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Gene Action for Plant Height, Grain Yield and Its Components in Spring Wheat

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bstract

allel crosses involving genotypes K-65, LU26S, 6500, 5039 and 1671-1 should additive. Genetic variance with partial minance was observed for all the characters studied except spike length where over dominance was observed. Epistatic fect was absent for all the characters. The genotype 1697-1 seems to be the best source of height reduction as it ntained most recessive genes and its grain yield per plant was also high after K-65. These two lines could be used in the eeding programme to develop high yielding wheat varieties.

troduction

heat being the staple food for the human population, cupies a prominent position in the cropping pattern of the untry. Basic aim to all wheat breeding programmes is to prove yield. The wheat breeder has to work constantly to odify the genetic architecture of his varieties for greater stained wheat production. Genetic information in early nerations could play a crucial role to enhance the ficiency of wheat breeding programme.

he diallel cross technique developed and illustrated by ayman (1954) and Jinks (1954) provides genetic formation about parental lines in early generations. dditive type of gene action was reported to be involved in uch characters like plant height, grain yield and the mponents of yield by Khan *et al.* (1982), Iqbal *et al.* 989) and Chowdhry *et al.* (1993). Amawate and Bahl 995), Altinbas and Bilgen (1996) and Chowhdry *et al.* 997) have also reported partial dominance with additive pes of gene action for most of yield components in heat. The present studies were carried out to have formation on the inheritance pattern of yield and its mponents. The information so derived could be of great alue for a wheat breeding programme.

Materials and Methods

The study was carried out in the experimental area of the epartment of Plant Breeding and Genetics, University of griculture, Faisalabad during the crop years 1996-98. the xperimental material comprised of five wheat arieties/lines K-65, LU26S, 6500, 5039 and 1697-1. These were crossed in a diallel fashion. In the following ear the parental lines alongwith the crosses were sown in the field using randomized complete block design (RCBD) with three replications in single row plots spaced 30 centimeters apart with plants 15 centimeters apart. Other cultural and agronomic practices were kept uniform for the entire experiment. At maturity ten guarded plants selected randomly from each row were measured for plant height, spike length, number of spikelets per spike, grain weight per spike and grain yield per plant.

The data were subjected to analysis of variance and where the differences of means were significant, the data were further subjected to diallel analysis. The Vr/Wr graph plotted for each character indicated the type of gene action according to Hayman (1954) and Jinks (1954).

Results and Discussion

Analysis of variance revealed that the genotypic differences were highly significant for plant height, spike length, and grain weight per spike while significant for spikelets per spike and grain yield per plant (Table 1).

Plant Height: The regression line on Vr/Wr graph indicated partial dominance for plant height, as the regression line above the origin showing additive type of gene action (Fig. 1) as also reported by Khan *et al.* (1982, 1992) and Chowdhry *et al.* (1997). The genotype K-65 possessed maximum dominant genes being closer to the origin while the genotype 1697-1 contained most recessive ones. Insignificant deviation from unit slope of array points indicated the absence of non-allelic interaction. Partial dominance with additive type of gene action revealed that selection in early generations would be effective.

Spike length: The present studies exhibited that as the regression line cut the Wr-axis below the origin (Fig. 2). Over dominance appeared to be important. These results are in agreement with the findings of Zia and Chaudhary (1980), Chaudhry *et al.* (1983) and Altinbas and Bilgen (1996).

Absence of non-allelic interaction was cleared from the regression line unit slope. The genotype 5039 possessed most dominant genes while 1697-1 contained the most recessive ones. Selection in early segregating generation would be difficult.

