



ESTIMATE OF GENETIC FACTORS AND CORRELATION ANALYSIS IN MAIZE (*ZEAMAYS* L.)

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Abstract

Healthy seeds of 20 maize inbred lines were sown at experimental field of C.S.A.U.A.T., Kanpur in randomized complete block design (RCBD) with two replications under all standard agronomical practices. The objective of this study was to determine correlation between grain yield and other important agronomic traits. The genetic factor like range, mean, standard error, variance, standard deviation and correlation coefficient were estimated among 7 agronomic traits. Among 20 inbred lines of maize, plant height, ear height, leaf width, leaf length, number of leaves per plant, number of kernels per row and grain yield ranged from 133.2-180.5 cm, 73.8-105.1 cm, 6.5-10.8 cm, 60.8-90.6 cm, 9.35-14.15, 20.2-32.5 and 1.9-9.62 Mg/ha, respectively. Plant height, ear height, leaf length, leaves per plant and kernels per row correlated highly significant positive with grain yield. Hence, each morphological trait can be considered for the enhancement of grain yield in maize breeding programs.

Key words : Maize, agronomic trait, correlation coefficients, variance, standard deviation.

Introduction

Maize is one of the most important grown plants in the world. Major maize growing countries are USA, China, Brazil, Mexico, France, Argentina, Italy and India. Maize is a rich source of starch (70-75%), protein (8-10%), oil (4-5%), fat (3-5%) and minerals (1-2%). It plays an important role in the world economy and is valuable ingredient in manufactured items that affect a large proportion of the world population (Alvi *et al.*, 2003). Grain yield is a complex quantitative trait that depends on a number of factors. Thus, knowledge of relationship between grain yield and its contributing components will improve the efficiency of breeding programs through the use of appropriate selection indices (Mohammadi *et al.*, 2003).

Maize is a most versatile and very high potential crop of Poaceae family having diploid chromosome. It is one of the main cereal crops with the wide adaptability. In India, maize is the third most important cereal after rice and wheat that provides food, feed, fodder and serves as a source of basic raw material for the number of industrial products, *viz.* starch, oil, protein, alcoholic beverages, food sweeteners, cosmetics, bio-fuel, etc. The objective of this study was to determine correlation between grain yield

and other important agronomic traits of maize inbred lines for future use in breeding programs.

Materials and Methods

Seeds of 20 inbred lines of maize were obtained from Department of Genetics and Plant Breeding, C.S.A. University of Agriculture & Technology, Kanpur (U.P.), India (table 1). The experimental material was sown at experimental field of C.S.A.U.A.T., Kanpur (U.P.), India. Healthy seeds of maize inbred lines were sown in experimental field in randomized complete block design (RCBD) with two replications under all standard agronomical practices and observations were taken for two seasons *viz.*, 2009-10 and 2010-11. Measurements and observations for various agronomic traits like plant height (cm), ear height (cm), leaf width (cm), leaf length (cm), number of leaves per plant, number of kernel per row and grain yield (Mg/ha) were recorded on 10 competitive plant basis in the middle of each block for each inbred lines under field condition as per standard procedure.

Agronomic data of ten plants for each inbred lines were recorded for the different traits as follow :

1. **Plant height (cm)** - The total height of a plant from ground level to the base of the tassel was measured

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after milk stage.

2. **Ear height (cm)** - The total height of an ear from ground level to the node bearing the uppermost ear was measured after milk stage.
3. **Leaf width (cm)** - The total width of a leaf was measured on the same leaf as leaf length from mid-way along its length.
4. **Leaf length (cm)** - The total length of a leaf from ligule to apex was measured after flowering.
5. **Leaves per plant** - Counted on at least 10 representative plants after milk stage.
6. **Kernels per row** - Number of kernel per row in the central part of the uppermost ear of taken plants were counted and averaged to per plant.
7. **Grain yield (Mg/ha)** - The average yield of the plants was recorded after threshing.

Table 1 : List of inbred lines of maize (*Zea mays* L.).

S. no.	Inbred line	S. no.	Inbred line
1.	TSK-7	11.	TSK-41
2.	TSK-9	12.	TSK-43
3.	TSK-11	13.	TSK-45
4.	TSK-14	14.	TSK-48
5.	TSK-16	15.	TSK-49
6.	TSK-22	16.	CIM-7242-67
7.	TSK-33	17.	CIM-7242-149
8.	TSK-34	18.	CIM-130
9.	TSK-36	19.	CIM-127
10.	TSK-39	20.	CIM-104

Finally, two years (2009-10 and 2010-11) pooled agronomic data for plant height (cm), ear height (cm), leaf width (cm), leaf length (cm), number of leaves per plant, number of kernels per row and grain yield (Mg/ha) were analyzed using simple statistics to calculate the genetic parameters like range, mean, standard error, variance and standard deviation for quantitative traits and to calculate the correlation coefficient among 7 agronomic

Table 2 : Range, mean, standard error, variance and standard deviation for 7 agronomic traits in 20 maize lines.

