POTENSI DAN KARAKTERISASI KANDIDAT BAKTERI PENDEGRADASI LEMAK LIMBAH CAIR INDUSTRI MINYAK KELAPA SAWIT

TESIS

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ABSTRAK

Bakteri pendegradasi lemak dari kolam pengolahan *Palm Oil Mill Effluent* (*POME*) mampu melisis lemak melalui produksi enzim lipase oleh bakteri lipolitik ataupun melalui jalur pemasaman oleh bakteri fermentatif. Penelitian bertujuan menentukan keberadaan bakteri potensial, menganalisis potensi *in vitro* isolat pendegradasi lemak, menentukan karakter isolat pendegradasi lemak, dan menganalisis aktivitas degradasi lemak isolat potensial dalam limbah cair industri minyak sawit. Eksplorasi bakteri potensial pendegradasi lemak limbah cair minyak kelapa sawit dilakukan menggunakan metode *survey* dengan beberapa tahapan, yaitu deteksi keberadaan, pengujian *in vitro* potensi indeks, karakterisasi, serta metode eksperimental untuk uji degradasi lemak dan penentuan aktivitas lipase. Hasil penelitian menunjukkan persentase keberadaan beberapa golongan bakteri dalam limbah cair minyak kelapa sawit, yaitu 50-74% Lipolitik, 31-90% Fermentatif, 76-83% Proteolitik, dan 51-74% Selulolitik. Isolat pendegradasi lemak terpilih memiliki potensi *in vitro* (indeks lipolitik dan fermentatif) kategori tinggi dengan (E3) memiliki indeks lipolitik terbesar, nilai degradasi (48,72%), aktivitas lipase (0,12 U/ml), dan teridentifikasi sebagai *Bacillus cereus* CCM 2010. Sementara (F2) memiliki indeks fermentatif terbesar, nilai degradasi (22,35%), aktivitas lipase (0,01 U/ml), dan teridentifikasi sebagai *Bacillus thuringiensis* ATCC 10792. Berdasarkan hal tersebut isolat terpilih E3 dan F2 berpotensi untuk dimanfaatkan sebagai kandidat agen biologis dalam proses bioremediasi limbah cair industri minyak kelapa sawit.

Kata kunci: bakteri pendegradasi lemak, fermentatif, lipolitik, POME

ABSTRACT

Lipid-degrading bacteria in Palm Oil Mill Effluent (POME) from processing ponds are capable to lysing lipids through the production of lipase enzymes by lipolytic bacteria or through the acidification pathway by fermentative bacteria. This study aims to obtained the existence of potential bacteria, analyze the in vitro potential of isolates degrading lipids, determine the characteristics of isolates degrading lipids, and analyze the activity of lipid degradation of potential isolates in the wastewater of the palm oil industry. Exploration of potential lipid-degrading bacteria in POME was carried out using a survey method with several stages: detection of bacteria's existence, in vitro testing of potential indexes, characterization, and using experimental method to lipid degradation test and determination of lipase activity. The results showed the existence percentage of several bacteria groups in POME, that is 50-74% lipolytic, 31-90% fermentative, 76-83% proteolytic, and 51-74% cellulolytic bacteria. Selected lipid-degrading isolates have high in vitro potential (lipolytic and fermentative indexes), with E3 had the largest lipolytic index, degradation value (48.72%), lipase activity (0.12 U/ml), and identified as *Bacillus cereus* CCM 2010. Meanwhile, F2 had the largest fermentative index, degradation value (22.35%), lipase activity (0.01 U/ml), and identified as *Bacillus thuringiensis* ATCC 10792. Based on this, the selected isolats E3 and F2 had the potential to be used as candidates for biological agents in the process of bioremediation of POME.

Keywords: lipid-degrading bacteria, fermentative, lipolytic, POME