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Inter-relationship studies among grain yield and its component characters in wheat (*Triticum aestivum* L.)

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Abstract
An experiment was conducted during *Rabi* (2015-16) by using randomized block design with three replications and 20 wheat genotypes along with two checks to obtain information on genetic variability parameters, heritability, genotypic and phenotypic co-relations. Analysis of variance revealed that there were significant differences among genotypes. On the basis of *Per se* performance for grain yield per plant, genotype viz: SHIATS BW 1105, SHIATS BW 1103, SHIATS BW 1101 and SHIATS BW 1111 were found promising line as they showed high value for grain yield of wheat. Wide range of phenotypic (VP or σ^2p) and genotypic variance (VG or σ^2g) were observed in the experimental material for all the traits studied. High estimates of phenotypic coefficient of variation (PCV) was obtained for grain yield per plant (16.33) and the lower phenotypic coefficient of variation (PCV) was observed for days to maturity (2.39), whereas wide range of genotypic coefficient of variation (GCV) was observed for all the traits, however the high estimates from grain yield per plant (14.40) and the lower estimates was recorded for days to maturity (1.16). High heritability (broad sense), in same value were recorded for plant height (0.89), number of grains per spike (0.89), while Moderate heritability was observed for peduncle length spike length, harvest index, days to maturity and the low heritability were observed for days to maturity. Suggest predominance of additive gene action in the expression of these traits. Grain yield showed the positive significant genotypic and phenotypic association with days to flowering, flag leaf length, leaf width, days to maturity, number of tiller per plant, no of spikelets per spike, number of grains per spike, biological yield, and test weight.

Keywords: Genetic variability parameters, Heritability (h^2), Genetic advance (GA %), genotypic and phenotypic co-relations wheat (*Triticum aestivum* L.)

1. Introduction

Wheat belongs to family *Poaceae* (*Gramineae*), is a self-pollinating annual plant in the true grass family *Gramineae (Poaceae*), Bread wheat (*Triticuma estivum* L), is the largest cereal crop extensively grown as staple food sources in the world (Mollasadeghi *et al*., 2011) [17]. In 1918, Sakamura reported the chromosome number sets (genomes) for each commonly recognized type. He separated wheat into three groups viz. diploids (2n=14), tetraploids (2n=28) and hexaploids (2n=42) chromosomes. Wheat (*Triticum aestivum* L.) is the first important and strategic cereal crop for the majority of world's populations. It is the most widely grown and consumed food crop all over the world and staple food about 35% of the world's population. At present India ranks second in the world after China with the harvest of 93.9 million tons wheat from its area of 29.4 million hectare with the productivity of 2.86 tons per ha during the year 2012 (Anonymous, 2012) [1] estimated to grow faster than any other crop. But resources available for wheat production are likely to be significantly lower. Furthermore as its high economic value and place among the food crops, it is also known as "The King of Cereals". Wheat is basically a crop of temperate zone, but on account of its genetic diversity, it has extended its frontiers and has become adapted to nearly all the climates of the world (Khan, *et al.,* 2000) [13]. It is grown in diverse agro-climatic conditions ranging from 110oN to 350oN, from 720oE to 920oE and from almost sea level to very high altitudes. Major wheat producing states in India lie between 200oN to 320oN.
In India, it is estimated to produce 109 million tons of wheat by 2020. In the recent past, we have all witnessed the serious threat of climate change especially due to rising temperature, drought, salinity, biotic threats like *Ug99* (in case of stem rust), prevailing races of leaf & brown rusts, powdery mildew and spot blotch. It is therefore, imperative to look for tools not only to increase the crop productivity but also ensure protection against loss of potential productivity due the environmental vagaries. Among abiotic and biotic factors, terminal heat is the major constraints limiting productivity of wheat and is a major cause of yield instability (Kumari, *et al.,* 2015) [15].

Abiotic stresses, such as drought, temperature, salinity and nutrient imbalance reduce wheat yield in many environments (Trethowan and Kazi., 2008) [22].

2. Materials and Methods

The experimental materials consisted of 20 genotypes of wheat, which were obtained from Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University, of Agriculture, Technology and Sciences, Allahabad, U.P. during *Rabi* (2015- 2016).

