Short Communication

Phytogenic synthesis of silver nanobactericides for anti-biofilm activity against human pathogen *H. pylori*

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Abstract

The present study reports the phytogenic synthesis of silver nanobactericides using *Acorus calamus* L. and their anti-biofilm activity against clinically isolated *H. pylori*. The synthesis was confirmed with change in the color of the reaction mixture to brown. The increased in the color intensity was periodically monitored with UV–visible spectroscopy which displayed maximum absorption at 410 nm. The biomolecular interaction was studied with FTIR spectral measurements of silver nanobactericides which revealed the presence of broad absorbance band appearing at 3361 is due to OH group and the prominent peak at 1634 correspond to an amide group. X-ray diffraction (XRD) displayed Bragg's intensities at 2θ angle reflecting (111), (200), (220) and (311) of the face centered cubic (fcc) structure of silver which was compared with standard XRD pattern. The morphological characteristics of nanobactericides were studied using Transmission electron microscopy (TEM) analysis which revealed the polydispersity of nanoparticles with size ranging from 5 to 60 nm. The anti-biofilm activity of silver nanobactericides against *H. pylori* was measured using crystal violet and ruthenium red assays which revealed 350 µg/mL to be more effective. The obtained activity was validated with standard antibiotics amoxicillin. Overall, the results obtained in the present investigation are promising enough to reveal the efficacy of silver nanoparticles to inhibit the biofilm production.

Keywords *Acorus calamus* L. · Anti-biofilm · *H. pylori* · Crystal violet assay · Ruthenium red assay

1 Introduction

The emergence and growing rate of drug resistance has resulted in scarcity of potent antibiotics thus affecting all forms of lives [1, 2]. The drug resistant pathogens have high virulence rate which elevate the mortality and morbidity rates [3]. One of the favorable habitats for drug resistant pathogens to explore is human body and hospitals which are often unrecognized [4]. In most of the cases, the normal flora is being treatment without diagnosing the real causative agents. Apart from ESKAPE pathogens which are recognized as the source of drug resistant pathogens, there are untraced pathogenic microbes which are often more dangerous [5, 6]. One such pathogen includes *H. pylori* which is regarded as one of the most common causes of microbial infections among different communities. According to World health Organization (WHO), *H. pylori* is ranked as Class I pathogen responsible for various gastric cancers which has been documented with different epidemiological studies which highlights the

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