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Correlation and Path Analysis for Grain Yield and it Components in Pearl Millet [*Pennisetum glaucum*(L). R.Br.]

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ABSTRACT
The study was conducted to determine the correlation and path coefficients among the yield and yield component characters in 13 parental lines (5 lines and 8 testers) and their 40 hybrids of pearl millet. Significant genotypic correlations were observed for panicle length, productive tillers per plant, panicle diameter, fodder yield per plot and plant height with grain yield per plant. The path coefficient analysis at genotypic level revealed that the characters viz., fodder yield per plot had exhibited largest direct effect on grain yield per plant followed by panicle length, 1000 grain weight and number of productive tillers per plant. Based on correlations and path analysis, the main yield contributing characters in pearl millet are number of productive tillers per plant, panicle length, 1000 grain weight and fodder yield per plot.
Key words : *Correlation, Grain yield, Hybrids, Parental lines, Path analysis, Pearl millet.*

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INTRODUCTION

Pearl millet [*Pennisetum glaucum* (L.) R. Br.] an important coarse grain drought tolerant warmseason cereal is commonly known as bajra in different parts of the world. It is a highly cross-pollinated diploid (2x=14) annual C4 crop with protogynous flowering and wind-borne pollination mechanism, amenable for development of heterozygous populations, which can be utilized for the production of high grain yielding hybrids. It is a originated in western Africa. Pearl millet provides nutritionally superior and staple food for millions of people.

Knowledge of the association between yield and its component characters and among the component characters themselves can improve the efficiency of selection in plant breeding. The correlation studies alone are often misleading and the actual dependence of grain yield on the correlated yield component characters needs confirmation, which can easily be untangled and unravelled by path coefficient analysis. The path coefficient analysis is simply a standardized partial regression coefficient which measures the direct influence of one variable upon the other and permits the separation of correlation coefficients into components of direct and indirect effects. The present research was undertaken to study the correlations and path analysis in different parental lines and hybrids of pearl millet to develop a criterion for selection that could be effectively used for selecting the desirable genotypes or lines with high yield potential in future.

MATERIALS AND METHODS

Five lines were crossed with eight testers in Line x Tester design. Subsequently, the resulting 40 F_1 crosses along with parents (lines and testers) and two standard checks were evaluated. Each entry was sown in three rows of five meters length with a spacing of 45 cm between rows and 15 cm between the plants in a Randomized Block Design (RBD), replicated thrice. The data were recorded on nine quantitative characters *viz.,* days to 50 per cent flowering, days to maturity, plant height, number of productive tillers per plant, panicle length, panicle diameter, 1000 grain weight, grain yield per plant and fodder yield per plot.

RESULTS AND DISCUSSIONS

Grain yield is a complex character and is dependent on several contributing traits. Hence, character association was studied in the present investigation to assess the relationships among yield and its components for enhancing the usefulness of selection. In general, genotypic correlations were found to be higher than phenotypic correlation, which indicates that though there is strong influence of environment and considering the importance of phenotypic correlation. Grain yield per plant exhibited significant positive association with 1000 grain weight followed by panicle length, productive tillers per plant, panicle diameter, fodder yield per plot and plant height. These results are similar to the earlier studies reported in pearl millet by several workers on different traits i.e., for the association of grain yield with 1000 grain weight (Unnikrishnan *et al*. 2004), panicle length (Om Vir Singh and Singh 2016), productive tillers per plant (Kale *et al*. 2011), panicle diameter (Omar Abdalla Bakhit and El Hag Hassan Abu Elgasim 2015), fodder yield per plot (Bhuri Singh *et al.* 2015) and plant height (Shashikant *et al*. 2012). Negative association with days to maturity. Similar observations were also reported for days to maturity by (Mukesh Sankar *et al*. 2013).

The path coefficient analysis allows separation of the direct effect and their indirect effects through other attributes by partitioning the correlation (Wright, 1921). The path coefficient analysis at genotypic level revealed that characters, fodder yield per plot (0.5200) exhibited highest direct effect on grain yield followed by panicle length (0.4674), 1000 grain weight (0.3719), number of productive tillers per plant (0.3527). The high direct effect of number of productive tillers per plant, panicle length,1000 grain weight and fodder yield per plot appeared to be the main factors for their strong association with grain yield per plant (Rakesh *et al.* 2015). Further, days to maturity (Salunke *et al.* (2006), days 50 per cent flowering (Mukesh Sankar *et al.* (2013), panicle diameter and plant height (Patil and Jadeja (2005) recorded negative direct effect on grain yield in the present investigation. The residual effect was 0.8429 for phenotypic and -0.0378 for genotypic path coefficient analysis. As residual effect is low, it indicates that all the characters studied contributed for grain yield.

CONCLUSION

Based on correlations and path analysis, the main yield contributing characters in pearl millet are number of productive tillers per plant, panicle length, 1000 grain weight and fodder yield per plot.

