

Supplementary Table S1: List of Urdbean genotypes used in the study

Sr. No.	Genotypes	Source
1	Mash 1008	Punjab Agricultural University, Ludhiana, India
2	Mash 218	Punjab Agricultural University, Ludhiana, India
3	Mash 114	Punjab Agricultural University, Ludhiana, India
4	SuG 1137	Punjab Agricultural University, Ludhiana, India
5	SuG 1141	Punjab Agricultural University, Ludhiana, India
6	SuG 1153	Punjab Agricultural University, Ludhiana, India
7	SuG 1157	Punjab Agricultural University, Ludhiana, India
8	SuG 1169	Punjab Agricultural University, Ludhiana, India
9	SuG 1170	Punjab Agricultural University, Ludhiana, India
10	SuG 1172	Punjab Agricultural University, Ludhiana, India
11	Pant U31	Punjab Agricultural University, Ludhiana, India
12	IPUS19-11	Indian Institute of Pulses Research, Kanpur, India
13	IPUS19-20	Indian Institute of Pulses Research, Kanpur, India
14	IPUS19-46	Indian Institute of Pulses Research, Kanpur, India
15	IPU 19-31	Indian Institute of Pulses Research, Kanpur, India
16	IPU 11-02	Indian Institute of Pulses Research, Kanpur, India
17	IPU 13-1	Indian Institute of Pulses Research, Kanpur, India
18	UTTARA (IPU 94-1)	Indian Institute of Pulses Research, Kanpur, India
19	IPU 2-43	Indian Institute of Pulses Research, Kanpur, India
20	IPU 18-2	Indian Institute of Pulses Research, Kanpur, India
21	IPU 18-6	Indian Institute of Pulses Research, Kanpur, India
22	IPU 18-5	Indian Institute of Pulses Research, Kanpur, India
23	IPU 18-04	Indian Institute of Pulses Research, Kanpur, India
24	PGRU- 95016	Indian Institute of Pulses Research, Kanpur, India
25	PLU-272	Indian Institute of Pulses Research, Kanpur, India
26	IPUS19-54	Indian Institute of Pulses Research, Kanpur, India

Supplementary Table S2: Maximum, minimum temperature, relative humidity (RH) and light intensity during normal and late-sown (heat-stressed) the years 2018 and 2019

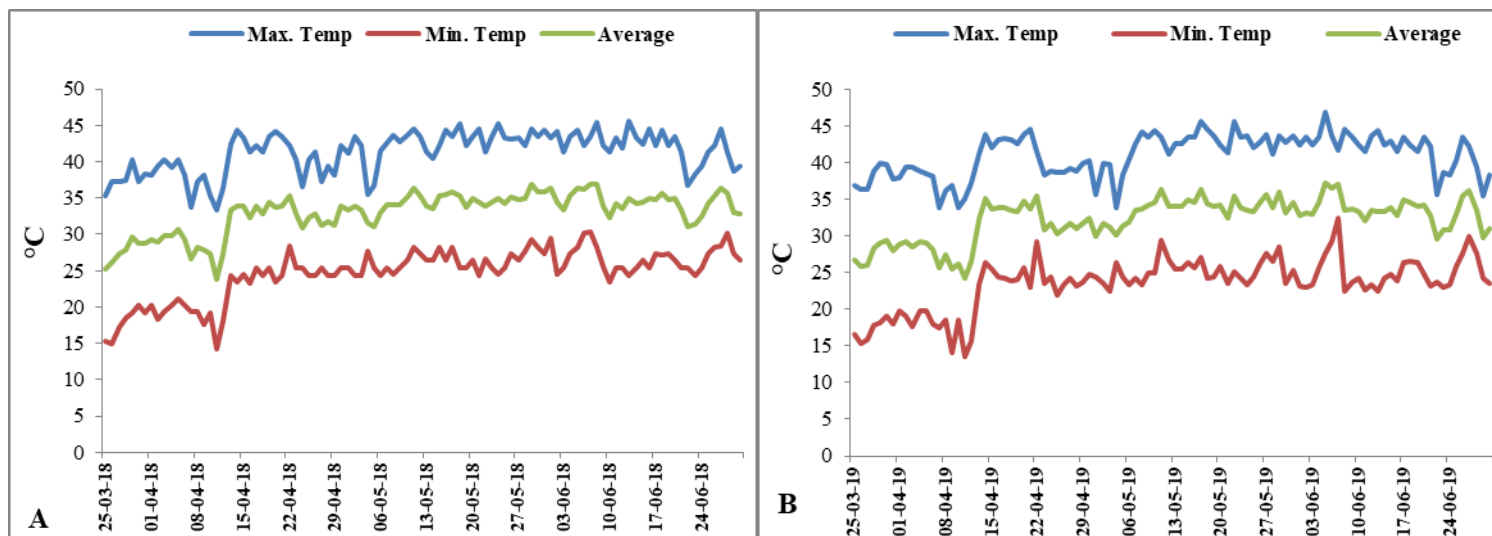
Season		Growth stage	Average Max/Min Temp RH
1.	2018 Normal Sown	Reproductive stage	27.6-31.4°C (maximum) and 19.4-25.6°C (minimum) 56.7-74.6% (maximum) and 24.5-57.8% (minimum)
2.	2018 Late-sown (heat-stressed) Light intensity: 1,321–1,469 $\mu\text{mol m}^{-2} \text{s}^{-1}$	Reproductive stage	35.4-45.4°C (maximum) and 32.9-36.9°C (minimum) 41.3-61.3% (maximum) and 22.5-46.7.1% (minimum)
3.	2019 Normal Sown	Reproductive stage	18.3-32.4°C (maximum) and 9.2-17.3°C (minimum) 73-84% (maximum) and 17-60% (minimum)
4.	2019 Late-Sown (heat-stressed)	Reproductive stage	37.3-42.6°C (maximum) and 33.3-37.5°C (minimum) 38.6-57.4% (maximum) and 21.5-42.3% (minimum)
Light intensity: 1,451–1,562 $\mu\text{mol m}^{-2} \text{s}^{-1}$			

