

RINGKASAN

Tandan kosong kelapa sawit (TKKS) merupakan salah satu limbah padat sawit yang terbuang dengan volume terbesar pada saat pengolahan sawit. Setiap pengolahan tandan buah segar (TBS) sebanyak 1 ton dapat dihasilkan TKKS sebesar 25% dari total tandan segar kelapa sawit yang diproduksi. Proses pengomposan tandan kosong secara alami memerlukan waktu yaitu 6-12 bulan disebabkan oleh tingginya kandungan selulosa yang menyusun struktur tanaman. Salah satu upaya untuk mempercepat proses degradasi selulosa yang tinggi pada limbah TKKS dapat dilakukan dengan bantuan mikroorganisme secara enzimatik melalui bakteri selulolitik. Keberadaan bakteri selulolitik dalam limbah TKKS belum dieksplorasi secara luas, sehingga pencirian karakteristik dan potensi degradasinya terhadap limbah berselulosa tinggi perlu diteliti untuk memperoleh isolat dengan potensi tinggi dalam menghasilkan enzim selulase. Penelitian ini bertujuan untuk mengetahui karakteristik dan potensi degradasi isolat bakteri selulolitik asal limbah tandan kosong kelapa sawit.

Penelitian dilakukan di Laboratorium Agroekologi Fakultas Pertanian, Universitas Jenderal Soedirman. Penelitian telah dilaksanakan pada bulan Juni hingga Oktober 2024. Penelitian ini merupakan penelitian deskriptif dan eksperimen. Rancangan pada penelitian ini yaitu Rancangan Acak Lengkap (RAL) non faktorial yang terdiri dari 14 perlakuan dengan 3 kali ulangan, sehingga diperoleh 42 unit percobaan dengan variabel pengamatan selisih susut bobot kering limbah TKKS. Data hasil penelitian dianalisis menggunakan analisis ragam (ANOVA) pada taraf $\alpha = 5\%$. Apabila berpengaruh nyata (F hitung $>$ F Tabel) maka diuji lanjut menggunakan uji *Duncan's Multiple Range Test* (DMRT) pada taraf kesalahan 5%.

Berdasarkan penelitian yang telah dilakukan dapat disimpulkan bahwa Isolat J2, J4, dan L4 didapatkan sebagai isolat bakteri selulolitik potensial dengan kemampuan mendegradasi bahan organik berdasarkan hasil uji aktivitas enzim selulase secara kualitatif dan uji susut bobot kering. Isolat bakteri selulolitik J2, J4 dan L4 ditunjukkan memiliki potensi dalam mendegradasi tandan kosong kelapa sawit kategori Indeks Selulolitik (IS) kuat dengan persentase susut bobot kering masing-masing sebesar 13,05%, 12,50%, dan 12,79% Isolat J2 didapatkan memiliki ciri karakteristik morfologi ukuran koloni titik, bentuk bulat, elevasi rata, tepi utuh, warna bening, bentuk sel basil, dan termasuk bakteri Gram negatif; isolat J4 memiliki ukuran koloni titik, bentuk berbenang, elevasi membukit, tepi berbenang, warna putih, bentuk sel kokus, dan termasuk bakteri Gram negatif; isolat L4 memiliki ukuran koloni kecil, bentuk bulat, elevasi rata, tepi utuh, warna putih kekuningan, bentuk sel kokus, dan termasuk bakteri Gram positif.

SUMMARY

Empty oil palm bunches (EFB) are one of the solid wastes of palm oil that are discarded with the largest volume during palm oil processing. Every processing of 1 ton of fresh fruit bunches (FFB) can produce EFB of 25% of the total fresh oil palm bunches produced. The composting process of empty fruit bunches naturally takes 6-12 months due to the high cellulose content that makes up the structure of the plant. One effort to accelerate the high cellulose degradation process in EFB waste can be done with the help of microorganisms enzymatically through cellulolytic bacteria. The presence of cellulolytic bacteria in EFB waste has not been widely explored, so the characterization of its characteristics and degradation potential for high-cellulose waste needs to be studied to obtain isolates with high potential in producing cellulase enzymes. This study aims to determine the characteristics and degradation potential of cellulolytic bacterial isolates from empty oil palm bunch waste.

The study was conducted at the Agroecology Laboratory, Faculty of Agriculture, Jenderal Soedirman University. The research was conducted from June to October 2024. This research is a descriptive and experimental study. The design of this study was a non-factorial Completely Randomized Design (CRD) consisting of 14 treatments with 3 replications, so that 42 experimental units were obtained with the observation variable of the difference in dry weight loss of OPEFB waste. The research data were analyzed using analysis of variance (ANOVA) at the $\alpha = 5\%$. If there is a significant effect ($F_{count} > F_{table}$), then it is further tested using the Duncan's Multiple Range Test (DMRT) at an error level of 5%.

Based on the research that has been conducted, it can be concluded that Isolates J2, J4, and L4 were obtained as potential cellulolytic bacterial isolates with the ability to degrade organic materials based on the results of qualitative cellulase enzyme activity tests and dry weight loss tests. Cellulolytic bacterial isolates J2, J4 and L4 were shown to have the potential to degrade empty oil palm bunches in the strong Cellulolytic Index (IS) category with dry weight loss percentages of 13.05%, 12.50%, and 12.79%, respectively. Isolate J2 was found to have morphological characteristics of point colony size, round shape, flat elevation, intact edges, clear color, bacillus cell shape, and included Gram-negative bacteria; isolate J4 had a point colony size, threaded shape, hilly elevation, threaded edges, white color, coccus cell shape, and included Gram-negative bacteria; isolate L4 had a small colony size, round shape, flat elevation, intact edges, yellowish white color, coccus cell shape, and included Gram-positive bacteria.