



Studies on correlation and path coefficients analysis in barley (*Hordeum vulgare* L.)

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ABSTRACT

An experiment involving fifty genotypes/strains of barley was conducted during Rabi 2014 at Crop Research Farm, Nawabganj, of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur in a Randomized Block Design with three replications. Data were recorded and analyzed on the bases of following 11 characters viz, days to 50 % flowering, days to maturity, plant height, number of productive tillers per plant, length of spike, number of grains/spike, grain weight/spike, 1000-grain weight, biological yield, harvest index and grain yield per plant. Grain yield per plant had positive correlation with biological yield, number of productive tillers per plant, harvest index, number of grains per spike, days to maturity and plant height at the genotypic level. At phenotypic level grain yield per plant was positively and significantly associated with biological yield, number of productive tillers per plant, harvest index and number of grains per spike. Path coefficient analysis indicated that the highest positive direct effect on seed yield per plant was exerted by biological yield, number of productive tillers per plant, number of grains per spike, plant height, length of spike, days to maturity, harvest index.

Key words: Correlation coefficient, Path coefficient analysis

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INTRODUCTION

Pearlmillet (*Pennisetum glaucum*) is an important cereal crop of rainfed areas. It is efficient in utilization of soil moisture and has a greater level to heat tolerance. It thrives well on light textured and well drained soils. However, crop yields are very poor in rainfed condition perhaps because of non-adaptation of proper agronomic practices. Rainfed pearlmillet crop is seldom fertilized while it responds well to fertilizer application. Fertilization of crop in rainfed condition does not provide nutrients only but also enhances water use efficiency, controls soil erosion by promoting rapid and heavier crop growth, checks run-off and increases water holding capacity of soil. Intercropping of pulses in pearlmillet makes the system more productive through efficient utilization of natural resources viz. solar radiation, soil moisture, space, nutrients and other inputs applied. It helps in giving additional production and return per unit area and time. Soil moisture availability to the crop is main problem of rainfed agriculture, thus use of soil moisture conservation practices have been proved useful to take the proper advantage of other inputs applied. Keeping these points in view the present study was undertaken to find out the significance of intercropping, increasing fertility levels and moisture conservation practices in rainfed pearlmillet crop under central Uttar Pradesh condition.

MATERIALS AND METHODS

The present investigated materials of germplasm was carried out during Rabi season of 2013 -14 at Crop Research Farm Nawabganj, C S Azad University of Agriculture and Technology, Kanpur 208002. The experimental material which were studied comprised on 50(exotic and indigenous) germplasm lines of barley collected from Barley Breeder, section of Rabi Cereals of C.S. Azad University of Agriculture and Technology, Kanpur. These genotypes exhibited wide spectrum of variation for various agronomical and morphological characters. The experiment was laid out in Randomized Block Design (RBD) with three replications during Rabi 2013-14. Each plot consisted of two row of 3 m length with a spacing of 5 cm

within plants and 30 cm between the rows. Recommended cultural practices were followed to raise good crop viz. days to 50 % flowering, days to maturity, plant height, number of productive tillers per plant, length of spike, number of grains/spike, grain weight/spike, 1000-grain weight, biological yield, harvest index and grain yield per plant.

RESULTS AND DISCUSSION

Correlation measures degree and direction of relationship between two traits. If the value of one trait would be change it can change the value of other trait also. The correlation coefficients were estimated for all characters discussed with grain yield and among the characters themselves both at genotypic and phenotypic levels. Days to 50 per cent flowering showed no positive significant association, while negative significant association with plant height and harvest index at phenotypic and positive association at genotypic level.

Table-1 Genotypic (above diagonal) & phenotypic (below diagonal) correlation coefficient in barley genotypes.

