

Analysis of the Essential Oils from Thyme (*Thymus vulgaris* L) and from Peppermint (*Mentha piperita* L)

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Abstract: Peppermint oil and thyme oil is obtained by steam distillation from the fresh overground parts of flowering plant of *Mentha piperita* L and *Thymus vulgaris* L. For essential oil obtained, were determined the chemical property. Thyme oil and peppermint oil were analyzed using the chromatography before and after microorganisms absorptions. Essential oils is used in different pharmaceutical products and these have antimicrobial activity.

Keywords: essential oils, chromatography, antimicrobial activity

1. Introduction

Essential oils are known to possess antimicrobial activity. Compounds isolated from this plants presents the biological activity, eliminating pathogenic microorganisms because of the resistance that many microorganisms have built up to antibiotics.

Essential oils produced by plants have been traditionally used for respiratory tract infections, and are used nowadays as ethical medicines for colds. In the medicinal field, inhalation therapy of essential oils has been used to treat acute and chronic bronchitis and acute sinusitis. Inhalation of vapours of essential oils augmented the output of respiratory tract fluid, maintained the ventilation and drainage of the sinuses, had an anti-inflammatory effect on the trachea and reduced asthma.

In contrast to antibiotics, essential oils are highly volatile at room temperature. It has already been shown that the antimicrobial activity of volatile compounds results from the combined effect of direct vapour absorption on microorganisms and indirect effect through the medium that absorbed the vapour. A phenomenon that occurred predominantly in the gaseous state but was not marked in the solution phase was the spontaneous degradation of unstable constituents by air.

In this paper was determined the chemical composition of the essential oil of thyme (*Thymus vulgaris* L) and of peppermint (*Mentha piperita* L), examining them by chromatography. We analysed the results from GC analysis before and after microorganisms absorptions.

2. Experimental data

The essential oils of thyme (*Thymus vulgaris* L.) and of peppermint (*Mentha piperita* L) were obtained by

steam distillation. Peppermint oil is obtained by steam distillation from the fresh overground parts of the flowering plant of *Mentha x piperita* L.

The essentials oils from thyme(*Thymus vulgaris* L) and peppermint (*Mentha piperita* L) were analysed using a chromatograph HPLC-ABLE & JASCO PU – 1580, Injector – manual –Rhetodyne, Detector – Jasco-1575, Processing data – Borwing, Column: -l= 100 mm, d=4.6 mm, Stationary phase -Nucleosil100, C18, 5 μ . Flow: 1ml/min, injection volume: 20 μ l, temperature: ambient, elution type: isocratic, wavelength: 237 nm. Before the vapour therapy the essential oils have the chromatograms presented in figure 1 and figure 2.

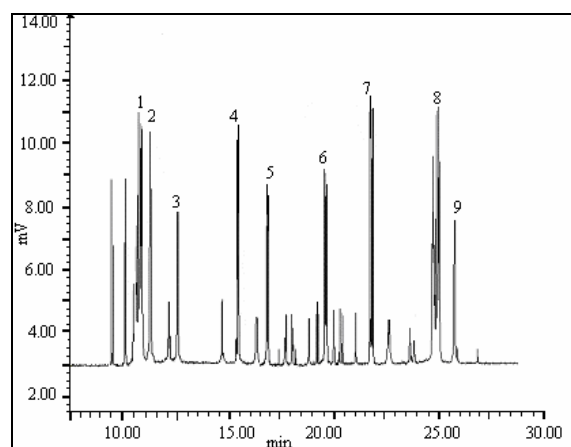


Figure 1. The chromatogram for thyme oil (*Thymus vulgaris* L) before microorganisms absorptions

1-terpinen-4-ol; 2- γ -terpinene; 3-limonene; 4- α -pinene; 5- β -pinen; 6-myrcene; 7-thymol; 8-carvacrol; 9- linalol

