STUDY OF HERITABILITY AND GENETIC ADVANCE FOR IMPROVEMENT OF BREAD WHEAT (TRITICUM AESTIVUM L.)

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ABSTRACT

The parental diallel crosses always having diversified parents showed high hertiability in F_1 crosses for days to reproductive phase and plant height followed by moderate heritability for number of grains per spike and harvest index, low heritability for grain yield was due to the involvement of non-fixable genetic effects, moderate genetic gain indicated that longer grain filling period or a high reproductive phase should be more considerable for selection. Low genetic gain coupled with high heritability and moderate heritability could be provided vigorous selections pressure. Such variability in genetic gain and hertability estimates indicated for pedigee method of selection in breeding programme to enhance the grain filling period for better recovery of grain yield.

Keywords: *Heritability, Genetic advance, Biometrical Analysis, Genetic componenis.*

INTRODUCTION

Wheat grain is the dominant cereal in world market. The grain quality and production have the meaning to regenerate under constricting environments. Heritability estimates of various traits determines suitable strategy for crop improvement. It is estimated under simple experimental designs using simple models for analysis. Heritability in narrow sense and genetic advance in per cent over mean for the characters compared with three standard categories viz. high (>30%), moderate (>10% and <30%) and low (<10%). According to Dodley and Moll (1969), plant breeding comprises (i) assembly or creation of pool of variable germplasm (ii) selection of superior individuals from the pool and (iii) utilization of selected individual to create a superior variety for which heritability and genetic advance are important.

The concept of heritability is to determine whether phenotypic differences observed among various individuals are either due to genetical changes or the effect of environmental factors. Genetic advance refers to the genotypic improvement in the genotypic value in the new population as compared to the past. The genetic gain depends upon (i) amount of genetic variability differences among the different individuals in the base population, (ii) magnitude of marking effect of environmental and interaction components of variability, on the genetic diversity and (iii) intensity of selection Comstock and Robinson (1952). Genetic gain in a character is a product of heritability and selection differential expressed phenotypically of that character. Heritability value itself have no

significance without conjunction with selection differential as genetic gain from selection.

MATERIALS AND METHODS

Ten varieties of bread wheat viz. HD2285, K8305, UP2121, K8565, K8020, HUW234, PBW226, K8103, HUW300 AND H1633 of different diverse bases were employed for the study of heritability and genetic advance. The material was grown in Randomized Block Design in three replications in maintaining the 3 meter length at 23 cm apart. The agricultural practices were made as usual. Data on six quantitative characters were collected and put for biometrical analysis of heritability in percent and genetic advance in per cent over mean. Heritability (in broad sense) by Burton and Vane (1953) and genetic advance (Robinson et.al., 1949) were calculated.

Table 1 : Heritability and Genetic advance for 6 characters in F1 diallel generation of wheat

S.No.	Characters	X	H (%)	GA	GA in % over mean
1.	Days to reproductive phase	49.86	30.15	6.24	12.52
2.	Plant Height	86.08	32.59	6.94	8.00
3.	Number of productive tillers/plant	17.26	7.61	0.49	2.85
4.	Number of grains/spike	59.59	16.36	3.81	6.39
5.	Harvest index	46.19	15.92	1.52	3.29
6.	Grain yield / Plant	45.42	8.04	1.18	2.57

X = grand mean of the character

h = heritability estimate in percent

GA = Genetic advance

GA in % = genetic advance in percent over mean of the characters.

RESULTS AND DISCUSSION

High estimates of heritability (<30.0) for days to reproductive phase and plant height was much appreciable as compared to those characters showed moderate heritability (>10 and <30) for number of grains per spike and harvest index (Table-1). The low heritability (<10) was confined to number of productive tillers per plant and grain yield per plant in the study. The heritability indicated that reliance should be place mainly on mass selection as Lush (1940) pointed that mass selection criteria will be beneficial when heritability is high in population. Similarly, if the heritability becomes lower, the emphasis should be given to pedigree method of selections, sib-tests and progeny test. The heritability estimates are generally influenced by the method of estimation, generation of study, sample size and environments (Hanson, 1963).

Genetic advance though not an independent entity has an added advantage over heritability where character is to be improved

through segregation of generation. Thus heritability and genetic advance are subsequently, most important in selection breeding programme (Johnson et.al., 1955). As Hanson (1963) stated that heritability and genetic advance are two complementary concepts.

The genetic advance in per cent over mean in this study was 12.52 for days to reproductive phase, 8.06 for plant height, 6.39 for number of grain per spike, 3.29 for harvest index, 2.85 for number of productive tillers and 2.59 for grain yield per plant. According to Kung (1977) the genetic advance would be over estimated in either low selection proportion with low heritability. In this study, the high heritability for days to reproductive phase and plant height was in vicinity to Kumar et.al. (1991) and Garg an Pal (1991) which indicated that high heritability estimates were due to higher contribution of fixable genetic components. Low and moderate estimaes of heritability were in agreement with genetic analysis indicated the greater role of non-fixable genetic effects (Singh et.al. and Kumar et.al., 1991). Moderate estimates of genetic genetic gain for days to reproductive phasea and low estimates for plant height, number of productive tillers, number of grain per spike, harvest index and grain yield (Table 1) was according to the Ahmad et.al. (1990) and Kumar et.al. (1991). It indicated that longer grain filling period and reduced plant height should be given more preference during selection breeding programme.

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