Agromorphological Studies for Variability, Heritability and their Associations of Local Wheat Varieties (Triticum Spp.) Grown in South Gondar Zone, Ethiopia

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Abstract
Wheat is the most important cereal crop in Ethiopia ranking third in terms of area after teff and maize and second in terms of production after maize. Six local wheat varieties commonly cultivated in South Gondar, one of the eleven zones found in Amhara region, were collected from the local farmers to study their variability and associations of yield and yield related traits using twelve agro-morphological traits. The studied genotypes were grown in main rain season of 2014/15 at Farta district in a complete randomized block design with three replications. Analysis of variance indicated the presence of highly significant difference among the studied genotypes which revealed the presence of high genetic variability of wheat in the study area. Highest yield was recorded from the local variety *Ferno* with 1957 kg/ha followed by *Chekole* (1588.33kg) and *Canada Sendie* (1580.7kg). Higher value of GCV and PCV were recorded in most of the studied traits indicating selection may be effective from these traits and phenotypic expression would be good indication of the genotypic potential. Broad sense heritability estimates were very high for most traits signifying the possibility of success in selection. Correlation study revealed that number of tillers per plant, number of seeds per plant and harvest index had positive and highly significant correlation with grain yield. The present investigation will guide in planning future breeding strategy with desired traits to improve this crop in the study area.
Keywords: Local wheat varieties; agro-morphological traits; genetic variability; Heritability; Correlation

1. INTRODUCTION

Wheat is one of the most important cereals world-wide and it is grown in many areas (Briggle and Curtis, 1987). It has been described as the 'King of Cereals' because of the acreage it occupies, high productivity and the prominent position it holds in the international food grain trade (FAO, 2004). During the past four decades, wheat has made a significant contribution to the increase in global food production. This is due to the use of higher-yielding, water and fertilizer responsive, and disease resistant cultivars, combined with strengthened input delivery systems, tailored management practices and improved marketing (Ortiz et al., 2008; Dixon et al., 2006).

Wheat is the most important small cereal crops in Ethiopia (CSA, 2007). Both durum (*Triticum turgidum L.* var *durum)* and bread wheat (*Triticum aestivum* L.) species are widely cultivated in the country although other species are cultivated to a lesser extent (Amsal, 2001). Wheat is a temperate crop even currently it is also becoming most important cereals grown on a large scale in the tropical and subtropical regions of the world (Onwueme and Sinha, 1999). This makes it the most suitable and commonly cultivated crop in South Gondar highland areas. According to South Gondar Agriculture and rural development office, wheat has been the leading cultivated crop in the zone for longer years.

Variability is the occurrence of differences among individuals due to differences in their genetic composition and/or the environment in which they are raised (Allard, 1960; Falconer and Mackay, 1996). If the character expression of two individuals could be measured in an environment identical for both, differences in expression would result from genetic control and hence such variation is called genetic variation (Falconer and Mackay, 1996). Information on the nature and magnitude of genetic variability present in a crop species is important for developing effective crop improvement program. Heritability in broad sense refers to the portion of phenotypically expressed variation, within a given environment and it measures the degree to which a trait can be modified by selection (Christiansen and Lewis, 1982).

Grain yield is the most complex trait because it is influenced by all factors (known and unknown) that determine productivity (Araus *et al.*, 2001). Consequently, the inheritance and interrelationships of grain yield and of characters influencing grain yield are highly important. It is, therefore, imperative to estimate the magnitudes of correlations between grain yield and its components.

Despite extensive wheat research practices have been conducted in different parts of the country, further cooperative investigations from different institutions is still needed to exploit the existing genetic resource which enables the nation to meet the goal of self sufficiency. Therefore, this research work was aiming to collect the existing local wheat varieties from local farmers in South Gondar zone and investigating thier extent of variability, heritability and correlations using some agro-morphological traits.

2. MATERIALS AND METHODS

2.1. Description of the Study Area

All the studied genotypes were collected from local farmers living in different districts of South Gondar zone. The experiment was conducted at Farta district which is found in South Gondar Zone, Amhara regional state, Ethiopia. The study area is located at 660 km Northwest of Addis Ababa, capital city of Ethiopia and lies between the coordinates of 11°32' to 12°03' N latitude and 37°31' to 38°43' E longitude with an estimated area of 1118 km^2. The entire area of the study district has a topography characterized by extremely high relief in the upper watershed of Blue Nile River system. The altitude of the study area varies between 1920 and 4235 meter above mean sea level with topography of gentle to undulating.

