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Studies on Genetic Variability in Wheat (*Triticum aestivum* L. Em Thell) Under Temperate Conditions of Kashmir

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Abstract: ***The present investigation was carried out with 20 wheat genotypes to study the variability, heritability and genetic advance. Analysis of variance revealed considerable variability among the genotypes for 13 quantitative characters. On the basis of mean performance highest grain yield per running meter was exhibited by genotype MALAN1(452.526g). High genotypic coefficient of variation (GCV) was observed for number of tillers per running meter (20.35) followed by grain yield per plant (18.08) biomass yield (17.06) and thousand seed weight (15.47) while as medium to low GCV was observed for other characters. High phenotypic coefficient of variation was exhibited by flag leaf width (25.96) followed by Number of tillers (20.36) while as other characters showed moderate to low phenotypic coefficient of variation. High estimates of broad sense heritability were observed for number of tillers (99.88%) followed by 1000 seed weight (98.53%) harvest index (94.22%) , plant height (94.09%), days to maturity and biomass yield, while as other characters showed moderate to low broad sense heritability. Biomass yield (188.57%) exhibited highest value of genetic advance followed by grains yield per running meter (111.96%) and moderate genetic advance was observed for number of tillers (56.58) while as other characters showed flow estimates of genetic advance. Maximum genetic advance as percent of mean was recorded for number of tillers per running meter (41.89) followed by grain yield, biomass yield and thousand seed weight while as other traits show low genetic advance as percent of mean.***

Keywords: Variability, Heritability, genetic advance and *Triticum aestivum* L.

1. Introduction

Wheat is a cereal crop belongs to family *Graminae* (*Poaceae)*. It is the world's largest cereal crop. It has been described as the "King of cereals" because of the acreage it occupies, high productivity and prominent position it holds in the international food grain trade. Wheat is a crop of global significance grown in diversified environments. It is an important cereal crop of cool climate, and plays an important role in food and nutritional security of world. It provides food for 36% of the global population and contributes 20% of the food calories **(Singh and Choudhary, 2006)**. Wheat is widely grown all over the world and stands first among the cereals both in area and production.

The world's acreage under wheat crop is 81.47 million hectare with an average yield of 2717 kg / ha. The area under cultivation of wheat crop in India is 28.40 million hectare. with production of 80.71 million tons**(Anonymous, 2010).** India is the second largest producer of wheat in the worldwith 84.27 million tones of production in 2011 **(Singh, 2011).** In Jammu and Kashmir state wheat crop ranks second in cultivation after maize but third in production. In Kashmir wheat is cultivated in limited area due to climate and geographical conditions. The area under wheat in Jammu and Kashmir is about 2.62 lakh hactares with an annual production of 36.68 lakh tones **(Anonymous, 2011)**.Grain yield is a complex trait and highly influenced by many genetic factors and environmental fluctuations. Development of high yielding varieties requires a thorough knowledge of the existing genetic variation for yield and its components. The observed variability is a combined estimate of genetic and environmental causes, of which only the former is heritable. However, estimates of heritability alone do not provide an idea about the expected gain in the next generation, but have to be considered in conjunction with estimates of genetic advance and the change in mean value between generations **(Shukla et al., 2006).** Success in crop improvement generally depends on the magnitude of genetic variability and the extent to which the desirable characters are heritable. Genetic variability is an important factor in evolution as it affects the individual's response to environmental stress and thus can lead to differential survival of organisms with in a population due to natural selection of most fit variants. Heritability and genetic advance are two important selection parameters. The breeders are interested in selection of superior genotype based on phenotypic expression; the major function of heritability estimate is to provide information on their phenotypic expression the other major function of heritability is to provide information on transmission of character from the parent to progeny. Yield and its component traits are controlled by poly genes, whose expression is greatly affected by environment, if a character or trait is controlled by non additive gene action it gives high heritability but low genetic advance, while the character ruled by additive gene action, heritability and genetic advance both would be high **(Ahmad *et al.*, 2007).**

