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Genetic variability, Correlation and Path analysis for Yield and yield components in F_6 generation of Wheat (*Triticum aestivum* Em. Thell.)

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Abstract: *The present experiment entitled "Genetic variability, Correlation and Path analysis for yield and yield components in F_6 generation of wheat (Triticum aestivum L.Em. Thell.)" Was conducted in Rabi 2015-16 at the Field Experimentation Centre of the Department of Genetics and Plant Breeding, SHUATS, Allahabad. The experiment was carried out in augmented design with three (3) blocks to obtain information on estimates of variability, correlation coefficient and path analysis among 19 genotypes of wheat. Analysis of variance revealed that there was significant differences among all the genotypes. On the basis of Per se performance for grain yield per plant, genotype SAM-106, SAM-102, SAM -110, SAM-109 and SAM-105were found promising as they showed high value for grain yield and its components of wheat. Wide range of phenotypic (VP or O^2p) and genotypic variance (VG or O^2g) were observed in the experimental material for all the traits studied. High estimates of genotypic coefficients of variation (GCV) and phenotypic coefficients of variation (PCV) were obtained for plant height followed by biological yield per plant, harvest index, seed yield per plant, tillers per plant and number of grains per spike suggesting sufficient variability and thus scope for genetic improvement through selecting for these traits. Grain yield exhibited positive and significant correlation with days to maturity, plant height, number of grains per spike, and number of spikelet per spike. Number of productive tillers per plant, Weight of 1000 seeds, No of spikelet per spike, days to 50% heading and flag leaf length/cm had positive direct effect on total yield per plant.*

Keywords*: Variability, Correlation coefficient, Path analysis, F_6 Generation of wheat (Triticum aestivum L. Em. Thell.)'*

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I. Introduction

Wheat (*Triticum aestivum Em. Thell.*) is the most important cereal crop for the majority of world's populations. It is the most important staple food of about two billion people (36% of the world population). Among the food crops, wheat is one of the most abundant sources of energy and protein for the world population (**Salem et al., 2007**).

It provides more calories and protein to human diet than any other crop. There is also more wheat and wheat flour moving in the world trade than any other grain.

India is one of the principal wheat producing and consuming countries in the world. The annual production of wheat in India during 2011-12 was 94.88 million tonne (MT) (**Sharma, 2013**). It 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**). Globally, it is one of the largest sources of the protein in comparison to other cereals and it ensures food and nutrition security to a majority of the Indian population. Wheat has a good nutritional profile with 12% protein, 1.8% lipids, 2% reducing sugar, 59.2 % starch, 70% carbohydrates, and provides 314K cal/100g of food.

The knowledge about genetic variability, correlation coefficients and its other parameters help in further improving the grain yield through directed selection of component traits and their interrelationship with yield. It is but natural, that the domestication of wheat should have taken place in the Fertile Crescent, since this is the centre of its wild progenitor's geographical distribution (**Harlan &Zohary, 1966; Zohary, 1970)**. All the naturally distributed species were adapted to their changing environments through the conservation of high genetic variability in their natural populations, and this resulting variability was the promoting force behind the evolution of the species and speciation.

Genetic variability is the most essential pre-requisite for successful improvement through breeding. The variability will help the breeder in basic selection on phenotypic performance.Analysis of variability among the traits and the association of a particular character with other traits contributing to yield of a crop would be great importance in planning a successful breeding programme (**Mary and Gopalan, 2006**). Genetic variability among durum wheat genotypes can be estimated based on qualitative and quantitative traits.

Correlation and path coefficient analysis could be used as an important tool to bring information about appropriate cause and effects relationship between yield and some yield components (***Khan et al., 2003***).Keeping the above facts in view, the present investigation was proposed to obtain information on genetic variability and correlation between yield and its components traits and also to identify the promising genotypes based on mean performance for yield.

