Int.J.Curr.Microbiol.App.Sci (2019) *8*(1): 1020-1027

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 01 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.801.111

Correlation and Path Analysis for Different Characteristics in Germplasm of Finger Millet (*Eleusine coracana* (L.) Gaertn.)

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Keywords

Correlation coefficient, Path analysis, Germplasms, Finger millet (*Eleusine coracana (L.) Gaertn.*)

Article Info

Accepted:
10 December 2018
Available Online:
10 January 2019

A B S T R A C T

The present investigation entitled "Correlation and Path Analysis for Different Characteristics in Germplasm of Finger Millet (*Eleusine coracana* (L.) Gaertn.)" was undertaken during Kharif 2017. The experiment was carried out in Randomized block Design (RBD) with three replications to derive Correlation coefficient and Direct and Indirect effects in 40 germplasm of Finger millet. In 40 genotypes it has been revealed that, number of tillers per plant, number of productive tillers per plant, main earhead length, number of fingers per earhead were good indicators of grain yield per plant and can be used for making direct selection for yield. The grain yield per plant was positively and significantly correlated with number of tillers per plant, number of productive tillers per plant, main earhead length, number of fingers per plant. The high magnitude of direct effect of number of tillers per plant, number of productive tillers per plant, main earhead length, number of fingers per earhead along with highly significant correlation in the desirable direction towards grain yield per plant indicated the true and perfect relationship between grain yield and these characters suggesting direct selection based on these character would help in selecting the high yielding genotypes in finger millet.

Introduction

Millet is a collective term referring to a number of small seeded annuals grasses that are cultivated as grain crops, primarily on marginal lands in dry areas in temperate, subtropical and tropical regions. Finger millet, (*Eleusine coracana*), is also known as African millet, ragi, nachani, nagali. Finger millet (*Eleusine coracana* (L.) Gaertn.), is one among highly utilized belong to family Poaceae and it ranks 4th in the importance of world. Finger millet is originated from Ethiopia. It is allopolyploid with chromosome number 2n=4x=36 and evolved from a cross between two diploid species *Eleusine indica* (AA) and *Eleusine floccifolia* or *Eleusine tristachya* (BB) as genome contributors (Hiremat and Salimath, 1992). Finger millet is mostly self pollinating with some amount of cross pollination (1%) mediated by wind (Jansen and Ong, 1996, Purseglove, 1972). It is important staple food in parts of eastern and Central Africa and India. Finger millet is very

adaptable to a wide range of environmental and climatic conditions, thrives at higher elevations than most other tropical cereals and tolerates salinity better than moist cereals. It is important cereal in Karnataka. It is intensively grown in Karnataka, Tamil Nadu, Andhra Pradesh, Orissa, Bihar, Gujarat, Maharashtra and in the hilly regions of Uttar Pradesh, Himachal Pradesh with a total area of 2.5 million hectares and 2.2 million tones of production.

Correlation studies provide knowledge of association among different characters and grain yield. The study of association among various traits is useful for breeders in selecting genotypes possessing groups of desired traits. The correlation coefficients become insufficient for using yield components as selection criteria to improve grain yields. It is reasonable to know whether any yield components has a direct or indirect effect on grain yield, so that selection studies can be carried out successfully.

Correlated response: Two characters say x and y, are correlated. A change in the mean of x through selection will cause an associated change in the mean of y also. This change in y brought about through indirect selection on an associated character x is known as correlated response (Singh and Chaudhary, 1977).

The path coefficient analysis provides a more realistic picture of the relationship as it considers direct as well as indirect effects of the variables by partitioning the correlation coefficients.

Correlation and path analysis estimates between yield and other characters are useful in selecting desired plant type in designing an effective breeding programme. When change in one variable causes the change on other variable, the variables are said to be correlated. Keeping the above facts a view, the present investigation entitled, "Correlation and Path Analysis for Different Characteristics in Germplasm of Finger Millet (*Eleusine coracana* (L.) Gaertn.)" was proposed to gather information on the following objectives:

To better insight into the cause and effect relationship between pairs of characters, study of correlation in conjunction with path analysis is essential.

