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Research Article

Evaluation and identification of wheat hybrids for wider adaptability

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Abstract
The experimental material comprising F_1, F_2, BC_1 and BC_2 generations derived from crosses involving five parents were evaluated to find out stability in bread wheat under four environments. The differences among the crosses were significant for most of the characters studied except ear length, number of spikelets per spike, spike weight per plant, biological yield, harvest index and grain yield per plant. Among environment + varieties x environment interaction significant differences were found for characters such as days to 50% flowering, plant height, number of tillers per plant, number of spikelets per spike and harvest index. The differences for environments were significant for most of the characters except number of tillers per plant, number of grains per spike, spike weight per plant, biological yield, harvest index and grain yield per plant. Further stability analysis revealed that most of the genotypes showed varying stability for different crosses, generations and characters. Cross HI 1500 x HD 2868 was found stable over environments for yield per plant while cross M3020 x NI 5439 and HD 2868x HI 1500 was found stable for harvest index.

Key words
Wheat, stability, G x E interaction, grain yield

Introduction

Wheat is the most important staple food for humans. Approximately one-sixth of the total arable land in the world is cultivated with wheat. Wheat is grown under wide range of climatic conditions but adapted to cool and dry environment. The global area under wheat comes to 226.95 m. ha and contributes to the extent of about 27% of the total food grain production. It is staple food for nearly 40 per cent of world population covering at least, 43 countries and provides 20 per cent of food calories to the mankind. In Madhya Pradesh, wheat shares major area of *rabi* crops about 62-65 percent, mainly grown in partial irrigated condition (1-2 irrigation). The area production and productivity (2014-15) of wheat in M.P. are 5.56 million hectares, 14.18 million tons and 2551 kg/ha, respectively. The productivity of wheat in M.P. is estimated to be 2.5 tonnes/ha, which is quite low in comparison to productivity at national level (2.9 tons/ha.). The objective in many plant breeding programmes is the selection of genotypes which give consistent performance over a wide range of environments. The selection is often ineffective due to lack of information on genotype x environment. In the present study an effort was made to identify suitable crosses having stability and wider adaptability for different environments.

Materials and Methods

The experimental material consisted of F_1, F_2, BC_1 and BC_2 generations derived from the crosses made between 5 diverse parents *viz*. MP 3020, NI 5439, HD 2868, HI 1500 and HD 2889. Experiment was conducted in four environments *viz*. irrigated condition 2012-13, rainfed 2012-13, irrigated condition 2013-14, rainfed 2013-14. The experiment was laid out in randomized complete block design with 4 replications; one row of P_1, P_2, F_1, BC_1, BC_2 and twenty rows of F_2 generation in each of the four crosses (MP 3020× NI 5439, HD 2868× HI 1500, HI 1500× HD 2868 and HI 1500× HD 2889) in each replication were grown, under rainfed and irrigated condition. The observations were recorded in 10 randomly selected plants in each replication of all the generations raised for 12 characters *viz.* days to 50 % flowering, days to maturity, plant height (cm), number of tillers/ plant, ear length (cm), number of spikelets per spike, number of grains per spike, spike weight per plant (g), grain yield per plant (g), 1000-grain weight (g), biological yield (g) and harvest Index (%). The data were statistically analysed to find out adaptability of hybrids using Eberhart and Russell model.

Results and Discussion

The variation due to variety x environment (linear) interaction had showed significant differences for plant height, number of tillers per plant and harvest index (Table 1). Similarly pooled deviation was found significant for all characters except number of tillers per plant and harvest index. The above results are in agreement with the finding of Bangarwa and Luthra(1966).

The stability parameters such as mean (m), regression coefficient (bi), deviation from regression (S^2di) for all twelve characters of each generation were estimated and are presented in table 2 to 4.

