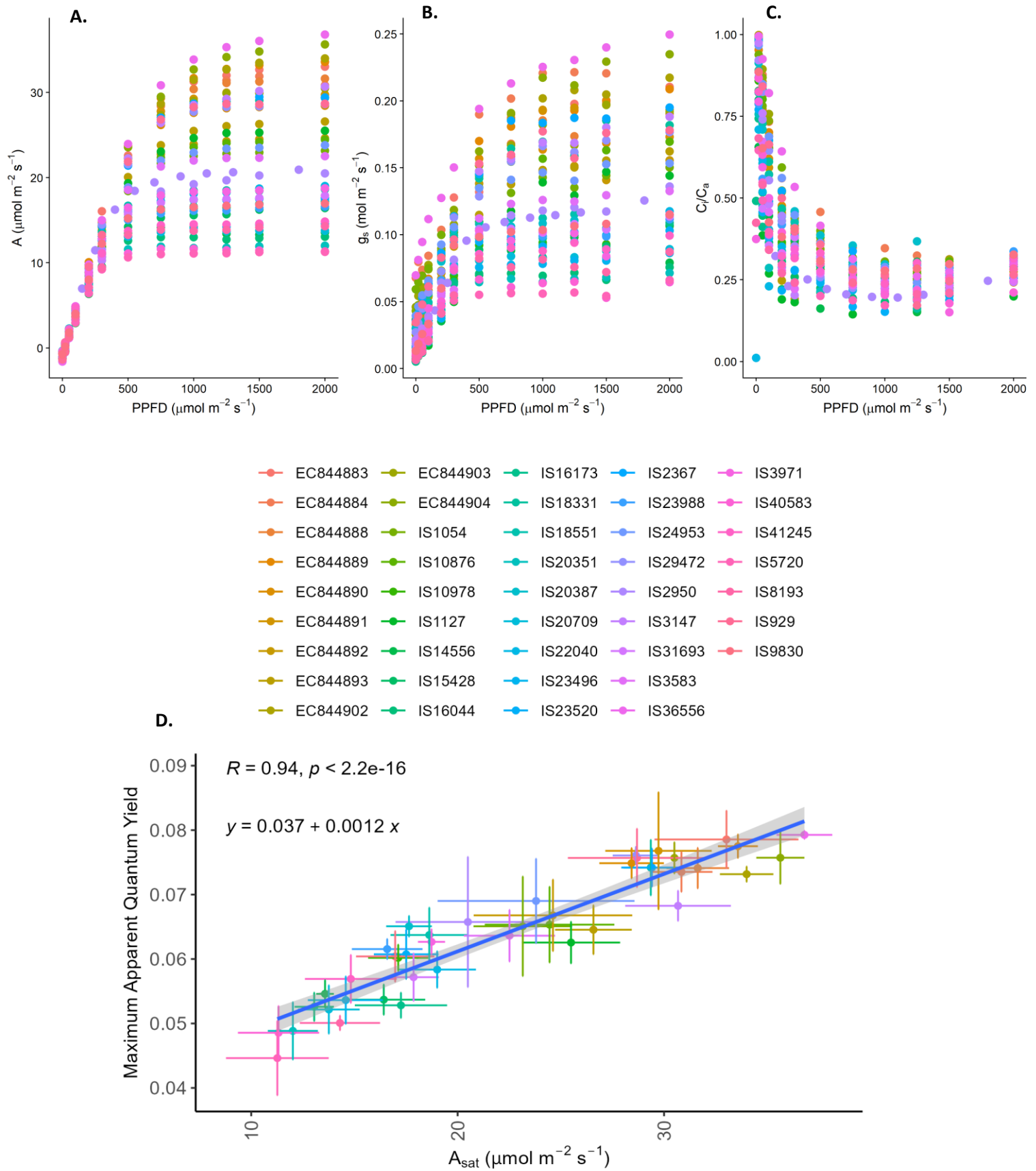
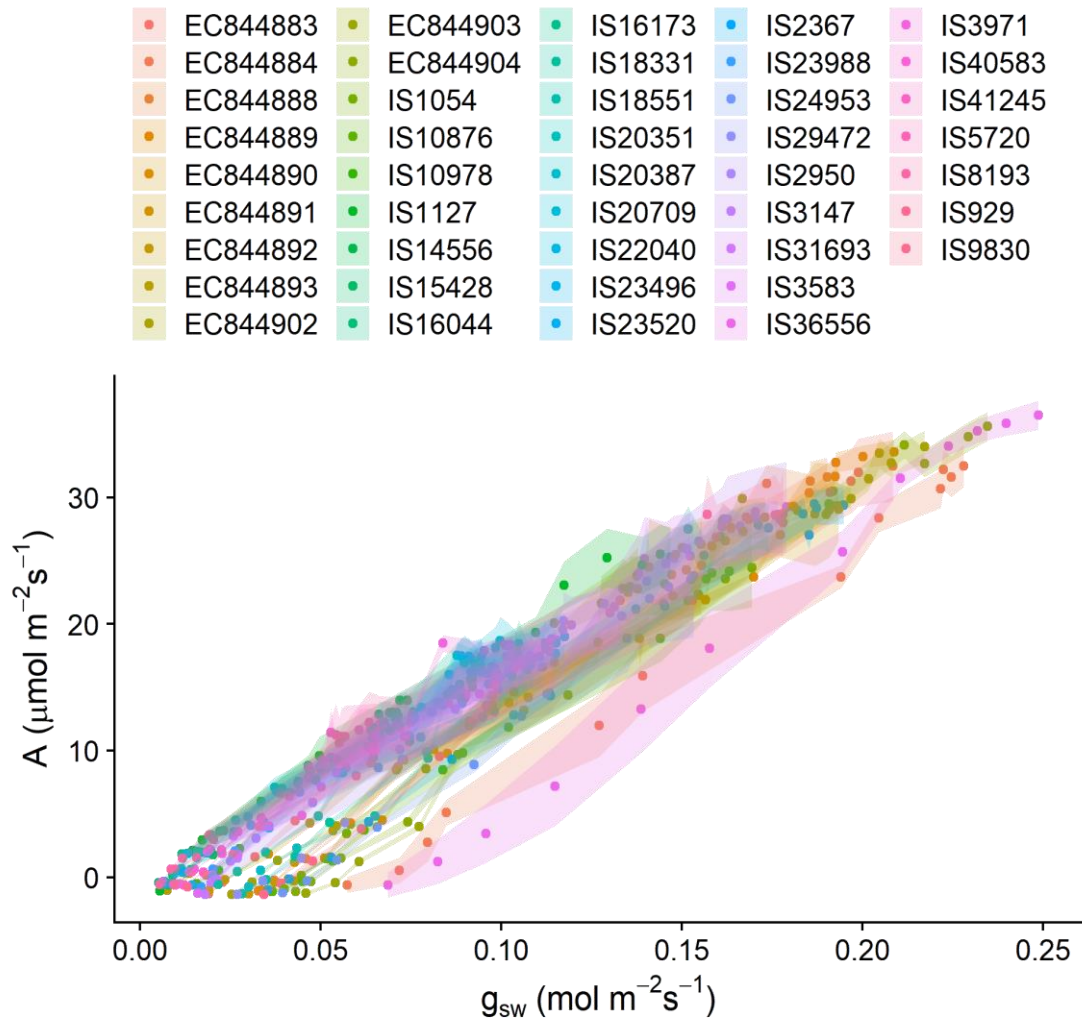


Supplemental Table S1. *Sorghum bicolor* L. Moench Accessions used in this study

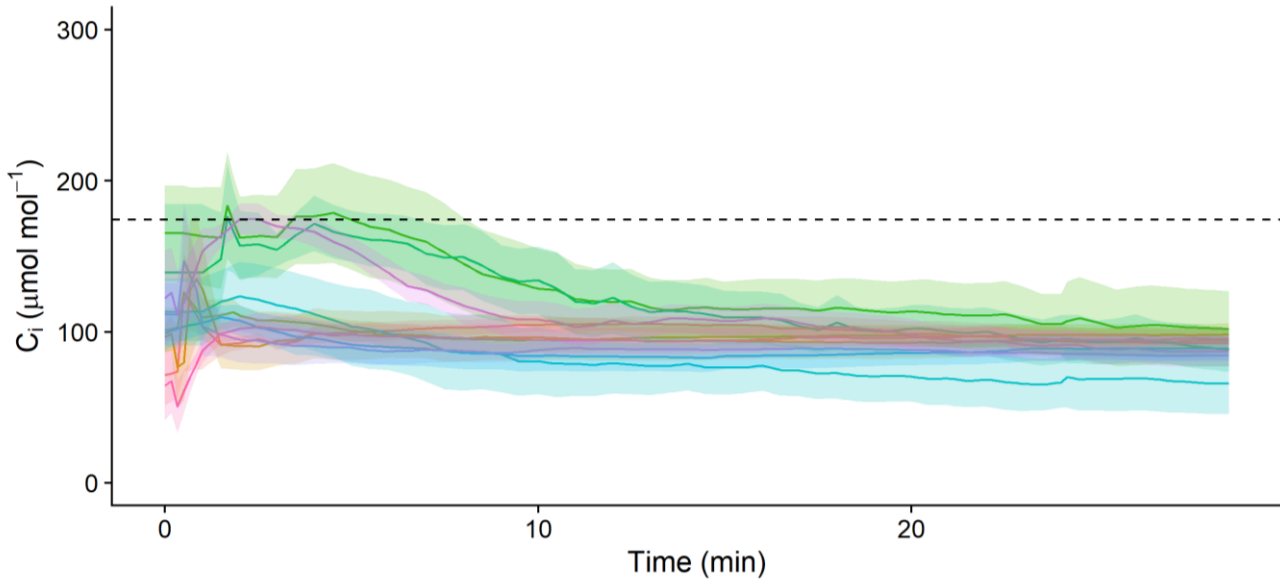
Accession Number	Alternative Name	Country of Origin	Biological Status
IS 929	PI 568989	Sudan	Traditional cultivar/Landrace
IS 1054	PI 248264	India	Advanced/Improved cultivar
IS 1127	A 35	India	Traditional cultivar/Landrace
IS 2367	Q2-4-74	Nigeria	Traditional cultivar/Landrace
IS 2950	R-16 / SA 7526-1-20-8-2-10-1	USA	Breeding/Research material
IS 3147	DL 60/114	South Africa	Traditional cultivar/Landrace
IS 3583	HSD 7867	Sudan	Traditional cultivar/Landrace
IS 3971	IC 8946	India	Traditional cultivar/Landrace
IS 5720	Janera pipla	India	Traditional cultivar/Landrace
