Abstract

Synthetic plastics have become one of the major pollutants around the globe. Hence, bioplastics are being considered as an alternative to synthetic plastics because of its potential biodegradability and eco-friendly nature. The purpose of present study was biosynthesis, recovery and characterization of polyhydroxyalkanoates (a bioplastic) from indigenous bacteria. Different bacterial colonies were isolated and screened qualitatively and quantitatively for the accumulation of PHA. Qualitative screening for PHA accumulating bacterial strains was performed by using two PHA specific staining dyes; Sudan Black B and Nile Blue A. For quantitative screening, each screened PHA accumulating bacterial strain was subjected for bioplastic production (via submerged fermentation) and PHA production was estimated by performing crotonic acid assay. Among all isolates (C3) was found best potential isolate for maximum PHA accumulation under defined conditions. The PHA accumulation was increased by C3 isolate with the use of sucrose (2%) as a carbon source, at pH 7, temperature 37°C, in 48 hours incubation with 2% inoculum of 24 hrs old bacterial pre-culture at 150 rpm agitation. PHA yield was enhanced by using yeast extract and ammonium sulfate as organic and inorganic nitrogen source, respectively. The maximum PHA production (10.5±0.14 mg/mL) was obtained by optimizing the physical and chemical parameters. Chloroform hypochlorite dispersion method was found to be the best recovery method with 66.2 % (PHA) of dry cell weight. The most potent isolate (C3) was identified to be *Bacillus sp.* through biochemical characterization. Morphological characterization of extracted PHA was done by scanning electron microscope (SEM) analysis which showed the smooth surface morphology of PHA with cracks, indicating its resilient nature. The Fourier Transform Infrared spectrum confirmed that the extracted biopolymer was PHA with C=O, C=C, C-H and O-H functional groups. Thermal properties of PHA was studied by differential scanning calorimetry that showed different transition temperatures such as onset weight loss temperature (341.5°C), maximum rate of weight loss at (375.8°C) and the complete degradation at (437.1°C). Mechanical properties of PHA i.e. tensile strength and Young's modulus of PHA were 1.5 GPa and 0.8 respectively. PHA blends with thermoplastic starch were also produced to reduce the cost of PHA production and to improve its properties.