

## **Blue or far-red light supplementation induced pre-hardening in the leaves of the *Rht12* wheat dwarfing line: hormonal changes and freezing tolerance**

Zsolt Gulyás<sup>1</sup>, Mohamed Ahres<sup>1\*</sup>, Tamás Pálmai<sup>1</sup>, Kitti Kulman<sup>1,2</sup>, Zahra Tahmasebi<sup>1,3</sup>, Kalpita Singh<sup>1,2</sup>, Kristóf Jobbágy<sup>1,4</sup>, Danuše Tarkowská<sup>5</sup>, Petre Dobrev<sup>6</sup>, Radomíra Vanková<sup>6</sup>, Péter Borbély<sup>1\*</sup>, Andreas Börner<sup>7</sup>, Gábor Galiba<sup>1,8</sup>

<sup>1</sup>Agricultural Institute, Centre for Agricultural Research, HUN-REN, H-2462, Martonvásár, Hungary

<sup>2</sup>Doctoral School of Plant Sciences, MATE Hungarian University of Agricultural and Life Sciences, H-2100, Gödöllő, Hungary

<sup>3</sup>Festetics Doctoral School, MATE Hungarian University of Agricultural and Life Sciences, H-8360, Keszthely, Hungary

<sup>4</sup>Doctoral School of Biology and Institute of Biology, ELTE Eötvös Loránd University, H-1053, Budapest, Hungary

<sup>5</sup>Laboratory of Growth Regulators, Faculty of Science, Palacký University Olomouc and Institute of Experimental Botany, the Czech Academy of Sciences, CZ-78371 Olomouc, Czech Republic

<sup>6</sup>Laboratory of Hormonal Regulations in Plants, Institute of Experimental Botany of the Czech Academy of Sciences, CZ-165 02 Prague, Czech Republic

<sup>7</sup>Leibniz Institute of Plant Genetics and Crop Plant Research, 06466 Seeland, OT Gatersleben, Germany

<sup>8</sup>Department of Agronomy, MATE Hungarian University of Agricultural and Life Sciences, GEORGIKON Campus, H-8360, Keszthely, Hungary

