

Physiological investigations on heat and drought stress tolerance in wheat

Heat and Drought Tolerance Screening Trial (HDTST) was conducted to identify the temperature and drought stress tolerant lines among AVT final year genotypes and the trial was planted under timely sown (TS), late sown (LS) and drought stress (DR) conditions. The HDTST trial was conducted using 25 entries including checks sown in 5 x 5 lattice square design with two replications during the crop season 2022-23. The trial was planted at 12 locations under TS (November) and LS (December) conditions keeping at least 21 days difference between the sowing dates to expose the crop to optimum and high temperature environments, respectively. In addition, one set was also planted under drought stress condition with pre sown irrigation. Observations on weather, growth and yield parameters were recorded at all the locations in the prescribed format. Physiological parameters namely Normalized Difference Vegetation Index (NDVI), canopy temperature (CT) and chlorophyll content index (CCI) were recorded at 15 days after anthesis (DAA) and 21 DAA at Karnal, Ludhiana, Hisar, Sabour, Junagadh, Vijapur, Dharwad and Pune locations. The data from Ranchi centre was not included for analysis, as there was no yield reduction under stress conditions and rest of the 11 locations data were considered for pooled analysis.

Magnitude of heat and drought stress:

- In NWPZ and NEPZ, the mean minimum and maximum temperature across centres was higher by 1.3°C and 1.1°C respectively, under reproductive stage in LS compared to TS conditions. The RH ranged from 42-73% and the rainfall received was more under LS reproductive stage compared to TS.
- In CZ and PZ, the mean minimum and maximum temperature across centres was higher by 1.9°C and 1.8°C respectively, under reproductive stage in LS compared to TS conditions. The RH ranged from 38-70% and the rainfall received was higher in reproductive phase in both the zones.

Impact of heat/drought stress was adjudged by taking into account, Heat Sensitivity Index (HSI) and Drought Sensitivity Index (DSI). HSI/DSI was calculated using the formula $HSI/DSI = (1 - YD/Yi) / (1 - XD/Xi)$ where, YD and Yi are the grain yield for each genotype under stress and control conditions respectively. XD and Xi are the means of all study genotypes grain yield under stress and control conditions respectively. For reference, HSI/DSI < 0.5 is considered as highly tolerant, HSI/DSI < 0.5-1 as moderately tolerant and HSI/DSI > 1.0 as stress susceptible genotypes.

Under heat stress, the genotype HD3386 showed lowest HSI (0.76) with a minimum yield reduction of 18.6%, but was higher than the best check WH730 (0.63). Under drought condition, CG1040 showed lower DSI (0.87) and was also slightly higher than the best check MACS6768 (0.86) with a minimum yield reduction of 32.6%. The list of genotypes showing HSI /DSI < 1 in HDTST are listed in Table 1.

Table 1: List of wheat genotypes identified as heat/ drought tolerant (HSI/DSI<1.0) in HDTST during 2022-23.

Trial	Genotypes	
	HSI<1	DSI<1
HDTST	HD3386 (0.76), NIAW4028 (0.85), GW547 (0.88), HD3388 (0.89), UAS478(d) (0.89), CG1040 (0.89), HI8840(d) (0.94), NWS2194 (0.97), HI1665 (0.98).	CG1040 (0.87), GW547 (0.90), NIAW4028 (0.90), HI1665 (0.91), HD3386 (0.91).

Values in the paranthesis indicates HSI /DSI

Correlation of grain yield with different traits under late sown and drought conditions

The correlation of different growth, yield and physiological traits with yield under late sown condition indicated that, the grain yield is positively correlated with biomass and thousand grain weight. Whereas, it is negatively correlated with CT at both the stages. The grain yield under drought condition is positively correlated with tiller number, biomass, plant height and NDVI at both one month after germination and 21 DAA.

