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Studies on genetic divergence among fifty indigenous Maize (*Zea mays* L.) Inbreds lines

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ABSTRACT

In the present experimental work, Fifty Indigenous inbred lines of Maize were evaluated for fourteen characters during Kharif 2018. To study the genetic divergence using Mahalanobis D^2 analysis, which revealed that the fifty indigenous inbred lines were grouped into six distinct clusters indicating the presence of diversity. The maximum intra cluster distance was recorded within cluster II, while it was lowest for the genotype of cluster I. The maximum inter cluster distance was observed between clusters IV and VI and the minimum inter cluster distance was observed between cluster IV and V. Parental material selection from these clusters would give high manifestation of heterosis as well as wide spectrum of variation when they are hybridized.

Key words: *Genetic diversity, D^2, Cluster*

Introduction

Inbred lines are the prerequisite for hybrid variety development in crop plants. For developing high yielding hybrids in maize, inbred lines need to be developed and evaluated for their diverged gene pool. The genetic diversity between the genotypes is important as the genetically diverged parents are able to produce high heterotic effects (Falconer, 1960).

It has become possible to quantify magnitude of genetic diversity among germplasm with the help of advanced biometrical methods such as multivariate analysis (Rao, 1952) based on Mahalanobis' (1936) D2 statistics. The genetic diversity between the genotypes is important as the genetically diverged parents are able to produce high heterotic effects (Falconer, 1960).

Materials and Methods

This research work was carried out to analyze genetic diversity on fifty Indigenous Maize inbred lines by utilizing fourteen characters, which was conducted at Mathod, Shivamogga, and Karnataka during Kharif 2018. The crop was sown in Randomized Block Design with two replications with spacing of 60X 30cm and the standard agronomical package of practices followed to raise healthy crop. The experimental site which is geographically situated between 13° 27′ to 14° 39′ N latitude and 74° 37′ to 75° 52′ E longitude with an altitude of 650 m above the MSL. The place lying in Southern transition Zone (Zone-7).

The following Observation of fourteen characters viz., Germination %, Plant height (cm), Ear height (cm), Days to 50% tasseling, Days to 50% silking, Cob Length (cm), Cob width (cm), No. Rows per

cob, Grains/Row, Dehusk cob weight(g), Rind weight(g), Test Weight(g), Shelling %, Grain Yield per plant (g) were recorded.

Data were analysed using Mahalanobis (1936) D^2 statistic to assess the genetic divergence between populations. Intra-cluster and inter-cluster distance and cluster mean were estimated as showed by Singh and Chaudhary (1985). D^2 analysis was done by using the programme WINDOSTAT 9.2 software.

The diversity among fifty inbred lines was measured by employing D^2 statistic. The contribution of each character towards total genetic diversity is presented in Table 1. Fourteen characters studied, Ear height (38.04 *per cent*), Days to 50% tasseling (10.86 *per cent*) and Cob width (13.80 Grain yield per plant (9.31 *per cent*) , Cob length (7.51 *per cent*) contributed more towards divergence. Whereas, remaining traits contributed very little for divergence.

Table 1. Percent contribution towards genetic diversity in maize.

Sl. No.		Character Contribution %
1	Ear height (cm)	38.04
2	Days to 50% tasseling	10.86
3	Cob width (cm)	13.80
4	Grain yield per plant (g)	9.31
5	Cob length (cm)	7.51
6	Plant height (cm)	4.57
7	Dehusk cob weight (g)	4.33
8	Rind weight (g)	4.24
9	Germination %	3.02
10	Test weight (g)	2.45
11	Shelling %	0.90
12	Grains/row	0.49
13	Days to 50% silking	0.24
14	Number of rows per cob	0.24

Clustering of genotypes is presented in Table 2. All the genotypes were grouped into six clusters, indicating the presence of diversity for different traits, Similar results were showed by Singh *et al*., (2005) and Liu YuAi *et al*., (2006) Azad *et al*., (2012). The cluster III had highest number of genotypes (27) followed by cluster II (16), cluster I (4), cluster VI (1), cluster V and clusters VI.

Intra and inter cluster distance are given in Table 3. The maximum intra cluster distance was recorded within cluster II (33.97), while it was lowest for the genotype of cluster I (18.85).

