Biotechnologies towards Sustainable Development in Malaysia

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Chapter 7

Heavy metal uptakes by plants

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Introduction

Heavy metal uptake varies considerably, depending on plant species and the types of heavy metals. Herein, three key issues in relation to heavy metal uptake will be discussed: 1) bioavailability of heavy metals, 2) root uptake and xylem transport, 3) toxicity and detoxification.

Bioavailability of heavy metals and affecting factors

Heavy metal bioavailability is one of the key factors leading to the success of phytoremediation. Bioavailability is the metal concentrations that are available for uptake into plants. Different metals have different mobilities in the soils. Hence, total metal concentrations in contaminated sites do not necessarily correspond to bioavailability (John and Leventhal, 1995). For example, Zn and Cd occur primarily as soluble forms in the soil and thus are readily bioavailable for plant uptake. On the other hand, Pb tends to remain bound and immobile within the soil matrix. Thus Pb occurs in the form of insoluble precipitates, including phosphates, carbonates and hydroxides, which are mostly unavailable for plant uptake (Lasat, 2002). The release of metals from mineral deposits is strongly influenced by soil physical, chemical, and biological properties (John and Leventhal, 1995; Saxena *et al.*, 1999). These physico-chemical processes subsequently affect