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CORRELATION STUDIES IN MAIZE (*ZEA MAYS* L.) FOR YIELD AND OTHER YIELD ATTRIBUTING CHARACTERS

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ABSTRACT
An experimental study was conducted to evaluate the relationship between yield and its components in maize through correlation studies. Yield being a complex character is governed by a large number of genes. The influence of each character on yield could be known through correlation studies with a view to determine the extent and nature of relationships prevailing among yield and yield attributing characters. From the present investigation, it is inferred that characters *viz*., cob length with husk, cob length without husk, leaf width, ear height, plant height and tassel length are highly significant and positively correlated with grain yield per plant at genotypic and phenotypic levels. These traits contributed maximum to higher grain yield compared to other characters, thus, selection for these characters helps in selection of superior cross combinations for improvement of yield.

KEYWORDS: Correlation, Characters, Yield, *Zea mays* L.

INTRODUCTION

Maize (*Zea mays* L.) is the third most important cereal in India after rice and wheat that provides food, feed, fodder, fuel and serves as a source of basic raw material for a number of industrial products *viz*., starch, oil, protein, alcoholic beverages, food sweeteners, cosmetics and biofuel *etc*. It is grown from latitude 58N to 40S, from sea level to higher than 3000 m altitude and in areas receiving yearly rainfall of 250 to 5000 mm (Downsell *et al*., 1996). It is a crop of wider adaptability to varied agro-ecologies grown from sea level to an altitude of more than 3000 meters that serves as one of the driving force for crop diversification. India had produced only 15.5million tonnes maize in 2015-16 *Kharif* season, down from 17.01 million tonnes a year ago, according to the farm ministry data. India's *Kharif* maize acreage was at 1.15million hectares as of 23rd June 2016, down 12% from a year-ago level, according to data from the agriculture ministry. It is used as an important raw material in food processing, feed industry and in various other industrial applications. In the last few years, maize is increasingly being used for feed consumption. Thereby, assuming almost steady demand and reasonable price, the total maize consumption for 2016-17 for feed is likely to rise to 13000 thousand metric tonnes compared to 2015-16 estimated consumption of 12700 thousand metric tonnes. Yield being a complex character is governed by a large number of genes. The influence of each character on yield could be known through correlation studies with a view to determine the extent and nature of relationships prevailing among yield and yield attributing characters. In general, genotypic correlation was higher than phenotypic correlation indicating a low influence of environmental factors and relative stability of the genotypes (Bhole and Patil, 1984). Improvement in yield and quality of crop is the primary objective of a plant breeder.

MATERIALS & METHODS

Experimental Material

The experimental materials consisted of 30 accessions of maize (*Zea mays* L.) obtained from the my supervisor Prof. Rajesh Singh, Maize Breeder in Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi.

Experimental design and land preparation

The experiment was laid out in randomized block design. The field was divided into three homogeneous replication blocks. Thirty genotypes were randomly planted in three replications. Each entry was represented by a double row of 4 m length spaced at 75cm between the rows and 20 cm between the plants within the rows. A uniform piece of land was selected for laying out the experiment. The land was brought to the fine tilth by ploughing and harrowing.

Observations

Observations on following twelve characters were recorded on five randomly selected plants from each plot in each replication. These plants were tagged before tasseling. The data were recorded on plant height (cm), days to 50% tasselling, days to 50% silking, days to 75% brown husk , ear height (cm), leaf width (cm), tassel length (cm), cob length with husk (cm), cob length without husk (cm), cob diameter (cm), 100 seed weight (g), and grain yield per plant (g).

Statistical Analysis

Correlation

To understand the association among the characters, genotypic and phenotypic correlations coefficient were worked out by adopting method described by Singh and Chaudhary (1977).

Phenotypic correlation coefficient

$$r_p = \text{Covariance X, Y}/\sqrt{\text{variance X . Variance Y}}$$

Where, r_p = phenotypic correlation between character X and Y

Genotypic correlation coefficient

$$r_g = \text{covariance X,Y}/\sqrt{\text{variance X . Variance Y}}$$

Where, r_g = genotypic correlation between character X and Y.

Significance of correlation coefficient was tested by't' test (Panse and Sukhatme, 1967).

RESULTS & DISCUSSION

The phenotypic and genotypic correlation coefficients were worked out for twelve characters in thirty maize genotypes and the data is presented in Table1 and Table 2 respectively.

TABLE 1: Estimates of Genotypic Correlation co-efficient between yield and its related trait in thirty genotypes of maize

Characters	PH	DTT	DTS	DBH	EH	LW	TL	CLWH	CLWOH	CD	100 SW	GY
PH	1.000	0.204	0.153	0.260*	1.009**	0.585**	0.296**	0.290**	0.245*	0.303**	0.006	0.485**
DTT		1.000	1.105	1.367**	0.141	0.515**	0.332**	0.112	0.265*	-0.144	-0.383**	0.781**
DTS			1.000	1.139**	0.144	0.290**	0.323**	0.246*	0.501**	0.108	-0.036	0.817**
DBH				1.000	0.206	0.285**	0.112	0.077	0.518**	0.073	-0.175	0.706**
EH					1.000	0.606**	0.260*	0.325**	0.223*	0.379**	0.041	0.530**
LW						1.000	0.391**	0.107	0.060	-0.033	0.099	0.552**
TL							1.000	-0.019	0.031	-0.386**	0.603**	0.365**
CLWH								1.000	1.719**	-0.258*	0.928**	0.883**
CLWOH									1.000	-0.135	0.675**	0.717**
CD										1.000	0.054	0.219*
100 SW											1.000	0.430**

