

MECHANISMS OF PLANT TOLERANCE TO HEAVY METALS

S u m m a r y

Plants have evolved complex of protective mechanisms that allow them to grow and develop in heavy metal-contaminated environments. They show different degrees of tolerance to heavy metals, depending on the species, population or even developmental stage of the plant. This is a review of literature data on the anatomical, physiological and biochemical mechanisms responsible for the formation of “the heavy metal tolerance syndrome” in plants. Numerous factors have been involved in development of heavy metal tolerance. The main ones encompass processes occurring on the root surface of the plants that lead to restriction of heavy metal absorption, mycorrhizae, transport of heavy metals through the apoplastic path-

way, transport from the epidermis to the vascular cylinder, transport from the root to the shoot, and transport across the plasma membrane to the cytoplasm. Plants are able to detoxify heavy metal ions inside the cell with phytochelatins, metallothioneins or organic acids. Other factors involved in, and contributing to heavy metal tolerance include excretion of heavy metals from the cytoplasm to the apoplast and from plant organs, specific mineral-handling pathways and water regimes of plants, as well as the ability to synthesize heavy metal-resistant enzymes. Knowledge of the fundamentals of heavy metal tolerance will aid in the effective use of plants in phytoremediation.