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### ABSTRACT

#### The Antibacterial, Antioxidant, and Anticancer Activity of Sage and Nutmeg Ethanolic Extract

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**Background:** Alternative cancer and bacterial infection treatments are desperately needed, as worries about the declining effectiveness and side effects of traditional drugs grow. To aid in the creation of new medications and preventative measures. the study attempts to confirm the therapeutic potential of nutmeg (*Myristica fragrant*) and sage (*Salvia officinalis*) extracts in addressing these health issues.

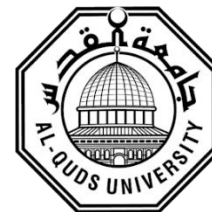
#### Research Questions:

-What is the effectiveness and impact of Sage (*Salvia officinalis*) and Nutmeg (*Myristica fragrant*) ethanolic extracts against bacteria, cancer, and oxidants?

-What is the difference between the effect of a plant extract and a drug?

#### Research Objectives:

-Explore the usefulness and evaluation of the effectiveness of the plant extract as an anti-bacterial, antioxidant, and anticancer agent.



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-Compare the plant extract, which has proven effective, with other antibiotics and with literature reviews.

**Methods:** We evaluated the extracts' antimicrobial activity against gram-positive (*Staphylococcus aureus* and *Bacillus*) and gram-negative (*Escherichia coli* and *Pseudomonas aeruginosa*) bacteria, two ethanol concentrations were used in the preparation process. Furthermore, various quantities of the extract were applied to HT29 cancer cell lines to assess its anticancer properties.

**Results** showed that sage extract exhibited potent antibacterial activity against *Staphylococcus aureus* and *Bacillus* comparable to conventional antibiotics, while nutmeg extract also showed effectiveness similar to some antibiotics. Both extracts showed concentration-dependent cytotoxic effects on colon cancer cells, suggesting their potential as alternative cancer treatments. Furthermore, substantial antioxidant activity was observed in both extracts, indicating their potential therapeutic benefits against oxidative stress-related conditions.

**Conclusion:** The findings of this study enhance the literature on natural remedies and their medicinal uses by providing empirical evidence supporting their antibacterial, antioxidant, and anticancer properties. Future research directions include exploring the extracts' efficacy on other cancer cell types and investigating their potential anti-biofilm properties, offering promising avenues for further investigation and the development of effective medicines against a range of diseases.

**Keywords:** Biofilm, Sage and Nutmeg extract, anti-biofilm, (MRSA) and E.coli biofilm, synthetic, microtiter plates assays.