

Supplementary Material

Contributions of cryptochromes and phototropins to stomatal opening through the day

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Table S1. Concentration of C_a maintained by gas-exchange system under each light treatment for each genotype during the period of ZT = 00:00 to ZT = 11:30.

Fig. S1 Spectral photon irradiance measured in the growth room with a cosine diffuser level with the top of the seedlings.

Fig. S2 (a) Normalized spectral photon irradiance of (non-polarized) light emitted by the red, green, and blue channels of the LED-array source used for gas-exchange measurements. (b) Photograph of the custom-built LED-array light source used for gas-exchange measurements.

Fig. S3 Stomatal conductance (g_s) for individual plants from 12 midnight until 6 p.m. on the next day.

Fig. S4 Net carbon assimilation rate (A_{net}) for individual plants from 12 midnight until 6 p.m. on the next day.

Fig. S5 Ratio of C_i/C_a for individual plants from 12 midnight until 6 p.m. on the next day.

Fig. S6 Light absorption. Average spectral absorbance of illuminated leaves from 5 or 6 plants of each genotype.

Table S1. Concentration of C_a maintained by gas-exchange system under each light treatment for each genotype during the period of ZT = 00:00 to ZT = 11:30.

	Red light	Green light	Blue light	Darkness
Col-5	387.6 ± 0.1	387.8 ± 0.1	387.6 ± 0.1	390.3 ± 0.0
<i>phot1 phot2</i>	388.4 ± 0.0	388.1 ± 0.1	388.4 ± 0.1	390.3 ± 0.0
Ler	386.9 ± 0.1	387.4 ± 0.1	386.9 ± 0.1	390.1 ± 0.0
<i>cry1 cry2</i>	387.8 ± 0.1	387.9 ± 0.1	387.8 ± 0.1	390.1 ± 0.0