Grain yield/ plant	-0.080	0.049	0.092	0.617	-0.121	0.224	-0.022	-0.176
Harvest index	-0.145	0.271	-0.216	0.360	-0.099	0.044	0.068	-0.063
Biological yield (gm.)	0.164	0.101	0.002	0.481	-0.260	0.179	0.130	-0.050
1000 grain wt. (gm)	0.082	0.192	-0.023	0.026	0.107	-0.314	0.049	
Grain weight/ Spike (gm)	0.061	0.092	-0.114	-0.271	-0.098	0.339		0.046
No. of grain/ spike	-0.039	-0.008	0.208	-0.044	0.243		0.314**	-0.124
Length of spike (cm)	0.048	0.038	-0.319	0.071		0.197**	-0.067	0.125
No. of productive tiller/plant	-0.083	-0.016	-0.015		0.055	-0.042	-0.269**	0.015
Plant height (cm.)	-0.292	-0.104		-0.007	-0.238**	-0.204**	-0.117	-0.027
Days to maturity	-0.085		-0.090	-0.004	-0.024	-0.006	0.066	0.142
Days of 50% flowering		0.115	-0.229**	-0.064	-0.009	-0.028	0.046	0.040
Days of 50% flowering								

0.762	0.367	
0.400		0.295**
	0.303	0.703**
-0.037	-0.023	-0.174*
0.121	0.034	-0.025
0.181*	0.036	0.206**
-0.196**	-0.024	-0.101
0.452**	0.293**	0.588**
-0.001	-0.162*	0.097
0.061	0.136	0.033
0.105	-0.146*	-0.063
Biological yield(gm.)	Harvest index	Grain yield/plant

*Significant at 5, **Significant at 1%

Table:-2 Path coefficient analysis showing direct and indirect effects of different characters on yield in barley genotypes at genotypic level.

	1.	2.	3.	4.	5.	6.
Harvest index	0.0153	0.0059	-0.0211	0.1139	-0.0027	0.0057
Biological yield (g)	-0.0173	0.0022	0.0002	0.1522	-0.0070	0.0242
1000 Grain (wt)	-0.0086	0.0042	-0.0022	0.0082	0.0029	-0.0181
Grain weight /spike	-0.0065	0.0020	-0.0111	-0.0859	-0.0026	0.0459
No of grains / spike	0.0041	-0.0002	-0.0204	-0.0141	0.0065	0.1351
Length of spike (cm)	-0.0050	0.0008	-0.0311	0.0225	0.0268	0.0329
No of productive tillers /plant	0.0088	-0.0004	-0.0015	0.3162	0.0019	-0.0060
Plant height (CM)	0.0307	-0.0023	0.0975	-0.0048	-0.0085	-0.0282
Days to maturity	0.0090	0.0218	-0.0102	-0.0052	0.0010	-0.0011
Days to 50% flowering	-0.1050	-0.0019	-0.0285	-0.0265	0.0013	-0.0053
Characters	Days to 50% flowering	Days to maturity	Plant height (CM)	Number of productive tillers/plant	Length of spike (cm)	Number of grains/spike
S.No.	1.	2.	3.	4.	5.	6.

-0.0025	0.0082	0.2421**	0.0025	0.3673**
-0.0047	0.0066	0.6047	0.0010	0.7621**
-0.0018	-0.1296	-0.0306	-0.0002	-0.1759*
-0.0364	-0.0064	0.0787	0.0002	-0.0221
-0.0124	0.0174	0.1082	0.0001	0.2244**
0.0036	-0.0140	-0.1576	-0.0002	-0.1213
0.0099	-0.0034	0.2911	0.0009	0.6175**
0.0042	0.0030	0.0013	-0.0005	0.0923
-0.0034	-0.0249	0.0615	0.0007	0.0492
-0.0022	-0.0107	0.0994	-0.0004	-0.0797
Grain weight/spike (gm)	1000 Grain wt (gm)	Biological yield(gm)	Harvest index	Grain yield/plant
7.	8.	9.	10.	11

R SQUARE= 0.7261

RESIDUAL EFFECT= 0.5234

Table:-3 Path coefficient analysis showing direct and indirect effects of different characters on yield in barley at phenotypic level.

