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Research Article

APPRAISAL OF GENETIC VARIABILITY FOR DIFFERENT QUANTITATIVE TRAITS IN MAIZE (*ZEA MAYS* L.) GENOTYPES

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Abstract: The present study was conducted at AKS University, Satna, M.P. during *Rabi* 2019. Altogether 25 maize genotypes were grown under RBD design replication. In the present study various parameters of genetic variability, broad sense heritability and genetic advance estimates in inbreed line of maize. Analysis of variance revealed that the mean sum of square showed significant due to genotypes for all the 17 characters studied. High GCV and PCV were recorded for seed yield per plant, seed yield per cob, cob ear weight and shelling %. Traits seed yield per plant, seed yield per cob, total seeds per cob, cob year weight and shelling % were showed high heritability accompanied with high genetic advance which indicated that most likely the heritability due to additive gene effects and selection may be effective in early generation for these traits. Whereas high to moderate heritability along with low estimates of genetic advance which indicates that non additive gene effects. The genotypes which shows non additive gene effects will not be consider for further breeding programme.

Keywords: *Maize, Heritability, Genetic advance, GCV and PCV*

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Introduction

Maize (*Zea mays* L.) is grown throughout the year in India. It is predominantly a *Kharif* crop with 85% of area under cultivation in the season. Maize is the third most important cereal crop in India after rice and wheat. It is mainly produced in temperate region of the western hemisphere and China, Brazil and several countries in Europe *etc*. Its production is mainly dominated by top five countries *viz*. USA, China, Brazil, Mexico and Argentina accounts mainly 75% of the world production [1]. Its highest yield was obtained in industrialized countries such as France and United States (both 9.5T/ha), Canada (8.5 T/ha), Argentina (7.5 T/ha) where the production is highly mechanized and based on well-developed crop cultivars, seed selection and adequate inputs along with soil conditions [2].

Maize is the only species in the genus *zea* has its diploid chromosome number 2n=20. The success of the crop improvement or breeding programme depends upon the selection of suitable parents, although knowledge of genetic variability, heritability and type of gene action is very essential. In addition, characters upon which selection of parent is based should be known. Relatively higher estimates of genotype coefficient of variation for seed yield per plant, seed yield per cob, total seed per cob and cob ear weight along with high heritability suggests that selection can be effective for these traits. Keeping this in view the present study was under taken to study the genetic parameter of selected genotypes of maize the nature and magnitude of genetic variability [3-6].

Materials and Methods

The experimental materials comprising of twenty-five maize inbreed lines were grown in a randomized block design with three replications at the horticultural research farm of Department of Genetics and Plant Breeding, Faculty of Agriculture Science and Technology, AKS University, Satna, M.P. during *kharif* 2019. Each plot consisted of two row plots of 2m length with a spacing of 70 cm X 45 cm were 2 seed per hill were dropped manually later on plant per hill was maintained after thinning.

Recommended dose of fertilizers (NPK-120:60:40 Kg/Ha) were applied for raising healthy and uniform crops. The data was collected for some morphological traits like Days to 50% tasseling, Days to 50% shelling, Plant height, Leaf per plant, Cob per plant, Days to 50% maturity, Biological yield per plant, Cob ear weight, rows per cob, seed per rows, Total seed per cob, Loose seed weight, Seed yield per plant, Shelling % and Harvest Index were taken from five randomly selected plants from middle row of each entry in each replication were subject to analysis of variance as suggested [7]. The variability present in the genotypes was estimated by phenotypic and genotypic variance and coefficient of variability using the procedure suggested [8].

Result and Discussion

Analysis of variance revealed significant differences for all the 17 quantitative traits studied which was presented in [Table-1]. High estimates of GCV and PCV were recorded for seed yield per plant (32.29 & 32.27), seed yield per cob (32.26 & 32.34), shelling %(24.06 & 24.55), cob ear weight (23.95 & 24.22) and Biological yield per plant (23.33 & 24.00) as presented in [Table-2] suggesting sufficient variability and offers selection. Similar result was reported by Praveen Kumar, *et al*., (2014) [1], Zahid Mahmood, *et al*., (2004) [2], Rajesh, *et al*., (2013) [9], Tripathi, *et al*., (2013) [10]. Heritability was found to be highest for seed yield per plant (100%) followed by seed yield per cob (99%), total seed per cob (99%), cob ear weight (98%), shalling % (96%) presented in [Table-2]. High value of heritability in broad sense indicates character is less influenced by environmental effect. Similar result was reported by Zahid Mahmood, *et al*., (2004) [2], Ojo, *et al*., (1995) [6], Chen ling, *et al*., (1996) [11].

Heritability and genetic advance are important selection parameters. Heritability estimates along with genetic advance are normally more helpful in predicting the grain under selection than heritability estimates alone. Hence knowledge about genetic advance coupled with heritability is most useful.