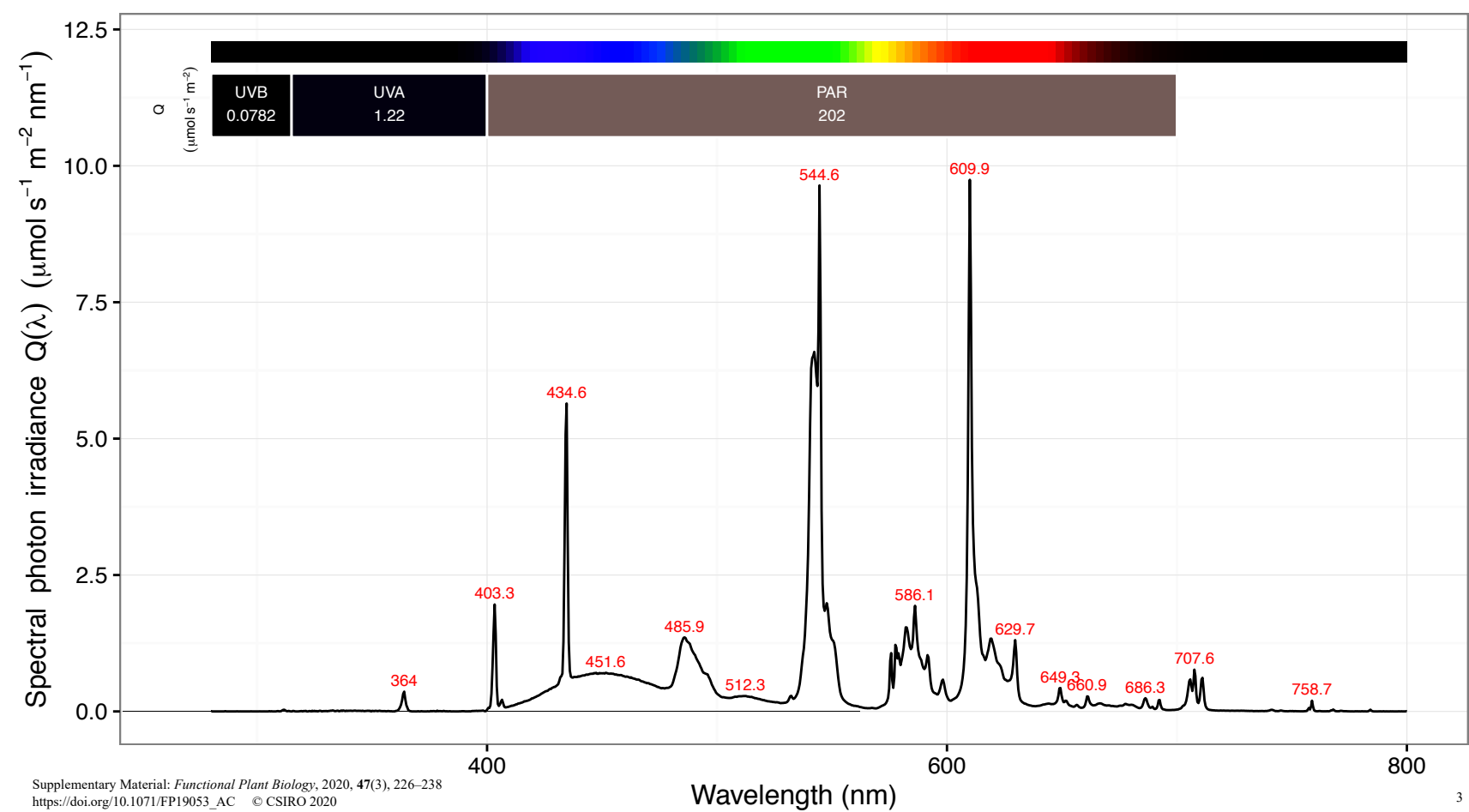
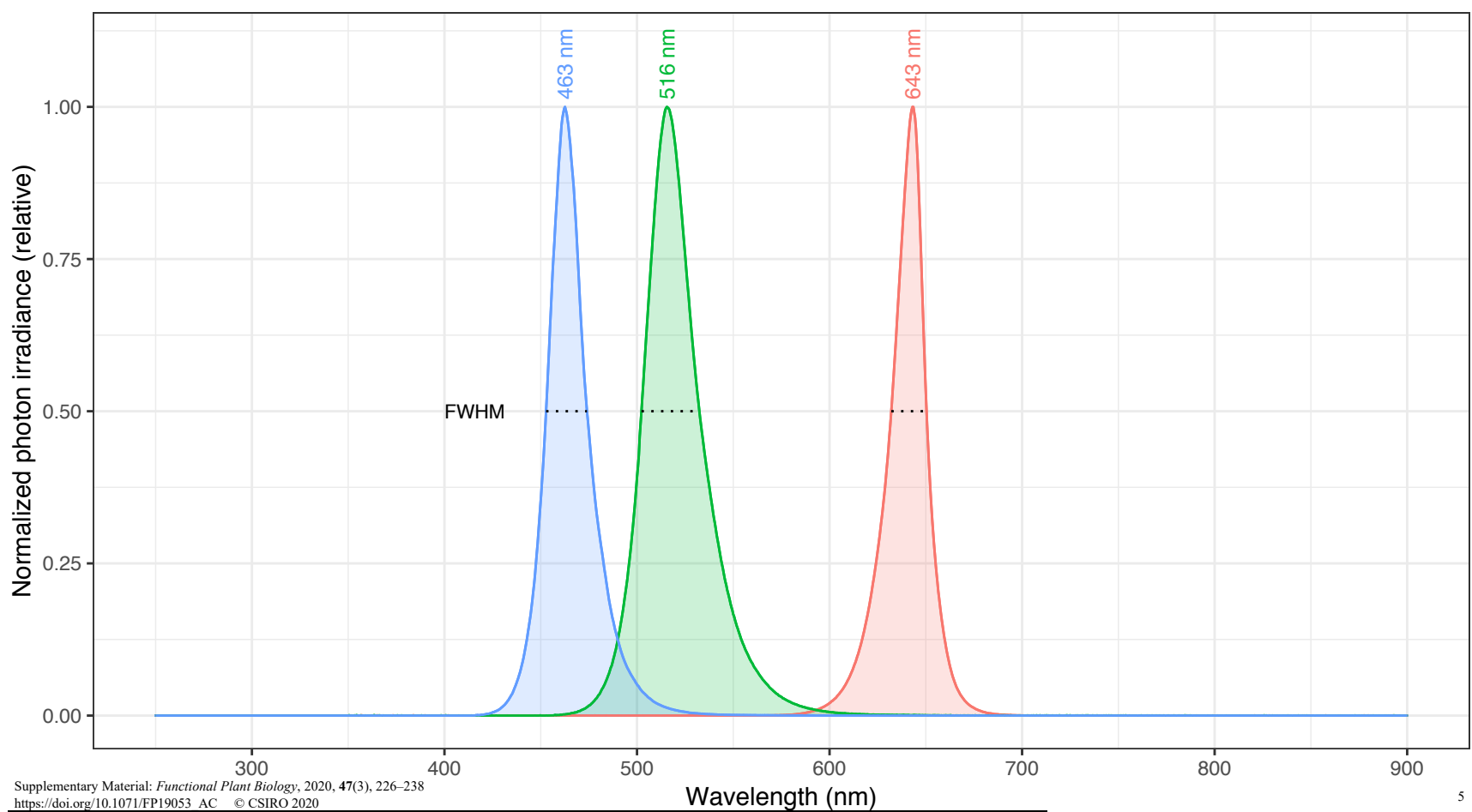