The regression coefficient of less than unity, high mean values with lesser deviation from regression have been revealed for most of the crosses,

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generations and characters. In cross HD2868 x HI1500 parent P_1, cross HI1500 x HD2868 parent P_2, generationF_1 and backcrosses BC_1 and BC_2 for days to 50 % flowering, for days to maturity (Table 2) in cross HD2868 x HI1500 P_1 F_1 F_2, cross HI1500 x HD2868 parents P_1 P_2, cross HI1500 x HD2889 parents P_1 P_2 F_1 F_2 BC_1 and BC_2, for plant height in cross MP3020 x NI5439 P_1 P_2 F_2, cross HI1500 x HD2889 P_1 and F_2, for number of tillers per plant (Table 2) in cross MP3020 x NI5439 F_2, for number of grains per spike (Table 3) P_1 F_1 in cross MP3020 x NI5439, for ear length cross (Table 3) HI1500 x HD2868 P_1 P_2 F_1, cross HI1500 x HD2889 parents P_1 P_2 F_1 and BC_1, for number of spikelets per spike (Table 3) in cross HI1500 x HD2868 P_1 P_2 F_1 F_2 BC_1 and BC_2 and in cross HI1500 x HD2889 P_1 P_2 F_1 F_2 BC_1 and BC_2, for spike weight per plant (Table 3) in cross HI1500 x HD2868 generation F_2, cross HI1500 x HD2889 P_1 and F_2, for character 1000 grain weight (Table 4) cross MP3020 x NI5439 F_1 and BC_2, cross HI1500 x HD2889 BC_2, in cross HI1500 x HD2889 P_2 and F_2, for harvest index (Table 4) in cross HD2868 x HI1500 F_1, cross HI1500 x HD2868 F_1 and for grain yield per plant (Table 4) in cross MP3020 x NI5439 generation F_2, cross HI1500 x HD2868 parent P_2, generation F_1 $F_2$and BC_1 and in cross HI1500 x HD2889 parents P_1 P_2, generations F_1 and F_2. These have been possessed high stability and reflecting they have wider adaptation could be grown under all type of environments. The finding of Mishra *et al.,* (2000) suggested that WH 147 was responsive to rich environment which contradictory with present investigation.

The crosses, generations and characters have regression coefficient less than unity with low mean values *viz*. for character days to 50 % flowering (Table 2) in cross MP3020 x NI5439 in generations F_1, cross HI1500 x HD2889 parent P_1 and generation F_1 and backcross BC_2, for days to maturity in cross (Table 2) HI1500 x HD2868 in parents P_1 P_2, for plant height (Table 2) in cross HD2868 x HI1500 P_1 P_2 F_1 F_2 BC_1 and BC_2, for number of grains per spike (Table 3) in cross MP3020 x NI5439 P_2 F_1 BC_1 and BC_2, cross HI1500 x HD2889 generation F_2, for number of spikelets per spike (Table 3) in cross HD2868 x HI1500 P_1 P_2 F_1 F_2 BC_1 and BC_2, for harvest index (Table 4) in cross MP3020 x NI5439 P_1 P_2 F_1 and F_2, cross HD2868 x HI1500 parents P_1 P_2 generation F_2 and backcrosses BC_1 BC_2, cross HI1500 x HD2868 parents P_1 P_2 generation F_2 backcross BC_1 and BC_2, and for grain yield per plant (Table 4) in cross HI1500 x HD2868 in P_1 and BC_2 recorded above average stability and they are suitable for specific environment. Same findings were exhibited by Borghi (1990) having regression coefficient (b) more than unity and mean values less than their population mean exhibited below average stability performance, these, crosses, generations and characters such as plant height (Table 2) in cross MP3020 x NI5439 in generation F_1 and BC_2, cross HD2868 x HI1500 parent P_1 P_2 generations F_1 F_2 and backcrosses BC_1 BC_2, for ear length (Table 3) in cross HD2868 x HI1500 parent P_1 and generation F_1, cross HI1500 x HD2868 parent P_1 P_2 generations F_1 F_2, for number of spikelets per spike (Table 3) in cross HI1500 x HD2868 parent P_2, for spike weight per plant (Table 3) in cross MP3020 x NI5439 P_2 F_1 and BC_2, cross HI1500 x HD2889 P_1 F_1 and BC_2, for 1000 grain weight in cross MP3020 x NI5439 parent P_1 and P_2, cross HD2868 x HI1500 parent P_1 and P_2, cross HI1500 x HD2868 generation F_1, cross HI1500 x HD2889 P_1 and P_2, for biological yield (Table 4) in cross MP3020 x NI5439 P_2 and BC_2, cross HD2868 x HI1500 P_1 F_1 and BC_2, cross HI1500 x HD2889 P_2 and BC_2, for harvest index (Table 4) in cross MP3020 x NI5439 parent P_2, cross HI1500 x HD2889 generation F_1 and for grain yield per plant (Table 4) in cross MP3020 x NI5439 parent P_2 F_1 and BC_1, cross HD2868 x HI1500 backcrosses BC_1 and BC_2. Hence these are not highly stable and they are poorly adapted to all environments. Same findings were reported by Shazia *et al.* (2015), and Misganaw *et al*. (2016).

