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The Mean Performance of Different Bread Wheat (*Triticum Aestivum.* L) Genotypes in Gurage Zone, Ethiopia

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Abstract- In Ethiopia, a number of improved bread wheat *(TriticumaestivumL.)* varieties have been released by different research centers inorder to see the adaptability and performance of different bread wheat genotypes. However nothing has been done at Gurage Zone and therefore a total of twenty five bread wheat *(TriticumaestivumL.)* genotypes were evaluated for adaptability and performance at Gurage zone at two different environments. The genotypes were grown in randomized complete block design. Data were collected on 13 agronomic characters. Based on the mean separation, highest grain yield (4941.70kg/ha) was recorded from Hoggana, while lowest yield of (1983.30 kg/ha) was obtained from Kakaba and Sofumar at Fereziye. At Kotergedra, the highest grain yield of (5366.7 kg/ha) was also recorded from Hoggana and the lowest yield of (3166.7 kg/ha) was obtained from Kakaba. The highest above ground biomass also obtained from Hoggana at both location 10850.00 kg/ha and 16992.00 kg/ha at Fereziye and Kotergedra respectively. Statistically, the variety Hoggana gave the highest tillers per plant and spikes per plant at both locations those are positive contributions to grain yield. Therefore, the genotypes can be considered when increment of these characters was needed. Therefore genotype Hoggana could be used for the seed system program in the respective location.

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I. Introduction

Wheat, a self-pollinating annual plant in the true grass family *Gramineae (Poaceae)*, is extensively grown as staple food sources in the world [5]. It is exclusively produced under rain fed conditions, *meher* and *belg* (long and short rainy seasons), respectively. The genetic origin of wheat is of interest; since it is a classic example of how closely related species may be combined in nature into a polyploid series. The species of *Triticum* (*T.*) and their close relatives can be divided into diploid, tetraploid and hexaploid groups, with chromosome numbers of 2n = 14, 28 and 42, respectively, in which the basic chromosome number of wheat is x = 7. *Triticum durum* originated thousands of years ago from a hybridization between the wild diploid *T. monococcum* L. (A genome donor) and the donor of the B genome which, according to morphological, geographical and cytological evidence, has been recognized as *T. speltoides* (Tausch) Gren or a closely related species [1].

Wheat is grown at an altitude ranging from 1500 to 3000 m.a.s.l, between 6-16^0 N latitude and 35-42^0 E longitude in our country. The most suitable agro-ecological zones, however, fall between 1900 and 2700 m.a.s.l [1]. Wheat in Ethiopia is an important cereal crop and it ranks fourth in total area coverage next to teff, maize and sorghum; also fourth in total production next to maize, teff and sorghum. 4.23 million tons of wheat is produced on an area of 1.7 million ha and about 4.6 million farmers were involved. Oromia, Amhara, SNNP and Tigray are the major wheat producing regions in the country with area coverage of 875641.45, 529609.63, 137294.72 and 108865.39 ha respectively. Furthermore, 47259 farmers were involved with unestimated area coverage in Gurage Zone in 2015 main production season [3].

In Ethiopia, bread wheat improvement has started in 1949 and up to now many varieties have been released by the national and regional research institutes. However, those varieties are not widely distributed to all parts of the country. This is because of several constraints including the remoteness and in accessibilities of the growing areas that limited to test the adaptability and yields of the varieties in such areas. It is necessary to evaluate varieties for the intended growing regions since varieties were recommended as high yielding after evaluating at few representative wheat growing areas, in other words the varieties were not evaluated in all wheat growing regions. At Gurage Zone of South Nation, Nationality region is one of the areas where improved varieties are not widely distributed so far, most probably due to the above indicated problems. Particularly, the potential of the area to wheat crop is not exploited due to lack of improved varieties, there is no detail information indicating the adaptability and production status of the improved bread wheat varieties in the area. Since it provides information that can be utilized to improve wheat yield through breeding and to

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identify high yielding and more adaptable varieties to improve productivity and production of wheat. In view of the above limitation, the present study was undertaken with the following specific objectives:

1. To see the adaptability and performance of different bread wheat verities in the studied area.

II. Materials and Methods

a) Experimental Materials

Experimental materials comprised of twenty five bread wheat genotypes released from different agricultural research centers (Table 1).

