

RINGKASAN

Timbal merupakan jenis logam berat non-esensial yang bersifat toksik dan menyebabkan kerusakan hati, ginjal, sistem saraf, jaringan lunak, tulang dan otak pada manusia. Untuk menanggulangi dampak tersebut diperlukan cara untuk mengurangi toksisitas timbal salah satunya melalui bioremediasi. Bioremediasi merupakan cara untuk memulihkan lahan tercemar dengan mengurangi toksisitas bahan pencemar menggunakan bakteri. Bakteri dapat bertahan pada lingkungan tercemar cenderung dapat digunakan sebagai bioremediator seperti rhizobakteria. Rhizobakteria merupakan kelompok bakteri yang berada di daerah rizosfer. Rhizobakteria isolat Rb2, Rb8, dan Rb10 diisolasi dari rizosfer *Ipomea* sp. mampu menurunkan kadar Pb. Aplikasi isolat berupa kultur murni kurang optimal sehingga diperlukan media pembawa agar isolat rhizobakteria dapat dikemas dan tahan lama saat diaplikasikan di lapangan. Tujuan penelitian adalah untuk mengetahui media pembawa yang paling baik dalam mempertahankan viabilitas rhizobakteria Rb2, Rb8, dan Rb10 serta mengetahui efektivitas media pembawa yang mengandung isolat Rb2, Rb8, dan Rb10 dalam mereduksi Pb pada limbah cair batik

Penelitian ini dilakukan secara eksperimental menggunakan metode rancangan acak lengkap (RAL). Perlakuan terdiri atas 6 macam, yaitu serbuk gergaji mengandung isolat rhizobakteria Rb2 (Rb2C1), serbuk gergaji mengandung isolat rhizobakteria Rb8 (Rb8C1), serbuk gergaji mengandung isolat rhizobakteria Rb10 (Rb10C1), limbah padat tahu mengandung isolat rhizobakteria mengandung Rb2 (Rb2C2), limbah padat tahu mengandung isolat rhizobakteria mengandung Rb8 (Rb8C2), limbah padat tahu mengandung isolat rhizobakteria Rb10 (Rb10C2). Setiap perlakuan diterapkan pengulangan sebanyak 3 kali. Sehingga diperoleh 18 satuan percobaan. Variabel bebas dari penelitian adalah isolat rhizobakteria dan media pembawa. Variabel terikat dari penelitian adalah kemampuan isolat rhizobakteria dalam media pembawa untuk mendegradasi logam timbal. Parameter utama dalam penelitian adalah viabilitas isolat rhizobakteria dalam media pembawa dan konsentrasi timbal dalam limbah cair batik sebelum dan sesudah diaplikasikan dengan media pembawa bermuatan rhizobakteria, sedangkan parameter pendukungnya adalah pH dan populasi bakteri.

Hasil dari penelitian menunjukkan serbuk gergaji merupakan media paling baik dalam mempertahankan viabilitas *Pseudomonas* sp. Rb2, *Lactobacillus* sp. Rb8 dan isolat Rb10 sampai hari-30 masing-masing sebanyak 8,11 log CFU/mL, 8,32 log CFU/mL, dan 8,34 log CFU/mL. Bakteri *Lactobacillus* sp. Rb8 dalam media limbah padat tahu paling efektif dalam mendegradasi logam Pb pada limbah cair batik dengan persentase penurunan logam Pb sebesar 75,6%.

Kata kunci : *Bioremediasi, Limbah cair batik, Rhizobakteria, Timbal (Pb)*

SUMMARY

Lead is a non-essential heavy metal that is toxic and causes damage to the liver, genital, nervous system, soft tissue, bone, and brain in humans. In order to overcome the aforementioned impacts, it is necessary to identify a method of reducing lead toxicity. One potential solution is bioremediation. Bioremediation is a process by which the toxicity of contaminants in polluted land is reduced through the use of bacteria. Bacteria that are able to survive in polluted environments are often employed as bioremediators, with examples including rhizobacteria. Rhizobacteria is a group of bacteria that reside in the rhizosphere. Rhizobacteria isolates Rb2, Rb8, and Rb10, which were isolated from the rhizosphere of *L. sp.*, have been demonstrated to be capable of reducing Pb levels. The application of these isolates in their pure culture form is suboptimal, necessitating the use of a carrier medium to ensure the viability and durability of the rhizobacteria isolates when applied in the field. The objective of this study was to identify the optimal carrier media for maintaining the viability of rhizobacteria Rb2, Rb8, and Rb10 and to assess the effectiveness of carrier media containing isolates Rb2, Rb8, and Rb10 in reducing Pb in batik liquid waste.

This research was conducted using a Completely Randomized Design (CRD) in an experimental setting. The treatment consisted of six distinct types of sawdust, each containing a different rhizobacterial isolate: Rb2C1, Rb8C1, Rb10C1, Rb2C2, Rb8C2, and Rb10C2. The experimental subjects were tofu solid waste containing rhizobacterial isolates containing Rb2 (Rb2C2), tofu solid waste containing rhizobacterial isolates containing Rb8 (Rb8C2), and tofu solid waste containing rhizobacterial isolates Rb10 (Rb10C2). Each treatment was conducted in three times, resulting in a total of 18 treatments. The independent variables of the study were the rhizobacteria isolates and the carrier media. The dependent variable of the study is the ability of the rhizobacteria isolates in the carrier media to degrade the lead metal. The main parameters of interest in this study were the viability of the rhizobacteria isolates in the carrier media and the concentration of lead in the batik liquid waste prior to and following the application of the carrier media loaded with the rhizobacteria. The supporting parameters included the pH and the bacterial population.

The results demonstrated that sawdust was the optimal medium for maintaining *Pseudomonas sp.* Rb2, *Lactobacillus sp.* Rb8 and isolates Rb10 until day 30 were 8,11 log CFU/mL, 8,32 log CFU/mL, and 8,34 log CFU/mL, respectively. Bacteria *Lactobacillus sp.* Rb8 in solid tofu waste media was most effective in degrading Pb metal in batik liquid waste with a reduction percentage of Pb metal of 75.6%.

Keyword : *Bioremediation, Batik liquid waste, Lead (Pb), Rhizobacteria*