Harvest index	0.0083	0.0052	-0.0191	0.1021
Biological yield (g)	--0.0060	0.0024	0.0000	0.1572
1000 Grain (wt)	-0.0023	0.0055	-0.0032	0.0052
Grain weight / spike	-0.0026	0.0026	-0.0139	-0.0936
No of grains / spike	0.0016	-0.0002	-0.0242	-0.0149
Length of spike (cm)	0.0006	-0.0009	-0.0282	0.0191
No of roductive tillers /Plant	0.0037	-0.0002	-0.0009	0.3478
Plant height (CM)	0.0130	-0.0035	0.1182	-0.0026
Days to maturity	-0.0066	0.0384	-0.0106	-0.0015
Days to 50% flowering	-0.0568	0.0044	-0.0271	-0.0224
Characters	Days to 50% flowering	Days to maturity	Plant height (CM)	Number of productive
S.No.	1.	2.	3.	4.

0.0001	0.0051	-0.0006	0.0033	0.1546*	0.0359	0.295**
0.0003	0.0251	-0.0022	0.0053	0.5097	0.0109	0.703**
-0.0002	-0.0171	-0.0008	-0.01412	-0.0192	-0.0009	-0.174*
0.0001	0.0434	-0.0180	-0.0066	0.0619	0.0012	-0.025
-0.0003	0.1379	-0.0057	0.0175	0.0927	0.0013	0.206**
-0.0014	0.0272	0.0012	-0.0177	-0.1000	-0.0009	-101
-0.0001	-0.0059	0.0048	-0.0021	0.2304**	0.0105	0.588**
0.0003	-0.0282	0.0021	0.0038	-0.0001	-0.0058	0.097
0.0001	-0.0008	-0.0012	-0.0202	0.0313	0.0049	0.034
0.0001	-0.0039	-0.0008	-0.0058	0.0539	-0.0052	-0.0634
Length of spike (cm)	Number of grains /	Grain weight /	1000 Grain wt (gm)	Biological yield (gm)	Harvest index	Grain yield/plant
5.	6.	7.	8.	9.	10.	11

R SQUARE= 0.6433

RESIDUAL EFFECT= 0.5973

Days to maturity showed neither positive nor negative significant association with any characters at phenotypic level. Plant height showed negative and significant association with spike length, days to 50 per cent flowering, number of grain per spike and harvest index at phenotypic level. Productive tillers per plant showed highly significant positive correlation with grain yield per plant, biological yield per plant and harvest index while, negative but significant association with grain yield per spike. Spike length showed significant and positive correlation with number of grain per spike while, negative significant association with plant height and biological yield per plant. Coefficient values were more or less same magnitude and direction both at phenotypic and genotypic levels. Number of grains per spike showed highly significant positive correlation with grain yield per spike and significant positive correlation with grain yield per plant while, negative significant association with plant height. Grain yield per spike showed highly significant positive correlation with number of grains per spike while, this trait has significant negative correlation with productive tillers per plant. 1000 seed weight only showed significant but negative correlation with grain yield per plant. Biological yield per plant showed highly significant positive correlation with grain yield, number of productive tiller per plant and harvest index while, positive significant association with number of grains per spike. This character also showed significant negative correlation with length of spike. Harvest index showed highly significant positive correlation with biological yield, grain yield per plant and number of productive tillers per plant, and significant negative association with plant height and days of 50 per cent flowering. The estimates of genotypic correlation coefficients among 11 characters were, in general, similar in sign or nature but higher in magnitude than the corresponding phenotypic correlation coefficients. The characters showing positive and significant association with seed yield per plant were biological yield, number of productive tillers per plant, harvest index and number of grain per spike therefore due consideration should be given to these characters during selection, which would be help full in increasing the seed yield of barley.

Kishore *et al* [3], Kumar *et al* [4], Singh *et al* [6] and Singh *et al* [7] had also observed strong positive correlations between grain yield and biological yield in barley. Path-coefficient analysis is a tool to partition the observed correlation coefficient into direct and indirect effects of yield components on grain yield to provide clear picture of character associations for efficient selection. In the present investigation path coefficient analysis revealed that biological yield per plant followed by number of productive tillers per plant, number grain of per spike, plant height, days to maturity and harvest index had high and positive direct effect on grain yield per plant resulted in positive and significant correlation at phenotypic level. In general, most of the characters also exerted higher indirect effects on grain yield per plant through other characters both at genotypic and phenotypic levels indicated that these traits are major yield attributing traits in barley. Similar result observed Ali, H. [1], Fathi, G.H. and Rezaeimoghddam, K. [2] and Shahinnia [5].

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