

Chapter 19

Bioremediation via Nanoparticles: An Innovative Microbial Approach

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ABSTRACT

Arena of nanotechnology has revolutionized the field of bioremediation to overcome the problems of environmental pollutions. Approaches applied for the monitoring and treatment of contaminants includes control of pollutants, sensing the pollutants and remediation by nanoparticles. Among the three approaches, the most important is to remediate the pollutants. This chapter highlights the eco-friendly, accurate, cost effective, ex-situ and sustainable approach for the “Green Bioremediation” with the help of nanoparticles. Nanoparticles covers the treatment of surface water, groundwater and industrial wastewater contaminated by toxic metal ions, radionuclides, organic and inorganic solutes and also reduce aromatic recalcitrant compounds from soil and air pollution. There is also a scope of enhancing the remediation potential of nanoparticles by manipulating size and geometry. They have given a new hope towards positive sustainable approach for environment and human welfare.

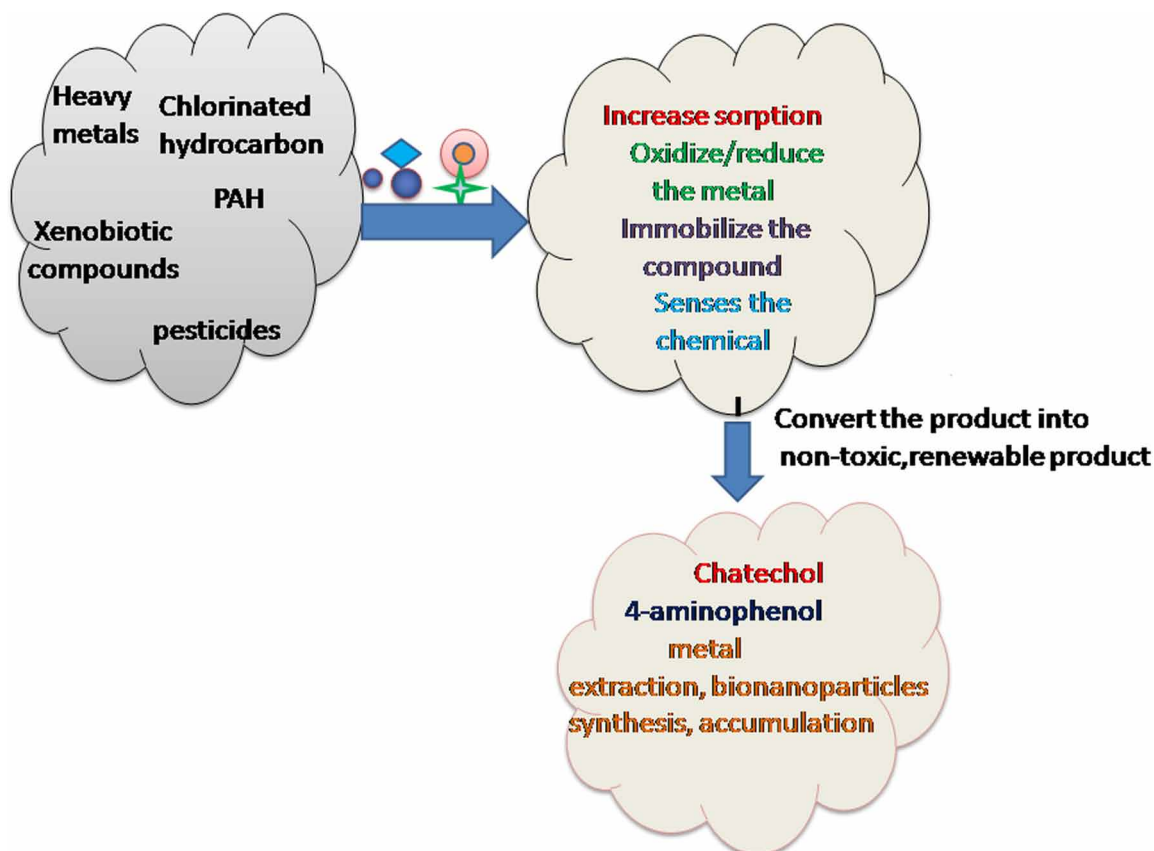
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INTRODUCTION

Increment in the population density, necessity of up gradation in agriculture productivity, industrialization and urbanization of human societies are accountable for environmental contamination (Figure 1). The extensive use of anthropogenic materials contaminates the natural ecosystem which degrades the environment in long term by several means such as loss in biodiversity, introducing heavy metals and other organic recalcitrant compounds. On this regard decontamination of these hazardous wastes via eco friendly approaches is an enigma. In the diverse biological species present in nature, many are blessed with the ability to tolerate heavy metals. Progress in science and technology facilitate us to concern the ability of biological diversity for depletion of pollution which is termed as bioremediation. This is promising efficient novel technology for dealing with extensive range of contaminants. This technology mediates phytoremediation (plants), rhizoremediation (plant and microbe interaction) and remediation via biosynthesis of nanoparticles (nanoparticles synthesized by microbes).

Currently maintaining ecosystem and biodiversity has become an increasingly important field of research, as well as a resource management goal. Various industrial chemicals are released daily which are hazardous to the environment and cause harmful effects to the biodiversity by entering the food

Figure 1. Effect of nanoparticles on contaminate sites and their possible mechanism to reduce the contaminants



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