FILAMENTOUS FUNGI OF THE GENUS *TALAROMYCES* IN THE BIOSYNTHESIS OF SILVER NANOPARTICLES

Davi, N. M.[1]; Silva, E.M. [1]; Barreto, C.C. [1;] Duarte, G.C.[1]; Chaves, C.R. [1]; Teixeira, T.A[1]
1 [1]Institute of Biotechnology, Federal University of Uberlândia, Patos de Minas, Brazil
Email: nathalia.davi@ufu.br

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Nanostructures have represented a significant advancement across various scientific fields in recent years. Due to their unique chemical and physical properties, these structures have applications ranging from electronics to biological sciences. Nanoparticles (NPs) are particularly important in biomedical fields due to their role in the development of drug nanocarriers, contrast agents for diagnosis, and therapeutic applications. Additionally, their utility extends to industrial and environmental sectors. With the increasing demand for new nanomaterials in recent years, the search for more efficient and sustainable synthesis methods has also grown. Although physical and chemical synthesis methods are effective, they present considerable disadvantages. In addition to their high cost, these methods generate toxic waste that is challenging to dispose of. In this context, green synthesis, or biosynthesis of NPs, emerges as a promising alternative due to the utilization of natural reducing agents, such as plant extracts, microorganisms, and other biological materials [1]. Fungi have gained prominence in NP biosynthesis owing to their ability to produce a range of enzymes and secondary metabolites that can reduce metal ions, thereby facilitating the formation of nanomaterials [2,3]. In this study, we synthesized metallic nanoparticles (NPs) using a fungus collected from the Mocambo Municipal Park in Patos de Minas, MG. The fungus was isolated on Potato Dextrose Agar (PDA) medium for DNA extraction and sequencing, and it was identified as belonging to the genus Talaromyces. After cultivation on solid medium, samples of the fungus were scraped and transferred to 200 mL of Potato Dextrose medium (Figure 1).

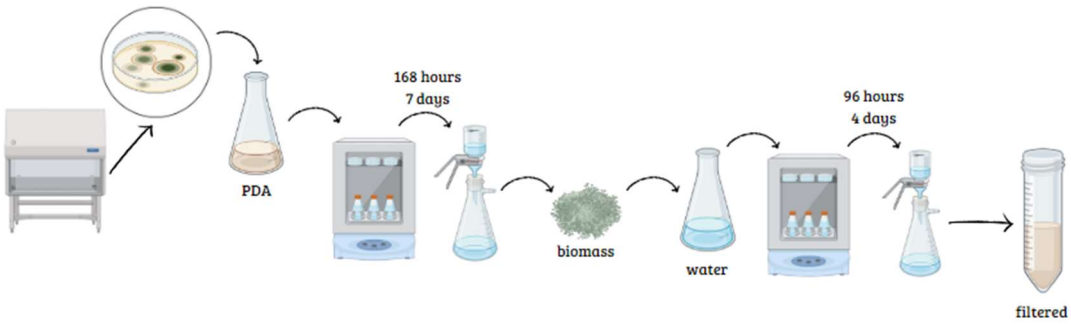


Figure 1: Scheme of production of filtrate from the biomass of Talaromyces.

The samples were maintained under agitation (120 RPM) at 28°C for 7 days. Subsequently, the medium was filtered to separate the biomass. We then added 2 g of the biomass to 150 mL of deionized and autoclaved water. The resulting

mixture was incubated under agitation (120 RPM) at 28°C for 4 days. Finally, 5 mL of $AgNO_3$ (3 mM) were added to 45 mL of the filtrate, and the mixture was kept under agitation (120 RPM) at 28°C for 72 hours (3 days). Alongside the filtrate/$AgNO_3$, a negative control (water/$AgNO_3$) and a positive control (filtrate) were prepared. After the 3-day period, a color change was observed, indicating the formation of nanoparticles (Figure 2a). The cell filtrate, cell filtrate/$AgNO_3$, and water/$AgNO_3$ samples were also characterized by UV-Vis (ultraviolet-visible) spectroscopy (Figure 2b). However, we observed low absorption intensity in the range of 350 nm to 550 nm. Transmission electron microscopy (TEM) images will be obtained to confirm the shape and concentration of the nanostructures.

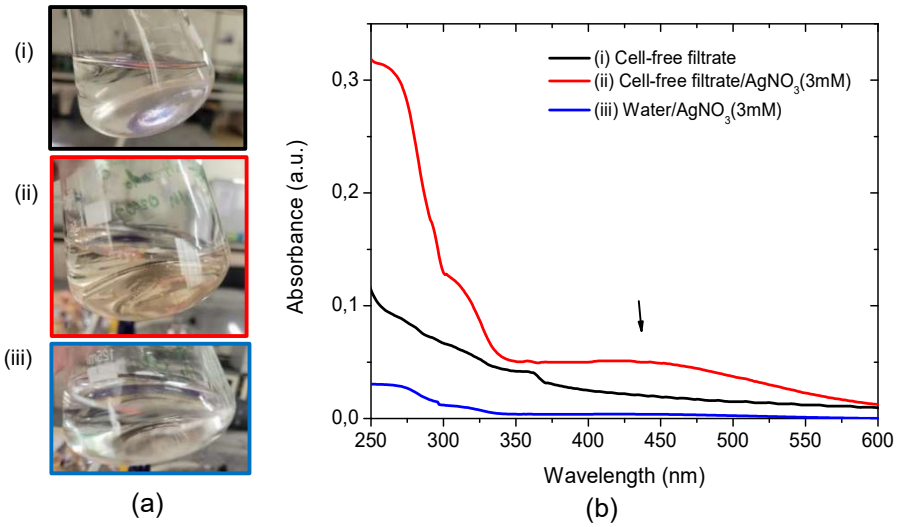


Figure 2: Photograph and UV- Vis spectra of (i) cell-free filtrate (black); (ii) cell-free filtrate/$AgNO_3$ (red); and (iii) water/$AgNO_3$ (blue).

This preliminary study indicates that fungal-mediated biosynthesis is a straightforward, cost-effective method that can be performed under mild conditions, making it a promising approach for the large-scale production of NPs with potential applications in biomedicine, electronics, and environmental science. Further experimental tests will be conducted to confirm the formation of AgNPs.

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