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Correlation and path coefficient analysis for grain yield and its components in pearl millet [*pennisetumglaucum* (l.) R. Br.]

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ABSTRACT

An experiment was conducted to study the correlation and path analysis for eleven characters of 60 inbred lines in pearl millet during *rabi*, 2015-16. Grain yield per plant was found to be significantly and positively correlated with plant height, ear length, ear diameter, productive tillers per plant, head yield per plant, fresh stover yield per plant, dry matter yield per plant, 1000 grain weight and grain harvest index while days to 50 per cent flowering recorded negative and significant aossiation with yield. Path analysis at genotypic level revealed that head yield per plant had exhibited the maximum positive direct effect followed by grain harvest index, fresh stover yield per plant, 1000 grain weight, productive tillers per plant, ear diameter, days to 50 per cent flowering and ear length.

Key words: *Correlation, Grain yield per plant, Path analysis, Pearl millet.*

MATERIAL AND METHODS

The material used in the experiment comprised of 60 inbred lines of Pearl millet and evaluated during *rabi*, 2015 at Agricultural college farm, Naira, ANGRAU, Andhra Pradesh in a Randomized block design with two replications.The planting was done on ridges which were 45 cm apart. Each entry was planted in two rows of 2 m length with a spacing 15 cm between plant to plant, at a uniform depth. Standard agronomic management practices were followedthroughout the entire growing period as required.The data on 11 quantitative traits were recorded, out of 11 traits, observations on days to 50% flowering, productive tillers per plant, head yield per plant (g plant^{-1}), grain yield per plant (g plant^{-1}), fresh stover yield per plant (g plant^{-1}), dry matter yield per plant (g plant^{-1}), 1000-grain weight (g)and grain harvest index (%) were recorded on plot basis. The data on remaining quantitative traits *viz*., plant height, ear length and ear diameter were recorded on five randomly selected representative plants in a plot. Average values of these five plants were computed and mean values were used for statistical analysis. The data were subjected to statistical analysis using software Windostat Version 9.2. The phenotypic and genotypic correlation coefficients were worked out as per the method suggested by Johnson *et al*., (1955). Path analysis was carried out using the simple correlation coefficients to know the direct and indirect effects of the yield and components of yield as suggested by Wright (1921) and illustrated by Dewey and Lu (1959).

RESULTS AND DISCUSSION

Analysis of variance revealed significant differences for grain yield and its ten component traits. The genotypic correlations in general were higher than the phenotypic correlations, revealing strong inherent relationship among the characters studied which was presented in Table 1.Grain yield per plant was significantly and positively correlated with plant height, ear length, ear diameter, productive tillers per plant, head yield per plant, fresh stover yield per plant, dry matter yield per plant, 1000 grain weight and grain harvest index. Similar results were reported earlier in pearl millet for association of grain yield with plant height, ear length, ear diameter, fresh

Table 1.Phenotypic (P) and Genotypic (G) correlation coefficient analysis of yield and yield component characters in Pearl millet[*Pennisetumglaucum* (L.) R. Br.]