Similarly, for character days to 50 % flowering (Table 2) in cross MP3020 x NI5439 parent P_1 P_2 generation F_2 backcrosses BC_1 and BC_2, cross HD2868 x HI1500 P_2 F_1 and F_2, cross HI1500 x HD2889 parent P_2 F_2 and BC_1, for days to maturity (Table 2) in cross MP3020 x NI5439 parents P_1 P_2 generations F_1 F_2 and backcrosses BC_1 BC_2, cross HD2868 x HI1500 backcross BC_1, cross HI1500 x HD2868 F_1 F_2 BC_1 and BC_2, for plant height (Table 2) in cross HI1500 x HD2868 generation F_1 backcross BC_1 and BC_2, cross HI1500 x HD2889 P_2 and F_1, for number of tillers per plant (Table 2) in cross MP3020 x NI5439 parent P_1 P_2 generation F_1 and backcrosses BC_1 BC_2, cross HD2868 x HI1500 P_1 P_2 F_1 F_2 BC_1 and BC_2, cross HI1500 x HD2868 generation P_1 P_2 F_2 BC_1 and BC_2, cross HI1500 x HD2889 P_1 P_2 F_1 and F_2, for number of grains per spike (Table 3) in cross HD2868 x HI1500 parents P_1 P_2 F_2 BC_1 and BC_2, cross HI1500 x HD2868 P_1 P_2 F_1 BC_1 and BC_2, cross HI1500 x HD2889 parent P_1, for character ear length (Table 3) in cross MP3020 x NI5439 for all generations P_1 P_2 F_1 F_2 BC_1 and BC_2, cross HD2868 x HI1500 P_2 F_2 BC_1 and BC_2, cross HI1500 x HD2889 generation F_2, for number of spikelets per spike (Table 3) in cross MP3020 x NI5439 parent P_1 P_2 generations F_1 F_2 and backcrosses BC_1 BC_2, for spike weight per plant (Table 3) in cross HD2868 x HI1500 parent P_2 and generation F_2, for 1000 grain weight (Table 4) in cross HD2868 x HI1500 generation F_1 F_2 backcross BC_1 and BC_2, for biological yield (Table 4) in cross HI1500 x HD2868 parent P_2 generation F_2 and backcross BC_2, cross HI1500 x HD2889 parent P_1 generation F_1 F_2 and BC_1showed specific

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adaptation since they had regression coefficient greater than one and mean values more than their population mean for majority of the characters and, therefore, these crosses and generations may be exploited under optimal favorable environmental condition. Same findings revealed by Luthra OP (1994), Shazia *et al.* (2015) Kurt *et al*. (2016).

It is concluded from the above study that cross HI 1500 x HD 2868 was found stable over environments for yield per plant while cross M3020 x NI 5439 and HD 2868 x HI 1500 was found stable for harvest index.

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Table 1. Pooled analysis of variance for seed yield per plant and its components in wheat

Source of variation	d.f.	Days to 50% flowering	Days to maturity	Plant height (cm)	Number of tillers/ plant	Ear length (cm)	Number of spikelets/ spike (g)	Number of grains per spike (g)	Spike weight/ plant (g)	1000-grain weight (g)	Biological Yield (g)	Harvest Index (%)	Grain Yield/ plant (g)
Varieties	23	20.96**	20.51*	612.28***	48.99**	7.29	0.85	153.30***	139.93	132.36***	346.16	640.87	56.39
Env.+(var.*Env.)	72	16.24*	13.81	259.10*	20.38***	7.85	7.38***	56.87	103.66	21.95	221.25	558.08**	30.47
Environments	3	200.26***	76.18***	924.21*	16.11	55.06***	158.86***	35.25	80.90	110.26***	69.96	1399.33	37.98
Var.*Env.	69	8.24	11.10	230.18	20.57***	5.80	0.79	57.81	104.65	18.11	227.82	521.51**	30.15
Environments (Lin.)	1	600.79***	228.52***	2772.63***	48.32**	165.17***	476.58***	105.75	242.70	330.77***	209.87	4197.99***	113.93
Var.*Env. (Lin.)	23	6.38	13.34	371.31**	47.70***	2.82	0.97	57.53	88.73	22.58	279.53	1040.27***	12.04
Pooled Deviation	48	8.80***	9.56***	152.96***	6.71	6.99**	0.68***	55.54***	107.92***	15.21***	193.56***	251.20	37.57***
Pooled Error	288	3.52	1.92	23.55	12.13	3.97	0.33	16.09	34.80	4.33	44.25	636.60	12.23
Total	95	17.39	15.43	344.60	27.31	7.72	5.80	80.22	112.44	48.68	251.49	578.13	36.75

