ABSTRACT

Plastics are important in every sphere of human life. But because of their non-degradable nature their use leads to diverse problems, so synthetic plastics must be replaced with bio-degradable material. The purpose of the present study was fermentative production, purification and characterization of polyhydroxyalkanoates (a bioplastic) from *Alcaligenes latus.* Five bacterial species including *Alcaligenes latus, Azotobacter* sp., *Bacillus subtilis, Bacillus thuringienesis* and *Bacillus cereus* were qualitatively (Sudan Black dye) and quantitatively (Crotonic acid assay) screened out in order to obtain optimum strain for PHA production. In current work, *Alcaligenes latus* was able to produce highest amount of PHA having properties comparable to polypropylene (synthetic plastic). Two stage fermentation technique was used while in first stage nutrient rich media was inoculated with bacterial pre-culture and biomass from this medium was separated by centrifugation and added to nitogen limited production medium. Enhanced production of PHA was obtained by using 2% sucrose as a carbon source and ammonium sulfate as nitrogen source. The optimum PHA production was achieved at 37°C, pH 7.0 and 150 rpm. For maximum PHA production 2% (v/v) of 24 hrs bacterial culture was the best inoculum. At 48 hrs incubation period (in both culture medium) 7.7± 0.22 g/L (64.14% content of dry cell weight) PHA was obtained. For recovery of biopolymer four methods were used, the highest amount of PHA was obtained with chloroform hypochlorite dispersion extraction. The produced PHA was characterized by different ways. The compositional analysis revealed that PHA molecule has no ash content, no protein, nitrogen or phosphorus indicating good purity of biopolymer. The Fourier Transform Infrared spectrum confirmed that the extracted biopolymer was PHA. XRD revealed presence of crystalline phase at different peaks. The PHA showed good thermal properties with glass transition temperature, crystalline temperature and melting temperature of 3.9°C, 55°C and 170°C, respectively. The average molecular weight was found to be 0.812×10^6. The tensile strength and Young's modulus of PHA were 0.9 and 1.3 GPa. These properties almost resembled to synthetic plastic so PHA can be a good alternative of synthetic plastic.