2.2. Experimental Materials and Design

The trial was established on May 20, 2014 at Farta district on farmer's field. Six local wheat varieties which were commonly cultivated in different districts of South Gondar zone were collected and used for this study (Table 1). The experiment was conducted in randomized complete block design with three replications. The total plot size was 2m × 3m consisted of 10 rows per plot and net plot size of 2m × 2.8m with 6 harvestable rows. Distance of 20cm and 10cm were used for between rows and plants, respectively. The Seed rate was 150 kg/ha and sowed by hand drilling at 20 cm row spacing and fertilizer rates were applied as recommended. All other pre and post-stand establishment management practices were done by following the recommended wheat husbandry practices.

Table 1. List of the six local wheat varieties used for this study

S. N.	Given Code	Local/Vernacular name	Meaning of the local name
1	LC1	Canada sendie	Indicating the name of the country where the variety brought from
2	LC2	Chekole	Fast matured variety/needs short period of time for cultivation
3	LC3	Key Sendie	Signifying color of this variety is red
4	LC4	Wond alfa	Indicating the variety needs intensive work to cultivate
5	LC5	Gomadie	indicates lack of awn on the seed
6	LC6	Ferno	Notifying the seed color is white

2.3. Data Collection

Data was collected on phonological and yield components based on twelve agro-morphological characters viz. days from plant emergence to heading, days from sowing to physiological maturity, grain filling period, plant height (cm), number of fertile tillers per plant, number of spikes per m^2, spike length (cm), number of grains per spike, number of spikelets per spike, biomass yield per plot (gm), grain yield per plot (gm) and harvest index per plot (%).

Plant height, number of fertile tillers, spikelets per spike, number of grains per spike and spike length was determined on the basis of 10 randomly chosen plants per plot. Days to heading was counted from the date of sowing till 75% of the heads emerged while days to maturity was recorded from the date of sowing till 75% of the plant will get matured. A plant physiologically matured when 75 percent of the glumes of the primary spike were turned yellow. Biomass and grain yield was recorded on a per plot basis, and harvest index was determined from the ratio of grain yield to biomass. Biomass and grain yield per plot recorded was converted into kg/ha.

2.4. Statistical Analysis

Mean data collected from the field was subjected to analysis of variance using appropriate procedures of the SAS software version 9.2 (SAS Institute Inc., 2008). The treatment effects were compared using LSD test at 5% and 1% probability level. Descriptive statistics was used to observe the existing variability among the studied genotypes for each agro-morphological trait. Pearson's correlation coefficient was used to see the association between traits. The variability present in the genotypes was estimated by phenotypic and genotypic variances and coefficient of variations using the procedure suggested by Burton and De Vane (1953).

$$\delta^2 g = \frac{MSg - MSe}{r} \quad \text{and} \quad \delta^2 p = \delta^2 g + \delta^2 e$$

where δ^2 g = Genotypic variance, δ^2 p = phenotypic variance , δ^2 e = environmental (error) variance or error mean square, MSg = Mean square due genotype, MSe = mean square of error (environmental variance) and r = number of replication.

Phenotypic coefficient of variance (PCV), genotypic coefficient of variance (GCV) and broad sense heritability (h^2) was calculated as follow:

$$PCV = \frac{\sqrt{\delta 2\ p}}{X} \times 100,$$

$$GCV = \frac{\sqrt{\delta 2\ g}}{X} \times 100$$

$$h^2 = \frac{\delta 2\ g}{\delta 2\ p} \times 100$$

where, x = population mean of the character

3. RESULTS

3.1. Days from Sowing to Heading (DTH)

Analysis of variance (Table 2) revealed that high significant difference was recorded for days taken from sowing to heading across the studied genotypes. This trait showed a wide variation with a mean of 82.17days, ranged from 64 days to 97 days and 13.76 % coefficient of variation (Table 3). Medium GCV (14.11%) and PCV (14.42%) were recorded for DTH indicating the presence of some environmental influence. Very high (95.68 %) heritability was recorded that indicates successful selection. From the tested local genotypes the longest day to reach heading was recorded for LC6 (94 days) followed by LC3 (90.67 days) and LC4 (88.67 days) but the shortest day was recorded for LC1 (65.67 days) (Table 4). Days from sowing to heading had a positive and highly significant correlation with days taken from sowing to physiological maturity and days of grain filling period (Table 5).

