Internat. J. Agric. Sci. Vol.3 No.2 June, 2007 : 57-60

Correlation studies in maize (*Zea mays* L.) evaluated for grain yield and other yield attributes

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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 is the foremost consideration in the breeding of any crop. Since the yield depends upon many yield contributing characters, it becomes essential to study the contribution of each character to the yield. Correlation is an important in estimating the relative importance of various characters on grain yield. From this studies, Ear girth recorded significant and highest positive correlation on grain yield followed by kernel rows, grains per row, grain weight, ear length, shelling percentage and crude protein. Plant height was significantly and positively correlated with grain yield. Days to maturity, days to silking and days to tasselling were negatively and significantly correlated with grain yield. These characters were significantly and positively inter correlated among the yield components. Hence ear girth, kernel rows, grains per row, grain weight and ear length should be given more importance while formulating selection indices for grain yield improvement in maize.

Key words : Correlation, Grain yield, Maize, *Zea mays* L.

INTRODUCTION

Maize (*Zea mays* L.) occupies a prominent position in global agriculture and is an important cereal crop of India. Maize is used as human food, animal feed and industrial raw materials and also used as source for more number of industrial products. Grain yield in maize is a complex characters controlled by many factors. Selection for desirable genotypes should be made based on grain yield and also other yield component characters which influence the yield. Studies on correlation coefficients of different plant characters are useful criterion to identify desirable traits that contribute to improve the dependent variable. Correlation coefficient is one of the important biometrical tools for formulating a selection index as it reveals the strength of relationship among the group of characters. This also helps to decide the dependability of the characters that have little or no importance. The relationship of a character with yield and other component characters could also be useful for the proper choice of parents for hybridization programme. Yield being a complex character, direct selection could be an efficient approach without knowing its genetic background (Roy *et al.*, 1995). Grain yield is also one of the such dependent trait, which is influenced by many independent characters. The present study was conducted to assess the genetic relationships among yield components, through association analysis for enhancing the usefulness of selection for grain yield improvement in maize.

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MATERIALS AND METHODS

The experimental material for the study was undertaken at Agricultural College and Research Institute, Tamil Nadu Agricultural University, Killikulam during February 2004. Individual seven lines *viz*., UMI 82, UMI 112, UMI 123, UMI 124, UMI 154, UMI 176 and UMI 198 and seven testers viz., UMI 203, UMI 208, UMI 213, UMI 221, UMI 228, UMI 246 and UMI 303 obtained from Millet Breeding Station (MBS), Tamil Nadu Agricultural University, Coimbatore. These were crossed in a Line x Tester model of mating design was followed in which all the seven lines were crossed with each of the seven testers and a total of fourty nine cross combinations were obtained. The hybrid seeds were utilized for raising the F_1's along with the parents and one check variety (CO 1) were raised in a Randomized Block Design (RBD) with three replications during July 2004 under irrigated condition. Each genotype was planted in one row plots of four meter length adopting spacing of 60 x 20 cm for varieties and 60 x 30 cm for hybrids. All the recommended agronomic practices were followed throughout the cropping period.Observations were recorded from five randomly selected plants in each treatment, all the three replications for fourteen characters *viz*., days to tasselling, days to silking, plant height (cm), leaves above uppermost ear (no), days to maturity, ear length (cm), ear girth (cm), kernel rows (no), grains per row (no), grain weight (g), grain yield (g), shelling percentage and biochemical characters like crude protein

