



Department of Botany and Microbiology

**Pharmacological properties of bacterial yellowish-orange
pigments: nanoparticles biological application**

**A thesis submitted in partial fulfilment of the requirements for
the degree of Master of Science**

In

Microbiology

Presented by

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1. summary

1.1. English summary

Bacterial pigments (e.g., melanin and carotenoids) are considered to be among the most important secondary metabolites due to their various pharmacological activities against cancer and microbial resistance.

1. Different pigmented bacterial strains were isolated from soil samples from El Mahmoudiyah governance
2. The antimicrobial activity of the extracted pigment has been screened against different pathogenic bacteria.
3. The most promising pigment producer was identified as *Micrococcus lylae* MW407006; furthermore, the produced pigment was identified as echinenone (β -carotene pigment).
4. The pigment production was optimized through a central composite statistical design to maximize the biomass production, pigment concentration, and the antimicrobial activity. It was revealed that the most significant fermentation parameters were the glucose (as a carbon source) and asparagine (as a nitrogen source) concentrations.
5. Nanoechinenone was synthesized using the ball milling technique, characterized, and finally assessed for potential antimicrobial, antioxidant, and antitumor activities.



6. The data revealed that the synthesized nano-echinenone had higher antimicrobial activity than the crude pigment.
7. The cytotoxic potency of echinenone and nano-echinenone was investigated in different cell lines (normal and cancer cells). The inhibition of cell proliferation and induction of cell death was observed in Caco-2 and Hep-G2 cells. The data proved that nano-echinenone is a suitable candidate for use as a safe antimicrobial and anti-hepatocellular-carcinoma agent.