



“Gheorghe Asachi” Technical University of Iasi, Romania



Book Review

PHYTOREMEDIATION AND BIOFORTIFICATION:

Two Sides of One Coin

Yin Xuebin, Yuan Linxi, Editors

Springer, ISBN: 978-94-007-1438-0, 126 pages

Over the past few decades phytoremediation has been popularized as green technology that uses plants to cleanup polluted sites with heavy metals, which contaminate food chain. In contrary to this, Biofortification was another plant-based biotechnology raising the mineral level in human foods. Its means natural mineral elements show both toxicity and nutrient benefits in human foods, depending on their concentrations.

Producing sufficient, safe and nutritious foods to human beings is the main goal of sustainable agriculture. Previous scientific efforts have focused on increasing crop yields, but enhancing the mineral level in human foods has become an urgent task because about half of the world population suffers from the malnutrition of mineral micronutrients.

Generally nutrient deficiencies pertain to mineral micronutrients like iron, zinc, iodine and selenium. Furthermore, over exploitation of lands can show micro-nutrient deficiencies in food crops and in human nutrition. Nutrient depletion (nutrient mining) may take several years when the soils were not supported with custodian agricultural practices. Generally, this type of problem is found on those soils where agricultural residues are not recycled in the crop fields.

In this book, authors appraised well two pathways to connect phytoremediation and biofortification, as earlier suggested by international groups. Indeed, in relation to essential mineral nutrients such as Fe, I, Cu, Zn and Se, both phytotechnologies could be integrated closely and might be said that both are two sides of one coin. The title of the book clearly reflects the objective of integrating biofortification and phytoremediation

technologies in the practice for the benefits of raising the mineral level in human foods.

This book is a compilation of five chapters on phytoremediation and biofortification of selenium, zinc, iron, cadmium, and copper. Book is edited by two Chinese professors and Eleven authors (all Chinese) are contributed in this book. Book contains 80 pages with good contents and seems a “tea-table book”. This book provides a well-structured grounding in the essentials of combining phytoremediation and biofortification technologies for raising mineral nutrient in human foods, yet is presented in highly readable and easy-to-understand format.

The book opens with introductory chapter by Prof. Xuebin Yin and colleagues which provides the emerging concept and discussion about the environmental and human health concerns associated with the processes of phytoremediation and biofortification, the future research needs, and integration of the both phytotechnologies in relation to increase human mineral dietary intake.

Chapter 2 addresses some issues viz. selenium in plants and soils, selenium biofortification, selenium hyper-accumulating plant and its implication, selenium distribution in staple crops and soils, selenosis in Enshi, China (the world capital of selenium), selenium-biofortified agricultural products in Enshi, selenium biofortification strategy (It is divided in two categories i.e. agronomic biofortification strategies, genetic engineering for biofortification). Selenium biofortification in China is also discussed in this chapter which includes selective Se-accumulated crop species, foliar application of Se fertilizer, application of soil Se fertilizers.

Chapter 3 covers some important topic of zinc such as physiological processes of zinc in plants, zinc uptake from soil by plants, zinc chelation and compartmentation in roots, translocation of zinc from root-to-shoot, zinc distribution and storage in aerial parts of plant, phytoremediation of zinc-contaminated soils, zinc phytoremediation strategies, zinc-biofortification for human nutrition, zinc biofortification strategies.

Chapter 4 includes some important aspects of essential micronutrient iron viz. iron for human health, iron deficiency, strategies to alleviate iron deficiency, molecular mechanisms of iron uptake into plant seeds, iron-biofortified crops and iron biofortification strategies. This chapter also describes that biofortification is a tool to struggle against iron deficiency.

Chapter 5 or last chapter of the book documents the contamination of Cd and Cu in a soil-plant system of environment which is a most serious concern. The last chapter also includes the phytoremediation of Cd and Cu from contaminated soils. In this book, the role of mineral elements that are of primary importance for human beings is highlighted. It could show both toxicity and nutrient benefits, depending on their doses. Authors of the book reviewed two routes to connect these two green technologies for the development of sustainable technology raising the mineral level in human foods.

Some important topics such as the soil bioavailability bottleneck (a common constraint) for both phytotechnologies as well as localization of nutrients in biofortification have been ignored entirely. Few chapters on biofortified crops and molecular genetic approaches regarding to biofortification should be included in the present book. Agricultural biotechnology is a potential approach for the development of more nutritious crops.

Linking phytoremediation and biofortification and its implementation towards sustainable agriculture and avoiding the micronutrient malnutrition in humans should have been covered in separate chapter.

In conclusion, this book will be valuable as a collection of all the aspects of the phytoremediation and biofortification. This book will encourage more studies to focus on interesting advanced biofortification and phytoremediation technologies in the practice for human well-being. This book could be read by graduate students as well as researchers to build a serious picture of the micronutrients fields. For those who have an interest in the domain of biofortification and phytoremediation, the book will give them a clear overview to make the roadmap of agricultural technology, which raises a new conception to produce nutraceutical foods.

Linking biofortification and phytoremediation may be a new strategy to tackle malnutrition as well as environmental remediation regarding to mineral nutrients viz. Fe, I, Cu, Zn and Se. Therefore, linking both phytotechnologies is a current need for sustainability and its implementation would immensely benefit to environment and society. Indeed, this book provides a good material for ecologists, economist, social scientists, agricultural scientists, environmentalists, policy makers, researchers and degree students who want to research in green-technologies for sustainability.

Sustainability science is a current need to mitigate environmental pollution in changing climate and this book provides the perspective of phytoremediation and biofortification.

Vimal Chandra Pandey

*Department of Environmental Science,
Babasaheb Bhimrao Ambedkar University
(A Central University)
Raibareilly Road, Lucknow 226025,
Uttar Pradesh, India*