

## Supplementary Material

### **Agronomic, physiological and molecular characterisation of rice mutants revealed the key role of reactive oxygen species and catalase in high-temperature stress tolerance**

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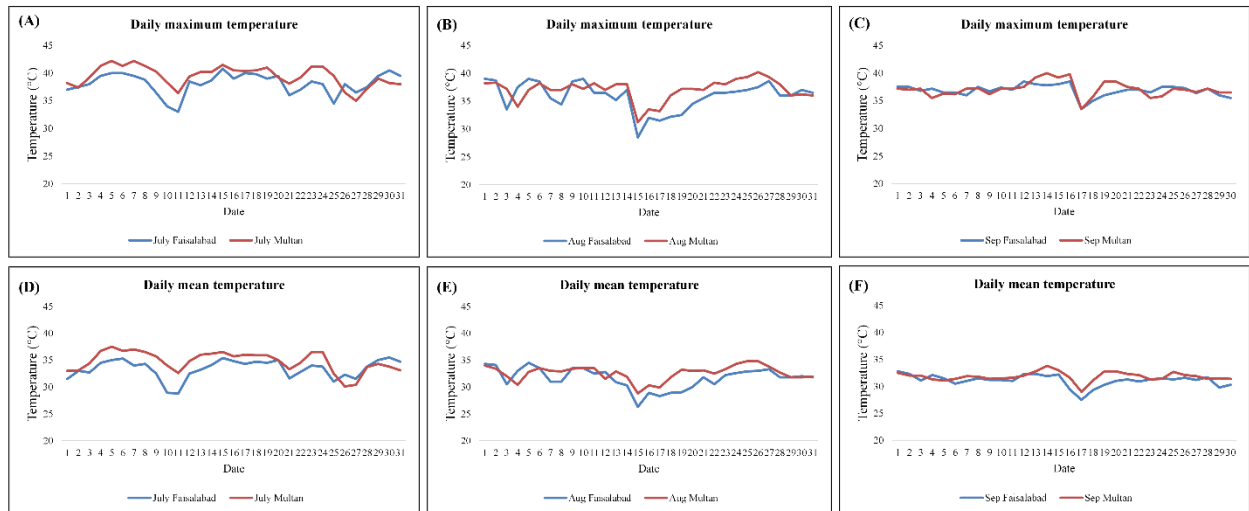
**Fig S1.** Daily mean and maximum temperatures during the critical growth period of rice.

**Table S1.** List of genotypes used in the study.

**Table S2.** Primer sequences related to quantitative real-time PCR.

**Table S3.** Eigen values and variability estimate contributed by principal components under control and HTS environments.

**Table S4.** Eigen vectors of the PCA axis for morpho-physiological, biochemical and agronomic traits under control and HT.



**Fig S1.** Representation of daily mean and maximum temperature during critical growth period of rice crop. A-C, daily maximum temperature of Faisalabad and Multan; D-F, daily mean temperature of Faisalabad and Multan. Aug: August, Sep: September.

**Fig S1.** Daily mean and maximum temperatures during the critical growth period of rice. (A–C) daily maximum temperature in Faisalabad and Multan; (D–F) daily mean temperature in Faisalabad and Multan. Aug: August, Sep: September.

**Table S1. List of genotypes used in the study.**

Sr. no.	Mutant	Sr. no.	Mutant	Sr. no.	Mutant/ variety
1	HTT-1	16	HTT-98	31	HTT-119
2	HTT-5	17	HTT-101	32	HTT-120
3	HTT-18	18	HTT-102	33	HTT-121
4	HTT-19	19	HTT-103	34	HTT-125
5	HTT-25	20	HTT-104	35	HTT-132
6	HTT-29	21	HTT-105	36	HTT-138
7	HTT-31	22	HTT-106	37	HTT-139
8	HTT-39	23	HTT-107	38	HTT-140
9	HTT-51	24	HTT-108	39	HTT-156
10	HTT-53	25	HTT-110	40	Super Basmati
11	HTT-59	26	HTT-112	41	IR-64
12	HTT-74	27	HTT-114		
13	HTT-81	28	HTT-116		
14	HTT-92	29	HTT-117		
15	HTT-97	30	HTT-118		

**Table S2. Primer sequences related to quantitative real-time PCR.**

Gene name	Forward primer (5'-3')	Reverse primer (5'-3')
<i>CATA</i>	CAACCGCAACGTCGACAACTTCTT	TTCACCGGCAGCATCAGGTAGTTT
<i>CATB</i>	GCTTGCTTTCTGCCAGCGATAAT	AAATAGTTTGGGCAAGACGGTGC
<i>SODA</i>	ATCTGGATGGGTGTGGCTAGCTTT	AGTACGCATGCTCCCAGACATCAA
<i>SODB</i>	TCCGCCGTATAAACTTGATGCCCT	TGGGTTGCCGTTGTTGTATGCTTC
<i>OsSRFP1</i>	AGATGCTGAAGCACGACAAGTTC	AGTCGTTGCACACGATCCATCC
<i>Actin1</i>	TCCATCTTGGCATCTCTCAG	GGTACCCTCATCAGGCATCT

**Table S3. Eigen values and variability estimate contributed by principal components under control and HTS environments.**

