

Plastid Signals Confer *Arabidopsis* Tolerance to Water Stress

Jian Cheng^{a,c,§}, Chun-Xia He^{a,b,§}, Zhong-Wei Zhang^{a,c}, Fei Xu^c, Da-Wei Zhang^a, Xiao Wang^a, Shu Yuan^{c,*}, and Hong-Hui Lin^{a,*}

^a Ministry of Education Key Laboratory for Bio-Resource and Eco-Environment, College of Life Science, Sichuan University, Chengdu 610064, China.
Fax: 86-28-85 415300. E-mail: honghui968@hotmail.com

^b Department of Life and Resource Environment, Ili Normal University, Kuitun 833200, China

^c Plant Physiology Laboratory, College of Life Science, Sichuan University, Chengdu 610064, China. Fax: 86-28-85 412571. E-mail: roundtree318@hotmail.com

* Authors for correspondence and reprint requests

Z. Naturforsch. **66c**, 47–54 (2011); received June 16/August 25, 2010

Plastid-to-nucleus retrograde signalling coordinates nuclear gene expression with chloroplast function and is essential for the photoautotrophic life-style of plants. The relationship between plastid signalling and water stress response was investigated with genome uncoupled (*gun*) mutants, *gun1*, *gun3*, and *gun5*, and an abscisic acid (ABA)-responsible transcription factor mutant, *abi4*. The results showed that *gun1*, *gun3*, *gun5*, and *abi4* mutants suffered from more oxidative damages than the wild-type plants under the water stress and the water stress + herbicide (norflurazon, NF) co-treatment. Superoxide dismutase (SOD), peroxidase (POD), and ascorbate peroxidase (APX) activities could not be prompted in the plastid-signalling defective mutants under the stress conditions. At the same time, *Lhcb* expression was not repressed in the plastid-signalling defective mutants by the NF treatment or water stress. Therefore, the photosynthetic apparatus in the mutant cells could not be closed during the stresses and the excessive light caused more photodamages on the mutant leaves. The roles of GUN1, GUN3, GUN5 and ABI4 proteins in environmental stress adaptation have been discussed.

Key words: Norflurazon, Reactive Oxygen Species, Water Stress