

ROLE OF PLANT GROWTH PROMOTING RHIZOBACTERIA ON *Pteris vittata* L AS A POTENTIAL HYPERACCUMULATOR PLANT FOR GOLD PHYTOMINING AGENT

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ABSTRACT

Gold phytomining is the extraction of gold from soil substrates by harvesting specially selected hyperaccumulator plants, so it can be an environmentally friendly alternative mining technology. Ratatotok District, Southeast Minahasa Regency, North Sulawesi Province is an area that was a gold producer and still has high gold content ranging from 0.012 g/t to 2.41 g/t. The results of research in 2022 show that the dominant plant species at the mine site and which has a fairly high ability to bioaccumulate gold metal is *Pteris vittata* L with a Bioaccumulation Factor (BCF) value of 0.126. The ability of *Pteris vittata* L to survive metal stress is possible due to the presence of colonies of rhizosphere bacteria that live in the roots which help plants resist metal stress in the soil by producing secondary metabolite compounds such as Indole Acetic Acid (IAA) or other growth triggers as well as siderophore compounds so that they can chelate metals in the soil and transport them into their cells. Therefore, the aim of this research is to analyze the ability of rhizosphere bacteria isolated from the Ratatotok gold mine area, North Sulawesi to help bioaccumulate gold in *Pteris vittata* L plants as potential phytomining agents in ex-gold mine land.

The research location in the Microbiology and greenhouse laboratory of FMIPA, Yogyakarta State University, while the gold concentration test in bacterial growth media, soil and *Pteris vittata* L biomass is in the Environmental Engineering Laboratory of the Islamic University of Indonesia. The experimental tests carried out included 2 stages, namely: (1) tolerance test of bacterial isolates to gold stress and gold reduction by bacteria at the FMIPA UNY Microbiology Laboratory; and (2) gold uptake test by *Pteris vittata* L in the FMIPA UNY greenhouse. Descriptive analysis was carried out on the role of gold-resistant rhizosphere bacterial isolates on gold reduction in the media and bioaccumulation in *Pteris vittata* L, and quantitative analysis using ANOVA to analyze the differences between the bioaccumulation ability of *Pteris vittata* L with treatment with the addition of gold-resistant rhizosphere bacterial isolates and without treatment. This research shows that there is a role for rhizosphere bacteria (*Pseudomonas aeruginosa* Schröter RTKP1) isolated from the Ratatotok gold mine area, North Sulawesi in helping the bioaccumulation of gold in *Pteris vittata* L so the plants as a potential phytomining agent: (1) increasing plant resistance with the IAA it produces, (2) increasing BCF, especially in the roots by helping the hyperaccumulator plant *Pteris vittata* L to accumulate Au, especially in the roots, (3) increasing TF by increasing the phytoextraction mechanism (the process of absorbing Au by plant roots which is then translocated to the shoot), (4) adding It is possible that compost in tailings as a planting medium for *Pteris vittata* L actually inhibits the effectiveness of the work of the *Pseudomonas aeruginosa* Schröter RTKP1 bacteria in increasing BCF and TF values, due to the formation of organic acids which cause metals to not dissolve easily and bind strongly in the soil.

Kata Kunci: *Bacteria*, *Pteris vittata* L, phytomining, gold