* at 5 % probability, ** at 1 % probability and *** at 0.1 % Probability

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Table 2. Estimates of stability parameters for days to 50 % flowering, days to maturity, plant height and number of tillers per plant

Crosses	Generations	Days to 50% flowering			Days to maturity			Plant height			Number of tillers/ plant		
		Mean	bi	S^2di	Mean	bi	S^2di	Mean	bi	S^2di	Mean	bi	S^2di
MP3020 X NI5439	P_1	79.84	1.046	-2.87	132.3	1.061	5.3*	138.3	0.367	14.5	13.75	2.510	-5.45
	P_2	81.12	1.318	-3.45	133.0	1.186	11.5**	132.3	0.518	151.0***	11.81	3.299	-9.60
	F_1	74.99	0.982	-2.89	136.9	2.042	4.9*	124.0	2.583	181.9***	11.19	1.249	-11.99
	F_2	81.01	1.147	-2.59	135.9	1.499	-0.5	136.0	0.516	68.5*	18.30	0.398	100.32***
	BC_1	79.94	1.849	5.43	134.0	1.760	13.0***	109.0	-0.288	212.6***	11.07	1.365	-10.34
	BC_2	78.80	1.183	-2.75	135.0	2.634	33.8***	114.5	-2.549	360.7***	11.87	1.869	-11.19
HD2868 X HI1500	P_1	77.42	0.533	5.14	129.6	0.369	0.0	114.3	3.627	122.3**	11.26	3.130	-12.04
	P_2	82.54	1.178	0.96	133.3	1.594	15.3***	125.1	1.954	12.4	11.83	2.760	-8.87
	F_1	78.59	1.479	28.29***	132.8	0.428	3.5	111.1	5.259	144.1***	10.90	1.894	-7.32
	F_2	81.25	1.071	-1.79	133.1	0.796	1.9	122.6	2.359	8.0	12.97	3.138	-10.35
	BC_1	82.41	0.978	24.12***	133.6	1.390	26.4***	106.4	1.649	179.1***	9.87	2.285	-9.48
	BC_2	81.56	0.026	41.18***	134.9	0.731	65.6***	106.1	3.857	199.2***	10.24	3.188	-8.28
HI1500 X HD2868	P_1	78.62	1.068	-1.34	129.6	0.369	0.0	135.0	0.768	39.5	11.54	2.043	-11.45
	P_2	81.74	0.821	-0.55	130.8	0.614	-1.3	135.4	0.732	34.6	12.99	3.023	-10.63
	F_1	75.81	0.236	1.72	133.7	1.231	-0.6	139.3	1.200	133.1	12.57	0.033	-12.13
	F_2	81.32	1.105	-1.90	133.7	1.398	-1.0	134.3	0.932	70.8*	12.42	1.667	-11.67
	BC_1	81.20	0.438	19.54**	135.5	1.096	6.3*	121.8	-1.022	90. 0**	11.55	1.699	-11.66
	BC_2	82.16	0.293	39.72***	138.5	4.009	5.8*	127.4	1.097	107.4**	10.25	4.118	-9.36
HI1500 X HD2889	P_1	79.29	0.801	-3.44	130.7	-0.328	-1.1	138.7	0.352	-10.1	12.27	1.078	-11.94
	P_2	80.82	1.185	-3.36	130.9	-0.676	-1.0	129.6	1.376	182.2***	12.89	3.154	-10.50
	F_1	74.49	0.759	-3.34	135.1	0.392	-1.2	138.7	1.263	149.9***	11.71	1.160	-11.91
	F_2	81.11	1.192	-2.76	134.9	0.669	-1.1	134.3	0.929	70.3*	27.19	-21.125*	0.005
	BC_1	81.15	2.389	-2.97	131.6	-0.359	-1.2	110.7	-1.586	250.1***	11.11	-0.801*	-12.02
	BC_2	78.20	0.916	-3.40	131.3	-0.645	-0.9	100.7	-1.885	362.9***	12.35	-0.065*	-12.13
	Mean	79.81	1.00		133.4	1.0		124.4	1.0		12.66	1.00	
	S.E.(m)	1.71	0.59		1.8	1.0		7.1	1.2		1.49	1.82	

