IPJPSAR-22-15027

Estimation of Genetic Variability, Quality and Agronomic Contributing Traits of Durum Wheat (*Triticum Turgidum* L) Landraces in Bale Highlands, Ethiopia

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Received date: November 25, 2022, Manuscript No. IPJPSAR-22-15027; **Editor assigned date:** November 29, 2022, PreQC No. IPJPSAR-22-15027 (PQ); **Reviewed date:** December 14, 2022, QC No. IPJPSAR-22-15027; **Revised date:** February 20, 2023, Manuscript No. IPJPSAR-22-15027 (R); **Published date:** February 28, 2023, DOI: 10.36648/IPJPSAR.7.2.98
Citation: Ebsa MA, Tesso B, Dhugo TL (2023) Estimation of Genetic Variability, Quality and Agronomic Contributing Traits of Durum Wheat (*Triticum Turgidum* L) Landraces in Bale Highlands, Ethiopia. J Plant Sci Agri Res Vol:7 No:2

Supplementary data

Appendix 1: Performance mean values of yield and yield components of 49 durum wheat accessions studied at Sinana 2018/19.

S/N	Accession	DH	DM	PLH	GFP	BM	GY	HI	SPL	KPS	SPS	PTL
1	Acc 5152	61.0 b-e	113.0 f-i	112.1 c-j	52.0 f-j	10350.0 i-p	4469.4 f-k	43.2 a-d	7.4 b-j	28.1 e-i	15.6 c-f	2.8 def
2	Acc 5373	63.5 bcd	113.5 e-i	97.4 g-m	50.0 hij	12700.0 e-n	4444.1 f-k	36.4 a-h	7.2 c-j	32.4 d-i	15.9 c-f	1.4 fg
3	Acc 243733	60.5 b-e	114.5 e-i	112.8 bcd	54.0 d-j	11700.0 f-p	4614.9 d-i	39.5 a-g	6.6 e-k	36.0 c-g	17.2 b-e	2.8 cde
4	Acc 242791	65.5 bc	115.0 e-i	107.8 c-j	49.5 hij	17050.0 a-e	5448.8 a-d	31.9 c-h	5.8 h-k	40.0 a-d	18.4 a-d	2.9 def
5	Acc 5457	61.0 b-e	118.5 b-i	108.1 c-j	57.5 a-i	11200.0 g-p	4517.5 f-i	40.9 a-g	6.7 e-k	34.0 d-h	16.9 b-e	2.7 def
6	Acc 242787	60.0 cde	117.0 c-i	106.2 c-j	57.0 a-j	16700.0 a-f	4424.8 f-k	27.7 gh	5.6 ijk	33.6 d-i	15.2 e-f	2.8 cde

7	Acc 5344	65.0 bc	117.0 c-i	90.0 lmn	52.0 f-j	11200.0 g-p	4370.4 f-k	39.1 a-g	7.3 c-j	29.4 d-i	12.5 fg	3.0 cde
8	Acc 7576	65.0 bc	122.0 b-e	105.7 b-h	57.0 a-j	14950.0 c-j	4385.1 f-k	31.2 d-h	7.6 b-j	26.9f -i	16.3 b-e	3.4 cde
9	Acc 7010	86.5 a	138.5 a	135.3 a	52.0 f-j	8850.0 l-p	2191.7 n	24.7 h	12.0 a	26.5f -i	16.4 c-f	3.0 cde
10	Acc 5760	61.0 b-e	119.0 b-i	104.3 c-j	58.0 a-i	10250.0 i-p	4399.6 f-k	42.9 a-e	7.4 b-j	23.0i	15.6 c-f	2.6 def
11	Acc 7580	65.5 bc	117.0 c-i	99.8 g-m	51.5 f-j	19000.0 a-c	5774.1 ab	30.5 d-h	7.6 b-j	36.5 b-f	20.0 ab	5.0 a
12	Dire	63.5 bcd	124.5 bcd	88.0 lmn	61.0 a-f	20850.0 a	6023.7 a	28.9 f-h	5.8 hik	47.0 a	22.0 a	4.3 ab
13	Acc 243701	64.0 bcd	116.5 d-i	103.9 c-j	52.5 f-j	10950.0 g-p	4962.6 b-g	45.5 ab	8.3 b-f	33.4 d-i	16.8 b-e	3.1 cde
14	Acc 5472	61.5 b-e	124.5 bcd	116.4 b-e	63.0 a-d	10075.0 i-p	4041.6 h-j	40.1 a-g	7.7 b-i	35.0 c-h	16.1 c-f	3.1 bcd
15	Acc 230678	56.0 e	121.5 b-f	98.5 e-m	65.5 ab	7750.0 n-p	3151.4 lm	40.7 a-d	7.7 b-i	26.3 f-i	15.1 c-f	3.1 cde
16	Bulala	57.5 e	118.0 b-i	87.6 mn	60.5 a-g	11350.0 g-p	4511.5 f-i	39.8 a-g	6.3 f-k	40.0 a-d	16.5 b-e	2.2 def
17	Acc 6988	65.5 bc	116.0 d-i	70.5 b	50.5 hij	14950.0 c-j	4576.7 e-i	34.0 b-h	8.0 b-g	30.6 d-i	16.8 b-e	3.4 bcd
18	Acc 5473	64.5 bcd	119.5 b-i	110.5 cj	55.0 d-j	11700.0 f-p	4094.9 g-j	35.8 b-g	7.5 b-j	29.3 d-i	16.6 b-e	3.0 cde
19	Acc 5149	61.0 b-e	118.0 b-i	98.0 h-n	57.0 a-j	13700.0 d-l	4364.9 f-k	34.4 b-h	6.7 e-k	23.0 i	16.3 c-f	2.3 efg
20	Acc 222393	63.5 bcd	113.5 e-i	102.6 c-j	50.0 hij	15250.0 b-i	4741.0 c-g	31.0 d-h	8.2 b-f	36.7 b-f	17.2 b-e	2.1 efg
21	Acc 7295	60.5 b-e	111.5 hi	99.5 k-n	51.0 g-j	10600.0 h-p	4266.1 f-k	40.4 a-g	6.9 d-k	26.0 f-i	11.0 g	3.1 cde
22	Acc 6978	63.5 bcd	115.0 e-i	110.0 b-e	51.5 f-j	13350.0 d-m	4645.3 d-i	34.7 b-h	7.3 c-j	29.6 d-i	15.9 c-f	3.3 bcd
23	Acc 8072	62.5 b-e	115.5 e-i	110.8 bcd	53.0 e-j	14700.0 c-k	4353.5 f-k	32.3 b-h	6.9 d-k	25.5 g-i	16.0 c-f	2.6 def
24	Acc 5020	63.0 b-e	114.5 e-i	103.0 c-j	51.5 f-j	16050.0 a-g	5395.1 a-e	33.7 b-h	8.6 b-e	40.0 a-d	18.5 abc	2.6 def
25	Acc 5342	63.0 b-e	117.0 c-i	96.6lmn	54.0 d-j	9750.0 j-p	4295.8 f-k	43.8 a-d	7.9 b-h	26.1 f-i	13.5 efg	3.1 cde
26	Acc 5586	61.5 b-e	114.0 e-i	113.7 bc	52.5 f-j	9650.0 k-p	3898.0 h-l	40.4 a-g	6.3 f-k	32.0 d-i	19.1 abc	2.3 def

27	Acc 5428	62.5 b-e	112.0 g-i	112.7 b-i	49.5 h-j	12200.0 e-o	4045.9 h-j	34.1 b-h	6.5 e-k	26.3 f-i	16.9 b-e	3.1 cde
28	Acc 6933	62.5 b-e	118.5 b-i	105.3 c-j	56.0 b-j	10750.0 h-p	3908.5 h-l	36.3 b-g	8.3 b-f	38.0 a-e	17.5 bcd	4.2 abc
29	Obsa	60.0 cde	126.0 b	83.0 n	66.0 a	16900.0 a-e	5624.4 ab	33.2 b-h	5.9 g-k	45.1 a-c	18.0 bc	4.5 ab
30	Acc 242780	63.0 b-e	125.5 bc	96.1 g-n	62.5 a-e	17900.0 a-d	4500.1 f-j	25.1 gh	8.0 b-g	46.5 ab	17.5 bcd	2.9 cde
31	Acc 2211	62.0 b-e	113.5 e-i	107.8 c-j	51.5 f-j	13200.0d-m	4483.6 f-k	35.0 b-h	8.9 bcd	29.9 d-i	16.6 b-e	4.0 abc
32	Acc 226897	64.5 bcd	118.5 b-i	93.3 i-m	54.0 d-j	10100.0 i-p	3919.7 h-l	38.8 a-g	6.6 e-k	23.0 i	15.7 c-f	2.5 def
33	Acc 5141	62.0 b-e	111.0 i	105.3 d-l	49.0 ij	8350.0 m-p	2921.3 m	35.8 b-g	5.8 h-k	35.0 c-h	16.3 b-e	2.6 def
34	Acc 7665	62.5 b-e	118.5 b-i	90.0 k-n	56.0 b-j	18000.0 a-d	4995.1b-f	27.7 gh	6.5 e-k	30.2 d-i	16.1 c-f	2.6 def
35	Acc 5354	62.5 b-e	112.0 ghi	101.3 c-j	49.5 h-j	10150.0 i-p	4251.5 f-k	41.8 a-f	5.5 jk	30.5 d-i	15.6 c-f	2.5 def
36	Acc 7673	63.0 b-e	114.5 e-i	102.4 c-j	51.5 f-j	6750.0 p	3038.3 m	45.0 abc	8.3 b-f	35.3 c-f	18.1 abc	2.9 cde
37	Acc 5198	59.0 cde	116.0 d-i	111.2 b-e	57.0 a-j	13950.0 c-l	4009.6 hij	28.8 fgh	7.6 b-j	29.6 d-i	16.0 c-f	2.3 efg
38	Acc 243706	64.0 bcd	120.0 b-h	117.8 b	56.0 b-j	13700.0 d-l	4705.7 c-i	35.7 b-g	9.5 b	29.0 e-i	16.6 b-e	2.9 cde
39	Acc 5510	62.5 b-e	112.0 g-i	112.5 b-c	49.5 h ij	10450.0 h-p	4552.4 e-i	43.7 a-d	9.0 bcd	30.7 d-i	18.2 bcd	3.3 cde
40	Acc 242783	61.5 b-e	115.0 f-i	107.5 c-j	53.5 d-j	20050.0 ab	5914.3 a	29.5 e-h	8.4 b-f	38.5 a-e	20.0 ab	4.5 ab
41	Acc 242782	67.5 b	115.0 f-i	118.7 b	47.5 j	10700.0h-p	3892.5 h-l	36.3 b-h	9.2 bc	28.8 e-i	15.6 c-f	3.2 bcd
42	Acc 226694	63.0 b-e	118.5 b-i	112.0 b-g	55.5 c-j	7250.0 op	3628.3 j-m	49.8 a	7.0 d-k	30.9 d-i	15.8 c-f	3.2 cde
43	Acc 235051	62.0 b-e	126.0 b	109.8 b-j	64.0 abc	15650.0 c-h	5510.7 abc	35.2 b-h	7.2 c-j	35.5 c-h	18.0 bcd	3.8 abc
44	Acc 7210	62.5 b-e	116.0 d-i	101.2 d-k	53.5 d-j	10500.0 h-p	3855.2 i-l	36.7 a-h	6.7 e-k	29.2 d-i	15.4 c-f	2.1 efg

