HERITABLE VARIATION FOR GRAIN YIELD AND SOME DROUGHT RELATED TRAITS IN F" GENERATION OF SPRING WHEAT *(TRITICUM AESTIVUM* L. EM. THELL)

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Yield is one of the main fundamental breeding objectives in case of wheat. Data were recorded on six wheat "varieties/lines and five F4 populations to compute coefficient of variability, heritability and expected genetic advance for flag leaf venation, epidermal cell size, stomatal frequency, stomata size and grain yield per plant. Ranges of estimates of heritability for these characters were 37.13-66.67%, 67.20-80.08%, 56.90-69.64%, 49.12-64.00% and *77.R9-84.67'f,J,* respect ively and those of genetic advance were 0.18-0.46, 253J)()-5B.OO, 0.69-0.92, 2.25-3.45 and 7.()8-1O.12, in the same order.

INTRODUCTION

Bread wheat *(Triticum acstivum* L. cm. Thell) is the staple food of masses in most of the countries of the world. It is the most widely cultivated cereals in Pakistan as well as in the whole world. Availability or wheat to the consumers at reasonable rates is an important socioeconomic factor in Pakistan. In order to improve the dubious and tottering food situation and bring wheat supply to a level commensurate with its demand, serious efforts have been carried out of the last 2-3 decades. Hybridization is the primary step for creation of genetic variability. Effectiveness of selection is directly proportional to the extent of heritable variation. Heritability is the most important genetic mechanism because it determines transmissibility of the genetic traits. More a character is heritable, more easily it may be fixed with simple selection procedures.

Mahmood (1991) observed low to moseratc heritability for flag leaf venation and 'high heritability associated with high expected genetic advance for epidermal cell size, stomatal frequency and yield per plant. Marlin ()IJ70) observed moderate heritability (about *W%)* for number of stomata in wheat. Bhagwa! and Bharia ()IJIJ3) recorded heritability, *42'f,J* in F)-F4 and RI % in F4-FS based on parent progeny regression, for stomatal frequency. Boromotov and Smirnova (1981) computed low estimates of heritability in broad-sense (44-45%) for size of stomatal guard cells. Viswanatha and Kohli (1973), Srivastava *et al.* (1981) and Sharma *et al.* (1986) studied high narrow sense heritability associated with high expected genetic advance for grain yield per plant, while Ahmad (1991) found low heritability (37%) for this trait.

MATERIALS AND METHODS

The present research was carried out in the experimental area of Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad. Single seed was harvested from individual plants of F) populations to raise F4 populations of the undermentioned five crosses involving six strains/varieties of wheat (*Triticum aestivum* L. em. Thel). Seeds of crosses along with their parents were space planted with the help of a dibble keeping plant to plant and row to row distance of 15 and 30 cm, respectively, during November, 1992.

1. High ABA 11 x Pak. 81
2. High ABA 15 x Pak. 81
3. High AEA 16 x Pak. 81
4. High ABA 20 x Pak. 81
5. High ABA 20 x LU26S

All of the plants from F4 generation of each cross and 20 randomly selected plants from each parent were examined at specific developmental stages for estimation of heritability. Following plant attributes were studied.

Flag leaf venation: For the study of this character nag leaf strips of about 3 cm length were obtained from the plant and then immediately dipped in Cornoy's solution. After 48 hours these were removed from the solution and washed with alcohol to remove the chlorophyll pigments and then were preserved in alcohol. Then these strips were examined under a compound microscope at 10X magnification. Number of parallel veins was counted per microscopic field. Each strip was used to take five observation and the average was then calculated to use in statistical analysis.

Epidermal cell size: Observations for epidermal cell size were taken from the same leaf strips used for leaf venation study. A fine peel from each strip was taken and studied under microscope at 40X magnification. Measurements on length and breadth of epidermal cells were taken with the help of an ocular micrometer. Then these measurements were converted in microns using ocular and stage micrometers. Length and breadth were then multiplied to calculate the value of epidermal cell 'size. Five observation were taken from each strip and average was then calculated.

Stomatal frequency: The leaf strips used for leaf venation studies were also used to examine the stomatal frequency. The strips were observed under microscope at 40X microscopic field and number of stomata was counted per microscopic field. Five observation were taken from each strip and then average was calculated.

Stomata size: Same leaf strips used for calculating stomatal frequency were examined for size of stomata including guard cells. Leaf strips were observed Under microscope at 40X magnification. Stomatal length was measured in microns from upper surface of leaf strips. Five stomata were measured from eaeh strip, at random, for length with the help of ocular micrometer and the average was then calculated.

Grain yield per plant: At maturity all plants were harvested and threshed separately and then grams yield weighed in grams for each plant. An electronic balance was used for this purpose.