Table 1: List of Genotypes

Entry	Variety Name	Source Center	Year of Release
1	ETBW 5879	Kulumsa	2014
2	ETBW 6095	Kulumsa	2014
3	WORRAKATTA/PASTOR	Sinana	2014
4	UTQUE96/3/PYN/BAU//MILLAN	Sinana	2014
5	Hidasse	Kulumsa	2012
6	Ogolcho	Kulumsa	2012
7	Hoggana	Kulumsa	2011
8	Hulluka	Kulumsa	2012
9	Mekelle-3	Mekelle	2012
10	Mekelle-4	Mekelle	2013
11	Shorima	Kulumsa	2011
12	Mekelle-1	Mekelle	2012
13	Mekelle-2	Mekelle	2011
14	Ga'ambo	Werer	2011
15	Kakaba	Kulumsa	2010
16	Danda'a	Kulumsa	2010
17	Gassay	Adet	2007
18	Alidoro	Holleta	2007
19	Digelu	Kulumsa	2005
20	Tay	Adet	2005
21	Sofumar	Sinana	1999
22	Mada-Wolabu	Sinana	1999
23	Pavon-76	Kulumsa	1982
24	Jefferson	Kulumsa	2012
25	King Bird	Kulumsa	2014

b) Experimental Design and Field Management

The genotypes were planted in early July 2015 at Wolkite University stations (Kotergedra and Fereziye) (Table 2). The genotypes were grown in randomized complete block design (RCBD) with three replications. Each plot consisted of six rows spaced 20cm X 2.5m long. The plot area was $3m^2$ (2.5m X 1.2m). A 1.5 meter distance was maintained between replication and 50cm between plots used for both sites.

Fertilizers (both N and P_2O_5) was applied at the rate of 150 kg/ha urea and 100 kg/ha DAP at the time of planting and tillering. Seeding was done at the rate of 125Kg/ha. Seed and fertilizer was drilled uniformly by hand. Weeding and other agronomic practice was carried out as per recommendations of the respective sites.

Table 2: Location and descriptions of weather conditions for the two testing sites

Sites	Seasonal Temperature (°C)		Soil type	Soil PH	Seasonal Rainfall (mm)	Location		
	Max	Min				Latitude	Longtiude	Altitude
Fereziye	24.37	10.2	EutricNitisols	5.4	1336.8	8.2^0N	37.9^0E	1980 masl
Kotergedra	23	8	EutricNitisols	5.7	1450	8.05^0N	37.5^0E	2600 masl

c) Data collection

The data on the following attributes was collected on the basis of the central four rows in each plot.

1. *Days to heading (DTH):* The number of days from date of sowing to the stage where 75% of the spikes have fully emerged.
2. *Days to maturity (DTM):* The number of days from sowing to the stage when 90% of the plants in a plot have reached physiological maturity.
3. *Grain filling period (GFP):* The number of days from heading to maturity, i.e. the number of days to maturity minus the number of days to heading.

4. *Grain yield (GY):* Grain yield in grams obtained from the central four rows of each plot and converted to kilograms per hectare at 12.5% moisture content.
5. *1000-kernel weight (TKW):* Weight of 1000 seeds in gram.
6. *Above ground biomass (AGB):* The plants within the four central rows were harvested and weighed in grams.
7. *Harvest index (HI):* On a plot basis, the ratio of dried grain weight to the dried above ground biomass weight multiplied by 100.

Ten plants were randomly selected from the four central rows for recording the following observations:

1. Tillers/plant (TPP): The average number of tillers
2. Plant height (PHT): The average height in cm from ground level to the tip of the spike.
3. Kernels per spike (KPS): The average number of kernels per spike.
4. Spikelet per spike (SkPS): The average number of spikelet's per spike.
5. Spike length (SL): The average spike length in cm from its base to the tip.
6. Spikes per plant (SPP): The average number fertile spikes per plant including tillers.

d) Data Analysis

The data were recorded were subjected to analysis by using General Linear Model procedure and the statistical package SAS version 9.1 was used for the following statistical procedures.

e) Analysis of variance

The analysis of variance was conducted using randomized complete block design (RCBD). Before computing the combined analysis, error variance homogeneity test was performed using the procedure suggested by [4]. In the combined analysis of variance, locations were considered random and genotypes were considered fixed. The least significant difference (LSD) was used to compare two means at the 5% and 1% level of significance.