Screening and evaluation of 20 different wheat genotypes available in Department of Genetics and Plant Breeding in three replications, for selection of best wheat inbred lines on the base of (Inter relationship of studies among grain yield and its component characters) in wheat (*Triticum aestivum* L.). Randomization of the experimental materials in (RCBD), the experimental material comprising of 20 genotypes including two checks, were grown under randomized block design (RBD) with three replications, during *Rabi* 2015-2016. Each genotype was accommodated in a one row of 2 meter length spaced at 25 cm with an approximate plant to plant distance of 5 cm. The sowing was done on November 31th 2015. Thinning was done to maintain a plant to plant spacing of 5(cm). The recommended dose of N: P: K (120:60:60) was applied.

The recommended doses of fertilizer @ 120:60:60 kg (N: P: K) per ha, was applied. Total quantity of phosphorous and potash and 25% of total nitrogen was applied in the soil at the time of land preparation. 50% of total nitrogen was top dressed at tillers stage and the remaining 25% nitrogen was top dressed at panicle initiation stage.

The data recorded on five randomly selected plants from each genotype in each replication leaving the first two border rows from all the four sides, in order to avoid the sampling error. Twenty genotypes of wheat (*Triticum aestivum* L.) grown during *Rabi*-2015-16 under randomized block design with three replications. The observations were recorded on five randomly collected plants in each entry and each replication and their mean values were used for statistical analysis. The characters studied were, plant height (cm), number of tillers per plant, days to heading, days to flowering, flag leaf length (cm), flag leaf width (cm) and flag leaf area (cm^2), spike length (cm), number of spikelets per spike, Peduncle length, days to maturity, number of grains per spike, biological yield /plant, test weight (1000 grains), harvest index (%), and grain yield per plant (g). The data recorded for these characters were subjected to analysis of variance Panse and Sukhatme (1967) [18]. The genotypic (GCV) and phenotypic coefficients of variation (PCV) were calculated by the formula given by Broad-sense heritability (h2) was calculated as the ratio of the genotypic variance to the phenotypic variance Burton and De Vane (1953) [4]**.** Genetic advance was calculated following using Johnson *et al.* (1955) [11] at 5 % selection intensity.

3. Results and discussion

The present investigation was carried out to assess, genetic variability, correlation studies and identify of promising genotypes for yield and quality trait. The results of various parameters are reported and discussed in the chapter under following heads. The mean sum of squares showed significant differences among all the characters except for flag leaf width are given in table (4.1). 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 have also reported by Shankarao *et al.* (2010) [20] and Kalimullah *et al.* (2012) [12].

Through this study, an attempt was made to assess the mean performance and extent of variability in twenty wheat genotypes. Table (4.2) depicts the mean performance of 20 wheat genotypes of fifteen characters along with mean, range and critical difference, which is elaborated as under.

Variability plays an important role in crop breeding. An insight into the magnitude of variability present in crop species is of all most important as it provides the basis for selection. One of the important considerations in any crop improvement is the detailed study of genetic variability. Variability was measured by estimation of mean; the total variation present in a population arises due to a measure by estimation of phenotypic and genotypic variance, genotypic and phenotypic coefficient of variation, heritability, genetic advance and genetic gain for different quantitative traits. Estimation of phenotypic variance (σ^2p) and genotypic variance (σ^2g) were obtained for different characters (Table 4.3). A wide range of variance was observed for all the characters. The highest variability (VG) was recorded for plant height (69.90), while second values were observed for number of grains per spike (19.27), whereas days to flowering (14.00), days to heading (13.23), test weight (9.40), flag leaf length (7.79), grain yield peduncle length (5.14), (6.33), test weight (4.88), number of spikelets per spike (2.77), canopy biological yield (1.71), days to maturity (1.65), spike length (1.17), tillers per plant(0.81), harvest index (2.95) and grain yield per plant (0.43) showed low variance.

The highest variability (VP) was recorded for plant height (78.84), second value were observed for number of grains per spike (21.59), whereas days to flowering (13.91), days to heading (16.00), peduncle length (11.24), test weight (11.15), flag leaf length (9.37), days to maturity(6.97), number of spikelets per spike (3.20), spike length (2.66), biological yield (1.95), harvest index (4.47), number of tiller per plant (1.08) grain yield per plant (0.56) and leaf width (0.02) showed low variance. Phenotypic variance was higher than genotypic variance for all the yield and yield contributing characters indicates the influence of environmental factors on these traits. Similar findings were reported by Gulzaz *et al*. (2011) [7] and Ahmed, *et al*. (2007) [2] and Ajmal *et al*. (2009) [3].

