Table S1. Wheat genotype names and their pedigrees.

Genotype pedigrees	
Genotype	Pedigree
Gemmeiza-9 (G1)	Ald "S"/Huac "S"//CMH74A. 630/5x CGM4583-5GM-1GM-0GM
Gemmeiza-10 (G2)	Maya 74 "S"/On//1160-147/3/Bb/4/Chat"S" /5/ctow.
Gemmeiza-11 (G3)	B0W"S"/KVZ"S"//7C/SERI82/3/GIZA168/SAKHA61.CGM7892-2GM—1GM-2GM-
Gemmeiza-12 (G4)	OTUS/3/SARA/THB//VEE (CMSS97YOO227 S-5Y-010M-010Y- 010M-2Y – 1M-0Y- OGM)
Giza-168 (G5)	MRL/BUC//Seri. CM93046-8M-0Y-0M-2Y-0B-0GZ
Giza-171 (G6)	Sakha 93 / Gemmiza 9 S.6-1GZ-4GZ-1GZ-2GZ-0S
Sakha-95 (G7)	PASTOR//SITE/MO/3/CHEN/AEGILOPS SQUARROSA (TAUS)//BCN/4/WELL1 CMA01Y00158S-040POY-040M-030ZIM-040SY26M- 0Y-0B-0ET
Shandweel 1 (G8)	SITE//MO/4/NAC/TH.AC//3*PVN/3/MIRLO/BUC. CMSS93B00567S-72Y-010M-010Y- 010M0HTY-0SH.
Sids-14 (G9)	BOW"s"/vee"s"//BOW" S"/TSI/BANI SEWEF1 AND SD293-1SD-2SD-4SD-0SD

Table S2. Test statistics and P-value for Bartlett's test and Shapiro–Wilk test for ten traits.

Traits	Homogeneity test (Bartlett's test)		Normality test (Shapiro–Wilk test)	
	Test statistic	P-value	Test statistic	P-value
RT	9.290	0.233	0.977	0.212
RWC	5.528	0.596	0.926	0.000
WD	9.290	0.233	0.977	0.212
Chl T	7.189	0.409	0.925	0.000
CARs	12.854	0.076	0.982	0.385
PH	0.893	0.996	0.972	0.110
SL	11.266	0.127	0.989	0.762
NGS	7.931	0.339	0.980	0.312
GY	10.888	0.144	0.954	0.011
BY	12.376	0.089	0.945	0.003

RT: relative turgidity; RWC: relative water content; WD: water deficit; T Chl: total chlorophylls; CARs: carotenoids; PH: plant height; SL: spike length; NGS: number of grains per spike; GY: grain yield; BY: biological yield.

Table S3. Means of eight environments for studied traits.

Traits	Environments							
	E1 (100% AW× AW× 1st)	E2 (85% AW× 1st)	E3 (70% AW× 1st)	E4 (55% AW× 1st)	E5 (100% AW× 2nd)	E6 (85% AW× 2nd)	E7 (70% AW× 2nd)	E8 (55% AW× 2nd)
RT	83.33[a]	77.78[b]	74.68[d]	67.90[f]	82.76[a]	75.64[c]	72.84[e]	67.46[f]

RWC	76.54ᵃ	67.26ᶜ	64.65ᶜᵈᵉ	61.95ᵉᶠ	71.78ᵇ	66.00ᶜᵈ	64.13ᵈᵉ	60.04ᶠ
WD	16.67ᶠ	22.22ᵉ	25.32ᶜ	32.10ᵃ	17.24ᶠ	24.36ᵈ	27.16ᵇ	32.54ᵃ
T Chl	1.43ᵃ	1.23ᶜ	1.16ᵈ	1.07ᵉ	1.35ᵇ	1.24ᶜ	1.15ᵈ	1.08ᵉ
CARs	0.52ᵃ	0.47ᶜ	0.42ᵉ	0.36ᶠ	0.49ᵇ	0.44ᵈ	0.40ᵉ	0.33ᵍ
PH	99.54ᵃ	92.34ᵇ	83.07ᵈ	73.31ᶠ	99.33ᵃ	90.75ᶜ	81.49ᵉ	71.77ᵍ
SL	12.54ᵃ	11.32ᶜ	10.89ᵈ	9.64ᵍ	11.88ᵇᶜ	10.49ᵉ	10.03ᶠ	8.77ʰ
NGS	61.77ᵃ	55.67ᶜ	51.30ᵉ	48.06ᶠ	58.79ᵇ	53.55ᵈ	48.00ᶠ	43.04ᵍ
GY	4.58ᵃ	3.81ᶜ	3.03ᵉ	2.44ᵍ	4.40ᵇ	3.68ᵈ	2.87ᶠ	2.22ʰ
BY	15.00ᵃ	12.84ᶜ	10.75ᵈ	9.10ᶠ	14.65ᵇ	12.58ᶜ	10.43ᵉ	8.33ᵍ