Analysis of variance of randomized complete block design for each test location was computed using the following mathematical model:

$$Yij = \mu + rj + gi + \varepsilon ij$$

Where: Y_{ij} =the observed value of the trait Y for the i^{th} genotype in j^{th} replication
μ= the general mean of trait Y
rj = the effect of j^{th} replication
gi= the effect of i^{th}genotypes and
εij= the experimental error associated with the trait y for the i^{th}genotype in j^{th}replication.

Analysis of variance of randomized complete block design for combined location was computed using the following mathematical model:

$$Yijk = \mu + gi + Ej + GEij + Bk(j) + \varepsilon ijk$$

Where: $Yijk$= observed value ofgenotype $_i$ in block $_k$ of location $_j$
μ= grand mean
Gi= effect of genotype $_i$
Ej= environment or location effect
$GEij$= the interaction effect of genotype$_i$ with location/environment $_j$
$Bk(j)$= effect of block k in location/environment $_j$
εijk = random error or residual effect of genotype$_i$in block $_k$ of location $_j$

Least significant Difference (LSD) among genotypes and coefficient of variation in percent (CV %) for all characters was computed [4].

$$LSD = \alpha\ (2\sigma^2 e/r)^{½}$$

CV%= $[(\sigma^2 e)^{½} / \bar{x}) \times 100]$ where, α = t- value at 5% and 1% probability level.

III. Results and Discussion

a) Range and Mean of Different Characters

Estimated range, mean, coefficient of variation and list significant difference the mean are presented in Tables 3, 4 and 5 for Fereziye, Kotergedra and combined locations respectively. Wide ranges were recorded for most traits at Fereziye. Based on the mean separation, highest grain yield (4941.70kg/ha) was recorded from Hoggana, while lowest yield of (1983.30 kg/ha) was obtained from Kakaba and Sofumar at Fereziye. At Kotergedra, the highest grain yield of (5366.7 kg/ha) was also recorded from Hoggana and the lowest yield of (3166.7 kg/ha) was obtained from Kakaba. The highest above ground biomass also obtained from Hoggana at both location 10850.00 kg/ha and 16992.00 kg/ha at Fereziye and Kotergedra respectively.

Most of the genotypes headed and matured earlier at Fereziye than at Kotergedra due to the lower altitude and high temperature. The mean days to maturity of 115.8 with the range of 101.00-135.00 for Fereziye and 148.69 with the range of 142.67-156.00 for Kotergedra. Related range was obtained from the finding of [6]. Based on the mean separation, variety Digelu and Kakaba were late and early matured genotypes respectively at Fereziye. Moreover, Digelu, Alidoro and Pavon-76 had late whereas Kakaba had early matured genotypes at Kotergedra. The mean days to heading of 65.53 with the range of 53.00-75.33 at Fereziye and 79.21 with the range of 76.00-85.00 at Kotergedra. Alidoro, Tay and Hogana had late whereas Kakaba had early headed genotypes at Fereziye. ETBW

6095 and Pavon-76 had late and early headed genotypes at Kotergedra.

Higher mean plant height (66.4 cm) with range of 54.70-82.57 was recorded at Fereziye. At Kotergedra, mean plant height was shorter (56.25 cm) with the range of 46.00-66.83. Alidoro was the highest plant height from the genotypes at both locations. The grand mean for grain yield (3742.33 kg/ha) and biological yield (11922.00 kg/ha) were recorded at Kotergedra and (2941.00 kg/ha) and (8281.00 kg/ha) that were recorded at Fereziye. Related grain yield range was reported by [2].

At Kotergedra, mean grain filling period was 69.48 with the range of 64.33-78.00 and 50.27 with the range of 40.00-61.33 for Fereziye. Genotypes Millan and pavon-76 had early grain filling periods whereas Digelu had late grain filling period at Fereziye. Pastor and Pavon-76 had early and late grain filling period respectively at Kotergedra. At Fereziye the mean 1000 kernel weight was 43.53 with the range of 35.00-50.00 and 44.00 with the range of 33.33-53.33 was recorded at Kotergedra. The mean tiller per plant (7.73) with the range of 5.03-12.83 was recorded at Fereziye and (7.88) with the range of 5.40-10.43 was recorded at Kotergdra. Therefore wide ranges were recorded for most studied characters at Fereziye than Kotergedra.