45	Acc 7647	61.5 b-e	120.5 b-g	114.5 bc	59.0 a-h	14000.0 c-l	4573.5 e-i	32.5 b-h	7.0 d-k	38.7 a-e	15.9 c-f	1.5 fg
46	Acc 6974	63.0 b-e	117.0 c-i	110.5 b-i	54.0 d-j	14850.0 c-k	4970.6 b-f	33.4 b-h	7.5 b-j	33.3 d-i	15.6 c-f	3.1 cde
47	Acc 5591	62.0 b-e	113.0 f-i	110.3 b-f	51.0 g-j	9800.0 k-p	3624.5 klm	37.0 a-h	7.7 b-i	24.7 i	15.4 c-f	2.3 def
48	Acc 242790	62.5 b-e	115.5 f-i	99.8 f-m	53.0 e-j	10400.0 i-p	3018.1 m	29.0 fgh	5.0 k	32.2 d-i	16.1 c-f	1.0 g
49	Acc 243703	61.0 b-e	114.0 e-i	97.1 mn	53.0 e-j	12700.0 e-n	4351.8 f-k	35.5 c-h	7.7 b-i	34.4 e-h	16.9 b-e	3.3 bcd
Mean		62.89	117.41	104.27	54.51	12712.8	4380.82	35.9	7.37	32.29	16.56	2.95
LSD (5%)		5.97	7.01	26.49	8.12	4252.95	768.33	10.99	1.86	8.56	3.05	1.06

Where: DH: Days to Heading; DM: Days to Mature; PLH: Plant Height; GFP: Grain Filling Period; BM: Biological Yield; GY: Grain Yield; HI: Harvest Index; SPL: Spike Length; SPS: Number of Spike Per Spike; KPS: Number of Kernel Per Spike; PTL: Productive Tiller; CV: Coefficient of Variation; LSD: Least Significance Difference

Appendix 2: Performance mean values of quality traits of 49 durum wheat accessions studied at Sinana 2018/19.

S/N	Accession	TKW	HLW	VTR	GPC	GGL	ZI	WGL	ASC	SDS
1	Acc 5152	54.4 a	78.6e-n	62.0ab	9.9j	29.6ijk	43.6j	33.6a-e	0.8gh	37.5hij
2	Acc 5373	36.4 i-l	80.8c-f	94.8a	14.1c-g	32.8e-j	63.9b-i	35.2abc	1.2a-f	47.5c-h
3	Acc 243733	44.0 c-g	78.6e-n	92.7a	14.0c-g	34.0e-j	68.3a-h	34.6abc	1.0d-g	47.5c-h
4	Acc 242791	38.3 f-l	70.0o	97.9a	13.0e-i	33.2e-j	65.8b-i	30.2cde	1.3a-e	52.5c-e
5	Acc 5457	35.4 jkl	75.4n	78.5ab	13.2d-i	30.9g-j	56.5hi	30.7a-e	1.1a-g	37.5hij
6	Acc 242787	38.4 f-l	77.8f-n	93.5a	10.0j	24.9k	53.0ij	31.9a-e	1.2a-g	47.5c-h
7	Acc 5344	39.4 e-j	80.2cde	97.4a	14.1c-g	32.8e-j	65.9b-i	33.4a-e	1.5ab	47.5c-h
8	Acc 7576	36.2 i-l	78.0f-n	90.6a	14.2c-g	32.4e-j	63.3c-i	33.4a-e	1.5a	47.5c-h
9	Acc 7010	39.5 e-l	81.6b-e	88.9a	17.2a	44.5a	80.7a	28.6e	1.5ab	67.5a

10	Acc 5760	43.9 c-g	79.2 e-l	96.5 a	13.7 efg	35.8 b-g	63.4 b-i	32.9 a-e	1.1 a-g	52.5 cde
11	Acc 7580	36.9 h-l	80.0 c-j	92.7 a	14.6 a-g	33.3 e-j	67.5 a-h	32.1 a-e	1.4 abc	48.0 c-h
12	Dire	43.5 d-h	86.4 a	98.9 a	13.4 d-i	31.1 g-j	70.1 a-g	32.4 a-e	1.0 d-g	63.0 ab
13	Acc 243701	33.5 l	75.8 lmn	96.9 a	14.0 c-g	32.2 e-j	62.4 c-i	30.3 b-e	1.3 a-e	55.0 bcd
14	Acc 5472	40.6 e-j	77.2 g-n	89.5 a	14.6a-g	34.5 d-j	69.9 a-h	28.8 de	1.5 a	52.5 cde
15	Acc 230678	42.0 d-j	80.8c-f	81.5 ab	14.1 c-g	35.2 b-h	62.2 c-i	33.0 a-e	0.7 h	52.5 cde
16	Bulala	51.1 ab	83.4 abc	96.7 a	12.9 e-i	30.5 g-j	66.4 b-i	30.4 b-e	1.2 a-g	47.5 c-h
17	Acc 6988	44.9 b-f	80.8 c-f	92.9 a	14.0 c-g	33.1 e-j	67.8 a-h	23.8 f	0.9 e-h	45.0 d-i
18	Acc 5473	37.8 g-l	77.0 h-n	95.0 a	15.1 a-f	35.5 b-h	66.7 a-h	35.5 ab	1.2 a-f	47.5 c-h
19	Acc 5149	41.9 d-j	81.6 b-e	90.8 a	13.8 c-h	32.1 e-j	63.5 b-i	33.3 a-e	1.3 a-f	39.0 f-j
20	Acc 222393	36.9 h-l	80.2 c-i	94.8 a	17.0 ab	39.9 a-d	76.2a bc	34.5 abc	1.3 a-e	57.5 bc
21	Acc 7295	41.6 d-j	78.9 e-m	91.8 a	14.2 c-g	37.1b-f	68.1 a-h	32.8 a-e	1.3 a-e	37.5 h-j
22	Acc 6978	42.7 d-i	78.4 e-n	82.3 ab	12.7 f-i	34.4 d-j	68.6 a-h	33.3 a-e	0.9 e-h	37.5 h-j
23	Acc 8072	47.6 bcd	79.6 d-k	91.9	15.4 a-f	35.0 c-j	71.4 a-g	35.4 abc	1.3 a-e	36.0 ij
24	Acc 5020	39.4 e-l	79.9 d-j	95.7 a	14.2 c-g	35.5 b-h	62.4 e-i	35.8 a	0.9 fgh	42.5 e-j
25	Acc 5342	39.4 e-l	80.6 c-g	96.1 a	14.0 c-g	36.5 b-f	68.8 a-h	35.8 a	1.1 a-g	38.0 h-j
26	Acc 5586	36.3 i-l	79.0 e-m	94.4 a	13.6d-i	31.5 e-j	65.0 b-i	34.0 abc	1.4 abc	40.0 f-j
27	Acc 5428	33.9 kl	76.3 k-n	97.9 a	14.7 a-g	34.4 l-s	72.9 a-e	32.7 a-e	1.4 ab	53.0 cde
28	Acc 6933	37.6 g-l	76.7 i-n	93.8 a	15.7 a-d	41.1	74.9 a-d	32.8 a-e	1.0 c-h	37.5 hij
29	Obsa	50.1 abc	84.7 ab	98.3 a	11.0 ij	29.8 ik	68.2 a-h	32.1 a-e	1.1 b-g	47.5 c-h
30	Acc 242780	45.4 bcd	83.0 bc	98.9 a	14.0 c-g	33.8 e-j	73.5 a-e	32.7 a-e	1.5 a	33.5 j
31	Acc	35.5	79.2 e-	94.8 a	16.5	40.5	77.0	34.8	1.1 c-	34.0 j