II. Materials and Methods

Field experiments

This study was carried out at the field Experimentation Centre of the department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, located at 25.57^{o} N latitude, 81.51^{o} E longitude and 98 meter above the sea level in the South-East part of Uttar Pradesh, India.

The experimental material comprising of 19 diverse wheat genotypes SAM 10,SAM102, 103, SAM104, SAM105, 106, SAM107, SAM108, SAM109, SAM110, SAM111, 112, SAM113, SAM114, SAM115,SAM116, SAM117, SAM118 and a K-9162 as check, were grown under Augmented Design with three blocks, during Rabi 2015-2016. The experimental field was divided into 3 blocks of equal size and each block possesses 19 plots. Each genotype was accommodated in a single row of 2m length and spaced at 30 cm between rows with an approximate plant to plant distance of 5 cm. The sowing was done on December 3rd 2015. Thinning was done to maintain a plant to plant spacing distance maintained. The recommended dose of N: P: K was applied.

The observations were recorded on five randomly selected plants from each replication leaving the two boarder rows from all the sides, in order to avoid the sampling error for the following characters; Days to 50% heading, Grain yield per plant, Days to 50% flowering, Number of grains per spike, Flag leaf length(cm), Harvest index (%) , Flag leaf width(cm), 1000 seed weight(g), Plant height (cm), biological weight(g), Number of tillers per plant, Spike length (cm), Days to maturity, Length of peduncle (cm) and Number of spikelet.

Data Analysis

The data thus recorded were subjected to statistical and biometrical analysis as detailed as follows: Analysis of variance as suggested by **Federer (1956),** Coefficient of variation as suggested by **Burton (1952)**to estimate the Phenotypic Coefficient of Variation (PCV) and Genotypic Coefficient of Variation (GCV).Correlation coefficient analysis as calculated by **Al-Jibouri*et al.,*(1958)**to test the significant correlation between the traits. Path coefficient analysis was performed to assess direct and indirect effect of the measured traits on grain yield according to the technique outlined by **Dewey and Lu (1959).**

III. Result and Discussion

Analysis of variance

The mean sum of squares for all the fifteen (15) characters studied were subjected to analysis of variance and the results are presented in Table 4.1. The mean sum of squares due to genotypes were significant for all the fifteen characters studied, suggesting that the genotypes selected were genetically variable and considerable amount of variability existed among them. Similar findings in wheat has also reported by **Bergale*et al*.(2002), Dwivedi*et al.*(2002), Asif *et al.*(2004), Ali *et al.* (2008),Mukherjee *et al.* (2008), Khan *et al.*(2013), Arvind *et al.* (2014)**, **Ashfaq*et al.* (2014), Khan *et al*. (2015) and Kumar *et al*. (2015).**

Mean performance of quantitative characters

Through this study, an attempt was made to assess the mean performance and extent of variability in nineteen wheat genotypes. Table 4.2 depicts the mean performance of nineteen wheat genotypes of fifteen characters along with standard error of difference and critical difference. The results from the investigation concluded that genotype SAM106, SAM102, SAM110, SAM109, and SAM105 identified as desirable genotypes with high data for Total grain yield, 1000 grain weight, days to maturity, number of grains per spike, and plant height respectively.

Estimation of genetic parameters

The highest variability (VG) was recorded for plant height (271.12), followed by harvest index (163.65), biological weight (86.77), Number of grain per spike-(77.62).

The highest variability (VP) was recorded for plant height (284.16), followed by harvest index (194.27), Number of grain per spike-(111.82), and biological weight (92.07).

Coefficient of variation

Phenotypic variance was higher than genotypic variance for all the yield and yield contributing characters indicates the influence of environmental factors on these traits**.**

Higher magnitude of PCV was recorded for Total yield per plant/g-(41.40), biological weight (37.21), Harvest index (%)-(27.93), seed yield per plant-(27.73), and Number of grain per spike-(24.81).

Higher magnitude of GCV was recorded for Total yield per plant/g-(40.43), biological weight (36.12), seed yield per plant (25.69), harvest index (25.64,) and Number of grain per spike-(20.68).