At Fereziye the mean number of kernel per spike (47.92) with the range of 35.83-66.00, the mean number of spikelet per spike (16.50) with the range of 13.53-21.30, the mean spike length (8.61) with the range of 6.73-11.30 and the mean number of spike per plant (6.69) with the range of 4.03-11.83 were recorded. However, the mean number of kernel per spike (53.11) with the range of 44.17-70.60, the mean number of spikelet per spike (16.51) with the range of 14.20-21.40, the mean spike length (8.44) with the range of 6.87-10.07 and the mean number of spike per plant (6.75) with the range of 5.30-10.27 was recorded at Kotergedra. Some related range and mean was found from [6]. Statistically, the variety Hoggana gave the highest tillers per plant and spikes per plant at both locations those are positive contributions to grain yield. Therefore, the genotypes can be considered when increment of these characters was needed.

Across allocation (Table 5), the mean days to heading (72.37) with the range of 64.67-78.17, the mean days to maturity (132.25) with the range of 122.17-145.67, the mean grain filling period (59.87) with the range of 53.67-69.50 were recorded. The mean 1000 kernel weight (43.77) with the range of 34.17-51.67, the mean above ground biomass (10101.60) with the range of 7487.5-13920.8 was recorded across allocation. Moreover, the mean tillers per plant (7.40) with the range of 5.62-11.63, the mean plant height (61.33) with the range of 50.93-74.70 were recorded. The mean spikelet per spike (16.50) with the range of 13.87-21.35, the mean spike length (8.52) with the range of 6.85-10.45 and the mean spikes per plant (7.15) with the range of 5.98-9.18 were recorded across allocation.

Table 3: Mean performance of 25 bread wheat genotypes for the 13 characters tested at Fereziye

