STUDY OF GENE ACTION FOR ECONOMIC CHARACTERS IN MAIZE

Muhammad Ijaz Tabassum & M. Saleem
Department of Plant Breeding and Genetics,
University of Agriculture, Faisalabad

The gene action was ascertained by conducting 6 x 6 diallel cross analysis in all the possible combinations of maize inbred lines. Number of ears plant^{-1} was found to be controlled by over-dominance type of gene action while number of kernel rows ear^{-1}, 100-grain weight and grain yield plant^{-1} were controlled by additive type of gene action. Epistasis was observed for number of ears plant^{-1} and grain yield plant^{-1}.

INTRODUCTION

The maize breeding programmes aim at evolving high yielding and locally adopted 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 mechanism governing yield and yield components. Diallel cross analysis technique (Hayman, 1954; Jinks, 1954, 1955) provides such information in early filial generation to make selection of desirable parents. Chaudhry (1974) attributed genetic variance for number of kernel rows and kernel weight to additive gene effect. He added that dominance was involved in the gene action controlling kernel row^{-1} and grain yield. Saghir (1984) performed diallel cross analysis with 6 inbred lines and showed that 100-kernel weight and grain yield plant^{-1} were controlled by over dominance type of gene action while number of kernel rows ear^{-1} was controlled by additive type of gene action. The present study was conducted to ascertain the best cross combinations regarding genetic information for economic characters in maize.

MATERIALS AND METHODS

The investigations reported here were carried out in the Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad during the year 1987-88. Six inbred lines of maize viz. L 1, Pb 37, A 50-2, A 427-2, B 34-2 and 82 P1 were crossed in a complete diallel fashion. Seed of F1 single crosses and reciprocals along with their parents were planted in 2 rows with the help of dibbler keeping 60 cm row to row and 30 cm plant to plant distances in a randomised complete block design with 3 replications. The data were recorded on 10 guarded plants for number of ears plant^{-1}, number of kernel rows ear^{-1}, 100-kernel weight and grain yield plant^{-1}. The data were subjected to diallel analysis technique following Hayman (1954) and Jinks (1954, 1955) in order to have information about gene action of characters under study.

RESULTS AND DISCUSSION

Number of ears plant^{-1}: The position of the regression line on the Vr/Wr graph (Fig. 1) suggested over dominance type of gene action for number of ears plant^{-1} as the regression line cut the Wr-axis below the origin.

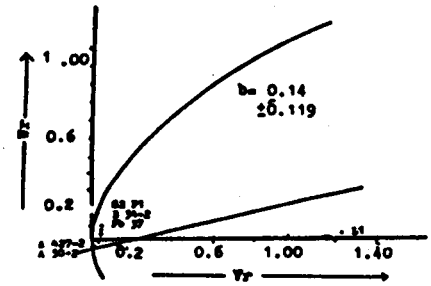

Fig. 1. Vr/Wr graph for number of ears plant^{-1}.

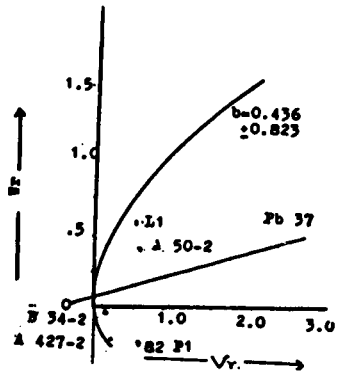

Fig. 2. Vr/Wr graph for kernel rows ear^{-1}

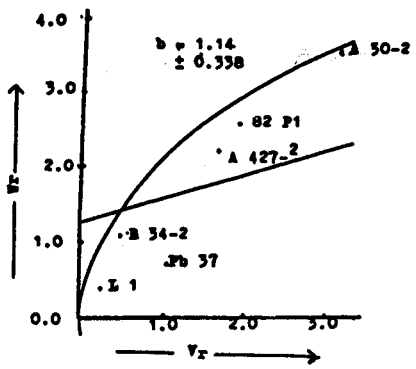

Fig. 3. Vr/Wr graph for 100-grain weight.

