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Heritability and Genetic Advance Estimates from Maize Genotypes in Shishi Lusht a Valley of Krakurm

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ABSTRACT

Broad-sense heritabilty, coefficients of variability and genetic advance values were computed for days taken to tasseling, number of days taken to silking, plant height, ear length, number of kernel rows ear^{-1}, number of kernels row^{-1}, 100-grain weight and grain yield plant^{-1}. Low, medium and high estimates of broad sense heritability were found in different plant characters under study. Highest heritability estimates were found in grain yield plant^{-1} (0.993) and by plant height (0.990). Values of genetic advance ranged between 43.80 for grain yield plant^{-1} to 1.33 for number of kernel rows ear^{-1}. Greater magnitude of broad sense heritability coupled with higher genetic advance in characters under study provided the evidence that these plant parameters were under the control of additive genetic effects. Indicating that selection should lead to a fast genetic improvement of the material

Key Words: Heritability; Genetic; Estimates; Genotypes; Karakuram

INTRODUCTION

Corn plant has a wide adaptation, and is able to grow in regions ranging from semiarid with annual rainfall of 20 to 25 cm, to those where annual rainfall may exceed 400 cm. Morphologically corn exhibits a greater diversity of phenotypes than perhaps any other grain crop (Kuleshov, 1933), and is extensively grown in temperate, subtropical and tropical regions of the world. The range of cultivation for maize crop stretches from 50^{o} N 40^{o} S latitude and at altitude from sea level to 3,300 meters. In Pakistan maize is sown on an area of 0.962 m ha with annual yield 1.67 m tons and average production 1730 kg ha^{-1} (Anonymous, 2000). There is great range for escalating maize production in the country with sole objective to achieve the level of self-reliance in food grains.

Keeping in view the genetic studies on maize were undertaken in Shishi Lusht a valley of Krakurm, District Chitral to estimate the genetic component of variance for grain yield and its related traits and to compute broad sense heritability and genetic advance for different plant traits.

MATERIALS AND METHODS

The study was conducted in Shishi Lusht a valley of Krakurm**,** District Chitral, during summer 2001. Five maize hybrids viz. Babar, YHB 555, 3012, 3062, 3130 and five open pollinated varieties possessing a wide genetic background viz. EV 1097, EV 1098, EV 2097, EV 5098 and Sarhad Yellow were grown in randomized complete block design with three replications. Each plot consisted of three rows of three-meter length with row spacing and plant spacing of 60 and 30 cm, respectively. Data on number of days taken to tasseling, number of days taken to silking, plant height, ear length, number of kernel rows ear^{-1}, number of kernels row^{-1}, 100-grain weight and grain yield plant^{-1} were recorded from 15 randomly earmarked plants in each plot during the cropping season and after harvest.

Analysis of variance for all the plant traits recorded was carried out according to Steel and Torrie (1980). Duncan's Multiple Range Test (1995) was applied to compare the mean values of all the genotypes. The heritability estimate of a trait was computed as ratio between the estimate of genetic variance and phenotypic variance. Heritability estimate was worked out following the formula and procedures as outlined by Singh and Chaudhry (1985). Genetic advance was estimated as described by Mehdi and Khan (1994)

RESULTS AND DISCUSSION

Analysis of variance was carried out to partition the variances into its components. The results of the analysis revealed highly significant differences among the mean values for all traits i.e. number of days taken to tasseling, number of days taken to silking, plant height, ear length, number of kernel rows ear^{-1}, number of kernels row^{-1}, 100-grain weight and grain yield plant^{-1} (Table I).

Data given in Table II depicted that sufficient genetic variability existed in most of the characters. Highest coefficient of genotypic variance was observed in grain yield plant^{-1} (21.24) followed by number of kernels row^{-1} (14.68) and 100-grain weight (12.71). More consistency was observed in kernel rows ear^{-1} and minimum level of genotypic coefficient of variance was found for this character (5.48). Almost similar pattern was recorded for phenotypic coefficient of variance for different plant characters. Grain yield plant^{-1} exhibited grater magnitude of coefficient of phenotypic variance (21.32) followed by number of kernels row^{-1} (15.56). Minimum level of phenotypic coefficient of variance was found in number of kernel rows ear^{-1}. Magnitude of phenotypic coefficients of

Table I. Analysis of variance for different plant traits in maize

Source of variation	**Degree of freedom**	**No. of days taken to tasseling**	**No. of days taken to silking**	**Plant height**	**Ear length**	**No. of kernel rows ear^{-1}**	**No. of kernels row^{-1}**	**100-grain weight**	**Grain yield plant^{-1}**
Varieties	9	57.200**	68.059**	1129.346**	12.309**	2.077**	65.426**	37.894**	1876.414**
Blocks	2	1.200	3.633	0.700	0.619	0.042	2.233	0.374	14.179
Error	18	1.756	1.337	5.737	0.665	0.098	2.604	2.897	4.564

** Significant at 1% probability level

Table II. Genotypic and phenotypic coefficient of variations, heritability and genetic advance for some plant traits in maize

Source of variation	**No. of days taken to tasseling**	**No. of days taken to silking**	**Plant height**	**Ear length**	**No. of kernel rows ear^{-1}**	**No. of kernel row^{-1}**	**100-grain weight**	**Grain yield plant^{-1}**
Genotypic coefficient of variation	8.08	8.41	10.28	12.50	5.48	14.68	12.71	21.24
Phenotypic coefficient of variation	8.45	8.66	10.33	13.53	5.88	15.56	14.20	21.32
Heritability (h^2)	0.913	0.973	0.990	0.850	0.870	0.880	0.800	0.993
Genetic advance	7.22	8.05	40.70	3.20	1.33	7.59	5.37	43.80

variance was greater than those of genotypic coefficient of variance indicating the influence of environment. Environment played its role in modifying the value of genotypic coefficient in phenotypic coefficient particularly in case of 100-grain weight where the coefficient had changed from 12.71 to 14.20.

Low, medium and high estimates of broad sense heritability were found in different plant traits under study (Table II). Highest heritability estimates were found in grain yield plant^{-1} (0.993) and by plant height (0.990). Number of days taken to silking and number of days taken to tasseling also showed higher estimates of broad sense heritability that was 0.973 and 0.913, respectively. Swamy *et al.* (1971), Patil *et al.* (1972) and Singh and Chaudhry (1985) also reported similar findings. They computed high heritability estimates for grain yield plant^{-1}, days taken to silking and plant height. Bhalla *et al.* (1986) also reported high heritability for grain yield plant^{-1} and plant height. Results of present studies also got support from the findings of Jha and Ghosh (1998). Values of genetic advance ranged between 43.80 for grain yield plant^{-1} to 1.33 for number of kernel rows ear^{-1}. Greater magnitude of broad sense heritability coupled with higher genetic advance in grain yield plant^{-1}, plant height, days taken to silking and days taken to tasseling provided the evidence that these plant parameters were under the control of additive genetic effects. Results are in conformity with those of Swamy *et al.* (1971), Afzal *et al.* (1997) and Singha *et al.* (2000). They also reported high genetic advance for grain yield plant^{-1}, days taken to silking and plant height.

Results of high heritability and genetic advance of grain yield plant^{-1} are also in accordance with those reported by Li and Song (1991), Jha and Ghosh (1998) and Singh and Dash (2000). Hence provides better opportunities for selecting plant material regarding these traits. Value of broad sense heritability was greater in case of days taken to silking whilst the value of genetic advance was moderate. Careful selection for days taken to silking may also lead towards improvement in this trait.

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