

MAJOR OUTCOMES

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Thesis Title:

PROTEOMIC ANALYSIS OF *ARABIDOPSIS THALIANA* EXPOSED TO SULPHUR DEFICIENCY AND CADMIUM STRESS

- Blue-Native PAGE-resolved Multi-protein-pigment complexes (MPCs) and BNP-SDS-PAGE-resolved Subunits showed great degree of modulation in expression level and/or arrangement and assemblage.
- Cd stress resulted in a decline of PSII-supercomplex, PSI monomer and PSII-dimer; however, PSII and Cytb6/f remained unchanged.
- Under dual stress of S-deficiency and Cd stress there was prominent decline almost in every MPC except PSII and Cytb6/f complex.
- 2-D/MALDI-TOF-MS/PMF/MASCOT analysis showed that S-deficiency up-regulates 10 proteins, down-regulates 15 proteins and induces one (5'-adenyl sulfate reductase) protein.
- Cd stress up-regulated 21 proteins, down-regulated 17 proteins and induced 2 new proteins (HSP23.5 and stress induced protein KIN1).
- Dual stress of S-deficiency and Cd up-regulated 10 proteins, down-regulated 20 proteins and induced one (defensin like protein 151) new protein.
- Cadmium (Cd) treatment resulted in considerable elevation of oxidative stress and cell impairment. However, Cd upregulated enzymes of the antioxidative defense system and led to curtailment of oxidative stress in the tissues of Arabidopsis.
- Cadmium induced higher oxidative stress under S-deficiency; also defense system failed to upregulate.
- Under Sulfur (S) starvation Cd failed to stimulate the activity of SOD, APX, GR, GST and CAT.

- Antioxidative enzymes are highly sensitive to S-deficiency and S is essential for their upregulation under Cd stress.
- Proline emerges as a key player for the tolerance under S-deficiency and Cd stress.
- Level of chlorophylls under S deficiency and Cd stress were significantly reduced. However, S helped plants retaining to a certain level.
- Chloroplasts were normal with unique shape and well organized grana in control but under S-deficiency shape of chloroplast were normal but some hyaline regions indicate 'fragile' state of envelope.
- Cadmium stress resulted into irregular shape of chloroplast, disorganized grana and thylakoids.
- A combined stress of S-deficiency and Cd caused severe alteration to chloroplast shape and damage to grana as well thylakoids and envelop.
- Sulfur deficiency and Cadmium stress severely decline the rate of photosynthesis; more under dual stress of S-deficiency and Cd.
- Reduction in rate of transpiration and stomatal conductance accompanied by decreased leaf chlorophyll content contributed to the reduction of leaf photosynthetic rate; more under dual stress.
- Degree of decline in amount of chlorophylls, rate of photosynthesis and related parameters, and growth are comparatively lower under S-deficiency followed by Cd stress but highest under the dual (-S/+Cd) stress.