

Supporting information for

Combining heat stress with pre-existing drought exacerbated effects on chlorophyll fluorescence rise kinetics in four contrasting plant species

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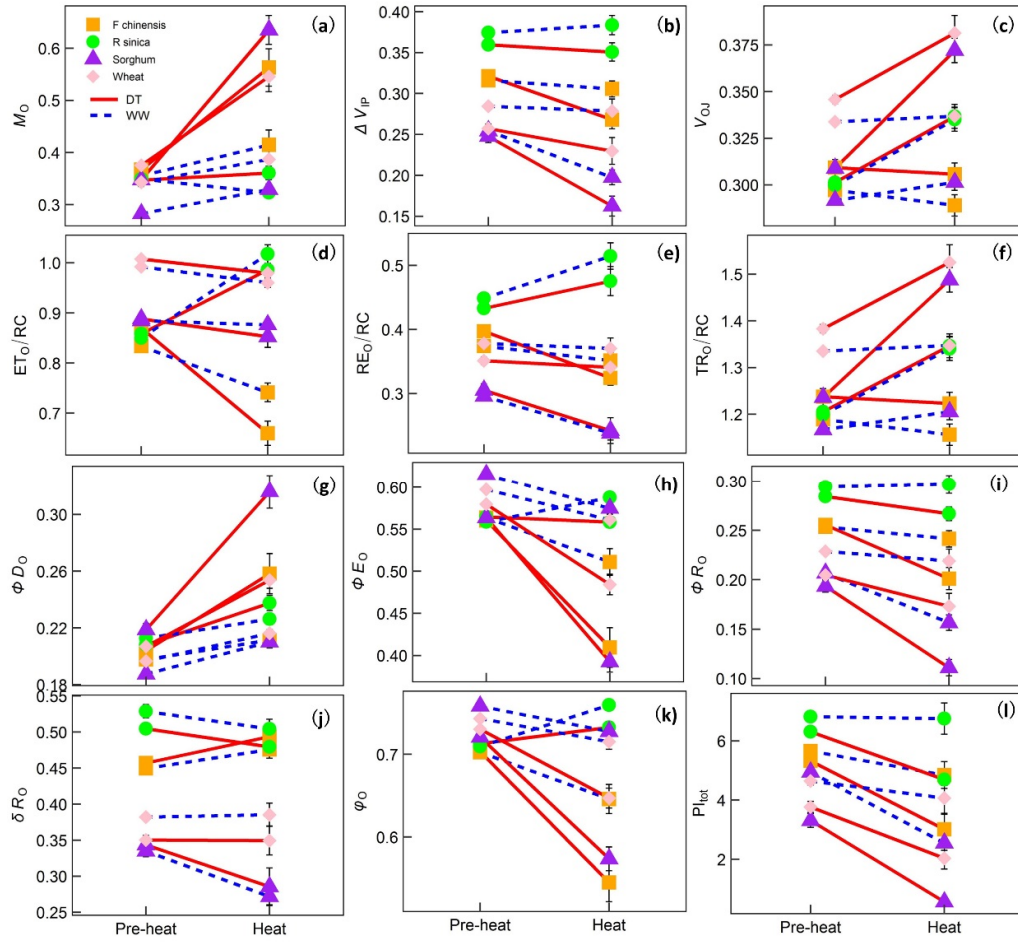


Figure S1. Responses of chlorophyll fluorescence OJIP parameters to either heat, drought or their combination in four plant species. Red line connects each drought-treated (DT) species under pre-heat and heat treatments; blue dashed line connects each well-watered (WW) species. The corresponding linear mixed-effects model analysis of variances results are shown in Table S3.

Table S1. Linear mixed-effects model analysis of variance of the effects of heat and drought and their interaction on OJIP parameters.

		Heat	Drought	Species	Heat x Drought	Heat x Species	Drought x Species	Heat x Drought x Species
<i>Mo</i>	t value	10.482	-1.364	-1.783	-5.041	-5.95	-3.686	-1.838
	P value	< 0.0001	0.173	0.075	< 0.0001	< 0.0001	0.0002	0.066
<i>V_{OJ}</i>	t value	-1.005	-4.422	11.867	-0.780	6.896	2.377	-3.385
	P value	0.315	< 0.0001	< 0.0001	0.435	< 0.0001	0.018	0.0007
ΔV_{IP}	t value	-4.951	-0.655	-9.138	2.814	2.650	3.794	-1.168
	P value	< 0.0001	0.513	< 0.0001	0.005	0.008	0.0001	0.243
TRo/RC	t value	-1.02	-4.444	11.838	-0.767	6.896	2.390	-3.388
	P value	0.308	< 0.0001	< 0.0001	0.443	< 0.0001	0.017	0.0007
ETo/RC	t value	-17.693	-3.916	14.612	7.185	16.312	1.820	-3.354
	P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.069	0.0008
REo/RC	t value	-6.031	-2.572	-7.732	2.861	5.238	4.550	1.739
	P value	< 0.0001	0.01	< 0.0001	0.004	< 0.0001	< 0.0001	0.082
ΦE_o	t value	-17.579	0.639	2.883	8.517	10.650	3.448	-3.926
	P value	< 0.0001	0.523	0.004	< 0.0001	< 0.0001	0.0006	< 0.0001
ΦD_o	t value	11.109	-2.503	3.974	-5.440	4.152	-5.300	-2.046
	P value	< 0.0001	0.012	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.041
ΦR_o	t value	-6.512	-0.308	-8.742	3.643	-3.46	3.682	-1.492
	P value	< 0.0001	0.758	< 0.0001	0.0003	0.00005	0.0002	0.136
δR_o	t value	2.325	-0.761	-12.44	-0.519	-4.032	3.797	0.699
	P value	0.02	0.446	< 0.0001	0.603	< 0.0001	0.0002	0.484