Table4.1: Analysis of variance for different quantitative and physiological characters in 19 genotypes of wheat.

Characters	Mean sum of squares		
	Replications d.f =02	Treatment d.f =19	Error =36
Days To Heading	0.342	12.391**	0.275
Days To Flowering	2.965	16.144**	1.412
Plant Height(cm) 1st	27.815	275.470**	13.041
Plant Height(cm) 2nd	38.679	32.860**	10.729
Plant Height(cm) 3rd	63.285	66.230**	31.188
No. of Spikelets	0.632	4.450**	0.758
Length of Spike(cm)	6.009	5.237**	1.845
Leaf Length(cm)	0.940	10.682**	1.026
Leaf Width(cm)	0.023	0.077**	0.007
Days To Maturity	3.577	8.848**	2.663
Biological Weight	13.573	88.536**	5.305
No. of Grains Per Spike	20.289	89.022**	34.197
1000 Seeds Weight	0.697	79.157**	6.847
Harvest Index	72.343	173.858**	30.625
Seed Yield Per Plant	1.199	7.073**	1.105

** Significant at 1% level

Table4.2 Mean performance

Genotypes	Days To Heading	Days To Flowering	Plant Height(Cm) 1st	Plant Height(Cm) 2nd	Plant Height(Cm) 3rd	No. Of Spikelets	Length Of Spike (Cm)	Leaf Length (Cm)	Leaf Width (Cm)	Days To Maturity	Biological Weight	No. Of Grains Per Spike	1000 Seeds Weight	Harvest Index	Seed Yield per Plant
1	73.53	78.27	38.80	52.00	90.07	19.07	11.67	22.67	1.67	78.20	32.53	48.40	38.53	48.33	12.67
2	71.53	74.47	42.73	52.87	91.13	16.00	12.47	22.27	1.63	76.60	33.93	36.33	50.00	44.07	12.20
3	73.80	78.47	39.00	46.93	84.13	16.67	10.87	24.93	1.76	77.73	18.13	34.53	36.80	48.13	8.60
4	71.87	70.47	42.33	48.20	89.53	18.07	10.80	21.27	1.41	77.67	23.27	44.73	49.07	44.40	9.27
5	71.60	75.53	44.27	54.53	91.27	16.67	11.87	21.13	1.51	76.73	26.47	42.13	48.40	53.20	11.67
6	72.87	75.47	42.40	53.87	88.40	19.07	12.20	21.27	1.33	76.73	27.47	37.80	42.20	44.13	12.73
7	73.13	78.73	43.93	57.00	88.67	18.80	14.80	20.73	1.34	77.33	25.20	44.53	46.73	62.73	9.40
8	75.27	76.80	34.47	49.93	81.67	18.67	14.00	21.13	1.45	78.40	34.13	40.93	40.20	50.33	11.07
9	76.67	78.40	37.00	49.20	84.07	19.67	14.60	21.27	1.45	79.13	23.67	55.87	33.27	67.27	10.27
10	71.67	77.33	42.40	53.93	85.73	17.93	15.20	23.47	1.66	76.93	18.27	43.20	45.47	54.67	9.20
11	71.27	73.33	33.13	49.07	80.40	16.60	14.27	18.73	1.41	77.93	24.60	51.07	34.60	41.87	10.80
12	70.07	74.73	42.47	58.60	83.20	17.33	13.67	20.80	1.38	72.93	38.00	40.60	46.33	50.80	9.33
13	75.53	78.60	31.33	49.27	77.27	17.40	13.00	21.73	1.37	77.67	24.67	36.87	43.80	50.33	10.07
14	74.33	77.80	31.20	46.07	74.87	17.07	14.20	16.60	1.49	77.13	21.47	37.53	44.20	58.13	10.13
15	72.80	75.67	33.13	48.27	83.07	15.80	13.40	19.87	1.25	77.00	19.47	41.80	37.47	42.73	8.40
16	71.87	75.07	75.67	49.73	81.93	16.13	12.00	21.27	1.66	75.67	25.67	47.93	46.27	57.40	7.33