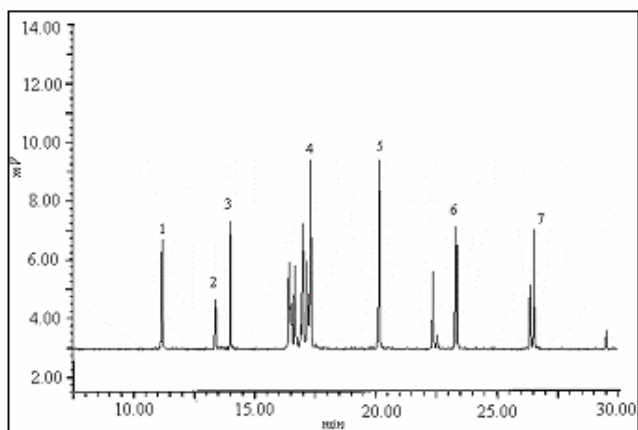


Figure 2. The chromatogram for peppermint oil (*Mentha piperita* L) before microorganisms absorptions

1-menthol; 2- limonene; 3- cineole; 4. menthone;
5- isomenthone; 6-menthyl acetate; 7-carvone.

C-analyses of thyme essential oils identified 9 constituents, representing the 80.0% of the total oil. The main components of thyme essential oil were, terpinen-4-ol, γ -terpinene, α -pinene, β -pinene, limonene, myrcene, thymol, linalol and carvacrol. The essential oil of thyme was characterized containing: terpinen- α -ol, γ -terpinene, myrcene, p-cymene, limonene, thymol, carvacrol.

The essential oil of peppermint contains: menthol, cineole, menthone, isomenthone, menthyl acetate, limonene, carvone.

After the vapour therapy we examined to chromatograph the essential oils. After absorption the microorganisms the essential oils have the chromatograms presented in figure 3 and figure 4.

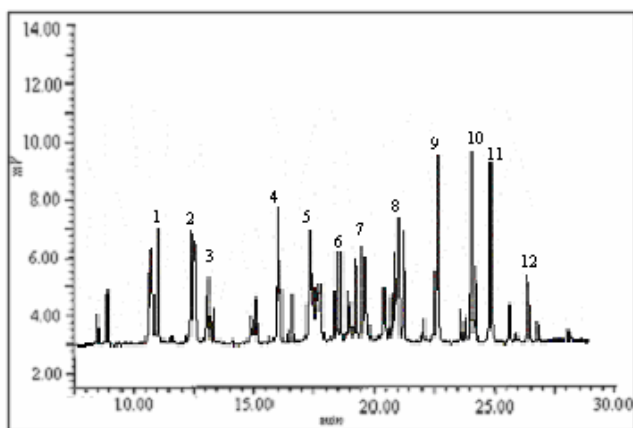


Figure 3. The chromatogram for thyme (*Thymus vulgaris* L) oil after microorganisms absorptions

1-terpinen-4-ol; 2- γ -terpinene; 3-limonene; 4- α -pinene;
5- β -pinene; 6-myrcene; 7-myrcenol; 8-thymol; 9-sobrerol;
10-carveol; 11-carvacrol; 12-menthanthreol.

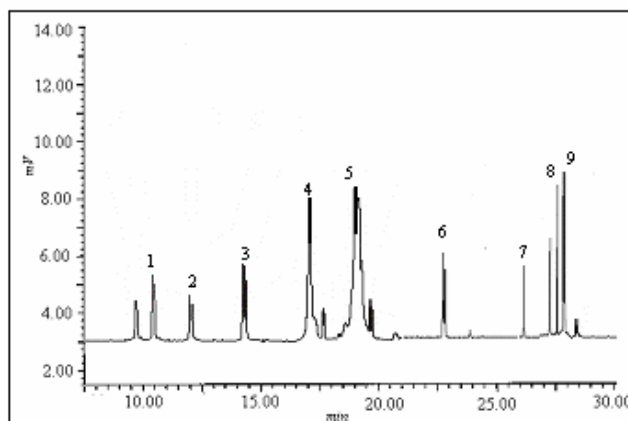


Figure 4. The chromatogram for peppermint oil (*Mentha piperita* L) after microorganisms absorptions

1-menthol; 2- limonene; 3- cineole;
4. menthone; 5- isomenthone; 6-menthyl acetate;
7-carvone; 8-carvomenthol ; 9- pulegone.

