Table 3. Mean performance ± standard error of P_1, P_2, F_1, F_2, BC_1, and BC_2 populations and potence ratio (PR) of two bread wheat crosses for the studied traits under normal (N) and water stress (S) conditions.

Trait	DH		PLH		S/P		K/S		100- KW		BY		GY		STI% (GY)
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	
Cross 1-P_1	103.23±0.26	97.57±0.29	102.60±0.58	97.33±0.82	11.57±0.29	9.23±0.33	43.47±0.93	35.09±1.00	4.45±0.04	3.81±0.05	50.10±0.92	42.93±1.73	15.95±0.62	12.29±0.88	77.05
P_2	102.60±0.27	96.10±0.31	114.70±0.55	98.63±0.77	9.87±0.29	8.47±0.28	38.71±0.80	30.20±0.91	5.07±0.04	4.31±0.04	46.82±0.82	34.13±1.65	18.85±0.61	14.91±1.19	79.10
F_1	103.53±0.27	96.88±0.32	114.20±0.57	108.00±0.71	10.23±0.33	8.57±0.26	35.97±0.83	29.28±1.42	5.06±0.01	4.50±0.11	49.57±1.19	43.73±1.65	17.47±0.67	14.45±0.97	84.16
F_2	103.41±0.23	96.43±0.16	114.76±0.43	98.40±0.46	10.33±0.18	8.11±0.24	40.53±0.52	38.05±0.68	4.54±0.03	3.92±0.05	58.72±0.91	46.16±1.06	20.36±0.43	15.84±0.49	77.80
BC_1	104.67±0.39	94.67±0.26	106.83±0.73	94.63±0.77	10.22±0.29	8.10±0.37	35.35±0.73	29.35±1.27	4.60±0.03	3.88±0.07	50.73±1.44	37.43±1.71	16.40±0.61	12.75±0.91	77.74
BC_2	102.57±0.41	100.97±0.31	115.00±0.65	101.10±0.80	8.72±0.30	8.67±0.37	37.09±0.95	38.17±1.04	4.77±0.05	4.25±0.08	55.45±1.34	50.93±1.73	16.57±0.74	13.61±0.79	82.21
L.S.D 0.05	**1.50**	**1.34**	**2.84**	**3.51**	**1.37**	**1.49**	**3.87**	**5.19**	**0.19**	**0.33**	**5.42**	**7.71**	**2.98**	**4.31**	-----
PR%	**1.95**	**0.06**	**-0.92**	**15.41**	**-0.57**	**-0.74**	**2.33**	**1.38**	**0.95**	**1.78**	**0.68**	**1.18**	**0.16**	**-0.19**	-----
Cross 2-P_1	103.67±0.36	97.60±0.37	105.27±0.75	96.27±0.72	10.10±0.48	8.27±0.60	37.71±1.00	31.60±1.49	4.79±0.08	4.04±0.07	50.23±1.47	40.63±1.00	17.52±1.11	11.66±0.85	66.55
P_2	99.53±0.31	90.87±0.26	100.00±0.83	90.60±0.75	9.80±0.52	8.53±0.52	39.27±0.95	31.01±1.65	4.56±0.09	4.09±0.07	48.23±1.29	37.87±0.93	17.88±0.98	10.94±0.83	61.19
F_1	102.33±0.30	94.50±0.35	104.77±0.79	93.07±1.00	9.27±0.43	9.07±0.52	41.50±1.18	35.72±1.51	4.68±0.08	4.36±0.09	67.60±1.49	45.47±1.00	21.79±0.97	17.97±0.78	82.47
F_2	102.28±0.29	96.33±0.29	110.66±0.55	101.65±0.63	13.35±0.31	10.90±0.31	43.41±0.96	34.65±1.05	4.46±0.05	4.17±0.05	70.81±1.13	58.96±0.96	24.93±0.68	17.20±0.65	68.99
BC_1	102.55±0.45	95.35±0.40	108.50±0.93	96.48±1.04	13.00±0.55	8.60±0.50	41.76±1.62	33.25±1.77	4.57±0.08	4.14±0.09	54.30±1.63	42.72±1.57	21.95±1.15	17.36±1.05	79.09
BC_2	100.37±0.46	92.48±0.50	113.30±0.85	97.28±0.91	11.38±0.48	11.17±0.55	39.65±1.51	34.94±1.66	4.94±0.08	4.22±0.08	61.92±1.83	49.35±1.57	24.38±1.03	19.77±1.13	81.11
L.S.D 0.05	**1.76**	**1.78**	**3.80**	**4.11**	**2.25**	**2.45**	**5.93**	**7.39**	**0.37**	**0.36**	**7.16**	**5.78**	**4.79**	**4.31**	-----
PR%	**0.35**	**0.08**	**-0.81**	**0.48**	**-4.53**	**-5.00**	**3.85**	**-14.88**	**0.03**	**10.60**	**18.37**	**4.49**	**-22.91**	**18.44**	-----