Materials and Methods

The experimental materials consisting forty germplasm of finger millet collected from Nashik, Dhule, Ahmednagar, Satara Pune, Jalgaon and Nandurbar districts of Maharashtra. The experiment was laid out in RBD with three replications at Department of Botany, College of Agriculture, Dhule (M.S.) during Kharif 2017. By adopting a spacing of 22.5 cm between rows and 10 cm between plants respectively, at recommended package of practices were followed to raise good and healthy crop stand. Data were collected on eleven yield and yield contributing characters viz., days to 50% flowering, days to maturity, plant height (cm), number of tillers per plant, number of productive tillers per plant, main eahead length (cm), number of fingers per earhead, 100 ml volume weight, grain yield per plant (g) and qualitative characters viz., grain iron content (mg/100 g), grain calcium content (mg/100 g).

The mean of five plants was subjected to statistical analysis. The data for different characters were statistically analyzed for significance by using analysis of variance technique described by Panse and Sukhatme (1985).The adapted design was Randomized Block Design (RBD) with three replications. The significance of mean sum of square for each character was tested against the corresponding error degrees of freedom using

"F" Test (Fisher and Yates, 1967). Correlation between eleven characters was estimated according to the method given by Singh and Chaudhary (1977). Direct and indirect effects were estimated as described by Dewey and Lu (1959). Statistical analysis was done by using WINDOSTAT program.

Results and Discussion

Analysis of variance revealed significant differences among genotypes for all the characters (Table 1).

Analysis of variance for eleven characters indicated that the genotypes used in the present studies were significantly different. The correlation coefficients at both genotypic and phenotypic levels estimated between grain yields per plant with all other characters are presented in Table 2 and 3 respectively. In the present investigation, the genotypic correlation coefficients were higher than the phenotypic correlation coefficients as observed by Johnson *et al.,* (1955). This might have occurred due to genes governing two traits were similar and the environmental conditions pertaining to the expression of these traits might have small and similar effects.

Grain yield exhibited highly significant positive correlation with all other characters except plant height, 100 ml volume weight, grain calcium content suggesting dependency of yield on these characters (Table 2 and 3). The highest association of yield was with days to 50 per cent flowering (0.847) followed by days to maturity (0.831), number of productive tillers per plant (0.831), number of tillers per plant (0.796), main earhead length (0.677), number of fingers per earhead (0.468). While grain yield per plant showed non-significant positive genotypic correlation with grain iron content (0.106). But, it showed non-significant negative genotypic correlation with 100 ml volume weight (-0.172), grain calcium content (-0.130) and plant height (-0.041). These results are in accordance with the findings of Rao (1992), Ramakrishna *et al.,* (1996), Gowda (1996), Ramakrishna *et al.,* (1996), Mahto *et al.,* (2000), Chaudhari and Bedis *et al.,* (2006) and Gowda *et al.,* (2008), Ganapathya *et al.,* (2011).

Table.1 Analysis of variance for different characters in finger millet

Sr. No	Characters	Mean sum of square		
		Replication	Genotype	Error
1	Days to 50% flowering	33.908	279.59**	16.429
2	Days to maturity	33.033	393.21**	35.272
3	Plant height (cm)	41.308	415.080**	45.445
4	No. of tillers / plant	0.582	7.679**	0.308
5	No. of productive tillers / plant	0.410	6.308**	0.210
6	Main earhead length (cm)	0.290	11.546**	0.272
7	No. of fingers / earhead	0.614	6.986**	0.374
8	100 ml volume weight (gm)	16.808	662.402**	14.859
9	Grain yield / plant (gm)	8.258	210.99**	4.053
10	Grain iron content (mg/100 gm)	0.069	19.561**	0.069
11	Grain calcium content (mg/100 gm)	1210.40	11756.44**	554.75

