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COMPARATIVE STUDY OF YIELD AND YIELD CONTRIBUTING TRAITS OF DIFFERENT GENOTYPES IN BREAD WHEAT

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ABSTRACT

Ten different genotypes of bread wheat were evaluated for analysis the yield and yield related traits. The objectives of the study was to study the performances of some wheat varieties for grain yield and its contributing characters and study the heritability for grain yield and its contributing characters. The study revealed that there have significant differences among the different genotypes of bread wheat. From the observation it is clear that Akbar and Shourav have highest height and they were 69.3cm. Sufi was the smallest variety (54.33cm). Shatabdi and Barkat had highest number of tillers (3.67). Pradiv had the highest spike length (16.20cm), relatively high number of spikelet/spike and grains weight in per spike was highest (2.33gm). Some characters of bread wheat are highly heritable such as length of spike, 100-grain weight, yield etc. So these characters would be effective for selection in breeding programme. Sufi and Gourav varieties are semi dwarf. Pradiv, Shatabdi and Prativa have the higher yield than other varieties are semi dwarf in nature. The degree of relationship varied from genotype to genotype.

Keywords: bread wheat (*Triticum aestivum*), yields, traits, genotypes.

INTRODUCTION

The priority of wheat improvement programme is to increase grain yield. Any improvement programme for increasing yield requires sufficient information on their parental materials in respect of variation for yield and yield contributing character. It helps the breeder for improving the selection efficiency. For this many researchers studied variation for yield and yield contributing characters in wheat.

Manal. H. Eid (2009) estimated heritability and genetic advance of yield traits in wheat (*Triticum aestivum* L.) under drought condition. The mean average for plant height, spike length, number of spikes per plant, number of grains per spike, 50% heading date and 1000 grain-weight revealed highly significant differences among genotypes and crosses under both sowing conditions. Low, medium and high heritability was found in different yield traits under study. High heritability accompanied by high genetic advance was observed for spike length and 1000 grain-weight. Low heritability coupled with low genetic advance was for plant height and number of grains per spike.

Yadav, R. K., Parvez Khan and Singh, P. (2006) worked on heritability and genetic advance in common wheat (*Triticum aestivum* L.). In general, heritability estimates were high for all the characters studied except for peduncle length, grain filling period and grain yield per running metre. High heritability coupled with high genetic advance was recorded for number of tillers.

Khalil Ahmed Laghari (2009) studied on comparative performance of wheat advance lines for yield and its associated traits. Some morphological (grain yield, plant height, 1000-grain weight, spike length, number of spike lets/spike, number of grains/spike, main spike yield and phenological data (days to ear emergence, maturity period and grain filling period) were studied. Number of tillers per plant, flag leaf area, peduncle length and grain yield per plant ranged from 6.30 to 19.88, 1.87 to 4.42, 4.78 to 10.10, 2.68 to 10.38 and 4.95 to 11.61, respectively.

Spike per plant is one of the primary yield components of wheat and sometimes studied as number of effective tillers per plant. Srivastava *et al*., (1988) studied variation and reported significant differences among the genotype for spike per plant in spring wheat. In their studies both genotypic and phenotypic coefficient of variation were found high.

Spikelet per plant is an important character related to grain yield in wheat. Sing and Tiwari (1990) reported high genotypic and phenotypic coefficient of variation for this character. Pathak and Nema (1985) recorded 6.51% genotypic coefficient of variation and 10.25% phenotypic coefficient of variation for spikelet per spike.

In wheat, grains per spike are one of the important primary yields contributing character. In study with 25 spring wheat varieties Mondal and Sarker (1996) found significant differences among the yield components. They observed wide range of variation for number of grains per spike. Similar result were obtained by Shoran (1995), Amin *et al.*, (1992), Pratik *et al.*, (2003) But genotypic and phenotypic coefficient of variation was moderate for number of grains per spike as reported by Singh and Tiwary (1990).

100 grains weight has direct effect on grain yield. If 100 grain weight increase, the ultimate total yield increases. A wide range of variation for grain weight was observed by Nessa *et al*., (1994). Pathak and Nema (1985) found genotypic and phenotypic coefficient of variation for 100 grains weight is up to 30.93%. Yadav and Mishra (1993) studied 10 varieties under rainfed condition and they found maximum coefficient of variation for grain weight.

Heritability for spikes per plant of wheat was extensively studied. Narwal *et al*., (1999) reported high heritability for spike per plant in bread wheat. But Kamboj *et al*. (2000) indicated that spike per plant was poorly heritable character.

Plant height was highly heritable as reported as Afiah *et al*., (2000). Camargo and Ferreira (1999) estimated moderate to high narrow sense heritability for plant height in bread wheat.

