

The Potential Effects of the Essential Oil of Coriander Seeds on Bacterial Biofilm and Immune Cells

Eliza Hasen

Applied Science Private University, Jordan.

DOI: <https://doi.org/10.35516/jjps.v16i2.1530>

ABSTRACT

Background: Nowadays, the pharmacological activities of many natural phytochemicals have a huge impact on pharmaceutical research and drug development. Hence, numerous studies have been conducted to investigate plants' efficacy, fractions, and isolated pure compounds to discover new therapeutic agents. Aim: This study aimed to evaluate the potential activity of coriander essential oil (CEO) on bacterial biofilm and immune cells. Methods: CEO has been extracted from the seeds through the hydrodistillation method, and its chemical composition was analyzed using gas chromatography (GC) and Nuclear magnetic resonance (NMR). The antibacterial activity of CEO was assessed using different bacterial strains (*P. aeruginosa*, *S. aureus*, *S. epidermidis* and *E. coli*), both in planktonic and biofilm forms. In addition, this activity has been investigated individually and in combination with selected antibiotics (Gentamicin and Ciprofloxacin), using the bacterial enumeration following the MBEC Assay® protocol. Pyocyanin (PYO) has been measured using a plate reader on 690 nm absorbance, where wells tested were treated with different CEO concentrations (12.5, 25, 50 and 100 mg/mL). An MTT assay was also used to examine the CEO's effect on the viability of RAW 246.7 murine macrophages. Data were analyzed using GraphPad Prism 9 software. Results: Six major compounds were identified in CEO; Linalool was the most predominant. Regarding the activity of the CEO on planktonic bacteria, cell count was obtained and calculated as log reductions; significant log reductions ($p < 0.05$) were measured on 300 mg/mL of CEO for all *P. aeruginosa*, *S. aureus*, *S. epidermidis* and *E. coli*, 2.00, 6.73, 6.93 and 7.68 respectively. While for the bacterial biofilm, a significant ($p < 0.05$) log reduction in the cell count was obtained at 300 mg/mL of CEO for all of *P. aeruginosa*, *S. aureus*, *S. epidermidis* and *E. coli*, 2.22, 5.33, 5.83 and 6.76, respectively. Minimum inhibitory concentrations (MIC) of the combination of antibiotics Gentamicin (0.60, 0.15, 1.22, 0.3 µg/mL) or Ciprofloxacin (0.075, 0.03, 0.004 and 0.002 µg/mL) for all *P. aeruginosa*, *S. aureus*, *S. epidermidis* and *E. coli*, respectively, with 50 mg/mL of CEO on planktonic and biofilm bacteria. PYO measurements obtained showed anti-quorum sensing activity of CEO, the absorbance detecting PYO levels, was decreasing as the concentration of CEO was increasing, absorbances were (0.66, 0.075, 0.097 and 0.11), whereas the control of *P. aeruginosa* was (0.124). On the other hand, the antibacterial/antibiofilm concentrations were cytotoxic (percentage of viability $< 80\%$) to macrophages and the safe level was (0.30 mg/mL) of CEO. Conclusion: These results indicated that CEO may have a promising role in bacterial biofilm eradication, which may help manage and prevent chronic infections in the future. However, more investigations are required to understand the exact mechanism and improve its safety on immune cells.