Fig. S1 Spectral photon irradiance measured in the growth room with a cosine diffuser level with the top of the seedlings. Spectral irradiance on the growth room shelves was measured with a Maya2000 Pro spectrometer (Ocean Optics, U.S.A) fitted with a D7-H-SMA cosine diffuser (Bentham Instruments, Reading, U.K.).



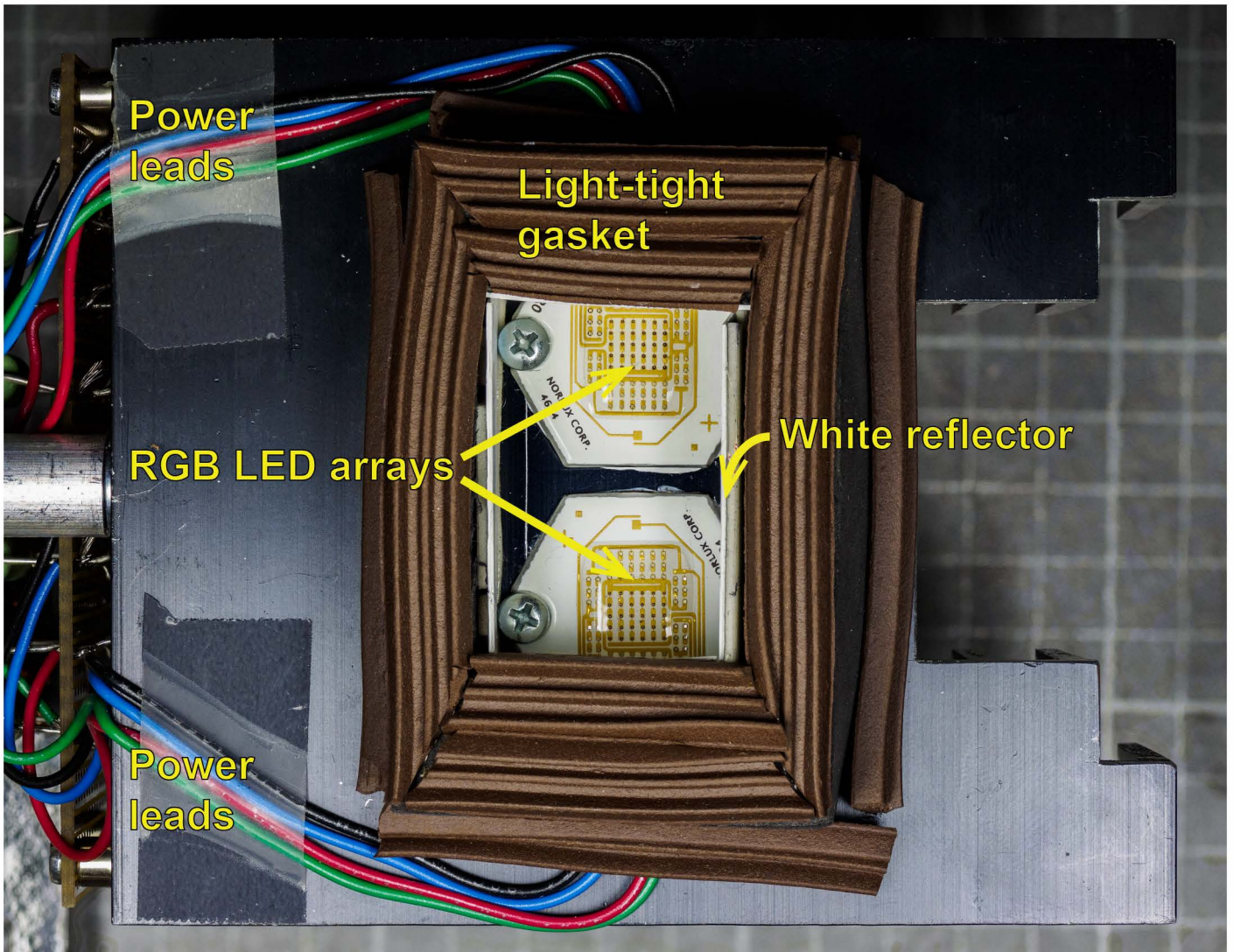


Fig. S2 (a) Normalized spectral photon irradiance of (non-polarized) light emitted by the red, green, and blue channels of the LED-array source used for gas-exchange measurements (presented in Fig S3, S4 and S5). The overlap in normalized photon irradiance between the blue and green channels is 3.9% of their combined photon irradiance, and between green and red channels the overlap is 0.4%. There is no measurable overlap (<0.05%) between red and blue channels; (b) Photograph of the custom-built LED-array light source used for gas-exchange measurements. Each array has three independent channels, emitting BL, GL, or RL.