φ_0	t value	-17.385	0.014	4.004	8.131	11.961	2.647	-3.911
	P value	< 0.0001	0.988	< 0.0001	< 0.0001	< 0.0001	0.008	0.0001
PI _{tot}	t value	-12.384	1.491	-2.048	6.021	6.04	4.016	-2.213
	P value	< 0.0001	0.136	0.041	< 0.0001	< 0.0001	< 0.0001	0.027

Table S2. Linear mixed-effects model analysis of variance of the effects of heat release and re-watering on OJIP parameters.

		Heat release (DT)	Species	Heat release (DT) x Species	Heat release (WW)	Species	Heat release (WW) x Species	Re- watering (DT)	Species	Re- watering (DT) x Species
M_o	t value	-5.616	-5.771	3.417	-0.625	-3.744	1.732	1.104	4.431	3.213
	P value	< 0.0001	< 0.0001	0.0007	0.532	0.0002	0.085	0.27	< 0.0001	0.005
V_{OJ}	t value	0.542	4.982	-2.596	2.956	8.209	-5.895	0.436	7.129	4.704
	P value	0.588	< 0.0001	0.01	0.004	< 0.0001	< 0.0001	0.663	< 0.0001	< 0.0001
ΔV_{IP}	t value	2.993	-5.473	-2.233	1.162	-4.973	-1.490	-0.805	-9.419	2.967
	P value	0.003	< 0.0001	0.027	0.247	< 0.0001	0.138	0.421	< 0.0001	0.003
TRo/RC	t value	0.553	3.441	4.978	2.951	8.207	-5.892	0.441	7.122	4.701
	P value	0.58	0.0007	< 0.0001	0.004	< 0.0001	< 0.0001	0.66	< 0.0001	< 0.0001
ETo/RC	t value	9.911	12.897	-8.879	4.991	13.597	-9.091	-0.807	6.374	3.915
	P value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.42	< 0.0001	< 0.0001
REo/RC	t value	3.571	5.839	-3.395	2.647	8.363	-4.323	-0.615	-6.48	3.482
	P value	< 0.0001	< 0.0001	0.0008	0.009	< 0.0001	< 0.0001	0.538	< 0.0001	0.0006
ΦE_o	t value	8.332	7.54	4.716	1.778	4.912	-3.387	-1.272	-2.118	-1.858
	P value	< 0.0001	< 0.0001	< 0.0001	0.77	< 0.0001	0.0008	0.204	0.035	0.064
ΦD_o	t value	-4.931	3.047	2.532	0.409	2.733	-2.852	1.017	2.735	2.592
	P value	< 0.0001	0.003	0.012	0.683	0.001	0.004	0.31	0.007	0.01
ΦR_o	t value	3.789	-5.498	-2.49	1.109	-4.682	-1.674	-0.913	-9.288	-2.412
	P value	0.0002	< 0.0001	0.014	0.269	< 0.0001	0.095	0.362	< 0.0001	0.017
δR_o	t value	-1.466	-7.639	2.549	0.063	1.402	-8.646	-0.294	-10.095	3.447

	P value	0.144	< 0.0001	0.012	0.95	0.163	< 0.0001	0.769	< 0.0001	0.0006
ϕ_0	t value	9.060	9.485	6.335	2.188	6.498	-3.575	-1.357	-1.85	1.537
	P value	< 0.0001	< 0.0001	< 0.0001	0.03	< 0.0001	0.0004	0.176	0.066	0.126
PI_{tot}	t value	6.175	4.804	-3.78	0.722	2.445	-2.16	-1.155	-4.898	-3.112
	P value	< 0.0001	< 0.0001	0.0002	0.471	0.015	0.032	0.249	< 0.0001	0.002

Table S3. Linear regression results between ΦE_o and J , RE_o/RC and V_{cmax} , δR_o and A_{net} .

Linear model	a	b	r^2	P
$\Phi E_o = a + b * J$			0.4110	< 0.0001
Wheat	0.4533	0.0009		
Sorghum	0.2913	0.0015		
<i>F. chinensis</i>	0.3103	0.0021		
<i>R. sinica</i>	0.4983	0.0005		
$RE_o/RC = a + b * V_{cmax}$		0.001	0.7155	< 0.0001
Wheat	0.2674			
Sorghum	0.2525			
<i>F. chinensis</i>	0.3030			
<i>R. sinica</i>	0.3636			
$\delta R_o = a + b * A_{net}$			0.8232	< 0.0001
Wheat	2.61E-01	-2.17E-01		
Sorghum	3.56E-01	-1.89E-03		
<i>F. chinensis</i>	4.76E-01	-1.82E-03		
<i>R. sinica</i>	4.96E-01	5.52E-04		