
Table of Contents

Chapter 1

Field Demonstrations of Phytoremediation of Lead-Contaminated Soils..... 1

Michael J. Blaylock

Chapter 2

Phytoremediation by Constructed Wetlands 13

Alex J. Horne

Chapter 3

Factors Influencing Field Phytoremediation of Selenium-Laden Soils..... 41

Gary S. Bañuelos

Chapter 4

Remediation of Selenium-Polluted Soils and Waters by Phytovolatilization 61

*Adel Zayed, Elizabeth Pilon-Smits, Mark deSouza, Zhi-Qing Lin,
and Norman Terry*

Chapter 5

Metal Hyperaccumulator Plants: A Review of the Ecology and Physiology
of a Biological Resource for Phytoremediation of Metal-Polluted Soils 85

Alan J. M. Baker, S. P. McGrath, Roger D. Reeves, and J. A. C. Smith

Chapter 6

Potential for Phytoextraction of Zinc and Cadmium from Soils Using

Hyperaccumulator Plants..... 109

S. P. McGrath, S. J. Dunham, and R. L. Correll

Chapter 7

Improving Metal Hyperaccumulator Wild Plants to Develop Commercial

Phytoextraction Systems: Approaches and Progress 129

*Rufus L. Chaney, Yin-Ming Li, Sally L. Brown, Faye A. Homer, Minnie Malik,
J. Scott Angle, Alan J. M. Baker, Roger D. Reeves, and Mel Chin*

Chapter 8

Physiology of Zn Hyperaccumulation in *Thlaspi caerulescens* 159

Mitch M. Lasat and Leon V. Kochian

Chapter 9

- Metal-Specific Patterns of Tolerance, Uptake, and Transport of Heavy Metals
in Hyperaccumulating and Nonhyperaccumulating Metallophytes..... 171
Henk Schat, Mercè Llugany, and Roland Bernhard

Chapter 10

- The Role of Root Exudates in Nickel Hyperaccumulation and Tolerance in
Accumulator and Nonaccumulator Species of *Thlaspi* 189
David E. Salt, N. Kato, U. Krämer, R. D. Smith, and I. Raskin

Chapter 11

- Engineered Phytoremediation of Mercury Pollution in Soil and Water
Using Bacterial Genes 201
R. B. Meagher, C. L. Rugh, M. K. Kandasamy, G. Gragson, and N. J. Wang

Chapter 12

- Metal Tolerance in Plants: The Role of Phytochelatins
and Metallothioneins 221
Peter Goldsbrough

Chapter 13

- The Genetics of Metal Tolerance and Accumulation in Higher Plants..... 235
Mark R. Macnair, Gavin H. Tilstone, and Susanne E. Smith

Chapter 14

- Ecological Genetics and the Evolution of Trace Element
Hyperaccumulation in Plants..... 251
A. Joseph Pollard, Keri L. Dandridge, and Edward M. Jhee

Chapter 15

- The Role of Bacteria in the Phytoremediation of Heavy Metals..... 265
*D. van der Lelie, P. Corbisier, L. Diels, A. Gilis, C. Lodewyckx,
M. Mergeay, S. Taghavi, N. Spelmans, and J. Vangronsveld*

Chapter 16

- Microphyte-Mediated Selenium Biogeochemistry and Its Role in *In Situ*
Selenium Bioremediation 283
Teresa W.-M. Fan and Richard M. Higashi

Chapter 17

- In Situ* Gentle Remediation Measures for Heavy Metal-Polluted Soils..... 303
S. K. Gupta, T. Herren, K. Wenger, R. Krebs, and T. Hari

Chapter 18

In Situ Metal Immobilization and Phytostabilization of

Contaminated Soils..... 323

M. Mench, J. Vangronsveld, H. Clijsters, N. W. Lepp, and R. Edwards

Chapter 19

Phytoextraction and Phytostabilization: Technical, Economic, and

Regulatory Considerations of the Soil-Lead Issue..... 359

Scott D. Cunningham and William R. Berti

Index..... 377