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Synthesis, characterization, and biological activity of silver nanofibers essential oils of *prunus dulcis*

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Background
Prunus dulcis possesses various beneficial qualities, including liver-protective, cardio metabolic, antimicrobial, anti-inflammatory, and anxiety-reducing properties. Furthermore, the oil is a fantastic moisturizing cream for hair and skin, to it can help prevent stretch marks and ultraviolet-visible spectroscopy damage. These biological applications highlight the importance of developing nanotechnology applications for *P. dulcis* almond oils.

Materials and methods
In this study, essential oils derived from the fruit of the almond tree (*P. dulcis*) were employed as reducing agents for producing silver nanofibers (AgNFs). Synthesized AgNFs were characterized using ultraviolet-visible spectroscopy, scanning electron microscopy, and Fourier transform infrared spectroscopy. The biological activities of (AgNFs) were examined.

Results
The current study showed the absorption of synthesized (AgNFs) at 415 nm. Scanning electron microscopy analysis showed the nanofibers average diameter varied from 200 nm to 10 nm. The biological activities of (AgNFs) were evaluated using minimum inhibitor concentration, half-maximal inhibitory concentration (IC_{50}), and flow cytometry tests. The cell cycle test of (AgNFs) showed it arrested with S-phase of two types of human cancer cells (HepG2 liver cancer cells and MDA-MB-231 breast cancer cells).

Conclusion
These antibacterial and anticancer properties of AgNFs highlight the increased medicinal value of essential oils when coupled with AgNFs produced from almond essential oil.

Keywords:
antibacterial, anticancer, essential oils, prunus dulcis, silver nanofibers

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Introduction

Nanotechnology and nanoparticles are prized for their small size and high surface area to volume ratio, which improves chemical, mechanical, magnetic, and optical characteristics [1]. These properties lead to their well-established biomedical applications, including using antioxidant substances, antimicrobial agents, and chemotherapeutic medicines [2,3]. Further investigation into green techniques is critical for increasing the usage of metal nanoparticles in a wide range of applications. Biosynthesis approaches that use microbes, algae, and plants are considered innovative for generating metal nanoparticles [4,5] Metallic nanoparticles, such as gold, silver, zinc, platinum, copper, and iron, have attracted substantial attention because of their numerous biological properties, including anticancer, antibacterial, and medicine delivery abilities, making them valuable for different biomedical applications [6]. Because of their unique properties, including thermal and electric conductivity and antibacterial activity, silver nanoparticles in particular have become commonplace in various industries [7]. Nanoparticles can be produced using a variety of processes, including chemical reduction, electrical reduction, electrospinning, and photochemical reaction reduction. Electrospinning yields nanofibers, whereas reduction yields nanoparticles. The technique utilized to generate nanoparticles is crucial since it impacts their shape, size, stiffness, and chemical and physical properties [8,9]. Nanofibers have outstanding properties such as surfaces with pores, small fiber diameters, and a high surface-to-volume ratio [10]. Several researches have

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