UNIVERSIDAD DE LA FRONTERA

Facultad de Ingeniería y Ciencias

Doctorado en Ciencias de Recursos Naturales

GREEN SYNTHESIS OF COPPER NANOPARTICLES MEDIATED BY MACROCYSTIS PYRIFERA.

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

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“ Green Synthesis of copper nanoparticles mediated by Macrocystis pyrifera”

Esta tesis fue realizada bajo la supervisión de la directora de tesis, Dra. Olga Rubilar del Instituto de Agroindustrias 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 proposed a successful and direct strategy based on a biomolecule-assisted technique for the green synthesis of biologically reduced copper ions into copper nanoparticles (CuO-NPs), utilizing proteins precipitated from an aqueous extract of macroalgae M. pyrifera as both reducing and encapsulating agents. High and low molecular weight (HMW and LMW) fractions were effectively used as reducing and stabilizing agents for CuO-NPs synthesis, showing some correlation between hydrodynamic size and protein size. Reducing capacity was present in fractions with both high and low protein content, without distinction. The highly negative average zeta potential values of the obtained copper nanoparticles suggested high stability, which also correlated with protein size. Therefore, further research is crucial to fully elucidate the role of biomolecules and their impact on the green synthesis of CuO-NPs. These preliminary results on protein fraction- mediated CuO-NPs characterization could indeed expand the range of potential applications. This ecological method should also be extendable to the preparation of different metallic or biocompatible nanomaterials."