Inter-relationship and Path Coefficient Analysis between some Yield Components in Maize

A study of the yield components which are less susceptible to environment is very valuable. Higher the association of a particular character with yield will be a better indicator for selection. The use of simple correlation in selection is not so useful but by using the path coefficient analysis the real inter-relationship between the yield components may be seen.

For the study, 45 F_1 crosses from a diallel set of 10 selected inbred lines namely C. I. 21, Fla 5B-48, Fla-3H-94, M. P. 414, CM 105, CM 104, CM 111, Eto-25A, (venz$_1$ × venz 400), and Wf$_9$ were sown in randomized block design with 4 replications at Ludhiana during 1966 khariff. Each plot consisted of two rows of 30 ft. length having 2.5 ft. line to line and 9 inches seed to seed distances. Ten plants were randomly selected from each plot and observations recorded on plant height, ear height, ear weight, ear length, kernel rows number per ear, kernel number per row, kernel number per ear, 100 kernels weight, cob weight, per plant yield and days to 75% silking. For analysis of variance, plot means were used to test the significance of differences between cultures. Plot means were also used to find out the correlations between yield and other characters.

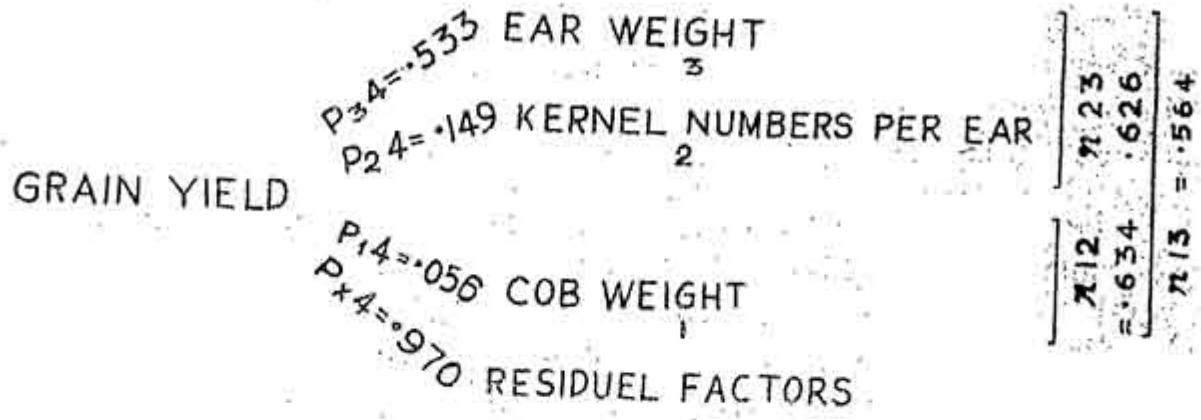
The analysis of variance showed significant culture differences among the cultures for all the characters except plant height and ear length, while the correlation study revealed that only the ear weight, 100 kernel weight, cob weight and kernels number per ear had significant association with yield. On the basis of this preliminary analysis, four characters namely per plant yield ear weight, kernel numbers per ear and cob weight were selected for further analysis. The path coefficient analysis was done as stated by Li (1948).

Phenotypic (P) and genotypic (G) correlation among above mentioned characters are as follows :

TABLE 1

Characters		Ear weight	Kernel number per ear	Cob weight
Per plant yield	P	0.849**	0.474**	0.395**
	G	0.594	0.448	0.339
Ear weight	P	—	0.605**	0.586**
	G	—	0.626	0.564
Kernel numbers per ear	P		—	0.594**
	G		—	0.634
Cob weight	P			—
	G			—

High positive genotypic correlations were observed among all the characters. So, these characters seem to be highly associated with each other. Their specific interrelationship is presented below:



The genotypic correlations between yield and other characters were of high magnitude (Table 1). The path coefficient analysis indicated that ear weight has direct bearing on yield while kernel numbers per ear and cob weight have little or no direct relation with yield.

The break up of the genotypic correlations between yield and other characters into direct and indirect components through other characters is as follows:

(1)	Cob weight × grain yield	r =	.339
	Direct effect of cob weight (P_{14})	=	-.056
	Indirect effect through kernel number per ear ($r_{12} P_{24}$)	=	.094
	Indirect effect through ear weight ($r_{13} P_{34}$)	=	.301
	Total		.339
(2)	Kernel numbers per ear × yield	r =	.448
	Direct effect of kernel numbers per ear (P_{24})	=	.149
	Indirect effect throug cob weight ($r_{12} P_{14}$)	=	-.035
	Indirect effect through ear weight ($r_{23} P_{34}$)	=	.334
	Total		0.448
(3)	Ear weight × grain yield	r =	.594
	Direct effect of ear weight (P_{31})	=	.533
	Indirect effect through cob weight ($r_{13} P_{11}$)	=	-.030
	Indirect effect through kernel numbers per ear ($r_{23} P_{31}$)	=	.093
	Total	=	.594

The above analysis indicates that cob weight and kernel numbers per ear showed no association with yield but both have sufficient bearing through ear weight, while the character ear weight has direct effect on yield supported by kernel numbers per ear.

Ear weight, kernel numbers per ear, cob weight and grain yield per plant appear to be of positive value being strongly correlated genotypically. The contribution of the various factors to the observed correlations is made clear by partitioning the correlation coefficient into its components. However, the path coefficient analysis showed that ear weight has direct effect on yield while kernel numbers per ear and cob weight increases the yield through ear weight. So their genotypic correlations seem to be misleading. The differences between two analyses arise due to the fact that correlations measure only the mutual association regardless of their inter-relationship while path coefficient analysis specifies their real contribution.

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