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CORRELATION STUDIES IN TEMPERATE MAIZE (*ZEA MAYS* L.) INBRED LINES

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Abstract

The present investigation was conducted to assess the correlation coefficients among fifty maize inbred lines using eleven quantitative parameters *viz.*, days to 50 per cent tasseling, days to 50 per cent silking, days to maturity, plant height, ear height, ear length, ear girth, number of kernel rows ear^{-1}, number of kernels row^{-1}, 100 grain weight and grain yield plant^{-1} during *Kharief* 2014 and 2015. All other possible correlations were positive and significant. Plant height, ear height, ear girth, number of kernel rows ear^{-1}, number of kernels row^{-1} and 100 grain weight showed positive and significant correlation coefficients with grain yield plant^{-1} at genotypic level hence, direct selection for these traits would be beneficial. Other traits *viz.*, days to 50% tasseling, days to 50% silking and days to maturity were found to have negative and significant association with grain yield hence suggesting selection of early maturity lines. Ear girth exhibited highest positive correlation with grain yield plant^{-1}.

Key words : *Zea mays* L., maize, correlation, yield.

Introduction

Maize is among the world's third leading cereal crop after rice and wheat but ranks first with respect to its production and productivity. Maize occupies important place as food, feed and as a source of diverse industrially important products. It is predominantly grown under wide range of climatic conditions, mostly in warmer areas of the temperate region and areas of humid sub-tropical climate. Maize is cultivated during *Kharief* season in Jammu and Kashmir and about 85% of the copped area is rainfed. In Jammu & Kashmir, maize is grown over an area of 315.8 thousand hectares with a production of 633.2 thousand tones and a productivity of 2.04 tones per hectare (Anonymous, 2014).

The inherent or heritable association between two traits is referred as genotypic correlation, which may be either due to pleiotropic action of genes or due to linkage or both. This type of correlation is of paramount importance for a plant breeder to bring about genetic improvement in one trait by selecting the other trait of a pair that is genetically correlated. Genotypic correlations reveal the existence of real associations, whereas phenotypic correlations may occur by chance. Significant phenotypic correlations without significant genotypic associations are of no value. If the genotypic correlation is significant and phenotypic is not, it means that the existing real association is masked by environmental effect. In general, genotypic correlations were of higher magnitude than the corresponding phenotypic values and hence only the genotypic correlations are discussed (Wright, 1921).

Grain yield is the end product of interaction among yield contributing components. Selection based on this trait is usually not very useful but the one based on its component characters could be more effective. Knowledge of interrelationship serves many purposes from breeder's point of view. Most importantly, these are highly useful in selection for characters which are not easily observed or genotypic values of which are modified by environmental effects (Dewey, 1959).

There is simple evidence to show that selection directly for grain yield or which make a significant contribution to yielding ability would be useful in improvement of yield. Partitioning the genotypic correlation coefficient of yield components with grain yield into direct and indirect effects will help to estimate the actual contribution of an attribute and its influence through other characters. In breeding programs designed to increase the crop yield potential an understanding of the inheritance mode of the yield components, the correlations among them and the relationship between the components and yield is necessary for a better selection of breeding procedures for developing high-yielding varieties (Rahman *et al*., 2015).

Keeping this in view, the present investigation was undertaken to have knowledge on yield contributing characters which can be kept as the selection criteria and to understand the association of grain yield with yield contributing traits to determine the inter-correlation between the traits at the genotypic level, showing the extent of direct and indirect effects of various biometrical traits on grain yield.

Materials and Methods

Fifty inbred lines of maize at advanced stage of selection were evaluated during *Kharief* 2014 and 2015 in a randomized block design. Each entry was sown in two rows of four meters length with a spacing of 75 cm between rows and 20 cm between the plants in three replications containing twenty plants in each row. Five competitive plants were selected at random in each replication and biometrical observations like days to 50 per cent tasseling, days to 50 per cent silking, days to maturity, plant height (cm), ear height (cm), ear girth, number of kernel rows ear^{-1}, number of kernels row^{-1}, 100 grain weight (g) and grain yield plant^{-1} (g) were recorded. For days to 50 per cent tasseling, days to 50 per cent silking, days to maturity were recorded on plot basis. The mean values were used for statistical analysis. Data was analyzed in Windowstat version 9.1 and results were then correlated with other growth, yield components and yield parameters.

Results and Discussion

The data (table 1) revealed that genotypic correlations were slightly higher in magnitude than phenotypic ones. This indicated that though there was a strong inherent association between characters studied and its expression was lessened due to the influence of environment. But, there was a general agreement in both sign and magnitude between the estimates of genotypic and phenotypic correlations. This type of magnitudinal difference occurred due to conduction of experiment in one location/ season only, where genotype × environment (G × E) component was not included.

