

ABSTRAK**FORMULASI KONSORSIUM MIKROBA PENGURAI LIMBAH
DALAM UPAYA PENGOLAHAN LIMBAH CAIR DOMESTIK**

oleh

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Tujuan penelitian adalah a) mengisolasi dan mengidentifikasi isolat bakteri heterotrofik dari limbah cair domestik Kota Malang yang memiliki potensi toleransi deterjen, *Linear Alkylbenzene Sulphonate (LAS)*, antagonistik patogen, amilolitik, proteolitik, dan lipolitik, b) mendapatkan 4 spesies bakteri yang memiliki potensi unggul dengan parameter amilolitik, proteolitik, lipolitik, dan antibiotik dengan hubungan sinergisme, c) membuat formula konsorsium bakteri heterotrofik paling efektif dalam toleransi deterjen, *LAS*, antagonistik patogen, dan pendegradasi senyawa organik, dan d) menguji formula konsorsium bakteri heterotrofik paling efektif mendegradasi amilum, protein, dan lemak, menurunkan *COD*, *TSS*, residu deterjen, dan *BOD* pada limbah cair domestik alami.

Metode penelitian yang digunakan adalah eksploratif, deskriptif, dan eksperimental. Tahap pertama meliputi isolasi, karakterisasi, uji potensi, identifikasi, dan uji hubungan antarspesies dilakukan secara eksploratif dan eksperimental dengan pendekatan survai, metode observasi, dan metode laboratorik. Tahap kedua adalah penelitian eksperimental dengan indikator kemampuan konsorsium bakteri heterotrofik toleransi deterjen, *LAS*, antagonistik patogen, dan degradasi amilum, protein, dan lemak. Tahap ketiga merupakan penelitian eksploratif dan eksperimental pada limbah cair domestik alami dengan indikator reduksi amilum, protein, lemak, *BOD₅*, *COD*, *TSS*, residu deterjen, pH, dan *cfu*.

Hasil penelitian adalah sebagai berikut a) Ada 37 isolat bakteri heterotrofik dari limbah cair domestik asal Kota Malang dan 15 isolat toleran terhadap deterjen. b) Semua isolat bakteri heterotrofik toleran terhadap *LAS* konsentrasi 0,06%-100%. c) Isolat dengan potensi antagonistik (antibiotik) terhadap *Salmonella typhi* paling baik adalah isolat A3, A15, A13, C13, C15, dan A4; *Shigella dysenteriae* (A13, A4, C20, C15, A15, dan A16); *Vibrio cholerae* (A15, A13, C15, A16, A4, dan A14), dan *Escherichia coli* (C20, C15, A15, C17, A13, dan A4). d) Isolat bakteri heterotrofik dengan potensi amilolitik paling besar yakni isolat A15, C15, A4, A13, C9, dan C10; proteolitik (C15, A13, A4, A15, A3, dan C18), dan lipolitik (A13, A15, C15, A4, C10, dan C18). e) *Bacillus cereus* A13, *Bacillus pumilus* A15, *Bacillus subtilis* C15, dan *Bacillus megaterium* A4 adalah spesies bakteri potensi paling unggul dengan indikator toleran deterjen, *LAS*, amilolitik, proteolitik lipolitik, dan antagonistik dan tidak bersifat antagonis satu dengan lainnya. f) Formula konsorsium ABC adalah formula konsorsium spesies bakteri heterotrofik paling efektif dengan indikator toleran deterjen, *LAS*, amilolitik, proteolitik, lipolitik, dan antibiotik. g) Formula konsorsium bakteri heterotrofik yang paling efektif mendegradasi limbah cair domestik secara alami adalah formula konsorsium ABCD dan konsorsium ABC.

Kata kunci: formulasi, konsorsium mikroba, pengolahan limbah cair domestik

ABSTRACT**THE FORMULATION OF WASTE DECOMPOSER MICROBE CONSORTIUM IN EFFORT TO TREAT DOMESTIC WASTEWATER**

by

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The objectives of this research were a) to isolate and to identify the isolate of heterotrophic bacteria from domestic wastewater in Malang which was potential for tolerance against detergent, *Linear Alkylbenzene Sulphonate (LAS)*, antagonistic pathogen, amilolitic, proteolitic, and lipolitic, b) to discover 4 species of bacteria that have prominent potential with amilolitic, proteolitic, lipolitic, and antibiotic parameters in a synergism relations, c) to create the most effective formula of heterotrophic bacteria consortium for tolerance against detergent, *LAS*, antagonistic pathogen, and organic compounds degradation, and d) to examine the most effective formula of heterotrophic bacteria consortium for degrading amylum, protein, and fat, reducing *COD*, *TSS*, detergent residue, and *BOD* in natural domestic wastewater.

The research employed explorative, descriptive, and experimental methods. The first stage included isolation, characterization, potential test, identification, and the test of inter-species relationship was conducted in explorative and experimental ways with surveys, observation, and laboratory methods. The second stage incorporated experimental research by employing the ability indicator of heterotrophic bacteria consortium with tolerance against detergent, *LAS*, antagonistic pathogen, and the degradation of amylum, protein, and fat. The third stage covered explorative and experimental research on natural domestic wastewater with the reduction indicator of amylum, protein, fat, *BOD*, *COD*, *TSS*, detergent residue, pH, and *cfu*.

The findings of this research were a) 37 isolates of heterotrophic bacteria from domestic wastewater in Malang and 15 of which were tolerant to detergent; b) all isolates of heterotrophic bacteria were tolerant to *Linear Alkylbenzene Sulphonate (LAS)* with the concentration of 0.06%-100%; c) the best isolates with antagonistic (antibiotic) towards *Salmonella typhi* were isolate A3, A15, A13, C13, C15, and A4; *Shigella dysenteriae* (A13, A4, C20, C15, A15, and A16); *Vibrio cholerae* (A15, A13, C15, A16, A4, and A14), and *Escherichia coli* (C20, C15, A15, C17, A13, and A4); d) the isolates of heterotrophic bacteria with the biggest amilolitic potential were isolate A15, C15, A4, A13, C9, and C10; proteolitic (C15, A13, A4, A15, A3, and C18), and lipolitic (A13, A15, C15, A4, C10, and C18); e) *Bacillus cereus* A13, *Bacillus pumilus* A15, *Bacillus subtilis* C15, and *Bacillus megaterium* A4 were the most potential bacterium species with tolerant indicator against detergent, *LAS*, amilolitic, proteolitic, lipolitic, and antagonistic, but not antagonistic one another; f) ABC consortium formula was the most effective consortium formula of heterotrophic bacteria with tolerant indicator against detergent, *LAS*, amilolitic, proteolitic, lipolitic, and antibiotic; g) the most effective consortium formula of heterotrophic bacteria to degrade domestic wastewater were consortium ABCD and consortium ABC.

Key words: formulation, microbe consortium, the treatment of domestic wastewater