

# Genetic Analysis of Yield and its Components in Maize Diallel Crosses (*Zea mays L.*)

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## ABSTRACT

A genetic analysis of 6x6 set of diallel crosses among six elite inbred lines of maize i.e. A 639, 70 No.2, N 18, A 638, A 649 and W 64 was carried out and the nature of gene action was investigated for number of kernel rows per ear, number of kernels per row, 100 grain weight and grain yield per plant. Vr/Wr graphs indicated that that number of kernels per row, 100-grain weight and grain yield per plant were controlled by over-dominance type of gene action while number of kernel rows per ear was under the control of additive type of gene action. Line A 649 possessed most dominant genes for number of kernel rows per ear, number of kernels per row and grain yield per plant. The inbred line 70 No.2 possessed most dominant genes for 100-grain weight. All the parameters, except number of kernel rows per ear, were under the control of over-dominance type of gene action. The number of kernel rows per ear was under the control of additive type of gene action. Over-dominance for most of the parameters reveals that selection in later generations may be more effective and the selection in early generations will be more effective for the trait which is additively controlled.

**Key Words:** Genetic analysis; Yield; Diallel crosses; Maize

## INTRODUCTION

Maize, being a short duration crop, can be grown successfully twice a year and fits well in our existing cropping system. Although, the yield potential of our present varieties is high enough but it has not been fully explored. It is potentially capable of producing large quantities of food grain in short duration and can effectively solve the food problems of soaring population of our country. Most maize breeding programmes aim at evolving high yielding and locally adapted varieties and as a result, a number of synthetic varieties with high yield potential have been developed in the past for commercial cultivation. However, breeding for improved varieties is a continuous process and requires primarily a thorough knowledge of the genetic mechanisms governing yield and the various components of yield. In the present study, it is proposed to ascertain the best cross combinations for some economic characters amongst some elite inbred lines of maize.

## MATERIALS AND METHODS

This study was conducted in the Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad. The experimental material was comprised of the following six inbred lines of maize: i. A 639, ii. 70 No.2, iii. N 18, iv. A 638, v. A 649, and vi. W 64. The inbred lines were crossed in a diallel fashion to obtain all possible single and reciprocal crosses. During the next growing season

seeds of all possible crosses along with the parents were sown in a triplicated trial according to RCBD. Each entry was sown in two rows of 5 m length keeping row to row distance 60 cm. Data were recorded for number of kernels rows per ear, number of kernels per row, 100- grain weight (g), and grain yield per plant (g). The data were subjected to analysis of variance and further evaluated for gene action according to Hayman (1954) and Jinks (1954).

## RESULTS AND DISCUSSION

**Number of kernel rows per ear.** Analysis of variance showed that the differences among the genotypes were highly significant. It is evident from Fig. 1 that the regression line passes above the point of origin which suggests the additive type of gene action for this character. Inbred line A 649 possessed maximum dominant genes, while inbred line W 64 carried most recessive genes. The results are in line with those of Manoliv (1969) and Piovarci (1975). However, the results differ from those of Khistova (1975) and Kanaka (1982) who reported non-additive type of gene action.

**Number of kernels per row.** Analysis of variance for number of kernels per row indicated that the differences among the genotypes were significant. The regression line passed below the point of origin (Fig 2), which demonstrated over dominance type of gene action for this character. From the relative position of the array points on the regression line. It is evident that inbred line A 649 possessed most dominant

genes, while inbred line W 64 carried most recessive genes. These results are compatible with Arif (1990) and Kanaka (1982) who reported over-dominance type of gene action. The present results however, differ from those of Chaudhry (1974) who observed additive type of gene action for this trait.

**100 - grain weight.** Analysis of variance for 100-grain weight revealed that the differences among the genotypes were highly significant. It is evident from Fig. 3 that the regression line passed below the point of origin, which suggests over-dominance type of gene action controlling this character. Inbred line 70 No.2 possessed maximum dominant genes while, inbred line N 18 carried most recessive genes. Kanaka (1982) and Saghir (1984) reported that grain weight was under the control of over-dominance type of gene action. However, the results of present study differ from those of Chaudhary (1964), Setty (1975) and Ramamurthy (1980) who reported additive type of gene action.

**Fig. 1. Vr/Wr graph for number of kernel rows/ear**

**Fig. 2. Vr/Wr graph for number of kernels/row**

**Grain yield per plant.** The differences among the genotypes were highly significant. It is evident from Fig. 4 that the regression line passes below the point of origin, which shows over-dominance type of gene action in the inheritance of grain yield per plant. Inbred line A 649 possessed maximum dominant genes, while inbred line W 64 carried most recessive genes. The results corroborate with the findings of Piovarci (1975) whereas, Manoliv (1969), Setty (1975), Khristova *et al.* (1983) and Singh *et al.* (1985) found that this character was controlled by additive type of gene action. Predictions in the case of additive gene action would be expected to be more reliable as compared to the characters, which are controlled by non-additive genes. As suggested by Laval *et al.* (1971) a preponderance of non-additive effects would not favour mass selection in altering any of the traits but pedigree test, sib test, progeny test or various combinations among them, will certainly be required to improve grain yield though various yield components.

**Fig. 3. Vr/Wr graph for 100-grain weight**

**Fig. 4. Vr/Wr graph for grain yield per plant**

## CONCLUSION

It may be said that overall information obtained in the present study if practised with care can, in general, go a long way in developing promising synthetics and hybrids of maize. All the parameters, except number of kernel rows per ear, were under the control of over-dominance type of gene action. The number of kernel rows per ear was under the control of additive type of gene action. Over-dominance for most of the parameters reveals that selection in later generations may be more effective and the selection in early generations will be more effective for the trait which is additively controlled.

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