

Investigating the Antimicrobial Activity of Essential Oil Derived from *Pistacia atlantica* Gum against Extensively Drug-Resistant Gram-Negative *Acinetobacter baumannii*

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Abstract : Bacterial resistance is a pressing global health issue, with multidrug-resistant (MDR), extensively drug-resistant (XDR), and pandrug-resistant (PDR) strains to pose a serious threat. In this context, researchers are investigating effective, safe, and affordable metabolites to combat these pathogens. This study focuses on gum essential oil (GEO) extracted from *Pistacia atlantica* and its activity and the mechanism of action against XDR Gram-negative *Acinetobacter baumannii*. GEO was extracted by hydrodistillation and analyzed using GC-MS. Eleven *A. baumannii* isolates were collected from the ward environment of Burn and Plastic Surgery Hospital in Al Sulaymaniyah City, Iraq. They were identified using the VITEK 2 system, 16S rRNA gene, and confirmed with the *bla_{oxa-51}* gene; *A. baumannii* ATCC 19606 was used as a reference strain. The isolates were identified as resistant to twelve different antibiotics spanning six distinct antibiotic classes while showing susceptibility to tetracycline and trimethoprim. Over 40 chemical constituents were detected in the gum's essential oils, with α -pinene being the most abundant. GEO was found to inhibit the growth of *A. baumannii* isolates; the minimum inhibitory concentration (MIC) of GEO was 2.5 μ l/ml. GEO induced protein leakage, phosphate, and potassium ion efflux, distorted cell morphology, and cell death in the tested bacteria. GEO exhibited bacterial clearance and anti-adhesion activity using Band-Aids. This study's findings suggest that GEO could be used as a potential alternative treatment for infectious diseases caused by XDR pathogens, shedding further light on the importance of GEO in biomedical applications. Future studies must focus on generating clinically feasible sources of GEO for testing in small animal models before proceeding to human trials, ensuring safe and effective translation from the laboratory to the clinic.

Keywords : antibiotic resistance, *Acinetobacter baumannii*, essential oils, *Pistacia atlantica*, α -pinene

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