Table 2: Correlation (r^2) of pooled analysis traits with GYLS and GYDR

Traits	GYLS	GYDR
Days to heading	0.23	0.11
Days to maturity	0.29	0.21
Tiller number	0.19	0.39*
Biomass	0.69**	0.84**
Thousand grain weight	0.49*	0.26
Plant height	0.38	0.38*
Harvest index	0.14	0.23
Grain filling Period	0.21	0.24
Grain number per spike	0.24	0.13
Grain weight per spike	0.23	0.27
CT at 15DAA	-0.43*	0.23
CT at 21DAA	-0.55**	0.32
CCI at 15DAA	0.24	0.21
CCI at 21DAA	0.16	0.18
NDVI at 1month after germination.	0.32	0.44*
NDVI at 21 DAA	0.13	0.42*

* Significant@ 5%, ** @ 1% .

Annexure I: The grain yield, HSI, DSI and yield reduction percentage of genotypes pooled across locations during 2022-23

	Grain Yield/plot (g)			HSI	DSI	Yield reduction %	
	TS	LS	DR			HS	DS
CG1040	1183.0	922.9	798.0	0.89	0.87	22.0	32.6
DBW359	1397.8	988.2	803.0	1.19	1.14	29.3	42.6
DBW377	1364.3	948.9	826.1	1.24	1.06	30.5	39.4
GW547	1146.8	899.0	761.0	0.88	0.90	21.6	33.6
HD3386	1293.1	1052.4	853.3	0.76	0.91	18.6	34.0
HD3388	1237.0	966.9	743.1	0.89	1.07	21.8	39.9
HI1665	1226.9	930.0	810.1	0.98	0.91	24.2	34.0
HI8840(d)	1219.8	936.8	696.7	0.94	1.15	23.2	42.9
MP1378	1199.8	861.3	708.1	1.15	1.10	28.2	41.0
NIAW4028	1237.1	978.2	820.3	0.85	0.90	20.9	33.7
NWS2194	1258.1	957.6	750.3	0.97	1.08	23.9	40.4
UAS478(d)	1030.9	805.3	635.1	0.89	1.03	21.9	38.4
WH1402	1184.2	862.4	729.0	1.10	1.03	27.2	38.4
DBW110©	1243.0	867.7	821.8	1.23	0.91	30.2	33.9
DBW187©	1277.9	954.3	759.9	1.03	1.09	25.3	40.5
GW322©	1224.2	840.8	757.0	1.27	1.02	31.3	38.2
HD2932©	1263.4	950.9	832.4	1.00	0.92	24.7	34.1
HD3086©	1152.4	812.8	702.9	1.20	1.05	29.5	39.0
HI1605©	1252.8	950.1	766.4	0.98	1.04	24.2	38.8
HI1650©	1164.6	875.3	743.8	1.01	0.97	24.8	36.1
MACS6768©	1185.7	961.0	806.0	0.77	0.86	18.9	32.0
NIAW3170©	1320.0	969.0	827.7	1.08	1.00	26.6	37.3
NIDW1149(d)©	1236.5	885.9	754.7	1.15	1.05	28.4	39.0
RAJ3765©	1049.3	834.9	673.5	0.83	0.96	20.4	35.8
WH730©	1105.8	934.7	716.2	0.63	0.95	15.5	35.2

HS-Heat stress, DS-Drought stress

Annexure 2a: The grain yield, HSI, DSI and yield reduction percentage of genotypes at Hisar and Karnal locations during 2022-23

