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Morpho-physiological and Proteome Level Responses of *Brassica napus* L. Leaves to Cadmium Stress

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[Introduction]

Among the abiotic stresses, heavy metals such as cadmium (Cd), copper (Cu), Zinc (Zn), Lead (Pb) and mercury (Hg) are thought to be the most hazardous pollutants. Cadmium (Cd) is one of the common abiotic stresses, particularly in places contaminated with heavy metals. Cd is a highly toxic heavy metal and a widespread environmental pollutant. Generally, Brassica species are tolerant to heavy metals due to their fast growth, high biomass production, and ability to uptake greater amount of heavy metals. Proteomics is acknowledged as an efficient approach to dissect the plant's response mechanisms to abiotic stress, including toxic metals. Here, we investigated the effects of Cd stress on morpho-physiological and proteome of *Brassica napus* using a label-free shotgun proteomic approach to elucidate plant response mechanisms to Cd toxicity.

[Materials and Methods]

Seeds of *B. napus* L. were surface-sterilized with sodium hypochlorite solution (5%) for 20 min. Then sterile seeds were placed in petri dishes containing two layers of filter papers, and germinated in controlled conditions for 21-days. Following germination, the morphologically uniform seedlings were transferred to plastic pots and hydroponically grown for 7-days. The nutrient solution was renewed every 2 days. After one weeks of transplanting, uniform plants were treated with $CdCl_2$ as T1: Control, T2: Cd (25 μM), T3: Cd (50 μM).

[Results and Discussion]

Cd stress significantly affects the plant growth characters. Cd stress caused significant influences in leaf morphology. In particular, Cd stress significantly influences the fresh weight when seedlings were exposed to several concentrations of $CdCl_2$. Number of leaves per plant and leaf area was found to be decreased when the seedlings were exposed to Cd stress. In leaves, Proline content was increased by 49 and 74% in Cd-stressed seedlings (Cd25 and Cd50 μM) respectively compared with control. We conducted morpho-physiological and proteomic analyses to improve our understanding of the responses of *B. napus* to Cd stress. A total 9277 proteins were identified in *B. napus* seedlings leaves exposed to Cd stress using the label-free proteomics. Of these, a total of 431 differentially abundant proteins (DAPs) were identified in response to Cd stress. In total, 76 up- and 47 down-regulated proteins were identified in the control vs Cd25 comparison, while 342 up- and 209 down-regulated proteins were identified in the control vs Cd50 comparison. Functional annotation indicated that these differentially expressed proteins (DAPs) were mainly involved in carbohydrate and energy metabolism, photosynthesis, protein metabolism, stress and defense and signal transduction processes. Taken together, our results from the proteome level provide new evidence for further understanding the molecular mechanisms of the plant Cd stress response.

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