

Impact of Heavy Metal (Pb²⁺) Stress on the Structural Integrity of Cells and Tissues of *Zea mays* L.

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Abstract: Responses of plants to toxic substances that are ubiquitous in the environment are manifested at various levels of organization. The harmful effects of these toxic substances may not be reflected in the gross morphology of plants, however, may be manifested at the cellular level. In this study, corn seedlings grown in potted soil were subjected to various levels of lead nitrate [Pb (NO₃)₂]. After 21 days of treatment, harvested plant samples were processed using the Paraffin Micro-technique procedures. Prepared slides were analyzed using quantitative and qualitative anatomical parameters. Results revealed significant ($p < 0.05$) enlargement of root pith, root cortex, stem ground parenchyma, stem vascular bundle, leaf vascular bundle and diameter of root metaxylem at the higher treatments (HT-2000 and 5000 mg kg⁻¹). A similar increase in the number of root metaxylem cell at 500 and 5000 mg kg⁻¹ treatments was also noted. However, remarkable decreases in the number of root metaxylem, widths of root pith and root cortex at 100 mg kg⁻¹ treatment, and reduction of the width of stem ground parenchyma and stem vascular bundles at 500 mg kg⁻¹ treatment were documented, respectively. Photomicrographs of root cortex exposed to HT showed disrupted cell walls. Likewise, there was a damage of root metaxylem in plants exposed to Pb. Distortion of root cortex was observed at 2000 and 5000 mg kg⁻¹ treatments, while aberration of stelar area was noticed at 500 mg kg⁻¹ treatment. Results suggest that the nitrate counter ion brought the positive growth of tissues, however, the damaging effects of Pb on the cells and tissues of corn were evident. Our results provide valuable information on the cellular responses of the widely consumed crop (corn) to a toxic heavy metal (Pb).

Keywords: Toxic heavy metal, lead, corn tissues, micro-technique