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Genetic studies of parents and F_1 on terminal heat tolerance in wheat (*Triticum aestivum* L.) under late sown irrigated condition using Line X Tester design

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Abstract
The present investigation entitled "Genetic studies of parents and F_1 on terminal heat tolerance in wheat (*Triticum aestivum* L.) under late sown irrigated condition using Line X Tester design" was carried out during *rabi* 2017-18 and 2018-19 at the All India Co-ordinated Wheat and Barley Improvement Project, B.T.C. College of Agriculture and Research Station (IGKV), Bilaspur (C.G.). The experiment was conducted in RBD involving six lines, three testers and 18 F_1s hybrids of wheat with two replications for study of character associated with yield and yield contributing traits. Among the lines, CG 1015 (Chhattisgarh Gehu)-04 was found good in mean performance for days to 50% flowering, number of seed per spike, spike weight, canopy temperature depreciation and biological yield per plant and Raj 4238 was found good for the character of spike length, number of tillers per plant, number of spikelet per spike, 1000 seed weight and biological yield per plant. Among the testers, Halna was good in mean performance for the character of days to maturity, canopy temperature depreciation, and chlorophyll reflection index, Among the crosses, CG 1015 (Chhattisgarh Gehu-04) X HUW 661 was good in mean hybrid performance for days to50% flowering, canopy temperature depreciation and chlorophyll refection index. Raj 4238 X PHSL 10 was good in mean hybrid performance for plant height, number of tillers per plant and canopy temperature depreciation. HD 2285 X HUW 661 was good in mean hybrid performance for spike weight and yield per plant and crosses HD 2932 X Halna was good in mean hybrid performance for the character of 1000 seed weight.

Keywords: Wheat, line X tester, terminal heat tolerance, late sown irrigated condition

Introduction
Wheat (*Triticum aestivum* L.) is India's second biggest Staple raised food next to rice, it is widely cultivated. In the central region, bread wheat (Hexaploid 2n=42) and durum wheat (Tetraploid 2n=28) are mostly grown zone. Chhattisgarh comes under the central zone along with MP, Gujarat and some part of Rajasthan. Wheat is just the thermo-sensitive longer day crops, widely grown primarily in the developing countries densely populated tropical and subtropical regions. During the growing season the weather condition, specifically temperature, has a significant effect on wheat metabolic processes. Over the past two decades global warming has triggered temperature changes rapidly. The increased temperature of plant growth during reproductive process has emerged as important problems in many parts of the world. Growth and production of crops are greatly affected by climate change variants like temperature. Changing the atmosphere is the source of temperature rise in many parts of the world causing stagnation of cereal grain productivity and increased yield potential variability. Among different genetic techniques, the combining ability analysis developed by Kempthorne (1957) [6]

Materials and Methods
The present research was conducted in two seasons of *rabi* in 2017-18 and 2018-19 at All India Co-ordinated Wheat and Barley Improvement Project at B.T.C. College of Agriculture and Research Station (Indira Gandhi Krishi Vishwavidyalaya), Bilaspur, Chhattisgarh, India. Nine wheat genotypes including six lines and three testers were crossed in a Line x Tester matting design and developed 18 F_1 hybrids during *rabi* 2017-18 (Table 1). The experiment was laid out with 18 hybrids and 9 parents in a randomized block design with two replication during *rabi* 2018-19.

Five competitive plants were randomly selected to record the observation on 15 characters *viz.* days to 50% flowering, days to maturity, plant height, peduncle length, spike length, number of tillers, number of spikelet per spike, number of seeds per spike, spike weight, yield per plant, 1000 seed weight, canopy temperature depreciation, chlorophyll reflection index, biological yield per plant and harvest index. Kempthorne (1957) [6]

Result and Discussion

Mean performance of female (line) parents

Among the lines, CG 1015 Chhattisgarh Gehu 04 was found good in mean performance for days to heading, number of seed per spike, spike weight, canopy temperature depreciation and biological yield per plant. Raj 4238 was found good for the character of spike length, number of tillers per plant, number of spikelet per spike, 1000 seed weight and biological yield per plant (Table 2). Similar results observed by Gupta *et al.*, (2017) [2].

Mean performance of male (tester) parents

Among the testers, Halna was good in mean performance for the character of days to maturity, canopy temperature depreciation, and chlorophyll reflection index (Table 2). Similar results observed by Singh *et al.*, (2012) [7].

Mean performance of hybrids (crosses)

Among the crosses, CG 1015 (Chhattisgarh Gehu-04) X HUW 661 was good in mean hybrid performance for days to heading, canopy temperature depreciation and chlorophyll refection index. Similar results observed by Joshi *et al.* (2003) [5]. Raj 4238 X PHSL 10 was good in mean hybrid performance for plant height, number of tillers per plant and canopy temperature depreciation. Similar results observed by Gothwal *et al.*, (2006) [3]. HD 2285 X HUW 661was good in mean hybrid performance for spike weight and yield per plant. Similar results observed by Jatav *et al.* (2014) [4]. crosses HD 2932 X Halna was good in mean hybrid performance for the character of 1000 seed weight (table-3). Similar results obtained by barot *et al.*, (2014) [1].