	Genotype	Hisar							Karnal						
		GYTS	GYLS	GYDR	HSI	DSI	YR%H	YR%D	GYTS	GYLS	GYDR	HSI	DSI	YR%H	YR%D
1	CG1040	1409	911	1291	0.87	0.53	35.3	8.4	1685	1297.5	1648	1.34	0.15	23.0	2.2
2	DBW359	1632	983	1505	0.98	0.49	39.8	7.8	1872.5	1655	1599	0.68	0.97	11.6	14.6
3	DBW377	1950	972.5	1550	1.23	1.30	50.1	20.5	1735	1600	1611	0.45	0.47	7.8	7.1
4	GW547	1492	939.5	1163	0.91	1.40	37.0	22.1	1617.5	1240	1316	1.36	1.23	23.3	18.6
5	HD3386	1440.5	956	1288	0.83	0.67	33.6	10.6	1960	1610	1754	1.04	0.69	17.9	10.5
6	HD3388	1740.5	881.5	1220	1.21	1.90	49.4	29.9	1837.5	1852.5	1393	-0.05	1.60	-0.8	24.2
7	HI1665	1651	997	1330	0.98	1.23	39.6	19.4	1570	1347.5	1793	0.83	-0.94	14.2	-14.2
8	HI8840(d)	1452	958.5	1339	0.84	0.49	34.0	7.8	1520	1030	1108	1.88	1.79	32.2	27.1
9	MP1378	1881.5	991.5	1335.5	1.16	1.84	47.3	29.0	1850	1370	1463	1.51	1.38	25.9	20.9
10	NIAW4028	1720	947	1475.5	1.11	0.90	44.9	14.2	1747.5	1677.5	1444	0.23	1.15	4.0	17.4
11	NWS2194	1922	899.5	1385	1.31	1.77	53.2	27.9	1785	1600	1263	0.60	1.93	10.4	29.2
12	UAS478(d)	1405.5	777	1134.5	1.10	1.22	44.7	19.3	1252.5	1235	964	0.08	1.52	1.4	23.0
13	WH1402	1573	1130	1433.5	0.69	0.56	28.2	8.9	1617.5	1517.5	1483	0.36	0.55	6.2	8.3
14	DBW110©	1768.5	998.5	1603	1.07	0.59	43.5	9.4	1902.5	1545	1622	1.09	0.97	18.8	14.7
15	DBW187©	1679	944	1563	1.08	0.44	43.8	6.9	1782.5	1392.5	1329	1.27	1.68	21.9	25.4
16	GW322©	1643	1024.5	1328	0.93	1.21	37.6	19.2	1297.5	752.5	1196	2.45	0.52	42.0	7.8
17	HD2932©	1389	937	1322.5	0.80	0.30	32.5	4.8	1575	1075	1259	1.85	1.33	31.7	20.1
18	HD3086©	1348	854.5	1267.5	0.90	0.38	36.6	6.0	1532.5	1307.5	1381	0.85	0.65	14.7	9.9
19	HI1605©	1539.5	998	1341.5	0.87	0.82	35.2	12.9	1552.5	1385	1441	0.63	0.47	10.8	7.2
20	HI1650©	1506.5	995	1332.5	0.84	0.73	34.0	11.5	1272.5	1080	1550	0.88	-1.44	15.1	-21.8
21	MACS6768©	1885	1000.5	1359	1.16	1.77	46.9	27.9	1427.5	770	1374	2.68	0.25	46.1	3.7
22	NIAW3170©	1780.5	968	1506	1.12	0.98	45.6	15.4	1700	1432.5	1208	0.92	1.91	15.7	28.9
23	NIDW1149(d)©	1508	934.5	1247	0.94	1.10	38.0	17.3	1630	1317.5	1264	1.12	1.48	19.2	22.5
24	RAJ3765©	1369.5	892	1269	0.86	0.47	34.9	7.3	1310	970	909.5	1.51	2.02	26.0	30.6
25	WH730©	1683	1079.5	1409	0.88	1.03	35.9	16.3	1572.5	1570	1108.5	0.01	1.95	0.2	29.5

GYTS- Grain yield under timely sown(g), GYLS- Grain yield under late sown(g), GYDR- Grain yield under drought(g), YR%H -Yield reduction percentage under heat stress, YR%D – Yield reduction percentage under drought stress

Annexure 2b: The grain yield, HSI, DSI and yield reduction percentage of genotypes at Ludhiana and Pusa locations during 2022-23

