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Mercury-Resistant Bacteria Isolated from Mercury-Contaminated Site near Rice Field

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Abstract

Several traditional gold minings in North Sulawesi, Indonesia, discharge tailings containing mercury to nearby rice fields. Rainwater can carry mercury waste to the rice fields, contaminate the soil, and accumulate the mercury in the rice plants. Given the situation, it is deemed necessary to develop remediation approaches at mercury contaminated sites.

This research was aimed at isolation and identification of mercury-resistant bacteria from traditional mining site in North Sulawesi and analysing their ability to reduce mercury chloride ($HgCl_2$).

The bacterial isolates (AA, BB, and DD) were isolated from soil samples obtained from three mining waste location points by growing them in LB media containing 40 ppm $HgCl_2$. Discrete bacterial colonies were isolated and identified conventionally by morphology, physiology and biochemistry test of H_2S formation, carbohydrate fermentation test, citrate test, lysine test, indole test and catalase test and molecularly using 16S rRNA gene marker. The ability of bacteria to reduce of 40 ppm $HgCl_2$ was evaluated. Analysis of mercury concentration in the medium was carried out using the cooling vapour atomic absorption spectroscopy (CV-AAS)

The results showed that there were 3 bacterial isolates from all three samples can grow in LB broth medium with 40 ppm $HgCl_2$. Biochemical identification showed that all the isolates belong to *Pseudomonas* genera. Using 16S rRNA, isolates AA and DD showed high similarity with *P. plecoglossicida* and BB with *P. aeruginosa*. All isolates reduced almost 100 % of $HgCl_2$ within 24 hours.

All three bacterial isolates AA, BB and DD showed potential to be used for remediation of mercury waste.

Keywords: Mercury waste, mercury-resistant bacteria, remediation

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