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HERITABILITY ESTIMATES OF PLANT HEIGHT, YIELD AND YIELD COMPONENTS IN WHEAT *(TRITICUM AESTIVUM L. EM. THELL.)*.

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Broad sense heritabilities and genetic advance values were computed for plant height, number of tillers per plant, spike length, number of spikelets per spike, number of grains per spike, 1000-grain weight and grain yield per plant, involving four wheat (Triticum aestivum L. em. Thell.) crosses viz. LU26 x PMHCS, LU60 x PW7, LU31 x V79353 and LU31 x Mant7. All the characters studied were quantitatively inherited. The heritability estimates for different characters were generally high to moderate in all the crosses with expected genetic advances. Cross LU31 x V79353 showed extremely high heritability for plant height, number of tillers per plant, 1000-grain weight and grain yield per plant. Keeping in view the high heritability estimates for various characters, selection should lead to a fast genetic improvement of this material.

INTRODUCTION

Wheat being the staple food and major cereal in Pakistan has always in sharp focus for sustained genetic improvement. The success of any breeding programme is conditioned by the type and extent of genetic variability present in the material at hand. Broader the spectrum of variability more are the chancee of designing the visualized cultivar. Heritability estimates provide an authentic information about the extent to which a particular genetic trait will be transmitted to the successive generation

and help in making desirable selections. The present research was thus planned to estimate the heritability of yield and its prominent components like plant height, number of tillers per plant, spike length, number of spikelets per spike, number of grains per spike, 1000-grain weight and grain yield per plant in four single crosses of seven wheat varieties. Considerable research on this aspect has already been reported by Misher (1971), Singh et al., (1973), Tikka et al., (1973), Bhatia et al., (1978), Khan and Chowdhry (1979), Din (1980), Kinasz (1980), Naumova (1981) and Tahir et al., (1983).

MATERIAL AND METHODS

Four single crosses namely (LU26 x PMHCS, LU60 x PW7, LU31 x V79353, and LU31 x Mant7) comprised the research material. The F_1 seeds, alongwith their parents were space planted in the experimental area of Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad during 1984-85 keeping plant to plant and row to row distance of 22 cms and 30 cms, respectively. At maturity 150 plants from F_2 population of each cross and 30 plants from each parent were selected at random and the data on the following seven quantitative characters were recorded on each selected plant.

1. Plant height

The height of the main tiller of each selected plant was measured in centimeters from groud level upto the tip of spike excludig awns.

2. Number of tillers per plant

Number of tillers per plant were counted from the selected plants at maturity.

3. Spike length

The length of the main spike of selected plant excluding awns was measured in centimeters at maturity.

4. Number of spikelets per spike

Number of spikelets of main spike were counted.

5. Number of grains per spike

Number of grains were counted from the main spike of each selected plant.

6. 1000-Grain weight

Weight of 1000-grains was recorded from each selected plant.

7. Grain yield per plant

The total grain produce obtained from each selected plant was recorded in gms.

Heritability estimates in broad sense were computed using the formula proposed by Mahmud and Kramer (1951).

$$h^2 = \frac{VF_2 - \sqrt{VP_1 \times VP_2}}{VF_2} \times 100$$

Genetic advance was calculated by the following formula at 10 percent selection intensity.

$$GA = SD^F_2 \times h \times i$$

RESULTS AND DISCUSSION

The estimates of coefficient of variability, heritability and genetic advance are presented in Table 1. As is obvious from the Table 1, plant height coefficients of variation ranged from 5.81 to 17.23, heritability ranged from 65.38 to 80.45 per cent and genetic advance ranged from 7.03 to 25.65 for the crosses LU26 x PMHCS and LU31 x V79353, respectively. Cross LU26 x PMHCS gave the lowest genetic advance (7.03) and also showed lower coefficient of variation (5.81), while cross LU31 x V79353 showed the highest heritability (80.45 per cent) and genetic advance (25.65) for plant height. Similar results have

Table 1. *Coefficient of variability, broad sense heritability estimates and genetic advance for various characters in four crosses of Triticum aestivum L.em.Thell.*