IS 8193	KA 4	Uganda	Breeding/Research material
IS 9830	PI 563310	Sudan	Traditional cultivar/Landrace
IS 10876	BO50	Nigeria	Traditional cultivar/Landrace
IS 10978		USA	Traditional cultivar/Landrace
IS 14556		Ethiopia	Traditional cultivar/Landrace
IS 15428	2-1-6-7	Cameroon	Traditional cultivar/Landrace
IS 16044	4-3-26-3	Cameroon	Traditional cultivar/Landrace
IS 16173	4-1-3-15	Cameroon	Traditional cultivar/Landrace
IS 18331	N 13	India	Breeding/Research material
IS 18551	Jijwerjere 935	Ethiopia	Breeding/Research material
IS 20351	SG 2303	Niger	Traditional cultivar/Landrace
IS 20387	SG 2375	Niger	Traditional cultivar/Landrace
IS 20709	HDW 128	USA	Traditional cultivar/Landrace
IS 22040	Yerra jonna	India	Traditional cultivar/Landrace
IS 23496		Ethiopia	Traditional cultivar/Landrace
IS 23520	Sima	Ethiopia	Advanced/Improved cultivar
IS 23988	AR 220	Yemen	Traditional cultivar/Landrace
IS 24953	No. 2360	Zambia	Traditional cultivar/Landrace
IS 29472		Lesotho	Traditional cultivar/Landrace
IS 31693	S. bicolor 71	Algeria	Traditional cultivar/Landrace
IS 36556	S-35	Nigeria	Traditional cultivar/Landrace
IS 40583	BTX 623	USA	Breeding/Research material
IS 41245	296-B	India	Breeding/Research material
EC 844883	Framida	Birkina Faso	Breeding/Research material
EC 844884	Grinkan / 02-sb-f4dt-275	Mali	Breeding/Research material
EC 844888	DOUA-G	Ivory Coast	Breeding/Research material
EC 844889	GNOSSICONI	Birkina Faso	Breeding/Research material
EC 844890	RIBDAHU	Niger	Breeding/Research material
EC 844891	SAMBALMA	Nigeria	Breeding/Research material
EC 844892	GPN01 S01 -9-3-3-VAR	Mali	Breeding/Research material