		Ludhiana							Pusa						
		GYTS	GYLS	GYDR	HSI	DSI	YR%H	YR%D	GYTS	GYLS	GYDR	HSI	DSI	YR%H	YR%D
1	CG1040	820.5	1176.5	1028.5	-1.45	-1.16	-43.4	-25.4	555	293	439	1.11	0.55	47.2	20.9
2	DBW359	1815	998	902.5	1.50	2.30	45.0	50.3	610	297.5	292	1.20	1.38	51.2	52.1
3	DBW377	1714	597.5	863.5	2.17	2.27	65.1	49.6	770	452	449	0.97	1.10	41.3	41.7
4	GW547	917.5	911.5	1007	0.02	-0.45	0.7	-9.8	595	339.5	456	1.01	0.62	42.9	23.4
5	HD3386	1728	1077	1110.5	1.26	1.63	37.7	35.7	473	532.5	597	-0.30	-0.69	-12.6	-26.2
6	HD3388	1314	836	975	1.21	1.18	36.4	25.8	560	367	395	0.81	0.78	34.5	29.5
7	HI1665	1158	718	871	1.27	1.13	38.0	24.8	725	337.5	327	1.25	1.45	53.4	54.9
8	HI8840(d)	1561.5	975	750	1.25	2.37	37.6	52.0	290	235	102.5	0.44	1.71	19.0	64.7
9	MP1378	953	752.5	687	0.70	1.27	21.0	27.9	560	304	375.5	1.07	0.87	45.7	32.9
10	NIAW4028	680	688	854.5	-0.04	-1.17	-1.2	-25.7	572.5	259	315	1.28	1.19	54.8	45.0
11	NWS2194	1312	854.5	948	1.16	1.27	34.9	27.7	467	302	293	0.83	0.98	35.3	37.3
12	UAS478(d)	1296.5	892	922	1.04	1.32	31.2	28.9	387.5	183.5	141	1.23	1.68	52.6	63.6
13	WH1402	1610	1020	1177	1.22	1.23	36.6	26.9	355	274.5	347	0.53	0.06	22.7	2.3
14	DBW110©	1240	587	1231	1.76	0.03	52.7	0.7	328	185.5	260	1.02	0.55	43.4	20.7
15	DBW187©	1386	976.5	992	0.99	1.30	29.5	28.4	737.5	324	347	1.32	1.40	56.1	52.9
16	GW322©	1211	864	910	0.96	1.13	28.7	24.9	432.5	279.5	359	0.83	0.45	35.4	17.0
17	HD2932©	1149.5	760	1182	1.13	-0.13	33.9	-2.8	752.5	320	390	1.35	1.27	57.5	48.2
18	HD3086©	1340	892.5	1073.5	1.11	0.91	33.4	19.9	685	407	455	0.95	0.89	40.6	33.6
19	HI1605©	1249	863	1057	1.03	0.70	30.9	15.4	630	424.5	277	0.77	1.48	32.6	56.0
20	HI1650©	1112.5	891	829	0.66	1.16	19.9	25.5	373	205	195	1.06	1.26	45.0	47.7
21	MACS6768©	884.5	753.5	939.5	0.49	-0.28	14.8	-6.2	550	385.5	380	0.70	0.82	29.9	30.9
22	NIAW3170©	1256.5	1010.5	963	0.65	1.07	19.6	23.4	557.5	230	358	1.38	0.95	58.7	35.8
23	NIDW1149(d)©	1197	957	1086.5	0.67	0.42	20.1	9.2	355	200	110	1.02	1.82	43.7	69.0
24	RAJ3765©	1211.5	936.5	1036	0.76	0.66	22.7	14.5	422.5	242	350	1.00	0.45	42.7	17.2
25	WH730©	1158.5	907	1031.5	0.72	0.50	21.7	11.0	613.7	283.4	293.3	1.26	1.38	53.8	52.2