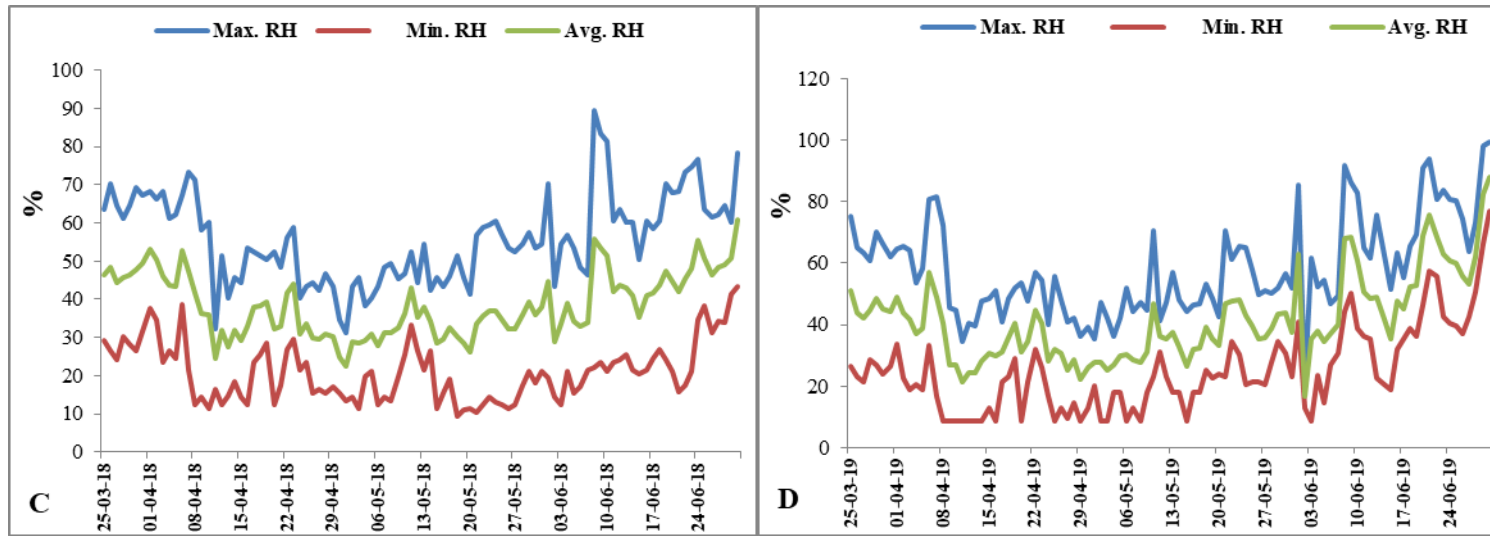
Supplementary Table S3

ANOVA for various traits recorded in urd bean genotypes grown outdoors in 2018 and 2019, and in a growth chamber under controlled conditions.

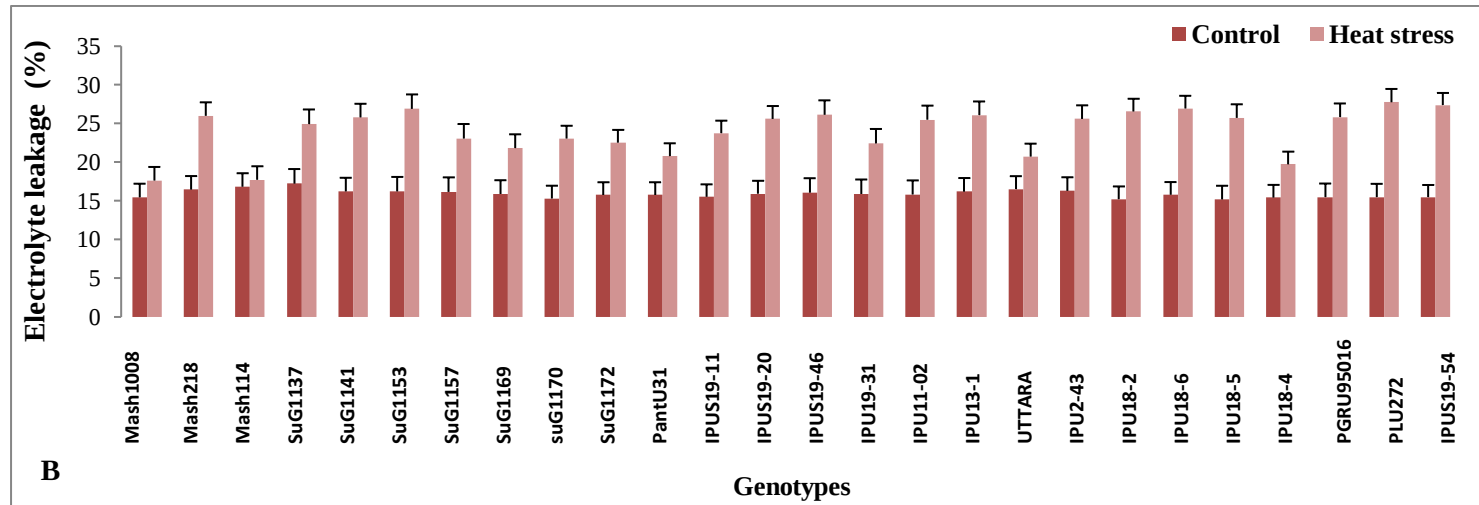
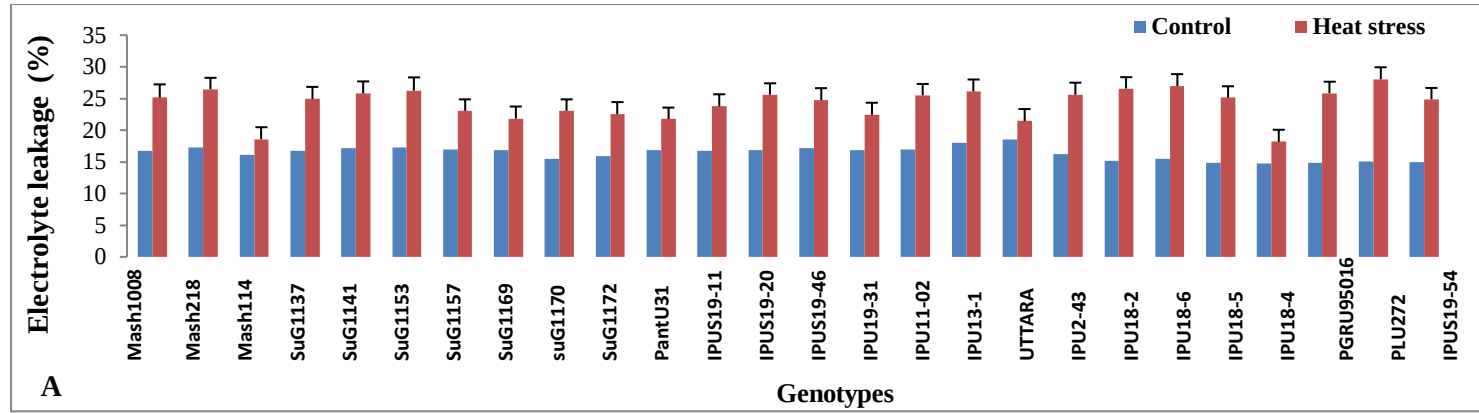
	Outdoor environment			Outdoor environment			Growth chamber		
	2018			2019					
	T	G	Tx G	T	G	TxG	T	G	TxG
Chlorophyll content	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorophyll fluorescence	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Electrolyte leakage%	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Leaf area	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pods plant ⁻¹	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Stomatal conductance	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Seeds plant ⁻¹	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Seed yield plant ⁻¹	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Single seed weight	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