	2211	jkl	l		abc	abc	ab	abc	g	
32	Acc 226897	36.5 i-l	78.2 e-n	97.0 a	14.1 c-g	32.9 e-j	63.8 b-i	33.4 a-e	1.2 a-g	57.5 bc
33	Acc 5141	37.5 g-l	79.0 e-m	95.1 a	13.5 d-i	30.0 h-k	64.1 b-i	34.8 abc	1.3 abc	45.0 d-i
34	Acc 7665	38.3 f-l	80.8 c-f	88.4 a	13.7 d-h	32.4 e-j	63.5 b-i	35.9 a	1.1 c-g	38.5 f-j
35	Acc 5354	37.7 g-l	78.8 e-n	91.2 a	12.0 g-j	28.6 jk	60.2 e-i	33.1 a-e	1.4 ab	42.5 e-j
36	Acc 7673	36.0 i-l	76.5 j-n	88.2 a	13.2 d-i	33.5 e-j	63.3 b-i	35.5 ab	1.2 a-g	32.5 j
37	Acc 5198	40.7 e-j	80.8 c-f	98.6 a	14.8 a-f	37.4 b-e	67.2 a-h	34.6 abc	0.7 h	42.5 e-j
38	Acc 243706	39.1 e-l	79.8 d-k	98.1 a	13.1 d-i	31.4 f-j	62.2 c-i	31.7 a-e	1.0 c-h	38.0 g-j
39	Acc 5510	44.1 c-g	80.6 c-g	93.5 a	13.6 d-i	32.9 e-j	66.3 a-i	34.5 abc	0.9 e-h	47.5 c-h
40	Acc 242783	41.0 d-j	79.6 d-k	3.0 d	15.2 a-f	34.5 c-i	60.0 e-i	32.1 a-e	0.9 gh	46.5d-i
41	Acc 242782	42.8 d-i	80.6 c-g	49.8 c	15.5 a-e	34.3 e-j	59.0 f-i	34.1 abc	1.2 a-g	49.0 c-f
42	Acc 226694	39.3 e-l	80.6 c-g	87.1 a	12.7 f-i	32.0 e-j	61.0 e-i	34.3 abc	1.3 a-e	54.0 bcd
43	Acc 235051	41.6 d-j	77.8 f-n	95.4 a	14.9 a-f	36.8 b-f	72.7 a-e	34.8 abc	1.2 a-g	46.5 d-i
44	Acc 7210	37.7 g-l	78.7 e-n	90.4 a	15.1 a-f	35.5 b-f	72.5 a-f	32.3 a-e	1.4 a-d	52.5 cde
45	Acc 7647	40.0 e-l	75.5 mn	87.9 a	11.1 h-j	29.5 ijk	58.6 ghi	33.9 a-d	1.0 d-h	48.5 c-g
46	Acc 6974	38.4 f-l	80.0 c-j	94.4 a	14.0 c-g	33.0 e-j	62.1 d-i	34.4 abc	1.4 abc	38.5 f-j
47	Acc 5591	40.3 e-l	80.4 c-h	6.6 d	14.3 b-j	34.7 d-j	61.2 e-i	34.7 abc	1.3 a-e	46.5 d-i
48	Acc 242790	42.4 d-i	77.0 h-n	92.2 a	13.7 d-h	31.1 g-j	62.0 d-i	34.3 abc	1.1 c-h	47.5 c-h
49	Acc 243703	37.4 g-l	79.0 e-m	86.3 a	14.0 c-g	32.0 e-j	64.2 b-i	35.1 abc	1.3 a-d	42.5 e-j
Mean		40.33	79.25	87.79	13.93	33.7	65.57	33.18	1.18	45.83
LSD (5%)		6.07	2.87	21.11	2.23	5.01	11.2	4.27	0.33	8.76

Where: TKW: Thousand Kernel Weight; HLW: Hecto Liter Weight; VTR: Vitreousness; PC: Grain Protein Content; ZI: Zeleny Index; GGL: Grain Gluten; WGL: Wet Gluten; ASC: Ash Content and SDS: Sodium Dodecyl Sulphate; CV: Coefficient of Variation; LSD: Least Significance Difference

Appendix 3: Performance mean values of yield and yield components of 49 durum wheat accessions studied at Selka 2018/19.

S/N	Accession	DH	DM	PLH	GFP	BM	GY	HI	SPL	SPS	KPS	PTL
1	Acc 5152	64.0 b-g	119.8 b-i	118.9 bcd	55.8 b-j	10200.0 def	3954.1 b-h	38.7 a-d	7.9 b-h	15.8 d-h	28.1 c-k	2.7 bcd
2	Acc 5373	66.5 b-f	116.1 f-i	103.9 d-g	49.6 h-l	12200.0 b-f	3928.8 c-h	32.2 b-h	7.9 b-h	14.0 fgh	27.4 d-k	2.6 bcd
3	Acc 243733	65.5 b-g	121.5 b-h	115.5 bcd	56.0 b-i	14700.0 b-e	4097.2 b-g	28.0 c-h	7.9 b-h	15.1 e-h	27.0 e-k	2.7 cee
4	Acc 242791	66.0 b-f	115.1 hi	117.6 bcd	49.1 i-l	13200.0 b-f	4988.0 a-d	38.0 a-e	5.5 nop	18.7 bcd	38.9 ab	2.9 cee
5	Acc 5457	66.0 b-f	119.5 b-i	114.2 bde	53.5 d-l	14200.0 b-e	4002.5 b-h	28.6 c-h	6.9 f-n	13.0 h	31.9 b-k	2.7 cde
6	Acc 242787	67.0 b-e	118.8 c-i	115.6 bcd	51.8 f-l	15200.0 a-d	3908.6 d-h	26.8 e-h	6.2 h-p	16.6 d-h	26.8 e-k	2.6 bcd
7	Acc 5344	68.5 bc	116.6 e-i	104.7 d-g	48.1 kl	14200.0 b-e	3855.7 d-h	27.4 c-h	7.3 d-l	15.5 d-h	24.9 h-k	2.4 cde
8	Acc 7576	68.5 bc	118.1 c-i	115.5 bcd	49.6 h-l	15700.0 abc	3869.7 d-h	26.2 f-h	7.8 b-i	16.0 d-h	24.7 i-k	1.0 f
9	Acc 7010	84.5 a	136.0 a	142.8 a	51.5 f-l	20200.0 a	2191.3 k	10.8 i	7.5 c-k	15.2 d-h	24.1 jk	2.6 bcd
10	Acc 5760	65.0 b-g	123.5 bcd	104.2 d-g	58.5 a-f	10700.0 c-f	3883.3 d-h	36.3 a-f	7.4 c-l	17.3 c-f	30.7 b-k	3.1 bcd
11	Acc 7580	67.5 bcd	122.5 b-f	108.4 b-f	55.0 b-k	12200.0 b-f	5063.5 abc	42.3 ab	7.1 e-n	24.5 a	26.9 e-k	2.4 c-e
12	Dire	63.0 d-g	122.6 b-f	90.4 hi	59.6 a-e	15700.0 abc	5107.9 ab	35.6 a-g	5.4 p	21.0 bc	46.5 a	4.0 ab
13	Acc 243701	68.5 bc	115.6 ghi	110.6 b-e	47.1 l	14200.0 b-e	4446.1 a-e	31.4 b-h	9.3 ab	18.8 bdd	33.7 b-j	3.0 bcd
14	Acc 5472	66.0 b-f	120.5 b-i	114.4 b-e	54.5 c-k	13700.0 b-f	3525.2 e-j	26.1 fgh	6.1 i-p	16.4 d-h	26.6 g-k	1.4 ef
15	Acc 230678	61.5 fg	123.8 bcd	106.5 c-g	62.3 ab	12700.0 b-f	2924.5 h-k	23.4 h	7.9 b-h	15.5 d-h	26.2 g-k	2.5 c-e
16	Bulala	60.5 g	124.0 bc	92.7 fg	63.5 a	10700.0 c-f	3745.5 e-i	34.7 b-h	5.9 k-p	13.5 gh	36.9 bcd	2.3 def
17	Acc 6988	69.0 b	121.6 b-h	115.0 b-e	52.6 e-l	15700.0 abc	4061.0 b-h	26.8 e-h	7.3 d-l	16.2 d-h	34.2 b-i	3.1 bcd

