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SHORT COMMUNICATION

ENVIRONMENTAL POLLUTANTS AND BIODEGRADATION

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Innumerable novel organic compounds were synthesized during the past few decades [1]. Many of these compounds are used today as pesticides. This usage is causing serious pollution of aquatic bodies and consequently the agricultural soil and the ecosystem. There is excessive exploitation of the earth's petroleum reserves. These compounds are highly toxic to the living systems [2, 3]. Toxicity attained such a level that it is disastrous and is killing indigenous biota at an accelerated pace [4]. These pollutants are sometimes found in traces in public water supplies too, which even cannot be removed through the water treatment methodologies. This is unfortunate.

The term "pesticide" includes synthetic chemical agents that can kill insect pests (insecticides), weeds (herbicides) and pathogenic fungal member (fungicides). Different pesticides are currently used quite extensively for agricultural purposes. A few among them are DDT (dichlorodiphenyltrichloroethane), parathion, BHC (benzene hexachloride) and endosulfan. They harm the nitrogen fixing bacteria and eventually the environmental balance [4]. Many of these pesticides used are easily biodegraded; the extent of biodegradation depends on the composition and chemical structure of the pesticide used. Persistence time of many of them can be as long as 15 years. However, these structures are modified and easily biodegradable pesticides are currently in use. Although these compounds possess various types of chemical structures, most of them have simple hydrocarbon skeletons with various substituents such as halogens, amino, nitro, hydroxyl and other groups. The aliphatic hydrocarbons are first oxidized to fatty acids and then metabolized via ß-oxidation and tricarboxylic acid (TCA) cycle to carbon dioxide and water. Aromatic rings are dihydroxylated and then ring cleavage occurs and ultimately cleavage products are metabolized [1,4]

Several chlorinated hydrocarbons are first dechlorinated microbiologically and then metabolized. Easily biodegradable isomers of pesticides are selected for use in agriculture [2]. The alkyl benzyl sulfonates are anionic laundry detergents. Non linear forms have superior detergent property to the linear forms. These chemicals are now banned because they are non biodegradable in the aquatic bodies and produce excessive foaming in water bodies, thus harming aquatic biota. As the linear alkyl benzyl sulfonates are easily biodegradable, they are used even if they have inferior detergent quality. This is only to preserve the environment quality [3]. The polynuclear hydrocarbons (PNHs), polychlorinated hydrocarbons (PCHs) and other related compounds are slowly degrading pollutants in the aquatic environment and are hence easily biomagnified. In other words, their concentration increases in the biological organisms compared to their concentration in the surrounding aquatic environment. This happens due to the fact that the hydrocarbons are partitioned between the aquatic bodies and microbial lipids and pollutant concentration gradually increases from one tropic level to the next higher trophic level. Ultimately birds of prey and other animals who feed upon fishes and other aquatic biota uptake a large amount of toxic chemicals that exceed the deadly concentration in higher orders of ten at every step [2].

Bioremediation is an important approach to remove environmental pollutants. It is the utilization of microorganisms to degrade these pollutants [3]. This process is both

useful and cost effective and can degrade a wide range of pollutants including petroleum hydrocarbons and PCHs and can transform toxic heavy metals to less toxic states, such as enzymatic conversion of toxic hexavalent chromium to less toxic trivalent forms. Soils and ground water contaminated with PCBs (Polychlorinated biphenyls) or TCE (Trichloroethylene) can be treated in bioreactor by using a pure microbial culture or a mixed culture [4]. A fertilizer or suitable sources of nitrogen, carbon and phosphorus are added to the bioreactor before digestion at a suitable temperature. The PCBs are first degraded under anaerobic conditions and then less chlorinated PCB products are degraded aerobically in a separate fermenter. Recently recombinant *Rhodococcus* and *Burkholderia* species that can degrade PCBs have been developed in the laboratories. Recombinant *Pseudomonas* can detoxify heavy metals, carbon tetrachloride and naphthalene [3]. Although bioremediation is a suggested method of choice for this broad applicability and low cost, it is not the sole answer to the enormous problems associated with environmental pollution. In the near future, more environment friendly and cost efficient technologies will be needed for handling the environmental crises across the globe in such an accelerated pace.

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