The maximum inter cluster distance was observed between clusters IV and VI (199.77) followed by cluster I and VI (160.19), cluster V and VI (148.38) and clusters II and IV (135.01). These results suggest maximum divergence between genotype of cluster IV with genotypes of cluster VI indicating the fact that the genotypes found in one cluster differed entirely from the genotypes present in other cluster. The minimum inter cluster distance was observed between cluster IV and V (25.29) followed by cluster I and II (53.81), clusters III and V (63.18), III and VI (68.57). Similar results have also been reported by Singh *et al*., (2005) and Chen FaBo *et al*., (2007) Azad *et al*., (2012).

Variation observed for cluster means (Table 4). Mean values of Germination %, Plant height Days to 50% silking Cob width No. Rows per cob Grains/ Row and Rind weight were the highest in cluster V,; Ear height Days to 50% tasseling Cob Length Dehusk cob weight Grain Yield per plant and TestWeight in cluster IV. A wide range of variations for several characters among single as well as

Table 2. Grouping of fifty maize genotypes based on D^2 analysis.

Sl.No.	Clusters	No. of genotypes	Name of genotype
1	I	4	IC-470443, IC-333085, IC-337001, IC-337090
2	II	16	IC-447802, IC-447811, IC-447813, IC-542346, IC-542343, IC-470521, IC-550356, IC-470470, IC-553429, IC-447910, IC-470148, IC-337057, IC-551794, IC-552505, IC-550367
3	III	27	IC-280440, IC-273358 , IC-273346, IC-280217, IC-273348, IC-273353, IC-273356 , IC-280159, IC-280164, IC-280209, IC-280213, IC-280218, IC-280408, IC-280409, IC-280411, IC-280418, IC-280430, IC-280438, IC-280441, IC-280445, IC-280448, IC-280449, IC-280451, IC-280461, IC-280464, IC-280465, IC-331086
4	IV	1	IC-273359
5	V	1	**IC-331028**
6	VI	1	**IC-309931**

Table 3. Average intra and inter cluster D^2 values of clusters in maize.

Clusters	I	II	III	IV	V	VI
I	18.85	53.81	90.48	123.41	97.78	160.19
II		33.97	80.55	135.01	99.69	126.69
III			30.42	83.06	63.18	68.57
IV				0.00	25.29	199.77
V					0.00	148.38
VI						0.00

multigenotypic cluster was observed. However, the difference was clear for Cob width, No. Rows per cob Grains/ Row Dehusk cob weight Rind weight and Grain Yield per plant which has contributed largely to the total divergence. Hence, for the improvement of different characters under the present study, inbred lines should be selected form cluster IV and V. Parental material selection from these clusters would give high manifestation of heterosis as well as wide spectrum of variation when they are hybridized (Shazia, 2017).

Genetic diversity was studied to find out the more diverse inbred lines in maize which might be used in hybridization programme. Fifity maize inbred lines were grouped into six different clusters. The crosses involving parents/inbred lines from most divergent clusters are expected to manifest maximum heterosis and generate wide variability in genetic architecture.

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Table 4. Cluster means and relative contributions of fourteen characters to the total divergence in fifty indigenous Maize inbred lines.

Sl No	Cluster	N.G	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14
1	I	4	98.75	143.83	46.02	58.25	60.75	16.42	38.58	11.50	21.75	134.68	20.20	114.48	26.50	84.90
2	II	16	89.59	161.73	42.24	59.66	62.08	14.55	34.61	10.75	18.94	111.03	21.15	89.87	25.74	80.90
3	III	27	91.96	158.10	66.18	59.69	61.81	14.82	35.50	11.43	20.43	138.09	33.96	104.12	25.74	75.69
4	IV	1	94.50	161.62	69.83	62.50	64.00	17.60	40.33	13.00	23.50	197.16	45.99	151.16	28.71	76.78
5	V	1	99.50	167.96	64.37	62.00	64.00	17.20	40.37	14.00	24.00	194.52	55.89	138.63	28.67	71.33
6	VI	1	92.50	151.07	63.22	58.00	60.50	13.79	28.22	12.50	19.00	132.64	36.25	96.40	26.27	72.95

X1: Germination %, X2: Plant height(cm), X3: Ear height(cm), X4: Days to 50% tasseling, X5: Days to 50% silking, X6: Cob Length(cm), X7: Cob width (mm), X8: No. Rows per cob, X9: Grains/ Row (no.), X10: Dehusk cob weight (g), X11: Rind weight(g), X12: Grain Yield per plant (g), X13: Test Weight (g), X14: Shelling %.

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