*, ** Indicates significance at 5% and 1% level, respectively

Table.2 Genotypic correlation coefficient for eleven characters in finger millet

	Characters	1	2	3	4	5	6	7	8	9	10	11
1.	Days to 50 per cent flowering	1.000	0.992**	0.055	0.732**	0.774**	0.592**	0.442**	-0.124	-0.055	-0.201*	0.847**
2.	Days to maturity		1.000	0.084	0.749**	0.795**	0.577**	0.386**	-0.202*	-0.183*	-0.164	0.831**
3.	Plant height			1.000	0.112	0.112	0.127	-0.297**	-0.240**	0.199*	0.283**	-0.041
4.	No. of tillers /plant				1.000	0.998**	0.630**	0.295**	-0.252**	0.224**	-0.027	0.796**
5.	No. of productive tillers/plant					1.000	0.669**	0.310**	-0.222*	0.213**	-0.033	0.831**
6.	Main earhead length						1.000	0.030	-0.164	0.169	-0.114	0.677**
7.	No. of fingers /earhead							1.000	-0.147	-0.061	-0.150	0.468**
8.	100 ml volume weight								1.000	0.111	0.062	-0.172
9.	Grain iron content									1.000	0.425**	0.106
10.	Grain calcium content										1.000	-0.130
11.	Grain yield per plant											1.000

*, ** Indicates significance at 5% and 1% level, respectively

Table.3 Phenotypic correlation for eleven characters in finger millet

	Characters	1	2	3	4	5	6	7	8	9	10	11
1	Days to 50 per cent flowering	1.000	0.803**	0.027	0.625**	0.675**	0.513**	0.384**	-0.130	-0.058	-166	0.776**
2	Days to maturity		1.000	0.082	0.593**	0.629**	0.531**	0.276**	-0.194*	-0.154	-0.155	0.710**
3	Plant height			1.000	0.085	0.088	0.116	-0.226*	-0.217*	0.186*	0.221*	-0.016
4	No. of tillers /plant				1.000	0.917**	0.586**	0.261**	-0.236**	0.208*	-0.040	0.704**
5	No. of productive tillers/plant					1.000	0.593**	0.76**	-0.200*	0.198*	-0.029	0.759**
6	Main earhead length						1.000	0.020	-0.165	0.168	-0.114	0.629**
7	No. of fingers /earhead							1.000	-0.129	-0.052	-0.125	0.410**
8	100 ml volume weight								1.000	0.101	0.074	-0.165
9	Grain iron content									1.000	0.397**	0.099
10	Grain calcium content										1.000	-0.108
11	Grain yield per plant											1.000

Table.4 Genotypic path co-efficient for eleven characters in finger millet

	Characters	1	2	3	4	5	6	7	8	9	10	11
1	Days to 50 per cent flowering	0.675	0.670	0.037	0.494	0.523	0.400	0.298	-0.084	-0.037	-0.136	0.847**
2	Days to maturity	-0.200	-0.201	-0.017	-0.151	-0.160	-0.116	-0.077	0.040	0.037	0.033	0.831**
3	Plant height	-0.005	-0.008	-0.102	-0.011	-0.011	-0.013	0.030	0.024	-0.020	-0.029	-0.041
4	No. of tillers / plant	0.479	0.491	0.073	0.655	0.658	0.413	0.193	-0.165	0.147	-0.018	0.796**
5	No. of productive tillers / plant	-0.310	-0.318	-0.045	-0.4024	-0.400	-0.268	-0.124	0.089	-0.085	0.013	0.831**
6	Main earhead length	0.153	0.149	0.033	0.163	0.173	0.258	0.007	-0.042	0.043	-0.029	0.677**
7	No. of fingers / earhead	0.064	0.056	-0.043	0.043	0.045	0.004	0.146	-0.021	-0.009	-0.022	0.468**
8	100 ml volume weight	0.002	0.003	0.004	0.004	0.003	0.002	0.002	-0.017	-0.002	-0.001	-0.172
9	Grain iron content	-0.0005	-0.001	0.001	0.002	0.002	0.001	-0.0006	0.001	0.009	0.003	0.106
10	Grain calcium content	-0.011	-0.009	0.015	-0.001	-0.001	-0.006	-0.008	0.003	0.023	0.055	-0.130

