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# Eco-Friendly Production of Biodegradable Plastics From Waste Biomass Using Bacteria

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**ABSTRACT**

Environmental pollution has shifted interest towards the development of bioplastics, which offer the dual benefits of utilizing waste and enabling cost-effective production of biodegradable materials. Polyhydroxyalkanoates (PHAs) are a class of biodegradable plastics synthesized intracellularly by various bacteria. Inexpensive carbon substrates such as PET, wastewater, agricultural waste, molasses, lauric acid, whey, cellulose, plant oils, and starch hydrolysates can serve as excellent feedstocks for PHA production, presenting significant economic advantages. PHAs have emerged as potential useful materials for different applications owing to their unique properties. The versatility of PHAs in terms of their non-toxic degradation products, biocompatibility, desired surface modifications, wide range of physical and chemical properties, cellular growth support, and attachment without carcinogenic effects have enabled their use as in vivo implants. Microbial production of PHAs also provides the opportunity to develop PHAs with more unique monomer compositions economically through metabolic engineering approaches. At present, it is generally established that the PHA monomer composition and surface modifications influence cell responses. PHA synthesis by bacteria does not require the use of acatalyst (used in the synthesis of other polymers), which further promotes the biocompatibility of PHA-derived polymers.

We have stock of more than hundred bacterial stains which are able to produce Biodegradable plastic. Biodegradable plastic was extracted from bacterial strains, which were isolated from different environments of Pakistan. All the strains were analyzed for resistant markers. Extraction of PHA was done by different methods. PCR base strategy was used to amplify *Pha* biosynthesis operon. These studies are benefitting from the fact that the PHA polymer presents a great variety of characteristics in terms of its biodegradability, elasticity, non-toxicity, biocompatibility, ability to function as nanoparticles, and possibility for tailor-made physical-chemical properties.