse finger millet genotypes obtained from Agricultural Research Station (ARS), Vizianagaram District, Andhra Pradesh, India and these were evaluated in a randomized block design with three replications with a spacing of 20 x 10 cm. The plot size was 2.4 sq.m. Recommended agronomic practices were adapted during the crop growth.

Observations were recorded on ten randomly chosen plants for eleven different characters *viz.,* 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) and seed yield per plant (g). The correlation and path analysis were worked out as per the procedure given by Falconer (1964) and Dewey and Lu (1957), respectively.

RESULTS AND DISCUSSION

The phenotypic and genotypic correlations of different characters were estimated (Table.1) and found that the genotypic correlation coefficients were higher than the phenotypic correlation coefficients indicating that the apparent associations are largely due to genetic reason. Significant and positive correlation of productive tillers per plant, 1000-seed weight, fingers per ear, finger length, ear weight per plant with seed yield per plant at both genotypic and phenotypic levels was observed. Similar findings were also observed by Harikrishna

Table 1. Phenotypic and genotypic correlations among seed yield and yield contributing characters in finger millet [*Eleusine coracana* (L.) Gaertn.].

Character	Correlation	Daysto 50% flowering	Daysto maturity	Productive tillers per plant	Fingers per ear	Finger length	Ear weight per plant	1000-seed weight	Seed protein content	Seed calcium content	Seed yield per plant
Plant height	G	0.0984	0.2754**	0.1886*	0.2724**	0.0795	0.1406	0.1456	-0.2387**	0.2071*	0.2613**
	P	0.0557	0.1719	0.2002*	0.1849*	0.0331	0.0446	0.1160	-0.1802*	0.1368	0.0705
Days to 50% flowering	G		0.6542**	0.1924*	0.1661	0.3392**	0.3394**	0.1484	0.3537**	0.2004*	0.0280
	P		0.5812**	0.1729*	0.1205	0.2824**	0.2758**	0.1465	0.3492**	0.1963*	0.0135
Days to maturity	G			0.3308**	0.2082*	0.1826*	0.3100**	-0.0077	0.2197*	0.2985**	-0.0066
	P			0.2321**	0.1803*	0.1682	0.2127*	-0.0188	0.2024*	0.2733**	-0.0007
Productive tillers per plant	G				0.7618**	0.6242**	0.4875**	0.4793**	0.2729**	0.3565**	0.8257**
	P				0.4433**	0.4656**	0.1991*	0.3727**	0.2298**	0.2880**	0.5464**
Fingers per ear	G					0.4133**	0.3424**	0.5999**	0.1580	0.2167*	0.7689**
	P					0.2970**	0.2043*	0.4423**	0.1250	0.1770*	0.4391**
Finger length	G						0.2801**	0.4992**	0.3067**	0.2261**	0.5266**
	P						0.1715	0.4232**	0.2739**	0.2098*	0.3697**
Ear weight per plant	G							0.4237**	0.0230	0.4179**	0.4771**
	P							0.3411**	0.0209	0.3160**	0.2612**
1000-seed weight	G								-0.0999	0.0627	0.7371**
	P								-0.0953	0.0612	0.5431**
Seed protein content	G									0.2091*	-0.1022
	P									0.2077*	-0.0834
Seed calcium content	G										0.1250
	P										0.0887

P: Phenotypic correlation

G: Genotypic correlation

* Significant at 5% level

** Significant at 1% level

Table 2. Direct and indirect effects of different traits on seed yield per plant in finger millet [*Eleusine coracana* (L.) Gaertn.].