Residual effect = (0.4022) Bold values indicated direct effect

*, ** Indicates significance at 5% and 1% level, respectively

Table.5 Phenotypic path co-efficient for eleven characters in finger millet

	Characters	1	2	3	4	5	6	7	8	9	10	11
1	Days to 50 per cent flowering	**0.297**	0.239	0.008	0.186	0.201	0.153	0.114	-0.038	-0.017	-0.049	0.776**
2	Days to maturity	0.119	**0.148**	0.012	0.088	0.093	0.078	0.040	-0.028	-0.023	-0.023	0.710**
3	Plant height	-0.001	-0.005	**-0.066**	-0.005	-0.005	-0.007	0.015	0.014	-0.012	-0.014	-0.016
4	No. of tillers / plant	-0.036	-0.034	-0.004	**-0.057**	-0.052	-0.033	-0.015	0.013	-0.012	0.002	0.704**
5	No. of productive tillers / plant	0.221	0.206	0.029	0.300	**0.327**	0.194	0.090	-0.065	0.064	-0.009	0.759**
6	Main earhead length	0.117	0.121	0.026	0.134	0.136	**0.229**	0.004	-0.037	0.038	-0.026	0.629**
7	No. of fingers / earhead	0.062	0.045	-0.037	0.042	0.045	0.003	**0.163**	-0.021	-0.008	-0.020	0.410**
8	100 ml volume weight	0.001	0.001	0.001	0.002	0.001	0.001	0.001	**-0.008**	-0.0009	0.0006	-0.165
9	Grain iron content	-0.003	-0.010	0.012	0.014	0.013	0.011	-0.003	0.006	**0.067**	0.026	0.099
10	Grain calcium content	-0.001	-0.001	0.001	-0.003	-0.002	-0.0008	-0.0009	0.0005	0.002	**0.006**	-0.0007

Residual effect = (0.4854) Bold values indicated direct effect

*, ** Indicates significance at 5% and 1% level, respectively

The path coefficients at both genotypic and phenotypic levels estimated between grain yield per plant and yield contributing characters and qualitative characters were carried out by using correlation coefficient.

The results obtained are presented in Table 4 and 5, respectively. The characters which emerged as the major component of grain yield per plant in path coefficient analysis (Table 4 and 5) was exerted by days to 50% flowering followed by number of tillers per plant, main earhead length and number of fingers per earhead which had highest direct effects on grain yield per plant at genotypic level. At phenotypic level number of productive tillers per plant recorded maximum direct effect on grain yield per plant. This is in accordance with the findings of Anuradha *et al.,* (2013), Kumar (2014), Jyothsna *et al.,* (2016).

In general, correlation and path analysis carried concluded that the number of tillers per plant, number of productive tillers per plant, main earhead length, number of fingers per ear head influenced the grain yield more than any of the other characters. Hence, it would be worthwhile to lay more emphasis on these characters in selection programme to improve the grain yield in finger millet.

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How to cite this article:

Sneha R. Sapkal, V.V. Bhavsar, K.K. Barhate and Sarika N. Kohakade. 2019. Correlation and Path Analysis for Different Characteristics in Germplasm of Finger Millet (*Eleusine coracana* (L.) Gaertn.). *Int.J.Curr.Microbiol.App.Sci.* 8(01): 1020-1027.
doi: https://doi.org/10.20546/ijcmas.2019.801.111