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Genetic Variability, Heritability and Genetic Advance for Grain Yield and its Components in Maize (*Zea mays* L.)

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ABSTRACT

An investigation was carried out to assess the variability, heritability and genetic advance for nine characters viz., days to 50% tasseling, days to 50% silking, days to maturity, plant height, cob length, kernel rows per cob, 100-seed weight, protein content and grain yield per plant in 29 genotypes (twenty one hybrids, their seven parents along with a check). The results revealed that high PCV and GCV were observed for the character grain yield per plant. High heritability accompanied with high genetic advance had shown by the characters viz., 100-seed weight, grain yield per plant, cob length and plant height indicating the preponderance of additive gene action which may be exploited through breeding methods involving simple selection like mass selection and ear-to-row method.

Key words : Genetic advance, Heritability, Mesta, Variability.

Maize (*Zea mays* L.) is the second most important cereal crop in the world's economy. It ranks first in both productivity and production among the cereals and is having worldwide significance due to its demand as food, feed and industrial utilization. It is a good source of carbohydrate, starch, fat, protein, oil in addition to some of the important minerals and vitamins. Maize is known as "Queen of cereals" because of its high production potential and wider adaptability.

The success of any breeding programme depends upon the quantum of genetic variability present in the population. Wider range of genetic variability helps in selecting desired genotypes. In addition to the genetic variability, knowledge on heritability and genetic advance helps the breeder to employ the suitable breeding strategy. Therefore, it is necessary to have knowledge of genetic variability, heritability and genetic advance present in the available genetic material.

MATERIAL AND METHODS

Seven inbred lines were mated in Diallel fashion (method-2) during *kharif* 2013 to produce twenty one F_1s. All these twenty one F_1s, seven parents along with a check, 30-V-92 were evaluated during *rabi* 2013 at Agricultural College Farm, Bapatla in a Randomized Block Design with three replications. Observations were recorded on ten randomly chosen plants for nine quantitative characters *viz.,* days to 50% tasseling, days to 50% silking, days to maturity, plant height, cob length, kernel rows per cob, 100-seed weight, protein content and grain yield per plant. The data were subjected to statistical analysis and various genetic parameters such as PCV, GCV, heritability and genetic advance were worked out as per Johnson *et al.* (1955) and Hanson (1963).

RESULTS AND DISCUSSION

The analysis of variance revealed significant differences among all the 29 genotypes for all the characters studied, indicating a high degree of variability in the material for the traits studied (Table 1). The grain yield per plant ranged from10.86g to 145.73g with a mean of 94.51g. The variation among the genotypes was estimated as coefficients of variation (Table 2). The phenotypic coefficient of variance (PCV) was slightly higher in magnitude than genotypic coefficient of variance (GCV) for all the characters studied indicating the influence of environment on expression of these traits. Highest PCV and GCV (41.22 and 37.01) values were exhibited by grain yield per plant, whereas lowest PCV and GCV (2.75 and 1.88) values were recorded by days to maturity. These results were in accordance with the findings of Reddy *et al.* (2012) and Reddy *et al.* (2013).

Table 1. Analysis of variance for yield and yield component characters in maize (*Zea mays* L.).

Source of variations	d.f.	Days to 50% tasseling	Days to 50% silking	Days to maturity	Plant height	Cob length	Kernel rows per cob	100-seed weight	Protein content	Grain yield per plant
Replications	2	0.287	0.966	1.149	1391.472	3.202	0.206	0.003	0.021	352.598
Entries	28	32.580**	24.108**	10.736**	6071.369**	28.144**	4.171**	77.345**	0.518**	3965.108**
Error	56	0.752	0.846	2.971	568.063	1.666	0.661	0.599	0.007	293.773

** Significant at 1% level

Table 2. Estimates of variability, heritability and genetic advance as per cent of mean for grain yield and yield components in maize (*Zea mays* L.)