Characters/ crosses	LU26 x PMHCS			LU60 x PW7			LU31 x V79353			Lu31 x Mant7		
	CV%	h^2	GA	CV%	h^2	GA	CV%	h^2	GA	CV%	h^2	GA
Plant height	5.81	65.38	07.03	15.65	79.92	18.82	17.23	80.45	25.65	14.65	67.87	12.74
No. of tillers per plant.	32.72	58.10	07.34	34.69	58.48	06.61	39.80	78.46	10.52	33.21	52.44	05.29
Spike length	09.57	53.44	01.13	15.64	76.36	02.67	10.06	62.48	01.40	10.04	54.41	01.18
No. of spikelets per spike.	04.90	66.95	02.51	09.93	65.66	02.51	10.20	55.57	02.10	09.33	50.29	01.78
No. of grains per spike.	14.50	58.78	11.45	21.63	74.52	22.64	18.28	62.31	13.33	16.41	52.26	10.67
1000-grain weight.	08.43	59.70	04.00	10.81	64.21	04.61	09.44	71.55	05.47	09.31	53.91	03.09
Grain yield per plant.	36.32	69.75	23.69	40.26	57.19	16.70	42.21	71.61	23.64	38.11	44.14	09.97

earlier been reported by Misher (1971), Singh et al., (1973), Din (1980), Kinasz (1980) and Tahir et al., (1983). High heritabilities and a greater genetic advance for almost all the crosses indicated that genetic variability was present in the F_2 generations inconsiderable quantities, which would imply that different height levels could be effectively selected from these crosses. Moderate and high heritability estimates for number of tillers per plant obtained in this study are in full agreement with the findings of Tikka et al., (1973), Khan and Chowdhry (1979) and Tahir et al., (1983), who reported that high heritability values associated with high predicted genetic advance for ear bearing tillers in wheat. Moderate and high heritability estimates in all the crosses reflect that the character under observation was sufficiently heritable and selection for higher number of tillers can be successfully made. Similarly moderate to high heritability estimates calculated for spike length also show that carefully chosen parental material can lead to the progenies showing better spike length in wheat. Almost similar conclusion have earlier been reported by Misher (1971), Singh et al., (1973), Din (1980), Naumova (1981) and Tahir et al., (1983). Moderate heritability estimates with expected genetic advance for all the crosses. The values ranged from 50.29 to 66.95 per cent (Table 1). LU26 x PMHCS showed the highest value of 66.95. The trend is indicative that effective selection can be made in the progenies for improved spikelet number and thus increased yield. The progenies will however, be conditioned by the moderate genetic advance from 1.78 to 2.51. These findings are fairly supported by the researches reported on wheat by Misher (1971), Singh et al., (1973), Bhatia et al., (1978), Khan and Chowdhry (1979) and Tahir et al., (1983). The results recorded also indicated the highest heritability and greater genetic advance for number of grains per spike (Table 1). The ranges were 52.26 to 74.51 and 10.67 to22.64, respectively.

The results obviously suggest that this character can effectively be incorporated into new wheats by using appropriate genetic sources. The results recorded are also in conformity with earlier conclusion reported by Misher (1971), Singh et al., (1973), Bhatia et al., (1978), Khan and Chowdhry (1979), Din (1980), Kinasz (1980), Naumova (1981), and Tahir et al., (1983), who also computed high heritability for number of grains per spike. Moderate to high heritability estimates and greater genetic advance values for 1000-grain weight were observed in the present

study. The ranges were 53.91 to 71.55 and 3.09 to 5.47, respectively. The results were in agreement with those obtained earlier by Misher (1971), and Tahir et al., (1983), who also computed high heritability estimates and an expected progress in kernel weight by appropriate selection procedures. In the present studies data show a wide difference for heritability of grain yield. The values ranged from 44.14 to 71.61 per cent, whereas the genetic advance was 9.97 to 23.69. The findings therefore, suggest that complex character like grain yield can also be improved using appropriate parental material. Almost identical view have earlier been expressed by Singh et al., (1973), Tikka et al., (1973), Din (1980) and Tahir et al., (1983), who reported high heritability for grain yield per plant in wheat.

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