Supplementary Material

Contributions of cryptochromes and phototropins to stomatal opening through the day


AViikki Plant Science Centre (ViPS), Department of Biosciences, Faculty of Biological and Environmental Sciences, University of Helsinki, 00014, Finland.

BIFEVA, Facultad de Agronomía, Universidad de Buenos Aires and CONICET, Av. San Martín 4453, 1417 Buenos Aires, Argentina.


DInstitute of Plant Physiology, Russian Academy of Sciences, Botanicheskaya Street, 35, 127276 Moscow, Russia.

ECorresponding author. Email: pedro.aphalo@helsinki.fi

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 absorptance 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.

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Red light</th>
<th>Green light</th>
<th>Blue light</th>
<th>Darkness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Col-5</td>
<td>387.6 ± 0.1</td>
<td>387.8 ± 0.1</td>
<td>387.6 ± 0.1</td>
<td>390.3 ± 0.0</td>
</tr>
<tr>
<td>phot1 phot2</td>
<td>388.4 ± 0.0</td>
<td>388.1 ± 0.1</td>
<td>388.4 ± 0.1</td>
<td>390.3 ± 0.0</td>
</tr>
<tr>
<td>Ler</td>
<td>386.9 ± 0.1</td>
<td>387.4 ± 0.1</td>
<td>386.9 ± 0.1</td>
<td>390.1 ± 0.0</td>
</tr>
<tr>
<td>cry1 cry2</td>
<td>387.8 ± 0.1</td>
<td>387.9 ± 0.1</td>
<td>387.8 ± 0.1</td>
<td>390.1 ± 0.0</td>
</tr>
</tbody>
</table>
**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.).
https://doi.org/10.1071/FP19053_AC  © CSIRO 2020
**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.

https://doi.org/10.1071/FP19053_AC © CSIRO 2020
**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 $\Delta g_s$ 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 ($A_{\text{net}}$) for individual plants from 12 midnight until 6 p.m. on the next day. These data were used to calculate $A_{\text{net}}$ 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.
https://doi.org/10.1071/FP19053_AC © CSIRO 2020
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.
**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. S2a. 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. S2a) 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$^{-2}$. 