UNIVERSIDAD DE LA FRONTERA

Facultad de Ingeniería y Ciencias

Doctorado en Ciencias de Recursos Naturales

DEVELOPMENT OF SOIL QUALITY INDICES BASED ON BIOLOGICAL INDICATORS TO ASSESS CHEMICAL SOIL DEGRADATION BY METAL(LOID)S IN SOILS NEAR TO A COPPER SMELTER

DOCTORAL THESIS IN FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE DOCTOR OF SCIENCES IN NATURAL RESOURCES

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"DEVELOPMENT OF SOIL QUALITY INDICES BASED ON BIOLOGICAL INDICATORS TO ASSESS CHEMICAL SOIL DEGRADATION BY METAL(LOID)S IN SOILS NEAR TO A COPPER SMELTER"

Esta tesis fue realizada bajo la supervisión del Profesor Guía de Tesis, Dr. Pablo Enrique Cornejo Rivas, perteneciente al Departamento de Ciencias Químicas y Recursos Naturales de la Universidad de La Frontera y ha sido aprobada por los miembros de la comisión examinadora.

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Thesis summary

"The thesis developed soil quality indices to assess chemical degradation caused by metals. It considered soil biological properties as key indicators in contaminated systems. A quantitative literature review was conducted to explore soil quality indices for metal-contaminated soils, incorporating enzymatic activities as indicators. This led to the development of a meta-analysis, determining the most sensitive enzymatic activities to metal contamination and identifying moderators of this effect. In a second phase, a controlled experiment was conducted, applying increasing concentrations of Cu and As to evaluate various enzymatic indicators, along with determining physiological profiles at the community level. This information identified the most suitable indicators for field use, facilitating the development of proposed quality indices. These indices effectively differentiated various pollution levels in the Puchuncaví Valley, providing tools for the scientific community and decision-makers to assess soil quality."