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Research Note

Contribution of different yield components for grain yield improvement in Maize (*Zea mays* L.)

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Abstract:
Seventy two maize (*Zea mays* L.) hybrids along with their parental lines were assessed for genetic correlation among 14 quantitative traits. All the traits studied exhibited a positive and significant correlation with grain yield except days to tasselling, silking and days to maturity. Grains per row exhibited the highest positive and significant correlation with grain yield followed by cob diameter, cob length, plant height, leaf breadth, leaf length, cob height, and 100 grain weight, grain rows per cob and leaves per plant. A strong positive inter correlation was observed among the traits *viz.,* plant height, leaves per plant, leaf length, leaf breadth, cob length, cob diameter, grains per row and grain yield indicating that selection for these characters can help to improve the grain yield in maize indirectly.

Key Words: *Zea mays* L.; genetic correlation; yield; yield components

Maize (*Zea mays* L.) is the most widely grown cereal in the world. It is also the leading world cereal in terms of productivity. In India, it is the third most important cereal after wheat and rice. However, with its high yield potential and the scope of increasing its yield in the country, its improvement deserves special attention. In countries like India, where rapid growth in population outstrips our gains in cereal production, maize offers the best opportunity for increasing cereal production. Increased production of maize and its alternate utilization in food channel can reduce the pressure on wheat and its imports. Genetic correlation analysis is a handy technique which elaborates the degree of association among important quantitative traits. In order to develop promising genotypes with high yielding potential, it is essential to know the associations among different traits, especially with grain yield, which is the most important and ultimate objective in any breeding programme. Association studies could lead plant breeders in the selection of traits contributing towards the character(s) of concern, and ultimately their improvement through hybridization. With increased industrial demand, it is necessary to maximize maize production at a much faster pace than at current. Hybrids designed with desirable traits are a major contributing factor in improving the grain yield per unit area. Therefore to know the important yield contributing traits for a set of selected genotypes, the present study was carried out.

Seventy two single cross maize hybrids developed through Line x Tester mating design using twenty four lines and three testers along with their parental lines were grown in *Rabi* 2009 in a randomized block design with two replications. Rows were spaced 0.60 m apart with plant to plant distance of 0.25 m. Uniform cultural practices were carried out in all the plots in both replicates. Observations were recorded on 14 quantitative characters. Data related to days to 50 per cent tasseling, silking and days to maturity were recorded on plot basis while data related to other characters like plant and ear height, leaves per plant, leaf length and breadth, cob length and diameter, grain rows per cob, grains per row, 100 grain weight and grain yield per plant were recorded on five randomly selected plants for each genotype. The mean values were subjected to analysis. The genetic correlation was estimated by the covariance values for all the traits according to the formulae described by Falconer and Mackay (1996).

Grain yield was positively correlated with most of the traits under study, i.e., plant and ear heights, leaves per plant, leaf length and breadth, cob length and diameter, grain rows per cob, grains per row and 100 grain weight (Table 1). This finding is in agreement with those of Iqbal and Chauhan (2003) and Kashiani *et al*. (2010). Grain yield was negatively correlated with days to 50 per cent tasselling and silking. Similar findings have also been reported by Rehman *et al*. (1995), Umakanth *et al.* (2000), Venugopal *et*

al. (2003) and Appunu *et al.* (2006). Results of this study indicated that for corn, grain yield was significantly and positively correlated with plant and ear heights, leaf length and breadth, cob length and diameter, grain rows per cob and grains per row.

Days to 50 per cent tasselling showed highly significant positive correlation with days to silking and days to maturity. It also showed negative and significant correlations with cob length, cob diameter, grain rows per cob, and grains per row and grain yield per plant (Table 1). Days to silking exhibited positive and significant correlation with days to maturity. Negative and significant association of this trait with cob length, cob diameter, grain rows per cob, grains per rows and grain yield per plant was also noticed.

