19th International Conference on

NANOTECHNOLOGY AND EXPO

November 13-14, 2017 | Atlanta, USA

Optimization of reaction parameters for the green synthesis of copper nanoparticles using *Macrocystis pyrifera* free-biomass extract

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A mongst different organisms studied for the synthesis of Cu-nanoparticles (Cu-NPs), algal biomass is a resource that has been barely examined. We evaluate reaction parameters in the synthesis of Cu-NPs using *Macrocystis pyrifera* free-biomass non boiled (FBNB) extract. FBNB *M. pyrifera* extract was prepared and used to follow extracellular pathways, adjusting them to different pH (8, 10 and 12). Forthwith, CuSO₄ was mixed with the extract in different concentrations (1, 2 and 3 mM). Subsequently, samples were incubated at different temperatures (20, 45 and 70°C). FBNB extract along CuSO₄ solution were the controls. Response surface methodology based on a central composite design was used to evaluate three variables for nanoparticle synthesis: X₁: [CuSO₄]; X₂: pH; and X₃: temperature. Their effects were assessed on Cu-NP average size distribution, polydispersity index and zeta potential. Measured at 25°C by dynamic light scattering using the Zetasizer Nano ZS90 System. Shape, size and EDS were measured by Scanning Transmission Electron Microscope (STEM). Design Expert 7.0.0 was used for data regression and graphic analysis. Optimum values were obtained by solving the regression equation. We demonstrated an extracellular pathway for the green synthesis of Cu-NPs using an aqueous extract of *M. pyrifera*. Optimum observed conditions for size were: 2 mM [CuSO₄], pH 10 and 45°C (Av. Size obtained=102.4 nm). STEM images and EDS confirmed spherical Cu-NPs. Zeta potential evidenced stable Cu-NPs for all experimental conditions. These results will contribute to future studies to describe possible biomolecules acting as reductant/capping agents during the Cu-NPs green synthesis mediated by algae.

Biography

Araya-Castro K has completed her Biotechnology degree from University of La Frontera. She is currently enrolled in the Doctoral Program in Science of Natural Resources in the same institution and have gained broad experience in different research projects through her career. Simultaneously, she keeps an active and remarkable participation in social projects within the university. Durán-Vinet B is pursuing his second year of the Biotechnology program degree at the University of La Frontera and have already worked in several research projects through his career. Currently, he is also studying at the University of Regina for one semester thanks to the ELAP scholarship provided with the support of the Government of Canada.

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