Genotype	DTH	DTM	GFP	GY	TKW	AGB	HI	TPP	PHT	KPS	SKPS	SL	SPP
ETBW 5879	67.00	113.00	46.00	3066.70	46.67	8716.70	0.36	7.10	61.20	43.23	15.77	7.80	6.10
ETBW 6095	60.00	109.00	49.00	2300.00	46.67	7258.30	0.32	5.87	62.70	47.00	15.13	8.87	4.87
WORRAKATTA/PASTOR	62.33	111.00	48.67	2966.70	40.00	8791.70	0.34	7.80	58.33	50.23	14.60	7.10	6.80
UTQUE96/3/PYN/BAU//MILLAN	67.00	109.67	42.67	3091.70	41.67	9291.70	0.33	8.27	71.23	40.30	15.83	9.40	7.27
Hidasse	57.67	109.00	51.33	2316.70	43.33	6191.70	0.38	5.03	60.80	49.00	16.10	8.03	4.03
Ogolcho	71.67	121.33	49.67	2833.30	46.67	7916.70	0.36	6.83	71.83	49.87	16.47	9.57	5.83
Hoggana	75.33	130.33	55.00	4941.70	45.00	10850.00	0.47	12.83	72.03	49.33	17.97	9.10	11.83
Hulluka	67.00	122.00	55.00	4033.30	41.67	12508.30	0.32	9.97	66.30	50.10	16.47	8.40	8.97
Mekelle-3	60.00	103.67	43.67	2566.70	41.67	8316.70	0.31	7.13	67.13	41.87	15.93	8.00	6.30
Mekelle-4	71.33	121.00	49.67	3825.00	43.33	10291.70	0.38	9.13	61.03	49.30	16.77	9.33	8.13
Shorima	67.00	113.67	46.67	3083.30	43.33	8600.00	0.36	8.23	67.47	44.33	16.37	9.17	7.23
Mekelle-1	57.67	112.67	55.00	2633.30	41.67	7141.70	0.37	5.57	63.03	53.50	15.73	8.77	4.57
Mekelle-2	62.33	109.00	46.67	3883.30	45.00	9775.00	0.40	8.07	67.23	57.00	17.13	9.23	7.07
Ga'ambo	67.00	107.00	40.00	3116.70	45.00	8091.70	0.39	6.80	65.90	46.63	15.20	8.27	5.80
Kakaba	53.00	101.67	48.67	1983.30	45.00	4858.30	0.42	5.07	54.70	38.80	13.53	7.70	4.10
Danda'a	73.67	134.33	60.67	2208.30	50.00	5691.70	0.42	6.67	65.43	58.17	17.47	8.17	5.67
Gassay	67.00	122.00	55.00	3150.00	45.00	10316.70	0.31	8.43	68.63	48.97	17.47	8.40	7.13
Alidoro	74.00	130.67	56.67	3908.30	45.00	10941.70	0.36	9.37	82.57	66.00	21.30	11.30	7.97
Digelu	74.00	135.33	61.33	3150.00	36.67	10400.00	0.30	11.33	78.00	55.63	17.33	6.73	9.97
Tay	74.00	128.00	54.00	2858.30	41.67	9500.00	0.30	8.87	72.50	57.30	19.17	9.23	7.87
Sofumar	62.33	109.00	46.67	1983.30	45.00	5608.30	0.36	5.73	69.23	35.83	17.13	8.43	4.73
Mada-Wolabu	67.00	123.00	56.00	2625.00	50.00	7041.70	0.37	7.83	65.97	43.60	16.50	9.43	6.83
Pavon-76	62.33	105.00	42.67	2250.00	43.33	6841.70	0.33	7.07	65.40	37.13	15.30	8.30	6.07
Jefferson	53.00	101.00	48.00	2066.70	40.00	5558.30	0.37	6.10	59.93	39.53	16.03	8.33	5.10
King Bird	64.67	112.67	48.00	2683.30	35.00	6530.00	0.41	8.07	61.50	45.37	15.90	8.07	7.07
Mean	65.53	115.80	50.27	2941.00	43.53	8281.20	0.36	7.73	66.40	47.92	16.50	8.61	6.69
CV %	3.46	4.30	9.55	7.99	6.33	11.93	14.59	11.79	4.89	17.63	5.80	6.04	14.24
LSD 0.01	4.97	10.91	10.51	514.47	6.03	2164.40	0.12	2.00	7.11	18.50	2.10	1.14	2.09
0.05	5.33	8.17	7.88	385.66	4.52	1622.50	0.09	1.50	5.33	13.87	1.57	0.85	1.56

Where: DTH= Days to heading, DTM= Days to maturity, GFP= Grain filling period, GY= Grain yield, TKW= Thousand kernel Weight, AGB= Above ground biomass, HI= Harvest index, TPP= Tillers per plant, PHT= Plant height, KPS= Kernel per spike, SKPS= Spikelet per spike, SL= Spike length, SPP= Spike per plant, CV= coefficient of variation and LSD=least significant

Table 4: Mean performance of 25 bread wheat genotypes for the 13 characters tested at Kotergedra.