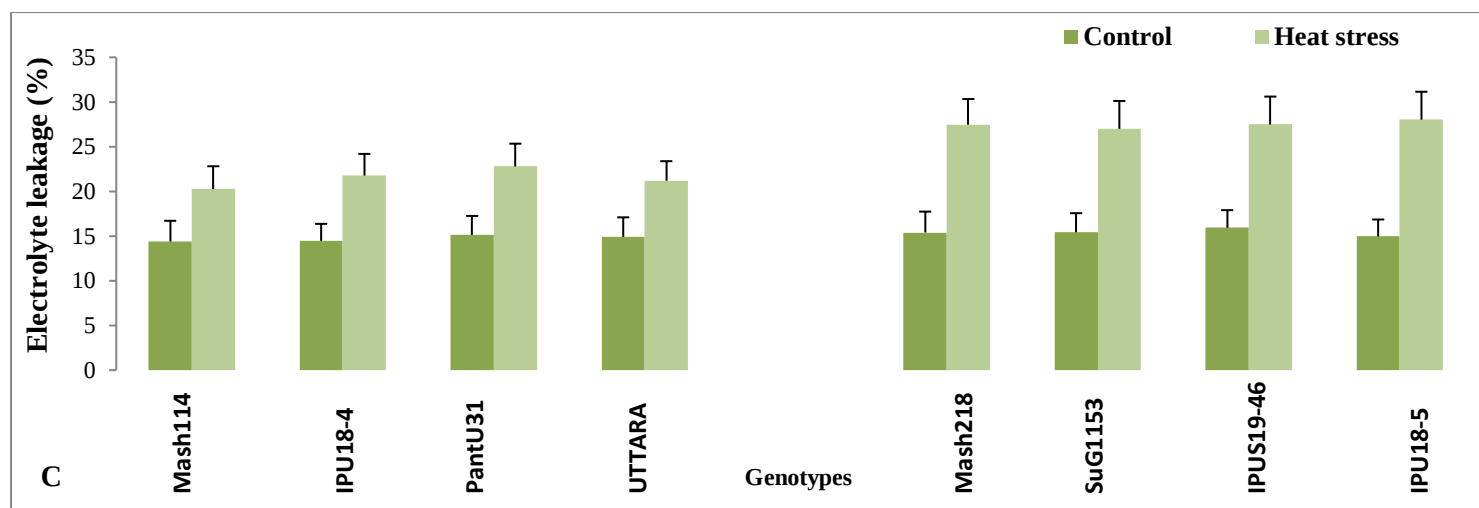
significance level
p<0.01



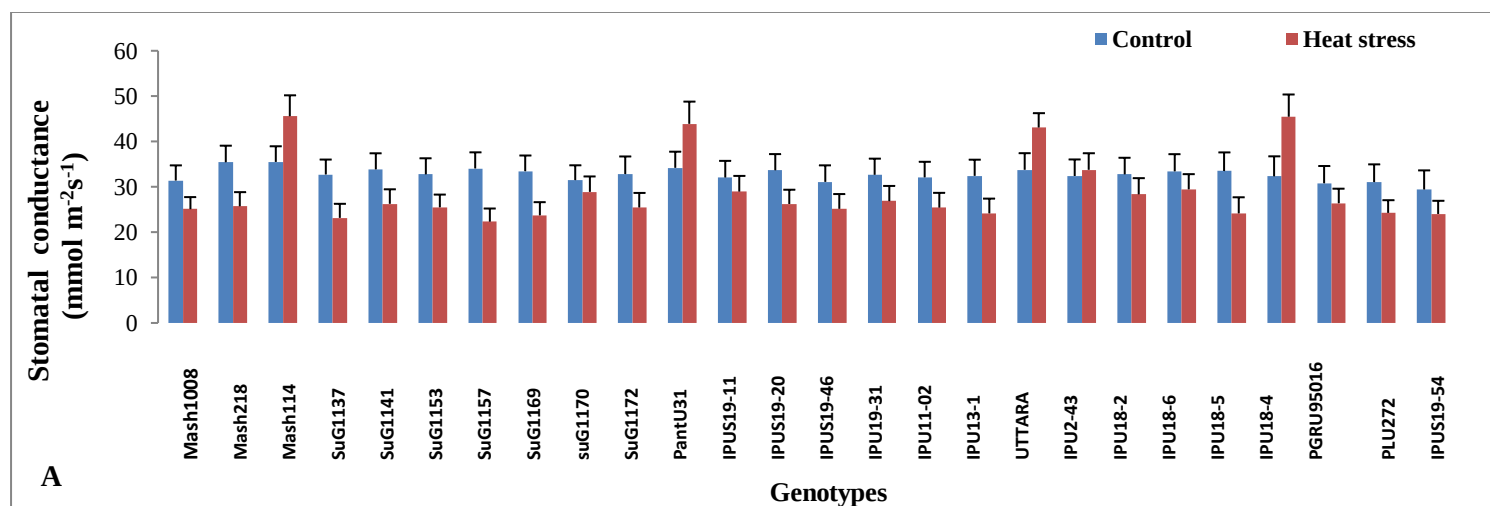


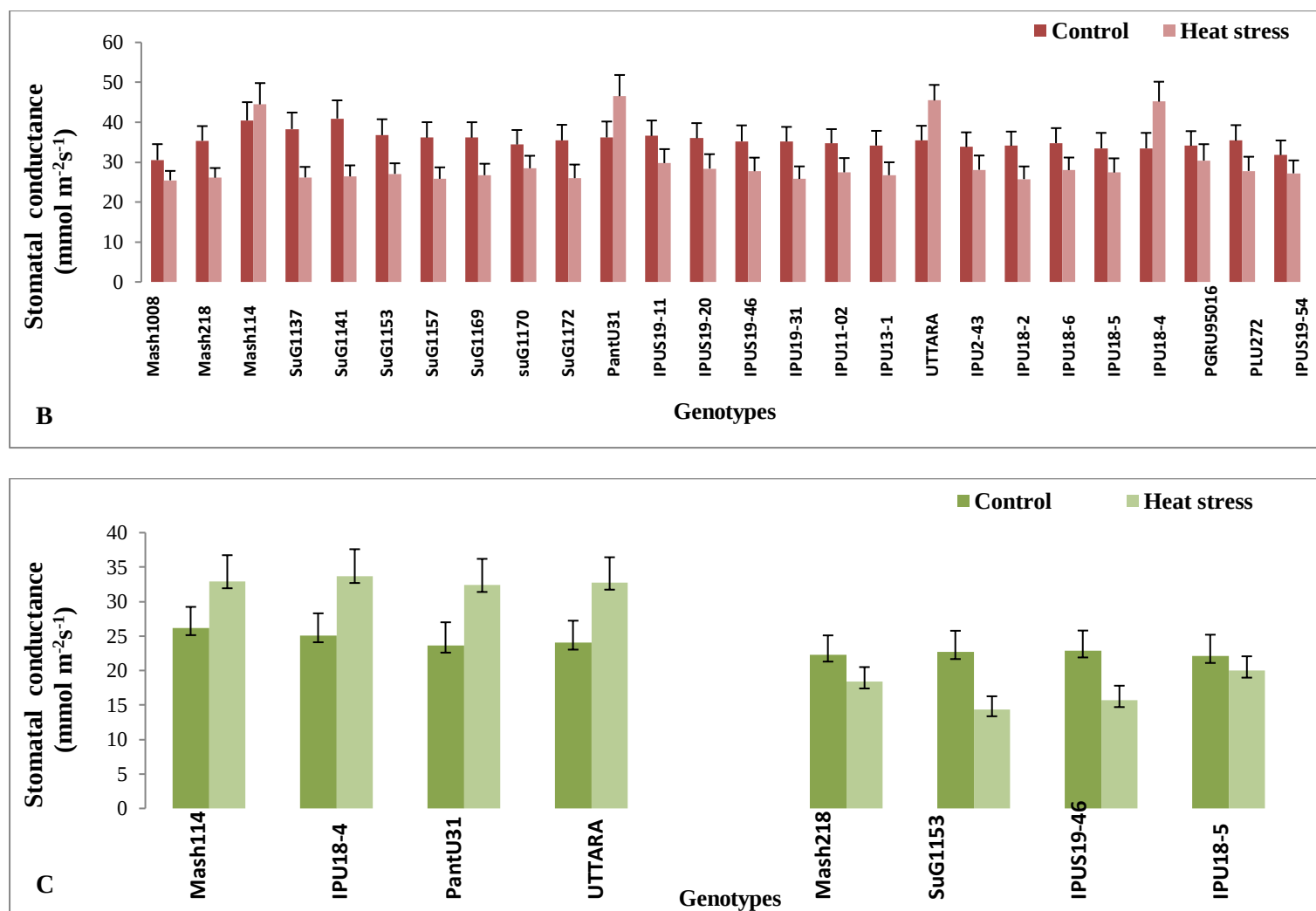
Supplementary Fig.S1: Weather data (maximum (Max), minimum (Min) and average (Avg) temperature ($^{\circ}\text{C}$), [A (2018, B(2019))] and relative humidity RH (%) [(C(2018), D (2019)].



