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Mechanism of hyperaccumulation of heavy metals by of *Verbascum thapsus* from soil

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The impact of inorganic pollutants in the zone of industrial wastewater settling tanks (South of Russia) was studied. The levels of Mn, Cr, Ni, Cu, Zn, Pb, Cd were determined for *Verbascum thapsus* L., which are part of the mesophilic succession of wild plants in the studied technogenically polluted territory. *V. thapsus* L. has been described as a species with great phenotypic plasticity and the capacity for ecotypic differentiation. The bioavailability of heavy metals (HM) for *V. thapsus* L. from transformed soils has been established. Anatomical and morphological features in the tissues of the plants affected by heavy metals were analyzed using light-optical and electron-microscopic methods. Contamination of the soil cover with Mn, Cr, Ni, Cu, Zn, Pb and Cd has been established with maximum content of Zn. The excess of the maximum permissible levels of pollution with Zn, Pb, Cr and Cd regulated in the Russian Federation was by 1.2, 16, 36 and 246 times higher, respectively analyzing *V. thapsus* L. The lower level of heavy metal content in the inflorescences in comparison with the root system, stems and leaves indicates the resistance of generative organs to technogenic pollution. In the root and leaves of *V. thapsus* L. the anatomical and ultrastructural observation was carried out using light-optical and transmission electron microscopy. Changes in the ultrastructure of plants under the influence of anthropogenic impact have been revealed. The most significant changes of the ultrastructure of the polluted plants were found in the cell organelles of leaves (mitochondria, plastids, peroxisomes, etc.) including the spatial transformation of the thylakoid system of plastids during the metal accumulation by plants. The study of the plant tissues role in the elements translocation and accumulation is necessary for understanding the mechanism of hyperaccumulation of HMs by plants.

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