Genotype	DTH	DTM	GFP	GY	TKW	AGB	HI	TPP	PHT	KPS	SKPS	SL	SPP
ETBW 5879	81.00	147.67	66.67	3483.30	45.00	10425.00	0.34	7.30	55.83	48.90	15.70	8.30	7.23
ETBW 6095	85.00	150.00	65.00	3433.30	45.00	9842.00	0.35	8.07	53.20	51.97	15.77	8.73	7.53
WORRAKATTA/PASTOR	82.67	147.00	64.33	3466.70	41.67	10150.00	0.34	6.73	51.00	51.57	14.93	8.47	6.67
UTQUE96/3/PYN/BAU//MILLAN	79.00	143.67	64.67	3816.70	41.67	12275.00	0.31	7.77	59.83	45.63	15.77	8.20	7.00
Hidasse	80.00	151.00	71.00	3500.00	43.33	10542.00	0.33	6.20	53.13	52.60	15.67	7.80	5.30
Ogolcho	79.00	151.00	72.00	3916.70	46.67	13375.00	0.29	7.70	62.10	55.60	16.63	8.63	7.27
Hoggana	79.33	144.33	65.00	5366.70	45.00	16992.00	0.32	10.43	63.13	57.33	18.43	8.77	10.27
Hulluka	78.33	144.33	66.00	3758.30	43.33	12442.00	0.30	9.17	54.17	51.93	16.23	7.87	8.87
Mekelle-3	80.33	146.33	66.00	3541.70	41.67	11133.00	0.32	6.53	46.00	46.30	16.03	7.13	5.67
Mekelle-4	77.00	148.67	71.67	3941.70	45.00	12817.00	0.31	7.00	51.50	58.47	16.77	9.17	6.10
Shorima	77.67	151.00	73.33	3600.00	43.33	11983.00	0.30	6.73	59.47	51.13	16.07	9.23	6.83
Mekelle-1	77.67	149.33	71.67	3633.30	41.67	12650.00	0.29	7.53	55.87	55.20	16.27	8.83	6.67
Mekelle-2	78.33	146.00	67.67	4166.70	45.00	13592.00	0.31	7.00	53.27	59.37	17.00	8.13	6.93
Ga'ambo	79.00	147.67	68.67	3708.30	45.00	11550.00	0.32	7.13	58.87	50.43	15.47	8.03	6.67
Kakaba	76.33	142.67	66.33	3166.70	45.00	10117.00	0.31	6.43	47.17	44.17	14.20	7.23	6.13
Danda'a	78.33	152.33	74.00	3608.30	46.67	12167.00	0.30	6.03	62.47	59.40	16.87	9.07	5.90
Gassay	77.33	149.33	72.00	4258.30	46.67	13600.00	0.31	6.73	58.90	57.27	17.17	9.80	7.03
Alidoro	82.33	156.00	73.67	4266.70	45.00	13775.00	0.31	7.37	66.83	70.60	21.40	9.60	7.03
Digelu	78.33	156.00	77.67	3616.70	40.00	11367.00	0.32	6.90	59.73	59.77	16.60	6.97	6.83
Tay	81.00	147.67	66.67	3708.30	41.67	11642.00	0.32	6.47	61.37	58.80	18.37	9.67	6.30
Sofumar	79.33	145.33	66.00	3458.30	46.67	10283.00	0.34	7.07	54.07	49.83	16.80	8.60	6.50
Mada-Wolabu	80.67	151.67	71.00	3575.00	53.33	10467.00	0.34	5.40	56.07	50.20	16.53	10.07	5.77
Pavon-76	76.00	154.00	78.00	3750.00	43.33	13433.00	0.28	7.07	57.47	48.40	15.63	7.47	6.40
Jefferson	80.00	145.00	65.00	3500.00	45.00	10917.00	0.32	5.90	51.13	45.47	16.17	6.87	5.73
King Bird	76.33	149.33	73.00	3316.70	33.33	10517.00	0.32	6.33	53.73	47.30	16.17	8.30	6.23
mean	79.21	148.69	69.48	3742.33	44	11922	0.32	7.08	56.25	53.11	16.51	8.44	6.75
CV%	4.01	2.16	6.07	11.16	6.45	12.50	7.50	15.43	6.82	6.05	6.07	7.97	14.14
LSD 0.01	6.96	7.04	9.23	914.78	6.21	3262.60	0.05	2.39	8.40	7.04	2.19	1.47	2.09
0.05	5.22	5.28	6.92	685.74	4.66	2445.70	0.04	1.79	6.30	5.28	1.64	1.10	1.57

Where: DTH= Days to heading, DTM= Days to maturity, GFP= Grain filling period, GY= Grain yield, TKW= Thousand kernel weight, AGB= Above ground biomass, HI= Harvest index, TPP= Tillers per plant, PHT= Plant height, KPS= kernel per spike, SKPS= Spikelet per spike, SL= Spike length, SPP= Spike per plant, CV= coefficient of variation and LSD=least significant difference

Table 5: Combined mean performance of 25 bread wheat genotypes for the 10 characters

