Chemical composition and biological activity of essential oil from *Mentha suaveolens* Ehrh. leaves

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Background

- *Mentha suaveolens* Ehrh. (Lamiaceae) is an aromatic herb, native to southern and western Europe, which is commonly used as culinary herb, as well as for aromatizing and traditional medicinal purposes (1,2). It presents itself as a potential source of raw material for extraction of essential oil and exploitation by the chemical and pharmaceutical industries (3).

Objective

• This study was designed to establish the chemical composition and biological activity of essential oil of *M. suaveolens* leaves.

Methodology

- **Essential oil extraction and chemical composition analysis:** The essential oil was obtained by hydrodistillation. Thus, water was boiled to produce steam, which pulled down most volatile chemicals of the aromatic material. The steam was then chilled in a condenser and the resulting distillate was collected. The essential oil was floated on top of the hydrosol (the distilled water component), separated off, and stored away from the light in amber-colored glass bottles at 4 ºC until analysis. The analysis of the volatile components of the essential oil was performed with a Hewlett Packard 6890 gas chromatograph (GC) equipped with a flame ionization detector (FID) and a 30 m x 0.32 mm x 0.25 µm (film thickness) of 5% phenyl-methyl-silicone column.
- **Antimicrobial activity:** The minimal inhibitory concentration (MIC) was studied for the essential oil. The target microorganisms (i.e., *Listeria innocua* and *Escherichia coli*) were cultured in Mueller Hinton broth (MHB) at 37 ºC for 24 h. For this purpose, 190 µl of MHB containing diluted bacteria (about 10^5 CFU ml^{-1}) and 10 µl of the different concentrations of the essential oils were mixed, and the 96-well microplate was incubated at 37 ºC for 24 hours under microaerophilic conditions. The absorbance value was determined at 450 nm.
- **Cytotoxic activity:** The cytotoxic effects of the essential oil were assayed by means of the CellTiter 96® AQueous One Solution Cell Proliferation Assay. HeLa (cervix cancer) and MDA-MB-231 (triple negative breast cancer) cells were seeded in 96-well plates, treated for 24 h with different concentrations of the essential oil, and the assays were performed by adding 10 µl of the CellTiter 96® AQueous One Solution Reagent directly to culture wells. Cells were then incubated for 1 h at 37 ºC, and the absorbance was recorded at a test wavelength of 490 nm.

Conclusion

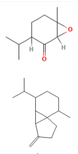
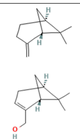
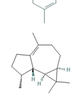
These findings suggest that the essential oil of *M. suaveolens* leaves represents a potential source of medicine for the treatment of infectious diseases and cancer.

References

1. Moreno et al. 2002. Phytother Res 16(S1): 10-13.
2. El-Kashoury et al. 2014. J Med Plant Res 8(20): 747-755.
3. Bozovic et al. 2015. Molecules 20(5): 8605-8633.

Results

Table 1. Chemical composition of essential oil of *Mentha suaveolens* (Lamiaceae) leaves.

Chemical name	2D estructure	Formula	MW	% GC-FID	Chemical name	2D estructure	Formula	MW	% GC-FID
Piperitone oxide		$C_{10}H_{16}O_2$	168.23	55.73	(-)-β-Pinene		$C_{10}H_{16}$	136.23	0.30
β-Cuvebene		$C_{15}H_{24}$	204.35	15.83	Myrtenol		$C_{10}H_{16}O$	152.23	0.28
Terpinen-4-ol		$C_{10}H_{18}O$	154.25	8.69	p-Mentha-1,4(8)-diene		$C_{10}H_{16}$	136.23	0.26
β-Caryophyllene		$C_{15}H_{24}$	204.35	6.73	Eucalyptol		$C_{10}H_{18}O$	154.25	0.24
Terpinene 4-acetate		$C_{12}H_{20}O_2$	196.29	5.32	β-Pinene		$C_{10}H_{16}$	136.23	0.20
(+)-Ledene		$C_{15}H_{24}$	204.35	1.30	Camphene		$C_{10}H_{16}$	136.23	0.20
epi-Cadinol		$C_{15}H_{26}O$	222.37	0.96	cis-Linalooloxide		$C_{10}H_{18}O_2$	170.25	0.14
Borneol		$C_{10}H_{18}O$	154.25	0.73	α-Fellandrene		$C_{10}H_{16}$	136.23	0.14
Linalool		$C_{10}H_{18}O$	154.25	0.59	Verbenone		$C_{10}H_{14}O$	150.22	0.13
Crithmene		$C_{10}H_{16}$	136.23	0.53	Carvone		$C_{10}H_{14}O$	150.22	0.12
α-Terpineol		$C_{10}H_{18}O$	154.25	0.44	3-Hexen-1-ol		$C_6H_{12}O$	100.16	0.12
trans-Caryophyllene		$C_{15}H_{24}$	204.35	0.31	o-Cymene		$C_{10}H_{14}$	134.22	0.11

