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Leaf and Root Proteome Analysis of Sorghum in Response to Lead and Cadmium Stress

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[Introduction]
Lead (Pb) is one of the most hazardous pollutants of the environment that is an ecological concern due to its impact on human health and the environment. Cadmium (Cd) is thought to be a major environmental problem in the agricultural system and considered as the seventh rank among the toxins. Several investigations have postulated that plants respond to any type of stress condition via rapid alterations in gene expression and protein synthesis.

[Materials and Methods]
Seeds of *Sorghum bicolor* L. (BTX 623) were surface sterilized, placed in petri dishes containing two layers of filter papers moistened with de-ionized water. The 10 days old plants were exposed to the Hoagland nutrient solutions supplied with different concentrations of Pb and Cd. After 5 days of Cd-treatment, the proteome analysis were performed using gel-free proteome techniques.

[Results and Discussion]
The results revealed that the growth inhibition induced by Pb and Cd depended on the degree of heavy metal concentration. The quantitative proteome analysis led to the identification of 627 proteins. Of the identified 627 proteins, a total of 383 proteins were specific to leaf proteins, and 244 proteins were specific to root proteins. The DAVID Bioinformatics analysis showed that the proteins with increased abundance were mainly associated with energy metabolism, detoxification and stress defense and protein metabolism, whereas the proteins related to the cell growth/division, intracellular traffic and photosynthesis were downregulated. Protein-protein interaction analyses highlighted an energy metabolism centered sub-network that synergistically responded to Pb stress. The protein abundance involved in glycolysis and tricarboxylic acid cycle, including glyceraldehyde 3-phosphate dehydrogenase was changed in in sorghum roots after Cd treatment. Abundance changes of these proteins, together with their putative functions provide us a new insight that can lead to an integrated understanding of the molecular basis of Cd responses in plants.

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