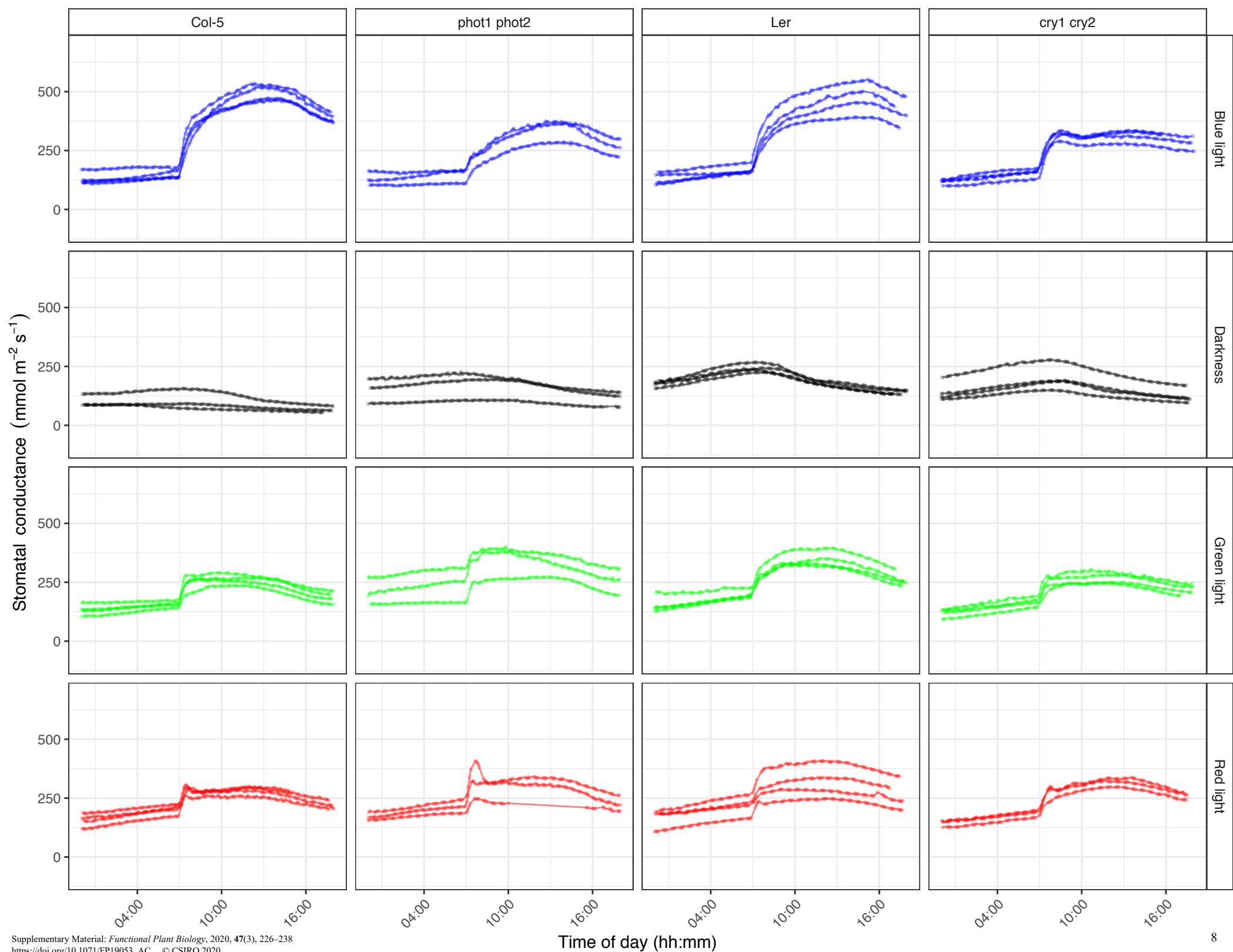


Fig. S3 Stomatal conductance (g_s) for individual plants from 12 midnight until 6 p.m. on the next day. These data were used to calculate the Δg_s values used in the model fits presented in Figs. 2 and 3, and in statistical tests of significance. The vertical dashed lines highlight 7 a.m. local time (ZT = 00:00), the time when LEDs were switched on during gas-exchange measurements, except for plants remaining in darkness.