In the resent investigation Table (4.3) & Fig (4.1) showed that estimates of phenotypic coefficient of variation was higher than their corresponding genotypic coefficient of variation, indicating that the little influence of environment on the expression of these characters. However, good correspondence was observed between genotypic coefficient of variation and phenotypic coefficient of variation in all the characters. The results are summarized as under.

A wide range of phenotypic coefficient of variation (PCV) was observed for all the traits ranged from days to maturity (2.39) to (16.33). Higher magnitude of phenotypic coefficient of variation was recorded for grain yield per plant (16.33), number of tiller per plant (15.31), spike length (14.95), flag leaf length (13.36), biological yield (12.60), number of grains per spike(11.03), peduncle length (10.01), number of spikelets per spike (9.94), test weight (9.57), plant height (9.13) while moderate estimates was observed for leaf width (8.32), days to heading (5.29), days to flowering (5.18), harvest index (5.17), harvest index (3.34) and days to maturity (2.39) and low estimates of phenotypic coefficient of variation was observed for days to maturity (2.39).

A wide range of genotypic coefficient of variation (GCV) was observed for all the traits ranged from days to maturity (1.16) to grain yield per plant (14.40). Higher magnitude of phenotypic coefficient of variation was recorded for grain yield per plant (14.40) number of tiller per plant (13.32), flag leaf length (12.18), biological yield (11.80), number of grains per spike (10.42), spike length (9.91), number of spikelets per spike (9.23), test weight (8.79), plant height (8.60),while the moderate magnitude genotypic coefficient of variation was observed for leaf width 96.40), days to heading (4.81), days to flowering (4.71), harvest index (4.19). However the low estimates of genotypic coefficient of variation values was observed for days to maturity (1.16). Similar findings were also reported by Imbrahim and Quick (2001) [9], Dharmendra and Singh, (2017) [6] observed the PCV values were higher than GCV values for different quantitative characters in wheat.

Genetic advance is the mean difference between selected population and the population from which the selection has been made. Both heritability and genetic advance are helpful in studying the genetic progress of a character

In the present investigation, heritability and genetic advance for the fifteen quantitative characters are presented Table (4.3). High heritability (broad sense), in same value were recorded for {plant height (0.89), number of grains per spike (0.89)}, biological yield (0.88), number of spikelets per spike (0.86), test weight (0.84), days to heading (0.83), days to flowering (0.83), grain yield per plant (0.78), number of tiller per plant (0.76), harvest index (0.66), leaf width (0.59). Moderate heritability was observed for peduncle length (0.46), spike length (0.44), days to maturity (0.24), while the low heritability were observed for days to maturity (0.24).

According to Panse, (1967) [18] such characters are governed predominantly by non-additive gene action and could be improved through individual plant selection. However, Khan, *et al.,* (2010) [14]. However character like number of tiller per plant (0.76, 1.62), harvest index (0.66, 2.87) leaf width (0.59, 0.17), peduncle length (0.46, 3.16), spike length (0.44, 1.48), and days to maturity (0.24, 1.29) possessed moderate heritability with low genetic advance, suggesting indicated that selection is ineffective in improving to outcome the desirable characters. The high heritability the traits were due to favourable influence of environment rather than genotypic and selection for these traits may not be rewarding similar were reported by Cheema, *et al.* (2006) [5] for plant height, number of tillers per plant exhibited higher heritability. The simple additive dominance (AD) model developed by Hayman (1954) [8] and Jinks (1954) [10], modified by Mather and Jinks (1982) [16].

Correlation coefficient is a statistical measure which is used to find out the degree (strength) and direction of relationship between two or more variable. A sportive value of correlation shows that the changes of two variables are in the same directions. In the present investigation correlation coefficient analysis measure the mutual relationship between various plant character and to determine the component character on which selection can be used for genetic improvement in yield while selecting the suitable plant type, correlation studies would provide reliable information in nature extent and the direction of the selection especially when the breeder needs to combine high yield potential with desirable traits and seed quality characters. Estimate of phenotypic and genotypic correlation coefficients between each pairs of characters. The results showed that, in general, the genotypic correlation coefficients (rg) were higher than the phenotypic correlation coefficients (rp) which indicated that association among these characters was under genetic control and indicating the preponderance of genetic variance in expression of characters. It might be due to depressing effect of environment on character association as reported earlier for wheat crop Paroda and Joshi, (1970) [19].

