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Evaluation of genetic variability for some quantitative traits in wheat (*Triticum aestivum* L.)

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Abstract
The experiment was conducted in *Rabi* 2014-15 at the Field Experimentation Centre of the Department of Genetics and Plant Breeding, SHIATS, Allahabad in randomized block design with three replications to obtain information among 30 genotypes of wheat. Analysis of variance revealed that there were significant differences among genotypes. On the basis of *per se* performances for grain yield per plant, genotype SHBW-112, SHBW -107, SHBW -104 and SHBW -125 were found promising as they showed high value for grain yield and its components of wheat. High genotypic and phenotypic variance was observed for plant height followed by Harvest Index. Maximum genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV) and heritability was exhibited by grain weight per spike followed by total yield per plant and harvest Index. High heritability combined with high genetic advance as per cent of mean was observed for grain weight per spike followed by harvest index and total yield per plant.

Keywords: Wheat (*Triticum aestivum* L.), Genetic variability, heritability, genetic advance.

Introduction

Wheat (*Triticum aestivum* L.) is the 2nd most important cereals in India after rice and improvement in the productivity has played a key role in making India self sufficient in the food production (Mahaptara *et al*., 2008) [11]. Wheat is the important food crop of the world it provides food to 36% of the global population contributing 20% of the food calories for the world people and is a national staple in many countries. In Eastern Europe and Russia, over 30% of the calories consumed come from wheat. Wheat plays an important role in Indian economy being the staple food of the population. Wheat is grown only in Central & south India and that too under rainfed conditions.100 grams of wheat contain about 10-14% of protein, 1-2% of total fat, 3-5% grams of carbohydrates.

The majority of the cultivated wheat varieties belongs to three main species of the genus *Triticum* are the hexaploid *Triticum aestivum* L (bread wheat), the tetraploid *Triticum durum* Desf, the diploid *Triticum dicoccum* Schrank and *Triticum monococcum.* Globally *aestivum* wheat is most important species as it covers 90 per cent of the area and durum wheat which covers about 9 per cent of the total area while *Triticum dicoccum* and *Triticum monococcum* wheat covers less than the one per cent of the total area (Sharma, 2005). India the third largest producer of wheat in the world. The area and production of wheat in india is 30 million ha and 97.5 million tones and productivity is 2935kg/ha (DWR, Annual Report, 2014). Uttar pradesh is country top wheat producer with yield of 30.25 million tones, area is 9.96 million hectares and productivity is 3038kg/ha (Agricultural Statistics at a Glance, 2014).

Variability is the most important characteristics and distinctive feature of any plant population and provides greater opportunity for crop improvement. Genetic variability is the most essential pre-requisite for successful improvement through breeding. The variability helps the breeder in basic selection on phenotypic performance. The extent of genetic variability is of paramount importance for the improvement of a crop, as greater is the genetic variability in the existing germplasm better would be the chances in selection of superior genotypes (Burton and Devane, 1953) [9].

Heritability estimates provide information about the extent to which a particular character can be transmitted to the successive generations.Heritability along with genetic advance would be more useful tool in predicting the resultant effect from selection of the best genotypes for yield and some of its components in wheat.

With this background, the present study aimed to estimate the genetic parameters among the various genotypes of Bread Wheat.

Materials and Methods

The present investigation was conducted during *Rabi* 2014-15 to evaluate 30 genotypes of Bread Wheat *Triticum aestivum* (L.).The experiment was conducted at the Field Experimentation Centre, Department of Genetics and Plant Breeding, SHIATS, Allahabad in Randomized Block Design (RBD) with three replications. Allahabad is located in the South-East part of Uttar Pradesh, India. Allahabad fall under agro-climatic zone IV, which is named as "Middle Gangetic Plains". The experiment site of is located at 25.57º N latitude, 81.51º E longitude and 98 meter above the sea level.Row to row and plant to plant distance was kept at 22.5 and 5 cm, respectively. The recommended doses of fertilizers @ 120:60:60 N: P_2O_5: K_2O kg per hectare were applied and agricultural package of practices was followed to raise a healthy crop. Five randomly selected plants were selected to record the data for sixteen quantitative characters viz. Days to 50% heading, Days to 50% flowering, Plant height (cm), Number of tillers per plant, Flag leaf length, Flag leaf width,

Spike length (cm), Days to maturity, Grain filling period, Number of grains per spike, Grain weight per spike (g),Biological yield (g), Harvest index (%), Test weight (g) and Seed yield per plant (g). The data recorded for these characters were subjected to analysis of variance Panse and Sukhatme (1967) [14]. The genotypic (GCV) and phenotypic coefficients of variation (PCV), were calculated by the formula given by Burton (1952) [6]. Broad-sense heritability (h2) was calculated as the ratio of the genotypic variance to the phenotypic variance Burton and De Vane (1953) [9]. Genetic advance was calculated following using Johnson *et al.* (1955) [16] at 5 % selection intensity.

