ABSTRACT

The present study was conducted to investigate fermentative production, recovery/extraction and characterization of poly(β-hydroxybutyrate) bioplastic from *Bacillus cereus* NRRL 3711. Five different species of genus *Bacillus* were screened by qualitative (sudan black staining) and quantitative (crotonic acid assay) methods to obtain a prospective strain for PHB accumulation. In the current study, *B. cereus* was potential candidate able to produce PHB with properties comparable with polypropylene (synthetic plastic) for its maximum industrial applications. The enhanced PHB production was achieved by using glucose (3%) as a carbon source, $(NH_4)_2SO_4$ as the nitrogen source and C/N of 10. The optimum PHB production was carried out at 30°C, pH 8, 200 rpm. The 3% (v/v) of 8 h old bacterial culture was best inoculum for maximum biopolymer synthesis with TES2 as excellent set of trace elements solution for maximum PHB accumulation. In addition, alanine amino acid enhanced the production of PHB bioplastic. The PHB accumulated rapidly during the stationary phase and maximum production of 13.89±0.421 g/L was achieved at 57 h of growth. A detailed study was conducted on the recovery of PHB, with acetone-alcohol extraction method as the best one with 56% (w/w) of DCW yield, 95% purity, crystallinity *Xc* of 51.3% and crystallinity index (CI) of 0.84. The compositional analysis revealed that extracted biopolymer contain no nitrogen, protein, phosphorus and ash content which indicated maximum purity of the recovered PHB biopolymer. The Fourier Transform Infrared spectrum of extracted PHB indicate the presence of C=O, -CH, CH3, CH2, C-O-C and CH2-S functional groups and confirmed that the extracted polyhydroxalkanoate (PHA) was poly(β-hydroxybutyrate). The average molecular weight of PHB was found to be 0.617×10^6. The PHB show good thermal properties i.e. Tg, 3.6°C; Tc, 54°C and Tm, 170°C with better thermal stability (T_o, 250°C ; T_p, 290°C and T_F, 370°C). The crystalline structure of PHB was study by powder XRD designated the presence of crystalline phase of bioplastic at specific peaks. The tensile strength at breakpoint of thin film of 26 MPa, elongation to breakage of 1.7% and young's modulus of 3.0 GPa of PHB, similar to synthetic plastic is a good alternate to synthetic polypropylene in different sectors of modern life. **In addition, this is the first report on the optimization, recovery and characterization of PHB bioplastic by the NRRL 3711 strain of *Bacillus cereus*.**