Table-1 *Analysis of variance for 17 different quantitative traits in 25 genotypes of maize*

		Mean sum of squares		
S	Characters	Replications (d.f.=2)	Treatments (d.f.= 24)	Error (d.f.= 48)
1	Days to 50 % Tasseling	14.44	142.47	40.55
2	Days to 50 % Silking	11.85	156.78	21.38
3	Plant Height (c.m.)	104.13	1145.76	66.20
4	Leaf Per Plant	2.36	2.71	1.03
5	Cobs Per Plant.	0.04	0.07	0.04
6	Days to 50 % Maturity.	6.24	216.41	42.03
7	Biological Yield Per Plant. (gram)	222.62	16389.61	313.51
8	Cob Ear Weight.	5.49	3320.98	25.01
9	Cob Length (c.m.)	3.00	5.01	2.65
10	Rows Per Cob.	2.10	3.74	1.13
11	Seeds Per Row.	6.08	27.45	10.03
12	Total Seeds Per Cob.	9.16	14848.49	31.01
13	100 Seed Weight. (gram)	2.96	82.79	3.52
14	Seed Yield Per Cob. (g)	2.78	3236.99	12.26
15	Seed Yield Per Plant.	0.27	3242.88	5.413
16	Shelling %	0.07	964.74	13.12
17	Harvest Index.	3.25	150.30	6.83

Table-2 *Genetic parameters for 17 biometrical characters of 25 maize genotypes*

SN	Characters	Genotypic Coefficient of variation (GCV)	Phenotypic coefficient of variation (PCV)	Heritability (%) (broad sense (h^2)	Genetic advance (GA)	Genetic advance as % of mean
1	Days to 50 % Tasseling	9.64	14.27	0.46	10.39	17.18
2	Days to 50 % Silking	10.75	13.05	0.68	14.61	23.37
3	Plant Height (c.m.)	9.41	10.24	0.84	46.02	22.84
4	Leaf Per Plant	6.17	10.41	0.35	1.17	9.65
5	Cobs Per Plant.	8.33	18.84	0.20	0.12	9.73
6	Days to 50 % Maturity.	7.39	9.70	0.58	15.33	14.86
7	Biological Yield Per Plant (gram)	23.33	24.00	0.94	187.84	59.86
8	Cob Ear Weight.	23.95	24.22	0.98	86.53	62.51
9	Cob Length (c.m.)	3.55	7.43	0.23	1.12	4.48
10	Rows Per Cob.	6.95	10.54	0.43	1.63	12.09
11	Seeds Per Row.	7.90	13.06	0.37	3.85	12.63
12	Total Seeds Per Cob.	19.48	19.54	0.99	184.96	51.27
13	100 Seed Weight. (gram)	18.34	19.52	0.88	12.75	45.48
14	Seed Yield Per Cob. (g)	32.16	32.34	0.99	86.07	84.42
15	Seed Yield Per Plant.	32.29	32.37	1.00	86.51	85.04
16	Shelling %	24.06	24.55	0.96	46.08	62.25
17	Harvest Index.	21.24	22.70	0.87	17.08	52.44

Character exhibiting high heritability may not necessarily give high genetic advance. High heritability should be accompanied with high genetic advance to arrive more reliable conclusion. Expected genetic advance as percent of mean indicates the mode of gene action in the expression of a trait, which helps in choosing an appropriate breeding method. High heritability with high estimates of genetic advance was observed for seed yield per plant, seed yield per cob, total seeds per cob. High heritability with moderate estimate of genetic advance were observed for 100 seed weight, Days to 50% tasseling, Days to 50% silking. High to moderate heritability along with low estimates of genetic advance were observed for cob length, No. of row per cob, seeds per row, leaf per plant presented in [Table-2].

High heritability accompanied with high to moderate GCV and genetic advance in case of seed yield per plant, seed yield per cob, shelling%, total seeds per cob, cob ear weight indicates that most likely the heritability is due to additive gene effect and selection may be effective in early generation for these characters. Whereas no. of rows per cob, cob length, leaf per plant and seed per row exhibited moderate to low heritability along with low GCV and PCV. Cob length, row per cob, seed per row, leaf per plant exhibited moderate to low heritability along with low genetic advance which indicates that non additive gene action and provides limited scope for improvement and through breeding programme. Similar results were reported by Praveen Kumar, *et al*., (2014) [1], Zahid Mahmood, *et al*., (2004) [2], Thanga Hemavathy, *et al*., (2008) [12].

Application of research: Study of genetic variability for different quantitative traits in maize (*Zea mays* L.) genotypes

Research Category: Genetics and Plant Breeding

Abbreviations:
PCV: Phenotypic coefficient of variation
GCV: Genotypic coefficient of variation

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Study area / Sample Collection: Department of Genetics and Plant Breeding, Faculty of Agriculture Science and Technology

Cultivar / Variety / Breed name: Maize (*Zea mays* L.)

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
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