Conclusion

Among the line (female) CG 1015 Chhattisgarh Gehu-04 and Raj 4238 was found good in mean performance for more number of characters. Among the tester (male) Halna was found good in mean performance for more number of characters. Among the hybrids (crosses) CG 1015 (Chhattisgarh Gehu-04) X HUW 661, Raj 4238 X PHSL 10, HD 2285 X HUW 661 and HD 2932 X Halna were good in mean hybrid performance for more number of traits. The findings of the experiment could be helpful in wheat breeding programmes under late sown irrigated and terminal heat stress condition.

Table 1: Details of parents used in study

S. N	Genotypes	Notification year	Parentage	Released by	Farming condition
	Male/tester				
1	Halna	2002	HD 1982/K816	SVRC	Late sown
2	HUW 661	2016-17	NASN 2016-17(32)	-	-
3	PHSL 10	2016-17(83)	NASN 2016-17(83)	-	-
	Female/ Line				
1	Chhattisgarh Genhu 4 (CG-1015)	2017	NI 908/BL 1986	SVRC	Late sown
2	HD-2932	2008	KAUZ/STAR//HD2643	CVRC	Late sown
3	HD-2864	2004	DL 509-2/DL 377-8	CVRC	Late sown
4	Raj-4238	2013	HW 2021/RAJ 3765	CVRC	Late sown
5	MP-3336	2013	HD 2402/GW 173	CVRC	Late sown
6	HD 2285	1984	HD 1918/HD 1592/HD 1962/E 4870/K-65/4/HD 2160/5/HD 2180	CVRC	Late sown

Table 2: Mean performance of parents

S. No.	Parents		Days to 50% flowering (days)	Days to maturity (days)	Plant height (cm)	Peduncle length (cm)	Spike length (cm)	Number of tillers (per plant)	Number of spikelet's per spike	Number of seed per spike
	Lines/ Testers									
1	CG 1015		54.50	94.50	78.42	30.72	8.18	5.50	17.34	62.00
2	HD 2864		59.50	94.50	73.22	31.90	10.53	6.84	17.00	50.00
3	HD 2932		61.50	92.00	84.40	26.32	8.75	5.50	18.12	49.27
4	RAJ 4238		58.50	92.50	74.82	25.73	7.98	10.82	14.33	50.74
5	MP 3336		66.50	95.50	78.90	29.70	10.03	5.17	19.64	53.00
6	HD2285		70.50	98.00	65.25	24.83	8.65	6.00	16.50	54.00
	Average		61.83	94.50	75.83	28.20	9.02	6.63	17.15	53.16
1	Halna		60.50	90.50	73.86	26.55	10.30	5.61	18.00	53.72
2	HUW 661		55.50	90.50	84.40	25.89	9.85	6.16	18.17	56.00
3	PHSL 10		59.00	92.50	74.35	24.88	9.95	6.14	15.67	49.00
	Average		58.33	91.16	77.53	25.77	10.03	5.97	17.28	52.90
	Overall average		60.66	93.33	76.40	27.39	9.35	6.41	17.19	53.08
	Range	Minimum	54.50	90.50	65.25	24.88	7.98	5.17	14.33	49.00
		Maximum	70.50	98.00	84.40	31.90	10.53	10.83	19.64	62.00
	SE(m)+		1.77	1.22	5.78	2.38	0.84	0.8	3.86	3.21
	CD (5%)		4.99	3.46	16.46	6.87	2.42	2.24	11.02	9.11
	CV (%)		4.1	1.88	11.5	10.55	10.85	14.7	10.22	8.57