Table 5. Types of gene action using generation means ± standard error for all studied traits under normal (N) and water stress (S) conditions

Trait	Cross	Treatments	Gene effects						Epistasis
			M	d	h	I	j	l	
DH	C1	N	103.41**±0.23	2.10**±0.57	1.43±1.50	0.81±1.46	1.78**±0.60	-2.38±2.53	---
		S	96.43**±0.16	-6.30**±0.40	5.53**±1.10	5.56**±1.03	-7.03**±0.45	-9.56**±1.89	D
	C2	N	102.28**±0.29	2.18**±0.64	-2.57±1.76	-3.30±1.72	0.12±0.68	5.34±2.90	---
		S	96.33**±0.29	2.87**±0.64	-11.40**±1.78	-9.67**±1.73	-0.50±0.68	7.47*±2.94	D
PLH	C1	N	114.76**±0.43	-8.17**±0.98	-9.81**±2.69	-15.36**±2.59	-2.12*±1.05	17.39**±4.48	D
		S	98.40**±0.46	-6.47**±1.11	7.88**±3.01	-2.13±2.88	-5.82**±1.24	22.63**±5.13	C
	C2	N	110.66**±0.55	-4.80**±1.26	3.08±3.48	0.95±3.34	-7.43**±1.38	-29.75**±5.82	---
		S	101.65**±0.63	-0.80±1.38	-20.43**±3.92	-19.06**±3.75	-3.63*±1.48	2.53±6.49	---
S/P	C1	N	10.33**±0.18	1.50**±0.42	-3.93**±1.16	-3.45**±1.09	0.65±0.46	7.48**±1.97	D
		S	8.11**±0.24	-0.57±0.52	0.82±1.45	1.11±1.41	-0.95±0.56	0.19±2.38	---
	C2	N	13.35**±0.31	1.62*±0.73	-5.30**±2.00	-4.62*±1.92	1.47±0.81	-5.71±3.37	---
		S	10.90**±0.31	-2.57**±0.74	-3.41±2.05	-4.08*±1.94	-2.43**±0.84	-0.52±3.48	---
K/S	C1	N	40.53**±0.23	-1.74**±0.57	-21.79**±1.50	-17.23**±1.46	-3.69**±0.06	25.33**±2.53	D
		S	38.05**±0.68	-8.82**±1.64	-20.55**±4.55	-17.18**±4.26	-11.27**±1.78	6.00±7.78	---
	C2	N	43.41**±0.96	2.11±1.00*	-7.79±6.03	-10.80**±3.88	2.89±2.32	7.90±10.05	---
		S	34.65**±1.05	-1.69±2.43	2.19±6.70	-2.23±6.43	-1.99*±1.00	-0.10±11.23	---
100-KW	C1	N	4.54**±0.03	-0.17±0.06	0.87**±0.16	0.57**±0.16	0.14*±0.07	0.34±0.28	---
		S	3.92**±0.05	-0.38**±0.10	1.01**±0.30	0.57*±0.28	-0.13±0.11	0.30±0.51	---
	C2	N	4.46**±0.05	-0.37**±0.11	1.16**±0.31	1.16**±0.29	-0.49**±0.13	-1.50**±0.53	D
		S	4.17**±0.05	-0.08±0.12	0.31±0.33	0.02±0.32	-0.05±0.13	0.10*±0.06	---
BY	C1	N	58.72**±0.91	-4.73*±1.97	-21.42**±5.54	-22.53**±5.38	-6.37**±2.07	6.23±9.10	---
		S	46.16**±1.06	-13.50**±1.65	-2.73±6.77	-7.93±6.45	-17.90**±2.71	-4.27±11.37	---
	C2	N	70.81**±1.13	-7.61**±2.45	-32.43**±6.89	-50.80**±6.65	-8.61**±2.64	52.02**±11.36	D
		S	58.96**±0.96	-6.63**±2.21	-45.47**±5.98	-51.69**±5.85	-8.02**±2.32	36.99**±9.95	D
GY	C1	N	20.36**±0.43	0.83±0.96	-17.75**±2.69	-17.52**±2.57	2.28*±1.05	22.73**±4.50	D
		S	15.84**±0.49	-1.86±1.21	-8.28*±3.35	-8.63**±3.12	-0.05±1.42	11.0±5.76	---
	C2	N	24.93**±0.68	-2.43±1.54	-2.97±4.29	-7.07±4.11	-2.25±1.71	-6.60*±3.32	---
		S	17.20**±0.65	-3.41±1.54	18.13**±4.16	11.46**±4.04	-3.77*±1.65	-33.2**±6.97	D