S. No.	Character	Mean	Range		Coefficient of variation		Heritability (broad sense)	Genetic advance as per cent of mean
			Minimum	Maximum	PCV (%)	GCV (%)		
1.	Days to 50% tasseling	52.40	47.33	57.67	6.43	6.21	93.38	12.37
2.	Days to 50% silking	56.13	51.00	61.67	5.22	4.96	90.16	9.70
3.	Days to maturity	85.57	81.67	88.00	2.75	1.88	46.56	2.64
4.	Plant height (cm)	202.84	119.90	284.33	24.16	21.11	76.36	38.00
5.	Cob length (cm)	17.75	11.10	21.60	18.24	16.73	84.12	31.62
6.	Kernel rows per cob	14.98	12.53	17.13	9.03	7.22	63.91	11.89
7.	100-seed weight (g)	16.09	4.46	25.46	31.79	31.42	97.71	63.99
8.	Protein content (%)	8.02	7.35	8.87	5.25	5.14	96.09	10.39
9.	Grain yield per plant (g)	94.51	10.86	145.73	41.22	37.01	80.64	68.47

PCV = Phenotypic coefficient of variation GCV = Genotypic coefficient of variation

Moderate PCV and GCV was recorded for cob length. While kernel rows per cob, days to 50% tasseling, protein content, days to 50% silking and days to maturity exhibited low PCV and GCV.

Heritability estimates were high for 100-seed weight, protein content, days to 50% tasseling, days to 50% silking, cob length, grain yield per plant, plant height and kernel rows per cob and moderate heritability was recorded for days to maturity. Similar results were obtained by Reddy *et al.* (2012) and Nataraj *et al.* (2014) for all the characters except protein content and Shanthi *et al.* (2011) and Bekele and Rao (2014) for protein content. The maximum value for heritability was recorded 100-seed weight (97.71%) and minimum was recorded by days to maturity (46.56%).

Heritability estimates along with genetic advance are more helpful in predicting the gain under selection than heritability estimates alone. The estimates of heritability and genetic advance as per cent of mean were high for 100-seed weight, grain yield per plant, cob length and plant height indicating that these characters were less influenced by environment and governed by additive gene action which may be exploited through breeding methods involving simple selection like mass selection, ear-to-row method, etc. These findings were in agreement with Nataraj *et al.* (2014).

High heritability coupled with moderate genetic advance as per cent of mean was observed for protein content, days to 50% tasseling and kernel rows per cob. Whereas days to 50% silking expressed high heritability accompanied with low genetic advance indicating the role of both additive and non-additive gene actions in the inheritance of this trait and can be improved either by population improvement methods or even heterosis breeding methods like production of hybrids and synthetics. While moderate heritability coupled with low genetic advance as per cent of mean was observed for days to maturity indicating the role of non-additive gene action and can be improved by population improvement methods involving selection, intermating among selected ones and reselection may help to improve this trait besides exploiting the methods of heterosis breeding.

LITERATURE CITED

Hanson W O 1963 *Heritability in Statistical Genetics and Plant Breeding,* Hanson, W.O and Robinson, H.F. (eds.), 1982. National Academy of Science and National Research Council, Washington D. C. pp. 125-139.

Johnson H W, Robinson H F and Comstock R E 1955 Estimates of genetic and environmental variability in Soybean. *Agronomy Journal,* 47: 314-318.

Bekele A and Rao T N 2014 Estimates of heritability, genetic advance and correlation study for yield and it's attributes in maize (*Zea mays* L.). *Journal of Plant Sciences*, 2 (1): 1-4.

Nataraj V, Shahi J P and Vandana D 2014 Estimates of variability, heritability and genetic advance in certain inbreds of maize (*Zea mays* L.). *International Journal of Applied Biology and Pharmaceutical Technology*, 5 (1): 205-208.

Reddy V R, Rao A S and Sudarshan M R 2012 Heritability and character association among grain yield and its components in maize (*Zea mays* L.). *Journal of Research*, *ANGRAU,* 40 (2): 45-49.

Reddy V R, Jabeen F, Sudarshan M R and Rao A S 2013 Studies on genetic variability, heritability, correlation and path analysis in maize (*Zea mays* L.) over locations. *International Journal of Applied Biology and Pharmaceutical Technology,* 4 (1): 195-199.

Shanthi P, Satyanarayana E, Babu G S and Kumar R S 2011 Studies on genetic variability for phenological, yield and quality parameters in quality protein maize. *Crop Research,* 41 (1,2&3): 188-191.

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