CHAPTER 17

Current Perspectives on Mycosynthesis of Nanoparticles and Their Biomedical application

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1. INTRODUCTION

Nanotechnology holds a promising platform to enhance and develop the properties of metals in the shape of nanoparticles (NPs) for their various applications in biotechnology, molecular biology, medicine, biomedical nanotechnology, food industries, material engineering, and many others [1]. Nanotechnology is an interdisciplinary science facilitating technology that deals with nanometer-sized particles, hence maximizing the application by minimizing the size of particles. There is a tremendous potential in this emerging field, including the synthesis of nanoscale materials and utilization of their peculiar physiochemical properties [2]. In the recent years, there has been an immense growth in the multidisciplinary field of nanotechnology across the world, and the rise of its potential applications is a big revolution in the industry in general and medicine in particular. In previous years, NPs have been synthesized by various physical and chemical processes by industries and have many benefits for commercial applications, although some chemical process needs to use the toxic chemicals for the synthesis [3]. Therefore there is a demand to develop biological methods for NPs synthesis using either microorganisms or plant extracts, which is a reliable and eco-friendly approach when compared with other methods [4]. Microorganisms (bacteria, fungi, and algae) are the ideal biological system for the production of a number of NPs attracting researchers and industries. Microbes have the ability of synthesizing NPs by extracellular and intracellular process, using different modes of mechanism [5]. Reportedly, microorganisms have the ability to reduce the toxicity of the reaction during the particle synthesis with the help of degrading enzymes present in the microbial cells [6]. In addition, the microbial synthesized nanomaterials are more definite in size that can be attributed to the optimization of growth conditions, such as temperature and pH, hence, saving the overall investment in NPs synthesis. Using microorganisms for the synthesis of NPs not only reduces the overall cost, but also is an eco-friendly way as it surpasses the use of toxic reducing agents that are expensive and detrimental for the environment [7]. This chapter is organized in to four sections. Section 1 is an introductory section that provides information about the eco-friendly role of fungi for the synthesis of NPs. Section 2 briefly represents the utilization of fungi, as an efficient system for the biosynthesis of various NPs, the probable mechanism of myconanoparticle synthesis and their role in the treatment of infectious diseases. Section 3 describes in detail about the mycosynthesis of various NPs by exploring different fungi species and their broad biomedical applications. Section 4 represents the conclusions and the future direction of mycosynthesis-based NPs.

2. MICROBIAL GREEN SYNTHESIS: A NOVEL AND ECO-FRIENDLY APPROACH

2.1. Fungi, An Efficient System for the Biosynthesis of NPs

Several metal NPs, such as silver, gold, iron, silica, selenium, tellurium, platinum, lead, titanium, zirconium, magnetite, and palladium, can be synthesized by

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