Where: * & ** Significant and high Significant at 0.05 & 0.01 level of probability, respectively **C** = Complementary **D** = Duplicate

Table 6. Heterosis, inbreeding depression (I.D%), Potence ratio (P.R%), components of variation, broad sense heritability (H^2b), narrow senses heritability (h^2n), and expected genetic advance (G.S) of two bread wheat crosses for all studied traits under normal (N) and heat stress (H) conditions.

Trait	Cross	Treatment	Heterosis (%)		I.D %	components of variation			$H/D^{1/2}$	Heritability		G.S%
			M.P	B.P		H	D	E		H^2b	h^2n	
DH	C_1	N	0.60	0.91*	0.12	20.11	9.62	2.16	1.45	81.99	40.10	2.77
		S	-0.03	0.73	0.39	3.50	4.68	2.78	0.87	53.60	39.00	2.04
	C_2	N	0.72	2.81	0.05	12.00	24.45	3.16	0.70	82.82	66.50	5.74
		S	-1.84**	1.80**	-4.14**	11.85	24.85	3.24	0.69	82.62	66.71	6.16
PLH	C_1	N	5.11**	11.31**	-0.49	25.95	49.75	9.64	0.72	76.50	60.67	6.97
		S	10.22**	10.96**	8.89**	37.76	39.57	17.67	0.98	62.33	42.19	6.05
	C_2	N	2.08*	-0.47	-5.63**	32.67	82.18	18.79	0.63	72.39	60.39	9.27
		S	-1.46	-4.36**	-10.41**	17.10	130.09	20.70	0.36	77.01	72.26	13.89
S/P	C_1	N	-4.51**	-11.53**	-0.93*	2.20	7.24	2.83	0.55	59.57	51.73	27.29
		S	-3.20**	-7.22**	5.37**	2.00	20.00	2.50	0.32	80.77	76.92	70.48
	C_2	N	-6.83**	-8.22	-43.98**	12.74	24.00	6.81	0.73	69.02	54.55	39.49
		S	7.94**	9.68**	-20.25**	7.53	22.00	9.12	0.59	58.56	50.00	44.31
K/S	C_1	N	-11.23**	-6.74**	-12.68**	18.51	66.78	21.98	0.53	63.36	55.65	21.91
		S	-10.32**	-3.06*	-29.97**	112.59	91.45	30.00	1.11	71.12	44.02	24.29
	C_2	N	7.81**	5.67	-4.61**	211.46	246.54	33.00	0.93	84.22	58.94	40.45
		S	14.12**	15.21**	2.99	128.10	292.00	71.98	0.66	71.21	58.40	54.89
100-KW	C_1	N	6.23**	-0.28**	10.26**	0.10	0.18	0.04	0.75	75.60	59.00	10.36
		S	10.96**	4.52**	12.86**	0.13	0.55	0.16	0.48	66.02	59.11	21.13
	C_2	N	-0.07	2.46	4.49**	0.37	0.36	0.21	1.02	56.94	37.50	12.00
		S	7.30**	6.56**	4.34**	0.34	0.68	0.17	0.71	71.11	56.77	21.71
BY	C_1	N	2.29	-1.06	-18.47**	63.76	285.54	29.29	0.47	84.42	75.94	36.53
		S	13.49**	1.86	-5.56**	70.29	302.00	84.43	0.48	66.63	59.68	42.36
	C_2	N	37.31**	34.57	-4.75*	57.35	420.00	60.66	0.37	78.72	73.68	36.19
		S	15.84**	11.89**	-29.67**	235.88	237.46	28.67	1.00	86.11	57.53	28.88
GY	C_1	N	-1.32	7.64**	-18.59**	9.70	53.16	12.00	0.43	70.74	64.83	41.99
		S	2.48**	17.54**	-9.61**	3.92	45.75	31.24	0.29	43.30	41.52	40.08
	C_2	N	23.13**	24.38	-14.38**	32.26	127.83	31.42	0.50	69.61	61.81	51.94
		S	59.09**	54.15**	4.28**	101.19	101.64	20.29	1.00	78.95	52.71	61.97

Where: * & ** Significant and high Significant at 0.05 & 0.01 level of probability, respectively **M.P**= Heterosis over mid parents **B.P**= Heterosis over better parent.