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## PRODUCTION AND CHARACTERIZATION OF POLY-B-HYDROXYBUTYRATE BY *BACILLUS* SP. USING AGRICULTURAL WASTE

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### Abstract

Poly- $\beta$ -hydroxybutyrate (PHB) is a biodegradable polymer with potential to replace petroleum-based plastics. Cost-efficient microbial production using agricultural residues as carbon sources remains a challenge. Eleven bacterial isolates were obtained from diverse ecological niches and screened for PHB accumulation using Sudan Black B and acridine orange staining. Four promising isolates (PHB1, PHB6, PHB7, PHB9) were selected and identified by 16S rRNA sequencing as *Bacillus halotolerans*, *Bacillus mojavensis*, *Bacillus amyloliquefaciens*, and *Bacillus velezensis*, respectively. PHB production was assessed in flask cultures using pretreated paddy straw and wheat straw as substrates. Polymer recovery was confirmed by Fourier Transform Infra-Red Spectroscopy (FTIR) and X-Ray Diffraction (XRD). Among the isolates, *B. velezensis* PHB9 yielded the highest PHB accumulation, reaching 83.26 % of dry cell weight with a biomass concentration of 0.94 g/100 mL. Production differed significantly ( $p < 0.05$ ) among substrates, with alkaline-pretreated paddy straw (2.0%) supporting the highest yield. These results establish *B. velezensis* PHB9 as an efficient PHB producer on low-cost agricultural residues, achieving yields comparable to or exceeding previously reported *Bacillus* strains. The findings support its potential for further scale-up and bioprocess optimization.

**Key words:** acridine orange, *Bacillus sp.*, bioplastic, poly- $\beta$ -hydroxybutyrate, paddy straw, sudan black B

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