Indian J. Pl. Genet. Resources 13(3): 226-229, 2000

INTERRELATIONSHIPS AND PATH-COEFFICIENT ANALYSIS IN MAIZE (*Zea mays* L)

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Ten maize inbreds and their 45 single-cross hybrid combinations (total 55 genotypes) along with a standard check were grown in a randomized complete block design with three replications in two locations. The phenotypic and genotypic coefficients of correlation were computed for grain yield and its component traits viz., 1000-grain weight, kernel rows per ear, kernels per row, ear length, ear circumference, days to maturity, plant height, ear height and biological yield. Grain yield showed positive association with 1000-grain weight, kernels per row, ear length, ear circumference, plant height and ear height at the phenotypic level. Path coefficient analysis indicated that plant height, ear circumference and kernels per row were the main characters through which the indirect contribution of most of the traits was positive and high.

Key words: Maize, correlation, path analysis

Knowledge of interrelationships serves two main purposes from the breeder's point of view. Firstly, these are highly useful in selecting for characters, which are not easily observed or genotypic values of which are modified by the environmental effects. There is ample evidence to show that selection directly for yield in plants is not easy. Thus, any morphological character that is associated with yield or which makes a significant contribution to yielding ability would be useful in the improvement of yield. Secondly, inter-relationships between characters make available to the breeders sources of information as to the nature, extent and direction of selection pressure among characters.

MATERIALS AND METHODS

Ten maize inbred parents were crossed in a diallel mating system excluding reciprocals. These ten parents and their 45 hybrid combinations (total 55 genotypes) along with a standard check were grown in a randomized complete block design with three replications at Regional Research Station, Bajaura and Himachal Pradesh Krishi Vishvavidyalaya, Palampur each, representing Mid-Hill Zone of H.P. Each plot consisted of four rows, each row 5 m in length and row-to-row and plant-to-plant spacings of 75 and 20 cm, respectively. Data were recorded on ten randomly chosen competitive plants for grain yield and its components (viz., 1000-grain weight, kernel rows per ear, kernels per row, ear length, ear circumference, days to maturity, plant height, ear height and biological yield). The data over two locations were pooled and the phenotypic and genotypic coefficients of correlation were computed as suggested by Al-Jibouri *et al.*, (1958) and the path coefficient analysis of various traits was done following Dewey and Lu (1959).

RESULTS AND DISCUSSION

A perusal of Table 1 reveals that genotypic coefficients, in general, were higher than the corresponding phenotypic ones, indicating the inherent association among various traits studied. Grain yield showed positive and significant association with 1000-grain weight, kernels per row, ear length, ear circumference, plant height, ear height and biological yield at the phenotypic level. Grain yield was found to be positively correlated with plant height, ear height, ear length, kernels per row (Sathyanarayana, .1995), kernel rows per ear and ear circumference (Gyanendra *et al.*, 1993). Among other component traits, besides grain yield, 1000-grain weight had positive and significant correlation with kernels per row, ear length, ear circumference, plant height and ear height, whereas negative with days to maturity. Kernels per row had positive and significant correlation with ear length, ear circumference, plant height, ear height and biological yield. Ear length and ear circumference each had positive and significant association with plant height and ear height. Plant height with days to maturity and ear height had also positive correlation. Similar results on correlation coefficients for ear height with plant height (Hemalatha, 1986) and plant height with ear length (Krishnan and Natarajan, 1995) have been observed. Grain yield is an ultimate product of interaction among the characters under the influence of environment. It is quite likely that the contribution of a

Table 1. Phenotypic(P) and genotypic(G) correlation coefficients among different characters pooled over two environments

Characters		GWT	KRE	KER	ELT	ECF	DTM	PHT	EHT	BLY
GYD	P	0.70**	0.10	0.77**	0.67**	0.45**	-0.08	0.52**	0.33*	0.51**
	G	0.78**	1.02**	0.92**	0.76**	0.52**	-0.07	0.64**	0.48**	0.51**
GWT	P		0.03	0.46**	0.52**	0.26*	-0.42**	0.35**	0.27*	0.27
	G		0.52**	0.05**	0.58**	0.30**	-0.49**	0.39**	0.38**	0.31*
KRE	P			-0.07	0.09	0.02	0.06	-0.12	0.07	0.11
	G			-0.54	0.98**	0.03	0.57**	-0.21**	1.33**	1.10**
KER	P				0.70**	0.46**	0.20	0.50**	0.44**	0.61**
	G				0.80**	0.60**	0.29*	0.67**	0.66**	0.77**
ELT	P					-0.05	0.02	0.55**	0.34*	0.37**
	G					-0.09	0.03	0.69**	0.47**	0.42**
ECF	P						0.19	0.43**	0.35**	0.52**
	G						0.29*	0.56**	0.49**	0.62**
DTM	P							0.35*	0.15	0.42**
	G							0.47**	0.32*	0.61**
PHT	P								0.52**	0.42**
	G								0.92**	0.55**
EHT	P									0.24
	G									0.33**

**Significant at 5 and I per cent levels, respectively.
GYD = grain yield, GWT = 1000-grain weight, KRE = kernel rows per ear, KER = kernels per row, ELT = ear length, ECF ear circumference, DTM = days to maturity, PHT = plant height, EHT = ear height and BLY = biological yield.