S. No.	Parents		Spike weight (g)	Yield per plant (g)	1000 seed weight (g)	Canopy temperature depreciation (°C)	Chlorophyll reflection index	Biological yield/ plant (gm)1	Harvest index (%)
	Lines/ Testers								
1	CG 1015		1.82	9.33	39.69	1.21	47.85	10.27	41.43
2	HD 2864		2.40	16.08	40.10	1.47	48.25	26.80	56.75
3	HD 2932		2.60	9.52	40.27	1.54	49.70	18.98	50.49
4	RAJ 4238		2.80	12.27	55.35	2.42	53.50	29.64	47.33
5	MP 3336		2.30	9.59	22.30	2.76	58.30	27.35	33.58
6	HD2285		2.31	9.76	39.71	2.69	56.45	20.40	41.66
	Average		2.37	11.09	39.57	2.01	52.34	22.24	45.20
1	Halna		1.97	8.52	34.42	3.61	63.05	18.62	40.78
2	HUW 661		1.97	8.57	29.19	3.60	47.05	24.52	43.25
3	PHSL 10		2.32	9.38	31.71	3.21	55.25	27.50	44.99
	Average		2.08	8.82	31.77	3.47	55.11	23.54	43.00
	Overall average		2.27	10.33	36.97	2.50	53.26	22.67	44.47
	Range	Minimum	1.82	8.52	22.30	1.21	47.05	10.27	33.58
		Maximum	2.80	16.08	55.35	3.61	63.05	29.64	56.75
	SE(m)+		0.24	1.09	3.84	0.29	3.04	2.11	5.19
	CD (5%)		0.67	3.2	10.95	0.86	8.65	6.01	14.76
	CV (%)		14.87	13.64	14.52	14.93	8.14	13.58	14.27

Table 3: Mean performance of hybrid

S. No.	Crosses		Days to 50% flowering (days)	Days to maturity (days)	Plant height (cm)	Peduncle length (cm)	Spike length (cm)
1	CG1015 X Halna		57.00	93.00	80.68	32.42	9.23
2	CG1015 X HUW661		54.00	92.00	69.48	29.80	9.09
3	CG1015 X PHSL10		53.00	92.00	68.22	29.88	7.63
	Average		55.33	92.33	72.79	30.7	8.65
4	HD 2864 X Halna		56.00	94.50	80.40	30.51	9.13
5	HD 2864 X HUW661		59.00	95.50	70.64	31.68	9.98
6	HD 2864 X PHSL10		60.00	94.50	78.47	29.23	11.00
	Average		58.33	94.83	76.50	30.47	10.03
7	HD 2932 X Halna		60.50	90.00	80.81	25.65	9.91
8	HD 2932 X HUW661		63.50	90.00	75.48	27.37	8.98
9	HD 2932 X PHSL10		63.50	89.00	72.41	25.90	9.05
	Average		62.5	89.66	76.23	26.30	9.31
10	RAJ4238 X Halna		58.50	91.50	79.85	31.95	10.13
11	RAJ4238 X HUW661		59.50	92.00	74.72	30.97	8.69
12	RAJ4238X PHSL10		61.00	91.00	83.09	31.37	8.18
	Average		59.66	91.5	79.22	31.43	9
13	MP3336 X Halna		61.50	91.50	82.13	30.54	10.95
14	MP3336 X HUW661		59.00	94.00	79.66	26.64	10.68
15	MP3336 X PHSL10		59.50	93.50	76.12	26.42	10.77
	Average		60	93	78.97	27.86	10.8
16	HD 2285 X Halna		65.50	94.50	68.00	21.73	9.43
17	HD2285 X HUW661		62.00	95.00	67.49	23.15	9.34
18	HD2285 X PHSL10		61.50	94.50	64.55	22.87	8.10
	Average		63	94.66	66.68	22.58	8.95
	Overall Average		59.80	92.66	75.06	28.22	9.45
	Range	Minimum	54	89	64.55	21.73	7.63
		Maximum	65.5	95.5	83.09	32.42	11
	SE(m)+		1.76	1.23	5.79	2.39	0.84
	CD (5%)		4.99	3.47	16.46	6.8	2.412
	CV (%)		4.10	1.86	11.10	11.55	11.85

S. No.	Crosses	No.of tillers/ plant	No. of spikelets/spike	No. of seedr/ spike	Spike weight (g)	Yield per plant (g)
1	CG1015 X Halna	7.67	15.50	48.50	1.56	9.53
2	CG1015 X HUW661	7.50	17.16	53.00	1.98	10.46
3	CG1015 X PHSL10	6.17	14.00	43.25	2.32	7.39
	Average	6.11	15.55	48.25	1.95	9.12
4	HD 2864 X Halna	6.50	15.50	47.75	1.77	12.74
5	HD 2864 X HUW661	7.34	19.16	60.50	2.53	15.17
6	HD 2864 X PHSL10	9.50	16.63	50.75	2.28	14.55
	Average	7.78	17.09	53	2.19	14.15
7	HD 2932 X Halna	6.67	18.50	58.25	2.02	10.11
8	HD 2932 X HUW661	6.50	19	57.50	2.16	12.32
9	HD 2932 X PHSL10	7.37	18	56.00	2.02	9.58
	Average	6.84	18.5	57.25	2.06	10.67