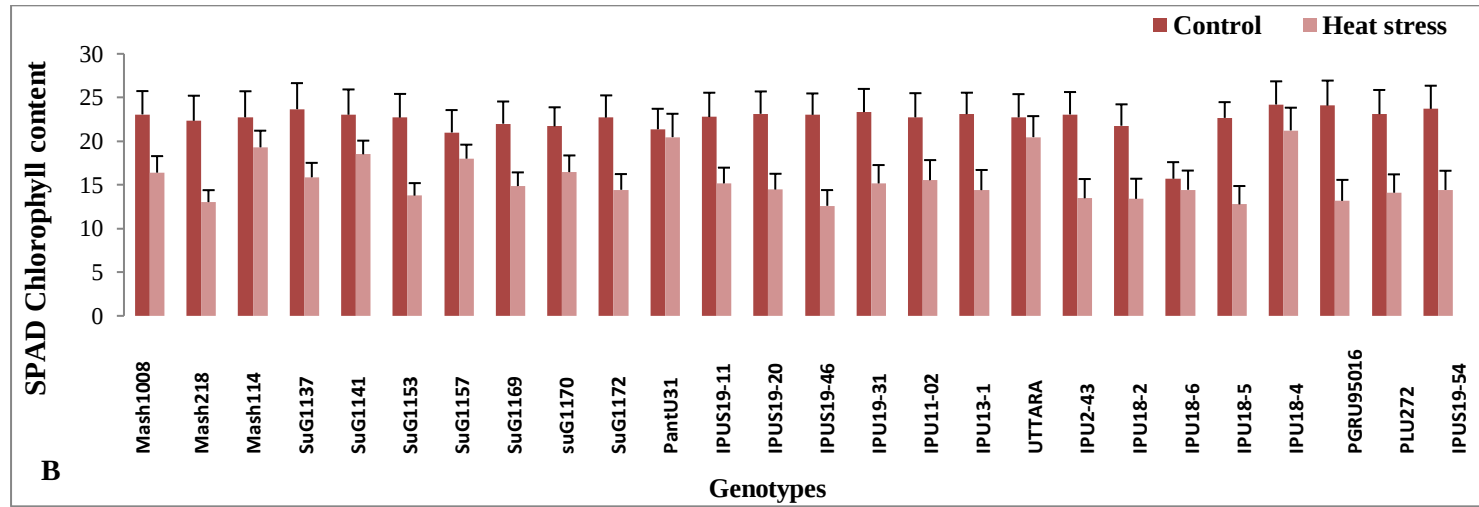
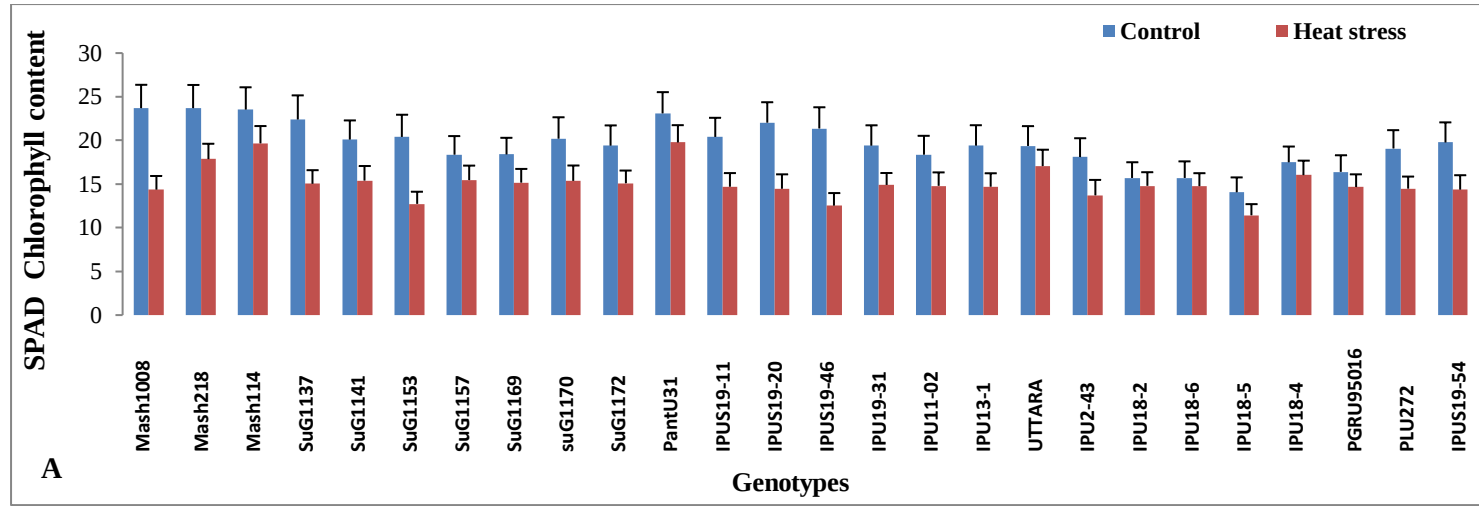


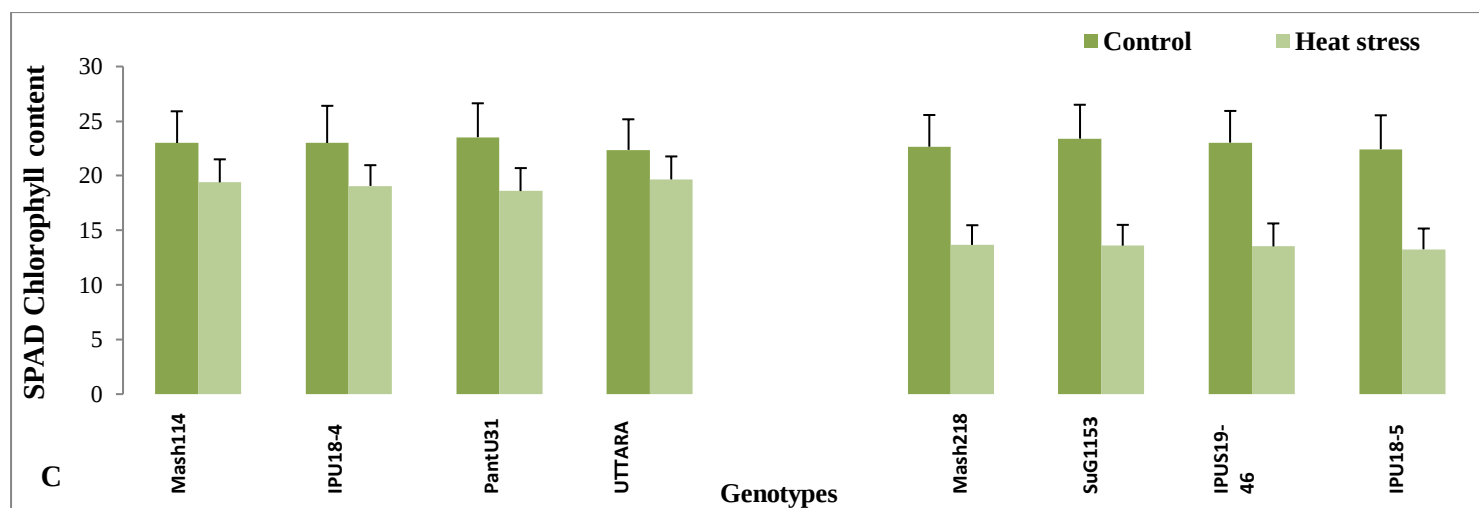
Supplementary Fig.S2: Electrolyte leakage of Urdbean genotypes under control (normal-sown; Control) and heat stress environment during 2018 (A),2019 (B) and in controlled environment of growth chamber (C;GC). LSD values ($P < 0.05$); genotype $\times$ treatment: 3.5 (2018), 2.9 (2019), 3.13 (GC). Values are means + SE. ($n = 3$).