EC 844893	GPN01 S01 -9-3-1-1	Mali	Breeding/Research material
EC 844902	GPN01 S01 -9-V1-2-34- 2	Mali	Breeding/Research material
EC 844903	CSM63-E	Mali	Breeding/Research material
EC 844904	BBISS-08	Wild (unknown region)	Breeding/Research material



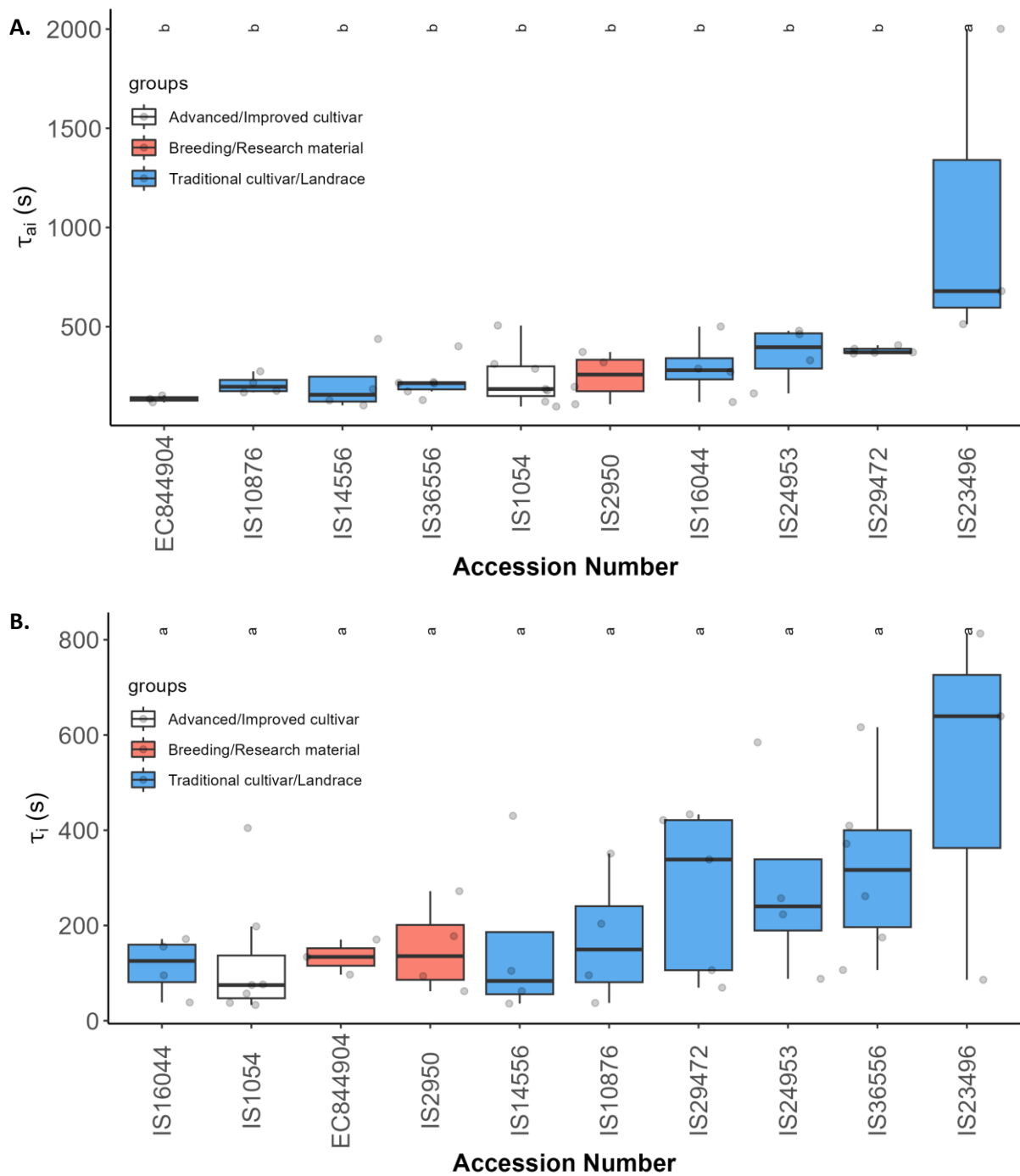
Supplementary Fig. S1. Relationship between maximum apparent quantum yield and photosynthetic CO₂ assimilation at 2000 $\mu\text{mol m}^{-2} \text{s}^{-1}$ (A_{sat}) for the 43 sorghum accessions tested in this study. Points indicate mean values for the accession of the associated colour. Error bars indicate standard error of the mean, $n = 3-8$. Line represents $R = 0.94$, $p < 2.2e-16$ with a regression formula of $y = 0.037 + 0.0012x$.



Supplementary Fig. S2. (A.) Rate of change of CO₂ assimilation rate (A) relative to stomatal conductance to water (g_s) in response to changes in PPFD irradiance intensities from 0 to 2000 μmol m⁻² s⁻¹, as shown in Fig. 2. Data shown here for all 43 tested accessions. Points indicate mean average of 3-6 plants and ribbons indicate standard error. (B.) Light saturated rate of photosynthetic CO₂ assimilation (A_{sat}; A at 2000 μmol m⁻² s⁻¹) relative to stomatal conductance under saturating light (g_{ssat}; g_s at 2000 μmol m⁻² s⁻¹) for each tested sorghum accession. Points indicate mean average values for accessions as indicated by colour. Error bars indicate standard error of the mean, n= 3-8. Shaded ribbon represent standard error around the mean. Line represents R = 0.99, p <2.2e-16 with a regression formula of y = 1.3 + 150 x.