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Table 3. Estimates of stability parameters for number of grains/spike, ear length, number of spikelets per spike and spike weight per plant

Crosses	Generations	Number of grains/spike			Ear length (cm)			Number of spikelets / spike			Spike weight per plant (g)		
		Mean	bi	S^2di	Mean	bi	S^2di	Mean	bi	S^2di	Mean	bi	S^2di
MP3020 X NI5439	P_1	63.69	-0.352	39.13*	11.49	1.077	-2.34	20.37	1.045	0.18	63.69	1.424	39.13*
	P_2	55.07	4.530	6.35	11.67	1.025	-1.70	20.11	1.014	-0.15	55.07	1.622	6.35
	F_1	51.63	-0.291	-0.73	11.02	1.139	-3.54	20.71	1.211	0.10	51.63	2.183	-0.73
	F_2	59.84	1.975	-14.95	12.01	1.830	-3.79	20.74	1.094	-0.08	59.84	0.207	-14.95
	BC_1	52.82	1.648	0.63	12.97	0.724	-0.09	19.95	1.055	0.91*	52.82	-0.504	-0.63
	BC_2	52.42	8.467	303.76***	12.87	1.185	-2.99	20.01	1.026	0.91*	52.42	3.295	303.76***
HD2868 X HI1500	P_1	55.50	1.765	1.65	11.80	1.555	-0.23	19.91	0.836	-0.27	55.50	1.925	1.65
	P_2	64.99	1.973	105.19***	12.17	1.539	-2.16	19.66	0.922	-0.10	64.99	2.802	105.19***
	F_1	56.29	-0.357	5.75	11.99	1.392	-2.19	19.86	0.905	0.99*	56.29	4.716	5.75
	F_2	66.32	4.776	55.09*	12.27	1.580	-3.58	21.29	0.228	7.71***	66.32	1.503	55.09*
	BC_1	55.37	-2.242	5.21	12.36	1.403	-3.37	19.84	1.102	0.89*	55.37	2.325	5.21
	BC_2	54.59	-2.373	530.59***	12.44	1.587	-3.20	19.80	1.125	0.86*	54.59	6.350	530.59***
HI1500 X HD2868	P_1	55.32	4.110	-6.75	10.36	0.387	-3.90	20.00	0.896	-0.30	55.32	0.079	-6.75
	P_2	57.56	3.695	-8.54	11.31	0.639	-3.80	19.55	1.098	-0.29	57.56	1.543	-8.54
	F_1	58.72	-2.662	-12.17	11.09	0.513	-3.86	20.60	0.986	-0.30	58.72	-2.441	-12.17
	F_2	60.54	-0.969	-15.57	11.95	1.332	-3.22	20.45	1.008	-0.30	60.54	-0.128	-15.57
	BC_1	51.29	2.098	-13.66	12.30	1.260	-3.31	20.45	1.322*	-0.28	51.29	-1.716	-13.66
	BC_2	72.69	3.418	-9.63	12.06	1.899	-2.47	20.22	1.423*	-0.27	72.69	8.388	-9.63
HI1500 X HD2889	P_1	66.34	-5.271	-0.72	10.44	0.333	-3.92	19.92	0.930	-0.30	66.34	-2.490	-0.72
	P_2	55.31	5.612	1.32	11.71	0.351	-3.92	19.92	0.930	-0.30	55.31	0.907	1.32
	F_1	52.05	3.024	-11.04	10.74	0.765	-3.72	20.20	1.165	-0.29	52.05	-1.982	-11.04
	F_2	59.10	0.256	-16.06	17.12	-1.018	141.14***	20.45	1.020	-0.30	59.10	0.952	-16.06
	BC_1	55.14	-1.054	-15.48	13.84	0.477	-3.87	19.30	0.852*	-0.30	55.14	-5.165	-15.48
	BC_2	43.62	-7.773	17.33	12.97	1.026	-3.53	19.40	0.807*	-0.30	43.62	-1.795	17.33
	Mean	57.34	1.00		12.12	1.000		20.11	1.00		57.34	1.00	
	S.E.(m)	4.30	3.55		1.52	1.007		0.47	0.18		4.30	3.55	

