

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

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The effects of Cd stress (200 $\mu\text{mol/L}$, 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 $\mu\text{mol/L}$ 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