Character	Correlation	DFF	PH	EL	ED	Till	HYP	FSYP	DMYP	TGWT	GHI	GYP
DFF	P		-0.1333	0.0095	-0.2862**	-0.2549**	-0.3900**	0.0439	0.0491	-0.2943**	-0.4161**	**-0.3862****
	G		-0.1744*	0.0117	-0.2883**	-0.3168**	-0.4771**	0.0595	0.0560	-0.3132**	-0.5087**	**-0.4858****
PH	P			0.7760**	0.4812**	0.0114	0.4329**	0.4443**	0.2976**	0.2672**	0.0757	**0.4157****
	G			0.7942**	0.4966**	-0.0019	0.4407**	0.4695**	0.3026**	0.2727**	0.0782	**0.4269****
EL	P				0.3018**	-0.0795	0.3713**	0.3901**	0.2468**	0.1635	-0.0512	**0.3087****
	G				0.3086**	-0.0974	0.3834**	0.4176**	0.2557**	0.1765*	-0.0698	**0.3147****
ED	P					0.0365	0.4554**	0.2182*	0.2086*	0.4895**	0.1672	**0.4450****
	G					0.0223	0.4787**	0.2235*	0.2168*	0.4958**	0.1782*	**0.4719****
Till	P						0.4577**	0.2646**	0.3117**	0.1185	0.2293*	**0.5353****
	G						0.4276**	0.2330*	0.2980**	0.1423	0.2320**	**0.5116****
HYP	P							0.4214**	0.2937**	0.4533**	0.2586**	**0.8825****
	G							0.4287**	0.2872**	0.4905**	0.2646**	**0.8815****
FSYP	P								0.9167**	0.2681**	-0.2224*	**0.5130****
	G								0.9283**	0.2776**	-0.2066*	**0.5433****
DMYP	P									0.1804*	-0.2976**	**0.4145****
	G									0.1852*	-0.2891**	**0.4236****
TGWT	P										0.2180*	**0.4598****
	G										0.2475**	**0.5055****
GHI	P											**0.5005****
	G											**0.5056****

* Significant at 5 per cent level; ** Significant at 1 per cent level

DFF– Days to 50 per cent flowering; PH- Plant height (cm); EL- Ear length (cm); ED- Ear diameter (cm); Till- Productive tillers per plant; HYP- Head yield per plant (g/plant); GYP- Grain yield per plant (g/plant); FSYP- Fresh stover yield per plant (g/plant); DMYP- Dry matter yield per plant (g/plant); TGWT- 1000 grain weight (g) and GHI- Grain harvest index (%).

P: at Phenotypic level; G: at Genotypic level

Table 2. Direct and indirect effects of different traits on grain yield per plant in pearl millet[*Pennisetumglaucum* (L.) R. Br.]

Character	Correlation	DFF	PH	EL	ED	Till	HYP	FSYP	DMYP	TGWT	GHI	GYP
DFF	**P**	**0.0477**	0.0040	0.0001	-0.0076	-0.0121	-0.2534	0.0045	0.0120	-0.0004	-0.1808	**-0.3862****
	G	**0.0166**	0.0130	0.0002	-0.0194	-0.0231	-0.2833	0.0176	0.0046	0.0029	-0.2149	**-0.4858****
PH	**P**	-0.0064	**-0.0299**	0.0063	0.0128	0.0005	0.2813	0.0452	0.0725	0.0004	0.0329	**0.4157****
	G	-0.0029	**-0.0748**	0.0149	0.0335	-0.0001	0.2617	0.1391	0.0250	-0.0026	0.0330	**0.4269****
EL	**P**	0.0005	-0.0232	**0.0081**	0.0080	-0.0038	0.2413	0.0397	0.0601	0.0002	-0.0223	**0.3087****
	G	0.0002	-0.0594	**0.0188**	0.0208	-0.0071	0.2277	0.1237	0.0211	-0.0017	-0.0295	**0.3147****
ED	**P**	-0.0136	-0.0144	0.0024	**0.0266**	0.0017	0.2959	0.0222	0.0508	0.0007	0.0727	**0.4450****
	G	-0.0048	-0.0371	0.0058	**0.0674**	0.0016	0.2843	0.0662	0.0179	-0.0046	0.0753	**0.4719****
Till	**P**	-0.0122	-0.0003	-0.0006	0.0010	**0.0474**	0.2974	0.0269	0.0759	0.0002	0.0997	**0.5353****
	G	-0.0052	0.0001	-0.0018	0.0015	**0.0728**	0.2540	0.0690	0.0246	-0.0013	0.0980	**0.5116****
HYP	**P**	-0.0186	-0.0129	0.0030	0.0121	0.0217	**0.6498**	0.0429	0.0716	0.0006	0.1123	**0.8825****
	G	-0.0079	-0.0330	0.0072	0.0322	0.0312	**0.5939**	0.1270	0.0237	-0.0046	0.1118	**0.8815****
FSYP	**P**	0.0021	-0.0133	0.0032	0.0058	0.0125	0.2738	**0.1018**	0.2233	0.0004	-0.0966	**0.5130****
	G	0.0010	-0.0351	0.0079	0.0151	0.0170	0.2546	**0.2962**	0.0766	-0.0026	-0.0873	**0.5433****
DMYP	**P**	0.0023	-0.0089	0.0020	0.0056	0.0148	0.1909	0.0933	**0.2436**	0.0002	-0.1293	**0.4145****
	G	0.0009	-0.0226	0.0048	0.0146	0.0217	0.1706	0.2750	**0.0825**	-0.0017	-0.1221	**0.4236****
TGWT	**P**	-0.0140	-0.0080	0.0013	0.0130	0.0056	0.2946	0.0273	0.0440	**0.0013**	0.0947	**0.4598****
	G	-0.0052	-0.0204	0.0033	0.0334	0.0104	0.2913	0.0822	0.0153	**-0.0094**	0.1046	**0.5055****
GHI	**P**	-0.0198	-0.0023	-0.0004	0.0045	0.0109	0.1680	-0.0226	-0.0725	0.0003	**0.4345**	**0.5005****
	G	-0.0084	-0.0058	-0.0013	0.0120	0.0169	0.1571	-0.0612	-0.0239	-0.0023	**0.4225**	**0.5056****

