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Ravindra Kumar
M.Sc. Student, Department of Genetics and Plant Breeding, Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan, India

PC Gupta
Principal Scientist, Agricultural Research Station, Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan, India

Sanjay Kumar Sanadya
Ph.D., Student, Department of Genetics and Plant Breeding, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Himachal Pradesh, India

Anil Kumar
Ph.D., Student, Department of Genetics and Plant Breeding, Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan, India

Mukesh Kumar Yadav
M.Sc. Student, Department of Genetics and Plant Breeding, Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan, India

Devendra Chandel
M.Sc. Student, Department of Genetics and Plant Breeding, Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan, India

Corresponding Author:
Sanjay Kumar Sanadya
Ph.D., Student, Department of Genetics and Plant Breeding, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Himachal Pradesh, India

Estimation of correlation coefficient and path analysis in hybrids of pearl millet [*Pennisetum glaucum* (L.) R.Br.]

Ravindra Kumar, PC Gupta, Sanjay Kumar Sanadya, Anil Kumar, Mukesh Kumar Yadav and Devendra Chandel

Abstract
Correlations and path coefficient analysis were evaluated for twelve characters including seed yield in eighty seven F_1s with three checks (RHB-177, MPMH-17 and HHB-67 Improved) of pearl millet along with during *Kharif* 2017-18. The experiment was carried out in Randomized Block Design (RBD) with two replications. The result from character association indicated that seed yield per plant had significantly and positive correlation with harvest index, no. of effective tillers per, biological yield per plant, test weight and negatively correlated with days to 50% flowering and days to maturity at phenotypic level. These characters need due consideration during any selection programmes. Path coefficient analysis revealed that characters *viz*., Harvest index, biological yield per plant, test weight and no. of effective tillers per plant had direct positive effective on seed yield per plant. The residual effects were low at phenotypic level which indicated choices of traits in the study were able to explain the most effects on seed yield. Therefore these traits can be taken into consideration while exercising selection for seed yield in pearl millet.

Keywords: RBD, hybrid, pearl millet, correlation coefficient and path coefficient

Introduction
Pearl millet [*Pennisetum glaucum* (L.) R. Br.] Commonly known as "Bajra", bari, sajja, combo, ganti or kambam is a coarse cereal belongs to family Poaceae. It is a diploid species with chromosome number 2n=2x=14. Pearl millet is a highly cross-pollinated species because of the protogynous nature of its hermaphrodite flowers. It originated in West Africa and from there was introduced in India. Pearl millet is India's fourth important cereal crop after rice, wheat and sorghum. It is a good source of protein (5.80-20.90%), fat (4.10-6.40%), carbohydrate (59.80-78.20%) and also has good amount of minerals, particularly phosphorus and iron (2.80%). India is the largest producer of pearl millet with an annual production of 8.06 million tons from an area of 6.98 million hectare with productivity being 1154 kg/ha. Rajasthan occupies first position in area and production of pearl millet in India. In Rajasthan, it is cultivated on 4.04 million hectare area with the production of 3.53 million tonnes and productivity of 872 kg/ha (Anonymous 2015-16) [2]. Use of hybrids in pearl millet has saved a way of great success since the inception of idea using hybrids as commercial varieties, particularly in field-crops. In India attempts were made to produce pearl millet hybrids as early as 1951 (Rao *et al*. 1951) [9] and commercial exploitation of heterosis began after the availability of male sterile line Tift 23A from Georgia, USA (Burton, 1958) [4]. Correlation estimates between yield and other characters are useful in selecting desired plant characteristics for designing an effective breeding programme. Correlation coefficient measures the degree of association, and also the genetic or non-genetic relationship between two or more characters which forms the basis for selection. Path analysis simply splits the correlation coefficient into the measures of direct and indirect effect of a set of independent variables on the dependent variables (Searle 1961) [10].

