Preface of Phytoremediation of Soil and Water Contaminants

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Abstract
PHYTOREMEDIATION, or the use of plants to remediate contaminated soils and water environments, has recently become an area of intense study. Ten years ago there was a realization that the root zone of plants was special with respect to its capacity for biotransformation of organic molecules. The rhizosphere, as it was named, has since been studied for its important role in nutrient availability, as well as for the enhanced microbial degradation of pesticides, polynuclear aromatic hydrocarbons, and other synthetic chemicals. Plants impact contaminant reduction principally by providing an optimal environment for microbial proliferation in the root zone. This often leads to enhanced degradation of chemicals in soils that are vegetated, compared to nonvegetated soils. Contamination can also be reduced as a result of plant uptake into the tissue where it can be further degraded to innocuous substances, or removed from the site. In the latter case, plants can be used to extract contaminants from the environment, a process referred to as phytoextraction.

Disciplines
Agronomy and Crop Sciences | Entomology | Environmental Health | Molecular, Genetic, and Biochemical Nutrition

Comments
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Preface

PHYTOREMEDIATION, or the use of plants to remediate contaminated soils and water environments, has recently become an area of intense study. Ten years ago there was a realization that the root zone of plants was special with respect to its capacity for biotransformation of organic molecules. The rhizosphere, as it was named, has since been studied for its important role in nutrient availability, as well as for the enhanced microbial degradation of pesticides, polynuclear aromatic hydrocarbons, and other synthetic chemicals. Plants impact contaminant reduction principally by providing an optimal environment for microbial proliferation in the root zone. This often leads to enhanced degradation of chemicals in soils that are vegetated, compared to nonvegetated soils. Contamination can also be reduced as a result of plant uptake into the tissue where it can be further degraded to innocuous substances, or removed from the site. In the latter case, plants can be used to extract contaminants from the environment, a process referred to as phytoextraction.

Within the last few years, the vegetation-based bioremediation approach has evolved into an important, viable option for cleanup of contaminated sites. It has now earned the new label “phytoremediation” and is recognized for some especially attractive features, such as its low input and environmentally friendly character. With the development of risk-assessment approaches to environmental contamination, it is apparent that in certain situations a slow, sure, and economical strategy is the most feasible. Phytoremediation demonstrates clear advantages over another newly named process called “natural attenuation”.

Traditional methods of remediating contaminated soils and water, such as excavation or combustion, are environmentally disruptive and quite expensive. Phytoremediation may provide a cost-effective remediation technique for some contamination situations. In addition, it may make it possible to treat most contaminants in situ. By eliminating or minimizing the need to move contaminated soils, the risk of causing secondary contamination is also greatly reduced.

The symposium on which this book is based took place at the 212th National Meeting of the American Chemical Society in Orlando, Florida, August 25–29, 1996. This book provides an accumulation of some of the most recent research on phytoremediation. An overview is presented that describes the current understanding and use of plants for stabilization and cleanup of
contaminants. An additional overview of rhizosphere ecology is also presented. The remainder of the book discusses three topics: phytoremediation of agrochemicals, industrial organic chemicals, and metals.

We believe that this book provides a good update of the field of phytoremediation since a previous rhizosphere–bioremediation symposium sponsored by the American Chemical Society in 1993. Our book that resulted from that assemblage of experts in the field was entitled Bioremediation Through Rhizosphere Technology (ACS Symposium Series No. 563), and it attempted to confirm and define the “rhizosphere effect” and explore ways to exploit it for improving environmental quality. The current book provides information related to remediation of metals and aquatic systems not included in the previous volume and focuses on direct application of the phytoremediation approach for specific contamination problems.

Acknowledgments

We thank the participants for their contributions to this volume. We are grateful to the ACS Division of Agrochemicals and the Division of Environmental Chemistry, Inc., for providing financial assistance and a forum for the symposium upon which this book is based. We also thank the peer reviewers of the chapters published in this volume for their expertise and efforts. We appreciate the efforts of Maureen Matkovich, Laura Manicone, and ACS Books in the culmination of this book. We thank Jennifer Anhalt, Pamela Tank, Brett Nelson, John Ramsey, Chris Schmidt, and Nancy Kite for their assistance in the preparation of this book. We also acknowledge Willis Wheeler for his help in coordinating the symposium and book.

We dedicate this book to our children Adam Kruger; Teagen Anderson; Sarah, Jesse, and Aaron Coats; and Beth and Annie Butin.

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January 9, 1997