In the present investigation the genotypic correlation coefficient of different characters with seed yield per plant and their relationship among themselves are presented in Table (4.4). Grain yield showed the positive significant genotypic association with number of tiller per plant (0.99**), days to maturity (0.97**), flag leaf length (0.50**), leaf width (0.57**), number of spikelets per spike (0.39**), number of grains per spike (0.41**), biological yield (1.00**), test weight (0.59**), and days to flowering (0.38**), while grain yield per plant showed positive non-significant with spike length and negative non-significant with plant height (0.34*) and harvest index.

Phenotypic correlation determines the association between two variables which can be directly observed. It includes both genotypic and environmental effects and therefore differs under different environmental conditions. In the present investigation the phenotypic correlation coefficient of different characters with seed yield per plant and their relationship among themselves is presented in Table (4.4).

Grain yield per plant showed the positive significant phenotypic association with biological yield (0.98**), test weight (0.51**), number of spike per plant (0.87**), days to heading (0.25*), days to flowering (0.29*), flag leaf length (0.38**), leaf width (0.40**), plant height (0.29*), number of tiller per plant (0.33*). The positive non-significant phenotypic association showed with peduncle length (0.11), spike length (0.02), while the negative non-significant was recorded for harvest index (-0.22). Similar results also reported by Singh *et al*. (2013) [21].

Table 1: Analysis of variance for different quantitative characters in wheat.

Characters	Mean sum of square		
	Replication	Treatment	Error
	df = 2	df = 19	df = 38
Days to heading	6.93	42.47*	2.76
Days to flowering	8.72	44.91*	2.90
Peduncle	50.16	21.51*	6.10
Flag leaf length	0.34	24.95*	1.58
Flag leaf width	0.02	0.04*	0.01
Days to maturity	27.52	10.26*	5.32
Plant height	18.87	218.64*	8.94
Number of tiller/plant	2.71	2.70*	0.26
Number of spikelets /spike	3.21	8.74*	0.44
Spike length	8.47	5.00*	1.49
Number of grains/spike	6.83	60.13*	2.32
Biological yield	0.75	5.37*	0.24
Test weight	0.72	29.94*	1.75
Harvest index	0.92	3.05*	1.21
Grain yield/plant	0.11	0.87*	0.05

Table 2: Mean performance of 20 wheat genotypes for different quantitative characters.