Materials and Methods
The experimental material for the present investigation consisted of 87 hybrids with three checks of pearl millet [*Pennisetum glaucum* (L.) R.Br.] Which were obtained from AICRP on Pearl millet, ARS, Bikaner. The experiment was carried out in RBD with two replications during Kharif 2017. By adopting a spacing of 60 cm between rows and 15 cm between plants

respectively, all the recommended package of practices were followed to raise good and healthy crop stand. Data were collected on ten yield and yield contributing characters *viz*., days to 50 per cent flowering, days to maturity, plant height, number of effective tillers per plant, ear length, ear head diameter, 1000-Seed weight, harvest index, biological yield per plant and Seed yield per plant. Two characters namely days to 50 per cent flowering and days to maturity were recorded on whole plot basis whether remaining traits were recorded on the five plant basis for each trait. The phenotypic and genotypic correlation coefficients were computed from the phenotypic, genotypic and environmental variance and covariance according to Singh and Chaudhary (1976) and the significance of correlation coefficient was tested. The direct and indirect effects were estimated through path coefficient analysis as suggested by Wright (1921) [13] and elaborated by Dewey and Lu (1959) [5].

Results and Discussion

a) Correlation coefficient analysis

In general genotypic correlation coefficients were greater than their corresponding phenotypic correlation coefficients, indicating the preponderance of genetic variance in expression of characters as well as masking effect of environment in modifying the total expression of the genotypes. The correlation of seed yield per plant was positive and significant at phenotypic level with characters *viz*., harvest index, number of effective tillers per plant, biological yield per plant and test weight. These characters need due consideration during any selection programmes. Similar findings of positive and significant correlation had been reported by number of workers for seed yield per plant with number of effective tillers per plant by Izge *et al*. 2006 and Bikash *et al*. (2013) [6, 3]. Similar finding for seed yield per plant with test weight were reported by Abuali and Idris (2012). Bikash *et al*. (2013) [1, 3] noticed positive and significant correlation between seed yield per plant and harvest index. Positive and significant correlation of seed yield per plant with biological yield per plant was reported by Kumar *et al*. (2016) [7]. Nehra *et al*. (2017) [3] reported that seed yield was positive and significantly correlated with harvest index, effective tillers per plant and biological yield per plant. Days to 50 per cent flowering and days to maturity were negatively significant associated with seed yield per plant. Similar finding had been reported by Singh *et al*. (1999) [12]. Ear head length showed positive association with plant height and no. of effective tillers per plant. Similar findings of positive and significant correlation had been reported by Izge *et al*. (2006) and Abuali and Idris (2012) [6, 1]. Biological yield per plant was positive and significantly correlated with days to maturity, no. of effective tillers per plant, test weight and seed yield per plant. These results are in accordance with the earlier finding of Kumar *et al*. (2016) [7]. These results indicated that early days to 50% flowering, test weight, number of effective tillers per plant, biological yield and harvest index are the important yield determiners in arid region. The association of days to 50 flowering and days to maturity with seed yield was significant and negative which is desirable for the development of hybrids with high yield and early maturity.

b) Path coefficient analysis

In the present study, path coefficient analysis was computed at phenotypic level as well as genotypic level for all the characters. Path coefficient analysis was carried out by taking seed yield per plant as dependent variable to partition the correlation coefficient into direct and indirect effect in order to determine the contribution of different characters towards the seed yield per plant. At phenotypic level, highest positive direct effect on seed yield was observed for harvest index followed by biological yield per plant, plant height, days to 50 per cent flowering, test weight and no. of effective tillers per plant. These findings support the observations made by Bikash *et al*. (2013) [3]. While highest direct negative effect were recorded for ear head length followed by ear head diameter and days to maturity; similar findings were reported by Nehra *et al*. (2017) [8]. At genotypic level, highest direct positive effect on seed yield per plant were observed for harvest index followed by biological yield per plant, plant height, test weight and ear head diameter. While highest direct negative effect were recorded for ear head length followed by days to 50 per cent flowering and number of effective tillers per plant. Path analysis further revealed that direct effect of harvest index and biological yield per plant were of high magnitude. The high positive association of other characters with seed yield per plant was also due to high indirect effect through these characters. This indicated that seed yield was mainly a product of direct and indirect effects of harvest index and biological yield per plant. The residual effects were low at phenotypic level which indicated choices of traits in the study were able to explain the most effects on seed yield.

