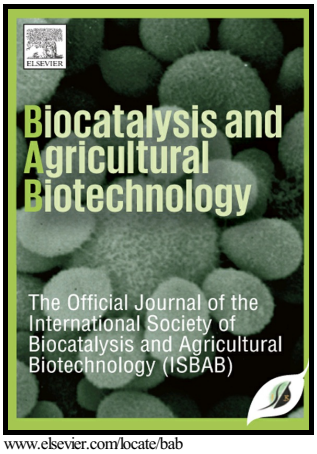
Biosynthesis of biocompatible and recyclable silver/iron and gold/iron core-shell nanoparticles for water purification technology

Pawan Kaur, Rajesh Thakur, Himanshu Malwal, Anju Manuja, Ashok Chaudhury



www.elsevier.com/locate/bab

PII: S1878-8181(17)30617-5
DOI: https://doi.org/10.1016/j.bcab.2018.03.002
Reference: BCAB714

To appear in: *Biocatalysis and Agricultural Biotechnology*

Received date: 1 December 2017
Revised date: 20 January 2018
Accepted date: 4 March 2018

Cite this article as: Pawan Kaur, Rajesh Thakur, Himanshu Malwal, Anju Manuja and Ashok Chaudhury, Biosynthesis of biocompatible and recyclable silver/iron and gold/iron core-shell nanoparticles for water purification technology, *Biocatalysis and Agricultural Biotechnology,* https://doi.org/10.1016/j.bcab.2018.03.002

Biosynthesis of biocompatible and recyclable silver/iron and gold/iron core-shell nanoparticles for water purification technology

Pawan Kaur[a], Rajesh Thakur[b*], Himanshu Malwal[b], Anju Manuja[c] and Ashok Chaudhury[b]

[a]*Department of Biotechnology, Chaudhary Devi Lal University, Sirsa -125055, India*

[b]*Department of Bio and Nano Technology, Guru Jambheshwar University of Science and Technology, Hisar -125001, India*

[c]*ICAR-National Research Centre on Equines, Sirsa road, Hisar-125001, India*

*Corresponding author: rthakur99@rediffmail.com

Abstract

The purpose of this study was to synthesize recyclable iron-silver core-shell nanoparticles (FeO/AgNPs) and iron-gold core-shell nanoparticles (FeO/AuNPs) and iron nanoparticles (FeONPs) using peel extract of pomegranate fruit (PEP). UV-visible spectroscopy confirmed the formation of FeO/AgNPs and FeO/AuNPs as absorbance peak was found at 465 nm and 530 nm, respectively. Electron microscopy analysis of FeO/AgNPs indicated that iron core of 13 nm was surrounded by 14 nm shell of silver nanoparticles while size of FeO/AuNPs was less than 100 nm. Antibacterial and antifungal activity of core-shell nanoparticles (CSNPs) were determined by zone of inhibition method and mycelium inhibition method *in vitro*, respectively. As a result, biologically synthesized nanoparticles showed high antimicrobial activity against all tested microorganisms. Degradation of aniline blue (AB) dye by the above nanoparticles was also monitored. CSNPs showed maximum dye degradation at 70 °C and pH 10. Biocompatibility study of CSNPs was also carried out on Vero cell lines and the results showed that these core-shell nanoparticles were biocompatible up to 500 μgml^{-1} concentration. These antimicrobial, biocompatible and recyclable nanoparticles will be suitable for application in water purification techniques.

Keywords: Antimicrobial activity. Biosynthesis. Dye degradation. Recyclable core-shell nanoparticles. Pathogens.

1. Introduction

Approximately a billion people have no facility of clean water and about 80% infections in developing world are caused by water. In India, 10% population lacks pure water access, and