

PESTICIDES REMOVAL USING PLANTS:
PHYTODEGRADATION VERSUS PHYTOSTIMULATION?

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Phytoremediation has been defined as the use of green plants and their associated micro-organisms, soil amendments and agronomic techniques to remove, contain or render harmless environmental contaminants. Plants can either accumulate and metabolise organic pollutants (phytodegradation) or stimulate appropriate rhizospheric micro-organisms (phytostimulation). Both approaches have been explored to remediate soils contaminated with pesticides.

The ability of vetiver to act as a natural barrier against soil erosion made the plant a major, simple and low cost tool for soil conservation on hill slopes in tropical developing countries. Vetiver is planted in hedges forming strips, suggesting that the plant could nowadays already play a role against agricultural chemicals runoff. Since vetiver is known to be resistant to atrazine, the aim of our work was to evaluate its actual ability to take up and metabolise the herbicide. Vetiver was indeed able to accumulate and metabolize atrazine: small amounts of dealkylated products were detected in roots and leaves, whereas conjugated atrazine was found mainly in leaves. Under transpiring conditions, conjugation to glutathione in leaves was important, but under non-transpiring conditions, atrazine was also trapped in roots oil according to the partition-diffusion law.

Although technical HCH, a mixture of several isomers of hexachlorocyclohexane, has been banned in many countries over the last decade, lindane (γ -HCH) is still in use today as an insecticide, especially in tropical countries. Lindane-degrading micro-organisms have been isolated from different contaminated soils. On the other hand, plant roots can release a vast range of organic compounds into the rhizosphere. Bacteria able to use these chemicals as carbon and/or energy sources often have enzymes that can (co-)metabolise pollutants with similar structures. Thus, the degradation of several chlorinated pesticides has been reported to be higher in a vegetated soil than a non-vegetated soil. Phytostimulation of bacteria present or added in soil seems the most promising approach to remove lindane from contaminated sites.

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