

Chapter 60

Removal of Toxic Pollutants From Soil Using Microbial Biotechnology

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ABSTRACT

At present the many of the man-made compounds released in soil by various ways. These compounds might be pesticides and other hazardous chemicals. Through food chain these compounds increased day by day at particular trophic level and also affect the soil biodiversity. Microbial cultures and associated biotechnology can be helpful to reduce such types of pollution from soil without affecting their natural habitat or niche. In this chapter we will discuss the indigenous microbial flora and their role for the maintenance of the sustainable environment.

INTRODUCTION

Soil is a natural body and also known as “Pedosphere”, It is a mixture of various minerals, organic matter, gases, liquids and many organisms that altogether support life on earth. It is also known as “the skin of earth” and performs major functions like serving as a medium for plant growth, modifies earth’s atmosphere, it is a mean of water storage, supply and purification and also habitat of many organisms

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which together modify the soil (Dominati et al., 2010). Soil also operates as a natural sink for number of contaminants that overtime accumulate and concentrate in soil from various sources. Thus, starting from an insignificant amount the contaminants may reach to a significant concentration level depending on the environmental conditions including soil types and the degradability of the released contaminant results in soil poisoning. When the top most layer of the land known as 'soil' is polluted and the productivity is decreased due to pollutants it is known as soil pollution. Soil pollution includes the pollution mostly with chemical materials that are out of place or are present at higher concentrations than normal which may have undesirable effect on human and other organisms. Soil pollution is also caused by ways other than the direct addition of xenobiotic (manmade) chemicals such as agricultural runoff waters, industrial waste materials, acidic precipitates and radioactive fallout. Organic contaminants (containing carbon) and inorganic contaminants (not carbon) are important soil pollutants. The most well-known chemical groups of organic contaminants are fuel hydrocarbons, polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), chlorinated aromatic compounds, along with detergents and pesticides. Inorganic contaminants include nitrates, phosphates, and heavy metals such as lead, chromium and cadmium; Inorganic acids; and radioactive substances. Soil pollution can even have various other adverse effect such as it can lead to water pollution if deadly poisonous chemicals leach into groundwater, or if contaminated runoff reaches streams, lakes, or oceans. Releasing of volatile compounds in to the atmosphere also contributes to air pollution naturally. Nitrogen is released from various sources through volatilization and denitrification of ammonia. Acid rains are caused by the decomposition of organic materials in soil that releases sulfur dioxide and other sulfur compounds. Heavy metals and other potentially lethal elements are the most serious soil pollutants in sewage. Sewage sludge containing heavy metals if applied repeatedly or in high amounts may end up in accumulation of heavy metals in the treated soil and as a result become incapable to support plant life.

Causal Reasons of Soil Pollution

Soil pollution can be caused due to any of the following reasons:

- Improper disposal of oily sludge by oil refineries during the processing of crude oil.
- Mining and other activities by other heavy metal industries.
- Accidental oil spills as may happen during activities, such as during storage and transport of chemicals as etc.
- Corrosion of underground storage tanks (including piping used to transmit the contents)
- Heavy use of agrochemicals, such as pesticides, herbicides and fertilizers in the farmland.
- Drainage of contaminated surface water into the soil
- Landfill disposal of toxic wastes such as oil and fuel dumping, nuclear wastes, direct discharge of industrial wastes to the soil, coal ash, electronic waste and ammunitions and agents of war.

Rising of environmental pollution has been among the furthestmost concerns for science as well as for the general public in the last five decades. The rapid growth in the industrialization of agriculture, spreading out of the chemical industry, and the requirement to generate and produce cheap forms of energy has resulted in continuous release of the manmade organic chemicals into the natural ecosystems. Therefore, the soil environment along with the atmosphere and water bodies has become polluted

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