PHYSIOLOGICAL ASPECTS OF PLANT HEAVY METAL TOLERANCE

SUMMARY

It is a common characteristic of all life forms that some of the elements present in the environment are accumulated and others are rejected. The rates of accumulation are necessarily governed by physiological requirements rather than toxicity. Because metals like Ca, Mg, Fe, Cu, Zn, Mn, Mo, Ni are essential for normal running a vast number of metabolic processes, plants evoke special systems of metal uptake and transport during evolution. On the other hand, the same metals present in an excess in plant cells may become seriously toxic to the cells. Moreover, the low specificity of the metal uptake and transport systems makes them to function also as an entrance for nonessential and toxic substances (Cd, Pb). The existence of a complex systems for metal uptake and transport processes, able to respond to continuously changing environmental conditions, is necessary for maintaining metal homeostasis in plants. It is highly probable that these complex systems of metal uptake and transport can function as systems of heavy metal tolerance in plants, as well. According to the recent reports, the main processes involved in maintaining heavy metal homeostasis in plants are: metal ions mobilization and uptake from the soil, their short distance transport in roots, complexation by different ligands in cytosol, compartmentation in root cells, xylem loading and long distance transport in xylem, distribution in shoots, xylem unloading, ions trafficking in apoplastic and symplastic passage of leave cells, their chelating in cytosol and compartmentation in leave cells and structures. Although some of these processes are well recognized, a number of them remain still enigmatic. It is strongly believed that further investigation of these processes should help to explain differences in metal tolerance between plant varieties as well as the phenomenon of heavy metal hyperaccumulation in plants.