Table 1 : Genotypic correlation coefficients between different traits

Traits	Days to tasselling	Days to silking	Plant height (cm)	Leaves above upper most ear (no)	Days to maturity	Ear length (cm)	Ear girth (cm)	Kernel rows (no)	Grains per row (no)	Grain weight (g)	Shelling percentage	Crude protein (%)	Total sugars (mg / 100g)	Grain yield (g)
Days to tasselling	1.000	0.920**	-0.085	0.018	0.394**	-0.273*	-0.255*	-0.251*	-0.246	-0.247	-0.093	0.090	-0.187	-0.255*
Days to silking		1.000	0.057	-0.110	0.328**	-0.271*	-0.269*	-0.278*	-0.247	-0.224	-0.117	0.028	-0.123	-0.275*
Plant height (cm)			1.000	0.145	-0.378**	0.289*	0.280*	0.277*	0.302*	0.325*	0.137	0.395**	0.396**	0.306*
Leaves above uppermost ear (no)				1.000	-0.166	0.202	0.200	0.249	0.206	0.143	0.168	0.461**	0.153	0.206
Days to maturity					1.000	-0.368**	-0.301*	-0.270*	0.252*	-0.291*	-0.147	-0.296*	-0.123	-0.304*
Ear length (cm)						1.000	0.938**	0.946**	0.908**	0.906**	0.486**	0.398**	0.117	0.954**
Ear girth (cm)							1.000	0.978**	0.963**	0.939**	0.479**	0.416**	0.138	0.980**
Kernel rows (no)								1.000	0.970**	0.943**	0.497**	0.411**	0.167	0.978**
Grains per row (no)									1.000	0.978**	0.490**	0.430**	0.165	0.978**
Grain weight (g)										1.000	0.510**	0.348**	0.127	0.962**
Shelling percentage											1.000	0.184	0.117	0.492**
Crude protein (%)												1.000	0.264*	0.415**
Total sugars (mg/100g)													1.000	0.168

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

(%) was estimated by the Micro-Kjeldhal method (Humpries, 1956) and total sugars (mg/100g) was estimated by the Anthrone reagent method (Hedge and Hofreiter, 1962). The correlation coefficient was worked out to find out the relationship between yield and its components in the parents and their hybrids. The correlation coefficients were calculated using the method given by Al-Jibouri *et al*. (1958).

RESULTS AND DISCUSSION

The genotypic correlation coefficients between yield and its component characters besides the inter-correlation coefficients among the component characters are presented in Table 1. Grain yield exhibited the highest significant positive correlation with ear girth (0.980) followed by kernel rows (0.978), grains per row (0.978), grain weight (0.962), ear length (0.954), shelling percentage (0.492) and crude protein (0.415). Similar reports of ear girth, kernel rows, grains per row, grain weight and ear length positively correlated with grain yield were reported by Jadhav *et al*. (1995) and Venugopal e*t al.* (2003). Annapurna *et al.* (1998) also suggested ear girth, kernel rows, grains per row and grain weight were positively associated with grain yield. Ear girth, kernel rows, ear length and shelling percentage positively correlated with grain yield were reported by Gautam e*t al.* (1999). Liu (1997) and Mohammad-Basheeruddin *et al*. (1999) reported that crude protein had significant positive correlation with grain yield. Plant height (0.306) was significantly and positively associated with grain yield which was already reported by Umakanth and Khan (2001) and Venkatesh *et al*. (2003). Days to maturity (-0.304), days to silking

(-0.275) and days to tasselling (-0.255) were negatively and significantly correlated with grain yield. Ramanadane e*t al.* (2000) and Venugopal e*t al.* (2003) reported that days to tasseling and days to silking were negatively and significantly associated with grain yield.

Studies on inter correlation among yield components, Ear girth had a significant positive correlation with kernel rows followed by grains per row, grain weight, shelling percentage and crude protein and significant negative correlation with days to maturity. Kernel rows exhibited significant positive association with grains per row followed by grain weight, shelling percentage and crude protein and significant negative association with days to maturity. Grains per row had a significant positive association with grain weight followed by shelling percentage and crude protein and significant negative correlation with days to maturity. Grain weight exhibited significant positive association with shelling percentage followed by crude protein and significant negative association with days to maturity.

Ear length exhibited significant positive association with kernel rows followed by ear girth, grains per row, grain weight, shelling percentage and crude protein and significant negative correlation with days to maturity. Manivannan (1998) reported that the characters ear girth, kernel rows, grains per row and ear length were inter correlated. Shelling percentage was positively associated with crude protein followed by total sugars and negatively associated with days to maturity. Crude protein had a significant positive association with total sugars. Plant height showed positive significant correlation with total sugars followed by crude protein, grain weight, grains per row, ear length, ear girth, kernel rows and significant negative association with days to maturity.

