Intisari

KARAKTERISASI BAKTERI SELULOLITIK HASIL ISOLASI DARI LIMBAH INDUSTRI KELAPA SAWIT

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Limbah kelapa sawit yang berupa tandan kosong kelapa sawit, serat/fiber, cangkang sawit, pelepah dan batang, merupakan komponen yang banyak mengandung cellulosa. Celulosa yang memiliki struktur kristalin tidak dapat dihidrolisis oleh selulase. Lytic polysaccharide Monooxygenase (LPMO) adalah ensim yang dapat merombak selulosa kristalin melalui mekanisme oksidasi. Beberapa jenis bakteri diketahui memiliki kemampuan dalam menghasilkan LPMO. Tujuan dari penelitian ini adalah untuk mengisolasi dan mengkarakterisasi bakteri seluloitik penghasil LPMO dari limbah kelapa sawit. Metode penelitian yang dilakukan adalah isolasi dan seleksi bakteri selulolitik dari limbah padat kelapa sawit, menguji kemampuan menggunakan MCC, menguji pengaruh penambahan H_2O_2 0; 0.1; 0.2; 0.4 mM terhadap aktivitas perombakan MCC. Identifikasi bakteri terpilih dilakukan melalui pengamatan morfologi dan molekular. Hasil penelitian menunjukan isolat bakteri terpilih, yaitu isolat PG31, memiliki aktivitas degradasi MCC dengan nilai indeks selulolitik 2.183 ± 0.320 dan laju pertumbuhan spesifik (μ) (3.05 ± 0.05) x 10^{-2} jam^{-1}. Penambahan H_2O_2 pada konsentrasi 0.1; 0.2; 0.4 mM mempengaruhi seacara nyata laju pertumbuhan spesifik isolat PG31. Morfologi isolat PG31 berupa sel batang pendek, dengan koloni berwarna merah, berbentuk *circular*, tepi *entire* dan berelevasi *convex*. Identifikasi molekular menunjukan bahwa isolat PG31 tergolong kedalam genus *Serratia.*

Kata kunci : Bakteri selulolitik, Lytic Polysaccharide Monooxygenase (LPMO), Hidrogen peroksida (H_2O_2), *Limbah kelapa sawit, Microcrystalline cellulose (MCC).*

Abstract

CHARACTERIZATION OF CELLULOLYTIC BACTERIA FROM PALM OIL INDUSTRY BY PRODUCT

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By products of palm oil idustry such as empty fruit bunches, palm press fibre, shells have been considered as the major problem from the environmental point of view, becuase of the high cellulose content. Cellulose having the crystaline structure is more resistant against the normal cellulase hydrolysis. Lytic Polysaccharide Monooxygenase (LPMO) is an enzyme that capable to oxidize the cellulose in the form of crystaline structure. LPMO has been known to be present in several bacteria. The objectives of this work were to isolate and characterize the LPMO producing celluolytic bacteria from the palm industry by product. Isolation of LPMO producing cellulolytic bacteria were carried out by enrichment method in the minimal media containing 1% of microcrystalline cellulose (MCC). Selected isolate was identified by phenotypic and molecular method. In this work, the effect of H_2O_2 on the growth of the LPMO producing cellulolytic bacteria was also examined. The results indicated that the PG31 isolate showed celulolytic activity with the cellulolytic index of 2.183 ± 0.320. Specific growth rate (μ) of the PG31 isolate on the minimal medium containing 1% of MCC was determined to be (3.05 ± 0.05) x 10^{-2} h^{-1}. The H_2O_2 addition at the concentration of 0.1; 0.2; 0.4 mM significantly affect the specific growth rate (μ) of the PG31 isolate. The cell and colony morphological characteristics of PG31 isolate are short rod, gram negative, red color of colony with circular form, entire edge, and convex elevated. Molecular identification based on the 16SrRNA gene sequence indicated that PG31 belong to the Serratia group.

Keywords: *Celluloytic bacteria, Lytic Polysccharide Monooxygenase (LPMO), Hydrogen peroxide (H_2O_2), Palm oil by product, Microcrystalline cellulose (MCC).*