Heritability for spike length of wheat was extensively studied. Chaturvedi and Gupta (1995) reported high heritability in spring wheat. But poor heritability for spike length character in spring wheat was also reported by Narwal *et al.,* (1997). Shoran (1995) reported high estimates of heritability with high genetic advance for the grains per spike. Kamboj *et al*., (2000) reported low heritability for the character.

Chaturvedi and Gupta (1995) reported poor heritability for 100-grain weight suggesting that the character would not give good response to selection.

MATERIALS AND METHODS

Ten wheat genotypes (*Triticum aestivum*) namely Bijoy, Akbar, Balaka, Shatabdi, Prativa, Shourav, Barkat, Sufi, Gourav and Pradiv were studied in this experiment. Seeds were collected from Regional Wheat Research Centre (RWRC), BARI, Rajshahi Bangladesh and were seeded at an experimental plot of Shahjalal University of Science and Technology, Sylhet in the Rabi season of 2009. The genotypes were grown in single row plot according to randomized completely block design with three replications for this agronomic study. Recommended agronomic practices were followed as and when necessary and the data of all the plants were recorded. Following six characters were studied:

a) **Plant height:** From base of the plant to top of the plant was measured in centimeter.
b) **Total number of tillers/plant:** Total number of tillers/plant was measured at maturity stage.
c) **Spike length:** Length of main spike excluding awn was measured in cm.
d) **Spikelet per plant:** Number of spikelet was counted from each spike of ten sample plants.
e) **Grains weight per spike:** Grains weights were obtained from spike of the sample plants weighted and averaged over per plant.
f) **100-grains weight:** One hundred clean sun dried grains were randomly taken and weight in a digital balance in gm.

Data were statistically analyzed and to distinguish the significant differences between two different means, least significant differences (LSD) were estimated. Mean squares of analysis of variances were worked out to text the significance. The heritability, genotypic variance and phenotypic variance were also estimated.

RESULTS AND DISCUSSIONS

The yield relating traits expressed different variation. Among this yield relating traits length of spike, spikelet number, grains weight show highly differences.

The length of spike was larger in Pradiv and its length was 16.20cm. The spike length in Shatabdi and Prativa also larger and they were 15.70cm and 15.43cm, respectively. On the other hand, the length of spike was smaller in Akbar and Bijoy. Their estimated length was 12.83cm and 12.87cm, respectively. All the other varieties had almost similar length of spike. At 5% level of significance there observed a significant variation.

Total number of tillers per plant was highest in Shatabdi and Barkat (3.67) and it was relatively lower in Pradiv (2.6).

Spikelet number also varies from variety to variety. Prativa composed high number of spikelet and it was estimated 15 spikelet's in per spike. Pradiv, Barkat, Shourav, Shatabdi and Bijoy also had well number of spikelet. Akbar, Balaka and Sufi had also around 12 to 13 spikelets. But Gourav produced only 9.67 spikelets which were smaller in compared to other varieties. At 5% level of significance it was highly significant. Tiwari (1993) and Amin (1992) *et al*., also reported same observation.

In the case of grains weight in per spike, there also show some variation. The weight of grains in a spike was relatively higher in Pradiv. In Pradiv the grain weight was 2.33gm.The weight of grains in Shatabdi and Prativa also higher and they were 2.13gm and 1.91gm, respectively. Akbar and Balaka had lower grains weight but the grains weight of Gourav was much lower than all other varieties and its weight was 0.97gm. At the 5% level of significant it was showed great variation.

For Pradiv and Akbar the weight for 100 grains weight were more than others. The weights were 5.78gm and 5.72gm respectively. Shatabdi and Gourav also had similar nature. But for Barkat, Sufi, and Prativa the 100-grains weight was lower and for Barkat it was 4.12gm. From the analysis of variation there observed a significant variation at 5% level of significant.

Table-1. Mean differences in six agronomic traits of ten wheat genotypes.

Genotypes	**Plant height** (cm)	**Total number of tillers/plant**	**Length of spike**	**No. of spikelet**	**Grains weight in per spike** (gm)	**100 grains weight** (gm)
Bijoy	67.00	3.00	12.87	14.00	1.64	4.41
Akbar	69.30	2.53	12.83	13.00	1.52	5.72
Barkat	58.00	2.67	13.10	12.00	1.53	4.63
Shatabdi	63.67	3.67	15.70	14.67	2.13	5.08
Prativa	66.67	3.30	15.43	15.00	1.91	4.23
Shourav	69.33	3.00	13.70	14.33	1.79	4.57
Barkat	61.32	3.67	13.87	14.67	1.66	4.12
Sufi	54.30	3.00	13.20	13.00	1.18	4.23
Gourav	56.32	3.00	13.53	9.67	0.97	5.36
Pradiv	57.33	2.60	16.20	14.67	2.33	5.78
LSD (5%)	5.95	1.81	0.90	1.97	0.44	0.45
LSD (1%)	8.15	2.48	1.24	2.70	0.60	0.62
CV (%)	5.56	11.48	3.76	8.51	15.43	5.47

LSD indicates the least significant differences at 5% and 1% level, respectively

Table-2. Mean square of analysis of variance of six agronomic traits of ten wheat genotypes.