Plant height was positively correlated with ear height, leaves per plant, leaf length and breadth, cob length and diameter, grain rows per cob, grains per row, 100 grain weight and grain yield (Table 1). Singha and Prodhan (2000) also reported grain yield to be positively associated with plant height. Umakanth *et al*. (2000) and Kashiani *et al*. (2010) found maximum correlation between plant height and grain yield. Ear height was found to have a positive relationship with plant height, leaves per plant, leaf length and breadth, cob length and diameter, grains per row, 100 grain weight, days to maturity and grain yield. Number of leaves per plant, leaf length and breadth showed positive and significant correlation with all the traits studied except days to tasselling and silking. Allen *et al*. (1973) and Malik *et al.* (2005) also found leaves per plant to be positively correlated with grain yield.

A positive and significant correlation of cob length and diameter with plant height, ear height, leaves per plant, leaf length and breadth, grain rows per plant, grains per row and grain yield was observed. Cob length exhibited negative and significant correlation with 50 per cent tasselling and silking. Singha and Prodhan (2000) and Kashiani *et al*. (2010) found grain yield to be positively correlated with these traits. Cob diameter was negatively correlated with days to 50 per cent tasselling and silking. It showed positive and significant association with all other traits. Venugopal *et al.* (2003) and Kashiani *et al*. (2010) reported that grain yield was positively associated with cob diameter.

Number of grain rows per plant was positively correlated with plant height, leaves per plant, leaf length and breadth, cob length and diameter, grains per row and grain yield and non-significantly with ear height, 100 grain weight and days to maturity but it was negatively associated with days to 50 per cent tasselling and silking. The trait, grains per row indicated positive and significant correlation with all the traits under study except days to maturity while days to 50 per cent tasselling and silking showed negative and significant association. Khakim *et al.* (1998), Thanga Hemavathy *et al.* (2008) and Kashiani *et al*. (2010) found grain rows per cob and grains per row to be positively correlated with grain yield. The trait, 100 grain weight was positively and significantly correlated with plant and ear heights, leaves per plant, leaf length and breadth, cob length and diameter, grains per row and grain yield per plant and negatively associated with days to tasselling and silking, days to maturity and grain rows per cob. Mani *et al.* (1999) reported that 100 grain weight was very closely correlated with grain yield. Similar findings were reported by Iqbal and Chauhan (2003) and Venugopal *et al.* (2003).

From the study it can be concluded that the traits *viz.,* grains per row, cob diameter, cob length, plant height, leaf breadth, leaf length, ear height, 100 grain weight, grain rows per cob and leaves per plant showed positive and significant correlations with grain yield per plant. Hence, these traits may be considered as important characters in selection programs aiming to improve maize yield.

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Table 1. Genotypic correlation coefficients of grain yield and yield component traits in maize

Characters	Days to 50 per cent silking	Plant height (cm)	Ear height (cm)	Leaves per plant	Leaf length (cm)	Leaf breadth (cm)	Cob length (cm)	Cob diameter (cm)	Grain rows per cob	Grains per row	100 grain weight (g)	Days to maturity	Grain yield per plant (g)
Days to 50 per cent tasseling	0.986**	-0.154	-0.023	0.145	-0.028	-0.044	-0.320**	-0.314**	-0.204*	-0.463**	-0.169	0.739**	-0.445**
Days to 50 per cent silking		-0.141	-0.010	0.174	-0.016	-0.028	-0.319**	-0.306**	-0.200*	-0.452**	-0.173	0.748**	-0.437**
Plant height (cm)			0.923**	0.782**	0.780**	0.687**	0.796**	0.773**	0.289**	0.739**	0.681**	0.087	0.809**
Ear height (cm)				0.761**	0.737**	0.640**	0.721**	0.662**	0.171	0.660**	0.635**	0.242*	0.695**
Leaves per plant					0.636**	0.571**	0.511**	0.540**	0.201*	0.491**	0.497**	0.276**	0.549**
Leaf length (cm)						0.748**	0.764**	0.663**	0.313**	0.749**	0.416**	0.217*	0.735**
Leaf breadth (cm)							0.723**	0.732**	0.498**	0.684**	0.413**	0.284**	0.740**
Cob length (cm)								0.786**	0.341**	0.866**	0.576**	-0.007	0.880**
Cob diameter (cm)									0.611**	0.806**	0.521**	0.009	0.902**
Grain rows per cob										0.432**	-0.113	-0.035	0.551**
Grains per row											0.411**	-0.050	0.942**
100 grain weight (g)												0.020	0.575**
Days to maturity													-0.051

*- Significant at 5% level **- Significant at 1% level