After absorption the microorganisms, the chromatogram show as, the essential oil of thyme has contained: of terpinen-4-ol, γ -terpinene, limonene, α -pinene, β -pinene, myrcene, myrcenol, thymol, sobrerol, carveol, carvacrol and menthanthreol.

The essential oil of peppermint, after the vapour therapy have content: menthone, isomenthone, menthyl acetate, carvone, carvomenthol, pulegone, menthol, limonene and cineole.

3. Results and discussions

The essential oils from thyme and peppermint have antimicrobial activity and antioxidant properties. A phenomenon that occurred predominantly in the vapour therapy was the spontaneous degradation of unstable constituents. On the other hand, formation of oxygenated products of the constituents from essential oils occurred in absorption the microorganisms. The antibacterial activity of the oxygenated products of limonene and pinene is considerable and terpene alcohols possess more activity than the parent hydrocarbons, implying that they contributed significantly to the bioactivity. Analysing the chromatograms for essential oils after microorganisms absorptions is noticed as, oxidation or oxido-reduction of aldehydes and unsaturated bonds, and rearrangement of linkage were phenomenon that occurred. Oxidation of d-limonene and α -pinene in air is already recognized. Thymol, a phenolic constituent of thyme oil have the biological activity comparable to that of cinnamaldehyde. Menthol, terpinen-4-ol and linalool showed moderate activity. Thus, carvacrol and thymol, which are very stable, moderately soluble in water and of low volatility, were accumulated into the agar layer in greater amounts. Antimicrobial action of essential oils to gaseous contact with the microorganisms is most efficient when exposed at big vapour concentration for a short time.

The chemical structures of oxidation products was presented in figure 5.

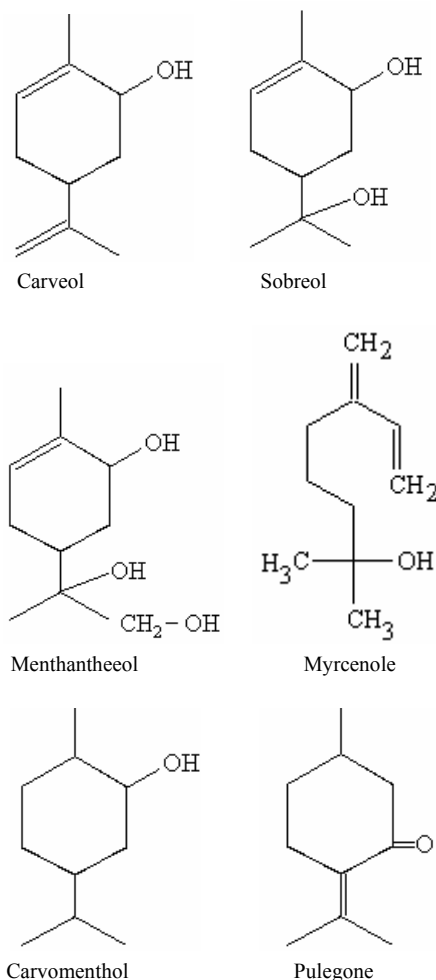


Figure 5. Oxidation products after vapour therapy of essential oils

4. Conclusions

A major components of thyme oil were: terpinen-4-ol, γ -terpinene, α -pinene, β -pinene, limonene, myrcene, thymol, linalol and carvacrol, but a major contributor for the bioactivity was assumed to be α -terpineol. A similar situation was seen for peppermint oil. The major constituents for peppermint oil was p-menthone and menthol. They contributes significantly to the antibacterial activity. Menthol, terpinen- α -ol and linalool showed moderate activity to contact with the microorganisms. In the medicinal field, inhalation therapy of essential oils has been used to treat acute and chronic bronchitis and acute sinusitis. Inhalation of vapours of essential oils augmented the output of respiratory tract fluid, maintained the ventilation and drainage of the sinuses, had an anti-inflammatory effect on the trachea and reduced asthma.

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