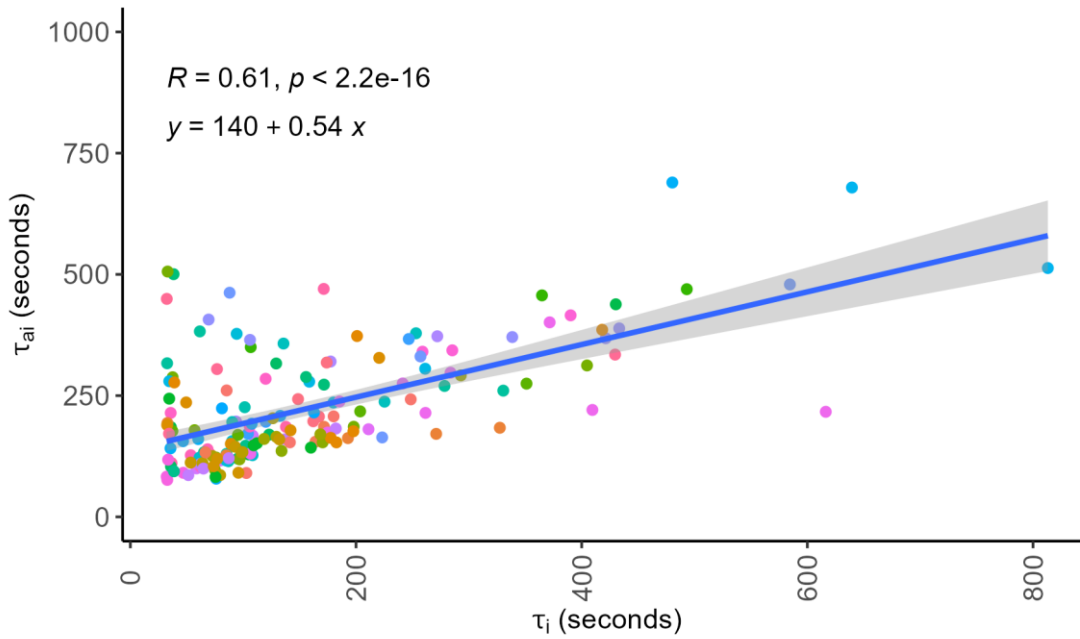


Supplementary Fig. S3. Temporal responses of internal CO₂ concentration (C_i) to a rapid increase in PPFD irradiance from 100 $\mu\text{mol m}^{-2} \text{s}^{-1}$ to 1000 $\mu\text{mol m}^{-2} \text{s}^{-1}$ in the ten representative sorghum accessions. $n = 4-8$ Shaded ribbon represent standard error around the mean

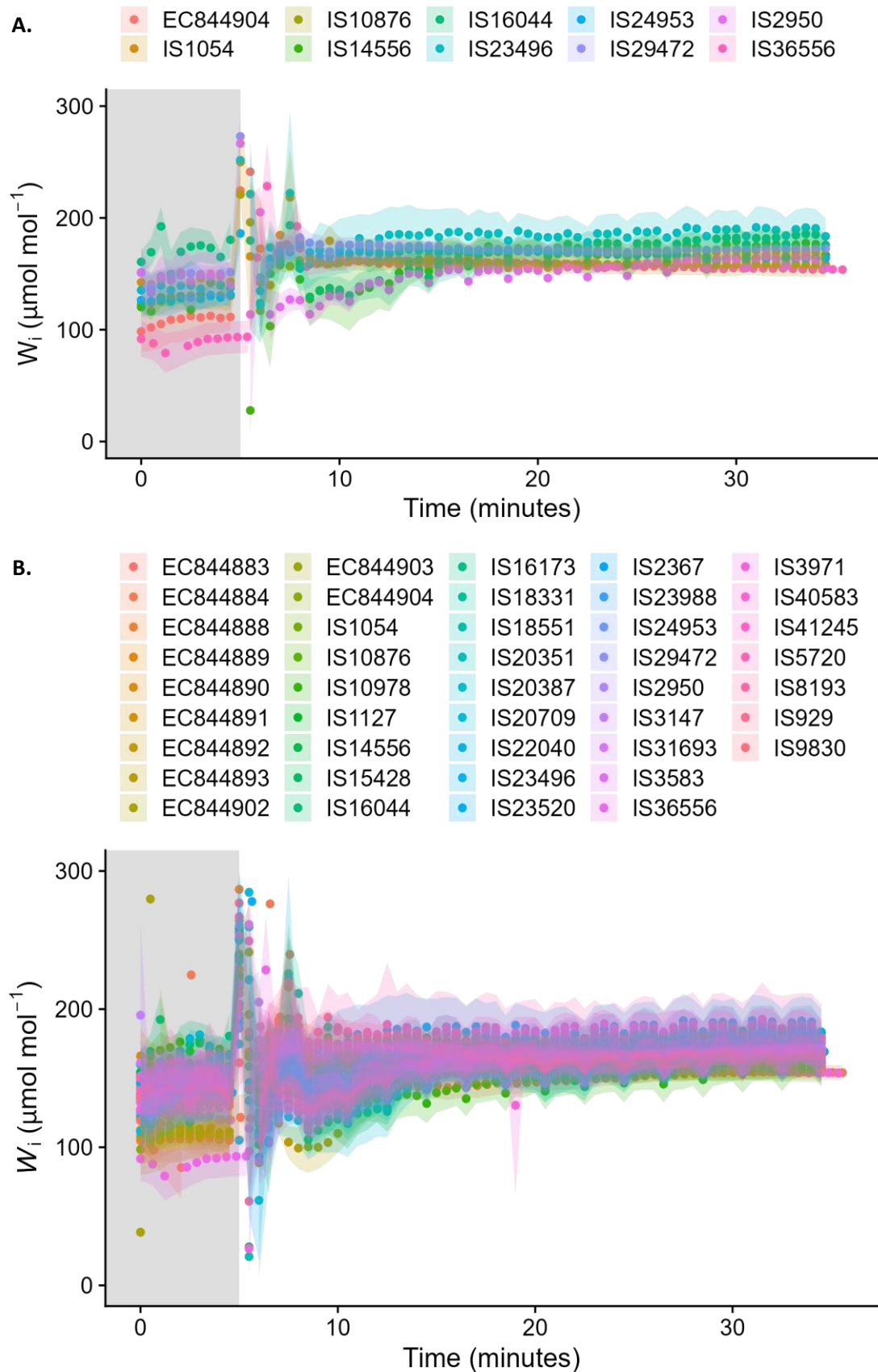


Supplementary Fig. S4. Time constants of (A.) light saturated rate of carbon assimilation (τ_{ai}) and (B.) stomatal opening (τ_i) in seconds, shown here for 10 representative sorghum accessions. Accession numbers in A. and B. ordered from lowest to highest mean τ_{ai} . Letters indicate significantly different groupings of ANOVA results ($p \leq 0.05$) calculated using a Tukey's test, $n = 3-8$.

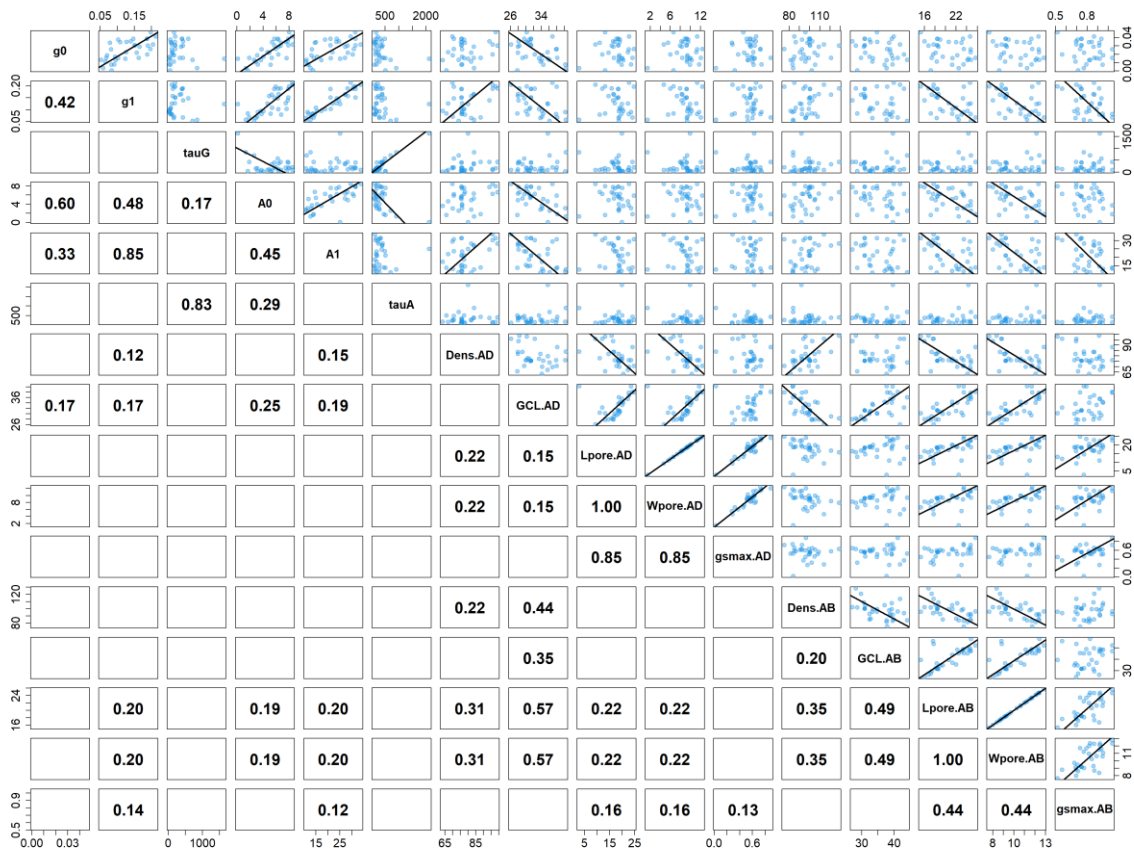
- | | | | | |
|------------|------------|-----------|-----------|-----------|
| ● EC844883 | ● EC844903 | ● IS16173 | ● IS2367 | ● IS3971 |