Table 2. Analysis of variance for the agro-morphological trait

S. No.	Traits	Mean squares		
		Genotypes	Error	P value
1	DTH	412.63 **	9.11	<0.0001
2	DTM	165.29**	16.78	<0.0006
3	DGFP	407.70**	8.89	<0.0001
4	PHT	962.20**	47.26	<0.0001
5	TPP	2.36*	0.50	0.0127
6	SPM	8379.43*	2488.28	0.0394
7	SL	11.90**	0.32	<0.0001
8	SkPS	21.95**	2.78	0.0017
9	NGPS	367.52**	15.76	<0.0001
10	BMY	3038131.52**	164040.61	<0.0001
11	GY	1086806.27**	14621.056	<0.0001
12	HI	169.83**	1.58	<0.0001

Notes: * = Significant at 0.05 level of significance, ** = Significant at 0.01 level of significance, DTH=Days from sowing to heading, DTM=Days from sowing to physiological maturity, DGFP=Days of grain filling period, PHT=Plant height (cm), TPP=Number of fertile tillers/plant, SPM=Number of spikes/m^2, SL=Spike length (cm), SkPS= spikelets per spike, NGPS=Number of grains/spike, BMY=Biomass/plot (kg/ha), GY=Grain yield (kg/ha), HI=Harvest index

3.2. Days from sowing to physiological Maturity (DTM)

Days from sowing to physiological maturity recorded high significant difference among the tested local wheat varieties (Table 2). Wide variation with a mean of 135.89 days, ranged from 121 to 152 days and 5.72 % coefficient variation was recorded for DTM trait (Table 3). Low GCV (5.15%) and PCV (5.73%) were recorded which indicates both were influenced by environment but very high heritability (81.56%) was recorded. A variety coded by LC6 recorded longest time to reach physiological maturity (144.67 days) followed by LC3 (139.67 days) while shortest time was taken by LC2 variety (122.67 days) (Table 4). Days from sowing to physiological maturity had a positive and higher significant correlation with grain filling period and days from sowing to heading (Table 5).

3.3. Days of Grain filling period (DGFP)

Analysis of variance (Table 2) revealed that days of grain filling period was highly significant across the tested local wheat varieties. The result of descriptive statistics (Table 3) revealed the presence of wider variation for DGFP trait with a mean of 102.22 days, ranged from 84 to 117 days and 10.99 % coefficient of variation. Medium GCV (11.28%) and PCV (11.53%) and very high heritability (95.73%) were recorded. The longest time taken for grain filling period was for genotype LC6 (114 days) followed by genotype LC3 and LC4 recording 110.67 days and 108.67 days respectively while the shortest day was taken by LC1 (85.67 days) (Table 4). For the correlation study (Table 5), grain filling period had a positive and highly significant correlation with days from sowing to heading and days from sowing to physiological maturity.

3.4. Plant height (PH)

Analysis of variance (Table 2) showed that local wheat genotypes were highly significant differences for plant height. Plant height showed a wide variation averaged 102.53 cm, with a range from 80 cm to 142.2 cm and 13.76 % coefficient of variation (Table 3). GCV and PCV were medium recording 17.03% and 17.89% respectively while heritability was very high with a value of 90.63%. Among the tested local genotypes, LC5 was the longest genotype (134cm), followed by LC2 and LC4 recording 110.34cm and 100.8cm respectively, while the shortest genotype was LC1 (82.8cm) (Table 4). Correlation studies (Table 5) showed that plant height had positive and highly significant correlation with spike length, positive but significant correlation with biomass while it has a negative and highly significant correlation with harvest index.

3.5. Number of tillers per plant (TPP)

Analysis of variance (Table 2) showed that number of tillers per pant was significant among tested local wheat genotypes. Tillers per plant showed wider variation but less when compared with other studied traits across the tested genotypes (Table 3) with a mean of 4.68, ranged from 2.8 to 6.2 and 21.86 % coefficient of variation. Medium GCV (16.82%) but higher PCV (20.82%) and heritability (65.26%) was recorded. Table of means (Table 4) revealed that genotype LC2 had maximum number of tillers per plant (5.7) followed by genotype LC6 (5.27) and LC1 (5) while the genotype LC3 (3.13 cm) had minimum number of tillers per plant among the tested local wheat genotypes. Result of correlation study (Table 5) for number of tillers per plant indicated that TPP had positive and highly significant correlation with biomass and grain yield but a positive and significant correlation with number of grains per spike.