Result and Discussion

Analysis of variance (Table 1) showed high significant differences for 16 quantitative characters studied, indicating that there is ample scope for selection of promising lines from present gene pool for yield. Ali *et al.* (2008) [3] also revealed highly significant differences among all the genotypes for all the characters.

Genetic parameters (Table-2) were studied to examine genetic worth of yield and yield contributing traits, based on genetic variability estimates viz., Phenotypic Variance(σ^2p),Genotypic Variance(σ^2g), phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability (h^2), and genetic advance as percent of mean (GAM).

Maximum genotypic and phenotypic variances was exhibited by Plant height followed by Harvest Index (186.54 and 145.25).Maximum PCV and GCV were observed for Grain weight per spike (g) followed by total yield per plant/g and harvest Index. Shankarran *et al*. (2011) earlier reported high PCV and GCV for grain weight per spike and yield per plant.

Broad sense heritability estimates revealed that all the characters exhibited high heritability *viz*., Days to 50 % heading (91.29) followed by harvest index(90.67), Dayo 50 % flowering (90.52), Test weight (88.97), Grain weight per spike (87.61), spike length with awn (87.27) total yield per plant (84.96), number of grain per spike (80.68),number of productive tillers per plant (79.73),flag leaf length (79.70), number of spikelets per spike (78.16), plant height (77.87), grain filling period (74.73), days to maturity (65.95) and flag leaf width (64.55). Similar results were reported by Khan *et al*. (2005) for days to heading, grain weight per spike, spike length, 1000 grain weight, grain yield and harvest index indicating the possibility of improving such characters through selection.

Shift in gene frequency towards superior side under selection pressure is termed as genetic advance. High to moderate genetic advance observed for plant height (21.91) followed by harvest index (17.94), test weight (14.51) and number of grain per spike (13.01).

Johnson *et al.* (1955) [18] suggested that estimates of heritability and genetic advance should be considered together for more reliable conclusions. High estimates of heritability coupled with high value of genetic advance as percent of mean was observed for grain weight per spike (87..61 and 71.49), harvest index (90.67 and 55.13) and total yield per plant(84.96 and 54.10) respectively suggesting that there was preponderance of additive gene action for the expression of these characters. These observations find support from Arvind *et al*. (2014) [2] recorded high heritability coupled with high genetic advance in grain yield per plant indicating the reliability of these characters for selection.

The present study concludes that there are significant differences for all the characters. High GCV and PCV were observed for grain weight per spike and heritability for all the characters. High estimates of heritability coupled with high to moderate values of genetic advance as percent of mean was observed for grain weight per spike, harvest index and total yield per plant indicating that these characters can be used as selection indices for wheat improvement.

Table 1: Analysis of variance for different quantitative and physiological characters in 30 genotypes of wheat.

Characters	Mean sum of squares		
	Replications (d.f. =02)	Treatment (d.f =29)	Error (df=58)
Days to 50% heading	6.30	27.86**	2.57
Days to 50% flowering	2.80	22.68**	2.29
Plant height (cm)	131.80	159.01**	41.28
Flag leaf length (cm)	7.279	10.21**	2.39
Flag leaf width (cm)	0.00	0.04	0.01
Number of productive tillers per plant	1.20	2.79**	0.65
Spike length with awn (cm)	1.91	4.70**	0.65
Days to maturity	1.90	10.44**	4.60
Grain filling period	1.20	14.50**	4.40
Number of grain per spike	21.37	53.36**	11.83
Number of spikelet per spike	0.42	3.25**	0.83
Weight of 1000 kernel (g)	18.91	58.05**	6.91
Biological yield plant $^{-1}$ (g)	48.23	27.54**	11.72
Harvest index	23.34	86.53**	8.60
Grain weight per spike(g)	0.061	0.32**	0.04
Total yield per plant (g)	1.00	6.18**	1.03

** Significant at 1% level

Table 2: Estimation of components of variance and genetic parameters for 16 quantitative characters in wheat genotypes.

