

Phenol toxicity and phytoremediation

ABSTRACT

Widespread applications of phenol in manufacturing industries and oil refineries had resulted in unprecedented leakage of phenol into the environment, which can cause serious health effects such as tissue necrosis and cardiac arrhythmia upon contact or ingestion. Plants exposed to phenol had reduced seed germination index, inhibited growth or even fatality. There are many technologies currently practised to remediate phenol pollution such as physiochemical methods (adsorption to activated carbon and chemical oxidation), biological methods (biodegradation by bacteria or fungus, and soil bioaugmentation), and phytoremediation method (using hairy roots of plants). As physiochemical and microbial phenol degradation are destructive and costly, phytoremediation is widely studied as an alternative phenol remediator which is environmental friendly and cost effective. Microorganisms can detoxify the aromatic xenobiotic through the aerobic or anaerobic pathway. Aerobic degradation of phenol is through either the meta- or ortho-pathway of catechol cleavage while anaerobic degradation occurs through the benzoate pathway. In plants, degradation of phenol is also through catechol cleavage as in microorganisms. However, different enzyme systems were utilised in the different pathways involved.

Keyword: Biodegradation; Pathways; Phenol; Physiochemical remediation; Phytoremediation