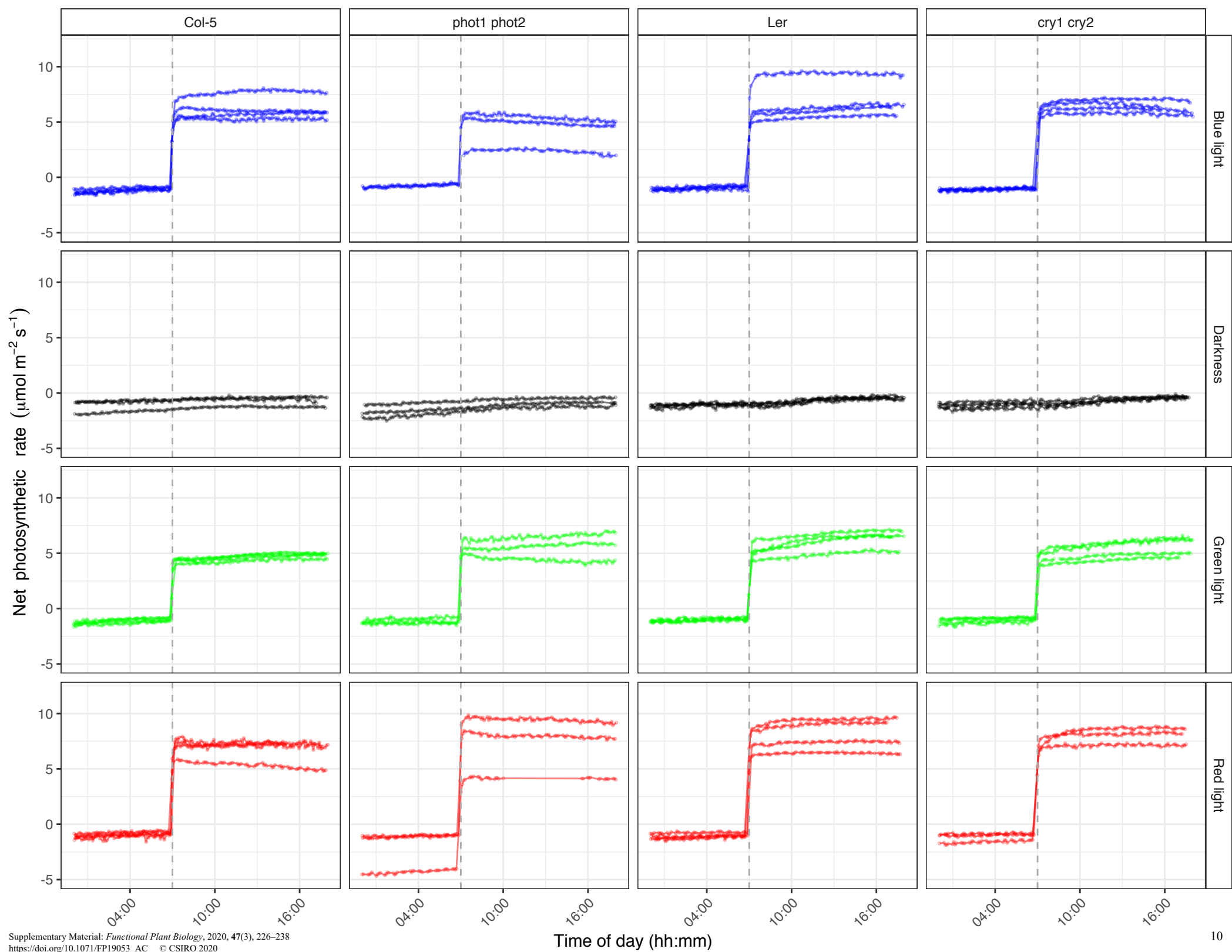


Fig. S4 Net carbon assimilation rate (A_{net}) for individual plants from 12 midnight until 6 p.m. on the next day. These data were used to calculate A_{net} values used in the model fits presented in Figs. 2 and 3, and in statistical tests of significance. Negative net carbon assimilation rate in darkness is respiration. The vertical dashed lines highlight 7 a.m. local time (ZT = 00:00), the time when LEDs were switched on during gas-exchange measurements, except for plants remaining in darkness.

