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ANTIMICROBIAL AND ANTIVIRULENCE ACTIVITY OF MAGNESIUM OXIDE NANOPARTICLES SYNTHESIZED USING *KLEBSIELLA PNEUMONIA* CULTURE FILTRATE

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ABSTRACT : The current study is the first in which the magnesium oxide nanoparticles were synthesized by mixing *K. pneumonia* culture filtrate with the magnesium nitrate solution, the color of the mixture changed from pale yellow to white, indicating the formation of MgONPs. The MgONPs were characterized using UV-Vis, FTIR, XRD, FESEM and AMF analysis. The results of UV-Vis spectroscopy showed that the absorption peak was at the value of 250 nm proved the existence of MgONPs. The FTIR spectra show bands at 3369, 2930, 1629, 1367and 434 cm^{-1}.The peak observed at 434cm^{-1} represents the formation of MgONPs. The XRD peaks were observed at values (111), (200), (220), (311) and (222). These results confirm that the material tested are MgONPs and are of high purity. The FESEM image of MgONPs, which exhibit flakes-like structure due to the aggregation of several thousand MgONPs. The size of MgONPs was observed from tip-corrected AFM measurements and the shape of MgONPs were determined. The results of antibacterial activity shows MgONPs at 100, 200 and 400µg/ml were active against gram negative and gram positive. The results showed MgONPs have antibiofilm activity against four types of bacteria tow belong to Gram negative bacteria and tow bacteria belong to Gram positive bacteria at 0.2 and 0.4 mg/ml concentrations. We concluded the biosynthesis of MgONPs using *Klebsiella pneumonia* culture filtrate, which have antimicrobial, antivirulence and it can be used as therapeutic agent.

Key words : Antimicrobial activity, antivirulence activity, *Klebsiella pneumonia*, MgONPs.

INTRODUCTION

Nanosciences and nanotechnology has been leading to a technological revolution in the world, which is concerned with materials with significantly novel and improved physical, chemical and biological properties (Wani *et al*, 2012; Sundrarajan *et al*, 2012). In this regard, nanoparticles are recognized as antibacterial agents due to their size, structure and surface properties (Raghupathi *et al*, 2011). Thus, nanotechnology offers a way to improve the activity of inorganic antibacterial agents. Metal oxide nanoparticles such as ZnO, MgO and CaO have been investigated as inorganic antibacterial agents (Tang *et al*, 2014; Krishnamoorthy *et al*, 2012; Maaroof *et al*, 2017; Pugazhendhi *et al*, 2019). MgO is an important inorganic material with a wide band-gap (Badar *et al*, 2012). It has been used in many applications such as catalysis, catalyst supports, toxic waste remediation, refractory materials and adsorbents, additive in heavy fuel oils, reflecting and anti-reflecting coatings, superconducting and ferroelectric thin films as the substrate, superconductors and lithium ion batteries (Al-Gaashani *et al*, 2012; Ouraipryvan *et al*, 2009). MgONPs are highly ionic nanoparticulate metal oxides with extremely high surface areas and unusual crystal morphologies (Mirzaei *et al*, 2012). In medicine, MgO is used for the relief of heartburn, sore stomach and for bone regeneration (Salem *et al*, 2015; Bertinetti *et al*, 2009). MgONPs also have considerable potential as an antibacterial agent.

Many methods, including sol-gel method, hydrothermal method, vapor phase method, mechanochemical method, microemulsion method etc., have been used for the preparation of MgONPs. Recently, researchers have tried to find biological methods for the synthesis of nanoparticles that will be the alternative to chemical or physical methods. Biological methods for the production of NPs are considered safe and environmentally friendly; they are also cost effective and ensure the complete elimination of toxic chemicals (Selvam *et al*, 2011). In addition, the synthesis of NPs using biological means, especially plants is biocompatible, as they secrete functional biomolecules which actively reduce metal ions Ogunyemia *et al*, 2019).