Studies on the Microbial degradation of Organic Pollutants

ABSTRACT

The thesis describes the isolation and characterization of bacterial strains capable of degrading the organic pollutants such as carbaryl and phenanthrene and the elucidation of biodegradative pathways which lead to the mineralization of these chemicals.

Carbaryl (1-naphthyl N-methylcarbamate) is a carbamate pesticide, used extensively in agriculture and public health. It is a potent inhibitor of cholinesterase and highly toxic to human and animals. Phenanthrene is one of the persistent aromatic hydrocarbons commonly identified in environmental samples. It is therefore essential to investigate the metabolic fate of such toxic chemicals in the environment. As much less is known about the biodegradation of carbaryl and Phenanthrene in different organisms, a detailed investigation was undertaken to elucidate the biodegradative pathways of these chemicals by the isolated bacterial strains.

The thesis is divided into six chapters, in addition to the summary and references at the end. The first chapter deals with the general introduction about the environmental organic pollutants and microbial degradation of aromatic compounds. The aim and scope of the present investigation has been given in this part.

The second chapter deals with the materials and methods used in these studies. The methods used for isolation and identification of microbial cultures,
growth and maintenance of cultures, isolation and identification of metabolites and enzyme assays has been described in this chapter.

The third chapter describes the isolation and characterization of carbaryl-degrading organism, which was identified as a *Micrococcus* sp. CRL. The utilization of various aromatic compounds by the *Micrococcus* sp.CRL has been described in this part.

The fourth chapter describes the results and discussion on the biodegradation of carbaryl by *Micrococcus* sp. CRL. Isolation and identification of metabolites, growth, oxygen-uptake and enzymatic studies have shown that the organism degraded carbaryl by hydrolysis to yield 1-naphthol and methylamine. 1-Naphthol was further metabolized via salicylate by a gentisate pathway.

The fifth chapter describes the isolation and characterization of Phenanthrene-degrading organism, which was identified as a *Bacillus* sp.PHE. The utilization of various aromatic compounds by *Bacillus* sp.PHE has been described in this part.

The sixth chapter describes the results and discussion on the biodegradation of phenanthrene by *Bacillus* sp.PHE. The isolation and identification of metabolites, growth, oxygen uptake and enzymatic studies shown that the organism degraded phenanthrene through the intermediate formation of 1-hydroxy-2-naphtoic acid, which was further metabolized via o-phthalate by a protocatechuate pathway.