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Correlation and path coefficient analysis of yield attributes in ber (*Zizyphus* spp.)

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Abstract

Correlation and path coefficient were studied for thirteen yield attributing characters in eleven genotypes of ber. Fruit set, fruit length, fruit breadth, fruit weight, stone diameter, pulp weight, specific gravity and harvest duration had significant positive correlation with fruit yield. At genotypic level, fruit length showed the highest direct positive effect on fruit yield followed by fruit weight and fruit breadth.

Key words : Correlation, path coefficient, ber, *Zizyphus mauritiana, Zizyphus rotundifolia.*

Introduction

Yield being a complex character is dependent on many component characters. The success of selection depends upon the amount of genetic variability present in breeding material. Correlation provide estimates of the degree of associations among various components of yield. It is, therefore, essential to measure the contribution of the various variables to observe association and partition of the correlation coefficient into the components of direct and indirect effects. Hence, an attempt was made to study the association of yield attributing characters with fruit yield and the direct and indirect effects of characters on fruit yield through path coefficient analysis in ber.

Materials and methods

Ten year old plants of eight commercial cultivars (Gola, Seb, Umran, Mundia, Illaichi, Tikadi, Jogiya and Bagwadi) belonging to *Zizyphus mauritiana* Lamk. and three local selections (Local-1, Local-2 and Local-3) belonging to *Zizyphus rotundifolia*, were used at S.K.N. College of Agriculture, Jobner. The experiment was laid out in a randomized block design with three replications. The row to row and plant to plant distance was 8 x 8 m. The observations on various traits like duration of flowering, fruit set percentage, fruit drop percentage, fruit length, breadth, weight, stone weight, length and diameter, pulp weight, specific gravity, harvest duration and fruit yield were recorded. The genotypic and phenotypic coefficients of correlation were calculated from the genotypic and phenotypic co-variances and variances as described by Singh and Chaudhary (1979) and Johnson *et al.* (1955). Direct and indirect estimates were calculated according to Wright (1921) and as elaborated by Deway and Lu (1959) at both genotypic and phenotypic levels.

Results and discussion

The correlation coefficients of different traits with fruit yield have been presented in Table 1. The table indicated that the magnitude of genotypic correlation coefficients for most of the character pairs were higher than their respective value of phenotypic correlation coefficients, which may be ascribed to low effect of environment on the expression. The association pattern revealed that fruit yield had highly significant positive association with specific gravity and harvest duration whereas it exhibited significant negative correlation with fruit drop. These observations are in confirmation with those of Bisla and Daulta (1986 and 1988), Prajapati *et al.* (1996) and Gupta and Mehta (2000). Negative association between fruit drop and fruit yield indicated a compensatory relationship between them. Low correlation of flowering duration and stone weight with fruit yield gives the impression that these may be a contributory component for increasing yield. An examination of the data presented in Table 1 revealed that the fruit set percentage exerted maximum influence on fruit yield per plant. Therefore, this character could be taken as selection criteria for achieving higher yield in these genotypes.

Path coefficient analysis (Table 2) showed that at genotypic level, fruit length had the highest direct positive effect on fruit yield followed by fruit weight, fruit breadth, fruit set percentage, flowering duration and specific gravity. Direct effect of fruit weight was close to its genotypic correlation coefficient with fruit yield. Stone diameter, fruit drop, harvest duration, stone weight, stone length and pulp weight had negative direct effects. Duration of flowering had direct positive effect but it also had indirect negative effects via stone weight, stone length, stone diameter, pulp weight and harvest duration. Fruit set percentage had positive direct effect but it also had indirect negative effects via stone weight, stone length, stone diameter, pulp weight and harvest duration.

At phenotypic level, among the various characters, pulp weight had the highest positive direct effect on the fruit yield followed by fruit set percentage, fruit weight, fruit length, duration of flowering, harvest duration and stone diameter, whereas, fruit breadth, specific gravity, stone weight, fruit drop and stone length had negative direct effect but values were very low except stone length. The high magnitude of residual factor at phenotypic level indicated the limitation of characters included in the present investigation, which need to be supplemented by more morphological traits to describe the whole range of variation. These results are in broad conformity with the findings of Bisla and Daulta (1987) and Prajapati *et al.* (1996) in ber.

Table 1. Phenotypic (above diagonal) and genotypic (below diagonal) correlation coefficients between yield attributes and fruit yield

Character	DF	FS	FD	FL	FB	FW	SW	SL	SD	PW	SG	FY	HD
Duration of flowering	-	0.220	-0.256	0.578**	0.347	0.643**	0.656**	0.535**	0.255	0.625**	0.075	0.199	0.071
Fruit set	0.217	-	-0.975**	0.552**	0.772**	0.604**	0.107	0.556**	0.738**	0.636**	0.543**	0.964**	0.524*
Fruit drop	-0.269	-1.005	-	-0.601**	-0.772**	-0.632**	-0.106	-0.605**	-0.713**	-0.666**	-0.570**	-0.953**	-0.519*
Fruit length	0.638**	0.588**	-0.611**	-	0.773**	0.935**	0.705**	0.918**	0.570**	0.934**	0.332	0.512*	0.347
Fruit breadth	0.355	0.791**	-0.777**	0.787**	-	0.853**	0.579**	0.639**	0.918**	0.858**	0.543**	0.756**	0.667**
Fruit weight	0.665**	0.611**	-0.640**	0.953**	0.856**	-	0.760**	0.814**	0.698**	0.998**	0.364	0.564**	0.414
Stone weight	0.678**	0.086	-0.099	0.744**	0.577**	0.768**	-	0.514*	0.523*	0.718**	0.010	0.097	0.247
Stone length	0.582**	0.586**	-0.613**	0.919**	0.647**	0.823**	0.535**	-	0.372	0.822**	0.364	0.445*	0.147
Stone diameter	0.225	0.767**	-0.731**	0.602**	0.925**	0.709**	0.505*	0.385	-	0.697**	0.354	0.768**	0.694**
Pulp weight	0.648**	0.646**	-0.675**	0.950**	0.862**	0.998**	0.728**	0.831**	0.712**	-	0.389	0.595**	0.420
Specific gravity	0.080	0.593**	-0.617**	0.345	0.573**	0.377	0.018	0.380	0.389	0.401	-	0.506*	0.570**
Fruit yield	0.200	0.972**	-0.966**	0.537**	0.766**	0.571**	0.079	0.463*	0.791**	0.604**	0.559**	-	0.610**
Harvest duration	0.066	0.630**	-0.610**	0.391	0.757**	0.453*	0.268	0.155	0.804**	0.459*	0.585**	0.721**	-

