

Biosynthesis of CuNP Using *Phragmites australis* Rhizomes: Biological Activity and Cytotoxicity Against MCF-7 Cell Line

Frahtia AHLEM^{1,2}, Samir DEROUICHE^{1,2*}, Islam BOULAARES^{1,2}, Janetta NIEMANN³,
Eshak ZOLKAPLI⁴, Nur Fathiah Mohd RADZI⁴, Htet Htet KYAW⁵,
Hussein A. YOUNUS⁵ & Mohammed AL-ABRI⁵

¹ Department of Cellular and Molecular Biology, Faculty of Natural Sciences and Life,
University of El-Oued, El-Oued 39000, Algeria

² Laboratory of Biodiversity and Application of Biotechnology in the Agricultural Field,
Faculty of Natural Sciences and Life, University of El-Oued, El-Oued 39000, Algeria

³ Department of Genetics and Plant Breeding, Poznan University of Life Sciences,
Dojazd 11, 60-632 Poznań, Poland

⁴ Faculty of Pharmacy, Universiti Teknologi Mara, 42300 Bandar Puncak Alam,
Selangor, Malaysia

⁵ Nanotechnology Research Center, Sultan Qaboos University,
Al-Khoud, P.O. Box 33, 123 Muscat, Oman

SUMMARY. The aim of this study was the use of rhizomes aqueous extract of *Phragmites australis* to mediate copper nanoparticles synthesis and evaluate their biological and pharmacological activities. The characterization of the CuNPs was done using different techniques. The antioxidant and anti-inflammatory activities were assessed using two methods for each. Anti-cancer potential was evaluated by the means of MTT assay. UV-Vis spectra showed a peak at 300 nm. The crystalline structure of the phyto-synthesised CuNPs was confirmed by XRD and the grain size was estimated to be 19.76 nm. Further, the obtained nanoparticles exhibit a remarkable antioxidant activity, with IC₅₀ values of 2.33 ± 0.22 µg/mL and 131.30 ± 0.67 µg/mL for DPPH and FRAP tests respectively. Values of IC₅₀ for the anti-inflammatory activity in both tests were conspicuous and revealed a substantial capability of green CuNPs. The cytotoxicity of *Phragmites australis* mediated synthesized CuNPs against MCF-7 cell lines disclosed a dose dependent efficacy. Green synthesized CuNPs showed a promising antioxidant and anti-inflammatory activities and a prominent anti-cancer power at very small doses.

RESUMEN. El objetivo de este estudio fue el uso de extracto acuoso de rizomas de *Phragmites australis* para mediar la síntesis de nanopartículas de cobre y evaluar sus actividades biológicas y farmacológicas. La caracterización de las CuNPs se realizó utilizando diferentes técnicas. Las actividades antioxidantes y antiinflamatorias se evaluaron utilizando dos métodos para cada una. El potencial anticancerígeno se evaluó mediante el ensayo MTT. Los espectros UV-Vis mostraron un pico a 300 nm. La estructura cristalina de las CuNPs fitosintetizadas se confirmó por XRD y el tamaño de grano se estimó en 19,76 nm. Además, las nanopartículas obtenidas exhiben una notable actividad antioxidante, con valores de IC₅₀ de $2,33 \pm 0,22$ µg/mL y $131,30 \pm 0,67$ µg/mL para las pruebas DPPH y FRAP respectivamente. Los valores de IC₅₀ para la actividad antiinflamatoria en ambas pruebas fueron notables y revelaron una capacidad sustancial de las CuNP verdes. La citotoxicidad de las CuNP sintetizadas mediadas por *Phragmites australis* contra las líneas celulares MCF-7 reveló una eficacia dependiente de la dosis. Las CuNP verdes sintetizadas mostraron actividades antioxidantes y antiinflamatorias prometedoras y un destacado poder anticancerígeno en dosis muy pequeñas.

KEY WORDS: anti-inflammatory, antioxidant, characterization, CuNPs, cytotoxic activity. *Phragmites australis*,

* Author to whom correspondence should be addressed. E-mail: *dersamebio@gmail.com