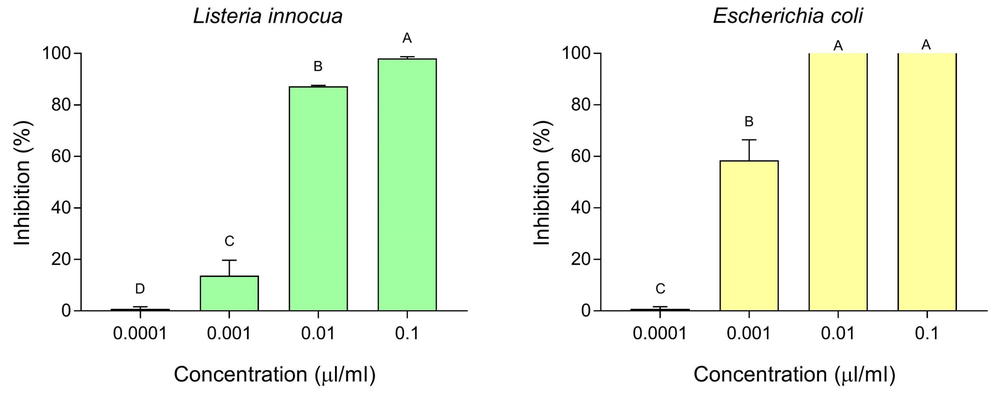


Figure 1. Minimal inhibitory concentration (MIC) of essential oil of *Mentha suaveolens* leaves. L. innocua and E. coli were challenged with increasing concentrations (0.1, 0.01, 0.001 and 0.0001 µl/ml) of essential oil for 24 hours. Values expressed are mean ± SD of four experiments. Values with the same capital letter are not significantly different (ANOVA, $P < 0.05$).

The MIC value for L. innocua ranges from 0.01 to 0.001 µl/ml, while such value for E. coli is approximately 0.001 µl/ml.

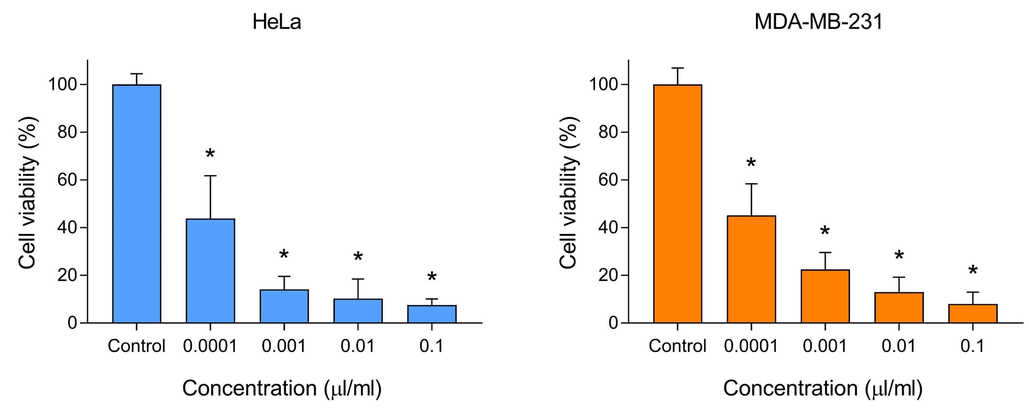


Figure 2. Cytotoxic effect of essential oil of *Mentha suaveolens* leaves. HeLa and MDA-MB-231 cells were stimulated with increasing concentrations (0.1, 0.01, 0.001 and 0.0001 µl/ml) of essential oil for 24 hours. Values are presented as mean ± SD of six experiments and expressed as percentage of control values (untreated samples). *$P < 0.05$ compared to control values.

The inhibitory concentration 50 (IC_{50}) value for both HeLa and MDA-MB-231 cells is approximately 0.0001 µl/ml.

Acknowledgements

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