E1: 100% AW× first season; E2: 85% AW× first season; E3: 70% AW× first season; E4: 55% AW× first season; E5: 100% AW× second season; E6: 85% AW× second season; E7: 70% AW× second season; E8: 55% AW× second season; RT: relative turgidity; RWC: relative water content; WD: water deficit; T Chl: total chlorophyll; CARs: carotenoids; PH: plant height; SL: spike length; NGS: number of grains per spike; GY: grain yield; BY: biological yield. Means with the same letter in the same row are not significant for α = 0.05 according to Tukey's test.

Table S4. Means of nine genotypes for studied traits.

Traits	Genotypes								
	G1	G2	G3	G4	G5	G6	G7	G8	G9
RT	73.65ᵈᵉ	72.65ᵉ	74.63ᶜᵈ	73.70ᵈᵉ	72.80ᵉ	77.62ᵇ	77.95ᵇ	75.58ᶜ	79.10ᵃ
RWC	64.46ᵈᵉ	62.81ᵈᵉ	69.30ᵇᶜ	63.38ᵈᵉ	61.58ᵉ	71.03ᵃᵇ	67.92ᶜ	65.01ᵈ	73.39ᵃ
WD	26.35ᵃᵇ	27.35ᵃ	25.37ᵇᶜ	26.30ᵃᵇ	27.20ᵃ	22.38ᵈ	22.05ᵈᵉ	24.42ᶜ	20.90ᵉ
T Chl	1.14ᵉ	1.22ᶜ	1.42ᵃ	1.42ᵃ	1.12ᵉᶠ	1.10ᶠᵍ	1.18ᵈ	1.25ᵇ	1.07ᵍ
CARs	0.42ᵉ	0.44ᶜᵈ	0.52ᵃ	0.48ᵇ	0.39ᶠ	0.37ᵍ	0.43ᵈᵉ	0.46ᶜ	0.35ʰ
PH	89.87ᵃ	81.37ᵉ	87.95ᶜ	79.65ᶠ	86.26ᵈ	89.33ᵃᵇ	88.30ᵇᶜ	87.95ᶜ	87.37ᶜᵈ
SL	11.13ᵃ	10.78ᵃᵇ	11.16ᵃ	10.92ᵃᵇ	9.78ᶜ	9.89ᶜ	11.12ᵃ	10.67ᵇ	10.83ᵃᵇ
NGS	52.58ᶜ	49.90ᵉᶠ	48.28ᶠ	57.07ᵃ	50.58ᵈᵉ	51.19ᶜᵈᵉ	56.45ᵃ	52.06ᶜᵈ	54.58ᵇ
GY	2.96ᶠ	2.96ᶠ	3.13ᵉ	3.06ᵉᶠ	3.64ᶜ	3.81ᵇ	3.98ᵃ	3.58ᶜ	3.28ᵈ
BY	10.58ᶠ	10.81ᵉᶠ	11.11ᵈᵉ	10.89ᵉᶠ	12.33ᶜ	12.80ᵇ	13.28ᵃ	12.28ᶜ	11.33ᵈ

G1: Gemmeiza-9; G2: Gemmeiza-10; G3: Gemmeiza-11; G4: Gemmeiza-12; G5: Giza-168; G6: Giza-171; G7: Sakha-95; G8: Shandweel-1; G9: Sids-14; RT: relative turgidity; RWC: relative water content; WD: water deficit; T Chl: total chlorophyll; CARs: carotenoids; PH: plant height; SL: spike length; NGS: number of grains per spike; GY: grain yield; BY: biological yield. Means with the same letter in the same row are not significant for α = 0.05 according to Tukey's test.