* Significant at 5 per cent level; ** Significant at 1 per cent level

DFF– Days to 50 per cent flowering; PH- Plant height (cm); EL- Ear length (cm); ED- Ear diameter (cm); Till- Productive tillers per plant; HYP- Head yield per plant (g/plant); GYP- Grain yield per plant (g/plant); FSYP- Fresh stover yield per plant (g/plant); DMYP- Dry matter yield per plant (g/plant); TGWT- 1000 grain weight (g) and GHI- Grain harvest index (%).

P: at Phenotypic level; G: at Genotypic level

Diagonal values indicate direct effects

Residual effect at phenotypic level = 0.2153; Residual effect at genotypic level = 0.1916.

stover yield per plant (Pareek, 2002); productive tillers per plant (Abuali*et al*., 2012); head yield per plant (Ezeaku*et al*., 2015); 1000 grain weight (Sabiel*et al*., 2014); dry matter yield per plant and grain harvest index (Singh *et al*., 2014a). A significant negative association was observed between grain yield per plant and days to 50 per cent flowering (Abuali*et al*., 2012 and Ezeaku*et al*., 2015) which is useful to identify early and late maturing hybrids.

Path coefficient analysis allows separating direct and their indirect effects through other attributes by partitioning correlation, presented in Table 2. Path coefficient analysis revealed that the characters, days to 50 per cent flowering, ear length, ear diameter, productive tillers per plant, head yield per plant, fresh stover yield per plant, dry matter yield per plant and grain harvest index had positive direct effects towards grain yield per plant. Direct negative effects on grain yield were attributed by plant height both at phenotypic and genotypic level and 1000 grain weight at genotypic level. Similar results were reported by Singh *et al*. (2014b) for ear length, ear diameter, productive tillers per plant and fresh stover yield per plant.

Head yield per plant had exhibited the maximum positive direct effect followed by grain harvest index, fresh stover yield per plant, 1000 grain weight, productive tillers per plant, ear diameter, days to 50 per cent flowering and ear length. These findings are similar toSingh *et al*. (2014b) and (Pareek, 2002). Head yield per plant with highest direct effect on grain yield per plant also contributed positive indirect effects through ear length, ear diameter, productive tillers per plant, head yield per plant, fresh stover yield per plant, dry matter yield per plant and grain harvest index, which further resulted in highest correlation with grain yield. The residual effects permit precise explanation about the pattern of interaction of other possible components of yield. The phenotypic and genotypic residual effects recorded 0.2153 and 0.1916, respectively, indicates that all characters studied contribute for grain yield per plant.

It may be concluded that head yield per plant, grain harvest index, fresh stover yield per plant, dry matter yield per plant, productive tillers per plant, ear diameter and ear length are the most important characters to be considered for development of high grain yielding genotypes in pearl millet.

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