GYTS - Grain yield under timely sown(g), GYLS - Grain yield under late sown(g), GYDR - Grain yield under drought(g), YR%H - Yield reduction percentage under heat stress, YR%D - Yield reduction percentage under drought stress

Annexure 2c: The grain yield, HSI, DSI and yield reduction percentage of genotypes at Sabour and Dharwad locations during 2022-23

		Sabour							Dharwad						
		GYTS	GYLS	GYDR	HSI	DSI	YR%H	YR%D	GYTS	GYLS	GYDR	HSI	DSI	YR%H	YR%D
1	CG1040	440	270	247.5	1.08	0.76	38.6	43.8	1517.5	1182.5	695	0.94	1.15	22.1	54.2
2	DBW359	682.5	450	245	0.95	1.11	34.1	64.1	1553.5	974	750	1.59	1.10	37.3	51.7
3	DBW377	637.5	364	257.5	1.20	1.04	42.9	59.6	1421	1255	916.5	0.50	0.75	11.7	35.5
4	GW547	485	345	295	0.80	0.68	28.9	39.2	1217.5	1026	634.5	0.67	1.02	15.7	47.9
5	HD3386	537.5	480	200	0.30	1.09	10.7	62.8	1334.5	1215.5	776.5	0.38	0.89	8.9	41.8
6	HD3388	575	351	300	1.09	0.83	39.0	47.8	1339.5	980.5	695	1.14	1.02	26.8	48.1
7	HI1665	550	481.5	210	0.35	1.08	12.5	61.8	1467	1130	792	0.98	0.98	23.0	46.0
8	HI8840(d)	552.5	280	230	1.37	1.02	49.3	58.4	1378	1128	595.5	0.77	1.21	18.1	56.8
9	MP1378	595	372.5	345	1.04	0.73	37.4	42.0	1422	1175	631	0.74	1.18	17.4	55.6
10	NIAW4028	490	382	140	0.61	1.24	22.0	71.4	1504.5	1156.5	899.5	0.99	0.85	23.1	40.2
11	NWS2194	670	390	235	1.16	1.13	41.8	64.9	1368	1115	938.5	0.79	0.67	18.5	31.4
12	UAS478(d)	310	175.5	172.5	1.21	0.77	43.4	44.4	1343	932	771	1.31	0.90	30.6	42.6
13	WH1402	520.5	243	230	1.49	0.97	53.3	55.8	1382	935.5	774	1.38	0.93	32.3	44.0
14	DBW110©	465	247	217.5	1.31	0.93	46.9	53.2	1566.5	1230	664	0.92	1.22	21.5	57.6
15	DBW187©	632.5	426	185	0.91	1.23	32.6	70.8	1365.5	957.5	757	1.27	0.95	29.9	44.6
16	GW322©	550	340	245	1.06	0.96	38.2	55.5	1571	1070	829	1.36	1.00	31.9	47.2
17	HD2932©	582.5	505	297.5	0.37	0.85	13.3	48.9	1369.5	1123	799.5	0.77	0.88	18.0	41.6
18	HD3086©	637.5	295.5	215	1.49	1.15	53.6	66.3	1358	863	599	1.56	1.19	36.5	55.9
19	HI1605©	592.5	215	200	1.77	1.15	63.7	66.2	1345.5	1178	671.5	0.53	1.06	12.4	50.1
20	HI1650©	552.5	230	207.5	1.63	1.09	58.4	62.4	1311.5	1175.5	716	0.44	0.96	10.4	45.4
21	MACS6768©	617.5	490	325	0.58	0.82	20.6	47.4	1269.5	930	731.5	1.14	0.90	26.7	42.4
22	NIAW3170©	647.5	442.5	240	0.88	1.09	31.7	62.9	1498.5	1036.5	823.5	1.32	0.96	30.8	45.0
23	NIDW1149(d)©	425	140	217.5	1.87	0.85	67.1	48.8	1486.5	954	720.5	1.53	1.09	35.8	51.5
24	RAJ3765©	575.5	427.5	217.5	0.72	1.08	25.7	62.2	1279.5	982.5	507	0.99	1.28	23.2	60.4
25	WH730©	495	513.5	190	-0.10	1.07	-3.7	61.6	1200.5	991.5	759	0.74	0.78	17.4	36.8