2. Materials And Methods

The experimental material of the study comprised of 20 genetically diverse genotypes of wheat*(T. aestivum*) were

obtained from Dr.(Mrs) Vijay Rana, Division of Plant Breeding and Geneitics, CSK Himachal Pradesh Krishi Vishwavidyalaya, Rice and Wheat Research Centre, Malan, Kangra (H.P.) along with two local checks SKW-1, and SKW-355 and evaluated in the Department of Plant Breeding and Genetics, MRCFC, SKUAST-Kashmir, Khudwani, Anantnag. Climate of the area is cold temperate and temperature ranged from 34^0C maximum to minimum temperature of -4 to -8^0C. Observations on the following 13 quantitative and qualitative traits were recorded from 20 each replication. The material was planted in RBD with three replications each in Rabi 2011-12. The row to row spacing was kept at 20 cm. All recommended agronomic field practices were followed during the crop growth period. Analysis of variance was done for partitioning the total variation into variation due to treatments and replications according to procedure given by **Panse and Sukhatme (1967).** In the present investigation three types of coefficient of variations were estimated viz., phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), error/environmental coefficient of variation (ECV) and heritability. It was calculated by the formula given by **Burton (1952)** and **Burton and Devane (1953).** The estimates of genetic advance were obtained by the formula given by **Johnson *et al.* (1953).**

3. Resutls And Discussion

The mean sum of square showed significant difference among all the characters except flag leaf width, and spike length in wheat genotype, indicates that there is an ample scope for selection of promising genotype from present genotypes for yield improvement. The wide range of variation observed in all the characters offer scope of selection for development of desirable type of wheat. The presence of large amount of variability might be due to diverse source of material as well as environmental influence affecting the phenotypes. Similar findings in wheat were also reported by **Mahmood *et al.* (2005); Nagireddy and Jyothula (2009); Nayeem *et al.* (2007); Ahmad *et al.*, (2003) and Khiziri *et al.* (2010) Kumar et al. (2014)**

In present investigation, the high estimates of genotypic co-efficient of variation were observed for number of tillers per running meter (20.35%), Grain yield per running meter (18.08%) and biomass yield (17.06%) and moderate to low genotypic coefficient of variation for other characters. Similar results were also observed by **Kalimulla *et al.* (2012**), for flag leaf area, grains/plant, number of tillers/plant. **Bergale *et al.* (2001)** for grain yield/plant. **Jagshoran (1995)** for grain yield/plot, number of tillers per plant.

Most of the characters viz. number of tillers per running meter (99.88%) thousand seed weight (98.53%) harvest index (94.22%), plant height (94.09%), days to maturity (94.04%) and biomass yield (92.78 %) showed high broad sense heritability, while as grain yield per running meter (82.52%), flag leaf length (67.49%) number of grains per spike (66.34%) and days to 50% flowering showed moderate broad sense heritability while as other characters showed low broad sense heritability. Similar results were observed by **Ahmad *et al.* (2007); Cheema *et al.* (2006), Khan *et al.* (2007) and Kumar *et al.* (2014).** The high heritability indicates that selection on the basis of phenotype may prove effective for these characters. Biomass yield (188.57), grain yield per running meter (111.96) showed high genetic advance, and the remaining characters number of tillers per running meter (56.58) thousand seed weight (16.74), Plant height (13.31), harvest index (11.35), Number of grain per spike (8.91), days to maturity, (8.01), number of spikelets per spike (5.48), flag leaf length (3.26), days to flowering (2.71) spike length (0.33), flag leaf width (0.06) showed low estimates of genetic advance. Similar results were observed by **Kumar *et al.* (2014), Singh *et al.* (2005); Ahmad *et al.* (2007) and Sharma and Garg (2002).** Number of tiller per running meter exhibited highest value of genetic advance as percent of mean (41.89) followed by grain yield per running meter (33.88), biomass yield (33.86), thousand seed weight(31.63).Low estimates of genetic advance as percent of mean was observed for number of grains per spike(19.98), flag leaf length (19.88), harvest index (19.55)and for other attributes. Simillar results were observed by **Patel and Jain (2002); Mukherjee *et al.* (2008); Kamboj (2010) and Kumar *et al.* (2014).**