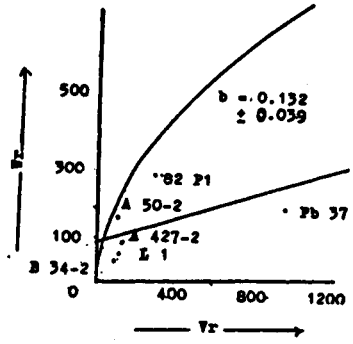

Fig. 4. Vr/Wr graph for grain yield plant^{-1}

The regression line deviated significantly from unit slope showing the presence of epistatis. The arrangement of the array points on the regression line showed that variety Pb 37 followed by A 427-2 and A 50-2 possessed maximum dominant genes while variety L 1 contained the most recessive genes for the manifestation of number of ears plant^{-1}. The results are in agreement with the findings of Singh and Nanda (1976).

Number of kernel rows year^{-1}: The graph (Fig. 2) showed that the regression line passes through the Vr-axis above the origin suggesting partial dominance with the additive type of gene action. As the regression line did not deviate significantly from unit slope, therefore, no non-allelic interaction was present for this character. From the position of the array points, the inbred line B 34-2 being nearer to the origin possessed

maximum dominant genes while Pb 37 being away from the origin carried maximum recessive genes. The results are in accordance to the findings of Chaudhry (1974).

100-grain weight: The position of the regression line on Vr/Wr graph (Fig. 3) suggested partial dominance with the additive effect for the manifestation of this character. As the regression line did not deviate significantly from unit slope, thus indicating the absence of non-allelic interaction. From the distribution of the array points on the regression line, the inbred L 1 possessed maximum dominant genes being nearer to the point of origin, while A inbred 50-2 had maximum recessive genes. These results corroborate the findings of Bawzir (1983).

Grain yield plant^{-1}: Graphical presentation of gene action for grain yield (Fig. 4) showed that the regression line intercepted the Wr-axis above the origin predicting additive type of gene action. The regression line deviated significantly from unit slope indicating the presence of genic interaction for grain yield. From the position of array points on the regression line, B 34-2 followed by L1 possessed maximum dominant genes being in close vicinity of the origin and Pb 37 had the most recessive genes. These results support the findings of Bhallah and Khera (1977).

It is concluded that 100-grain weight, kernel rows ear^{-1} and grain yield were controlled by additive type of gene action. Therefore, the selection for these three traits would be fruitful and reliable in early segregating generations.

REFERENCES

Bawzir, A.A.A. 1983. Studies on combining ability and the nature of gene action in F_1 diallel cross in grain sorghum. Agri. Res. Centre. Aden., FAO. pp: 658-666. (Plant Breed. Abst. 54: 2864; 1984).

Bhallah, S.K. and A.S. Khera. 1977. Analysis of combining ability in maize at varying plant densities. Maydica, 22: 19-26. (Plant Breed. Abst. 27: 11389; 1977).

Chaudhry, M.Y. 1974. Genetic variance for yield and its components in synthetic population of maize *(Zea mays* L.). Pak. J. Agri. Sci. 11: 67-80.

Hayman, B.J. 1954. 1954. The theory and analysis of diallel cross-1. Genetics, 32: 789-809.

Jinks, J.L. 1954. The analysis of continuous variation in a diallel cross of *Nicotiana rustica* L. varieties. Genetics, 39: 767-788.

Jinks, J.L. 1955. A survey of genetical basis of heterosis in a variety of diallel crosses. Heredity, 9: 223-238.

Manolive, M. 1969. Studies on the heritability of some quantitative characters in maize. Lucrari Stiinifice Institutal "W. Bal, Cescu" A, 12: 35-43.

Saghir, M. 1984. Diallel analysis of some agronomic characters of maize. M.Sc. Thesis, Dept. Plant Breed. Genetics, Univ. of Agri., Faisalabad.

Singh and Nanda. 1976. Inheritance of yield and yield contributing characters in rice. India J. Agri. Sci. 46: 323-326. (Plant Breed. Abst. 47: 9458; 1977).