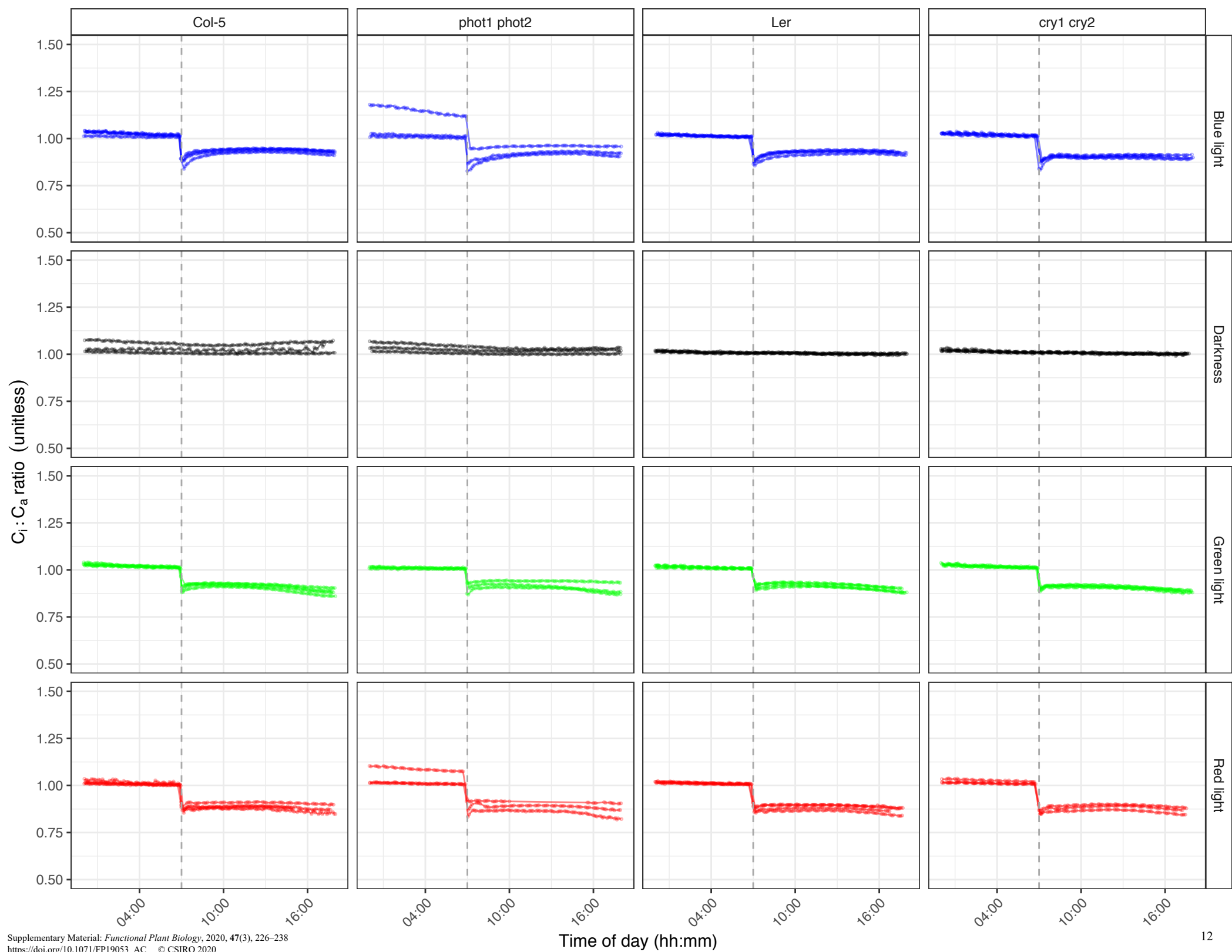
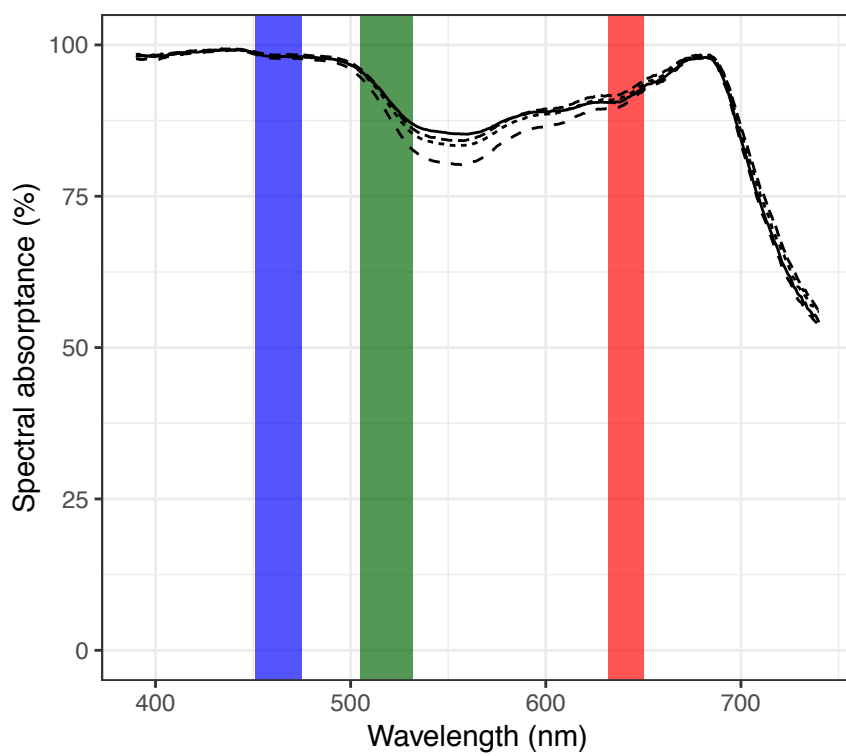