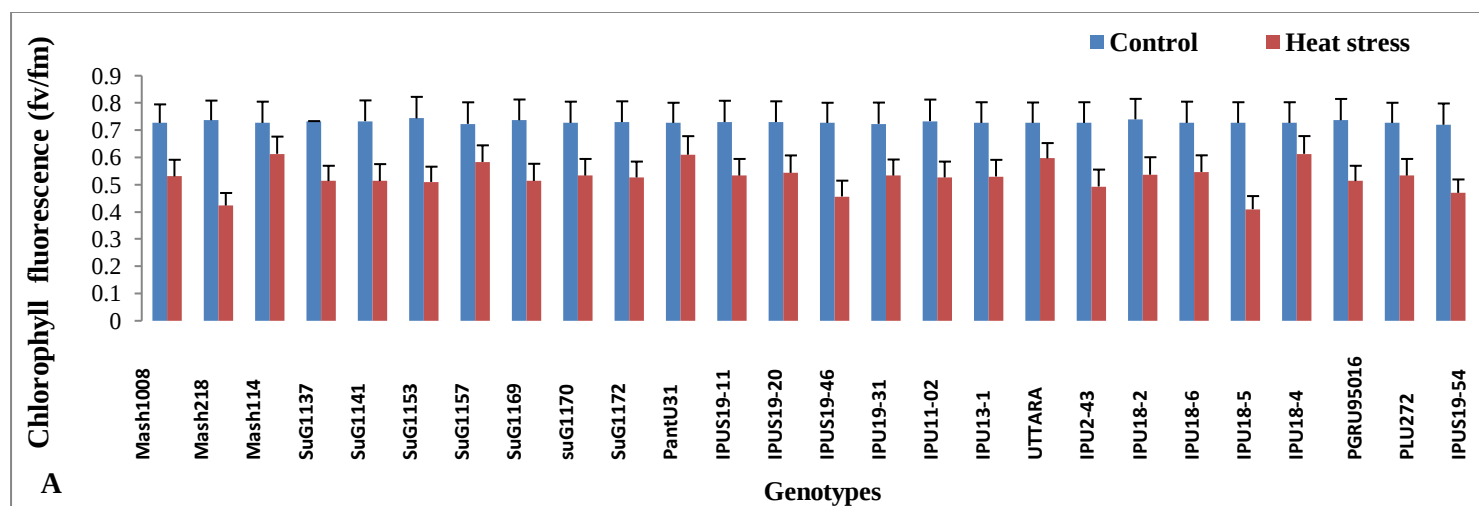


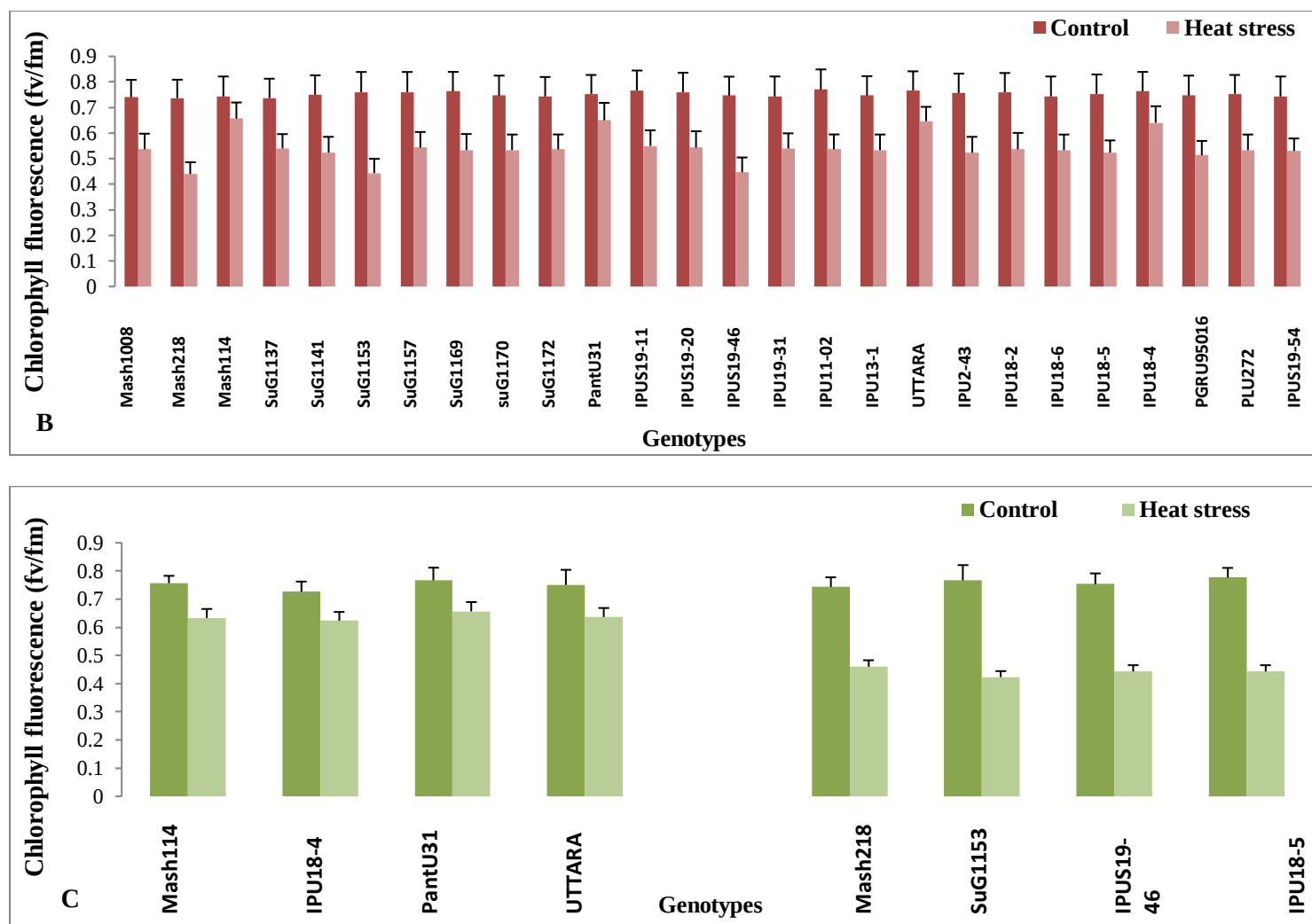
Supplementary Fig.S3: Leaf Stomatal conductance of Urdbean genotypes under control (normal-sown; Control) and heat stress environment during 2018 (A), 2019 (B) and in controlled environment of growth chamber (C; GC). LSD values ($P < 0.05$); genotype $\times$ treatment: 3.9 (2018), 3.1 (2019), 2.14 (GC). Values are means + SE. ($n = 3$).