3.6. Spike Length (SL)

Analysis of variance (Table 2) showed that spike length per plant was highly significant among tested genotypes. Like other studied parameters, a wide variation was recorded for spike length with an average of 9.58 cm, ranged from 5.3 cm to 11.8 cm and 20.17% coefficient of variation (Table 3). Higher GCV (20.53%), PCV (21.08%) and very high heritability (94.84%) was observed. The maximum length of spike was recorded for genotype LC4 (11.23cm) followed by LC6 and LC5 with 11 cm and 10.8 cm respectively while the shortest spike length was recorded for LC3 (6.13cm) (Table 4). Spike length had a positive and highly significant correlation with plant height, number of spikelets per spike and biomass yield and positive with significant correlation with number of grains per spike (Table 5).

3.7. Productive spikes per m^2 (SPM)

The analysis of variance (Table 2) showed that the number of productive spike per m^2 was significant among the tested genotypes**.** A wider range of variation was recorded for SPM (Table 3) with an average of 328.5, ranged from 224 to 440 and 19.78 % coefficient of variance. Medium GCV (13.49%), PCV (18.32%) and heritability (54.20%) was recorded. Table of means (Table 4) showed that maximum number of spike per m^2 was recorded for genotype LC5 (387.33) followed by LC1 (381) and LC4 (342.67) while the minimum number of spike per m^2 was recorded in genotype LC3 (252). In case of correlation studies (Table 5) number of spike per m^2 was found to have significant correlation with biological yield.

3.8. Number of spikelets per spike (SkPS)

The analysis of variance (Table 2) showed that the number of spikelets per spike was highly significant among the tested genotypes**.** An average of 18.78, ranged from 14 to 24 and 15.45 % coefficient of variance was recorded for SkPS that indicates the existence of wide variation among the tested genotypes (Table 3). Medium GCV (13.46%), PCV (15.29%) and high heritability (54.20%) was observed. From the result of table of means, (Table 4) maximum number of spikelets per spike was produced by genotype LC4 (22.67) followed by LC6 (21.33) and LC2 (18.67) while the minimum number of spikelets per spike was found in genotype LC3 (15.67) in comparison to other tested genotypes. In case of correlation studies (Table 5) number of spikelets/spike was found to have positive and highly significant correlation with spike length and number of grains per spike and positive and significant correlation with biomass and grain yield.

3.9. Number of grains per spike (NGPS)

Analysis of Variance (Table 2) showed that number of grains per spike was highly significant among genotypes. A mean of 52.55, ranged from 36.2 to 68.2 and 20.78 % coefficient of variance (Table 3) was recorded for NGPS that indicates the presence of wide variation among local wheat varieties. High GCV (20.61%), PCV (21.51%) and heritability (91.77%) were recorded. Maximum number of grains per spike was observed for LC6 (65.9) followed by genotype LC4 (62.73) but the minimum number of grains per spike was found in genotypes LC5 (39) among the tested genotypes (Table 4). Number of grains/spike had highly significant positive correlation with number of spikelets/spike, grain yield and harvest index, also it had positive and significant correlation with spike length, tillers/plant and biomass yield (Table 5).

3.10. Grain yield per hectare (GY)

Analysis of variance for grain yield showed the presence of difference at 1 % level of significance (Table 2). Grain yield was highly varied across the tested genotypes with a mean of 1025 kg/ha, ranged from 467 to 2001 kg/ha and with a coefficient of variation of 47.67% (Table 3). The highest GCV (49.58%) and PCV (50.25%) were recorded for grain yield while heritability was high (97.34%). Highest yield was recorded by genotype LC6 (1957kg/ha) followed by LC2 (1588.33kg) and LC1 (1580.7kg) while the lowest yield was found in LC5 (495kg) (Table 4). Number of grains per spike, number of tillers per plant and harvest index was found to have highly significant positive correlation with grain yield but it had significant and positive correlation with spikelets per spike and biomass (Table 5).

3.11. Biomass yield (BMY)

Analysis of variance (Table 2) revealed that high significant difference was recorded for biomass across the studied local wheat varieties. A mean of 4135 kg/ha, ranged from, 2100 to 5300 kg/ha and 24.29 % coefficient of variance was recorded which indicates existence of wider variation of biomass among the tested genotypes (Table 3). High GCV (23.67%) and PCV (24.98%) but very high heritability (89.75%) was recorded. From the tested local genotypes the highest biomass was recorded for LC4 (4885.3 kg/ha) followed by LC6 (4600.3 kg/ha) and LC5 (4554.7 kg/ha) while the least was recorded for LC3 (2166.7 kg/ha). Correlation study showed that biomass had a positive and highly significant correlation with number of tillers/plant and spike length and a positive and significant correlation with plant height, number of spikelets/spike and number of grains/plant (Table 5).