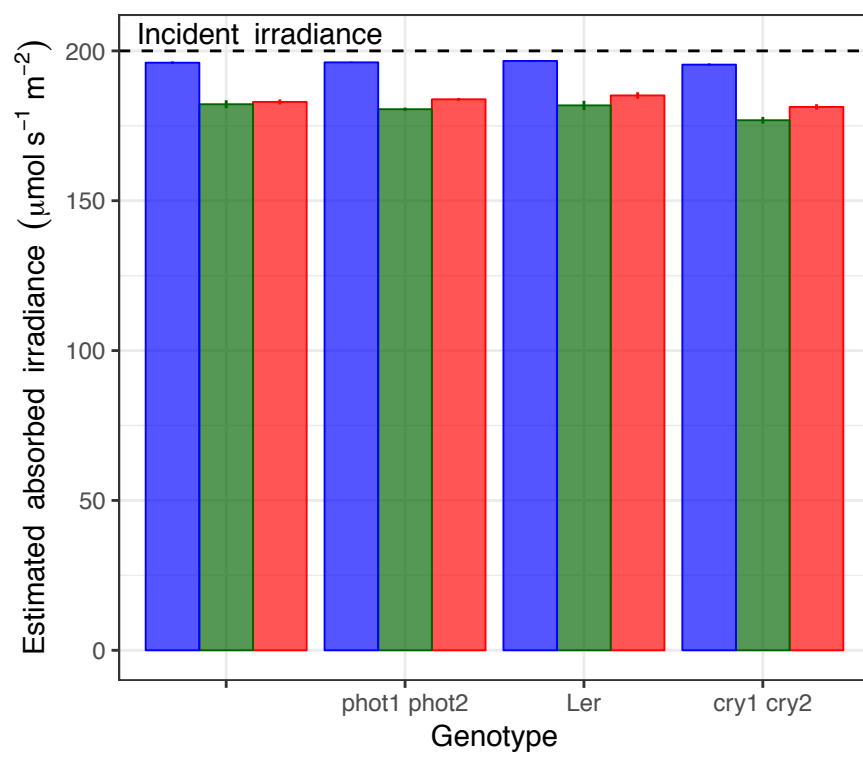


