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VARIABILITY, HERITABILITY AND GENETIC ADVANCE STUDIES IN SOME BREAD WHEAT (*Triticum aestivum* L. EM. THELL) GENOTYPES

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ABSTRACT

The present field investigation was conducted at Agriculture Research Farm of B.R.D. Post Graduate College (Campus), Deoria (U.P.) during *rabi* 2017-18 in normal soil, timely sown and irrigated conditions. Total81genotypes and 3 checks were evaluated under Augmented Block Design. Genetic variability, heritability andgenetic advance were studied in 81 genotypes of bread Wheat (*Triticum aestivum* L. em. Thell) in Uttar Pradesh toestimate variability parameters for high yield and their contributing characters in 81 germplasm lines of Wheat. The highestheritability per cent in broad sense 0.9762 was recorded for plant height followed by 1000 grain weight (0.9699). The highestgenetic advance 37.824 was recorded for plant height followed by peduncle length (12.389).The highest geneticadvance as per cent over mean was recorded for plant height (39.2545) followed by spike length (39.224).These findingsshow that these traits were governed by additive with epistatic effects for the phenotypic expression of thetraits. It indicates that these traits were governed by additive genetic effect which is fixable type and hence selection for these traits will reward for improvement.

Key words : Genetic advance, genetic advance over mean, heritability, variability, bread wheat.

Wheat (*Triticumb aestivum* L.); a self-pollinating annual plant in the true grass family Gramineae (Poaceae) and genus *Triticum,* is the world's most famous energy rich cereal crop. It has been described as the *"King of the cereals"* because of the acreage it occupies, high productivity and the prominent position it holds in the international food grain trade. Bread wheat is polyploid cereal crop with great genetic diversity worldwide. The ultimate goalof most of the breeding programs is to increase the production per unit area in per unit time. Genetic improvement of quantitative traits depends on nature and amount of variability present in the genetic stock and extent to which the desirable traits heritable. Our mentioned genotype identified as statistically equal to best genotype for economic yield. The genotype showing very high mean performance for various characters may be utilized as donor for improving those characters in a component breeding approach for effective selection of superior genotype in the germplasm lines. Knowledge on genetic parameters like variability and heritability is very much essential. Keeping this in view, genetic variability and heritability for yield and yield attributing traits in germplasm lines of rabi wheat.

METARIALS AND METHODS

The experimental material of wheat germplasm were considered of 81 germplasm lines collected from Department of Genetics and Plant breeding, NDUAT, Ayodhya, B.H.U., Varanasi and CSAUAT Kanpur, Uttar Pradesh. The experimental field under present investigation is located at 26.5 N latitude and 83.79 E longitude and 68 meter (223feet) above the mean sea level. The climate of district Deoria is semi-arid with hot summer and cold winter. The experiment with 81 genotypes with 3 checks variety of wheat in Augmented Block design. Two rows of each test genotype was present only once in each block with 3 checks in randomized manner along with the distance of 23 cm between the rows and 5 cm between the plants. The data on days to 50% flowering, flag leaf area, plant height, days to maturity, spike length, number of effective tillers per plant, number of spikelets per spike, peduncle length, biological yield per plant, grain yield per spike and 1000 grains weight were recorded to estimate genetic variability parameters. Genetic variability was measured and subjected to statistical analysis as : Analysis of variance, Heritability(Broad sense), Genetic advance and Genetic advance asper cent over mean; suggested by (1, 2, and 3) respectively.

RESULTS AND DISCUSSION

Variability is the most important characteristics feature of any population, Estimation genetic variability is an important prerequisite for realizing response to selection, as the progress in breeding depends upon its amount, nature and magnitude. The breeder should have the capability of distinguishing the genetic and non-genetic components of variation occurring in a population. The

Table-1 : ANOVA for yield and yield contributing characters in 81 germplsm lines of wheat.

S. No.	Characters	Source of variance		
		Blocks	Checks	Error
		df (8)	df (2)	df (16)
1.	Days to 50% flowering	6.667	49.556	52.444
2.	Flag leaf area (cm^2)	57.878**	42.077	24.779
3.	Plant height (cm)	168.920	6233.556**	135.294
4.	Days to maturity	208.519**	122.296	185.704
5.	Spike length (cm)	1.72795**	10.33122**	0.29750
6.	No. of spikelets per spike	3.710*	16.545**	4.681**
7	No. of effective tillers per plant	0.256	1.712*	0.728
8.	Peduncle length (cm)	24.102**	694.463	36.498
9.	Grains per spike	29.076	72.690*	57.176
10.	1000 grain weight (g)	1.887	364.51	9.995*
11.	Biological yield per plant (g)	69.229	497.305	68.994
12.	Grain yield per plant (g)	2.384	13.637	4.790*
13.	Grain yield per spike (g)	1.511**	5.126	1.346

**Significant at 5% Probability level, *Significant at 1% Probability level.

Table-2 : Estimate of Genetic variability, heritability and genetic advance in 81 germplasm lines of Wheat.

