

**UJI KEMAMPUAN FORMULA KONSORSIUM BAKTERI RHIZOSFER
DALAM BIOREMEDIASI LOGAM KROMIUM SECARA IN VITRO**

SKRIPSI

*diajukan sebagai salah satu syarat untuk memperoleh gelar Sarjana Sains
Program Studi Biologi*



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FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM
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BANDUNG
2024**

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Skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains pada Program Studi Biologi Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

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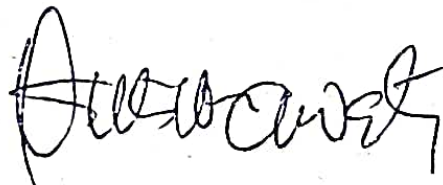
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LEMBAR PERNYATAAN

Dengan ini saya menyatakan bahwa skripsi dengan judul “Uji Kemampuan Formula Konsorsium Bakteri Rhizosfer Dalam Bioremediasi Logam Kromium Secara In Vitro” ini beserta seluruh isinya adalah benar-benar karya saya sendiri. Saya tidak melakukan penjiplakan atau pengutipan dengan cara-cara yang tidak sesuai dengan etika ilmu yang berlaku dalam masyarakat keilmuan. Atas pernyataan ini, saya bersedia menanggung risiko/sanksi apabila di kemudian hari ditemukan adanya pelanggaran etika keilmuan atau ada klaim dari pihak lain terhadap keaslian karya saya ini.

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Yang membuat pernyataan,

Nur Aziema

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Dalam proses penulisan skripsi ini, penulis menyadari bahwa masih terdapat ruang untuk perbaikan. Oleh karena itu, saran dan kritik yang membangun sangat diharapkan agar skripsi ini dapat menjadi referensi yang lebih baik di masa mendatang. Semoga hasil dari skripsi ini dapat memberikan kontribusi positif dalam pengembangan ilmu pengetahuan bagi penulis dan pembaca yang berkepentingan.

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ABSTRAK

Industri penyamakan kulit umumnya menggunakan krom sebagai bahan penyamak kulit, namun sebagian krom yang digunakan akan menjadi limbah yang dapat mencemari lingkungan. Salah satu metode yang dapat dilakukan untuk mengatasi pencemaran lingkungan ini adalah metode bioremediasi. Dalam bioremediasi, penggunaan konsorsium bakteri lebih efektif dibandingkan dengan isolat tunggal. Tujuan dari penelitian adalah untuk mengetahui kemampuan formula konsorsium bakteri dari area rhizosfer dalam bioremediasi logam krom. Bakteri diisolasi dari tanah area rhizosfer tumbuhan yang berada di sekitar bak penampungan limbah di wilayah Sukaregang, Kabupaten Garut. Bakteri diseleksi dengan memilih bakteri yang memiliki resistensi tertinggi lalu diidentifikasi secara biokimia. Kemampuan removal logam krom oleh konsorsium ditunjukkan berdasarkan kompatibilitas antar bakteri, laju pertumbuhan konsorsium, dan efisiensi bioremoval. Hasil uji kompatibilitas menunjukkan bahwa bakteri penyusun konsorsium saling bersinergis. Pertumbuhan bakteri dalam konsorsium selama proses bioremoval sama tanpa adanya dominansi ataupun interaksi antagonisme dalam konsorsium tersebut. Konsorsium dengan kombinasi kelima bakteri dengan genus *Pseudomonas*, *Citrobacter*, *Bacillus*, *Azotobacter*, dan *Micrococcus* memiliki efisiensi bioremoval tertinggi. Genus *Pseudomonas* dan *Micrococcus* memiliki peran dominan dalam removal logam krom dalam konsorsium. Resistensi bakteri terhadap logam krom tidak sama dengan kemampuannya dalam removal logam tersebut. Hal tersebut dilihat dari viabilitas sel yang sama namun efisiensi yang berbeda pada konsorsium. Semua bakteri dalam konsorsium berinteraksi sinergis dan mampu bertahan dalam kondisi adanya toksisitas logam krom namun memiliki kemampuan removal yang berbeda.

Kata Kunci: Bioremediasi, Konsorsium, Krom, Penyamakan Kulit, Rhizosfer

ABSTRACT

*The leather tanning industry typically utilises chromium as a tanning agent. However, a proportion of the chrome employed will inevitably become waste material that has the potential to pollute the surrounding environment. One potential solution to this environmental contamination is the utilisation of bioremediation techniques. The use of a bacterial consortium is more effective than that of a single isolate in bioremediation. The objective of this study was to ascertain the capacity of a bacterial consortium formula derived from the rhizosphere to remediate chromium metal. The bacteria were isolated from the soil of the rhizosphere area of plants situated in the vicinity of a waste storage basin in the Sukaregang area of Garut Regency. The bacteria were initially screened based on their resistance levels and then subjected to biochemical identification. The removal ability of chromium metal by the consortium was shown based on the compatibility between bacteria, the growth rate of the consortium, and the bioremoval efficiency. The compatibility test results demonstrated that the bacterial strains comprising the consortium exhibited a synergistic interaction. The growth of bacteria in the consortium during the bioremoval process was observed to be uniform, with no evidence of dominance or antagonistic interactions within the consortium. The consortium containing a combination of five bacterial species belonging to the genera *Pseudomonas*, *Citrobacter*, *Bacillus*, *Azotobacter*, and *Micrococcus* exhibited the highest bioremoval efficiency. The genera *Pseudomonas* and *Micrococcus* played a significant role in the removal of chromium metal within the consortium. It was important to note that bacterial resistance to chromium metal did not necessarily correlate with their ability to remove the metal. This could have been observed in the fact that the same cell viability showed different efficiency within the consortium. The bacteria in the consortium interacted synergistically and demonstrated resistance to chromium metal toxicity, but had different removal abilities.*

Keywords: *Bioremediation, Consortium, Chromium, Leather Tannery, Rhizosphere*

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