3.12. Harvest index (HI)

Harvest index was found to be significant at 1% level of significance (Table 2). Wide variation with a mean of 29.11%, ranged from 10.34 to 43.5 % and 39% coefficient of variance was recorded across the genotypes (Table 3). GCV and PCV were high recording 25.72% and 25.97% respectively but heritability was very high (98.14%). Highest mean value for harvest index was exhibited by LC6 (29.85) among the tested genotypes followed by LC1 (28.19), while the lowest mean value for harvest index was found in genotype LC5 (9.77) (Table 4). Grain yield and number of grains per spike was found to have highly significant positive correlation with harvest index but it had a negative and highly significant correlation with plant height (Table 5).

Table 3. Agro-morphological variations recorded in the studied local wheat varieties

S.N.	Traits	Range (min-max)	Mean ± S.E.	S.D	C.V (%)	Median	GCV (%)	PCV (%)	H^2 (%)
1	DTH	64-97	82.17±2.66	11.3	13.76	86.5	14.11	14.42	95.68
2	DTM	121-152	135.89±1.83	7.78	5.72	137.5	5.15	5.73	81.56
3	DGFP	84-117	102.22±2.64	11.23	10.99	106.5	11.28	11.53	95.73
4	PHT	80-142.2	102.53±4.19	17.79	17.35	98.2	17.03	17.89	90.63
5	TPP	2.8-6.2	4.68±0.24	1.02	21.86	4.9	16.82	20.82	65.26
6	SPM	224-440	328.5±15.31	64.97	19.78	317.5	13.49	18.32	54.20
7	SL	5.3-11.8	9.57±0.45	1.93	20.17	10.4	20.53	21.08	94.84
8	SkPS	14-24	18.78±0.68	2.9	15.45	18	13.46	15.29	77.54
9	NGPS	36.2-68.2	52.55±2.57	10.91	20.78	55.10	20.61	21.51	91.77
10	BMY	2100-5300	4135±236.8	1004.67	24.29	4495	23.67	24.98	89.75
11	GY	467-2001	1205.7±135.39	574.43	47.64	1236.5	49.58	50.25	97.34
12	HI	10.3-43.5	29.11±2.68	11.36	39.02	30.13	25.72	25.97	98.14

Notes: GCV=Genotypic coefficient of variance, PCV=Phenotypic coefficient of variance, H^2 =Broad sense heritability, DTH=Days from sowing to heading, DTM=Days from sowing to physiological maturity, DGFP=Days of grain filling period, PHT=Plant height (cm), TPP=Number of fertile tillers/plant, SPM=Number of spikes/m^2, SL=Spike length (cm), SkPS= spikelets per spike, NGPS=Number of grains/spike, BMY=Biomass/plot (kg/ha), GY=Grain yield (kg/ha), HI=Harvest index

Table 4. Means of six local wheat varieties for twelve agro-morphological traits.

S. No	Genotypes	Traits											
		DTH	DTM	PHT	DGFP	TPP	SL	SPM	SkPs	NGPS	BMY	GY	HI
1	**LC1**	65.67c	122.67c	82.80d	85.67d	5.00ba	8.33c	381.0a	17.33cd	53.07b	4003.3b	1580.67b	28.19a
2	**LC2**	69.67c	137.67ba	110.34b	90.00d	5.70a	9.87b	318.33abc	18.67bc	54.08b	4600.0ab	1588.33b	25.75b
3	**LC3**	90.67a	139.67ba	86.67cd	110.67ba	3.13c	6.13d	252.33c	15.67d	40.53c	2166.7c	545.67d	20.09c
4	**LC4**	88.67a	133.67b	100.8cb	108.67bca	4.70ba	11.23a	342.67ba	22.67a	62.73a	4885.3a	1067.33c	18.01c
5	**LC5**	84.33b	137.00ba	134.00a	104.33c	4.30bc	11.00a	387.33a	17.00cd	39.00c	4554.7ab	495.00d	9.77d
6	**LC6**	94.00a	144.67a	97.20c	114a	5.27ba	10.83ba	288.33bc	21.33ab	65.90a	4600.3ab	1957.00a	29.85a
	LSD	**5.37**	**7.29**	**12.23**	**5.31**	**1.25**	**1.00**	**88.74**	**2.97**	**7.06**	**720.53**	**215.11**	**2.23**
	CV	**3.67**	**3.01**	**6.705**	**2.92**	**15.1**	**5.89**	**15.18**	**8.88**	**7.56**	**9.79**	**10.03**	