18	Acc 5473	63.0 d-g	118.0 c-i	114.4 b-e	55.0 b-k	9700.0 ef	3578.2 e-i	38.7 a-d	7.3 d-l	16.5 d-h	34.6 b-h	2.3 def
19	Acc 5149	65.0 b-g	115.6 ghi	105.0 d-g	50.6 h-l	13700.0 b-f	3848.4 d-h	28.5 c-h	9.1 abc	19.0 bcd	30.9 b-k	2.6 cde
20	Acc 222393	65.0 b-g	121.5 b-h	111.4 b-e	56.5 a-h	16700.0 ab	4226.1 a-f	26.0 fgh	7.7 b-j	16.8 d-g	32.3 b-k	2.6 cde
21	Acc 7295	64.0 b-g	118.1 c-i	107.6 b-g	54.1 c-l	12200.0 b-f	3748.7 e-i	31.1 b-h	7.6 b-k	17.6 c-f	31.5 b-k	2.6 cde
22	Acc 6978	63.5 c-g	117.1 d-i	114.7 b-e	53.6 d-l	14700.0 b-e	4017.0 b-h	27.3 d-h	7.0 e-n	16.2 d-h	28.6 c-k	2.2 def
23	Acc 8072	61.5 fg	122.1 b-g	113.4 b-e	60.6 a-d	15200.0 abc	3838.4 d-i	26.0 fgh	6.5 g-p	17.2 d-g	26.5 g-k	2.1 def
24	Acc 5020	62.0 e-g	118.0 c-i	113.8 b-e	56.0 b-i	14700.0 b-e	4160.0 b-g	28.5 c-h	7.6 b-k	17.2 d-g	32.3 b-k	2.6 cde
25	Acc 5342	67.5 b-d	119.1 b-i	109.4 e-b	51.6 f-l	13200.0 b-f	3634.1 e-i	29.2 c-h	8.7 a-e	19.0 bcd	31.2 b-k	2.7 bcd
26	Acc 5586	67.0 b-e	122.1 b-g	114.1 b-e	55.1 b-k	12700.0b-f	3249.7 f-j	25.5 fgh	5.5 n-p	17.3 c-f	32.1 b-k	2.4 def
27	Acc 5428	66.5 b-f	125.0 b	119.8 bcd	58.5 a-f	13700.0 b-f	3528.7 e-j	26.1 fgh	5.9 k-p	16.6 d-h	29.9 b-k	2.7 cde
28	Acc 6933	61.5 fg	115.8 g-i	107.9 b-f	54.3 c-l	13200.0 b-f	3392.7 e-j	26.2 fbh	6.9 f-n	15.1 e-h	26.7 g-k	2.4 cde
29	Obsa	60.5 g	122.8 b-f	76.1 j	62.3 ab	11200.0 c-f	5309.0 a	47.4 a	5.6 m-p	21.5 ab	37.5 bc	5.0 a
30	Acc 242780	63.0 d-g	122.5 b-f	78.4 ij	59.5 a-e	10200.0 d-f	3985.1 d-h	39.0 abc	8.2 a-g	16.0 d-h	36.4 b-e	2.4 cde
31	Acc 2211	66.0 b-f	117.8 c-i	109.1 b-e	51.8 f-l	13700.0 b-f	3966.9 d-h	28.9 c-h	8.7 a-e	19.0 bcd	36.9 bcd	2.9 bcd
32	Acc 226897	67.0 be	114.1 i	91.3 ghi	47.1 l	13700.0 b-f	3402.8 e-j	25.0 fgh	8.0 a-g	17.1 d-g	28.3 c-k	2.6 cde
33	Acc 5141	67.5 bcd	108.1 j	107.6 b-g	40.6 m	8700.0 f	2397.7 jk	28.2 c-h	5.1 p	16.2 d-g	29.3 b-k	3.3 bc
34	Acc 7665	64.5 b-g	118.1 c-i	107.9 b-f	53.6 d-l	15700.0 abc	4479.6 a-e	28.5 c-h	7.7 b-j	16.9 d-g	28.8 c-k	2.5 cde
35	Acc 5354	65.5 b-g	117.1 d-i	113.0 b-e	51.6 f-l	11200.0 c-f	3579.0 e-i	32.9 b-h	6.0 j-p	15.9 d-h	30.1 b-k	3.5 bc
36	Acc 7673	64.0 b-g	118.6 c-i	111.1 b-e	54.6 c-k	11700.0 b-f	3002.4 g-j	25.7 fgh	7.7 b-j	16.7 d-h	30.1 b-k	1.2 f
37	Acc 5198	63.0 d-g	124.1 bc	117.6 bcd	61.1 abc	11950.0 b-f	3434.6 e-j	28.8 c-h	8.3 a-f	15.7 d-h	23.0 k	2.5 cde

38	Acc 243706	64.5 b-g	117.1 d-i	122.4 bc	52.6 e-l	15200.0 a-d	4189.7 a-f	27.5 c-h	9.0 a-d	17.0 d-g	28.4 b-k	2.8 cde
39	Acc 5510	62.5 d-g	116.1 f-i	123.6 b	53.6 d-l	12200.0 b-f	4035.7 b-h	33.0 b-h	8.3 a-f	19.0 bcd	26.8 g-k	3.0 bcd
40	Acc 242783	62.0 efg	120.1 b-i	116.8 bcd	58.1 a-g	15200.0 a-d	4301.4 a-f	28.0 c-h	9.6 a	17.3 c-f	36.0 b-e	4.0 ab
41	Acc 242782	62.5 d-g	116.5 e-i	118.0 bcd	54.0 c-l	11200.0 c-f	3381.3 e-j	30.1 c-h	9.1 abc	16.5 d-h	29.8 b-k	2.4 cde
42	Acc 226694	63.5 c-g	117.1 d-i	112.1 b-e	53.6 d-l	12700.0 b-f	3613.8 e-i	29.2 c-h	7.0 e-n	17.2 d-g	35.2 b-g	2.4 cde
43	Acc 235051	63.0 d-g	123.3 b-e	115.6 bcd	60.3 a-d	13200.0 b-f	5093.8 ab	38.6 a-d	7.3 d-l	17.3 d-g	27.9 c-k	2.9 bcd
44	Acc 7210	67.0 b-e	119.1 b-i	108.1 b-f	52.1 f-l	13200.0 b-f	3339.0 e-j	26.0 fgh	5.8 l-p	15.0 e-h	25.2 h-k	2.8 bcd
45	Acc 7647	67.0 be	118.1 c-i	110.2 b-e	51.1 g-l	16700.0 ab	4056.6 b-h	24.2 gh	6.2 h-p	18.6 b-e	36.0 b-e	2.5 cde
46	Acc 6974	63.0 d-g	118.1 c-i	98.8 efg	55.1 b-k	15200.0 a-d	4456.4 a-e	30.3 c-h	7.6 b-k	17.0 d-g	34.9 b-h	2.1 def
47	Acc 5591	67.5 bcd	116.3 f-i	103.6 d-g	48.8 j-k	10700.0 c-f	3361.7 e-j	31.4 b-h	7.2 e-m	17.4 c-f	25.5 g-k	2.3 f
48	Acc 242790	65.5 b-g	120.1 b-i	110.1 b-e	54.6 c-k	10700.0 c-f	2690.3 ijk	24.9 fgh	5.0 p	17.4 c-f	35.2 b-g	2.8 c-e
49	Acc 243703	65.5 b-g	114.3 i	104.5 d-g	48.8 jk	13200.0 b-f	3836.9 d-i	29.2 c-h	7.6 b-k	16.2 d-h	28.5 b-k	2.5 def
Mean		65.28	119.37	109.77	54.1	13317.35	3850.83	29.91	7.27	16.99	30.65	2.64
LSD (5%)		4.44	5.29	13.4	6.41	4486.37	945.96	9.54	1.39	3.12	7.79	1.06

Where: DH: Days to Heading; DM: Days to Mature; PLH: Plant Height; GFP: Grain Filling Period; BM: Biological Yield; GY: Grain Yield; HI: Harvest Index; SPL: Spike Length; SPS: Number of Spike Per Spike; KPS: Number of Kernel Per Spike; PTL: Productive Tiller; CV: Coefficient of Variation; LSD: Least Significance Difference

Appendix 4: Performance mean values of quality traits of 49 durum wheat accessions studied at Selka 2018/19.

S/	Accessio	TKW	HLW	VTR	GPC	ZI	GGL	WGL	ASC	SDS

N	n									
1	Acc 5152	50.3 a	77.4 f-m	62.6 de	12.3 c-g	46.5 j-n	31.1 f-l	34.2 a-g	0.7 ijk	43.5 c-g
2	Acc 5373	34.7 m-p	80.2 a-j	85.0 abc	12.0 d-g	43.1 mn	31.7 d-k	31.2 c-g	1.1 a-i	44.0 b-g
3	Acc 243733	44.0 b-e	76.5 lm	95.7 ab	14.1 a-f	64.2 b-h	33.6 c-j	35.3 a-e	1.1 a-i	50.0 b-e
4	Acc 242791	39.8 e-l	77.0 h-m	87.6 abc	13.3 b-g	48.2 h-n	32.6 c-k	31.0 d-i	1.1 b-i	51.5 b-e
5	Acc 5457	39.3 e-m	79.0 b-m	69.0 c-e	11.8 efg	40.0 n	31.4 f-l	29.7 f-i	0.8 g-k	46.5 b-f
6	Acc 242787	37.3 h-o	79.4 a-l	88.6 abc	11.5 fg	48.1 h-n	24.5 l	29.5 ghi	1.2 a-g	50.0 b-e
7	Acc 5344	36.0 j-p	75.5 m	84.5 abc	13.4 a-f	51.0 f-n	26.6 kl	19.3 k	1.2 a-g	50.5 b-e
8	Acc 7576	32.3 p	80.2 a-j	82.8 a-d	11.7 efg	40.1 n	26.9 kl	23.3 jk	1.3 a-f	50.0 b-e
9	Acc 7010	35.2 l-p	76.9 i-m	92.6 ab	16.2 a	80.0 a	40.5 ab	34.4 a-g	1.4 ab	70.0 a
10	Acc 5760	40.2 d-k	81.6 a-d	96.3 ab	13.8 a-f	53.1 f-n	35.5 a-h	34.2 a-g	0.9 d-j	60.0 abc
11	Acc 7580	35.2 l-p	79.8 a-l	93.1 ab	12.6 b-g	64.0 b-h	32.0 d-k	29.8 f-i	1.4 ab	47.5 b-e
12	Dire	39.0 f-m	83.0 a	92.5 ab	13.0 b-g	70.1 a-e	34.7 a-i	35.6 a-e	1.1 a-i	59.0 a-d
13	Acc 243701	34.2 nop	78.7 c-m	89.6 abc	11.5 fg	46.2 j-n	26.6 kl	32.0 b-g	1.3 a-f	50.0 b-e
14	Acc 5472	40.8 d-i	76.4 lm	78.1 a-e	12.2 c-g	45.7 k-n	28.8 h-l	20.5 k	1.3 a-f	50.0 b-e
15	Acc 230678	40.2 d-k	81.4 a-d	82.1 a-d	15.1 abc	53.9 e-n	34.3 a-j	33.4 a-g	0.5 jk	45.5 b-g
16	Bulala	47.5 ab	82.8 ab	97.1 a	14.0 a-f	61.5 b-k	35.5 a-h	33.8 a-g	1.5 a	45.5 b-g
17	Acc 6988	46.0 abc	80.4 a-j	94.6 ab	12.7 b-g	62.6 b-j	36.9 a-f	34.7 a-f	0.9 c-j	36.0 efg
18	Acc 5473	36.2 i-p	78.6 c-m	95.8 ab	13.0 b-g	55.2 d-n	34.0 c-j	36.1 a-d	1.2 a-h	51.5 b-e
19	Acc 5149	39.4 e-m	81.0 a-g	90.8 ab	12.6 b-g	56.5 c-m	31.6 f-l	33.4 a-g	1.2 a-h	51.0 b-e
20	Acc 222393	33.8 op	81.2 a-f	93.1 ab	13.4 a-g	60.4 b-k	34.7 a-j	33.3 a-g	1.1 a-h	47.5 b-e
21	Acc 7295	40.0 d-k	77.2 g-m	94.2 ab	15.0 abc	65.5 a-g	40.0 ab	34.1 a-g	1.0 b-i	60.0 abc