genotypes		Days to heading	Days to flowering	Peduncle	Flag leaf length	leaf width	Days to maturity	plant height	Number of tillers/plant	Number of spikelets /spike	Spike length	Number of grains/spike	Biological yield	Test weight (1000 grains (g)	Harvest index	Grain yield/plant
SHIATS BW 1101		76.00	81.83	33.60	28.93	1.75	112.47	101.93	7.89	20.93	12.60	50.37	13.03	40.87	41.62	5.20
SHIATS BW 1102		76.47	81.73	28.33	21.13	1.64	112.47	91.20	6.35	19.73	11.47	45.12	10.86	35.47	42.33	4.41
SHIATS BW 1103		76.80	80.27	31.07	26.67	1.87	111.60	90.40	8.48	18.00	10.13	42.51	13.15	34.80	40.50	5.33
SHIATS BW 1104		78.47	81.80	31.33	24.60	1.75	110.40	103.07	6.61	19.60	12.47	45.34	10.49	36.00	42.98	4.10
SHIATS BW 1105		79.27	82.73	35.80	24.20	1.68	113.40	110.00	9.44	19.60	11.00	46.88	14.33	41.95	40.58	5.77
SHIATS BW 1106		76.80	80.13	32.13	25.60	1.55	109.93	93.67	6.35	18.87	11.53	44.11	10.32	30.10	39.05	4.09
SHIATS BW 1107		78.33	81.73	31.80	21.00	1.55	112.33	95.20	5.71	18.87	10.47	44.15	9.62	33.10	40.21	3.85
SHIATS BW 1108		73.73	77.27	36.67	24.80	1.62	109.47	99.40	7.36	15.33	9.07	33.55	11.85	38.20	39.74	4.70
SHIATS BW 1109		78.07	81.40	32.00	22.40	1.59	109.67	101.27	6.19	18.47	11.27	42.77	10.15	33.17	39.75	3.93
SHIATS BW 1110		75.60	79.13	33.40	26.67	1.59	111.07	92.40	6.45	19.13	12.93	45.75	11.11	30.87	40.46	4.49
SHIATS BW 1111		80.53	84.33	33.87	21.40	1.85	111.80	108.47	7.25	20.13	11.67	47.09	12.63	32.90	38.61	4.88
SHIATS BW 1112		63.60	66.93	32.53	18.07	1.50	105.73	83.27	5.87	15.33	8.40	36.32	9.42	35.43	41.25	3.82
SHIATS BW 1113		71.93	75.40	38.33	23.40	1.59	110.07	97.07	5.76	15.53	12.80	35.63	9.23	32.00	40.37	3.72
SHIATS BW 1114		75.07	79.13	36.53	21.67	1.68	109.40	105.27	6.13	18.07	11.00	42.77	10.99	32.53	39.70	4.36
SHIATS BW 1115		70.07	73.73	34.13	21.47	1.50	109.80	94.47	7.04	16.47	9.53	38.77	11.84	33.53	40.27	4.77
SHIATS BW 1116		73.87	77.73	29.80	18.33	1.59	108.73	90.13	6.29	17.47	9.53	38.88	10.29	33.77	40.28	4.13
SHIATS BW 1117		76.07	80.47	38.53	22.87	1.81	111.93	117.20	5.92	18.87	11.40	45.81	10.64	39.63	39.90	4.25
SHIATS BW 1118		77.00	80.80	32.93	19.40	1.49	110.60	92.67	6.88	16.47	9.27	39.94	10.65	33.50	40.37	4.30
RAJ-3765 (Check)		76.67	80.40	34.80	24.93	1.60	107.27	86.60	6.72	17.60	10.67	40.53	10.33	34.40	40.35	4.17
HD-2733 (Check)		78.33	81.87	32.27	20.87	1.52	110.53	90.53	6.77	15.80	11.13	36.48	10.82	35.40	40.47	4.38
mean		75.63	79.44	33.49	22.92	1.64	110.43	97.21	6.77	18.01	10.92	42.14	11.09	34.88	40.44	4.43
Range	Max	80.53	84.33	38.53	28.93	1.87	113.40	117.20	9.44	20.93	12.93	50.37	14.33	41.95	42.98	5.77
	Min	63.60	66.93	28.33	18.07	1.49	105.73	83.27	5.71	15.33	8.40	33.55	9.23	30.10	38.61	3.72
SE		1.36	1.39	2.02	1.03	0.07	1.88	2.44	0.42	0.54	1.00	1.24	0.40	1.08	0.90	0.19
C.D 5%		2.75	2.82	4.08	2.08	0.14	3.81	4.94	0.85	1.10	2.02	2.52	0.81	2.19	1.82	0.38
CV		2.20	2.14	7.38	5.48	5.31	2.09	3.08	7.55	3.68	11.18	3.61	4.44	3.80	2.72	5.18

Table 3: Estimation of genetic variability parameters for different quantitative traits in wheat.

Characters	σ^2g	σ^2p	GCV	PCV	HERTI	GA	GA AS %
Days to heading	13.23	16.00	4.81	5.29	0.83	6.82	9.01
Days to flowering	14.00	16.91	4.71	5.18	0.83	7.02	8.83
Peduncle	5.14	11.24	6.77	10.01	0.46	3.16	9.42
Flag leaf length	7.79	9.37	12.18	13.36	0.83	5.24	22.88
Leaf width	0.01	0.02	6.40	8.32	0.59	0.17	10.15
Leaf area	37.55	48.34	16.23	18.41	0.78	11.13	29.47
Days to maturity	1.65	6.97	1.16	2.39	0.24	1.29	1.16
Plant height	69.90	78.84	8.60	9.13	0.89	16.22	16.68
Number of tiller/plant	0.81	1.08	13.32	15.31	0.76	1.62	23.88
Number of spikelets /spike	2.77	3.20	9.23	9.94	0.86	3.18	17.67
Spike length	1.17	2.66	9.91	14.95	0.44	1.48	13.55
Number of grains/spike	19.27	21.59	10.42	11.03	0.89	8.54	20.28
Biological yield	1.71	1.95	11.80	12.60	0.88	2.52	22.74
Test weight (1000 grains)	9.40	11.15	8.79	9.57	0.84	5.80	16.62
Harvest index	2.95	4.47	4.19	5.17	0.66	2.87	7.01
Yield/plant	0.43	0.56	14.40	16.33	0.78	1.19	26.14

Table 4: Genotypic correlation between grain yield and its components in wheat.