17	73.40	77.00	35.13	51.20	79.60	16.60	12.40	19.40	1.19	75.80	23.53	40.53	43.67	43.47	9.40
18	72.47	73.80	40.73	51.87	81.40	15.67	12.87	18.47	1.32	75.40	23.60	45.40	36.13	48.73	8.07
19	67.73	72.67	43.60	52.33	82.13	17.13	11.80	19.33	1.29	72.33	25.87	39.47	46.00	37.40	10.87
Mean	72.71	75.93	40.72	51.31	84.13	17.39	12.95	20.86	1.45	76.70	25.79	42.61	42.59	49.90	10.08
SE	0.43	0.97	2.95	2.67	4.56	0.71	1.11	0.83	0.07	1.33	1.88	4.77	2.14	4.52	0.86
CD5%	0.87	1.97	5.98	5.42	9.25	1.44	2.25	1.68	0.14	2.70	3.81	9.68	4.33	9.16	1.74
CV	0.72	1.56	8.87	6.38	6.64	5.01	10.49	4.85	5.82	2.13	8.93	13.72	6.14	11.09	10.43
Max	76.67	78.73	75.67	58.60	91.27	19.67	15.20	24.93	1.76	79.13	38.00	55.87	50.00	67.27	12.73
Min	67.73	70.47	31.20	46.07	74.87	15.67	10.80	16.60	1.19	72.33	18.13	34.53	33.27	37.40	7.33

Table-4.3 Estimation of components of variance and genetic parameters for 15 quantitative characters in wheat genotypes**.**

Characters	Genotypic variance $\sigma^2 g$	Phenotypic variance $\sigma^2 g$	GCV	PCV	Heritability (h^2) (BS)	Genetic advance	Genetic advance as % of mean %
Days To 50% Heading	12.30	12.57	4.82	4.88	97.81	7.14	9.83
Days To 50% Flowering	15.67	17.09	5.21	5.44	91.74	7.81	10.29
Plant Height(cm)	271.12	284.16	40.43	41.40	95.41	33.13	81.36
Number of tillers	2.58	3.24	21.61	24.20	79.93	2.95	39.74
No. of Spikelets	4.20	4.95	11.78	12.80	84.71	3.88	22.34
Length Of Spike(cm)	4.62	6.47	16.60	19.63	71.47	3.74	28.91
Flag Leaf Length(cm)	10.34	11.37	15.41	16.16	90.98	6.32	30.29
Flag Leaf Width(cm)	0.07	0.08	18.80	19.68	91.26	0.54	36.99
Days To Maturity	7.96	10.62	3.68	4.25	74.93	5.03	6.56
Biological Weight	86.77	92.07	36.12	37.21	94.24	18.63	72.24
No. of Grains Per Spike	77.62	111.82	20.68	24.81	69.42	15.12	35.49
1000 Seeds Weight	76.87	83.72	20.59	21.49	91.82	17.31	40.64
Harvest Index	163.65	194.27	25.64	27.93	84.24	24.19	48.47
Total Seed Yield Per Plant	6.70	7.81	25.69	27.73	85.86	4.94	49.04

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

Genotypic correlation coefficient

Total yield showed the positive significant genotypic association with harvest index (0.0.615**), No of spikelet per spike (0.495**), and days to maturity (0.989**). It showed negative significant genotypic correlation with Spike length with awn / cm (-0.260*),

Phenotypic correlation coefficient

Total yield per plant/ showed the positive significant phenotypic association with harvest index (0.545**), No of spikelet per spike (0.268**) and days to maturity (0.566**).

Path coefficient

Number of productive tillers per plant (3.89), Weight of 1000 kernal (8.46), No of spikelet per spike (3.59), Grain weight per spike/g (2.92), days to 50% heading (4.43), and Flag leaf length/cm (1.88), had genotypic positive direct effect on seed yield per plant.