Table S5. P-values for genotypes effect for REML/BLUP method of the analyzed traits.

Traits	E1	E2	E3	E4	E5	E6	E7	E8
RT	0.000	0.000	0.000	0.000	0.002	**0.536**	0.000	0.000
RWC	0.000	0.000	0.042	0.000	0.000	0.001	0.000	0.000
WD	0.000	0.000	0.000	0.000	0.002	**0.536**	0.000	0.000
T Chl	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CARs	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001
PH	**0.051**	0.004	0.000	0.000	0.000	0.002	0.000	0.000
SL	0.010	**0.127**	**0.330**	0.021	0.000	0.001	0.000	**0.198**
NGS	**0.083**	**0.235**	0.006	0.000	0.002	0.001	0.001	0.000
GY	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

BY	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001

Table S6. Eigenvalues, explained variance, and factor loadings after varimax rotation and commonalities obtained in the factor analysis for the traits for eight environments.

Traits	E1					E2				
	FA1	FA2	FA3	FA4	Commonality	FA1	FA2	FA3	FA4	Commonality
RT	**-0.94**	-0.19	-0.16	0.18	0.98	0.27	0.25	**0.90**	-0.05	0.96
RWC	**-0.92**	-0.09	-0.23	-0.15	0.93	-0.61	0.01	-0.41	**-0.65**	0.97
WD	**0.94**	0.19	0.16	-0.18	0.98	-0.27	-0.25	**-090**	0.05	0.96
T Chl	0.20	**0.94**	0.17	-0.12	0.96	-0.21	**-0.92**	-0.07	0.19	0.92
CARs	0.23	**0.90**	0.16	0.22	0.94	-005	**-0.96**	-0.22	0.06	0.98
PH	-0.31	-0.24	-0.36	**0.60**	0.65	0.12	0.24	0.07	**-0.90**	0.88
SL	0.09	0.12	0.34	**0.89**	0.93	**-0.86**	-0.17	-0.02	-0.33	0.88
NGS	-0.21	0.45	-0.38	**0.58**	0.73	-0.09	-0.46	**0.65**	0.34	0.75
GY	-0.25	-0.17	**-0.95**	-0.02	0.99	**0.91**	0.16	0.29	-0.16	0.96
BY	-0.17	-0.13	**-0.97**	-0.01	0.99	**0.92**	0.05	0.15	-0.20	0.92
E.V	4.45	2.01	1.50	1.13		4.3	2.36	1.51	1.00	
V. (%)	44.5	20.1	15.0	11.3		43.0	23.6	15.1	10.0	
Cu.V(%)	44.5	64.6	79.6	90.9		43.0	66.6	81.7	91.7	

Traits	E3				E4				
	FA1	FA2	FA3	Commonality	FA1	FA2	FA3	FA4	Commonality
RT	**-0.93**	-0.13	-0.12	0.90	**-0.97**	0.07	-0.16	0.16	0.99
RWC	**-0.66**	0.14	0.48	0.68	**-0.85**	0.14	-0.47	0.18	0.99
WD	**0.93**	0.13	0.12	0.90	**0.97**	-0.07	0.16	-0.16	0.99
Chl T	0.16	**0.82**	0.51	0.96	0.30	**-0.93**	0.01	0.06	0.96
CARs	0.24	**0.95**	0.06	0.96	0.26	**-0.93**	0.06	-0.23	0.99
PH	-0.04	0.08	**-0.88**	0.79	**-0.71**	0.37	-0.36	-0.37	0.90
SL	0.00	**0.90**	-0.32	0.92	-0.18	**-0.96**	0.12	-0.08	0.97
NGS	**-0.58**	-0.15	0.21	0.40	-0.21	0.17	-0.07	**0.95**	0.97
GY	**-0.73**	-0.12	-0.50	0.80	-0.29	0.13	**-0.93**	-0.02	0.98
BY	**-0.73**	-0.15	-0.53	0.84	-0.22	0.02	**-0.96**	0.08	0.99
E.V	4.31	2.1	**1.74**		5.06	2.32	1.30	1.05	
V. (%)	43.2	21.0	**17.4**		50.6	23.2	13.0	10.5	
Cu.V(%)	43.2	64.2	**81.5**		50.6	73.8	86.8	97.3	

