





---

# A Review on Genetically Modified Plants Designed to Phytoremediate Polluted Soils: Biochemical Responses and International Regulation

Edgar VÁZQUEZ-NÚÑEZ <sup>a</sup>  , Julian M. PEÑA-CASTRO <sup>b</sup>, Fabián FERNÁNDEZ-LUQUEÑO <sup>c</sup>, Eduardo CEJUDO <sup>d</sup>,  
Maria G. de la ROSA-ALVAREZ <sup>a e</sup>, Maria C. GARCÍA-CASTAÑEDA <sup>f</sup>

Show more 

 Share  Cite

---

[https://doi.org/10.1016/S1002-0160\(18\)60039-6](https://doi.org/10.1016/S1002-0160(18)60039-6) 

[Get rights and content](#) 

---

## Abstract

In recent years, there has been an increasing interest in finding sustainable strategies for the efficient removal of contaminants from soils. The objective of this review is to examine the biochemical principles of specific genetic modifications in plants, their applications in the field for specific contaminants as phytotechnologies, and their international regulation. In addition, the review presents some biological aspects of rhizosphere-related phenomena, the interactions of organic and inorganic pollutants with plants, and the performance of the phytotechnologies across the continents. During the last few decades, at least eight genera of genetically modified plants (GMPs) have been tested and used for soil remediation with outstanding results. *Arabidopsis*, *Nicotiana*, and *Oryza* are the plant genera most widely studied. Specific plant genes such as metal transporters, chelators, metallothioneins, phytochelatins, and oxygenases have been transferred to plants to improve the elimination of contaminants in soil. We discuss some important aspects of gene manipulation and its application for removal of diverse contaminants. A key challenge faced by phytotechnologies is the final disposal of the generated biomass, from a safety aspect. We argue that the commercial success of phytotechnologies depends on the generation of valuable biomass on contaminated land and its use for bioenergy generation. The use of such technologies would promote a broader understanding of the importance of plants, especially GMPs, in the environment and their contribution to environmental sustainability.

---