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EVALUATION OF THE CHEMICAL COMPOSITION AND ANTIMICROBIAL ACTIVITY OF THE ESSENTIAL OIL OF *FOENICULUM VULGARE*

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Abstract: Essential oils are the most powerful and effective extracts obtained from plants that contain volatile aromatic molecules (volatile oils) and should not be confused with vegetable oils. They are obtained from different parts of the plant: flowers, branches, leaves, wood, roots or the resin secreted by certain trees. Some plants have a very high load of volatile oils, others are less concentrated, sometimes thousands of kilograms of plant are needed to obtain one liter of essential oil. Depending on this concentration, the rarity of the plant or the difficulties of cultivation/harvesting, as well as the properties of the plant, some 100% pure and natural essential oils are rare and very expensive. Fennel essential oil is characterized by the presence of several components, including major components such as: trans-anethole, fenchone, methyl chavicol, eugenol, limonene, p-anisaldehyde, α -phellandrene, α -pinene, 1,8-cineole, γ -terpinene and p-cymene. The aim of this research was to evaluate the chemical composition and antimicrobial activity of fennel essential oil. The objectives of the research were to determine individual polyphenols from fennel essential oil and to evaluate the antimicrobial effect on gram positive and gram negative pathogens. For the in vitro testing of the samples, strains of *Staphylococcus aureus* (ATCC 25923), *Escherichia coli* (ATCC 25922), *Pseudomonas aeruginosa* (ATCC 27853), and *Streptococcus pyogenes* (ATCC 19615). Following the results obtained, we found that the essential oil of fennel shows antimicrobial activity against both gram-negative and gram-positive pathogens, an activity that is mainly related to the increased content

• Introduction

Essential oils, having distinct volatile aromas derived from plants, have been used throughout antiquity for medicinal purposes, from dermatological treatments to cures for cancer.

Essential oils are very complex natural mixtures that can contain approximately 20-60 components in quite different concentrations. They are characterized by two or three major components present in fairly high concentrations (20-70%) compared to other components present in fairly small amounts.

• Material and method

The fennel essential oil used in the study is shown in the image.

Method of obtaining: by steam distillation of the seeds.

Organoleptic properties: clear yellowish liquid, low viscosity.

Olfactory description: fresh, sweet, pleasant smell, similar to anise.

The identification of the volatile compounds in the essential oil of fennel was carried out by the GC-MS method.

Determination of antimicrobial activity of fennel essential oil using mass loss versus optical density.

Staphylococcus aureus (ATCC 25923), *Escherichia coli* (ATCC 25922), *Pseudomonas aeruginosa* (ATCC 27853), and *Streptococcus pyogenes* (ATCC 19615) strains were used for in vitro testing of the samples.

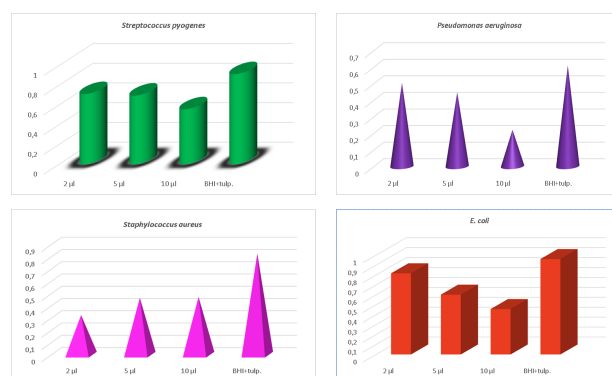
Over each suspension well, the sample was used directly by adding 2, 5 and 10 μ l to each well. Plates were covered and left overnight at 37 $^{\circ}$ C; then the OD (optical density) was measured at 590 nm using an ELISA reader (BIORAD PR 1100).

All samples were run in triplicate. Strain suspensions in BHI were used as a positive control.

• Results and discussions

Following GS-MS determinations, nine compounds were identified in fennel essential oil. The highest concentration was obtained for trans-anethole (68.42%), followed by anisole (3.15%), cis-anethole (2.61%) and m-cymene (1.83%). The elements identified were in proportion to 74.62% of the total oil.

Nr.	Compus	R.T (min.)	%
1.	D-limonene	6.129	0.41
2.	m-cymene	6.862	1.83
3.	c-terpinen	7.033	0.36
4.	Eucalyptol	7.194	0.22
5.	L-fenchone	7.562	0.5
6.	Anisole	8.112	3.15
7.	Camphor	8.785	0.27
8.	Trans-anethole	9.109	68.42
9.	Cis-anethole	9.814	2.61



• Conclusions

Following the study carried out on fennel essential oil, regarding its chemical composition and antimicrobial effectiveness, we can conclude that:

- ✓ nine compounds were identified in fennel essential oil, the highest concentration being obtained for trans-anethole (68.42%), followed by anisole (3.15%), cis-anethole (2.61%) and m-cymene (1.83%);
- ✓ fennel essential oil exhibits antimicrobial activity against both gram-negative and gram-positive pathogens;
- ✓ the highest inhibition percentages were found on *Pseudomonas aeruginosa* and *Escherichia coli* strains;
- ✓ the antimicrobial activity of fennel essential oil is mainly related to the increased content of anethole.