Table 1: Estimation of Phenotypic (P) and Genotypic (G) Correlation coefficient for ten characters in pearl millet

Characters		Days to 50% flowering	Days to Maturity	Plant height	No. of effective tillers per plant	Ear head length	Ear head diameter	Test weight	Harvest Index (%)	Biological yield per plant	Seed yield per plant
Days to 50% flowering	P	1.000	0.345**	0.125	-0.350**	-0.040	0.024	-0.198**	-0.261**	-0.134	-0.358**
	G	1.000	0.463	0.402	-0.406	0.044	-0.061	-0.261	-0.406	-0.048	-0.375
Days to maturity	P		1.000	-0.060	-0.133	-0.008	0.127	0.202**	-0.380**	0.245**	-0.218**
	G		1.000	-0.020	-0.240	-0.023	0.119	0.243	-0.567	0.472	-0.242
Plant height	P			1.000	0.237**	0.497**	-0.310**	-0.114	-0.059	0.107	0.074
	G			1.000	0.315	0.780	-0.390	-0.173	-0.096	0.126	0.090
No. of effective tillers/plant	P				1.000	0.181*	0.010	0.298**	0.239**	0.413**	0.622**
	G				1.000	0.178	-0.013	0.445	0.382	0.481	0.735
Ear head length	P					1.000	-0.103	-0.016	-0.059	0.039	-0.035
	G					1.000	-0.157	-0.015	-0.173	0.074	-0.088
Ear head diameter	P						1.000	0.218**	0.104	-0.030	0.043
	G						1.000	0.233	0.128	-0.018	0.051
Test weight	P							1.000	-0.045	0.385**	0.252**
	G							1.000	-0.058	0.530	0.280

Harvest index (%)	P								1.000	-0.421**	0.676**
	G								1.000	-0.230	0.795
Biological yield per plant	P									1.000	0.342**
	G									1.000	0.388
Seed yield per plant	P										1.000
	G										1.000

Table 2: Phenotypic (P) and Genotypic (G) path coefficient of various characters on seed yield per plant

Characters		Days to 50% flowering	Days to Maturity	Plant height	No. of effective tillers per plant	Ear head length	Ear head diameter	Test weight	Harvest Index (%)	Biological yield per plant	Correlation with Seed yield per plant
Days to 50% Flowering	P	0.0229	0.0079	0.0029	-0.0080	-0.0009	0.0006	-0.0045	-0.0060	-0.0031	-0.3584**
	G	-0.3856	-0.1786	-0.1554	0.1568	-0.0173	0.0236	0.1007	0.1569	0.0185	-0.3756
Days to maturity	P	-0.0068	-0.0198	0.0012	0.0026	0.0002	-0.0025	-0.0040	0.0076	-0.0049	-0.2187**
	G	0.0638	0.1377	-0.0028	-0.0331	-0.0032	0.0165	0.0335	-0.0781	0.0650	-0.2421
Plant height	P	0.0055	-0.0026	0.0440	0.0104	0.0219	-0.0136	-0.0050	-0.0026	0.0049	0.0744
	G	0.3215	-0.0160	0.7978	0.2518	0.6229	-0.3117	-0.1387	-0.0767	0.1010	0.0901
No. of effective tillers per plant	P	-0.0389	-0.0148	0.0264	0.0112	0.0202	0.0011	0.0331	0.0266	0.0459	0.6229**
	G	0.0557	0.0329	-0.0432	-0.1369	-0.0244	0.0018	-0.0609	-0.0524	-0.0659	0.7354
Ear head length	P	0.0021	0.0004	-0.0251	-0.0092	-0.0505	0.0052	0.0008	0.0030	-0.0020	-0.0353
	G	-0.0239	0.0123	-0.4162	-0.0952	-0.5331	0.0841	0.0084	0.0923	-0.0397	-0.0882
Ear head diameter	P	-0.0007	-0.0034	0.0083	-0.0003	0.0028	-0.0268	-0.0059	-0.0028	0.0008	0.0437
	G	-0.0064	0.0126	-0.0412	-0.0014	-0.0166	0.1055	0.0246	0.0136	-0.0019	0.0517
Test weight	P	-0.0027	0.0028	-0.0016	0.0041	-00002	0.0030	0.0137	-0.0006	0.0053	0.2527**
	G	-0.0341	0.0317	-0.0227	0.0581	-0.0021	0.0305	0.1306	-0.0077	0.0693	0.2803
Harvest index	P	-0.2465	-0.3594	-0.0562	0.2256	-0.0562	0.0983	-0.0429	0.9438	-0.3976	0.6767**
	G	-0.3454	-0.4815	-0.0816	0.3246	-0.1469	0.1093	-0.0500	0.8488	-0.1955	0.7959
Biological yield per plant	P	-0.0931	0.1703	0.0746	0.2865	0.0275	-0.0215	0.2673	-0.2922	0.6934	0.3426**
	G	-0.0210	0.2067	0.0554	0.2107	0.0326	-0.0079	0.2321	-0.1008	0.4378	0.3886