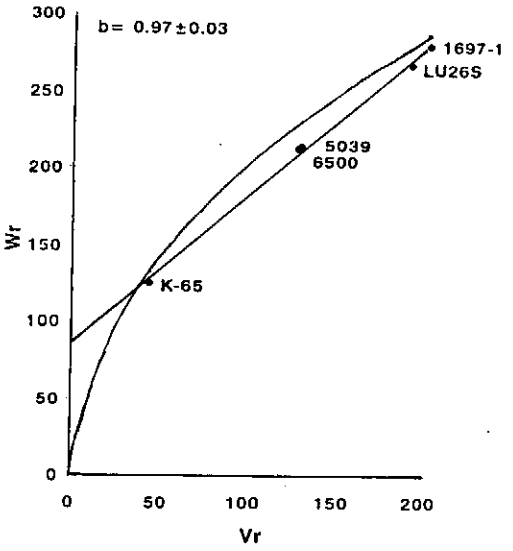
Spikelets per spike: The examination of figure 3 revealed that the regression line on Vr/Wr graph indicated partial dominance with additive type of gene action; as regression line cut the Wr-axis above the origin. Similar results were reported by Khan *et al.* (1982), Iqbal *et al.* (1989) and Khan *et al.* (1992). The regression line did not deviate from the unit slope and showed the absence of non-allelic interaction. The genotype LU26S being close to the origin

able 1: Analysis of variance for some metric characters in a 5 x 5 diallel cross of wheat

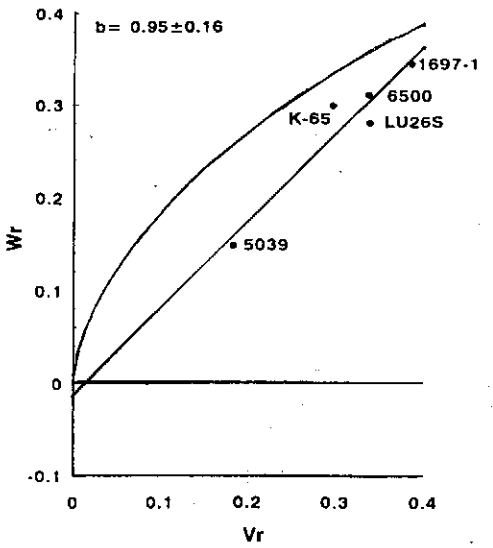
		Mean Squares				
ource of ariation	d.f.	Plant height	Spike length	Spikelets per spike	Grain weight	Grain yield per plant
eplications	2	70.191**	1.039*	1.400NS	0.075NS	133.405**
enotypes	24	695.511**	1.598**	1.392*	0.118**	27.167*
rror	48	12.450	0.267	0.708	0.024	12.595

S = Non significant
= Significant at 5 % level of probability
* = Significant at 1 % level of probability

ossessed maximum dominant genes while 1697-1 ossessed maximum recessive ones. Partial dominance uggested that caution would be needed while making election for desired spikelet number per spike.



g. 1: Vr/Wr graph for plant height (cm).



g. 2: Vr/Wr graph for spike length (cm).

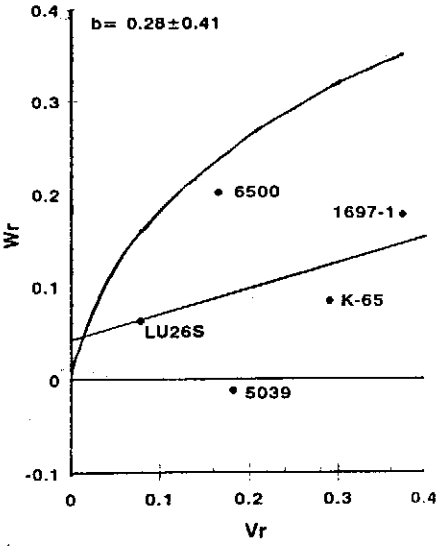


Fig. 3: Vr/Wr graph for spikelets per spike.

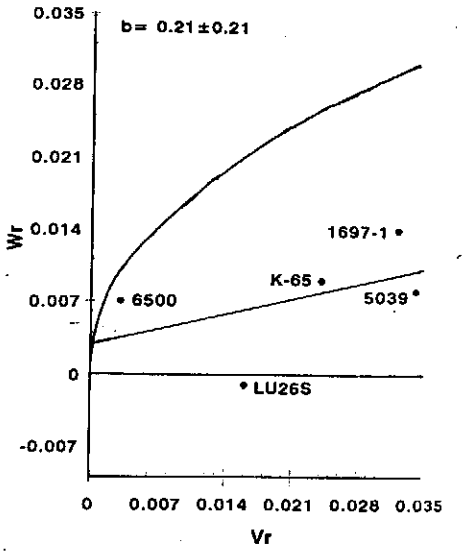


Fig. 4: Vr/Wr graph for grain weight per spike (g).