10	RAJ4238 X Halna		6.95	16.33	50.75	1.71	13.06
11	RAJ4238 X HUW661		7.17	14.16	43.25	1.98	15.16
12	RAJ4238X PHSL10		9.83	13.33	41.00	2.51	11.48
	Average		7.98	14.60	45	2.06	13.23
13	MP3336 X Halna		7.67	19.16	59.00	1.42	9.47
14	MP3336 X HUW661		5.33	19.83	61.25	1.58	10.44
15	MP3336 X PHSL10		4.84	20.33	62.75	1.92	9.57
	Average		5.94	19.77	61	1.64	9.82
16	HD 2285 X Halna		5.34	17.16	53.00	2.25	11.33
17	HD2285 X HUW661		5.33	16.00	50.00	2.80	15.63
18	HD2285 X PHSL10		5.50	15.83	48.50	2.33	8.69
	Average		5.39	16.33	50.5	2.46	11.88
	Overall Average		6.84	16.97	52.5	2.06	11.48
	Range	Maximum	4.84	13.33	41	1.42	7.39
		Maximum	9.83	20.33	62.75	2.8	15.63
	SE(m)+		0.8	3.85	3.24	0.21	1.09
	CD (5%)		2.27	11.02	9.12	0.65	3.1
	CV (%)		14.64	10.26	8.57	14.82	13.65

S. No.	Crosses		1000 seed weight	CTD(°C)	Chlorophyll reflection index	Biological yields /plant (gm)	Harvest index (%)
1	CG1015 X Halna		36.84	1.88	52.50	18.21	49.24
2	CG1015 X HUW661		37.55	1.77	59.60	18.65	65.14
3	CG1015 X PHSL10		41.07	1.79	56.60	19.98	47.80
	Average		38.48	1.81	56.23	18.94	54.06
4	HD 2864 X Halna		37.54	3.37	57.30	21.23	61.47
5	HD 2864 X HUW661		36.00	2.67	50.27	23.54	70.15
6	HD 2864 X PHSL10		31.53	2.65	52.50	24.65	53.38
	Average		35.02	2.89	53.35	23.14	61.66
7	HD 2932 X Halna		43.67	3.78	52.84	16.54	41.91
8	HD 2932 X HUW661		38.54	2.45	53.30	19.54	55.70
9	HD 2932 X PHSL10		37.87	3.12	48.10	21.54	55.24
	Average		40.02	3.11	51.41	19.20	50.95
10	RAJ4238 X Halna		37.03	3.70	50.42	28.41	47.00
11	RAJ4238 X HUW661		43.40	3.47	54.40	19.54	55.59
12	RAJ4238X PHSL10		39.17	3.90	48.35	20.56	48.88
	Average		39.86	3.69	51.05	22.83	50.49
13	MP3336 X Halna		34.84	3.28	53.70	28.41	35.80
14	MP3336 X HUW661		39.27	3.28	51.10	26.54	42.24
15	MP3336 X PHSL10		25.88	2.85	50.60	24.21	44.00
	Average		33.33	3.13	51.8	26.38	40.68
16	HD 2285 X Halna		38.22	2.84	47.95	21.54	48.18
17	HD2285 X HUW661		37.47	3.78	49.55	22.54	58.40
18	HD2285 X PHSL10		32.97	2.29	51.65	23.45	42.34
	Average		36.22	2.97	49.71	22.15	49.64
	Overall Average		37.15	2.93	52.26	22.17	51.24
	Range	Minimum	25.88	1.77	47.95	16.54	35.8
		Maximum	43.67	3.9	59.6	28.41	70.15
	SE(m)+		3.84	0.29	3.05	2.12	5.19
	CD (5%)		10.95	0.83	8.67	6.01	14.74
	CV (%)		14.51	14.92	8.11	13.57	14.27

References

1. Barot HG, Patel MS, Sheikh WA, Patel LP, Allam CR. Heterosis and combining ability analysis for yield and its component traits in wheat [*Triticum aestivum* (L.)]. Electronic Journal of Plant Breeding, 2014; 5(3):350-359
2. Gupta VK, Agarwal AP, Minz MG. Combining abilitystudy in wheat under timely sown irrigated condition. International journal of bio-resource and stress management. 2017; 8(6):784-789
3. Gothwal DK. Genetic studies on high temperature tolerance at post anthesis in wheat (*Triticum aestivum* L. em. Thell). Unpubl. Ph.D. Thesis, RAU, Bikaner, Campus- Jobner, 2006.
4. Jatav *et al*. genetic and combining ability analysis in wheat. Bhartiya Krishi Anushandhan Patrika, 2014; 29(2):55-58.
5. Joshi SK, Sharma SN, Singhania DL, Sain RS. Genetic analysis of yield and its components traits in spring wheat. Acta Agron. Hung. 2003; 51:139-147.
6. Kempthorne O. An introduction to Genetic Statistics. John Wiley and Sons Inc., New York; Champman Hall, London, 1957.
7. Singh K, Sharma SN, Sharma Y, Tyagi BS. Combining ability for high temperature tolerance and yield contributing traits in bread wheat. J Wheat Res. 2012; 4(1):29-37.