Table 1. Phenotypic (p) and genotypic (G) correlation coeeficient analysis of grain and its component characters in pearl millet

Character		Days to 50% flowering	Days to maturity	Plant height (cm)	No. of productive tillers per plant	Panicle length (cm)	Panicle diameter (cm)	1000 grain weight (g)	Fodder yield (kg/ plot)	Grain yield per plant (g)
Days to 50% flowering	P	1.0000	0.8916**	0.0343	-0.255**	0.0177	0.0052	-0.0391	0.12277	0.0586
	G	1.0000	0.8655**	0.0490	0.0148	0.0307	0.0534	-0.149	0.2129	0.0586
Days to maturity	P		1.0000	-0.0163	-0.0309	-0.0397	-0.0159	-0.0547	0.0083	0.0649
	G		1.0000	-0.0148	0.0320	-0.0545	0.0355	-0.0069	0.0461	-0.0287
Plant height (cm)	P			1.0000	0.0895	0.7050**	0.5436**	0.4597**	0.6677**	0.3433**
	G			1.0000	0.1327	0.7409**	0.7253**	0.6148**	0.7948**	0.5889**
No. of productive tillers per plant	P				1.0000	0.3402**	0.2354**	0.2729**	0.0278	0.3440**
	G				1.0000	0.4345**	0.4327**	0.5197**	0.0975	0.7280**
Panicle length (cm)	P					1.0000	0.5760**	0.4998**	0.4373**	0.4834**
	G					1.0000	0.7817**	0.7146**	0.5640**	0.8412**
Panicle diameter (cm)	P						1.0000	0.3773**	0.3293**	0.3373**
	G						1.0000	0.6990**	0.4996**	0.6964**
1000 grain weight (g)	P							1.0000	0.3520**	0.3288**
	G							1.0000	0.5065**	0.8709**
Fodder yield (kg/ plot)	P								1.0000	0.2149
	G								1.0000	0.6480**

P represents Phenotypic correlation coefficient.

G represents Genotypic correlation coefficient.

* and ** significance at 5 and 1 per cent level respectively.

Table 2. Phenotypic (p) and genotypic (G) path coefficient analysis of grain and its component characters in pearl millet

Character		Days to 50% flowering	Days to maturity	Plant height (cm)	No. of productive tillers per plant	Panicle length (cm)	Panicle diameter (cm)	1000 grain weight (g)	Fodder yield (kg/ plot	Correlation with grain yield per plant (g)
Days to 50% flowering	P	**-0.1068**	-0.0952	-0.0037	0.0027	-0.0019	-0.0006	0.0042	-0.0131	0.0586
	G	**-0.0338**	0.0293	-0.0017	-0.0005	-0.0010	-0.0018	0.0005	-0.0072	0.0586
Days to maturity	P	0.1647	**0.1847**	-0.0030	-0.0057	-0.0073	-0.0029	-0.0101	0.0015	0.0649
	G	-0.0101	**-0.0117**	0.0002	-0.0004	0.0006	-0.0004	0.0001	-0.0005	-0.0287
Plant height (cm)	P	0.0007	-0.0003	**0.0208**	0.0019	0.0146	0.0113	0.0095	0.0139	0.3433**
	G	-0.0205	0.0062	**0.4190**	-0.0556	-0.3104	-0.3039	-0.2576	-0.3330	0.5889**
No. of productive tillers per plant	P	-0.0050	-0.0061	0.0176	**0.1968**	0.0669	0.0463	0.0537	0.0055	0.3440**
	G	0.0052	0.0113	0.0468	**0.3527**	0.1532	0.1526	0.1833	0.0344	0.7280**
Panicle length (cm)	P	0.0059	-0.0132	0.2342	0.1130	**0.3322**	0.1913	0.1660	0.1453	0.4834**
	G	0.0143	-0.0255	0.3463	0.2031	**0.4674**	0.3654	0.3340	0.2636	0.8412**
Panicle diameter (cm)	P	0.0003	-0.0009	0.0311	0.0135	0.0329	**0.0572**	0.0216	0.0188	0.3373**
	G	-0.0019	-0.0013	-0.0256	-0.0153	-0.0276	**-0.0353**	-0.0247	-0.0736	0.6964**
1000 grain weight (g)	P	-0.0031	0.0043	0.0361	0.0214	0.0392	0.0296	**0.0785**	0.0276	0.3288**
	G	-0.0056	-0.0026	0.2286	0.1932	0.2657	0.2599	**0.3719**	0.1884	0.8709**
Fodder yield (kg/ plot)	P	0.0019	0.0001	0.0103	0.0004	0.0067	0.0051	0.0054	**0.0154**	0.2149
	G	0.1107	0.0240	0.4133	0.0507	0.2933	0.2598	0.2634	**0.5200**	0.6480**

Phenotypic residual effect = 0.8429 Genotypic residual effect = -0.0378

P represents Phenotypic correlation coefficient;

G represents Genotypic correlation coefficient.

* and ** significance at 5 and 1 per cent level respectively

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