\*Correspondence

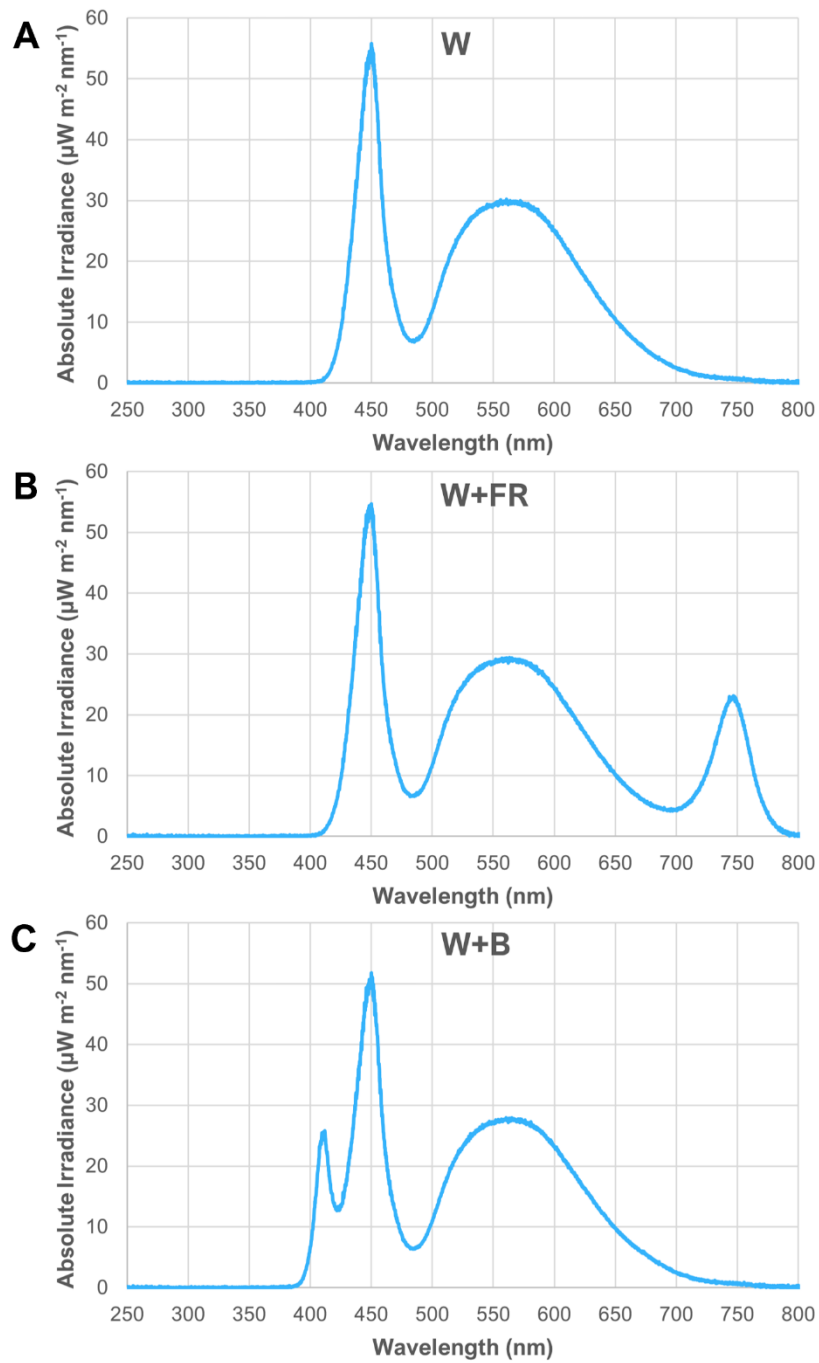
Péter Borbély

E-mail: [borbely.peter@atk.hun-ren.hu](mailto:borbely.peter@atk.hun-ren.hu)

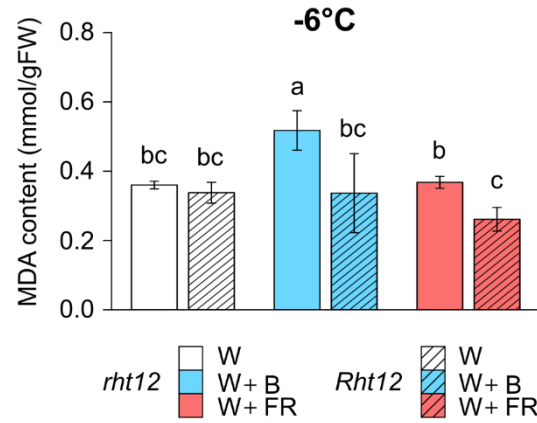
Mohamed Ahres

E-mail: [mohamed.ahres@atk.hun-ren.hu](mailto:mohamed.ahres@atk.hun-ren.hu)

## Supplementary figures



**Figure S1.** Spectral composition of light treatments at PPFD  $250 \mu\text{mol m}^{-2} \text{s}^{-1}$ . A: White light (W); B: White light supplemented with Far-Red light (W+FR); C: White light enriched with monochromatic Blue ( $\lambda_{\text{max}}=410 \text{ nm}$ ) light (W+B).



**Figure S2.** The effect of modified spectral conditions on lipid peroxidation at -6°C minimal temperature in the tall (*rht12*) and dwarf (*Rht12*) wheat leaf segments. The samples were collected to measure MDA content subsequently to the freezing tests implemented after 10 days of light supplementation treatments at 15°C. W: white light (control, white colour), W+B: blue light enrichment (blue colour), W+FR: far-red light enrichment (red colour). Solid bars: *rht12*; stripped bars: *Rht12*. Values marked with different letters are significantly different from each other at the level of  $p \leq 0.05$  ( $n=3$ ).