

عنوان مقاله:

Physicochemical characterization of biodegradable polymer polyhydroxybutyrate from halophilic bacterium local strain Halomonas elongata

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خلاصه مقاله:

**BACKGROUND AND OBJECTIVES:** Petroleum-based plastics produce tremendous amounts of plastic waste every year, which contributes to environmental problems. Biological polymers, such as polyhydroxybutyrate, have caught attention as an ecofriendly substitute to petroleum-based plastics. The present study focused on the production, enhancement, and characterization of polyhydroxybutyrate from the prospective local bacterium Halomonas elongata. This research aimed to develop an environmentally sustainable material for reducing the accumulation of plastic waste in the ecosystem. **METHODS:** A local bacterial strain from Mud Crater Bledug Kuwu, Grobogan, Central Java, Indonesia, was isolated and identified as Halomonas elongata. Nile red staining method confirmed that this bacterium accumulated polyhydroxybutyrate. The effect of incubation time, sodium chloride concentration, nitrogen, and carbon sources were evaluated via gas chromatography to enhance its productivity. The functional groups of isolated polyhydroxybutyrate were analyzed using nuclear magnetic resonance and Fourier transform infrared spectroscopy. Morphology and composition were demonstrated by scanning electron microscopy and energy-dispersive x-ray spectroscopy. Thermogravimetric analysis, differential thermogravimetry, and differential thermal analysis were used to analyze thermal stability. **FINDINGS:** Halomonas elongata produced polyhydroxybutyrate utilizing glucose as a carbon source, as evidenced by orange-fluorescence colonies under ultraviolet light. The optimum condition of polyhydroxybutyrate production was achieved when the bacterium was cultivated in a high medium containing  $\delta$  percent sodium chloride,  $\cdot\cdot\cdot$  percent yeast extract, and  $\delta$  percent glucose (as measured by weight per volume) after ۷۲ hours of incubation. The maximum polyhydroxybutyrate production in this medium reached  $۲\cdot۹۳ \pm ۰\cdot۰۳$  gram per liter dry cell weight and  $۷۸ \pm ۱$  percent polyhydroxybutyrate concentration. Structural elucidation studies revealed that the biopolymer produced by this bacterium was high-purity polyhydroxybutyrate, as proven by the presence of functional groups and proton resonance signals in the monomer structure. The isolated polyhydroxybutyrate consisted of ۱۴ percent carbon and ۸۶ percent oxygen. Thermal stability analysis showed that the isolated polyhydroxybutyrate had a maximum decomposition temperature of ۲۷۰ degrees Celsius. Micrographically, the isolated polyhydroxybutyrate appeared as ... a sheet structure with interconnected fibers measuring  $۰\cdot۷-۰\cdot۸$  micrometer in length. This finding also demonstrates that

کلمات کلیدی:

(Bioplastics, Halomonas elongata, Halophilic bacteria, Polyhydroxybutyrate (PHB