22	Acc 6978	41.5 d-h	80.0 a-j	83.2 a-d	14.2 a-f	62.5 b-j	32.5 c-k	36.4 abc	1.1 b-i	42.5 d-g
23	Acc 8072	48.0 ab	77.6 f-m	84.6 abc	14.3 a-f	72.5 abc	38.7 a-d	37.4 a	1.0 b-i	60.0 abc
24	Acc 5020	36.7 h-p	78.8 c-m	85.8 abc	12.9 b-g	53.4 f-n	35.4 a-h	35.1 a-e	0.8 h-k	51.0 b-e
25	Acc 5342	41.3 d-h	82.0 a-d	88.0 abc	13.6 a-f	66.9 a-f	34.2 c-j	36.6 ab	0.9 e-k	44.5 b-g
26	Acc 5586	37.5 h-o	79.6 a-l	86.5 abc	11.4 fg	47.8 h-n	29.3 g-l	33.8 a-g	1.5 ab	51.5 b-e
27	Acc 5428	33.6 op	79.8 a-l	84.2 abc	11.7 efg	49.9 g-n	28.2 i-l	33.4 a-g	1.3 a-d	47.5 b-e
28	Acc 6933	38.7f-n	80.9a-g	96.8a	15.5a b	66.1a-g	40.7a	36.6ab	0.9d-j	47.5b-e
29	Obsa	42.5 c-f	82.8 ab	94.6 ab	12.2 c-g	56.7 c-m	32.9 c-k	33.4 a-g	1.3 a-f	51.5 b-e
30	Acc 242780	46.6 abc	80.6 a-i	95.4 ab	14.0 a-f	73.3 ab	37.3 a-f	35.7 a-e	1.3 a-e	58.5 a-d
31	Acc 2211	37.7 h-o	81.0 a-g	90.0 abc	15.0 abc	71.2 a-d	40.1 ab	34.3 a-g	0.7 h-k	50.5 b-e
32	Acc 226897	33.6 op	78.6 c-m	95.5 ab	12.6 c-g	63.0 b-i	39.0 abc	35.2 a-e	1.3 a-e	47.5 b-e
33	Acc 5141	32.3 p	80.4 a-j	91.3 ab	12.7 b-g	55.3 d-n	30.1 g-l	35.5 a-e	1.4 ab	58.5 a-d
34	Acc 7665	37.4 h-o	78.8 c-m	85.5 abc	13.9 a-f	56.5 c-m	35.7 a-g	31.8 b-g	1.3 a-f	60.5 ab
35	Acc 5354	35.2 l-p	79.6 a-m	97.8 a	11.5 fg	53.9 e-n	31.9 d-k	32.4 a-g	1.4 ab	50.0 b-e
36	Acc 7673	32.2 p	78.4 d-m	90.2 abc	14.6 a-e	58.5 b-k	35.1 a-i	29.7 f-i	1.1 a-i	51.0 b-e
37	Acc 5198	40.6 d-j	81.6 a-d	93.1 ab	14.9 a-d	72.5 abc	37.9 a-d	35.2 a-e	0.5 k	58.0 a-d
38	Acc 243706	37.2 h-o	80.4 a-j	92.9 ab	13.0 b-g	48.5 h-n	31.8 d-k	34.4 a-g	1.2 a-g	42.5 d-g
39	Acc 5510	39.1 f-m	80.8 a-h	90.9 ab	12.7 b-g	65.5 a-g	33.0 c-k	34.9 a-f	0.9 e-k	50.5 b-e
40	Acc 242783	41.3 d-h	81.2 a-f	40.3 f	14.5 a-e	48.2 h-n	33.9 b-j	34.1 a-g	0.8 h-k	60.0 abc
41	Acc 242782	41.4d-h	82.3a-c	60.0e	13.4a-g	58.5b-k	31.4f-l	34.6a-g	1.1a-i	31.0 fg
42	Acc 226694	38.2 f-n	81.4 a-d	75.1 b-e	12.6 b-g	51.0 f-n	32.5 c-k	34.3 a-g	1.1 a-i	47.5 b-e
43	Acc	44.5	79.1 b-	94.2	13.1	66.0	37.9	33.2 a-	1.0	46.5

	235051	bcd	m	ab	a-g	a-g	a-d	g	b-i	b-f
44	Acc 7210	36.0 i-p	79.2 a-m	76.6 a-e	12.5 c-g	54.1 e-n	30.1 g-l	31.4 b-h	1.3 a-e	50.5 b-e
45	Acc 7647	40.2 d-k	75.4 m	81.8 a-d	10.5 g	47.4 i-n	28.3 i-l	26.1 ij	0.9 d-j	47.5 b-e
46	Acc 6974	35.5 k-p	76.7 j-m	90.4 abc	12.9 b-g	59.6 b-k	33.8 b-j	30.8 e-i	1.4 a-d	30.0 g
47	Acc 5591	36.0 j-p	81.0 a-g	35.1 f	14.7 a-e	54.5 e-n	38.5 a-d	34.0 a-g	0.8 f-k	50.0 b-e
48	Acc 242790	42.2 c-f	76.0 lm	77.1 a-e	12.2 c-g	62.5 b-j	31.4 f-l	30.9 e-i	0.9 d-j	50.0 b-e
49	Acc 243703	34.2 n-p	80.40 a-j	77.6 a-e	11.8 e-g	41.7 n	27.7 jkl	26.6 hij	1.2 a-h	42.5 def
Mean		38.85	79.56	85.32	13.17	57.02	33.35	32.61	1.09	49.77
LSD (5%)		3.89	3.15	17.58	2.39	14.16	6	4.25	0.37	13.54
Where: TKW: Thousand Kernel Weight; HLW: Hecto Liter Weight; VTR: Vitreousness; PC: Grain Protein Content; ZI: Zeleny Index; GGL: Grain Gluten; WGL: Wet Gluten; ASC: Ash Content; SDS: Sodium Dodecyl Sulphate; CV: Coefficient of Variation; LSD: Least Significance Difference										

Appendix 5: Performance mean values of yield and yield components of 49 durum wheat accessions over locations 2018/19.

S/N	Accession	DH	DM	PLH	GFP	BM	GY	HI	SPL	SPS	KPS	PTL
1	Acc 5152	63.0 e-i	116.4 i-n	115.5 c-i	53.9 g-n	10275.0 n-q	4211.8 e-l	40.9 a	7.6 e-l	16.0 h-n	28.0 i-o	3.0 efg
2	Acc 5373	65 .0 b-f	114.8 lmn	100.6 l-p	49.8 mno	12450.0 g-o	4186.4 e-m	34.3 a-k	7.5 f-l	15 .0 lmn	30 .0 g-o	2 .0 ghi
3	Acc 243733	63 .0 d-h	118.0 g-n	114.1 b-g	55.0 f-l	13200.0 d-m	4356.1 d-i	33.7 b-l	7.2 g-o	16 .0 g-n	32 .0 f-m	3 .0 e-g
4	Acc 242791	66 .0 b-e	115.0 k-n	112.7 c-i	49.3 no	15125.0 b-g	5218.4 abc	35.0 a-j	5.6 r-u	19 .0 cd	39 .0 bc	3 .0 fgh
5	Acc 5457	64 .0 c-h	119.0 f-l	111.1 d-k	55.5 e-k	12700.0 f-o	4260.0 d-k	34.7 a-j	6.8 j-r	15 .0 k-n	33 .0 e-j	3 .0 fgh
6	Acc 242787	64 .0 c-h	117.9 g-n	110.9 c-k	54.4 f-n	15950.0 a-d	4166.7 f-n	27.3 kl	5.9 p-u	16 .0 h-n	30 .0 g-o	3 .0 d-f
7	Acc 5344	67 .0 bc	116.8 h-n	97.3 n-q	50.0 lmn	12700.0 f-o	4113.1 g-p	33.2 b-l	7.3 g-n	14 .0 mn	27 .0 j-o	3 .0 efg
8	Acc 7576	67 .0 bc	120.0 c-i	110.6 c-i	53.3 h-n	15325.0 b-f	4127.4 g-o	28.7 h-l	7.7 e-l	16 .0 f-m	26 .0 no	2 .0 hi