Source of No. of variation	**d.f**	**ms**					
		Plant Height	**No. of Tillers/Plant**	**Length of spike**	**No. of Spikelet**	**Grains weight/spike**	**100 Grains weight**
Replication	2	11.44	.035	0.24	2.08	.16	0 .06
Genotype	9	95.04**	.55	4.73**	8.24**	.50**	1.18**
Error	18	12.03	1.11	0.28	1.32	.07	0.07

*, ** indicate significant at 5% and 1%, respectively

From Table-3, it was observed that length of spike was highly heritable and it was estimated 84%. The genotypic and phenotypic variances were observed 1.48 and 1.76, respectively. Number of spikelet also a heritable character and 64% of variation in it occur due to genetic constituents. Its genotypic and phenotypic variance estimated 2.31 and 3.63, respectively.

Table-3. Genotypic variance, phenotypic variance and heritability.

Character	**Length of spike**	**No. of spikelet**	**Weight of grains/ spike**	**100 grains weight**
Genotypic variance	1.48	2.31	0.14	0.37
Phenotypic variance	1.76	3.63	0.21	0.44
Heritability	0.84	0.63	0.68	0.84

Grains weight in per spike was also estimated. Its genotypic variance is 0.14 while phenotypic variance is 0.21. Its 68% variation was occurred due to genetic constituents. From the observation of 100 grains weight it was found that, genotypic and phenotypic variances in these varieties were 0.37 and 0.44, respectively. It was highly heritable character and its heritability was estimated as 84%.

Figure-1. Spikes of ten varieties.

Figure-2. Ten varieties of wheat.

The investigation was carried out to find genetic variation among the varieties and their lodging resistance activity in relation to different characteristics.

From the morphological view, Akbar and Shourav two plants height are comparatively higher than other genotypes. Bijoy also have higher height. Ten varieties also show genetic variation among them. The variety Akbar also produces higher weight in its 100 grains though its length of spike and number of spikelet not so higher than other varieties. Spike length of Pradiv is the highest and its spikelet number also more than other genotypes. Its grains weight in per spike is also more than other varieties. 100 grains weight of this genotype also so high but it height is lower than Akbar. The smallest genotype in this experiment was Sufi which yield is relatively lower than all other genotypes. From the yield producing point it is shown that four varieties are better than others. Those genotypes are Pradiv, Akbar, Gourav, and Shatabdi respectively.

For weight of grains in per spike there shown 14% genotypic variations and 21% phenotypic variation. There shown 37% genotypic variation and 44% phenotypic variation for 100-grains weight in all genotype. Pawar *et al.* (2002) reported high phenotypic and genotypic coefficient of variation for the characters spike length, 100-grain weight and yield per plant. Islam (1988) reported high genotypic and phenotypic coefficient of variation for 100-grain weight and grain yield per spike. Amin *et al*., (1992) observed that spikes per plant had high phenotypic coefficient of variation but its genotypic coefficient of variation was much low suggesting that the character was influenced by environmental factor.

Among the observation it is found that different genotypes show variation among them. So the grain yield and yield relating characters in wheat show variation in different degrees and this difference are accompanied by their genetic materials and effects of environmental factors.

The heritability of different character was also estimated. The heritability for length of spike, number of spikelet, weight of grains per spike, 100-grains weight are 84%, 63%, 68% and 84%. It's indicated that those characters were highly heritable.

Afia (2000) found high heritability for plant height and weight of grains per spike. Kamboj *et al*., (2000) reported that spikes per plant were poorly heritable character.

In this experiment different morphological and anatomical characteristics were observed and found significant phenotypic and genotypic variation due to their genetic constituent and environmental effect. Variety Akbar and Shourav had higher height than other variety. On the other hand Sufi and Gourav were two shortest varieties among the all varieties.

Spike length of Pradiv was higher than all other varieties. Shatabdi and Prativa had similar length of spike. All others genotype carries 12-13 cm spike. Spikelet number also varied in different genotypes. Relatively similar number of spikelet found in Bijoy, Shatabdi, Prativa, Barkat and Pradiv. Where, nearly 14 spikelets were found.