Character		Plant height	Daysto 50% flowering	Daysto maturity	Productive tillers per plant	Fingers per ear	Finger length	Ear weight per plant	1000-seed weight	Seed protein content	Seed calcium content
Plant height	P	**-0.0909**	-0.0051	-0.0156	-0.0182	-0.0168	-0.0030	-0.0041	-0.0105	0.0164	-0.0124
	G	**0.0909**	0.0089	0.0250	0.0171	0.0248	0.0072	0.0128	0.0132	-0.0217	0.0188
Days to 50%	P	-0.0030	**-0.0547**	-0.0318	-0.0094	-0.0066	-0.0154	-0.0151	-0.0080	-0.0191	-0.0107
flowering	G	0.0121	**0.1230**	0.0804	0.0237	0.0204	0.0417	0.0417	0.0182	0.0435	0.0246
Days to maturity	P	-0.0106	-0.0358	**-0.0617**	-0.0143	-0.0111	-0.0104	-0.0131	0.0012	-0.0125	-0.0169
	G	-0.0888	-0.2110	**-0.3225**	-0.1067	-0.0672	-0.0589	-0.1000	0.0025	-0.0709	-0.0963
Productive tillers	P	0.0832	0.0719	0.0965	**0.4158**	0.1843	0.1936	0.0828	0.1549	0.0955	0.1197
per plant	G	0.1539	0.1570	0.2700	**0.8162**	0.6218	0.5095	0.3979	0.3912	0.2227	0.2910
Fingers per ear	P	0.0302	0.0197	0.0295	0.0724	**0.1634**	0.0485	0.0334	0.0723	0.0204	0.0289
	G	0.0221	0.0135	0.0169	0.0619	**0.0813**	0.0336	0.0278	0.0488	0.0128	0.0176
Finger length	P	0.0031	0.0267	0.0159	0.0441	0.0281	**0.0946**	0.0162	0.0400	0.0259	0.0199
	G	-0.0042	-0.0179	-0.0096	-0.0330	-0.0218	**-0.0528**	-0.0148	-0.0264	-0.0162	-0.0119
Ear weight per plant	P	0.0043	0.0265	0.0204	0.0191	0.0196	0.0164	**0.0959**	0.0327	0.0020	0.0303
	G	0.0081	0.0195	0.0178	0.0281	0.0197	0.0161	**0.0575**	0.0244	0.0013	0.0240
1000-seed weight	P	0.0286	0.0361	-0.0046	0.0918	0.1090	0.1043	0.0841	**0.2465**	-0.0235	0.0151
	G	0.0364	0.0370	-0.0019	0.1196	0.1497	0.1246	0.1057	**0.2496**	-0.0249	0.0157
Seed protein content	P	0.0322	-0.0624	-0.0361	-0.0410	-0.0223	-0.0489	-0.0037	0.0170	**-0.1786**	-0.0371
	G	0.0539	-0.0798	-0.0496	-0.0616	-0.0357	-0.0692	-0.0052	0.0225	**-0.2256**	-0.0472
Seed calcium	P	-0.0066	-0.0094	-0.0131	-0.0138	-0.0085-	-0.0101	-0.0152	-0.0029	-0.0100	**-0.0481**
content	G	-0.0231	-0.0223	-0.0332	-0.0397	0.0241	-0.0252	-0.0465	-0.0070	-0.0233	**-0.1114**
Seed yield per plant	P	0.0705	0.0135	-0.0007	0.5464**	0.4391**	0.3697**	0.2612**	0.5431**	-0.0834	0.0887
	G	0.2613**	0.0280	-0.0066	0.8257**	0.7689**	0.5266**	0.4771**	0.7371**	-0.1022	0.1250

* Significant at 1% level
** Significant at 5% level
Diagonal values indicate direct effects
Residual effect at genotypic level = 0.2037

P: at phenotypic level
G: at genotypic level

et al. (2005) for productive tillers per plant and 1000-seed weight, Bedis *et al.* (2006) for fingers per ear and finger length and Muduli *et al.* (2012) for ear weight per plant.

Among the yield contributing traits, productive tillers per plant had positive and significant correlations with fingers per ear, finger length, ear weight per plant, 1000-seed weight, seed calcium content and seed protein content at both genotypic and phenotypic levels. Similar results were also reported by Ravindran *et al*. (1996) for finger length, Haider and Mahto (1995) for ear weight and Harikrishna *et al.* (2005) and Sarala *et al.* (2008) for seed calcium content and seed protein content.

Similarly, fingers per ear had positive significant association with 1000-seed weight, finger length, ear weight per plant and seed calcium content at both genotypic and phenotypic levels. Similar findings were also observed by Sumathi *et al.* (2006) for 1000-seed weight, Bedis *et al.* (2006) for finger length and Muduli *et al.* (2012) for ear weight per plant. Further, finger length also showed positive significant association with 1000-seed weight, seed protein content and seed calcium content at both genotypic and phenotypic levels These results were in agreement with the findings of Nagaraja *et al.* (2010) for seed calcium content and ear weight per plant also had significant positive association with 1000-seed weight and seed calcium content at both genotypic and phenotypic levels. Similar findings were also reported by Harikrishna *et al.* (2005) and Sarala *et al.* (2008).

The estimates of correlation coefficients mostly indicated the interrelationship of different characters but do not furnish information on cause and effect. Under such a situation, path analysis helps the breeder in identifying the ideal index of selection. The path coefficients based on correlation coefficients were estimated (Table.2) and found that maximum direct effect on seed yield per plant was exerted by productive tillers per plant at both phenotypic and genotypic levels (0.4158 & 0.8162). This is in agreement with the findings of Reddy *et al*. (1994). This indicates the importance of productive tillers per plant in selecting the high yielding genotypes.

Other characters *viz.,* 1000-seed weight (0.2465 & 0.2496), fingers per ear (0.1634 & 0.0813) and ear weight per plant (0.0959 & 0.0575) also exhibited positive direct effects on seed yield per plant at both genotypic and phenotypic levels. Similar results were also observed by Reddy *et al.* (1994) for fingers per ear, Bendale *et al*. (2002) for ear weight per plant and Reddy *et al.* (1994) for 1000 seed weight.

While the characters plant height, days to 50% flowering, days to maturity, finger length, seed protein content and seed calcium content which are having negative direct effect on seed yield per plant at either or both the levels had indirect contributions *via* productive tillers per plant, fingers per ear and ear weight per plant in common (Table.2). Considering the nature and magnitude of character associations and their direct and indirect effects, it can be inferred that productive tillers per plant, 1000-seed weight, fingers per ear and ear weight per plant could serve as important traits in selecting high yielding genotypes in finger millet.

Further, the residual effect at genotypic level is 0.2037 indicating that the characters included in present investigation are contributing around 80 per cent of variability pertaining to the dependent variable *i.e.*, seed yield per plant. Only twenty per cent of contribution is from the few other characters which were not included in present study.

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