Project update

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The Title of Your Project:

Plant species colonizing areas degraded by gold mining in the department of Chocó, Colombia: identification of candidates for phytoremediation of mercury.

Rufford I.D.
41948-1

Your Details
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Update

Gold mining is a key economic activity in the Chocó region of Colombia. However, it generates serious environmental, economic, and cultural impacts. One of the main concerns is the use of mercury in gold extraction. Mercury is used to form an amalgam with gold, which allows for the recovery of fine particles that would otherwise be lost during the washing process.

Mercury is one of the six most toxic elements on the planet and can affect multiple systems in the human body, including the neurological, cardiovascular, immune, and renal systems. In aquatic environments, it bioaccumulates and biomagnifies through the food chain. While several studies in Chocó have reported the presence of mercury in humans, water, sediments, and fish, very little is known about its presence in plant species.

The main objective of this project was to evaluate mercury concentrations in plant species growing in areas affected by gold mining. Specific goals included, (1) selecting gold mining-impacted areas with different periods of cessation; (2) measuring physicochemical parameters in water, soil, and sediment samples from the selected sites; (3) surveying and identifying plant species growing in these areas and assessing their conservation status; (4) Determining mercury content in selected plant species and (5) assessing the phytoremediation potential of these species for future ecological restoration efforts.

In the municipality of Atrato, three sampling areas were selected based on their time since mining cessation: 1.5, 3, and 5 years. Results showed a clear increase in plant cover over time, with more vegetation observed in areas

with longer recovery periods. A total of 1,852 seedlings were recorded, including *Cedrela odorata*, a species listed as Vulnerable by the IUCN.

Mercury concentrations in environmental matrices exceeded acceptable limits established by organizations such as the WHO, US EPA, and World Bank. Values surpassed 0.5 ppm in water, 20 ppm in soil, and 23 ppm in sediments. Other toxic metals, such as lead, arsenic, and cadmium, were also found in high concentrations in soils and sediments.

Regarding vegetation, some plant species accumulated mercury levels above 10 ppm in roots and 4 ppm in leaves, suggesting their ability to tolerate and concentrate the contaminant in plant tissues. This suggests potential applications in phytoremediation. Species such as *Pityrogramma calomelanos*, *Vismia macrophylla*, *Clidemia hirta*, *Cespedesia spathulata*, and the macrophyte *Eleocharis filiculmis* showed strong potential as mercury phytoremediators and may serve as valuable alternatives in the ecological restoration of mining-impacted landscapes.

📷 Photo 1 – Laboratory work: Analysis of Heavy Metals in Environmental Samples
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Photographer: Heiny Palacios

Caption: laboratory work for the determination of heavy metals in soil and plant samples. The lead researcher is shown performing a vacuum filtration process to remove solid particles from the solution. The resulting filtrate is used for elemental analysis via mass spectrometry to evaluate contamination levels.

Photo 2 – In-situ Water Quality Monitoring

© Lina Marcela Mosquera Chaverra
Research Assistant: Andrés Lloreda
Photographer: Juan David Córdoba Borja

Caption:
Fieldwork for water quality assessment in a mining-impacted area in the Chocó region, Colombia. Using a multiparameter probe, the research team measures key in situ parameters such as pH, conductivity, dissolved oxygen, temperature, and redox potential, which are essential for evaluating the ecological status of aquatic ecosystems.

Photo 3 – Field Sampling of Rhizospheric Soil and Plants

© Abigail Córdoba (field guide)
© Yilmar Córdoba (research assistant)
Photographer: Lina Marcela Mosquera Chaverra

Description:
Fieldwork conducted as part of a phytoremediation research project in mining-impacted areas of the Colombian Pacific. In the image, the research assistant (Yilmar Córdoba) and the field guide (Abigail Córdoba) are collecting a native plant species along with rhizospheric soil. This material will be analyzed to determine mercury content in both the plant tissues and the surrounding soil, aiming to identify native species with potential for mercury uptake and stabilization.