Variety Pradiv contain higher grain weight in per spike and it was 2.33gm, where Gourav contained 0.97gm wheat in per spike. But the 100-grains weight was higher in Gourav, which was 5.36gm. Highest weight of 100-grains was found 5.78gm in variety Pradiv.

High heritability and high yielding characters are suitable for selection. Plant height, spike length, 100- grain weight, number of spikelet, weight of grains in per spike had high phenotypic coefficient of variation and they had also high heritability. So selection for this character would be effective.

REFERENCES

Afiah A. S., N. Mohammed and N. A. Salim M. M. 2000. Statistical genetic parameter, heritability and graphical analysis in 8×8 wheat diallel cross under saline conditions. Annals of Agrill. Sci. Cairo. 45(1): 257-280.

Amin A. R., Barma N. C. and Razzaque M. A. 1992. Variability, heritability, genetic advance and correlation in wheat. RACHIS. 11(1-2): 30-32.

Bhatia R. S. Ahmed Z, Sharma J. C., Srivasta R. L. and Khanna A. N. 1978. Heritability and genetic advanced from F_1 to F_4 dialled generation in spring wheat. Indian J. Genet. 38: 155-159.

Bhuyian M. M. A., Shamsuddin A. K. M., Uddin M. K., Islam M. M. and Begum S. N. 1998. Coefficient of variation, genetic parameter, correlation and path analysis in bread wheat. Bangladesh J. Nuclear Agric. Cong. 1: 277-283.

Camargo C. E, de O, Ferreira, F. A. W. P. and Felicio J. C. 1998. Heritability and correlation in wheat hybrid populations for agronomic characteristics. Bragantia. 57(1): 95-104.

Chaturvedi B. K. and Gupta R. R. 1995. Selection parameters for some grain and quality attributes in spring wheat. Agric Sci Dig. 15: 186-190.

Kamboj M.C., Naveen C., Subhandra Yadav R.K. and Chaundra N. 2000. Genetic analysis of yield and its components in bread wheat (*Triticum aestivum* L.). Atlas of Agri-Bio-Research. 5(1): 41-43.

Khan A.S and Z. Ali. 2000. Genetic Studies of some morpho-physiological traits in wheat (*Triticum aestivum* L.). Journal of Pure and Applied Sciences. 19(2): 127-134.

Khalil Ahmed Laghari, Mahboob Ali Sial, M. Afzal Arain, M. Umar Dahot, M. Sher Mangrio and A.J. Pirzada. 2010. Comparative Performance of Wheat Advance Lines for Yield and its Associated Traits. IDOSI Publications. World Applied Sciences Journal 8 (Special Issue of Biotechnology and Genetic Engineering): 34-37. ISSN 1818-4952.

Manal. H. Eid. 2009. Estimation of heritability and genetic advance of yield traits in wheat (*Triticum aestivum* L.) under drought condition. International Journal of Genetics and Molecular Biology. 1(7): 115-120, October. ISSN 2006-9863.

Mondal A.S., Choudhary S. and Ghosac K.K. 1991. Genotypic and phenotypic variability in wheat. Envt. and Eco. 9: 926-928.

Narwal N.K., Verma P.K. and Narwal M.S. 1999. Genetic variability, correlation and path coefficient analysis in bread wheat in two climatic zones of Haryana. Agric Sci Dig, Karnal. 19(2): 73-76.

Pathak N.N. and Nema D.P. 1985. Genetic advance in land races of wheat. Indian J. Agric Sci. 55: 478-479.

Pawar S. V., Patil S. C., Naik R. M. and Jambhale V. M. 2002. Genetic variability and heritability in wheat. J. Maharashtra Agric Univ. 27: 324-325.

Pawar S.D., Thete R.Y. and Dumbre A.D. 1988. Estimates of genetic variability parameters in F2 population of wheat. J Maharashtra Agric Univ. 13: 210-211.

Sharma D.J., Yadav R.K. and Silarma R.K. 1995. Genetic variability and association of some yield components in winter x spring nursery of wheat. Adv in Pl Sci. 8(1): 95-99.s.

Shoran J. 1995. Estimation of variability parameters and path coefficient for certain metric traits in winter wheat (*Triticum aestivum* L.). Indian J. Gen and Pl Breed. 55(4): 399-405.s.

Strivastava L. M. 1966. Histochemical studies on lignin, Tappi. 49: 173-183.

Tiwari V.N. and Rawat G.S. 1993. Variability and correlation studies between grain yield and its components in segregating generations of aestivum wheat. Bhartiya Krishi Anusandhan. 8: 19-24.

Yadav R. K., Parvez Khan and Singh P. 2006. Heritability in wheat. Springerlink, India. 24: 06.