Antifungal Efficacy of SiO_2@Ag/CeO_2 core-shell nanoparticles against *Aspergillus niger*.

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Fungi such as *Aspergillus niger*, produce harmful mycotoxins like ochratoxin A, which can cause serious health risks to humans, including nephrotoxicity and other kidney-related diseases [1]. Unfortunately, like bacteria, fungi have started to be more resistant to the existing antifungal agents, such as azoles, a strong antifungal agent [2]. Developing new antifungal agents has become a priority in the scientific community, with a particular focus on metal-based nanoparticles, including silver (Ag) and silica (SiO_2). Combining SiO_2, which is an excellent carrier material for metal nanoparticles, with Ag and CeO_2, enhances the stability of the nanoparticles and their antimicrobial properties [3]. In the current study, the antifungal efficacy of SiO_2@Ag/CeO_2 core-shell nanoparticles were examined against *A. niger*. A screening method based on agar diffusion binary responses was applied to identify the minimum inhibitory concentration (MIC) of the nanoparticles against *A. niger* which was then validated using optical density (OD at 600 nm) measurements. Core-shell nanoparticles of SiO_2@Ag/CeO_2, demonstrated antifungal activity at concentrations of AgNPs and CeO_2 equal to 0.03 mM and 0.3 mM, respectively. However, comparing SiO_2@Ag/CeO_2 with SiO_2@Ag core-shell nanoparticles, reveals that *A. niger* was inhibited similarly, with a minimal difference in the effective concentration of 0.05 μL/mL. Additionally, the presence of CeO_2 appeared to stabilize the SiO_2@Ag core-shell nanoparticles, as was indicated by the lack of colour change after 6 days of incubation at 25°C, whereas the SiO_2@Ag nanoparticles without CeO_2 and AgNPs became noticeably darker over the same period and temperature. Validation of these observations with OD600, resulted in identifying the MIC of CeO_2, AgNPs, SiO_2@Ag, and SiO_2@Ag/CeO_2 at 0.5 mM, 0.11 mM, 0.07 mM, and 0.1mM, respectively. Overall, it can be concluded that core-shell nanoparticles have good stability properties and are effective antifungal agents.

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