Traits	Range		Mean	Std. error	Variance	Stand. dev
	Minimum	Maximum				
Plant height (cm)	133.20	180.50	161.66	3.87	299.65	17.31
Ear height (cm)	73.80	105.10	88.84	2.01	80.48	8.97
Leaf width (cm)	6.50	10.80	8.77	0.28	1.59	1.26
Leaf length (cm)	60.80	90.60	81.88	2.05	84.01	9.17
No of leaves/plant	9.35	14.15	11.87	0.36	2.53	1.59
No of kernels/row	20.20	32.50	26.34	0.87	15.08	3.88
Grain yield (Mg/ha)	1.90	9.62	6.79	0.58	6.75	2.60

traits of the 20 maize inbred lines using statistical package PAST (Version 2.03).

Results and Discussion

Agronomic traits and their mean performance

The mean performance and range for 7 agronomic traits of maize inbred lines is presented in table 2. Plant height of 20 maize inbred lines ranged from 133.2 cm (TSK-9) to 180.5 cm (TSK-41) and the mean was 161.66 cm. Ear height ranged from 73.8 cm (CIM-104) to 105.1 cm (TSK-41) and the mean was 88.84 cm. Leaf width varied from 6.5 cm (TSK-49) to 10.8 cm (TSK-36) and the mean was 8.77 cm. Leaf length of 20 inbred lines of maize ranged from 60.8 cm (CIM-130) to 90.6 cm (TSK-41) and the mean was 81.88 cm. The number of leaves per plant ranged from 9.35 (TSK-16) to 14.15 (TSK-41) and the mean was 11.87 leaves per plant. Among the 20 maize inbred lines, the minimum and maximum number

Table 3: Correlation coefficients among 7 agronomic traits in 20 inbred line of maize

Traits	PH	EH	LW	LL	LP	KR	GY
PH	1.000						
EH	0.709**	1.000					
LW	0.315	0.469*	1.000				
LL	0.800**	0.510*	0.212	1.000			
LP	0.959**	0.670**	0.259	0.723**	1.000		
KR	0.689**	0.514*	-0.094	0.712**	0.705**	1.000	
GY	0.894**	0.673**	0.335	0.825**	0.822**	0.730**	1.000

PH = Plant height, EH = Ear height, LW = Leaf width, LL = Leaf length, LP = Leaves per plant, KR = Kernels per row, GY = Grain yield. * = Significant at 5% level; ** = Significant at 1% level.

of kernel per row was recorded in TSK-9 (20.2 kernel per row) and TSK-14 (32.5 kernel per row), respectively and mean was 26.34 kernel per row. The highest grain yield of 9.62 Mg/ha was obtained in TSK-41 and the lowest was 1.9 Mg/ha in TSK-9. The mean of grain yield was 6.79 Mg/ha.

Among 20 maize inbred lines, TSK-41 showed maximum values for plant height, ear height, leaf length, number of leaves per plant and grain yield. TSK-9 showed minimum values for plant height, number of kernels per row and grain yield.

Correlation coefficient analysis

Correlation coefficient at phenotypic level among 7 agronomic traits in 20 inbred lines of maize is presented in table 3. Grain yield showed positive phenotypic correlation with plant height (0.894**), ear height (0.673**), leaf width (0.335), leaf length (0.825**), number of leaves per plant (0.822**) and number of kernels per row (0.730**).

Plant height showed positive and highly significant correlation with ear length (0.709**), leaf length (0.800**), number of leaves per plant (0.959**), number of kernels per row (0.689**) and grain yield (0.894**). Ear height showed positive significantly correlation with plant height (0.709**), leaf width (0.469*), leaf length (0.510*), number of leaves per plant (0.670**), number of kernels per row (0.514*) and grain yield (0.673**).

Leaf width showed positive significant correlation with only ear height (0.469*), while leaf length showed positive highly significant correlation with plant height (0.800**), number of leaves per plant (0.723**), number of kernels per row (0.712**) and grain yield (0.825**). Leaves per plant showed positive highly significant correlation with plant height (0.959**), ear height (0.670**), leaf length (0.723**), kernels per row (0.705**) and grain yield (0.822**).

Kernels per row showed positive highly significant correlation with plant height (0.689**), leaf length (0.712**), leaves per plant (0.705**) and grain yield (0.730**) but negative correlated with leaf width (-0.094).

Correlation coefficients of grain yield and its components estimated in this study indicated that most of the traits studied in the present investigation were positively and significantly correlated with yield. Our results are similarly to the findings of Alvi *et al.* (2003), Sumathi *et al.* (2005), Akbar *et al.* (2008), Bocanski *et al.* (2009), Sreckov *et al.* (2007, 2010), Zarei *et al.* (2012). Mohammadi *et al.* (2003) reported positive and strong correlation between ear length and grain yield. Siadaiah

et al. (2008) reported positive correlation between plant height and 100-grain weight. Our results showed that all agronomic traits had positive and highly significant correlated with grain yield.

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