RINGKASAN

DEFI ARTHA SARI. Skrining Enzim Lipase dan Alkana Monooksigenase dari Bakteri Sedimen Mangrove. Dibimbing oleh AGUNG DHAMAR SYAKTI dan IDRIS.

Penelitian ini dilatarbelakangi oleh tingginya potensi pencemaran di lingkungan mangrove, yang dapat ditangani melalui pendekatan bioteknologi menggunakan enzim pada mikroorganisme yang ramah lingkungan dan berkelanjutan. Enzim lipase dan alkana monooksigenase diketahui memiliki peran penting dalam proses biodegradasi senyawa lipid dan hidrokarbon, termasuk sebagai zat pencemar di lingkungan ekosistem tersebut. Penelitian ini bertujuan untuk mengidentifikasi kemampuan bakteri sedimen mangrove dalam menghasilkan kedua enzim tersebut melalui pendekatan biokimia dan molekuler. Penelitian dilakukan selama empat bulan, dari Oktober 2024 hingga Januari 2025, di Laboratorium Bakteriologi dan Mikrobiologi Lingkungan, Pusat Riset Mikrobiologi Terapan, BRIN Cibinong, Jawa Barat. Sebanyak 63 isolat bakteri dari sedimen mangrove kawasan Pengudang dan Dompak digunakan dalam penelitian ini. Uji aktivitas enzim lipase dilakukan menggunakan media rhodamin B dan minyak zaitun, sedangkan uji aktivitas alkana monooksigenase dilakukan dengan indikator DCPIP dan substrat *n*-Heksadekana serta LDPE. Deteksi gen *lipA* dan *alkB* dilakukan menggunakan metode PCR dengan primer spesifik. Hasil penelitian menunjukkan bahwa sebanyak 48 dari 63 isolat (76,2%) menunjukkan aktivitas lipase, dan sebanyak 59 isolat (93,65%) menunjukkan aktivitas alkana monooksigenase. Namun, dari 22 isolat yang dianalisis secara molekuler, tidak satu pun menunjukkan keberadaan gen *lipA*, dan hanya 5 isolat (22,7%) yang menunjukkan keberadaan gen *alkB*. Hal ini menunjukkan bahwa aktivitas enzimatik tidak selalu berkorelasi langsung dengan keberadaan gen tersebut, dan memungkinkan adanya gen lain yang turut berperan. Kesimpulannya, sebagian besar isolat bakteri dari sedimen mangrove memiliki kemampuan menghasilkan enzim lipase dan alkana monooksigenase, meskipun tidak semua dikarenakan gen *lipA* dan *alkB*. Penelitian ini menunjukkan potensi mikroba mangrove sebagai agen biodegradasi ramah lingkungan, serta pentingnya pendekatan kombinasi molekuler dan biokimia dalam eksplorasi mikroba penghasil enzim.

Kata kunci: Alkana Monooksigenase, Bakteri, Bioremediasi, Enzim, Lipase, Sedimen Mangrove

SUMMARY

DEFI ARTHA SARI. Lipase and Alkana Monooksigenase Enzyme Screening of Mangrove Sediment Bacteria. Supervised by AGUNG DHAMAR SYAKTI and IDRIS.

This research is motivated by the high potential for pollution in the mangrove environment, which can be addressed through a biotechnological approach using enzymes in microorganisms that are environmentally friendly and sustainable. Lipase and alkane monooxygenase enzymes are known to have an important role in the biodegradation process of lipid and hydrocarbon compounds, including as pollutants in the ecosystem environment. This study aims to identify the ability of mangrove sediment bacteria to produce these two enzymes through biochemical and molecular approaches. The research was conducted for four months, from October 2024 to January 2025, at the Laboratory of Bacteriology and Environmental Microbiology, Center for Applied Microbiology Research, BRIN Cibinong, West Java. A total of 63 bacterial isolates from mangrove sediments of Pengudang and Dompak areas were used in this study. Lipase enzyme activity test was conducted using rhodamine B and olive oil media, while alkane monooxygenase activity test was conducted with DCPIP indicator and *n*-Hexadecane and LDPE substrates. Detection of *lipA* and *alkB* genes was performed using PCR method with specific primers. The results showed that 48 out of 63 isolates (76.2%) showed lipase activity, and 59 isolates (93.65%) showed alkane monooxygenase activity. However, of the 22 isolates analyzed molecularly, none showed the presence of the *lipA* gene, and only 5 isolates (22.7%) showed the presence of the *alkB* gene. This suggests that enzymatic activity does not always correlate directly with the presence of these genes, and it is possible that other genes play a role. In conclusion, most bacterial isolates from mangrove sediments have the ability to produce lipase and alkane monooxygenase enzymes, although not all due to *lipA* and *alkB* genes. This study demonstrates the potential of mangrove microbes as environmentally friendly biodegradation agents, and the importance of a combined molecular and biochemical approach in the exploration of enzyme-producing microbes.

Keywords: Alkane Monooksigenase, Bacteria, Bioremediation, Enzymes, Lipase, Sediment Mangrove