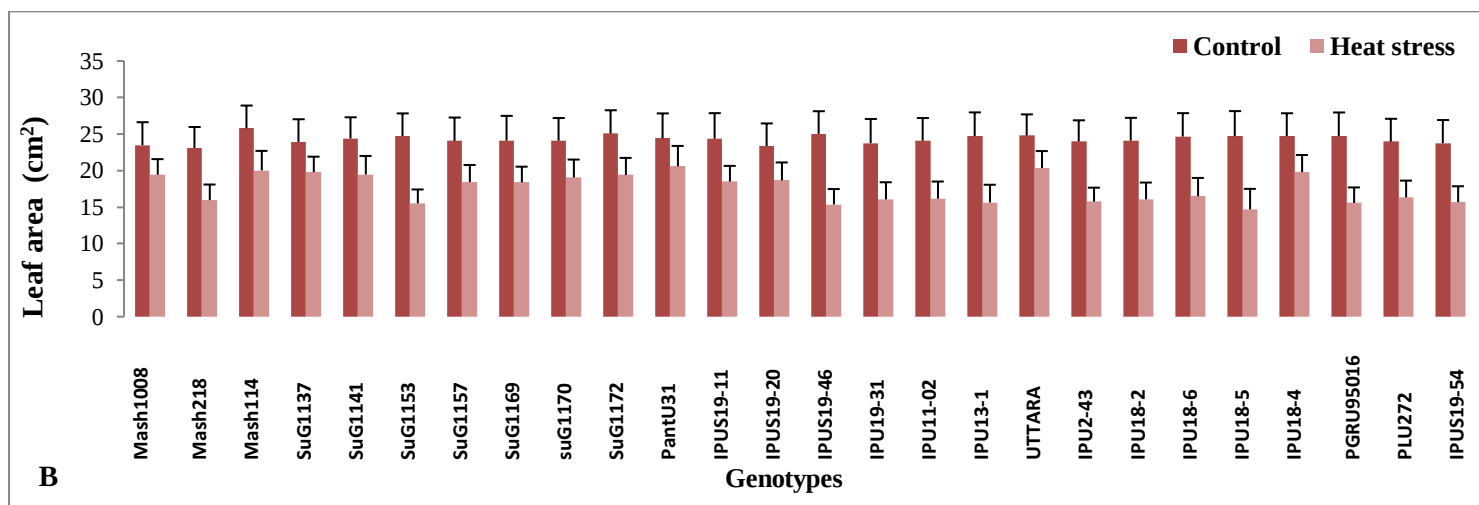
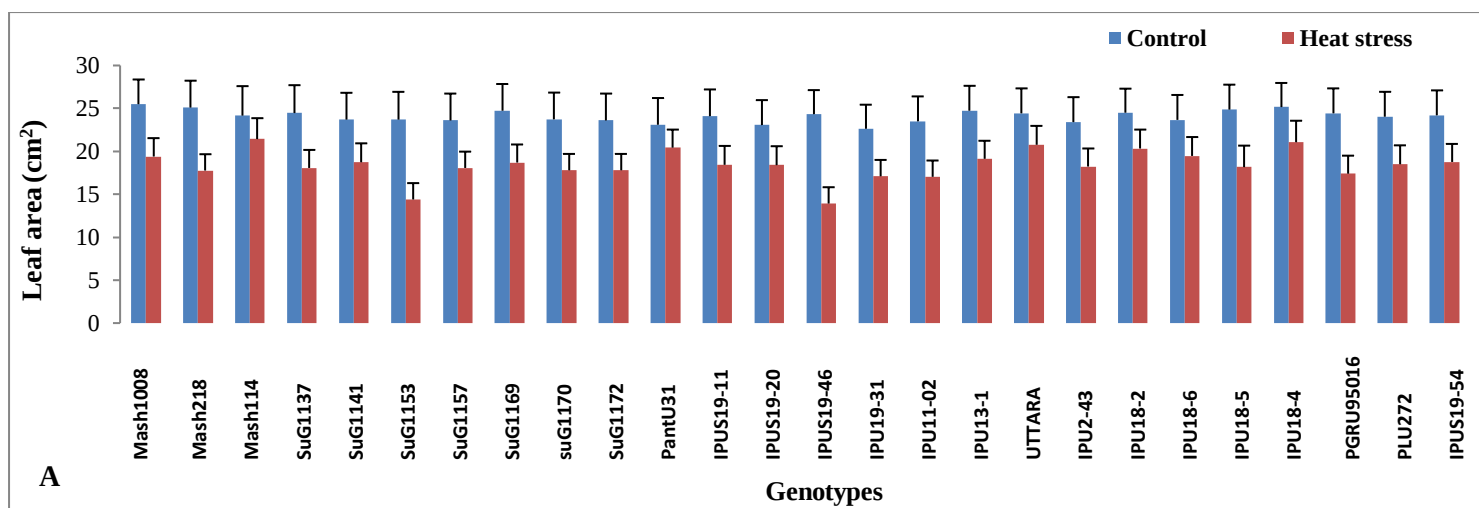


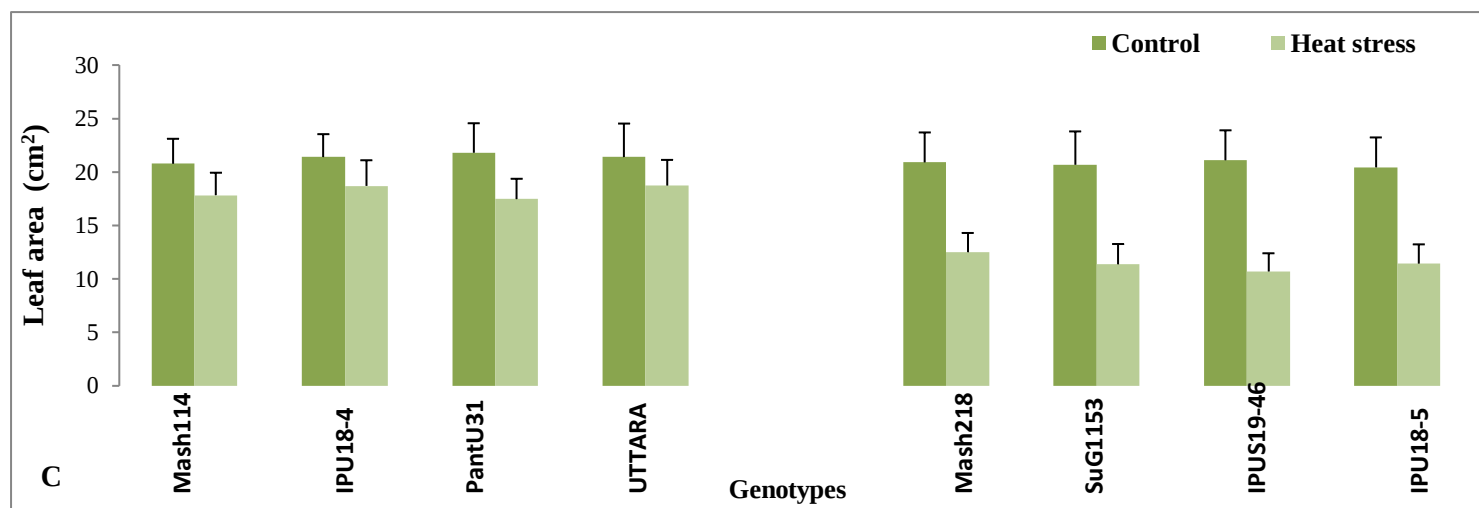
Supplementary Fig.S4: SPAD chlorophyll of Urdbean genotypes under control (normal-sown; Control) and heat stress environment during 2018 (A),2019 (B) and in controlled environment of growth chamber (C;GC). LSD values ($P < 0.05$); genotype $\times$ treatment: 2.76 (2018), 2.15 (2019), 1.4 (GC). Values are means + SE. ($n = 3$).