No of spikelet per spike (0.277), number of productive tillers per plant (0.225), Grain weight per spike/g (0.221), Flag leaf length/cm (0.200) Flag leaf width/cm (0.080), Weight of 1000 kernal (0.051) and Plant height / cm (0.043) had phenotypic positive direct effect on seed yield per plant.

Table 4.4.1 Genotypic correlation of different yield component with grain yield per plant in wheat

Characters	Days To Heading	Days To Flowering	Plant Height(cm) 1st	Plant Height(cm) 2nd	Plant Height(cm) 3rd	No. of Spikelets	Length of Spike(cm)	Leaf Length(cm)	Leaf Width(cm)	Days To Maturity	Biological Weight	No. of Grains Per Spike	1000 Seeds Weight	Harvest Index	Seed yield per plant
Days To Heading	1.00	0.723**	-0.372**	-0.560**	-0.344**	0.495**	0.289*	0.115	0.083	0.989**	-0.184	0.259	-0.482**	0.577**	0.022
Days To Flowering		1.00	-0.194	0.107	-0.026	0.436**	0.627**	0.360**	0.222	0.573**	-0.119	-0.007	-0.259	0.615**	0.009
Plant Height(cm) 1st			1.00	0.149	0.178	-0.191	-0.478**	0.194	0.427**	-0.436**	0.067	0.184	0.390**	0.270*	-0.352**
Plant Height(cm) 2nd				1.00	0.213	0.194	-0.160	0.086	-0.004	-0.713**	0.519**	-0.263*	0.527**	0.287*	0.279*
Plant Height(cm) 3rd					1.00	0.409**	-1.083**	0.626**	0.612**	0.266*	0.216	0.050	0.386**	0.027	0.711**
No. of Spikelets						1.00	0.243	0.303*	0.119	0.560**	0.239	0.203	-0.087	0.571**	0.528**
Length of Spike(cm)							1.00	-0.518**	-0.067	0.410**	-0.184	0.361**	-0.250	0.852**	-0.051
Leaf Length(cm)								1.00	0.711**	0.417**	0.018	-0.075	0.036	0.061	0.174
Leaf Width(cm)									1.00	0.430**	0.059	0.206	0.042	0.202	0.103
Days To Maturity										1.00	-0.369**	0.176	-0.518**	0.557**	0.023
Biological Weight											1.00	-0.108	0.286*	-0.064	0.520**
No. of Grains Per Spike												1.00	-0.489**	0.829**	-0.339**
1000 Seeds Weight													1.00	-0.097	0.166
Harvest Index														1.00	-0.191
Seed Yield Per Plant															1.00

Table4.4.2Phenotypic correlation of different yield component with grain yield per plant in wheat.

Characters	Days To Heading	Days To Flowering	Plant Height(cm) 1st	Plant Height(cm) 2nd	Plant Height(cm) 3rd	No. of Spikelets	Length of Spike(cm)	Leaf Length(cm)	Leaf Width (cm)	Days To Maturity	Biological Weight	No. of Grains Per Spike	1000 Seeds Weight	Harvest Index	Seed yield per plant
Days To Heading	1.00	0.642**	-0.336*	-0.314*	-0.128	0.268*	0.231	0.146	0.110	0.566**	-0.132	0.008	-0.405**	0.478**	-0.010
Days To Flowering		1.00	-0.308*	-0.194	-0.311*	0.246	0.106	0.184	0.317*	0.311*	-0.175	-0.141	-0.283*	0.545**	0.095
Plant Height(cm) 1st			1.00	0.329*	0.352**	-0.120	-0.071	0.244	0.231	-0.193	0.169	0.213	0.381**	0.106	-0.270*
Plant Height(cm) 2nd				1.00	0.656**	0.182	0.464**	0.202	-0.309*	-0.275*	0.553**	0.162	0.318*	-0.124	0.158
Plant Height(cm) 3rd					1.00	0.189	0.180	0.508**	0.039	0.042	0.343**	0.127	0.280*	-0.076	0.186
No. of Spikelets						1.00	0.235	0.228	-0.078	0.253	0.157	0.404**	-0.130	0.202	0.334*
Length of Spike(cm)							1.00	-0.033	-0.283*	0.003	0.114	0.260	-0.171	0.192	-0.122
Leaf Length(cm)								1.00	0.540**	0.121	0.084	-0.183	0.124	0.098	-0.039
Leaf Width(cm)									1.00	0.190	-0.061	-0.208	0.066	0.390**	0.010
Days To Maturity										1.00	-0.109	0.393**	-0.287*	0.169	0.362**
Biological Weight											1.00	0.056	0.219	-0.137	0.476**
No. of Grains Per Spike												1.00	-0.392**	0.002	0.124
1000 Seeds Weight													1.00	0.021	-0.027
Harvest Index														1.00	-0.257

