

Present study:

Pesticide biodegradation by soil bacteria

Pesticides have been used worldwide to control pests and pathogens to ensure higher food productivity that is necessary to support the world population of approximately 7 billion people. Lindane (γ -HCH) and technical HCH (mixture of α -, β -, γ -, and δ -HCH isomers) are efficient insecticides. Lindane is toxic but due to its low production cost and its effective insecticide properties, it is ubiquitously used in tropical countries to reduce vector-transmitted diseases, protect livestock's and to increase agricultural yields (Li, 1999; Vijgen et al., 2011). However, Lindane (γ -HCH) and technical HCH are persistent organic pollutants (POPs) and bioaccumulate through the food web, and pose a risk of causing adverse effects to human health (suspected carcinogen, affects nervous system, cardiovascular system, reproductive system, etc) and the environment. The use of Lindane has been banned in at least 52 countries and restricted in some of other countries including India. However, specific exemption allows it to be used in second-line treatments for head lice and scabies. Since, Lindane is a POP, its detoxification becomes necessary. Various approaches could be used to decontaminate the polluted locations. Physical-chemical techniques for the removal of Lindane and its waste isomers exist, but they are very expensive. In soil, microorganisms commonly exist in large populations. Provided with adequate supplies of carbon, energy and environmental conditions conducive to growth, microbial activity, especially the production of extracellular enzymes, can significantly assist in the amelioration of contaminated sites. Microbial degradation offers an effective approach to remove such toxic pesticides from the

environment. Previously it has been reported that the bacteria isolated from agricultural fields or industrial sites contaminated with HCH by enrichment method, demonstrate good Lindane degradation activities (Senoo et al., 1989; Sahu et al., 1990). Therefore, in the present study, Gamma Hexachlorocyclohexane (γ -HCH) degrading *Shewanella* sp. CGR-L1 and *Sphingobium* sp. CGR-L2 were isolated from industrial site soil (Baroda district, Gujarat, India) by direct isolation (without enrichment) and enrichment method (using γ -HCH as sole source of carbon), respectively. Finally, isolates showing promising γ -HCH biodegradation activity were studied in detail at biochemical and molecular level.

The present work was carried out with the following objectives:

OBJECTIVES:

1. Isolation and identification of γ -HCH (Lindane) degrading bacteria.
2. Biochemical and Molecular characterization of γ -HCH degraders.
3. Analysis of the biodegradation ability of the isolates.