Negative association among some components *viz*., days to tasselling, days to silking and days to maturity was also obvious in this study. It is difficult to exercise simultaneous selection of negatively associated traits to develop a variety. Under such situations judicious selection programme must be formulated for simultaneous improvement of such traits. Days to maturity had a significant negative association with crude protein. The days to silking exhibited significant positive correlation with days to maturity and significant negative correlation with kernel rows followed by ear length and ear girth. Days to tasselling showed significant positive association with days to silking followed by days to maturity and significant negative association with ear length followed by ear girth and kernel rows. Umakanth e*t al.* (2000) reported days to silking recorded significant negative correlation with ear girth. From the foregoing discussion, it can be concluded that the characters *viz*., ear girth, kernel rows, grains per row, grain weight, ear length, shelling percentage and crude protein had significant positive association with grain yield and hence these characters can be used as a selection programme for grain yield improvement in maize.

From results of correlation studies provides a measure of association between the characters and reveals the character that might be useful as an index for selection. This study concluded that ear girth, kernel rows, grains per row, grain weight, ear length, shelling percentage and crude protein had significant positive association with grain yield. Hence, these characters can be used as a selection index for improving grain yield in maize. These findings would be of great help to the breeders for improving the inbreds of maize, which can further be used in synthesizing the high yielding single cross hybrids.

ACKNOWLEDGEMENT

The authors thank Dr. S. Chidambaram, Professor, Department of Plant Breeding and Genetics, Dr. B. Uthayakumar, Professor, Department of Agronomy and Dr. S. Krishnaveni, Professor, Department of Biochemistry, Agricultural College and Research Institute, Killikulam for their guidance and suggestion during the research programme.

REFERENCES

AI-Jibouri, H.A., Miller, P.A. and Robinson, H.F. (1958). Genotypic and environment variances and covariances in upland cotton cross of inter-specific origin. *Agron. J.,* **50**: 633-637.

Annapurna, D., Khan, H.A. and Mohammad, S. (1998). Genotypic-phenotypic correlation and path co-efficient analysis between seed yield and other associated characters in tall genotypes of maize. *Crop Res.,* **16(2):** 205-209.

Gautam, A.S., Mittal, R.K. and Bhandari, J.C. (1999). Correlation and path coefficient analysis in maize (*Zea mays* L.). *Ann. Agric. Bio. Res.,* **4(2):** 169-171.

Hedge, J.E. and Hofreiter, B.T. (1962). In : *Carbohydrate chemistry* : p. 17.

Jadhav, B.S., Bhosale, A.S. and Patil, B.R. (1995). Correlation studies in irrigated rabi maize. *J. Maharastra Agric. Univ.,* **20(1):** 94-96.

Liu, Z. (1997). Correlation studies among kernel physical and quality characters in quality protein maize. *Maize Genetics Co-operation Newsletter,* **71**: 41.

Manivannan, N. (1998). Character association and component analysis in maize. *Madras Agric. J.,* **85**(5, 6): 293-294.

Mohammad Basheeruddin, M., Reddy, M.B. and Mohammad, S. (1999). Correlation coefficient and path analysis of component characters as influenced by the environments in forage maize. *Crop Res.,* **17(1):** 85-89.

Ramanadane, T., Krishnasamy, V., Ramamoorthi, N. and Thirumeni, S. (2000). Effects of seed ageing on association between yield and its components in maize (*Zea mays* L.) hybrids. *Madras Agric. J.,* **87(1-3):** 61-66.

Roy, A., Panwar, D.V.S. and Sarma, R.N. (1995). Genetic variability and causal relationships in rice. *Madras Agric. J.,* **82(4):** 251-255.

Umakanth, A.V. and Khan, H.A. (2001). Correlation and path analysis of grain yield and yield components in maize (*Zea mays* L.). *J. Res. ANGRAU,* **29(2/3):** 87-90.

Umakanth, A.V., Satyanarayana, E. and Nagesh Kumar, M.V. (2000). Correlation and heritability studies in ashwini maize composite. *Ann. Agric. Res.,* **21(3):** 328-330.

Venkatesh, S., Sekhar, J.C. and Lavakumar Reddy, M. (2003). Indigenous and exotic inbred testers to delineate performance of elite maize lines. *J. Res. ANGRAU,* **31(3):** 20-27.

Venugopal, M., Ansari, N.A. and Rajanikanth, T. (2003). Correlation and path analysis in maize (*Zea mays* L.). *Crop Res.,* **25(3):** 525-529.

Received : May, 2006; Accepted : January, 2007