Table 4.5.1: Genotypic Path coefficient of yield attributing traits with grain yield per plant.

Characters	days to 50% heading	Days to 50% flowering	Plant height / cm	Flag leaf length/cm	Flag leaf width/cm	number of productive tillers per plant	Spike length with awn / cm	Days to Maturity	Grain filling period	Number of grain per spike	No of spikelet per spike	Weight of 1000 kernal	Harvest index (%)	Grain weight per spike/g
Days to 50% heading	**4.43**	0.69	-1.29	0.58	-1.66	0.70	-1.32	-2.41	-1.73	0.01	1.88	-0.32	-0.07	0.57
Days to 50% flowering	3.43	**0.89**	-0.63	0.91	-1.20	1.33	-1.71	-2.51	-2.79	-0.03	0.98	0.50	-0.57	1.26
Plant height / cm	1.50	0.15	**-3.80**	0.62	-0.63	-2.33	-1.13	-1.01	0.20	0.07	1.04	4.73	-0.22	1.07
Flag leaf length/cm	1.36	0.43	-1.26	**1.88**	0.17	0.45	-1.80	0.79	-2.60	-0.11	-0.38	0.30	0.08	0.71
Flag leaf width/cm	2.03	0.29	-0.67	-0.09	**-3.61**	-1.77	-1.22	-0.59	-0.63	-0.02	1.90	2.50	0.57	1.54
number of productive tillers per plant	0.80	0.30	2.28	0.22	1.65	**3.89**	0.73	-2.88	0.88	0.48	0.93	-7.51	-0.10	-1.86
Spike length with awn / cm	1.86	0.48	-1.37	1.08	-1.40	-0.90	**-3.13**	-0.35	-2.03	-0.20	0.49	4.62	-0.50	0.96
Days to Maturity	3.13	0.65	-1.13	-0.44	-0.63	3.29	-0.32	**-3.40**	-0.67	0.33	1.95	-2.26	-0.33	0.45
Grian filling peroid	-2.27	-0.74	-0.22	-1.45	0.68	1.02	1.89	0.68	**3.37**	0.22	0.07	-1.55	0.49	-1.52
Number of grain per spike	0.07	-0.04	-0.42	-0.31	0.09	2.77	0.95	-1.68	1.13	**0.67**	2.01	-6.25	0.87	0.18
No of spikelet per spike	2.32	0.24	-1.10	-0.20	-1.91	1.00	-0.43	-1.84	0.06	0.37	**3.59**	-2.37	0.76	-0.14
Weight of 1000 kernal	-0.17	0.05	-2.13	0.07	-1.07	-3.45	-1.71	0.91	-0.62	-0.49	-1.01	**8.46**	-0.54	1.49
Harvest index (%)	-0.34	-0.52	0.87	0.15	-2.12	-0.40	1.63	1.17	1.70	0.61	2.84	-4.75	**0.96**	1.00
Grain weight per spike/g	0.86	0.38	-1.40	0.45	-1.91	-2.48	-1.03	-0.53	-1.76	0.04	-0.17	4.32	0.33	**2.92**

Residual are -0.24398

Table 4.5.2: Phenotypic Path coefficient of yield attributing traits with grain yield per plant.