The grain yield plant^{-1} was positively correlated with 100-seed weight, ear girth, ear length, number of kernels row^{-1}, plant height, number of kernel rows ear^{-1} and ear height. These observations are in conformity with the findings of 100-seed weight (Kumar *et al.*, 2006 and Pavan*et al*., 2011), ear girth (Raghu *et al*., 2011), ear length (Reddy *et al*., 2013), number of kernels per row (Sadek*et al*., 2006), plant height (Jayakumar *et al*., 2007), number of kernel rows per ear (Ravi *et al*., 2012) and ear height. Few characters *viz.*, days to 50 per cent tasseling, days to 50 per cent silking and days to maturity were negatively correlated with grain yield plant^{-1} and are similar to the results reported by Pavan *et al.* (2011).

Inter correlation among yield components (table 1) revealed that days to 50 per cent tasseling was significantly and positively correlated with days to 50 percent silking, days to maturity and ear height. Similarly for days to 50 per cent silking, the days to maturity and ear height exhibited significant positive correlation. Whereas days to maturity was negatively correlated with plant height, ear girth, ear length, number of kernel rows ear^{-1}, number of kernels row^{-1}, 100-seed weight and grain yield plant^{-1}, while the plant and ear height were positively correlated with ear girth, ear length, number of kernel rows ear^{-1}, number of kernels row^{-1}, 100-seed weight, and grain yield plant^{-1}. Ear girth and ear length was positively correlated with number of kernel rows per ear, number of kernels per row, 100-seed weight and grain yield plant^{-1}. Whereas the number of kernels row^{-1} and 100-seed weight were positively correlated with grain yield plant^{-1}.

Ear girth exhibited highest positive correlation with grain yield plant^{-1} followed by ear length, plant height, ear height, number of kernels row^{-1} and 100 grain weight. Similar findings were reported by Reddy *et al.* (2013). All possible correlations among the characters were significant and positive except days to 50 per cent tasseling and days to 50 per cent silking. Phenotypic and genotypic residual effects were 0.5547 and 0.3302 respectively indicating that some characters which had due weightage in selection for yield improvement are to be included.

Conclusion

To conclude, the investigation clearly indicated that direct selection for ear girth, 100 grain weight, number of kernels row^{-1} and indirect selection of plant height, ear girth, number of kernel rows ear^{-1} through other characters are highly rewarding. In the view of negative correlation observed between grain yield plant^{-1} and days to 50% tasseling, days to 50% silking and days to maturity, these characters should be considered for reliable results for getting higher yield in maize in addition to yield contributing traits hence suggesting selection of early maturity genotypes.

Table 1 : Phenotypic (P) and Genotypic (G) correlation coefficient analysis of yield and yield contributing characters in maize (Pooled).

Characters		Days to 50% tasseling	Days to 50% silking	Days to maturity	Plant height (cm)	Ear height (cm)	Cob length (cm)	Cob girth (cm)	No. of kernel rows/ear	No. of kernels/ row	100 grain weight (g)	Grain yield /plant (g)
Days to 50% tasseling	P=	1.00	0.80**	0.50**	-0.06	0.13	-0.07	-0.13	-0.09	-0.24**	-0.11	-0.24**
	G=	1.00	0.93**	0.57**	-0.03	0.18*	-0.11	-0.22**	-0.12	-0.32**	-0.12	-0.29**
Days to 50% silking	P=		1.00	0.39**	0.01	0.18*	-0.03	-0.08	-0.06	-0.23**	-0.03	-0.18*
	G=		1.00	0.47**	0.03	0.25**	-0.06	-0.17	-0.06	-0.23**	0.01	-0.21**
Days to maturity	P=			1.00	0.08	0.12	0.07	-0.04	-0.06	-0.08	-0.01	-0.12
	G=			1.00	0.08	0.13	0.07	-0.03	-0.02	-0.10	-0.03	-0.12
Plant height (cm)	P=				1.00	0.87**	0.67**	0.65**	0.27**	0.54**	0.47**	0.65**
	G=				1.00	0.90**	0.81**	0.83**	0.37**	0.66**	0.58**	0.71**
Ear height (cm)	P=					1.00	0.58**	0.62**	0.29**	0.46**	0.48**	0.59*
	G=					1.00	0.73**	0.80**	0.44**	0.60**	0.58**	0.65**
Cob length (cm)	P=						1.00	0.72**	0.35**	0.71**	0.42**	0.64**
	G=						1.00	0.75**	0.44**	0.80**	0.54**	0.73**
Cob girth (cm)	P=							1.00	0.45**	0.57**	0.44**	0.72**
	G=							1.00	0.51**	0.69**	0.54**	0.85**
No of kernel rows/ear	P=								1.00	0.37**	0.03	0.37**
	G=								1.00	0.46**	0.04	0.42**
No of kernels/row	P=									1.00	0.28**	0.63**
	G=									1.00	0.41**	0.76**
100 grain weight (g)	P=										1.00	0.56**
	G=										1.00	0.66**
Grain yield/plant (g)	P=											1.00
	G=											1.00

*Significant at 5 per cent level, ** Significant at 1 per cent level.
P represents Phenotypic correlation coefficient, **G** represents Genotypic correlation coefficient.

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