# BIOREMEDIASI LOGAM KROMIUM MENGGUNAKAN KONSORSIUM BAKTERI *Bacillus* sp. , *Bacillus licheniformis* DAN *Bacillus anthracis* SECARA IN VITRO

**SKRIPSI**

*Diajukan sebagai salah satu syarat memperoleh gelar sarjana sains*
*Program Studi Biologi*

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**BIOREMEDIASI LOGAM KROMIUM MENGGUNAKAN KOMBINASI FORMULA KONSORSIUM BAKTERI *Bacillus* sp. , *Bacillus licheniformis* DAN *Bacillus anthracis* SECARA IN VITRO**

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


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## LEMBAR PERNYATAAN

Dengan ini saya menyatakan bahwa skripsi berjudul "Bioremediasi Logam Kromium Menggunakan Kombinasi Formula Konsorsium Bakteri *Bacillus* sp. *, Bacillus licheniformis* dan *Bacillus anthracis* 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 siap menanggung resiko apabila dikemudian hari ditemukan adanya pelanggaran etika atau adanya klaim dari pihak lain terhadap keaslian karya saya ini.

Bandung, Juni 2025

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# ABSTRAK

## BIOREMEDIASI LOGAM KROMIUM MENGGUNAKAN KONSORSIUM BAKTERI *Bacillus* sp. , *Bacillus licheniformis* DAN *Bacillus anthracis* SECARA IN VITRO

Penelitian ini ditujukan untuk mendapatkan formulasi konsorsium bakteri yang memadai untuk penanggulangan limbah krom pada lingkungan, dimana bakteri *Bacillus* sp. , *Bacillus licheniformis* dan *Bacillus anthracis* yang diambil dari lingkungan tercemar krom memiliki potensi sebagai agen bioremediasi limbah krom. Penggunaan bioremediasi yang dinilai efektif dan efisien dalam penanggulangan limbah dan telah menjadi solusi untuk membersihkan lingkungan dari pencemaran tanpa harus menggunakan bahan kimia berlebihan. Metode dalam penelitian ini menggunakan metode kuantitatif dengan pendekatan eksperimental. Sampel diisolasi dari tanah kemudian diseleksi menurut resistensinya terhadap kandungan krom, lalu diidentifikasi secara biokimia dan molekuler, setelah itu sampel diuji kandungan krom pada awal pengamatan hingga akhir pengamatan pada jam ke 12. Temuan penelitian ini menunjukkan konsorsium bakteri *Bacillus* sp. dan *Bacillus anthracis* memiliki sinergitas yang paling baik yang ditandai dari terlihatnya pertumbuhan koloni streak. Pada uji reduksi kandungan krom, konsorsium *Bacillus* sp. dan *Bacillus anthracis* memiliki persentase reduksi logam krom yang paling tinggi, mencapai 26% sedangkan persentase dari konsorsium *Bacillus licheniformis* dan *Bacillus anthracis* memiliki persentase 9.4% menjadi yang paling rendah dari seluruh konsorsium yang diuji. Kesimpulan dari penelitian ini adalah konsorsium *Bacillus* sp. dan *Bacillus anthracis* sebagai konsorsium potensial untuk diaplikasikan dalam sistem bioremediasi limbah krom.



**Kata kunci:** Limbah krom, Konsorsium bakteri, Reduksi Krom, Bakteri resisten krom, Bioremediasi limbah krom

# ABSTRACT

## IN-VITRO CHROMIUM BIOREMEDIATION USING COMBINATION FORMULA FOR BACTERIA CONSORTIUM OF *Bacillus* sp. , *Bacillus licheniformis* AND *Bacillus anthracis*

This research aims to obtain an adequate formulation of bacterial consortium for chromium waste management, where the bacteria *Bacillus* sp., *Bacillus licheniformis* and *Bacillus anthracis* obtained from the chromium polluted environment have the potential as bioremediation agent of chromium waste. The use of bioremediation is considered to be effective and efficient in waste management and has become the solution to cleanse the environment from pollution without excessive use of chemical substances. The methods used in this research are quantitative methods with an experimental approach. Sample isolated from soils and then selected based on their resistance toward chromium stress, the sample then identified using biochemical and molecular method, after that the sample chromium content is tested in the beginning of the observation until the end of observation at the 12th hour. This research shows that the bacterial consortium of *Bacillus* sp. and *Bacillus anthracis* have the best synergy that is marked by the growth of streak colonies that are clearly seen. In the chromium reduction test, the *Bacillus* sp. and *Bacillus anthracis* consortia have the highest chromium reduction percentage, reaching 26% meanwhile the percentage of *Bacillus licheniformis* and *Bacillus anthracis* consortia have the reduction percentage of 9.4% marked as the lowest out of all the tested consortia. This research concludes that *Bacillus* sp. and *Bacillus anthracis* consortia as the potential consortia to be applied in chromium waste bioremediation systems.



**Keyword:** Chromium waste, Bacterial consortium, Chromium reduction, Chromium resistant bacteria, Chromium waste bioremediation

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## DAFTAR GAMBAR

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