Characters	days to 50% heading	Days to 50% flowering	Plant height / cm	Flag leaf length/cm	Flag leaf width/cm	number of productive tillers per plant	Spike length with awn / cm	Days to Maturity	Grain filling period	Number of grain per spike	No of spikelet per spike	Weight of 1000 kernal	Harvest index (%)	Grain weight per spike/g
Days to 50% heading	**0.016**	-0.121	0.011	0.046	0.019	0.026	-0.039	0.004	-0.038	0.000	0.104	-0.002	0.000	0.038
Days to 50% flowering	0.011	**-0.168**	0.007	0.068	0.019	0.040	-0.045	0.004	-0.081	-0.001	0.049	-0.003	-0.001	0.059
Plant height / cm	0.004	-0.026	**0.043**	0.036	0.008	-0.045	-0.033	0.001	0.005	0.002	0.054	0.016	0.000	0.045
Flag leaf length/cm	0.004	-0.057	0.008	**0.200**	0.015	0.019	-0.025	0.001	-0.028	0.003	0.033	-0.003	0.000	0.047
Flag leaf width/cm	0.004	-0.039	0.004	0.037	**0.080**	0.014	-0.006	0.001	-0.017	0.003	0.064	0.001	0.000	0.031
number of productive tillers per plant	0.002	-0.030	-0.009	0.017	0.005	**0.225**	0.005	0.002	0.007	0.000	0.003	-0.019	0.000	-0.002
Spike length with awn / cm	0.006	-0.067	0.013	0.045	0.004	-0.009	**-0.112**	0.001	-0.033	-0.004	0.023	0.016	0.000	0.040
Days to Maturity	0.008	-0.079	0.005	0.028	0.006	0.064	-0.008	**0.008**	0.043	0.002	0.068	-0.009	0.001	0.015
Grian filling peroid	-0.005	0.103	0.002	-0.042	-0.010	0.012	0.028	0.003	**0.132**	0.002	0.030	-0.003	0.001	-0.046
Number of grain per spike	0.000	0.004	0.002	0.021	0.008	-0.001	0.012	0.000	0.010	**0.032**	0.140	-0.008	0.000	0.021
No of spikelet per spike	0.006	-0.029	0.008	0.024	0.019	0.002	-0.009	0.002	0.014	0.016	**0.277**	-0.006	0.001	-0.001
Weight of 1000 kernal	-0.001	0.008	0.014	-0.012	0.001	-0.083	-0.036	-0.001	-0.008	-0.005	-0.034	**0.051**	0.000	0.052
Harvest index (%)	0.000	0.023	0.002	0.006	0.005	0.001	0.007	0.002	0.045	0.002	0.058	-0.002	**0.004**	-0.023
Grain weight per spike/g	0.003	-0.045	0.009	0.043	0.011	-0.002	-0.020	0.001	-0.027	0.003	-0.001	0.012	0.000	**0.221**

Residual are 0.70583

IV. Conclusion

From the results obtained in the present investigation, it was concluded that genotype SAM106, SAM102, SAM110, SAM109, and SAM105 identified as desirable genotypes with high data for Total grain yield, 1000 grain weight, days to maturity, number of grains per spike, and plant height respectively. Biological weight, plant height, harvest index, total grains per spike, and 1000 seed weight recorded high estimates for PCV & GCV. Seed yield per plant showed positive significant association with No of spikelet per spike, number of grains per spike, plant height and days to maturity. Number of productive tillers per plant, Weight of 1000 seeds, No. of spikelet per spike, days to 50% heading and flag leaf length/cm had positive direct effect on total yield per plant. Hence, these characters should be given due consideration during selection for yield improvement of wheat.

Since these findings are based on one year data, additive research is needed to further substantiate the results.

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