	Control			High temperature stress		
	Eigenvalue	Variability (%)	Cumulative (%)	Eigenvalue	Variability (%)	Cumulative (%)
<b>F1</b>	4.31	15.96	15.96	3.99	14.25	14.25
<b>F2</b>	3.45	12.77	28.73	3.54	12.65	26.90
<b>F3</b>	2.87	10.62	39.35	2.88	10.28	37.18
<b>F4</b>	2.03	7.53	46.88	2.71	9.66	46.84
<b>F5</b>	1.84	6.80	53.68	2.16	7.70	54.55
<b>F6</b>	1.68	6.21	59.89	2.02	7.23	61.78
<b>F7</b>	1.44	5.32	65.22	1.77	6.32	68.10
<b>F8</b>	1.27	4.71	69.93	1.52	5.42	73.52
<b>F9</b>	1.15	4.27	74.19	1.11	3.98	77.49
<b>F10</b>	1.15	4.26	78.45	1.08	3.85	81.34
<b>F11</b>	0.98	3.62	82.07	0.90	3.20	84.54
<b>F12</b>	0.90	3.32	85.39	0.79	2.82	87.37
<b>F13</b>	0.74	2.74	88.13	0.61	2.18	89.55
<b>F14</b>	0.60	2.22	90.36	0.51	1.82	91.37
<b>F15</b>	0.46	1.72	92.07	0.43	1.54	92.91
<b>F16</b>	0.44	1.62	93.69	0.34	1.23	94.14
<b>F17</b>	0.41	1.50	95.19	0.31	1.12	95.26
<b>F18</b>	0.28	1.04	96.23	0.28	1.01	96.27
<b>F19</b>	0.26	0.97	97.20	0.27	0.95	97.22
<b>F20</b>	0.21	0.78	97.98	0.23	0.84	98.06
<b>F21</b>	0.15	0.56	98.54	0.18	0.64	98.70
<b>F22</b>	0.15	0.55	99.09	0.13	0.46	99.16
<b>F23</b>	0.11	0.41	99.50	0.09	0.32	99.48
<b>F24</b>	0.07	0.25	99.74	0.08	0.28	99.75
<b>F25</b>	0.05	0.18	99.93	0.04	0.13	99.88
<b>F26</b>	0.02	0.07	100.00	0.03	0.10	99.98
<b>F27</b>	0.00	0.00	100.00	0.00	0.01	100.00
<b>F28</b>				0.00	0.00	100.00

**Table S4. Eigen vectors of the PCA axis for morpho-physiological, biochemical and agronomic traits under control and HT.**

LFW, leaf fresh weight; LDW, leaf dry weight; RWC, relative water contents; SFW, seedling fresh weight; SDW, seedling dry weight; CMTS, cell membrane thermo-stability; MDA, malondialdehyde; Lyco, lycopene; chl a, chlorophyll a; chl b, chlorophyll b; Car, carotenoids; TCC, total chlorophyll content; TSP, total soluble proteins; CAT, catalase; POD, peroxidase; APX, ascorbate peroxidase; SOD, superoxide dismutase; Prot, protease; Estr, esterase; TPC, total phenolic content; TOS, total oxidant status; PH, plant height; PTP, productive tillers per plant; PL, panicle length; SMP, spikelets per main panicle; PF, panicle fertility; TGW, thousand grain weight; PY, paddy yield (grain yield).

	Component loadings			
	Control		High temperature	
	PC1	PC2	PC1	PC2
<b>LFW</b>	0.2903	0.4846	0.6071	-0.1056
<b>LDW</b>	0.4736	0.3026	0.3519	-0.1497
<b>RWC</b>	-0.1680	0.0686	0.4756	0.2266
<b>SFW</b>	-0.1771	0.3116	0.7418	0.2298
<b>SDW</b>	0.2359	-0.1873	0.6657	0.2211
<b>CMTS</b>			-0.0173	0.0772
<b>MDA</b>	0.3121	-0.4455	-0.3222	-0.2341
<b>Lycopene</b>	0.9143	0.0107	-0.5012	0.6697
<b>chl a</b>	-0.6501	-0.0011	0.4905	0.4038
<b>chl b</b>	0.9299	-0.0832	-0.5704	0.6184
<b>carotenoids</b>	0.5102	0.0843	0.1633	0.6528
<b>total chl</b>	0.8996	-0.0998	-0.4571	0.7484
<b>TSP</b>	-0.1687	-0.2484	0.1471	-0.0764
<b>CAT</b>	-0.0851	0.4079	0.1793	0.1288
<b>POD</b>	0.1938	-0.0219	-0.1764	-0.3065
<b>APX</b>	-0.1043	0.2159	0.0566	0.1174
<b>SOD</b>	0.2744	0.0745	0.3896	0.0855
<b>Protease</b>	0.4475	-0.2624	0.1536	0.0145
<b>Estrase</b>	-0.1390	0.0035	-0.2618	-0.0897
<b>TPC</b>	-0.2982	0.1192	0.2913	0.0330
<b>TOS</b>	0.1833	-0.2379	0.4139	-0.1271
<b>PH</b>	-0.0203	0.6680	0.2066	0.6190
<b>PTP</b>	0.0255	-0.5076	-0.1827	-0.4041
<b>PL</b>	-0.0156	0.6831	-0.0745	0.4432
<b>SMP</b>	0.0771	0.5048	-0.2151	0.3716
<b>PF</b>	0.1221	0.4135	-0.0230	0.4241
<b>TGW</b>	0.1624	0.6787	0.6009	0.2205
<b>PY</b>	0.2120	0.5344	0.2082	0.2063