Conclusion

The information from correlation and path coefficient analysis in pearl millet will be helping in finding out the structural yield components that can be appropriately incorporated into an improved plant type. Being grown under marginal conditions, it requires a change in the plant type for wider adaptability. Considering the above results it becomes clear that direct selection can be done based on harvest index, biological yield per plant, plant height, days to 50 per cent flowering, test weight and no. of effective tillers per plant, which can help for the improvement of seed yield, in pearl millet.

References

1 Abuali AI, Idris AE. Character association and path analysis in pearl millet (*Pennisetum glaucum*). American Journal of Experimental Agriculture. 2012;2(3):370-381.
2 Anonymous. Area under fodder production in India. 2015-16. http://agropedia.iitk.ac.in/ content-area-under-fodder-production-India.
3 Bikash A, Yadav IS, Arya RK. Variability, correlation and path analysis in pearl millet. Journal of Plant Science Research. 2013;39(3):134-139.
4 Burton GW. Cytoplasmic male sterility in pearl millet. Agronomy Journal. 1958;50:230.
5 Dewey DR, Lu KH. A correlation and path coefficient analysis of components of erasted wheat grass production. Agronomy Journal. 1959;7:179-188.
6 Izge U, Kadams M, Gungula T. Studies on character association and path analysis of certain quantitative characters among parental line of pearl millet (*Pennisetum glaucum*) and their F^1 hybrids in a diallel cross. African Journal of Agricultural Research. 2006;1(5):194-198.
7 Kumar M, Gupta PC, Shekhawat HS. Correlation studies among pearl millet [*Pennisetum glaucum* (L.) R.Br.] hybrids. Electronic Journal of Plant Breeding. 2016;7(3):727-729.
8 Nehra M, Kumar M, Kaushik J, Vart D, Sharma RK, Punia MS. Genetic divergence, character association and path coefficient analysis for yield attributing traits in pearl millet [*Pennisetum Glaucum* (L.) R. Br] in breds. Chemical Science Review and Letters. 2017;6(21):538-543.
9 Rao PK, Nambiar AK, Madhava Menon, P. Maximization of production by cultivation of hybrid strain with special reference to cumbu (pearl millet). Madras Agricultural Journal. 1951;38:95-100.
10 Searle SR. Phenotypic, genotypic and environmental correlations. Biometrics. 1961;17:474-480.
11 Singh RK, Choudhary BD. Biometrical methods in quantitative genetic analysis. Kalyani Publishers. Ludhiana and Delhi. 1979.
12 Singh D, Nijhawan DC, Sagar P, Saxena KK. Character association in pearl millet for different traits. In Symp. On pearl millet improvement-past achievement and future priorities. CCS Harayana Agric. Univ. Hisar, 1999, 23.
13 Wright S. Correlation and causation. Journal of Agricultural Research. 1921;20:557-587.