9	Acc 7010	86 .0 a	137. 2 a	139.0 a	51.7 i-n	14525 .0 c-h	2191. 5 u	17.8 m	9.7 a	16 .0 h-n	25 .0 o	3 .0 def
10	Acc 5760	63 .0 d-h	121. 2 b-g	104.2 i-m	58.2 c-h	10475 .0 m-q	4141. 5 g-o	39.6 abc	7.4 g-m	16 .0 e-l	27 .0 k-o	3 .0 efg
11	Acc 7580	67 .0 bcd	119. 7 e-j	104.1 j-o	53.2 h-n	15600 .0 a-e	5418. 8a	36.4 a-g	7.3 g-n	22 .0 a	32 .0 e-l	4 .0 bc
12	Dire	63 .0 c-h	123. 5 b-e	89.2 qr	60.3 a-e	18275 .0 a	5565. 8 a	32.3 d-l	5.6 s-u	22 .0 ab	47 .0 a	4 .0 ab
13	Acc 24370 1	66 .0 bcd	116. 0 i-n	107.2 e-l	49.8 mno	12575 .0 f-o	4704. 4 c-f	38.5 a-d	8.8 a-e	18 .0 c-g	34 .0 d-i	3 .0 def
14	Acc 5472	64 .0 b-h	122. 5 b-f	115.4 b-h	58.7 b-g	11887 .5 h-p	3783. 4 j-q	33.1 c-l	6.9 h-o	16 .0 f-m	31 .0 f-n	2 .0 fgh
15	Acc 23067 8	59 .0 ij	122. 6 b-f	102.5 k-o	63.9 ab	10225 .0 n-q	3037. 9 rst	32.1 d-l	7.8 e-k	15 .0 i-n	26 .0 l-o	3 .0 efg
16	Bulala	59 .0 j	121. 0 b-g	90.1 qr	62.0 abc	11025 .0 k-q	4128. 5 g-o	37.2 a-f	6.1 o-u	15 .0 k-n	38 .0 bcd	2 .0 g-i
17	Acc 6988	67 .0 b	118. 8 f-m	92.7 bcd	51.5 j-n	15325 .0 b-f	4318. 8 d-j	30.4 f-l	7.6 e-l	17 .0 d-l	32 .0 e-k	3 .0 cde
18	Acc 5473	64 .0 b-h	118. 7 f-m	112.4 d-k	55.0 f-l	10700 .0 l-q	3836. 6 ijk	37.3 a-f	7.4 g-m	17 .0 e-l	32 .0 e-k	3 .0 fgh
19	Acc 5149	63 .0 d-h	116. 8 h-n	101.5 l-p	53.8 g-n	13700 .0 d-k	4106. 6 g-p	31.4 d-l	7.9 d-j	18 .0 d-i	27 .0 k-o	2 .0 ghi
20	Acc 22239 3	64 .0 b-g	117. 5 g-n	107.0 e-l	53.2 h-n	15975 .0 a-d	4483. 5 d-g	28.5 i-l	7.9 d-j	17 .0 d-k	35 .0 c-g	2 .0 ghi
21	Acc 7295	62 .0 e-j	114. 8 lmn	103.5 l-p	52.5 i-n	11400 .0 i-p	4007. 4 g-q	35.7 a-h	7.2 g-o	14 .0 mn	29 .0 g-o	3 .0 efg
22	Acc 6978	64 .0 c-h	116. 0 i-n	112.3 b-g	52.5 i-n	14025 .0 c-j	4331. 1 d-j	31.0 f-l	7.1 g-o	16 .0 h-n	29 .0 g-o	3 .0 efg
23	Acc 8072	62 .0 f-j	118. 8 f-m	112.1 b-h	56.8 d-i	14950 .0 b-g	4096. 0 g-p	29.2 h-l	6.7 k-s	17 .0 e-l	26 .0 mno	2 .0 ghi
24	Acc 5020	63 .0 e-i	116. 2 i-n	108.4 d-k	53.7 g-n	15375 .0 b-f	4777. 6 bcd	31.1 f-l	8.1 b-h	18 .0 c-h	36 .0 b-f	3 .0 fgh
25	Acc 5342	65 .0 b-f	118. 0 g-n	103.0 m-p	52.8 i-n	11475 .0 i-p	3965. 0 g-q	36.5 a-g	8.3 b-g	16 .0 f-m	29 .0 h-o	3 .0 def
26	Acc 5586	64 .0 b-g	118. 0 g-n	113.9 b-f	53.8 g-n	11175 .0 j-q	3573. 8 p-r	32.9 c-l	5.9 p-u	18 .0 c-f	32 .0 e-k	2 .0 ghi
27	Acc 5428	65 .0 b-g	118. 5 g-m	116.2 b-g	54.0 f-n	12950 .0 e-n	3787. 3 j-q	30.1 g-l	6.2 n-t	17 .0 d-l	28 .0 i-o	3 .0 efg

28	Acc 6933	62 .0 f-j	117. 1 g-n	106.6 g-m	55.1 f-l	11975 .0 h-p	3650. 6 m-q	31.3 e-l	7.6 f-l	16 .0 f-m	32 .0 e-k	3 .0 cde
29	Obsa	60 .0 i-j	124. 4 bc	79.5 s	64.1 a	14050 .0 c-i	5466. 7 a	40.3 ab	5.7 q-u	20 .0 bc	41 .0 ab	5 .0 a
30	Acc 242780	63 .0 d-h	124. 0 bcd	87.5 rs	61.0 abc	14050 .0 c-i	4242. 6 d-k	32.1 d-l	8.1 b-h	17 .0 d-l	41 .0 ab	3 .0 efg
31	Acc 2211	64 .0 b-g	115. 6 j-n	108.4 f-m	51.6 j-n	13450 .0 d-l	4225. 2 e-k	31.9 d-l	8.8 a-e	18 .0 c-h	33 .0 d-i	3 .0 cd
32	Acc 226897	66 .0 b-e	116. 3 i-n	92.3 p-r	50.5 k-n	11900 .0 h-p	3661. 3 l-q	31.9 d-l	7.3 g-n	16 .0 f-m	26 .0 n	3 .0 fgh
33	Acc 5141	65 .0 b-f	109. 5 o	106.4 i-n	44.8 o	8525. 0 q	2659. 5 tu	32.0 d-l	5.4 tu	16 .0 e-l	32 .0 e-k	3 .0 def
34	Acc 7665	64 .0 c-h	118. 3 f-n	98.9 m-p	54.8 f-m	16850 .0 abc	4737. 3 c-e	28.1 jkl	7.1 h-o	17 .0 e-l	30 .0 g-o	3 .0 fgh
35	Acc 5354	64 .0 b-g	114. 5 mn	107.1 e-l	50.5 k-n	10675 .0 l-q	3915. 2 h-q	37.4 a-f	5.7 q-u	16 .0 h-n	30 .0 g-o	3 .0 def
36	Acc 7673	64 .0 c-h	116. 5 i-n	106.7 e-l	53.0 i-n	9225. 0pq	3020. 4st	35.4 a-i	8.0 c-i	17 .0 d-e	33 .0 d-i	2 .0 hi
37	Acc 5198	61 .0 g-j	120. 0 c-i	114.4 b-e	59.0 a-f	12950 .0 e-n	3722. 1 k-q	28.8 i-l	7.9 d-j	16 .0 g-n	26 .0 l-o	2 .0 ghi
38	Acc 243706	64 .0 b-g	118. 5 f-n	120.1 b	54. 3f-n	14450 .0 c-h	4447. 7 d-h	31.6 d-l	9.2 ab	17 .0 d-k	29 .0 g-o	3 .0 efg
39	Acc 5510	63 .0e-i	114. 0n	118.0 bc	51.5j -n	11325 .0i-q	4294. 0d-j	38.4 a-e	8.6a -f	19 .0cd e	29 .0h-o	3 .0de f
40	Acc 242783	62 .0 f-j	117. 5 g-n	112.1 c-i	55.8 e-j	17625 .0 ab	5107. 9 abc	28.8 h-l	9.0 a-d	19 .0 cd	37 .0 b-e	4 .0 ab
41	Acc 242782	65 .0 b-f	115. 7 i-n	118.3 bc	50.7 j-n	10950 .0 k-q	3636. 9 m-q	33.2 b-l	9.1 abc	16 .0 g-n	29 .0 g-o	3 .0 def
42	Acc 226694	63 .0 c-h	117. 8 g-n	112.0 c-k	54.5 f-m	9975. 0 o-q	3621. 0 n-q	39.5 abc	7.0 h-o	17 .0 f-m	33 .0 e-j	3 .0 efg
43	Acc 235051	63 .0 e-i	124. 6 b	112.7 c-j	62.1 abc	14425 .0 c-h	5302. 3 ab	36.9 a-g	7.2 g-o	18 .0 d-i	32 .0 e-l	3 .0 cd
44	Acc 7210	65 .0 b-f	117. 5 g-n	104.6 h-m	52.8 i-n	11850 .0 h-p	3597. 1 o-q	31.3 e-l	6.2 m-t	15 .0 j-n	27 .0 j-o	2 .0 fgh
45	Acc	64 .0	119.	112.3	55.0f	15350	4315.	28.3i	6.6l-	17 .0	37 .0	2 .0

