UNIVERSIDAD DE LA FRONTERA

Facultad de Ingeniería y Ciencias

Doctorado en Ciencias de Recursos Naturales

ENHANCED PHYTOREMEDIATION OF COPPER MINE TAILINGS THROUGH RHIZOSPHERE MANAGEMENT USING COMPOST, ARBUSCULAR MYCORRHIZAL FUNGI AND YEASTS

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

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“Enhanced phytoremediation of copper mine tailings through rhizosphere management using compost, arbuscular mycorrhizal fungi and yeasts”

Esta tesis fue realizada bajo la supervisión del director de tesis, Dr. Pablo Cornejo del 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

This study explores a combined approach that uses arbuscular mycorrhizal fungi (AMF), plant growth-promoting yeasts, and compost to remediate copper mine tailings. The results show that the addition of compost doses of 5% and 10% improves plant growth, promotes AMF growth, and decreases copper availability by increasing the pH in the copper mine tailings. Copper-tolerant yeasts, AMF, and the combination of these microorganisms increase biomass up to threefold. AMF has a remarkable effect on copper stabilization in the plant roots, while yeasts showed an effect on the plant's antioxidant activity. Furthermore, the application of both microorganisms reduced the total phenolic compound content, suggesting relief from copper-induced stress. The study highlights the potential of Oenothera picensis plant for phytoremediation and emphasizes the synergistic effects of AMF and yeasts in copper retention and modulation of antioxidant responses. The incorporation of yeasts as a biotechnological tool in phytoremediation holds promise for efficiently remediating copper-contaminated environments. This approach has implications for industries dealing with soil and environmental contamination, benefiting mining and related sectors.