Heritability estimates in broad sense were computed through the method used by Cahancr and Hill (1980).

$$h^2_{F4P} = [V_{F4} - \overline{V_P}] / V_{F4}$$

h^2_{F4P} = The estimates of broad-sense heritability form F4 population and the original pure bred population.

V_{F4} = Phenotypic variance of the character in F4 population.

$\overline{V_P}$ = Average variance of the character within purebred parental lines.

Genetic advance was calculated by the following formula:

$$GA = \sigma_P . h^2 . i$$

Where,

σ_P = The phenotypic standard deviation

h^2 = The estimate of broad-sense

heritability in fraction.

i = Constant value that reflects selection intensity. The value for i = 1.755 in this study at 10% selection pressure.

RESULTS AND DISCUSSION

Table 1 presents values of broad-sense heritability (h^2) and expected genetic advance *(GA.)* for nag leaf venation, epidermal cell size, stomatal frequency, stomata size and grain yield per plant in five crosses of wheat *(Triticum aestivum* L. em. Thell). Data shows that values of heritability and expected genetic advance were moderate to high for most of the traits.

respectively, for the crosses High ABA 20 x Pak. 81 and High ABA 16 x Pak. 81. Similar results have also been reported by Mahmood (1991). Leaf venation is a character of fundamental importance in wheat because it helps in manifestation of drought resistance. These results emphasize on the need for careful and intensive selection when breeding for a variety with desirable leaf venation. Heritability estimates and' expected genetic advance values were moderate to high, for epidermal cell size. Maximum heritability (80%) coupled with high genetic advance (513) was observed, for the cross High ABA 20 x LU26S. The results concur to the findings of Mahmood (1*()()]).*

Table I. Estlmates or bread sense heritahility and expected genelic advance fur nag leaf venntlon, epidermal cell size, stomatal frequency, stonuua size and gnlin yield per plant in F" generation or five crosses or spring wheat,

Crosses		Flag leaf venation	Epidermal cell size	Stomatal frequency	Stomata size	Grain Yield per plant
High ABA 11 x Pak, 81	h^2	45.75	(,7.2(j	5(,.fl(j	50.70	82.91
	GA	0.23	253.(J(,	0.6')	2.49	8.28
IIigh AnA 15 x Pak. 81	h^2	47.90	67.99	61.96	49.12	&4.64
	GA	0.25	267.02	0.74	2.25	8.67
High AnA 16 x Pak, 81	h^2	66.67	68.08	62.50	56.00	81.45
	GA	0.46	271.64	0.79	2.82	7.97
High AnA 20 x Pak. 81	h^2	37.13	72.H	67.27	64.00	77.89
	GA	0.18	399.7!!	0.87	3.45	7.68
High AnA 20 x LU26S	h^2	49.75	80.08	69.64	62.12	&4.67
	GA	0.27	513.00	0.92	3.11	10.12

Values of heritability estimates and expected genetic advance, for nag leaf venation, were low to moderate ranging from 37.13 to 66.67% and 0.18 to 0.46

Smaller plant cells are thought to be useful to combat water stress, as revealed by different researchers (Kolkunov 1910 and Iljin 1(31). It is evident that selection for this character can prove useful but in the appropriate cross combinations. Therefore, efforts should be focussed on incorporation of this trait in promising wheat lines. Stomatal frequency showed highest values of heritability and expected genetic advance (69.64% and 0.92, respectively) for the cross High ABA 20 x LU26S, while their lowest values (56.90% and 0.69, respectively) were observed for high ABA 11 x Pak. 81. Results are in contradiction from findings of Mahmood (1991) who found high values 'If these two parameters, but somewhat near to the findings of Martin (1970) and Bhagwat and Bhatia (1993) who found reasonably good values of heritability for this character. Like leaf venation and cell size, stomatal frequency is also related with drought resistance. Under moisture stress frequency of stomata is increased (Ripple, 1919 and Kokin, 1926). Results demand appropriate selection for the improvement of this trait. High ABA 20 x Pak, 81 gave highest values of heritability and expect cd genetic advance (64.00% and 3,45, respectively) for stomatal size while lowest values (49.12(~> and 2.25, respectively) for this character were observed in case of High ABA 15 x Pak. 81. Similar results were reported by Boromotov & Smirnova (1981). This character also relates to drought tolerance. It is clear that intensive selection is indispensable to take this character at desirable plateau. High values of heritability coupled with high expected genetic advance ranging from 77.89 to 84.67% and 7.68 to 10.12, respectively, in crosses High ABA 20 x Pak. 81 and High ABA 20 x LU26S were observed for grain yield per plant. The results arc in accordance with the work of scientists like Viswanatha and Kohli (1973), Srivastava *et al.* (1981), Sharma *et al.* (1986), and Mahmood (1991). While different from findings of Ahmad (1991) which might be due to differences in the materials used and also the environment. This character is of prime importance to the breeder. Although yield is a complex character but heritability values indicate effectiveness of selection for the improvement of this trait.

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