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Cause and Effect Analysis for Fruit Yield in Ber (*Zizyphus mauritiana*, Lamk)

B. H. Prajapati, D. G. Gauswami and M. R. Prajapati

Department of Agriculture Statistics, C. P. College of Agriculture, Gujarat Agricultural University, Sardar Krushinagar-385 506, Dist : Banaskantha (Gujarat)

ABSTRACT

The data on six biometrical characters collected from a physiological experiment on ber (Cv. Umran) conducted at the Arid Zone Research Station, Gujarat Agricultural University, Sardar Krushinagar during 1991-92 were subjected to correlation and path analysis. The results showed significant positive association between fruit yield and fruit set, pulp-stone ratio, whereas yield had negative significant association with fruit drop and stone weight. The total variation accounted by all the characters was 86 per cent. Path analysis revealed positive direct contribution of fruit set and fruit length and negative contribution of fruit drop and stone weight. In breeding programme for ber genotypes due weightage should be given to these four characters for evolving high yielding genotypes.

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INTRODUCTION

The estimate of simple correlations provide information, which is incomplete in the sense that they do not throw light on the underlying causal schemes that are operative for various interrelationships. A better picture of the contribution from the component in building the total architecture of a complex character, may be obtained through the analysis of causal scheme i.e., path coefficient approach. Very limited work has been done and reported on fruit crops particularly on cause and effect analysis. In the present paper, efforts have been made to obtain such information on yield and its attributes in ber, which is an important fruit crop of arid and semi-arid region.

MATERIALS AND METHODS

The raw data were collected from physiological experiment on ber (Cv. Umran) conducted at the Arid Zone Research Station, Gujarat Agricultural University, Sardar Krushinagar during the *rabi* season of the year 1991-92 and were subjected to correlation and path analysis. The experiment was conducted in RBD with three replications. Nineteen treatment combinations consisting of three levels of NAA (10, 20, 40 PPM), three levels of GA_3 (10, 20, 40 PPM) and three levels of spraying (S_1, S_2, S_3) alongwith control were tried for the purpose. Single tree of ber was treated by each treatment, the distance being 8 meter between two trees. All the recommended practices in vogue were followed. The observations on six

biometrical characters alongwith yield recorded, were fruit set per cent (X_1); fruit drop per cent (X_2); fruit length in cm (X_3); fruit width in cm (X_4); stone weight in gm (X_5); pulp-stone ratio (X_6) and fruit yield kg/plant (Y). The observations on Y, X_1 and X_2 were recorded per tree basis whereas for X_3, X_4, X_5 and X_6 were recorded on ten randomly selected per fruits ber treatment. The data were analysed for correlation and path-co-efficients (Dewey and Lu, 1959).

RESULTS AND DISCUSSION

The estimate of simple correlation co-efficients presented in Table 1 revealed significant positive correlation of fruit yield with fruit set per cent (0.7065) and pulp-stone ratio (0.5588) whereas, it was negatively correlated with fruit drop per cent (–0.8063) and stone weight (–0.6413). Both fruit length and fruit width exhibited non-significant positive association. Jawanda and Bal (1987) reported high significant positive correlation between fruit set per cent and fruit yield and negative significant association in case of fruit drop with fruit yield.

The progress through selection for economic traits as stated by Gupta and Athwal (1986) also depends upon the relationship of an economic trait. The interrelationships of yield components revealed positive significant association between stone weight and fruit set, fruit width and fruit length; pulp-stone ratio with fruit length and fruit width. However, negative significant association was observed between stone weight and fruit drop, pulp-stone ratio with fruit drop. The total variation accounted for by all the characters was 86 per cent.

Since yield is influenced by its components, simple correlation does not provide clear picture about cause and effect of the components, which could be studied through path analysis. The estimates of path analysis are given in Table 2. The results (Table 2) showed the direct effect of fruit set per cent on fruit yield which was high and positive (0.3704). However, it had maximum indirect effect Via fruit drop per-cent (0.2073) which was followed by stone weight (0.2033). Its contribution through other characters was negative.

The fruit drop per cent had a negative and high direct effect on fruit yield per plant (-0.4250). Indirect effect of this trait Via pulp-stone ratio was positive (0.1815), but the remaining indirect effects were negative. The

TABLE 1

Correlation co-efficients for seven characters in ber.

Characters	*Y*	*X1*	*X2*	*X3*	*X4*	*X5*
X1	0.7065**					
X2	-0.8063**	-0.4878				
X3	0.3531	-0.0668	-0.2218			
X4	0.3799	0.0119	-0.2085	0.9423**		
X5	-0.6413**	0.5995**	-0.7064**	0.1687	0.2135	
X6	0.5588**	0.1550	-0.5132	0.8539**	0.7946**	-0.2686

TABLE 2

Direct and indirect effects for various yield attributes in ber.

Characters	*X1*	*X2*	*X3*	*X4*	*X5*	*X6*	*Corr. with Y*
X1	0.3704	0.2073	—0.0235	0.0037	0.2033	—0.0548	0.7065**
X2	—0.1807	—0.4250	—0.0781	—0.0643	0.2396	0.1815	—0.8063**
X3	—0.0247	0.0943	0.3522	0.2906	—0.0572	—0.3020	0.3531
X4	0.0044	0.0886	0.3319	0.3084	—0.0724	—0.2810	0.3799
X5	—2221	—0.3003	0.0594	0.0658	—3392	0.0950	—0.6413**
X6	0.0574	0.2181	0.3007	0.2450	0.0911	—0.3536	0.5588**
Residual effect = 0.0663					R^2 = 0.8658		

Legend : ** Significant at P = 0.01

Y = Fruit yield kg/plant

X1 = Fruit set per cent

X2 = Fruit drop per cent

X3 = Fruit length (cm)

X4 = Fruit width (cm)

X5 = Stone weigh (gm)

X6 = Pulp-stone ratio

direct effect of fruit length on fruit yield was positive and high (0.3522). Its indirect effect Via fruit set per cent, pulp-stone ratio, stone weight were negative but Via fruit drop per cent (0.0943) and fruit width (0.2906) were positive. The fruit width also had positive direct contribution (0.3084) to fruit yield per plant. Its indirect effect Via fruit set, fruit drop and fruit length were positive but Via stone weight and pulp-stone ratio were negative.

The direct effects of stone-weight and pulp-stone ratio with fruit yield per plant were negative (-0.3392 and -0.3536 respectively). The indirect effect of stone weight Via all the characters studied except fruit set and fruit drop were positive, whereas in case of pulp-stone ratio the indirect effect Via all the characters were observed positive. The characters studied accounted for 86.58 per cent of the total variation in ber fruit yield.

The residual effect for the path was low in magnitude (0.0663) suggesting that the characters studied are sufficient to express their contribution towards fruit yield of ber.

Based on the above discussion, the results lead to that the fruit set per cent and fruit length contributed positive and high direct effects whereas fruit drop and stone weight exhibited negative direct effects on fruit yield per plant in ber. These are the important attributes for selection criteria. In breeding research programme for ber crop, due weightage should be given to these four characters for evolving high yielding genotypes.

REFERENCES

Dewey, D. R. and K. H. Lu, 1959. A correlation and path coefficient analysis of components of crested wheat gross seed production. *Agron. J.* **51** : 515-518.

Jawanda, J. S. and J. S. Bal. 1987. Correlation analysis in Ber, *Punjab Hort. J.*, **21** (1) : 17-22.

Gupta, V. P. and D. S. Athwal. 1966. Genetic variability correlation and selection indices for green fodder characters in Pearlmillet. *J. Res., PAU,* 3 (4) : 581-584.