	7647	b-g	3 f-k	c-i	-l	.0 b-f	1d-j	-l	t	d-j	b-e	hi
46	Acc 6974	63 .0 d-h	117. 5 g-n	104.6 j-o	54.5 f-m	15025 .0 b-g	4713. 5cdf	31.9 d-l	7.5 f-l	16 .0 f-m	34 .0 c-h	3 .0 fgh
47	Acc 5591	65 .0 b-f	114. 6 mn	106.9 e-m	49.9 mno	10250 .0 n-q	3493. 1 q-s	34.2 a-k	7.4 g-l	16 .0 e-l	25 .0 o	2 .0 g-i
48	Acc 242790	64 .0 b-g	117. 8 g-n	105.2 i-n	53.8 h-n	10550 .0 m-q	2854. 2 t	26.9 l	5.0 u	17 .0 d-l	34 .0 d-i	2 .0 i
49	Acc 243703	63 .0 c-h	114. 1 n	100.8 opq	50.9 j-n	12950 .0 e-n	4094. 4 g-p	32.3 d-l	7.6 e-l	17 .0 d-l	31 .0 f-m	3 .0 def
Mean		64.0 9	118. 39	107.0 2	54.3	13015 .1	4115. 83	32.9 3	7.32	16.7 7	31.4 7	2.79
LSD (5%)		0.73	0.88	3.01	1.03	580.5 1	111.5	1.44	0.24	0.43	1.15	0.15

Where: DH: Days to Heading; DM: Days to Mature; PLH: Plant Height; GFP: Grain Filling period; BM: Biological Yield; GY: Grain Yield; HI: Harvest Index; SPL: Spike length; SPS: Number of Spike Per Spike; KPS: Number of Kernel Per Spike; PTL: Productive Tiller; CV: coefficient of Variation; LSD: Least Significance Difference

Appendix 6: Performance mean values of quality traits of 49 durum wheat accessions over location 2018/19.

S/N	Accession	TKW	HLW	VTR	GPC	ZI	GGL	WGL	ASC	SDS
1	Acc 5152	52.3 a	78.0 l-q	62.3 hi	11.1 no	45.0 u	30.3 rs	33.9 a-i	0.8 s-u	40.5 i-l
2	Acc 5373	35.5 n-s	80.5 d-j	89.9 a-f	13.1 h-m	53.5 o-u	32.3 i-s	33.2 c-j	1.1 d-o	45.8 d-k
3	Acc 243733	44.0 d-f	77.5 n-r	94.2 a-e	14.1 c-k	66.2 b-j	33.8 f-o	35.0 a-e	1.1 i-q	48.8 c-h
4	Acc 242791	39.1 h-n	73.5 s	92.7 a-f	13.1 h-m	57.0 k-t	32.9 h-r	30.7 j-n	1.2 d-o	52.0 cde
5	Acc 5457	37.3 k-s	77.2 o-r	73.7 gh	12.5 k-n	48.2 tu	31.2 m-s	30.2 k-n	0.9 m-s	42.0 g-l
6	Acc 242787	37.8 j-q	78.6 i-q	91.0 a-f	10.8 o	50.5 s-u	24.7 t	30.7 j-n	1.2 a-l	48.8 c-h
7	Acc 5344	37.7 j-r	77.8 m-q	90.9 a-f	13.7 d-k	58.4 i-s	29.7 rs	26.4 op	1.3 a-h	49.0 c-h
8	Acc 7576	34.2 q-s	79.1 g-o	86.7 a-f	13.0 h-m	51.7 r-u	29.6 rs	28.4 no	1.4 a-e	48.8 c-h
9	Acc 7010	37.3 k-s	79.2 f-o	90.7 a-f	16.7 a	80.3 a	42.5 a	31.5 g-m	1.4 a	68.8 a
10	Acc	42.0	80.4	96.4	13.7	58.2 i-	35.6	33.6 a-	1.0 j-	56.3

	5760	e-h	d-k	ab	d-k	s	d-j	j	q	bc
11	Acc 7580	36.0 n-s	79.9 d-m	92.9 a-f	13.6 d-k	65.7 b-k	32.6 i-r	31.0 i-n	1.4 abc	47.8 d-k
12	Dire	41.2 f-j	84.7 a	95.7 ab	13.2 g-m	70.1 b-e	32.9 h-r	34.0 a-h	1.1 i-q	61.0 ab
13	Acc 243701	33.8 s	77.2 n-r	93.2 a-f	12.7 klm	54.3 n-t	29.4 rs	31.2 i-n	1.3 a-i	52.5 cde
14	Acc 5472	40.7 f-k	76.8 pqr	83.8 b-g	13.4 e-k	57.8 j-s	31.7 k-s	24.7 p	1.4 a-f	51.3 cde
15	Acc 230678	41.1 f-j	81.1 c-g	81.8 e-g	14.6 b-i	58.1 i-s	34.7 d-l	33.3 c-j	0.6 tu	49.0 c-h
16	Bulala	49.3 ab	83.1 abc	96.9 a	13.4 e-k	63.9 c-l	33.0 g-q	32.1 e-l	1.4 a-g	46.5 d-k
17	Acc 6988	45.4 cde	80.6 d-i	93.7 a-f	13.3 e-l	65.2 b-l	35.0 d-k	29.3 mno	0.9 o-s	40.5 i-l
18	Acc 5473	37.0 l-s	77.8 m-q	95.4 abc	14.0 c-k	60.9 e-q	34.7 e-m	35.9 abc	1.2 a-m	49.5 c-g
19	Acc 5149	40.6 f-k	81.3 c-f	90.8 a-f	13.2 f-m	60.0 i-r	31.8 k-s	33.4 b-j	1.2 a-l	45.0 e-k
20	Acc 222393	35.3 o-s	80.7 d-i	93.9 a-f	15.2 a-d	68.3 b-h	37.3 c-f	33.9 a-i	1.2 a-k	52.5 cde
21	Acc 7295	40.8 f-k	78.0 l-q	93.0 a-f	14.6 b-h	66.8 b-i	38.6 bcd	33.5 a-j	1.2 d-o	48.8 c-h
22	Acc 6978	42.1 e-h	79.2 f-o	82.7 c-g	13.5 e-k	65.5 b-k	33.4 g-p	34.9 a-f	0.9 k-s	40.0 kl
23	Acc 8072	47.8 bc	78.6 i-q	88.2 a-f	14.8 b-g	71.9 abc	36.8 c-g	36.4 a	1.1 e-o	48.0 d-j
24	Acc 5020	38.0 i-p	79.3 e-n	90.7 a-f	13.5 e-k	57.9 j-s	35.4 d-j	35.5 a-d	0.8 q-t	46.8 d-k
25	Acc 5342	40.3 g-l	81.3 c-f	92.0 a-f	13.8 d-k	67.8 b-h	35.3 d-j	36.3 ab	0.9 k-s	41.3 h-l
26	Acc 5586	36.9 l-s	79.3 f-o	90.5 a-f	12.5 k-n	56.5 l-t	30.4 n-s	34.0 a-h	1.4 ab	45.8 d-k
27	Acc 5428	33.7 s	78.1 l-q	91.1 a-f	13.2 f-m	61.4 d-q	31.3 l-s	33.1 c-k	1.4 a-e	50.3 c-f
28	Acc 6933	38.1 i-p	78.8 i-p	95.3 abc	15.6 abc	70.5 abc	40.9 ab	34.8 a-f	0.9 l-s	42.5 f-k
29	Obsa	46.3 bcd	83.7 ab	96.4 ab	11.6 m-o	62.4 d-o	31.3 m-s	32.8 d-l	1.2 c-o	49.5 c-g
30	Acc 242780	46.0 bcd	81.8 bcd	97.1 a	14.0 d-k	73.4 ab	35.5 d-j	34.2 a-g	1.4 a-d	46.0 d-k
31	Acc 2211	36.6 m-s	80.1 d-l	92.4 a-f	15.7 ab	74.1 ab	40.3 abc	34.6 a-f	0.9 p-s	42.3 g-k