Table 2. Estimates of direct and indirect effects at phenotypic (P) and genotypic (G) levels of yield attributes.

Character		DF	FS	FD	FL	FB	FW	SW	SL	SD	PW	SG	HD	Correlation with FY
Duration of	P	0.078	0.162	0.077	0.372	-0.003	0.458	-0.105	-0.295	0.005	-0.552	-0.002	0.003	0.199
flowering	G	0.339	0.142	0.055	1.580	0.305	0.632	-0.507	-1.012	-0.009	-1.299	0.009	-0.035	0.200
Fruit set	P	0.017	0.735	0.295	0.356	-0.007	0.430	-0.017	-0.307	0.016	-0.561	-0.014	0.020	0.964**
	G	0.074	0.654	0.204	1.456	0.680	0.581	-0.064	-1.020	-0.031	-1.295	0.070	-0.336	0.972**
Fruit drop	P	-0.020	-0.717	-0.303	-0.387	0.007	-0.450	0.017	0.334	-0.015	0.588	0.014	-0.020	-0.953**
	G	-0.091	-0.657	-0.203	-1.514	-0.669	-0.608	0.074	1.067	0.030	1.353	-0.073	0.325	-0.966**
Fruit length	P	0.045	0.406	0.182	0.644	-0.007	0.666	-0.113	-0.506	0.012	-0.824	-0.008	0.014	0.512*
	G	0.216	0.384	0.124	2.479	0.678	0.905	-0.556	-1.598	-0.024	-1.903	0.041	-0.209	0.537**
Fruit breadth	P	0.027	0.568	0.234	0.498	-0.009	0.608	-0.092	-0.352	0.020	0.757	-0.014	0.026	0.756**
	G	0.120	0.517	0.158	1.955	0.860	0.813	-0.431	-1.126	-0.038	-1.726	0.068	-0.404	0.766**
Fruit weight	P	0.050	0.414	0.191	0.602	-0.007	0.713	-0.121	-0.449	0.015	-0.881	-0.009	0.016	0.564**
	G	0.225	0.400	0.130	2.362	0.736	0.950	-0.574	-1.432	-0.029	-2.000	0.044	-0.242	0.571**
Stone weight	P	0.051	0.078	0.032	0.454	-0.005	0.542	-0.160	-0.283	0.011	-0.633	0.000	0.010	0.097
	G	0.230	0.056	0.020	1.844	0.496	0.730	-0.747	-0.930	-0.021	-1.459	0.002	-0.143	0.079
Stone length	P	0.042	0.409	0.183	0.591	-0.006	0.580	-0.082	-0.551	0.008	-0.725	-0.009	0.006	0.445*
	G	0.197	0.383	0.124	2.277	0.557	0.782	-0.399	-1.740	-0.016	-1.664	0.045	-0.083	0.463*
Stone diameter	P	0.018	0.543	0.216	0.367	-0.008	0.497	-0.083	-0.205	0.021	-0.615	-0.009	0.027	0.768**
	G	0.076	0.502	0.148	1.492	0.796	0.674	-0.377	-0.669	-0.041	-1.426	0.046	-0.429	0.791**
Pulp weight	P	0.049	0.468	0.202	0.601	-0.007	0.711	-0.115	-0.453	-0.015	0.882	-0.010	0.016	0.595**
	G	0.220	0.423	0.137	2.354	0.741	0.948	0.544	-1.445	-0.029	-2.004	0.047	-0.245	0.604**
Specific gravity	P	0.006	0.399	0.172	0.214	-0.005	0.259	-0.002	-0.201	0.008	-0.343	-0.025	0.022	0.506*
	G	0.027	0.388	0.125	0.856	0.493	0.358	-0.014	-0.660	-0.016	-0.804	0.018	-0.312	0.559**
Harvest	P	0.006	0.385	0.157	0.224	-0.006	0.295	-0.039	-0.081	0.015	-0.371	-0.014	0.039	0.610**
duration	G	0.022	0.412	0.124	0.969	0.651	0.430	-0.200	-0.269	-0.033	-0.920	0.069	-0.534	0.721**

Diagonal values represent direct effects. *, ** Significant at p=0.05 p = 0.01, respectively, Residuals : Phenotypic = 0.0196, Genotypic = -0.0056.
DF=Duration of flowering, FS=Fruit set, FD=Fruit drop, FL=Fruit length, FB=Fruit breadth, FW=Fruit weight, SW=Stone weight, SL=Stone length SD=Stone diameter, PW=Pulp weight, SG=Specific gravity, FY=Fruit yield, HD=Harvest duration

From this study, it could be conferred that fruit weight, length and breadth may be considered as reliable criteria while selecting better genotype of ber.

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