Grain weight per spike: It is evident from Vr/Wr graph (Fi 4) that the regression line intercepted Wr-axis above the origin which indicated partial dominance and additive ty of gene action. The genotype 6500 possessed m

dominant genes while 1697-1 contained maximum recessive ones being far away from the origin. Epistatic effect was absent as regression line did not deviated significantly from unit slope.

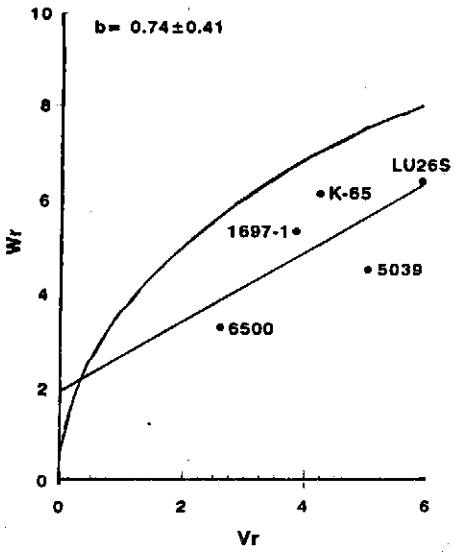


Fig. 5: Vr/Wr graph for grain yield per plant (g).

Selection for this trait in early generation would be fruitful due to partial dominance of gene action.

Grain yield per plant: The regression line on Vr/Wr graph indicated partial dominance for yield per plant as Vr cuts Wr-axis above the origin (Fig. 5). These type of findings were also reported earlier by Chowdhry *et al.* (1992, 1993). The genotype 6500 carried most dominant genes being close to the origin and LU26S contained most recessive genes being far away from the origin. Non-allelic interaction was absent because regression line deviated non-significantly from unit slope. The partial dominance with additive gene action suggested selection in early segregating generation.

It is concluded that the genotype 1697-1 was the best source of height reduction as it contained most recessive genes and its grain yield per plant was also high after K-65. These two lines could be used in the wheat breeding programmes.

References

Altinbas, M. and G. Bilgen, 1996. A study on gene action for spike characters in two spring wheat (*Triticum aestivum* L.) crosses. Anadolu, 6: 84-99.

Amawate, J. S. and P. N. Bahl, 1995. Genetical analysis of some quantitative components of yield in bread wheat. Indian J. Genet. and Pl. Br., 55: 120-125.

Chaudhry, M. A., A. S. Khan, B. Ahmad and M. L. Shah, 1983. Diallel cross analysis for yield and some of its components in bread wheat. J. Agri. Res., 21: 39-45.

Chowdhry, M. A., M. Rafiq and K. Alam, 1992. Genetic architecture of grain yield and certain other traits in bread wheat. Pak. J. Agric. Res., 13: 216-219.

Chowdhry, M. A., M. Y. Saleem, K. Alam, and I. Khaliq, 1993. Mode of gene action for some agronomically important characters in spring wheat. Pak. J. Agri. Sci., 30: 177-180.

Chowdhry, M. A., M. T. Arshad, G. M. Subhani and I. Khaliq, 1997. Inheritance of some polygenic traits in hexaploid spring wheat. J. Ani. Pl. Sci., 7: 77-79.

Hayman, B. I., 1954. The theory and analysis of diallel crosses. Genetics., 39: 789-809.

Iqbal, M., K. Alam and M. A. Chowdhry, 1989. Gene action studies for yield and yield components in some interaspecific crosses of wheat (*Triticum aestivum* L. em. Thell). Pak. J. Agri. Sci., 26: 444-450.

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

Khan, M. Q., K. Aleem and M. A. Chowdhry, 1992. Diallel cross analysis of some morphological traits in spring wheat. Pak. J. Agric. Res., 13: 211-215.

Khan, N. I., M. A. Bajwa, A. G. Asi, M. S. Bhatti and M. S. Qari, 1982. A five parental diallel analysis of some quantitative characters in wheat (*Triticum aestivum* L.). Pak. J. Agri. Sci., 19: 145-153.

Zia, M. A. and A. R. Chaudhry, 1980. Gene action for yield and its components in wheat. Pak. J. Agri. Sci., 17: 87-92.