Chapter 5

Bioremediation of Environmental Pollutants

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ABSTRACT

This chapter describes how pollutants are increasing in the environment due to the rapid industrialization all over the world. The environment has been contaminated with large number of organic and inorganic pollutants. The organic pollutants are largely anthropogenic and are introduced to the environment in many ways. Soil contamination with toxic metals, such as Cd, Pb, Cr, Zn, Ni, etc., as a result of world-wide industrialization has increased noticeably within the past few years. Bioremediation is a process for reclaiming the environment which has been polluted with the help of living forms. It is an option that offers the possibility to destroy various contaminants using natural biological activity and to degrade the environmental contaminants into less toxic forms. It is also applicable for the heavy metal hazards. It has proven to be cheap and efficient than other techniques. This chapter focuses on the possible trends in the remediation of environment pollutants with the help of plants as well as microbes.

INTRODUCTION

Bioremediation is a method which utilizing the life forms to kill or expel contamination from waste. It is vital to comprehend that this type of waste remediation utilizes no poisonous chemicals, in spite of the fact that it might utilize a living organism that can be detrimental in specific situations (Mathiyazhagan et al., 2011; Obreque et al., 2015; Akpomie et al., 2016; Satyapal et al., 2016, Ramakrishnan, 2016; Xe-DOI: 10.4018/978-1-5225-3540-9.ch005

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Bioremediation of Environmental Pollutants

In other words, we can say that bioremediation is the use of living microorganisms to degrade environmental pollutants or to prevent environment from pollution. It is an important technology for removing pollutants from the environment and thus restoring the original natural surroundings so that the environment can be prevent from pollution. It can be divided into three phases or levels. Firstly, by natural attenuation in which the contaminants are reduced by native microorganisms without any human augmentation, secondly the biostimulation is employed where nutrients and oxygen are applied in the systems to improve their effectiveness and to accelerate the process of biodegradation. Finally, during bioaugmentation microorganisms are added in the systems. The techniques of bioremediation are now widely being applied to remove the pollutants or contaminants from the environment.

Types of Bioremediation

There are much more than nine types of bioremediation, yet the accompanying are the most well-known ways in which it is utilized (Wilson et al., 1994, Griffiths, 2003, Lai et al., 1995, Edens,1984,). The list of some of the bioremediation techniques are as follows:

- **Phytoremediation**: Phytoremediation is a process of utilization of plants to expel contaminants. The plants can draw the contaminants from the soil and water into their structures and clutch them, adequately expelling them from soil or water.
- **Bioventing**: Bioventing is an *in situ* remediation technique that includes blowing of air through soil to expand oxygen rates in the waste. It works well with light contaminants as which can evaporate easily. It is a very efficient approach to neutralize certain oxygen sensitive metals or chemicals with the help of microorganisms.
- **Bioleaching**: This technique includes expelling metals from soil with the help of living life forms especially bacteria. Certain sorts of life forms attract to heavy metals and other type of contaminants and ingest them. This technique has widely being used to remove the metals like lead, zinc, cobalt, lead, gold etc.
- **Landfarming**: This technique involves placing the contaminants soil in a biocell which is consisting of a linear surrounded by a berm. After that the soil placed on the linear and turned periodically to help the microorganism to breakdown the pollutants.
- **Bioreactor**: The utilization of uniquely outlined containers to hold the waste while bioremediation happens.
- **Composting**: Containing waste so a characteristic decay and remediation process happens.
- **Bioaugmentation**: Adding microorganisms and living organisms to fortify the same in waste to permit them to assume control and purify the region.
- **Rhizofiltration**: The utilization of plants to expel metals in water.
- **Biostimulation**: The utilization of organisms intended to expel contamination connected in a medium to the waste.

Classes of Bioremediation

There are two classes of bioremediation which are as follows: