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Variability and Genetic Parameters for Kernel Yield and Its Components in Maize (*Zea mays L.*) Inbredlines

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ABSTRACT

The present study was undertaken to estimate the extent of variability and genetic parameters in twenty eight maize genotypes for 15 yield and yield component characters during *Kharif,* 2013. The magnitude of difference between PCV and GCV was relatively low for almost all the traits, indicating less environmental influence. High estimates of GCV and PCV (>20%) were recorded for kernel yield per plant, number of cobs per plant, number of branches in tassel, 100-kernel weight and harvest index. High estimates of heritability along with high genetic advance as percent of mean were recorded for number of kernel rows per cob, kernel yield per plant, number of branches in tassel, 100-kernel weight, cob length and harvest index indicating additive gene effects in genetic control of these characters. Hence, selection may be effective for these characters.

Key words : Genetic advance as percent of mean,Genetic variability, Heritability, Kernel yield.

Maize (*Zea mays L.*) is a widely cultivated cereal crop throughout the world. In India, maize is the third most important cereal crop after rice and wheat, which is cultivated in an area of 8.71 million hectares with a production of 22.23 million tonnes and productivity of 2552 kg/ha. It occupies in an area of 0.97 million hectares with a production of about 4.81 million tonnes with a productivity of 4959 kg/ha in Andhra Pradesh (Directorate of Economics and Statastics, 2013). There is still a considerable scope to improve productivity and adaptability by breeding heterotic hybrids. To initiate any breeding programme, genetic variability is the basic requirement as it provides wider scope for selection. Since, the effectiveness of selection is dependent upon the nature, extent and magnitude of genetic variability present in the material and the extent to which it is heritable, the present study was undertaken to determine the extent of genetic variation, heritability and genetic advance for yield and yield component characters.

MATERIALS AND METHODS

The experimental material consisted of 28 inbred lines of maize which were evaluated in a Randomized Block Design with three replications. This experiment was conducted during *Kharif*, 2013 at Agricultural college farm, Naira, Srikakulam, Andhrapradesh. Each genotype was planted in a single row of 4m length with a row to row and plant to plant spacing of 60cm and 20cm, respectively. Standard agronomic practices were followed to raise a healthy crop. Data were recorded on five competitive plants per each entry per each replication for yield related traits *viz*., plant height, number of cobs per plant, tassel length, number of branches in tassel, cob length, cob diameter, number of kernel rows per cob, number of kernels per cob, kernel yield per plant and harvest index. However, the data for the traits *viz.,* days to 50% tasseling, days to 50% silking, anthesis silking interval and days to maturity were recorded on plot basis. The data was subjected to a preliminary Analysis of Variance and the genotypic (GCV) and phenotypic (PCV) coefficients of variation were calculated as per procedure given by Burton (1952). Heritability in broad sense (h^2_{bs}) and genetic advance as percent of mean (GAM) were estimated as per the formula given by Allard (1960) and Johnson *et al.*(1955a), respectively.

RESULTS AND DISCUSSION

In the present study, analysis of variance (Table 1) revealed significant differences among the inbredlines for all the traits studied. The variance component derived from further partitioning of genotypic differences into phenotypic and genotypic coefficients of variation and heritability is a good index of transmission of characters from parents to their offsprings. The estimates of heritability along with expected genetic advance as percent of mean are more useful in predicting the resultant effects on selecting the best individuals. The estimates of genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability (h^2_{bs}) in broad sense and genetic advance as percent of mean were estimated for all the characters and are presented in Table 2.

Maximum range of performance was exhibited by kernel yield per plant followed by number of kernels per cob and plant height. High estimates of phenotypic and genotypic variances were displayed by kernel yield per plant followed by number of kernels per cob and plant height. On contrary, low estimates of phenotypic and genotypic variances were recorded for number of cobs per plant. High estimates of GCV and PCV were observed for kernel yield per plant followed by number of cobs per plant, number of branches in tassel, 100-kernel weight and harvest index indicating scope of genetic improvement through selection in these characters. On contrary, number of kernel rows per cob, anthesis silking interval, cob length and tassel length showed moderate values of GCV and PCV indicating little scope of improvement of them through selection. However, the low estimates of PCV and GCV were recorded for cob diameter, plant height, number of kernels per cob, days to 50% silking, days to 50% tasseling and days to maturity. Similar kind of high estimates of PCV and GCV were reported earlier for kernel yield per plant and number of cobs per plant (Aminu and Izge, 2012) and number of branches in tassel and 100-kernel weight (Ojo *et al,* 2006) and corroborated the findings of the present study.

Though GCV and PCV give an estimate of magnitude of variability existing in the genotypes, it is not possible to assess the portion of variation that is heritable. Heritable variation can be predicted through estimates of heritability. High heritability coupled with high genetic advance as percent of mean was recorded for number of kernel rows per cob followed by kernel yield per plant, number of branches in tassel, 100-kernel weight, cob length and harvest index, emphasizing the additive genetic variation was the major component of genetic variation in the inheritance of these traits. Similarly, Sandeep *et al.* (2013) also reported high heritability along with high genetic advance as percent of mean for number of kernel rows per cob, number of branches in tassel and 100-kernel weight and Panwar *et al.* (2013) for cob length and kernel yield

Table 1. Analysis of variancefor Itlain character in 28 inbred lines of maize.