Characters	Range			Variance						
	Min.	Max.	Mean	^2g	^2p	GCV (%)	PCV (%)	h^2 (BS) (%)	GA (%)	GAM
Days to 50% flowering	72.44	84.44	82.3015	2.388889	5.66667	1.8445	2.842	0.423	2.06728	2.4675
Flag leaf area (cm^2)	18.56	31.38	31.861	2.1656	3.71424	4.5447	5.9523	0.5830	2.3148	7.1488
Plant height (cm)	76.19	117.83	89.84	345.3691	353.825	19.288	19.522	0.9762	37.824	39.2545
Days to maturity	114.26	122.00	124.	5.5046	17.1112	1.9138	3.3743	0.3217	2.7413	2.2362
Spike length (cm)	7.54	13.20	9.1071	4.49805	4.8189	19.706	20.395	0.9334	4.223	39.224
No. of spikelets per spike	14.24	20.27	16.9572	0.8867	1.1793	4.9119	5.6646	0.75189	1.6819	8.7738
No. of effective tillers per plant	4.16	7.38	6.107	0.09005	0.13556	4.0940	5.0231	0.6643	0.5038	6.8738
Peduncle length (cm)	40.79	52.01	47.47	38.3278	40.6089	13.809	14.205	0.9438	12.389	27.619
Grains per spike	42.21	52.90	50.9645	3.6413	7.215	3.686	5.1879	0.505	2.7925	5.394
1000 grain weight (g)	22.59	34.56	30.6851	20.18167	20.807	13.015	13.214	0.9699	9.115	26.405
Biological yield per plant (g)	11.49	31.97	16.90086	27.149	31.462	19.989	21.518	0.863	9.972	38.252
Grain yield per plant (g)	4.48	12	7.871894	0.7244	1.0238	7.3553	8.744	0.708	1.475	12.7445
Grain yield per spike (g)	0.68	2.19	1.3265	0.276	0.3595	21.714	24.809	0.76601	0.9462	39.1498

analysis of variance revealed that the variance due to blocks was highly significant for most of the character except days of 50% flowering, grain per spike, biological yield per plant, grain yield per plant and grain yield per spike; which were non-significant. However, the variance due to checks was highly significant for characters flag leaf area, plant height, spike length, no. of spikelets per spike, no. of effective tillers per plant, peduncle length and grain yield per plant except days to 50%flowering, days to maturity, grains per spike, 1000grains weight biological yield and grain yield per spike; which were non-significant. This indicates presence of substantial amount of genetic variability amount the genotype under study (Table-1).

The character days to maturity (114.26-122)showed highest range, while the minimum range was observed in case of grain yield per spike (0.68-2.19), the other parameters with high range variation were days to 50% flowering(72.44-84.44), and plant height (76.19-117.83). Hence a breeder can concentrate more of these traits which can provide him ample scope for selection (Table 2)

The highest variance due to genotype with highest variance due to phenotype was observed for plant height

(i.e., 76.19) respectively followed by 1000 grain weight (22.59 and 34.56 respectively). Keeping this in mind a plant breeder can select these traits in his breeding program for this area to give farmers high yielding varieties.

Phenotypic and genotypic variance and phenotypic and genotypic coefficient of variance were computed for 14characters. The phenotypic and genotypic variances are influenced by unit of measurement of different traits. Therefore, these parameters were made unit free by estimating phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV). As GCV represents the heritable genetic component of the total variation, it would be more appropriate of use this parameter for comparing variability of different characters in the present investigation. Relatively higher values of GCV were noticed for 1000 grains weight, flag leaf area, peduncle length, spike length, plant height, no. of effective tillers per plant, grain yield per spike and no. of spikelets per spike while higher values of PCV were noticed for grain yield per spike, 1000 grains weight, grain yield per plant, flag leaf area, peduncle length, no. of effective tillers per plant, grains per spike and spike length. The low values of GCV were recorded for biological yield per plant, days to 50%flowering, days to maturity, grains per spike and grain yield per plant along with low PCV values for plant height, no. of spikelets per spike, days to 50% flowering and days to maturity. Difference between GCV and PCV values for the mentioned characters was very broad indicating influence of the traits (Table-2).

Heritability and genetic advance are important selection parameters, heritability estimate along with genetic advance are normally more helpful in predicting the grain under selection than heritability estimate alone. The estimate of heritability can be utilized for the prediction of genetic grain, which indicates the genetic improvement that would result from the selection of best individual. Hence, estimate of heritability is an essential prerequisite for formation of an effective selection method for genetic improvement. High estimates of heritability (>75%) were observed for plant height (89.84%), days to maturity (124), peduncle length (60%), spike length (76.42) and moderate heritability (50-75%) was recorded for no. of spikelets per spike (68.75%), 1000 grain weight (63.91%) and flag leaf area (61.77) indicating that a plant breeder can concentrate on these traits to explois effective selection for genetic improvement. Remaining 6 traits showed low heritability (<50%) (Table-2).

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