4. Conclusion

The results showed that significant variation existed among twenty wheat genotypes and genotype MALAN1 showed high mean performance for grain yield per running meter (452.52). High heritability along with high genetic advance was observed for number of tillers per running meter, biomass yield and grain yield per running meter. Genotypes MALAN1 (452.52) MALAN10 (425.10) MALAN8 (424.41) attributed high grain yield per running meter and should be selected as high yielding genotypes for future experimentation to obtain a better yielding varieties under Kashmir condition.

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Table 1: Analysis of variance of mean sum of squares for thirteen characters under study in wheat (*Triticum aestivum* L.)

Character	*Replication (d.f. =2)*	*TREATMENTS (d.f. =19)*	*Error (d.f. = 38)*
Days to 50% flowering	2.866	9.384**	1.415
Days to maturity	0.599	49.350**	1.02
Plant height	0.816	134.17**	4.43
Number of tillers per running meter	4.55	2266.71**	0.84
Flag leaf length	0.021	8.99*	0.174
Flag leaf width	0.015	0.051	0.036
Spike length	0.171	1.438	0.948
Number of spikelets per spike	33.95	53.78**	13.591
Number of grains per spike	12.35	98.61**	14.26
Biomass yield	4885.41	27866.55**	694.18
Harvest index	1.703	98.704**	1.97
1000 seed weight	1.731	197.97**	1.131
Grain yield per running meter	4170.08	11497.32**	758.055

*** and ** Significant at 1% and 5% level of significance respectively.**

Table 2: Estimates of Genetic variability parameters for thirteen characters under study in wheat (*Triticum. aestivum* L.).

S.No.	Character	Mean	Range	GCV	PCV
1.	Days to 50 % flowering	202.26	206.66-200	0.80	0.99
2.	Days to maturity	249.65	25.6-245	1.60	1.65
3.	Plant height (cm)	102.98	117.4-92.4	6.47	6.67
4.	number of tillers per running meter	135.05	188.33-91	20.35	20.36
5.	Flag leaf length (cm)	16.42	19.1-11.06	11.74	14.30
6.	Flag leaf width (cm)	0.8	1.03-0.6	10.07	25.96
7.	Spike length (cm)	9.01	10.32-7.46	4.56	11.69
8.	Number of spikelets per spike	48.2	58.66-42.33	7.98	11.53
9.	Number of grains per spike	44.61	54.33-31	11.91	14.62
10.	Biomass yield (g)	556.91	746.66-398.33	17.06	17.71
11.	Harvest index (%)	58.06	71.3-51.02	9.77	10.07
12.	1000 seed weight (g)	52.91	75.4-38.2	15.47	15.58
13.	Grain yield per running meter	330.87	452.5-243.58	18.08	19.90

Table 3: Estimates of heritability, Genetic advance & genetic advance as percentage over mean for thirteen characters under study in wheat (*Triticum. aestivum* L.).

S. No.	Characters	Heritability (%)	Genetic Advance	Genetic Advance as percentage of Mean.
1.	Days to 50 % flowering	65.34	2.71	1.343
2.	Days to maturity	94.04	8.01	3.212
3.	Plant height (cm)	94.09	13.31	12.933
4.	Number of tiller per running meter	99.88	56.58	41.892
5.	Flag leaf length (cm)	67.49	3.26	19.88
6.	Flag leaf width (cm)	15.06	0.06	8.058
7.	Spike length (cm)	15.22	0.33	3.66
8.	Number of spikelets per spike	47.90	5.48	11.38
9.	Number of grains per spike	66.34	8.91	19.98
10.	Biomass yield (g)	92.78	188.57	33.86
11.	Harvest index (%)	94.22	11.35	19.55
12.	1000 seed weight (g)	98.53	16.74	31.63
13.	Grain yield (g) per running meter	82.52	111.96	33.88