Notes: DTH=Days from sowing to heading, DTM=Days from sowing to physiological maturity, DGFP=Days of grain filling period, PHT=Plant height (cm), TPP=Number of fertile tillers/plant, SPM=Number of spikes/m^2, SL=Spike length (cm), SkPS= spikelets per spike, NGPS=Number of grains/spike, BMY=Biomass/plot (kg/ha), GY=Grain yield (kg/ha), HI=Harvest index

Table 5: Pearson′s correlation coefficient among yield related traits.

Traits	DTH	DTM	DGFP	PHT	TPP	SPM	SL	SKPS	NGPS	BMY	GY	HI
DTH	1.00											
DTM	0.729***	1.00										
DGFP	0.999***	0.733***	1.00									
PHT	0.005ns	0.167ns	0.008ns	1.00								
TPP	-0.417ns	-0.143ns	0.412ns	0.195ns	1.00							
SPM	-0.35ns	-0.403ns	0.357ns	0.337ns	0.004ns	1.00						
SL	0.161ns	0.197ns	0.162ns	0.564**	0.46	0.319ns	1.00					
SkPS	0.297ns	0.150ns	0.298ns	-0.115ns	0.097ns	0.036ns	0.664**	1.00				
NGPS	0.122ns	0.099ns	0.125ns	-0.280ns	0.463*	-0.027ns	0.576*	0.781**	1.00			
BMY	-0.121ns	-0.004ns	-0.119ns	0.510*	0.591**	0.556*	0.852***	0.549*	0.583*	1.00		
GY	-0.259ns	-0.004ns	0.257ns	-0.310ns	0.623**	0.024ns	0.257ns	0.457ns	0.792**	0.556*	1.00	
HI	-0.269ns	-0.056ns	-0.268ns	-0.657**	0.398ns	-0.248ns	-0.175ns	-0.236ns	0.591**	-0.015ns	0.877***	1.00

Notes: * = Significant at 0.05 level of significance, ** = Significant at 0.01 level of significance, DTH=Days from sowing to heading, DTM=Days from sowing to physiological maturity, DGFP=Days of grain filling period, PHT=Plant height (cm), TPP=Number of fertile tillers/plant, SPM=Number of spikes/m^2, SL=Spike length (cm), SkPS= spikelets per spike, NGPS=Number of grains/spike, BMY=Biomass/plot (kg/ha), GY=Grain yield (kg/ha), HI=Harvest index

4. DISCUSSION

Six locally cultivated wheat varieties were evaluated for variability, heritability and association of characters using twelve phonological and yield related traits. Highly significant variation was recorded in all traits except for tillers per plant and numbers of spikelets/m^2 that could indicate the presence of high wheat genetic variability in the study area. This finding agreed with Dawit *et al*. (2012) which indicated the presence of high genetic diversity of durum wheat genotypes in Ethiopia. Geleta *et al.* (2013) concluded the presence of considerable genetic variation for quantitative morphological and quality traits from different wheat accessions taken from Ethiopia. This investigation showed phenotypic coefficient of variance (PCV) had slightly higher than genotypic coefficient of variance (GCV) in all tested traits that indicates the presence of small environmental influence.

Awale *et al.* (2013) explained the presence of slightly higher PCV value than GCV on some bread wheat genotypes grown in Eastern Ethiopia. Asaye *et al.* (2013) got the same result on after tested on wheat genotypes from East Gojjam zone. Higher broad sense heritability was recorded in most of the tested traits which is because of smaller phenotypic variance and this is in line with Khan *et al.* (2010), Salem *et al.* (2008) and Awale *et al.* (2013). Grain yield had a positive and highly significant correlation with number of grains per spike, number of tillers per plant and harvest index that indicates these traits must be considered during selection. Nawaz *et al.* (2013) also got similar correlation result in some wheat varieties from Pakistan. This study showed that better yield was recorded from local variety *Ferno* followed by *Chekole* and *Canada Sendie* that indicates these varieties should be considered in future wheat yield improvement programs.

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