Genotype	DTH	DTM	GFP	TKW	AGB	TPP	PHT	SKPS	SL	SPP
ETBW 5879	74.00	130.33	56.33	45.83	9570.80	7.20	58.52	15.73	8.05	7.02
ETBW 6095	72.50	129.50	57.00	45.83	8550.00	6.97	57.95	15.45	8.80	7.70
WORRAKATTA/PASTOR	72.50	129.00	56.50	40.83	9470.80	7.27	54.67	14.77	7.78	6.38
UTQUE96/3/PYN/BAU//MILLAN	73.00	126.67	53.67	41.67	10783.30	8.02	65.53	15.80	8.80	7.70
Hidasse	68.83	130.00	61.17	43.33	8366.70	5.62	56.97	15.88	7.92	6.17
Ogolcho	75.33	136.17	60.83	46.67	10645.80	7.27	66.97	16.55	9.10	7.92
Hoggana	77.33	137.33	60.00	45.00	13920.80	11.63	67.58	18.20	8.93	9.18
Hulluka	72.67	133.17	60.50	42.50	12475.00	9.57	60.23	16.35	8.13	8.13
Mekelle-3	70.17	125.00	54.83	41.67	9725.00	6.83	56.57	15.98	7.57	6.25
Mekelle-4	74.17	134.83	60.67	44.17	11554.20	8.07	56.27	16.77	9.25	7.22
Shorima	72.33	132.33	60.00	43.33	10291.70	7.48	63.47	16.22	9.20	7.50
Mekelle-1	67.67	131.00	63.33	41.67	9895.80	6.55	59.45	16.00	8.80	7.22
Mekelle-2	70.33	127.50	57.17	45.00	11683.30	7.53	60.25	17.07	8.68	7.58
Ga'ambo	73.00	127.33	54.33	45.00	9820.80	6.97	62.38	15.33	8.15	6.97
Kakaba	64.67	122.17	57.50	45.00	7487.50	5.75	50.93	13.87	7.47	5.98
Danda'a	76.00	143.33	67.33	48.33	8929.20	6.35	63.95	17.17	8.62	6.53
Gassay	72.17	135.67	63.50	45.83	11958.30	7.58	63.77	17.32	9.10	7.22
Alidoro	78.17	143.33	65.17	45.00	12358.30	8.37	74.70	21.35	10.45	8.12
Digelu	76.17	145.67	69.50	38.33	10883.30	9.12	68.87	16.97	6.85	6.58
Tay	77.50	137.83	60.33	41.67	10570.80	7.67	66.93	18.77	9.45	7.27
Sofumar	70.83	127.17	56.33	45.83	7945.80	6.40	61.65	16.97	8.52	6.97
Mada-Wolabu	73.83	137.33	63.50	51.67	8754.20	6.62	61.02	16.52	9.75	7.10
Pavon-76	69.17	129.50	60.33	43.33	10137.50	7.07	61.43	15.47	7.88	6.85
Jefferson	66.50	123.00	56.50	42.50	8237.50	6.00	55.53	16.10	7.60	6.53
King Bird	70.50	131.00	60.50	34.17	8523.30	7.20	57.62	16.03	8.18	6.65
Mean	72.37	132.25	59.87	43.77	10101.6	7.4	61.33	16.5	8.52	7.15
CV %	3.86	3.14	7.55	6.33	12.43	13.69	5.77	5.88	7.08	12.36
LSD 0.01	4.23	6.29	6.85	4.20	1903.7	1.53	5.36	1.47	0.91	1.34
0.05	3.19	4.75	5.17	3.17	1438.1	1.16	4.05	1.12	0.69	1.10

Where: DTH= Days to heading, DTM= Days to maturity, GFP= Grain filling period, TKW= Thousand kernel weight, AGB= Above ground biomass, TPP= Tillers per plant, PHT= Plant height, SKPS= Spikelet per spike, SL= Spike length, SPP= Spike per plant, CV=Coefficient of variation and and LSD=Least Significant Difference

IV. Conclusions

This study generally indicated that there is an opportunity in selection of superior varieties among advanced bread wheat genotypes through direct selection at the study locations as short term strategy rather than a lengthy crossing program. Genotypes, Hoggana, Hulluka, Alidoro, Mekelle 2 and Mekelle 4 at Fereziye and Hoggana, Alidoro, Gassay, Mekelle 2, Mekelle 4, Ogolcho and Millan at Kotergedra are well performed genotypes. From these genotypes Hoggana can be used for wheat production and seed system program at both locations.

Abbreviation

CSA	Central Statistical Agency
RCBD	Randomized Complete Block Design
SAS	Statistical Analysis System
SNNP	South Nation, Nationality and People

V. Acknowledgement

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