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Table 4. Estimates of stability parameters for 1000 grain weight, biological yield, harvest index and grain yield per plant

Crosses	Generations	1000-grain weight (g)			Biological Yield (g)			Harvest Index (%)			Grain yield per plant(g)		
		Mean	bi	S^2di	Mean	bi	S^2di	Mean	bi	S^2di	Mean	bi	S^2di
MP3020 X NI5439	P_1	45.09	1.624	182.23***	74.60	4.366	221.83**	32.19	0.795	-590.26	22.92	2.970	-9.79
	P_2	45.66	2.215	6.63	57.99	1.934	389.54***	51.29	5.790	-265.06	19.15	3.330	-1.20
	F_1	47.58	0.464	26.19**	62.08	-0.820	422.24***	32.50	-0.545	-478.33	19.34	3.404	-7.84
	F_2	48.62	1.462	-3.55	73.13	2.043	-24.32	36.09	-0.416*	-634.03	26.52	-0.437	15.53
	BC_1	47.74	1.670	-4.14	57.66	-0.214	149.26*	53.70	6.051	-140.37	19.25	4.268	60.91**
	BC_2	50.29	0.728	15.68*	59.17	2.012	783.76***	41.80	2.517	-518.29	18.67	0.717	49.08**
HD2868 X HI1500	P_1	30.46	1.591	2.79	58.88	2.559	-40.11	32.11	-0.584*	-619.61	19.20	0.507	20.19
	P_2	43.90	1.149	-3.95	81.99	8.278	49.61	30.68	0.092*	-629.98	25.17	0.514	43.26*
	F_1	45.47	2.244	-3.78	47.41	-3.467	240.12**	42.97	-0.564	-604.65	19.96	3.468	2.07
	F_2	46.48	1.419	-0.42	71.76	3.737	-22.28	37.94	-0.072*	-630.63	27.29	1.133	10.39
	BC_1	47.45	1.068	11.97*	60.67	2.181	117.96*	27.34	0.303	-424.37	15.81	2.984	5.75
	BC_2	49.49	2.084	9.75*	52.66	-0.857	826.71***	27.64	-0.548	-578.65	14.42	2.167	70.48**
HI1500 X HD2868	P_1	27.45	0.770	-2.96	58.71	1.843	-38.77	31.17	-0.480*	-623.97	18.52	0.436	8.78
	P_2	42.69	0.426	-3.91	76.15	3.844	-20.43	29.86	0.247*	-633.24	22.45	0.073	-11.63
	F_1	44.04	1.335	-0.22	56.41	-7.003	34.74	43.83	-0.611*	-616.09	24.22	-0.336	0.26
	F_2	46.05	1.563	1.29	71.79	3.707	-22.10	38.69	-0.082*	-636.22	27.81	0.397	5.25
	BC_1	48.66	1.673	2.12	60.60	-7.949	57.54	37.67	-0.530*	-621.20	21.86	-0.507	16.23
	BC_2	48.69	0.565	-3.59	68.42	9.756	109.09*	26.69	-0.436*	-626.18	18.90	0.931	83.72***
HI1500 X HD2889	P_1	37.45	-3.895	30.57***	63.97	-1.200	-41.93	38.84	0.430	-626.46	24.49	-0.357	1.92
	P_2	41.70	0.886	-2.51	62.69	11.628	173.56**	74.68	5.560	1058.42	23.37	-0.050*	-11.94
	F_1	49.29	-1.114	-1.47	65.26	-12.12	192.33**	38.57	-1.234	-553.05	23.02	-0.776	-8.79
	F_2	47.85	0.723	-3.12	72.87	3.078	-28.98	35.69	-0.438*	-626.07	26.15	0.618	30.11*
	BC_1	46.52	1.108	-1.50	65.25	4.769	-7.59	70.61	6.598	1750.35	21.33	-1.375	197.02***
	BC_2	50.00	2.139	7.21	42.42	-8.108	61.65	54.81	2.157	-381.45	15.49	-0.677	38.45*
	Mean	44.94	1.00		63.44	1.00		40.31	1.00		21.47	1.00	
	S.E.(m)	2.25	1.05		8.03	4.70		9.15	1.20		3.54	2.81	