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### ABSTRACT

#### **Assessment of Antioxidant, Antimicrobial, and Anticancer Activity of *Olea europaea* Leaves Extracts and Its Effects on Apoptotic Genes**

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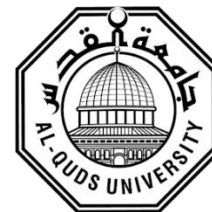
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**Background:** The olive tree (*Olea europaea*) is a rich source of phenolic compounds, known for their health benefits. These compounds, particularly abundant in Palestinian olive leaves, have been shown to possess antioxidant and antimicrobial properties. This study explores the potential of olive leaf extracts to target cancer by investigating their effects on genes involved in the critical process of apoptosis, or programmed cell death.

**Objectives:** To quantify the antimicrobial and antioxidant activities of olive leaf extract and assess its anti-cancer properties, particularly through up regulation of pro-apoptotic genes in breast cancer cells.

1. To determine the composition and quantity of polyphenols present in the extract.
2. To investigate how olive leaf extract down regulates Bcl-2 and its influence on cell cycle progression and proliferation in breast cancer cells.
3. To evaluate how assessing the extract's antimicrobial and antioxidant activities can inform its potential therapeutic applications.
4. To determine the feasibility of using olive leaf extract as a complementary therapy alongside chemotherapy to improve patient quality of life and shorten treatment duration in breast cancer patients.



**Methods:** Olive leaf extract will be obtained through a controlled ethanol solvent extraction process from dried and ground Palestinian olive leaves. The DPPH assay will be used to quantify the extract's antioxidant capacity. The standardized Mueller-Hinton Agar disc diffusion method will assess the extract's antimicrobial efficacy against various bacteria. A specific human breast cancer cell line will be treated with varying concentrations of the extract to investigate its anti-cancer potential by monitoring cell growth and proliferation. Semi-quantitative PCR will analyze the expression levels of key apoptotic genes (BAX, BCL-XL, CASP3) in the treated cancer cells to understand how the extract might influence apoptosis.

**Results (anticipated):** This study is designed to achieve several key outcomes:

**Characterization of Bioactive Compounds:** We expect to identify and quantify the main bioactive compounds present in the Palestinian olive leaf extract using established analytical techniques. **Quantifiable Antioxidant and Antimicrobial Activities:** The DPPH assay and the disc diffusion method will provide measurable data on the extract's antioxidant capacity and its effectiveness against various bacterial strains. Minimum Inhibitory Concentration (MIC) values will be determined to quantify the strength of its antimicrobial properties. **Insights into Apoptotic Gene Expression:** Semi-quantitative PCR analysis aims to reveal changes in the expression levels of key apoptotic genes (e.g., BAX, BCL-XL, CASP3) in breast cancer cells treated with the extract. This will provide valuable insights into how the extract might influence the apoptotic pathway, a critical mechanism for eliminating cancer cells.

**Conclusions (anticipated):** This study aims to characterize the potential of olive leaf extract as a natural therapeutic agent for breast cancer treatment. Our findings may reveal promising properties, including its ability to induce apoptosis in cancer cells. Further investigation is warranted to explore the extract's potential as a complementary therapy alongside conventional treatments.

**Key Words:** Cancer, Bcl2, Apoptosis, Olive leaf Extract, Antioxidant, Antimicrobial, Anticancer, Antibiotics, Chemotherapy, Bioactive compound