Source of variation	df	Days to 50% tasseling	Days to 50% silking	Days to maturity	Anthesis silking interval	Plant height	Cobs per plant	Tassel length
Replications	2	13.85	16.33	3.58	0.29	14.72	0.04	11.21
Genotypes	27	5.54*	9.82**	4.40**	2.29**	288.77**	0.69**	50.11**
Error	54	2.90	4.12	1.90	0.61	44.53	0.02	12.16
CV (%)		3.33	3.53	1.24	12.46	5.31	8.87	10.16

No. of branches in tassel	Cob length	Cob diameter	Kernel rows per cob	Kernels per cob	100 kernel weight	Kernel yield per plant	Harvest Index (%)
0.20	0.12	235.17	0.26	2.23	0.56	5.19	0.24
18.42**	8.72**	2.66**	11.35**	652.02**	56.83**	3380.59**	91.99**
0.19	0.18	0.02	0.07	1.91	0.85	32.31	2.02
4.59	3.75	1.74	2.45	0.81	5.40	10.23	5.06

* ,** significant at P = 0.05 and P = 0.01 level, respectively.

Table 2. Estimates of Variability and genetic parameters for fifteen characters in 28 inbred lines of maize.

S.No.	Character	Mean ± SEm	Range		Variance		Coefficient of variability		h^2_{bs} (%)	Genetic advance (%)	Genetic advance as percent of mean
			Maximum	Minimum	Phenotypic	Genotypic	PCV (%)	GCV (%)			
1	Days to 50% tasseling	51.14±0.98	48.0	53.0	3.7	0.8	3.8	1.8	23.2	0.9	1.8
2	Days to 50% silking	57.44±1.17	54.3	60.0	6.0	1.9	4.2	2.4	31.5	1.5	2.7
3	Days to maturity	111.15±0.79	109.3	113.0	2.7	0.8	1.4	0.8	30.4	1.0	0.9
4	Anthesis silking interval	6.30±0.45	4.6	8.0	1.1	0.5	17.1	11.8	47.4	1.0	16.8
5	Plant height (cm)	125.60±3.85	110.0	145.1	125.9	81.4	8.9	7.1	64.6	14.9	11.8
6	Cobs per plant	1.71±0.08	1.0	2.6	0.2	0.2	29.0	27.6	90.6	0.9	54.2
7	Tassel length (cm)	34.32±2.01	24.9	40.6	24.8	12.6	14.5	10.3	50.9	5.2	15.2
8	No. of branches in tassel	9.58±0.25	4.8	15.3	6.2	6.0	26.1	25.7	96.9	4.9	52.1
9	Cob length (cm)	11.60±0.25	8.5	14.6	3.0	2.8	15.0	14.5	93.7	3.3	28.9
10	Cob diameter(cm)	9.56±0.09	8.4	11.8	0.9	0.8	9.9	9.8	96.9	1.9	19.8
11	Kernel rows per cob	10.99±0.15	8.2	15.9	3.8	3.7	17.8	17.6	98.1	3.9	35.9
12	Kernels per cob	170.45±0.79	140.6	202.1	218.6	216.7	8.6	8.6	99.1	30.1	17.7
13	100- kernel weight (g)	17.11±0.53	9.4	25.3	19.5	18.6	25.8	25.2	95.6	8.7	50.8
14	Grain yield per plant (g)	55.53±3.28	13.2	136.3	1148.4	1116.0	61.0	60.1	97.1	67.8	122.1
15	Harvest Index (%)	28.04±0.82	19.3	40.7	32.0	29.9	20.1	19.5	93.6	10.9	38.9

per plant. The traits *viz.* number of kernels per cob, cob diameter and plant height exhibited high heritability with moderate genetic advance as percent of mean, indicating the importance of both additive and non additive gene effects for these traits. However, the trait, days to 50% tasseling had low heritability along with low genetic advance as percent of mean, implying that this trait was controlled by non-additive gene effects. Hence, simple selection may not be effective to improve this trait. Similarly, Sumathi *et al.* (2005) also reported high heritability along with moderate genetic advance as percent of mean for number of kernels per cob and Nataraj *et al.* (2014) for cob diameter and plant height. On contrary, Hemavathy *et al.* (2008) reported low heritability along with low genetic advance as percent of mean for days to 50% tasseling.

By and large, it is to conclude that the present inbredlines are characterised by substantial variability, which is necessary to develop suitable maize hybrids. Based on the estimates of genetic parameters, the traits number of kernels per cob, kernel yield per plant, number of branches in tassel, 100-kernel weight, cob length and harvest index exhibited high heritability along with high genetic advance and could be exploited for further improvement in these characters through simple selection procedures.

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