*and ** Significant at 5% and 1% level of significance, respectively. Where, PH (cm) = plant height, DTT (50%) = days to 50% tasseling, DTS(50%) = days to 50% silking, DBH(75%) =days to 75% brown husk, EH(cm) = ear height, LW(cm) = leaf width, TL(cm)= Tassel Length CLWH(cm) = cob length with husk, CLWOH(cm) =cob length without husk, CD(cm) = cob diameter, 100 SW(g) =100 seed weight, GY = grain yield per plant.

TABLE 2: Estimates of Phenotypic Correlation co-efficient between yield and its related trait in thirty genotypes of maize

Characters	PH	DTT	DTS	DBH	EH	LW	TL	CLWH	CLWOH	CD	100 SW	GY
PH	1.000	0.032	0.035	0.115	0.927**	0.516**	0.159	0.162	0.133	0.121	0.041	0.289**
DTT		1.000	0.864**	0.760**	0.064	0.142	-0.050	-0.018	0.086	0.080	-0.120	0.169
DTS			1.000	0.874**	0.036	0.142	-0.003	0.057	0.102	0.113	-0.139	0.164
DBH				1.000	0.114	0.179	-0.014	0.179	0.102	0.117	-0.143	0.261*
EH					1.000	0.507**	0.110	0.146	0.158	0.224*	0.046	0.275**
LW						1.000	0.222*	0.063	0.089	-0.010	0.044	0.326**
TL							1.000	0.140	0.024	0.071	0.120	0.302**
CLWH								1.000	0.473**	0.169	0.331**	0.347**
CLWOH									1.000	0.004	0.349**	0.350**
CD										1.000	-0.085	0.111
100 SW											1.000	0.216*

*and ** Significant at 5% and 1% level of significance, respectively. Where, PH (cm) = plant height, DTT (50%) = days to 50% tasseling, DTS(50%) = days to 50% silking, DBH(75%) =days to 75% brown husk, EH(cm) = ear height, LW(cm) = leaf width, TL(cm)= Tassel Length CLWH(cm) = cob length with husk, CLWOH(cm) =cob length without husk, CD(cm) = cob diameter, 100 SW(g) =100 seed weight, GY = grain yield per plant.

Correlation between yield and its components

In the present study, genotypic and phenotypic correlation among the twelve characters of maize genotypes was computed. Grain yield per plant exhibited high significant positive association with cob length with husk (0.883 G, 0.347 P), cob length without husk (0.717 G, 0.350 P), leaf width (0.552 G, 0.326 P), ear height (0.530 G, 0.275 P), plant height (0.485 G, 0.289 P) and tassel length (0.365 G, 0.302 P) indicating the importance of these traits in selection for yield. Similar results were reported earlier in maize by several workers on different characters *viz*., for the association of grain yield with plant height (Malik *et al*., 2005; Sadek *et al*., 2006, ear height (Kumar and Satyanarayana, 2001), ear length (Bhole and Patil, 1984; Umakanth and Sunil, 2000; Kumar and Satyanarayana, 2001; Choudhary and Chaudary, 2002; Mohan *et al*., 2002) and 100 grain weight (Umakanth and Sunil, 2000; Kumar and Satyanarayana, 2001; Mohan *et al*., 2002).

Association among the yield components

At this point, it is intended to consider issues concerning the significant inter relationships among the characters other than grain yield per plant which might aid in understanding an idea of plant type. Plant height had the highly significant positive correlation with ear height (1.009 G, 0.927 P), leaf width (0.585 G, 0.516 P) and grain yield per plant (0.485 G, 0.289 P). Similar observations were reported by Bhole and Patil (1984). Days to 50 per cent tasseling had high significant positive correlation with days to 75 per cent brown husk (1.367 G, 0.760 P) and days to 50 per cent silking (1.105 G, 0.864 P). Days to 50 per cent silking had positive and significant correlation with days to 75 per cent brown husk at both phenotypic and genotypic level. Ear height showed high positive and significant correlation with leaf width (0.606 G, 0.507 P) and grain yield per plant (0.530 G, 0.275 P) these were in agreement with the findings of Kumar and Satyanarayana (2001), Farzana Jabeen (2005), Tan *et al*. (2006) and Sofi and Rather (2007). Leaf width (0.552 G, 0.326 P) and tassel length (0.365 G, 0.302 P) showed highly significant and positively correlation with grain yield per plant. Grain yield per plant exhibited highly significant correlation in positive direction with tassel

length (0.365 G, 0.302 P). Cob length with husk and cob length without husk showed highly significant and positive correlation with 100 seed weight at genotypic and phenotypic level.

CONCLUSION

Based on the findings in this study, we concluded that characters *viz*., cob length with husk, cob length without husk, leaf width, ear height, plant height and tassel length are highly correlated with grain yield per plant and need to be considered for selection. The conclusions revealed that there is scope for simultaneous improvement of these traits through selection.

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