Characters	Days to heading	Days to flowering	Number of spikelets /spike	Peduncle length	Leaf length	leaf width	Days to maturity	plant height	Number of tiller /plant	Spike length	Number of grains/spike	Biological yield	Test weight	Harvest index	Grain yield/plant
Days to heading	1.00	0.99**	0.67**	-0.14	0.33**	0.49**	0.91**	0.48**	0.34**	0.62**	0.60**	0.39**	0.08	-0.20	0.34
Days to flowering		1.00	0.73**	-0.14	0.36**	-0.12	0.97**	0.51**	0.35**	0.66**	0.66**	0.43**	0.16	-0.14	0.38**
Number of spikelets /spike			1.00	-0.31*	0.45**	0.66**	1.01**	0.48**	0.28*	0.69**	1.00**	0.43**	0.22	0.21	0.39*
Peduncle length				1.00	0.22	0.19	0.03	0.60**	0.04	0.12	-0.15	0.07	0.08	-0.62**	0.06
Leaf length					1.00	0.49**	0.51**	0.22	0.49**	0.65**	0.47**	0.50**	0.23	0.12	0.50**
Leaf width						1.00	0.75**	0.69**	0.49**	0.48**	0.68**	0.62**	0.46**	0.01	0.57**
Days to maturity							1.00	0.87**	0.73**	0.90**	0.96**	0.95**	0.54**	0.21	0.97**
Plant height								1.00	0.23	0.44**	0.52**	0.40**	0.46**	-0.26*	0.34
Number of tiller /plant									1.00	-0.09	0.28*	0.98**	0.60**	-0.03	0.99**
Spike length										1.00	0.70**	0.06	-0.06	0.22	0.03
Number of grains/spike											1.00	0.45**	0.25*	0.15	0.41**
Biological yield												1.00	0.57**	-0.08	1.00**
Test weight													1.00	0.50**	0.59**
Harvest index														1.00	-0.17
Grain yield/plant															1.00

*, ** significant at 5% and 1% level of significance

Table 5: Phenotypic correlation between grain yield and its components in wheat.

Characters	Days to heading	Days to flowering	Number of spikelets /spike	Peduncle length	Leaf length	leaf width	Days to maturity	plant height	Number of tiller/plant	Spike length	Number of grains/spike	Biological yield	Test weight	Harvest index	Grain yield/plant
Days to heading	1	0.96**	0.53**	-0.12	0.30*	0.35**	0.52**	0.38**	0.29*	0.32*	0.52**	0.29*	0.07	-0.08	0.25*
Days to flowering		1.00	0.60**	-0.14	0.32*	-0.08	0.56**	0.38**	0.29*	0.34*	0.58**	0.32*	0.12	-0.01	0.29*
Number of spikelets/spike			1.00	-0.14	0.42**	0.49**	0.38**	0.47**	0.22	0.50**	0.93**	0.38**	0.18	0.12	0.33*
Peduncle length				1.00	0.21	0.09	-0.05	0.50**	0.02	0.14	-0.14	0.11	0.07	-0.22	0.11
Leaf length					1.00	0.41**	0.25*	0.21	0.39**	0.49**	0.39**	0.40**	0.22	0.06	0.38**
Leaf width						1.00	0.30*	0.47**	0.29*	0.26*	0.43**	0.45**	0.27*	0.03	0.40**
Days to maturity							1.00	0.32*	0.23	0.23	0.45**	0.26*	0.20	-0.01	0.23
Plant height								1.00	0.17	0.34*	0.48**	0.36**	0.42**	-0.17	0.29*
Number of tiller /plant									1.00	0.00	0.27*	0.87**	0.51**	0.12	0.87**
Spike length										1.00	0.46**	0.06	-0.05	0.12	0.02
Number of grains/spike											1.00	0.41**	0.20	0.15	0.37**
Biological yield												1.01	0.52**	-0.01	0.98**
Test weight													1.00	0.24	0.51**
Harvest index														1.00	-0.22
Grain yield/plant															1.00

*, ** Significant at 5% and 1% level of significance

Conclusion

It is concluded from the present study that all the 20 genotypes of wheat showed significant differences among them.

Based on performance for grain yield per plant and other character taken into consideration genotypes SHIATS BW 1105 (5.77), followed by SHIATS BW 1103 (5.33), SHIATS BW 1101 (5.20), was found to be better than other genotypes.

Highest genotypic and phenotypic coefficient of variation was observed for plant height, followed by number of grains per spike, grain yield per plant, test weight, plant height, biological yield and harvest index. Hence, these parameters could be used as selection criteria.

High heritability along with high genetic advance as % of mean was registered for plant height suggesting predominance of additive gene action in the expression of this trait.

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