GYTS - Grain yield under timely sown(g), GYLS - Grain yield under late sown(g), GYDR -Grain yield under drought(g), YR%H -Yield reduction percentage under heat stress, YR%D - Yield reduction percentage under drought stress

Annexure 2d: The grain yield, HSI, DSI and yield reduction percentage of genotypes at Pune and Niphad locations during 2022-23

		Pune							Niphad						
		GYTS	GYLS	GYDR	HSI	DSI	YR%H	YR%D	GYTS	GYLS	GYDR	HSI	DSI	YR%	YR%D
1	CG1040	1247	1031	311	2.63	1.11	17.3	75.1	1336.5	705	682	1.93	1.43	47.3	49.0
2	DBW359	1252	1209	378	0.52	1.03	3.4	69.8	1122.5	793	540	1.20	1.51	29.4	51.9
3	DBW377	1282	1102	396	2.13	1.02	14.0	69.1	961.5	688	705.5	1.16	0.78	28.4	26.6
4	GW547	1040	886	378	2.25	0.94	14.8	63.7	917.5	795.5	817	0.54	0.32	13.3	11.0
5	HD3386	1120	1111	330	0.12	1.04	0.8	70.5	1118	801	753	1.16	0.95	28.4	32.6
6	HD3388	1217	995	337	2.77	1.07	18.2	72.3	937	1239	752.5	-1.32	0.57	-32.2	19.7
7	HI1665	1176	1113	403	0.81	0.97	5.4	65.7	1308.5	752.5	738.5	1.74	1.27	42.5	43.6
8	HI8840(d)	1200	1270	390	-0.88	1.00	-5.8	67.5	904.5	959	590.5	-0.25	1.01	-6.0	34.7
9	MP1378	964	979	229	-0.24	1.13	-1.6	76.2	1058.5	623	692.5	1.68	1.01	41.1	34.6
10	NIAW4028	1201	1071	503	1.64	0.86	10.8	58.1	1095.5	896	825.5	0.75	0.72	18.2	24.6
11	NWS2194	1134	1033	395	1.35	0.96	8.9	65.2	1000	775	638.5	0.92	1.05	22.5	36.2
12	UAS478(d)	872	1018	273	-2.54	1.02	-16.7	68.7	907.5	678	670.5	1.03	0.76	25.3	26.1
13	WH1402	1094	1008	389	1.19	0.95	7.9	64.4	925.5	622.5	395	1.34	1.67	32.7	57.3
14	DBW110©	1129	934	292	2.62	1.10	17.3	74.1	1215.5	625	762.5	1.99	1.08	48.6	37.3
15	DBW187©	1064	958	420	1.51	0.89	10.0	60.5	893	807.5	466	0.39	1.39	9.6	47.8
16	GW322©	1322	1049	468	3.13	0.95	20.7	64.6	832.5	608.5	679	1.10	0.54	26.9	18.4
17	HD2932©	1127	1169	352	-0.57	1.02	-3.7	68.8	1162.5	638.5	721	1.84	1.11	45.1	38.0
18	HD3086©	1055	920	297	1.94	1.06	12.8	71.8	934	506.5	609	1.87	1.01	45.8	34.8
19	HI1605©	1170	1032	305	1.79	1.09	11.8	73.9	947	712.5	827	1.01	0.37	24.8	12.7
20	HI1650©	1085	1233	426	-2.07	0.90	-13.6	60.7	1057	748.5	644	1.19	1.14	29.2	39.1
21	MACS6768©	1016	1065	387	-0.73	0.92	-4.8	61.9	1000	1165	749.5	-0.68	0.73	-16.5	25.1
22	NIAW3170©	1246	1017	348	2.79	1.07	18.4	72.1	1001.5	844	769.5	0.64	0.67	15.7	23.2
23	NIDW1149(d)©	1244	1067	374	2.16	1.03	14.2	69.9	1085.5	758.5	699.5	1.23	1.04	30.1	35.6
24	RAJ3765©	959	999	401	-0.63	0.86	-4.2	58.2	895	742	465.5	0.70	1.40	17.1	48.0
25	WH730©	842	933	298	-1.64	0.96	-10.8	64.6	785.5	712	482.3	0.38	1.12	9.4	38.6