Traits	E5					E6			
	FA1	FA2	FA3	FA4	Commonality	FA1	FA2	FA3	Commonality
RT	**-0.93**	-0.15	-0.14	0.22	0.95	-0.17	0.28	**0.91**	0.93
RWC	**-0.84**	-0.34	0.18	0.08	0.86	**0.61**	-0.60	0.18	0.77
WD	**0.93**	0.15	0.14	-0.22	0.95	0.17	-0.28	**-0.91**	0.93
Chl T	0.20	0.13	0.22	**-0.93**	0.96	0.27	0.46	**-0.74**	0.82
CARs	0.24	0.25	-0.18	**0.91**	0.98	0.11	0.24	**-0.80**	0.71
PH	-.03	-0.30	**-0.88**	0.23	0.92	-0.19	**-0.83**	-0.04	0.72

Traits	FA1	FA2	FA3	FA4	Commonality	FA1	FA2	FA3	Commonality
SL	-0.15	0.38	**-0.71**	-0.43	0.86	**0.84**	0.04	-0.29	0.79
NGS	**-0.76**	0.08	-0.04	0.40	0.58	-0.04	**0.81**	0.06	0.66
GY	-0.18	**-0.94**	-0.08	0.21	0.98	**-0.94**	-0.06	0.23	0.94
BY	-0.13	**-0.96**	-0.02	0.16	0.96	**-0.94**	-0.07	0.15	0.91
E.V	4.45	2.01	1.39	1.15		4.09	2.17	1.92	
V. (%)	44.5	20.2	13.9	11.5		40.9	21.7	19.2	
Cu.V(%)	44.5	64.6	78.5	90.0		40.9	62.7	81.8	

Traits			E7					E8	
	FA1	FA2	FA3	FA4	Commonality	FA1	FA2	FA3	Commonality
RT	0.52	-0.10	**0.77**	-0.24	0.93	**-0.60**	-0.51	-0.52	0.89
RWC	-0.09	0.11	**-0.64**	0.13	0.45	-0.49	-0.37	**-0.79**	0.99
WD	-0.52	0.10	**-0.77**	0.24	0.93	**0.60**	0.51	0.52	0.89
Chl T	-0.25	0.29	-0.15	**0.90**	0.98	**0.93**	-0.19	-0.01	0.89
CARs	-0.12	-0.25	-0.15	**0.93**	0.97	**0.94**	0.01	0.09	0.90
PH	0.06	**-0.87**	0.26	-0.19	0.87	**-0.76**	-0.04	-0.41	0.75
SL	-0.56	0.07	**0.71**	0.37	0.97	0.08	**-0.95**	0.00	0.91
NGS	0.05	**0.91**	0.04	-0.16	0.85	0.03	**-0.84**	-0.10	0.71
GY	**0.96**	0.05	0.20	-0.14	0.99	-0.14	0.03	**-0.97**	0.95
BY	**0.97**	-0.02	0.17	-0.16	0.99	-0.03	-0.08	**-0.98**	0.96
E.V	4.26	1.92	1.51	1.25		5.24	2.13	1.50	
V. (%)	42.6	19.2	15.1	12.5		52.4	21.3	15.0	
Cu.V(%)	42.6	61.8	77.0	89.4		52.4	73.7	88.6	

E1: 100% AW× first season; E2: 85% AW× first season; E3: 70% AW× first season; E4: 55% AW× first season; E5: 100% AW× second season; E6: 85% AW× second season; E7: 70% AW× second season; E8: 55% AW× second season; RT: relative turgidity; RWC: relative water content; WD: water deficit; T Chl: total chlorophyll; CARs: carotenoids; PH: plant height; SL: spike length; NGS: number of grains per spike; GY: grain yield; BY: biological yield. V.: variance; Cu.V: cumulative variance.