
Title

Production of poly-3-hydroxybutyrate (PHB) nanoparticles using grape residues as the sole carbon source

Abstract

The production of poly-3-hydroxybutyrate (PHB) on an industrial scale remains a major challenge due to its higher production cost compared to petroleum-based plastics. As a result, it is necessary to develop efficient fermentative processes using low-cost substrates and identify high-value-added applications where biodegradability and biocompatibility properties are of fundamental importance. In this study, grape residues, mainly grape skins, were used as the sole carbon source in *Azotobacter vinelandii* OP cultures for PHB production and subsequent nanoparticle synthesis based on the extracted polymer. The grape residue pretreatment showed a high rate of conversion into reducing sugars (fructose and glucose), achieving up to 43.3 % w w⁻¹ without the use of acid or external heat. The cultures were grown in shake flasks, obtaining a biomass concentration of 2.9 g L⁻¹ and a PHB accumulation of up to 37.7 % w w⁻¹. PHB was characterized using techniques such as Fourier transform infrared spectroscopy (FTIR), thermogravimetric analysis (TGA), and differential scanning calorimetry (DSC). The formation of emulsified PHB nanoparticles showed high stability, with a particle size between 210 and 240 nm and a zeta potential between -12 and -15 mV over 72 h. Owing to these properties, the produced PHB nanoparticles hold significant potential for applications in drug delivery. © 2024 Elsevier B.V.

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84778-64-3, 8027-56-3; poly(3 hydroxybutyric acid), 26063-00-3; carbon, 7440-44-0; hydroxybutyric acid, 1320-61-2, 35054-79-6; Carbon, ; Hydroxybutyrates, ; poly-beta-hydroxybutyrate, ; Polyesters, ; Polyhydroxybutyrates, ; Polymers,

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