Parameters Characters	σ^2g	σ^2p	Coefficient of variation		Heritability (h^2)(BS)	Genetic advance	Genetic advance as % of mean
			GCV	PCV			
Days to 50% heading	27.01	29.58	7.34	7.69	91.29	10.23	14.45
Days to 50% flowering	21.92	24.21	6.04	6.35	90.52	9.18	11.84
Plant height (cm)	145.25	186.54	12.89	14.61	77.87	21.91	23.43
Flag leaf length (cm)	9.41	11.81	12.62	14.13	79.70	5.64	23.20
Flag leaf width (cm)	0.04	0.05	11.82	14.71	64.55	0.31	19.56
Number of productive tillers per plant	2.58	3.24	21.61	24.20	79.73	2.95	39.74
Spike length with awn (cm)	4.48	5.14	12.83	13.73	87.27	4.08	24.69
Days to maturity	8.91	13.51	2.59	3.19	65.95	4.99	4.33
Grain filling period	13.03	17.44	9.54	11.04	74.73	6.43	16.99

Number of grain per spike	49.41	61.25	20.44	22.76	80.68	13.01	37.82
Number of spikelet per spike	2.98	3.81	13.19	14.92	78.16	3.14	24.03
Weight of 1000 kernel (g)	55.75	62.66	18.33	19.44	88.97	14.51	35.62
Biological yield plant $^{-1}$ (g)	23.632	35.357	22.252	27.218	66.838	8.187	37.476
Harvest index	83.67	92.27	28.10	29.51	90.67	17.94	55.13
Grain weight per spike(g)	0.31	0.36	37.08	39.61	87.61	1.08	71.49
Total yield per plant (g)	5.84	6.88	28.49	30.91	84.96	4.59	54.10

Where- Vg = Genotypic variance GCV = Genotypic coefficient of variance PCV = Phenotypic coefficient of variance, h^2(bs) = Heritability(broad sense), GA = Genetic advance

References

1. Ali F, Khan AS, Zulfiqar A. Genetic variability and inheritance of grain yield and its components in wheat. Pakistan Journal of Agriculture Science. 2003; 40(3/4):176-179.
2. Arvind A, Raj S. Genetic variability in relation to qualitative and quantitative traits in wheat (Triticum aestivum L.). Indian Journal of Genetics and plant breeding, 2014; (3):23-28.
3. Ali Y, Atta BM, Javed A, Monneveux P, Lateef Z. Genetic variability, association and diversity studies in wheat (Triticum aestivum L.) germplasm, Pakistan Journal of Botany. 2008; 40(5):2087-2097.
4. Ahmad M, Mohammad F, Maqbool K, Azim A, Iqbal S. Genetic variability and traits correlation in wheat. Sarhad Journal of Agriculture. 2003; 19(3):347-351.
5. Ajmal SU, Zakir N, Mujahid MY. Estimation of genetic parameters and character association in wheat Journal of Agricultural Biological Science. 2009; 1(1):15-18.
6. Burton GW. Quantitative inheritance of grasses. Proc. 6th International, Grassland Congress, 17-23 August, Pennsylvania State College, Pennsylvania, USA, 1952; (1):277-283.
7. Cheema NM, Mian MA, Muhammad I, Rabbani G, Mahmood A. Studies on variability and some genetic parameters in spring wheat Pakistan Journal of Agriculture Science. 2006; 43(1-2):32-35.
8. DWR, Proceedings, Recommendations & Plan of Work (2011-12). *In*: 49th All India Wheat and Barley Research Workers' Meet, 2012, 27-30.
9. Burton GW, De Vane EH. Estimating heritability in all fescue (Festuca arundinacea) from replicated clonal material. Agron. J. 1953; 45:478-481.
10. Khan AS, Sami U Allah, Sadique S. Genetic Variability and Correlation among Seedling Traits of Wheat (Triticum aestivum) under Water Stress international Journal of Agriculture and Biology, 2010. Issn Print: 1560-8530; ISSN Online: 1814-9596.
11. Mahaptara S, Ali Z, Ahsan M. Combining ability analysis for yield and yield related traits among wheat varieties and their F_1 hybrids. International Journal Agriculture Biology. 2008; 10:599-604.
12. Palve SM, Raghavaiah P. Genetic variation and interrelationship of agronomic traits in interspecific derivatives of durum wheat (Triticum durum Desf.).Annals of Agricultural Research 2002; 23(4):602-607.
13. Panse VS, Sukhatame PV. Statistical method for Agricultural workers I.C.A.R. New Delhi, 1957.
14. Panse VG, Sukhatme PV. Statistical methods for agricultural workers, ICAR Publication, New Delhi, (IInd edition), 1967, 381.
15. Om vir, Sheikh M Sultan. Genetic variability and characters associations in the germplasm of wheat (Triticum aestivumL.) under rainfed conditions of Himalayas International Journal of Agricultural Sciences. 2013; 9(1):222-226.
16. Johnson HW, Robinson HF, Comstock RE. Estimates of genetic and environmental variability in Soybean. Agron. J. 1955; 47:314-318.
17. Sharma DJ, Yadav RK, Sharma RK. Genetic variability and association of some yield components in winter X spring nursery of wheat. Advances in Plant Science 1995; 8:95-99.
18. Johnson HW, Robinson AE, Comstock RE. Estimates of genetic and of Botany. 1955; 42(1):89-96.