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Heritability and Interrelationships Among Grain Yield and Yield Components in Maize (*Zea mays* L).

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ABSTRACT

Interrelationships of grain yield and its components were determined in 49 maize hybrids and 14 parental lines. The results indicated that grain yield was positively and significantly associated with all parameters studied. Kernels per row was highly positively correlated with grain yield, followed by plant height, ear height, length and its diameter. All these attributes were the main yield components. Heritability was also higher than 80% for all parameters showing heritable variation among genotypes. Heritability for kernel per row, plant height and grain yield per plant was higher than the other characters.

Key Words: *Zea mays*; Heritability; Correlations; Single cross; Hybrids

INTRODUCTION

Maize is the third most important cereal food crop of the world after wheat and rice. It is a multipurpose crop which provides edible oil for human use, feed for poultry and fodder for livestock. Correlation studies between yield and yield components are pre-requisite to plan a meaningful breeding programme. Many researchers studied association of characters for the selection of high yielding varieties. Khatun *et al.* (1999) studied that grain yield per plant was positively and significantly correlated with 1000 grain weight, number of kernels ear^{-1} and ear height. Orylan *et al.* (1999) studied that most important traits influencing grain yield were number of grains per row and number of grains per ear. Characters like number of grains per row, 1000-grain weight, ear diameter and plant height are useful for improving grain yield in hybrids. Highest correlation of grain yield was obtained with number of kernels per row followed by plant height and ear length (Guantum *et al.*, 1999). Mani *et al.* (1999) studied that grain yield per plant had highly significant correlation with all the other attributes. Devi *et al.* (2001) reported that ear length, number of row per ear, number of seeds per row and 100-seed weight direct influence on yield and indirect on several other components. Yousuf *et al.* (2001) reported that grain yield per plant had positive correlation with plant height, number of kernels rows per ear and number of kernels per row. The highest correlation was observed between plant height and ear height (Neto *et al.*, 2001).

MATERIALS AND METHODS

Eight diverse yellow seeded inbred lines of maize (F147, F131, F143, F113, MS-211, NYP-8, F129-2 and MO-17) were crossed with seven testers viz F-103, F-105, F-107, CML-299, TZI-4009, Batan-8987 and 935006 during kharif, 2001 to generate 49 hybrids. All these hybrids and 14 parents were grown in a Randomized Complete Block Design with three replications in February 2002 at Maize Research Station, AARI, Faisalabad. Each genotype was grown in single 5 meter long row having 75 cm x 20 cm crop geometry. The data were recorded from 10 random plants from each entry within replication for plant height (cm), ear height (cm), ear length (cm), ear diameter (cm), kernel rows per ear, kernels per row and yield per plant.

The analysis of variance was carried out according to the standard statistical technique to establish the level of significance among genotypes following Steel and Torrie (1980). Correlation coefficients were determined as described by Singh and Chaudhry (1979).

RESULTS AND DISCUSSION

The differences between genotypic coefficients of variance (GCV) and phenotypic coefficients of variance (PCV) were very low for all characters studied, indicating that the environmental effects in the development of these parameters are low (Table I). The range of mean values for all the traits was relatively high and treatment mean squares (TMS) were significant. GCV was the highest in case of grain yield per plant followed by plant height, ear height, kernels per row, 1000 kernel weight and ear length. Heritability was also higher than 80% for all parameters showing heritable variation among genotypes. Heritability for kernels per row, plant height and grain yield per plant was higher than other traits studied (Table I). Genetic advance (GA) as percentage of mean for grain yield per plant, plant height, ear height, ear length and ear diameter were higher showing that these parameters were under the control of additive genes. These observations are in confirmation with the findings of Mani, *et al.* (1999). Number of kernels per row had significant correlation with seed yield followed by plant height, height, diameter and length of ear. These data confirm the findings of Khatun *et*

Table I. Range, TMS, GCV, PCV, h^2 and G. A. as percent of mean

S. No.	Parameters	Range	TMS	GCV%	PCV%	h^2	G. A. (% age of mean)
1	Plant height (cm)	196- 66	2256.47**	710.79	752.15	0.95	45.61
2	Ear Height (cm)	122- 27	944.90**	292.11	314.94	0.93	28.97
3	Ear Length (cm)	20.25- 09.33	761.77**	3.30	3.62	0.91	03.06
4	Ear diameter (cm)	04.89- 03.05	0.35**	0.10	0.12	0.87	00.52
5	Kernel Rows Ear $^{-1}$	20.00- 09.33	8.48**	2.17	2.82	0.91	02.69
6	Kernels Rows $^{-1}$	43.67- 04.33	212.10**	67.92	70.70	0.96	14.21
7	1000 Kernels Weight (g)	37.50- 13.11	35.89**	11.09	11.96	0.93	05.64
8	Yield Plant $^{-1}$ (g)	184.64- 18.70	3445.53**	1080.73	1148.51	0.94	56.13

** Highly significant. TMS = Treatment Mean Square. GCV = Genotypic Coefficient of Variability.
PCV = Phenotypic Coefficient of Variability. H2 = Heritability. G. A. = Genetic Advance.

Table II. Correlation Coefficient of various yield components with grain yield in Maize

S. No.	Parameters	Ear Height (cm)	Ear Length (cm)	Ear Diameter (cm)	Kernel Rows^{-1}	Kernels Row^{-1}	1000 Kernel Weight (g)	Yield Plant^{-1}
1	Plant height (cm)	0.907**	0.535**	0.537**	0.544**	0.743**	0.329**	0.763**
2	Ear Height (cm)		0.440**	0.520**	0.547**	0.614**	0.298**	0.669**
3	Ear Length (cm)			0.373**	0.255**	0.617**	0.453**	0.600**
4	Ear diameter (cm)				0.499**	0.584**	0.374**	0.705**
5	Kernel Rows Ear $^{-1}$					0.509**	0.044**	0.563**
6	Kernels Rows $^{-1}$						0.317**	0.844**
7	1000 Kernels Weight (g)							0.833**

** > 0.179

al. (1999) and Devi *et al.* (2001). Ear and plant height were significantly correlated with grain yield, indicating that taller plants with high ear placement were better yielding as compared to shorter ones with low ear placement (Guatum *et al.*, 1999; Yousuf *et al.*, 2001; Neto *et al.*, 2001). The number of kernels per row appeared to directly contribute to grain yield per plant followed by plant height, diameter, height and ear length, number of rows per ear, and 1000 kernel weight (Table II). These data agree the findings of Orylan *et al.* (1999).

From the results of this study it is concluded that effective selection for superior genotype is possible considering number of kernel per row, ear length and ear diameter.

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