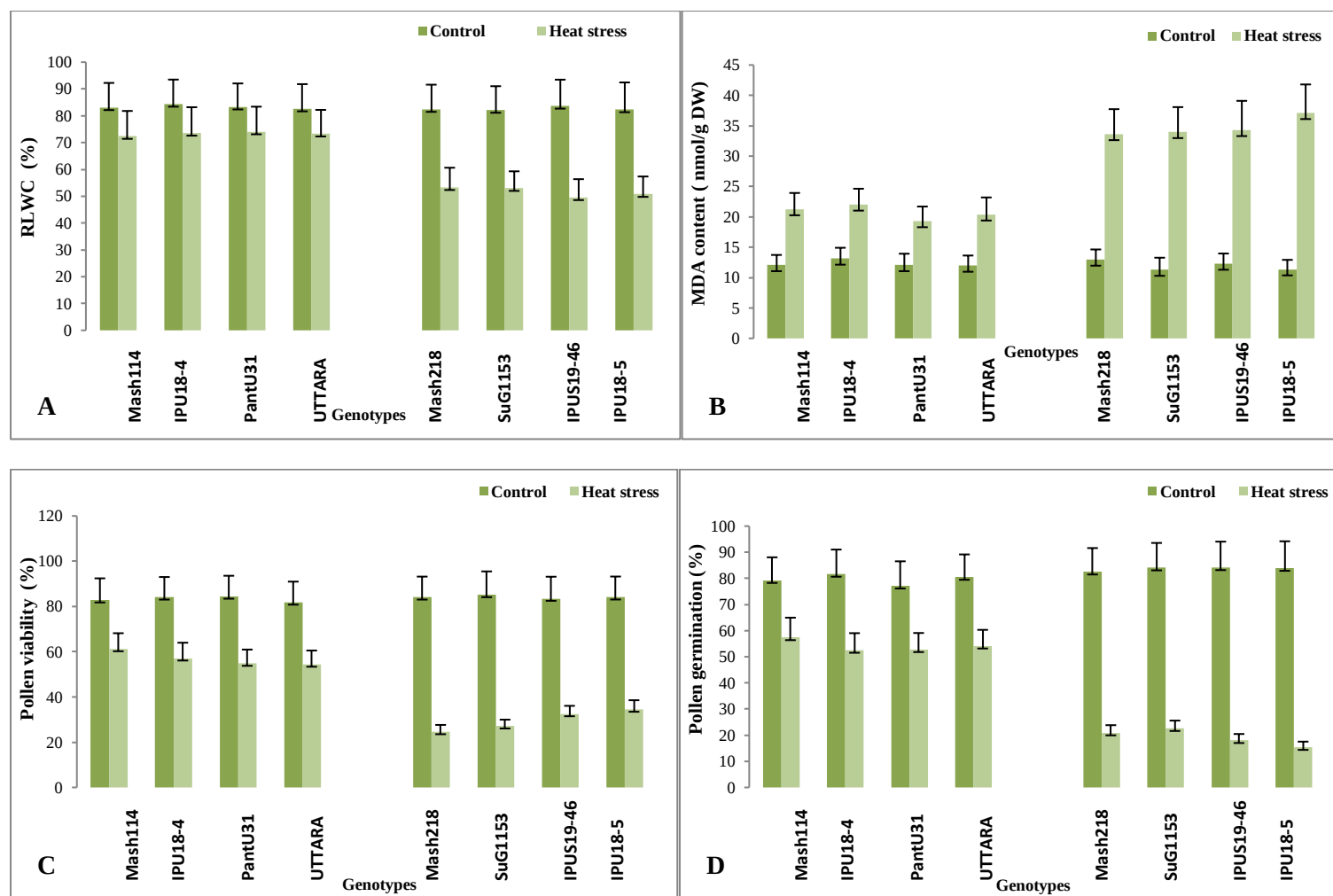


Supplementary Fig.S5: Chlorophyll fluorescence of Urdbean genotypes under control (normal-sown; Control) and heat stress environment during 2018 (A), 2019 (B) and in controlled environment of growth chamber (C; GC). LSD values ($P < 0.05$); genotype $\times$ treatment: 0.13 (2018), 0.16 (2019), 0.11 (GC). Values are means + SE. ($n = 3$).





Supplementary Fig.S6: Leaf area of Urdbean genotypes under control (normal-sown; Control) and heat stress environment during 2018 (A),2019 (B) and in controlled environment of growth chamber (C; GC). LSD values ($P < 0.05$); genotype $\times$ treatment: 3.8 (2018), 3.3 (2019), 3.5 (GC). Values are means + SE. ($n = 3$).



Supplementary Fig.S7: Relative leaf water content (RLWC; A), Malondialdehyde (MDA; B), Pollen viability % (PV; C) and Pollen germination % (PG; D) of Urdbean genotypes under control (normal-sown; Control) and heat stress environment during 2018 (A), 2019 (B) and in controlled environment of growth chamber (C; GC). LSD values ($P < 0.05$); genotype $\times$ treatment: 3.15 (RLWC), 5.4 (MDA), 7.8 (PV), 8.3 (PG). Values are means + SE. ($n = 3$).