GYTS - Grain yield under timely sown(g), GYLS - Grain yield under late sown(g), GYDR -Grain yield under drought(g), YR%H -Yield reduction percentage under heat stress, YR%D - Yield reduction percentage under drought stress

Annexure 2e: The grain yield, HSI, DSI and yield reduction percentage of genotypes at Indore and Junagadh locations during 2022-23

		Indore							Junagadh						
		GYTS	GYLS	GYDR	HSI	DSI	YR%H	YR%D	GYTS	GYLS	GYDR	HSI	DSI	YR%H	YR%D
1	CG1040	1395.5	1567.5	1383	1.33	0.16	-12.3	0.9	1395	565	510	1.04	0.99	59.5	63.4
2	DBW359	1665.5	1571	1468.5	-0.61	2.06	5.7	11.8	1590	645	515	1.04	1.06	59.4	67.6
3	DBW377	1339	1499	1396	1.29	-0.74	-11.9	-4.3	1455	515	485	1.13	1.04	64.6	66.7
4	GW547	1355.5	1640.5	1227	2.27	1.65	-21.0	9.5	1515	645	535	1.01	1.01	57.4	64.7
5	HD3386	1443	1921	1407	3.58	0.44	-33.1	2.5	1520	685	685	0.96	0.86	54.9	54.9
6	HD3388	1426.5	1566	1386.5	1.06	0.49	-9.8	2.8	1275	525	425	1.03	1.04	58.8	66.7
7	HI1665	1440.5	1653	1406.5	1.59	0.41	-14.8	2.4	1310	455	610	1.14	0.84	65.3	53.4
8	HI8840(d)	1649.5	1621.5	1588.5	-0.18	0.65	1.7	3.7	1215	485	335	1.05	1.13	60.1	72.4
9	MP1378	1343.5	1392	1188	0.39	2.02	-3.6	11.6	1235	490	405	1.06	1.05	60.3	67.2
10	NIAW4028	1662.5	1855.5	1509	1.25	1.61	-11.6	9.2	1455	645	515	0.98	1.01	55.7	64.6
11	NWS2194	1454	1852.5	1357.5	2.96	1.16	-27.4	6.6	1290	547.5	420	1.01	1.05	57.6	67.4
12	UAS478(d)	1347.5	1569.5	1225	1.78	1.59	-16.5	9.1	1265	550	440	0.99	1.02	56.5	65.2
13	WH1402	1204	1265	1040.5	0.55	2.37	-5.1	13.6	1470	515	400	1.14	1.14	65.0	72.8
14	DBW110©	1555	1578	1495	0.16	0.67	-1.5	3.9	1270	560	470	0.98	0.98	55.9	63.0
15	DBW187©	1337	1756.5	1297	3.39	0.52	-31.4	3.0	1550	580	510	1.10	1.05	62.6	67.1
16	GW322©	1712	1465.5	1318	-1.56	4.01	14.4	23.0	1635	735	535	0.96	1.05	55.0	67.3
17	HD2932©	1537	1657	1457.5	0.84	0.90	-7.8	5.2	1655	905	670	0.79	0.93	45.3	59.5
18	HD3086©	1256.5	1386.5	1177	1.12	1.10	-10.3	6.3	1150	470	445	1.04	0.96	59.1	61.3
19	HI1605©	1374.5	1633	1220	2.03	1.96	-18.8	11.2	1730	640	490	1.10	1.12	63.0	71.7
20	HI1650©	1595	1520.5	1377	-0.50	2.38	4.7	13.7	1520	610	520	1.05	1.03	59.9	65.8
21	MACS6768©	1338	1617	1365.5	2.25	-0.36	-20.9	-2.1	1555	820	585	0.83	0.97	47.3	62.4
22	NIAW3170©	1484.5	1825.5	1426.5	2.48	0.68	-23.0	3.9	1532.5	595	520	1.07	1.03	61.2	66.1
23	NIDW1149(d)©	1432.5	1404	1515	-0.21	-1.00	2.0	-5.8	1310	650	500	0.88	0.97	50.4	61.8
24	RAJ3765©	1264.5	1312.5	1403.5	0.41	-1.92	-3.8	-11.0	1225	600	580	0.89	0.82	51.0	52.7
25	WH730©	1585	1441.5	1483	-0.98	1.12	9.1	6.4	1285	760	650	0.72	0.77	40.9	49.4