Fig. S5 Ratio of C_i/C_a for individual plants from 12 midnight until 6 p.m. on the next day. These data were used to calculate ratio of C_i/C_a values used in the model fits presented in Figs. 4, and in statistical tests of significance. The vertical dashed lines highlight 7 a.m. local time (ZT = 00:00), the time when LEDs were switched on during gas-exchange measurements, except for plants remaining in darkness. Concentrations of C_a are listed in Table S1.



genotype

- Col-5
- phot1 phot2
- · - Ler
- - cry1 cry2



LED channel

- blue 463 nm
- green 516 nm
- red 643 nm

Fig. S6 Light absorption. Average spectral absorptance of illuminated leaves from 5 or 6 plants of each genotype. Upper panel (*a*): The colour bars show the full width at half maximum (FWHM) of the peak of photon emission spectra of the three LED channels from Fig. S2*a*. Lower panel (*b*): Estimate of the photon dose rate computed as the absorbed irradiance by convolution of the absorptance spectra of the leaves (upper panel) with the emission spectra of the LEDs (Fig. S2*a*) integrated over wavelengths. The dashed line indicates the photon irradiance incident on the plants. The absorbed energy irradiances averaged over genotypes were: RL 34.3 W m⁻², GL 41.4 W m⁻², and BL 50.4 W m⁻².