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# Antioxidant, Antimicrobial and Cytotoxic Activities of Camphor and Ginger Essential Oils

Teggar Hadjira[1, 2 *], Meziane Ahmed Malika[3,2], Agrouche Sakina[4, 2],Ayadi Khadidja [1,2], Abdullah Al-Mishari [5]

[1] Department of Process Engineering, Faculty of Sciences and Engineering Sciences, Hassiba Ben Bouali University, P.O. Box 151, Chlef 2000, Algeria

[2] Laboratory of Natural and Local Bioresources Bocca Hassiba Ben Bouali University. Chlef 02000, Algeria.

[3]Department of Agronomic Sciences University Hassiba Ben Bouali Chlef 02000 Algeria.

[4] Laboratory of Geo-Environments and species development, University of Mustapha Stambouli,Mascara 29000 Algeria

[5]Medicinal, Aromatic and poisonous Plants Research Center, College of Pharmacy, King Saud University, Riyadh 11451, Saudi Arabia

*Corresponding author's email: h.teggar@univ-chlef.dz

## ABSTRACT

The antioxidant, cytotoxic, and antimicrobial activities of the essential oils from the leaves and seeds of Cinnamomum camphora and Zingiber officinale were studied. The EOs of leaves and seeds had good antioxidant activity than ginger with DPPH and ABTS, and bacterial activity against Escherichia coli and Staphylococcus aureus. While, Ginger EO exhibited stronger cytotoxicity than camphor (leaf and seed) against A549 and MCF-7 cell lines, with $IC_{50}$ values of 52.0 and 48.4 µg/ml, respectively. The present results suggested promising antioxidant, cytotoxic and antibacterial properties for Cinnamomum camphora and Zingiber officinale EOs.

**Keywords:** Camphor, Ginger, Essential oils, Antioxidant activity, Cytotoxic activity, Antibacterial activity.

## 1. Introduction

Essential oils are complex molecules derived from different parts of the plant and containing different classes of volatile molecules. They bring several advantages, such as antibacterial, antioxidant, anti-inflammatory, anti-tumor, anti-viral, among others. Essential oils find application in the pharmaceutical and flavoring industries [1]. Cinnamomum camphora (camphor) and Zingiber officinale possesses numerous biological and pharmacological effects, has extensive antimicrobial, insecticidal, anti-inflammatory and antioxidant activities [2].

## 2. Experimental

The essential oils of camphor leaves (C.leaves) , camphor seeds (C.seeds) and ginger were extracted by hydrodistillation with a Clevenger apparatus. All samples were subjected to in vitro analysis to assess their antioxidant, cytotoxic and antibacterial properties. Antioxidant activity was measured using the DPPH and ABTS free radical scavenging methods. The EOs was tested against cancer cells, namely human lung carcinoma cell line (A549) and breast cancer cells (MCF-7), while antibacterial activity was evaluated against two predominant foodborne bacteria, Escherichia coli and Staphylococcus aureus, using microbroth dilution.

## 3. Results and Discussion

Results showed that the most potent antioxidant activities were observed in EOs with $IC_{50}$ ranging from 06.38mg/mL (C.seeds) to 39.38 mg/mL (C.leaves) in DPPH and 3.25mg/mL (ginger) to 4.87mg/mL (ginger) ABTS, respectively;



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All essential oils displayed cytotoxic proprieties, While ginger EO exhibited greater cytotoxic efficacy against A549 and MCF-7 cell lines, with $IC_{50}$ values of 52.0 and 48.4µg/mL, respectively. In addition, antibacterial activity with a minimum inhibitory concentration (table 1), ranging from 25µL/mL (C.seeds) to 200 µL/ml (ginger) against E.coli and 50µL/mL to 100 µg/ml against S.aureus

**Table 1:** Antibacterial activity of essential oils against E. coli and S. aureus

| **Essential oils** | **Bacteria strains** | **D (mm)** | **MIC (µL/mL)** |
|---|---|---|---|
| **Leaf** | E. coil | 18.1± 0.1 | 50 |
| | S. aureus | 15.4±0.15 | 100 |
| **Seed** | E. coil | 19.2±0.0 | 25 |
| | S. aureus | 15.9±0.25 | 50 |
| **Ginger** | E. coil | 15 ±0.1 | 200 |
| | S. aureus | 17.5 ±0.31 | 100 |

It could be proposed that the antioxidant, antibacterial and cytotoxic activity of EOs is related to their chemical composition. It can be said that the major component plays a role in the antibacterial activity, but minor components also help in exerting the synergistic effect [3].

## 4. Conclusions

The findings suggest that all essential oils have significant antioxidant properties, as well as potential antimicrobial and cytotoxic activities. It is recommended that these properties be utilized for both food and medicinal purposes. The results of the investigation do not reveal that which chemical compounds is responsible for aforementioned activity; now our study will be directed to explore the lead compound responsible for aforesaid activity from this plant.

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