| ● EC844884 | ● EC844904 | ● IS18331 | ● IS23988 | ● IS40583 |
| ● EC844888 | ● IS1054 | ● IS18551 | ● IS24953 | ● IS41245 |
| ● EC844889 | ● IS10876 | ● IS20351 | ● IS29472 | ● IS5720 |
| ● EC844890 | ● IS10978 | ● IS20387 | ● IS2950 | ● IS8193 |
| ● EC844891 | ● IS1127 | ● IS20709 | ● IS3147 | ● IS929 |
| ● EC844892 | ● IS14556 | ● IS22040 | ● IS31693 | ● IS9830 |
| ● EC844893 | ● IS15428 | ● IS23496 | ● IS3583 | |
| ● EC844902 | ● IS16044 | ● IS23520 | ● IS36556 | |



Supplementary Fig. S5. Association between the light saturated rate of carbon assimilation (τ_{ai}) and speed of stomatal opening (τ_i) in seconds. Each point indicates an individual plant. Accession number is indicated by colour. Line represents $R = 0.67, p < 2.2e-16$ with a regression formula of $y = 150 + 0.51 x, n = 3-8$.



Supplementary Fig. S6. Temporal response of intrinsic water use efficiency (W_i) to a rapid increase in PPFD irradiance from $100 \mu\text{mol m}^{-2} \text{s}^{-1}$ (shaded area) to $1000 \mu\text{mol m}^{-2} \text{s}^{-1}$ in (A.) ten representative sorghum accessions and (B.) all measured accessions. $n = 3-8$. Shaded ribbon represent standard error around the mean.



Supplementary Fig. S8. Matrix representing multiple regressions (using standard major axis) between modelled parameters describing the rapidity of stomatal and net CO₂ assimilation response and leaf anatomical parameters. Values in the lower panel represent the R² of the regression for each parameter pair, n= 3-8. Only significant regressions (p < 0.05) were represented by a line in the upper panel. Parameters g₀, A₀ and g₁, A₁ represent the initial and final value for g_s and A during a step change in light intensity; τ_g and τ_a represent the time constant for an increase in g_s and A; Dens represents the stomatal density; GCL represents the guard cell length; L_{pore} and W_{pore} represent the length and width of the stomatal pore; g_{smax} represents the maximum anatomical g_s; Suffixes AD and AB represent the adaxial and abaxial side of the leaf.