Table 2. Phenotypic(P) and genotypic(G) path coefficient analysis for different characters pooled over two environments.

Characters		GWT	KRE	KER	ELT	ECF	DTM	PHT	EHT	BLY
GWT	P	0.32	0.01	0.18	-0.16	0.10	-0.06	0.22	-0.01	0.08
	G	-0.80	0.07	-0.50	0.29	0.17	0.61	0.27	-0.09	0.40
KRE	P	0.01	0.38	-0.03	-0.03	0.01	0.01	-0.07	-0.01	0.03
	G	-0.42	0.13	0.50	0.49	0.02	-0.70	-0.83	-0.30	1.43
KER	P	0.15	-0.03	0.39	-0.22	0.18	0.03	0.32	-0.01	0.17
	G	-0.43	-0.07	-0.93	0.40	0.35	0.35	0.46	-0.15	1.01
ELT	P	0.17	0.04	0.27	-0.31	-0.02	0.02	0.35	-0.01	0.10
	G	-0.47	0.13	-0.75	0.50	-0.05	-0.03	0.47	-0.12	0.54
ECF	P	0.08	0.01	0.18	0.02	0.39	0.03	0.27	-0.01	0.15
	G	-0.24	0.01	-0.56	-0.01	0.59	-0.36	0.38	-0.11	0.80
DTM	P	-0.13	0.02	0.08	0.01	0.08	0.14	0.22	-0.01	0.12
	G	0.40	0.07	-0.27	0.01	0.17	-1.24	0.32	-0.07	0.79
PHT	P	0.11	-0.04	0.19	-0.17	0.17	0.05	0.63	-0.02	0.12
	G	-0.31	-0.16	-0.63	0.34	0.33	-0.58	0.69	-0.21	0.72
EHT	P	0.09	0.03	0.17	-0.10	0.14	0.02	0.32	-0.03	0.07
	G	-0.31	0.17	-0.62	0.24	0.29	-0.40	0.63	-0.23	0.43
BLY	P	0.08	0.04	0.24	-0.11	0.20	0.06	0.26	-0.08	0.28
	G	-0.24	0.14	-0.72	0.21	0.37	-0.75	0.38	-0.07	1.30
Corr. with yield	P	0.70**	0.10	0.77**	0.67**	0.45**	-0.08	0.52**	0.33**	0.51**
	G	0.78**	1.02**	0.92**	0.76**	0.52**	-0.07	0.64**	0.48**	0.51**

Significant at 5 and 1 per cent levels, respectively.
GYD = grain yield, GWT = 1000-grain weight, KRE = kernel rows per ear, KER kernels per row, ELT ear length, ECF = ear circumference, DTM = days to maturity, PHT = plant height, EHT = ear height and BLY = biological yield.
Residual P = 0.006; and G = 0.052

component showing highly significant association with grain yield may get diluted through the interaction with other component. Further, the information on relative contribution of direct and indirect effects of components on grain yield helps in giving appropriate weightage for the purpose of selection. Therefore, for efficient indirect selection, it is important to know the causal factors for the observed association between two characters with the help of estimates of direct and indirect effects through path-coefficient analysis.

At the phenotypic level, plant height had the maximum direct positive effect followed by ear circumference, kernels per row, kernel rows per ear, 1000-grain weight and biological yield. Plant height, ear circumference and kernels per row were the main characters through which the indirect contribution of most of the traits was positive and high and, therefore these traits can be found rewarding for increasing grain yield. Direct positive contribution of kernels per row and kernel rows per ear has been reported by Gyanendra *et al.*, (1993), whereas for plant height, kernels per row and 1000-grain weight by Debnath and Khan (1991). Indirect effects of various traits such as ear length via biological yield, 1000-grain weight via biological yield (Prasad,

1987) and biological yield through plant height (Donald and Hamblin, 1976) have been reported.

ACKNOWLEDGEMENTS

The first author is grateful to the Council of Scientific and Industrial Research, New Delhi, for granting Senior Research Fellowship.

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