GYTS - Grain yield under timely sown(g), GYLS - Grain yield under late sown(g), GYDR -Grain yield under drought(g), YR%H -Yield reduction percentage under heat stress, YR%D - Yield reduction percentage under drought stress

Annexure 2f: The grain yield, HSI, DSI and yield reduction percentage of genotypes at Vijapur location during 2022-23

		Vijapur						
		GYTS	GYLS	GYDR	HSI	DSI	YR%H	YR%D
1	CG1040	1212.5	1152.5	542.5	0.29	0.83	4.9	55.3
2	DBW359	1580	1295	637.5	1.05	0.90	18.0	59.7
3	DBW377	1742.5	1392.5	457.5	1.16	1.11	20.1	73.7
4	GW547	1462.5	1120	542.5	1.36	0.94	23.4	62.9
5	HD3386	1550	1187.5	485	1.36	1.03	23.4	68.7
6	HD3388	1385	1042.5	295	1.43	1.18	24.7	78.7
7	HI1665	1140	1245	430	-0.53	0.94	-9.2	62.3
8	HI8840(d)	1695	1362.5	635	1.14	0.94	19.6	62.5
9	MP1378	1335	1025	437.5	1.35	1.01	23.2	67.2
10	NIAW4028	1480	1182.5	542.5	1.17	0.95	20.1	63.3
11	NWS2194	1437.5	1165	380	1.10	1.10	19.0	73.6
12	UAS478(d)	952.5	847.5	272.5	0.64	1.07	11.0	71.4
13	WH1402	1275	955	350	1.46	1.09	25.1	72.5
14	DBW110©	1232.5	1055	422.5	0.83	0.99	14.4	65.7
15	DBW187©	1630	1375	492.5	0.91	1.05	15.6	69.8
16	GW322©	1260	1060	460	0.92	0.95	15.9	63.5
17	HD2932©	1597.5	1370	705	0.83	0.84	14.2	55.9
18	HD3086©	1380	1037.5	212.5	1.44	1.27	24.8	84.6
19	HI1605©	1650	1370	600	0.98	0.96	17.0	63.6
20	HI1650©	1425	940	385	1.97	1.10	34.0	73.0
21	MACS6768©	1500	1575	670	-0.29	0.83	-5.0	55.3
22	NIAW3170©	1815	1257.5	942.5	1.78	0.72	30.7	48.1
23	NIDW1149(d)©	1927.5	1362.5	567.5	1.70	1.06	29.3	70.6
24	RAJ3765©	1030	1080	270	-0.28	1.11	-4.9	73.8
25	WH730©	1007.9	1087.5	190.2	-0.46	1.22	-7.9	81.1

GYTS - Grain yield under timely sown(g), GYLS - Grain yield under late sown(g), GYDR -Grain yield under drought(g), YR%H -Yield reduction percentage under heat stress, YR%D - Yield reduction percentage under drought stress