32	Acc 226897	35.1 p-s	78.4 j-q	96.2 ab	13.3 e-l	63.4 c-n	35.9 d-i	34.3 a-g	1.2 a-l	52.5 cde
33	Acc 5141	34.9 p-s	79.7 d-m	93.2 a-f	13.1 h-m	59.7 h-r	30.0 rs	35.2 a-d	1.4 a-e	51.8 cde
34	Acc 7665	37.8 j-p	79.8 d-m	86.9 a-f	13.8 d-k	60.0 h-r	34.1 e-n	33.9 a-i	1.2 d-o	49.5 c-g
35	Acc 5354	36.5 n-s	79.2 f-o	94.5 a-e	11.7 l-o	57.1 k-t	30.3 o-s	32.8 d-l	1.4 a-d	46.3 d-k
36	Acc 7673	34.1 rs	77.4 n-r	89.2 a-f	13.9 d-k	60.9 f-q	34.3 e-n	32.6 k-l	1.1 g-p	41.8 g-l
37	Acc 5198	40.6 f-k	81.2 c-g	95.8 ab	14.9 b-e	69.8 b-f	37.6 b-e	34.9 a-e	0.6 u	50.3 c-f
38	Acc 243706	38.1 i-p	80.1 d-l	95.5 abc	13.0 h-m	55.4 m-t	31.6 k-s	33.1 c-k	1.1 f-p	40.3 j-l
39	Acc 5510	41.6 f-i	80.7 d-i	92.2 a-f	13.1 h-m	65.9 b-k	32.9 h-r	34.7 a-f	0.9 p-s	49.0 c-h
40	Acc 242783	41.2 f-j	80.4 d-k	21.6 j	14.8 b-f	54.1 o-u	34.2 e-m	33.2 c-k	0.8 r-u	53.3 bcd
41	Acc 242782	42.1 e-h	81.4 cde	54.9i	14.4 b-j	58.8 i-s	32.9 i-r	34.4 a-g	1.1 g-p	40.0 kl
42	Acc 226694	38.7 h-o	81.0 c-h	81.1 fg	12.7 k-n	56.0 m-t	32.3 j-s	34.4 a-g	1.2 b-n	50.8 cde
43	Acc 235051	43.0 d-g	78.4 j-q	94.8 a-e	14.0 c-k	69.4 b-g	37.3 b-f	34.0 a-h	1.1 h-p	46.5 d-k
44	Acc 7210	36.8 l-s	78.9 h-o	83.5 b-g	13.8 d-k	63.3 c-n	32.8 h-r	31.9 f-l	1.3 a-h	51.5 cde
45	Acc 7647	40.1 g-m	75.4 rs	84.8 a-g	10.8 o	53.0 q-u	28.9 s	30.0 lmn	0.9 n-s	48.0 d-j
46	Acc 6974	36.9 l-s	78.3 k-q	92.4 a-f	13.4 e-k	60.8 g-q	33.4 g-p	32.6 d-l	1.4 a-e	34.3 l
47	Acc 5591	38.1 i-p	80.7 d-i	20.8 j	14.5 b-j	57.8 j-s	36.6 d-h	34.4 a-g	1.1 i-p	48.3 d-i
48	Acc 242790	42.3 e-h	76.5 qr	84.6 a-g	12.9 j-m	62.2 e-p	31.3 m-s	32.6 d-l	0.9 k-s	48.8 c-h
49	Acc 243703	35.8 n-s	79.7 d-m	81.9 d-g	12.9 i-m	52.9 p-u	29.8 rs	30.9 j-n	1.3 a-k	42.5 f-k
Mean		39.59	79.41	86.55	13.551	61.3	33.53	32.9	1.133	47.8
LSD (5%)		0.73	0.43	2.62	0.33	1.83	0.75	0.6	0.05	1.59

Where: TKW: Thousand Kernel Weight; HLW: Hecto Liter Weight; VTR: Vitreousness; PC: Grain protein Content; ZI: Zeleny Index; GGL: Grain Gluten; WGL: Wet Gluten; ASC: Ash Content; SDS: Sodium Dodecyl Sulphate; CV: Coefficient of Variation; LSD: Least Significance Difference

Appendix 7: Range, mean, genotypic and phenotypic variance and genotypic and phenotypic coefficient of variance studied traits at Sinana.

Traits	range	mean	σ^2g	σ^2p	σ^2e	GCV	PCV	H_2	GA	GAM
DH	56.00-86.500	62.9	13.22	22.04	8.82	5.78	7.46	59.99	5.79	9.21
DM	111.00-138.50	117.41	20.71	32.86	12.15	3.88	4.88	63.03	7.43	6.33
PLH	84.50-132.50	103.09	86.94	112.23	25.29	9.04	10.28	77.47	16.87	16.37
GFP	47.50-66.00	54.51	13.87	30.19	16.33	6.83	10.08	45.93	5.19	9.52
BM	6750.00-20850.00	12712.8	10286307	14760485	4474178	30.22	30.22	69.69	5504.83	43.3
GY	2191.90-6023.80	4380.82	606294.1	732315.4	126021.3	17.77	19.53	82.79	1456.66	33.25
HI	24.70-49.80	35.95	18.45	48.33	29.88	11.95	19.34	38.18	5.46	15.18
SPL	5.00-12.00	7.37	1.27	2	0.73	15.27	19.19	63.37	1.84	25
KPS	23.00-47.00	32.29	2.38	4.68	2.3	4.78	6.7	50.83	2.26	7
SPS	11.00-22.00	16.56	28.5	46.64	18.14	32.24	41.25	61.11	8.58	51.82
PTL	1.00-5.00	2.95	0.57	0.85	0.28	25.55	31.19	67.08	1.27	43.02
TKW	33.50-54.50	40.33	16.74	24.6	7.86	10.14	12.3	68.04	6.94	17.2
HLW	70.00-86.40	79.25	6.46	8.5	2.04	3.21	3.68	76.04	4.56	5.75
VTR	3.00-98.90	87.79	366.69	476.92	110.23	21.81	24.88	76.89	34.52	39.32
GPC	9.90-17.30	13.93	1.73	2.96	1.23	9.45	12.35	58.54	2.07	14.86
GGL	24.90-44.50	33.7	28.42	59.45	31.02	15.82	22.88	47.81	7.58	22.49
ZI	43.60-80.70	65.57	9.87	15.39	5.52	4.79	5.98	64.12	5.17	7.89
WGL	23.85-35.90	33.18	3.07	7.57	4.5	5.28	8.29	40.52	2.29	6.91
ASC	0.70-1.50	1.18	0.03	0.06	0.02	15.83	20.54	59.42	0.3	25.09
SDS	32.50-67.50	45.83	55.4	74.38	18.98	16.2	18.8	74.4	13.21	28.8

						4	2	8		2

Where: DH: Days to Heading; DM: Days to Mature; PLH: Plant Height; GFP: Grain Filling period; BM: Biological Yield; GY: Grain Yield; HI: Harvest Index; SPL: Spike Length; SPS: Number of Spike Per Spike; KPS: Number of kernel Per Spike; PTL: Productive Tiller; TKW: Thousand Kernel Weight; HLW: Hecto Liter Weight; VTR: Vitreousness; PC: Grain Protein Content; ZI: Zeleny Index; GGL: Grain Gluten; WGL: Wet Gluten; ASC: ASH Content; SDS: Sodium Dodecyl Sulphate; σ2g: Genotypic Variance; σ2p: Phenotypic Variance; σ2p: Error variance; GCV: Genotypic Variance; PCV: Phenotypic Variance; H_2: Heritability; GA: Genetic Advance; GAM: Genetic Advance as Mean

Appendix 8: Range, mean, genotypic and phenotypic variance and genotypic and phenotypic coefficient of variance studied traits at Selka.

Traits	**Range**	**Mean**	**σ^2g**	**σ^2p**	**σ^2e**	**GCV**	**PCV**	**H_2**	**GA**	**GAM**
DH	60.50-84.50	65.28	12.35	16.72	4.38	5.38	6.26	73.83	6.21	9.51
DM	108.10-136.00	119.37	15.29	22.22	6.93	3.28	3.95	68.81	6.67	5.59
PLH	76.10-142.80	109.77	108.5	152.94	44.44	9.49	11.27	70.94	18.04	16.43
GFP	40.60-63.50	54.1	18.31	27.44	9.13	7.91	9.68	66.73	7.19	13.28
BM	8700.00-20200.00	13317.35	2813330	7260326	4446996	12.59	20.23	38.75	2146.67	16.12
GY	2191.00-5309.06	3850.83	347582.7	568931	221348.3	15.31	19.59	61.09	947.44	24.6
HI	10.85-47.40	29.91	26.57	49.07	22.5	17.23	23.42	54.15	7.8	26.07
SPL	5.00-9.60	7.27	1.26	1.74	0.48	15.45	18.15	72.44	1.96	27.03
SPS	13.00-24.50	16.99	3.01	5.43	2.41	10.22	13.71	55.56	2.66	15.66
KPS	23.00-46.50	30.65	16.3	31.3	15	13.17	18.25	52.08	5.99	19.54
PTL	1.00-5.00	2.64	0.39	0.63	0.24	23.66	30.11	61.74	1.01	38.22
TKW	32.25-50.30	38.85	19.07	22.81	3.74	11.24	12.29	83.58	8.21	21.13
HLW	75.40-83.00	79.56	3.1	5.54	2.45	2.21	2.96	55.87	2.7	3.4
VTR	35.10-97.80	85.32	152.03	228.46	76.43	14.45	17.72	66.55	20.68	24.24
GPC	10.50-16.25	13.17	0.94	2.35	1.41	7.36	11.6	39.9	1.26	9.56

							5	5		
ZI	40.00-80.00	57.02	78.1	121.98	43.88	15.5	19.37	64.03	14.54	25.5
GGL	24.55-40.75	33.35	13.46	20.98	7.52	11	13.73	64.17	6.04	18.12
WGL	19.35-3740	32.61	14.46	18.92	4.46	11.66	13.34	76.42	6.83	20.96
ASC	0.46-1.53	1.09	0.05	0.08	0.03	20.52	26.61	59.47	0.35	32.53
SDS	30.00-70.00	49.77	34.87	80.23	45.36	11.87	18	43.46	8	16.08

Where: DH: Days to Heading; DM: Days to Mature; PLH: Plant Height; GFP: Grain Filling Period; BM: Biological Yield; GY: Grain Yield; HI: Harvest Index; SPL: Spike Length; SPS: Number of Spike Per Spike; KPS: Number of kernel Per Spike; PTL: Productive Tiller; TKW: Thousand Kernel Weight; HLW: Hecto Liter Weight; VTR: Vitreousness; PC: Grain Protein Content; ZI: Zeleny Index; GGL: Grain Gluten; WGL: Wet Gluten; ASC: ASH Content; SDS: Sodium Dodecyl Sulphate; σ^2g: Genotypic Variance; σ^2p: Phenotypic Variance; σ^2p: Error variance; GCV: Genotypic Variance; PCV: Phenotypic Variance; H_2: Heritability; GA: Genetic Advance; GAM: Genetic Advance as Mean