Effects of Cadmium Stress on Alternative Oxidase and Photosystem II in Three Wheat Cultivars

Yong-Ping Duan\textsuperscript{a,§}, Shu Yuan\textsuperscript{c,§}, Shi-Hua Tu\textsuperscript{b}, Wen-Qiang Feng\textsuperscript{b}, Fei Xu\textsuperscript{c}, Zhong-Wei Zhang\textsuperscript{c}, Yang-Er Chen\textsuperscript{c}, Xiao Wang\textsuperscript{c}, Jing Shang\textsuperscript{c}, and Hong-Hui Lin\textsuperscript{c,*}

\textsuperscript{a} College of Life Science, Chifeng University, Chifeng 024000, China
\textsuperscript{b} Soil and Fertilizer Institute, Sichuan Academy of Agricultural Sciences, Chengdu 610066, China
\textsuperscript{c} Key Laboratory of Bio-resources and Eco-environment (Ministry of Education), College of Life Science, Sichuan University, Chengdu 610064, Sichuan, China.
Fax: 86-28-85 41 53 00. E-mail: honghuilin@hotmail.com

* Author for correspondence and reprint requests

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The effects of Cd stress (200 \(\mu\)mol/L, 8 days) on respiration and photosynthesis of three wheat cultivars were investigated: Chuanyu 12 (CY12), Chuanmai 42 (CM42), and Chuanmai 47 (CM47). Fifteen-day-old seedlings were exposed to 200 \(\mu\)mol/L CdCl\(_2\) for 4 days and 8 days, respectively. The results indicated that Cd was accumulated largely in roots, but little in leaves of all three cultivars. CY12 accumulated the highest level of Cd in roots and showed the weakest resistance. On the contrary, the other two cultivars, CM42 and CM47, adapted better to Cd stress, and their thiobarbituric acid-reactive substances (TBARS) contents were lower than in CY12, but the chlorophyll contents and water contents were higher than in CY12. Additionally, Cd stress prompted the alternative oxidase (AOX) activity and upregulated the cyanide-resistant respiration in CM42 and CM47 after 8 days; no such induction was observed for CY12. The CO\(_2\) assimilation rate, leaf stomatal conductance and chlorophyll fluorescence were inhibited by Cd stress in all cultivars, but more severe in the CY12 cultivar. Western blots indicated that the content of the photosystem II proteins LHCII and D1 decreased in CY12, but did not change in CM42 and CM47. While the content of the mitochondrial AOX protein increased markedly in CM42 and CM47, it did not in CY12. These results suggested that AOX and LHCII could be regarded as indicators of plant’s resistance to heavy metals.

Key words: Alternative Oxidase, Cadmium Stress, Light-Harvesting Complex II, Wheat