EXTRACTING ESSENTIAL OILS FROM TYME IN THEMICROWAVE FIELD

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REVIEW, RESEARCH ARTICLE

Abstract

The main objective of this work was to find a solution for the extraction of essential oils of tyme by means of microwaves without affecting its biological properties. During the experiments it was observed that with the diminishing of the size of the experimental material, the microwave power decreased, and the amount of oil increased, with a very good quality of its properties.

Keywords: microwave, esential oil, Satureja hortensis L., resonance cavity, variable power, bioactive compounds, affections
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INTRODUCTION

Thyme with the scientific name Satureja hortensis L., a short perennial plant of 20-30 cm, robust and bushy, adapts to drought and winter and grows on any type of soil, being a demanding plant, its importance has been noted since the Age medium.

The genus Thymus belongs to the family Labiate (Lamiaceae) subfamily Nepetoi-deae, tribe Mentheae. The geographical distribution is described as Eurasian and Mediterranean, especially in the Iberian Peninsula and North West Africa. About 250 accepted categories (214 species and 36 subspecies) are currently known and subdivided into 8 sections.[1]

From a chemical point of view, thyme is represented by two main classes of secondary products, volatile essential oil and non-volatile (poly)phenols. [1]

Thymol, a phenolic monoterpene, has an antimicrobial, anti-inflammatory, antioxidant, antitussive, sedative effect [1].

Essential oils are a secondary product of plants obtained using several methods, as traditional steam distillation (according to ISO 9235).

In this work we used the high frequency electromagnetic radiation method [2]. These volatile compounds vary in odor and flavor. Of particular importance was the distillation method by which the experiments were carried out because it determines the quality of the essential oil.

Subjecting the biological material to inappropriate experiments can lead to the loss of bioactivity of the resulting product [3]. The essential oils resulting from the experiments are concentrated solutions of complex mixtures and contain a lot of bioactive compounds.

Essential oils cannot combine with water and are called lipophilic compounds and are generally represented by molecules that predominantly contain non-polar bonds. They have the property of being well absorbed through the dermis, lungs and intestines [4]. Due to this property essential oils are used in many products with medical and cosmetic applications.

In the experiments, a furnace with an adjustable power magnet was used, in order to avoid damage to the furnace used in experiments, it worked in pulses throughout the experiments.

Throughout the experiments the systems were monitored with the help of measuring devices for detecting electromagnetic radiation leakage [5].

RESULTS AND DISCUSSIONS

The experimental material was harvested before flowering it was minced and allowed to dehydrate for 60 days in a hot stream of hot air [6].

The solvent used in the experiments was $C_2H_5 - OH$, ethyl alcohol, which is of medicinal purity.

The purpose of the experiments presented in this paper was the extraction of volatile oil from the rosehip using different powers of the high frequency electromagnetic field and the separation of the solvent oil [7].

The system used to heat the solvent consists of a 1kW electrical source, which is variable, the round bottomed balloon [8], [9], being placed in a nest made of a non- absorbent textile material [10].

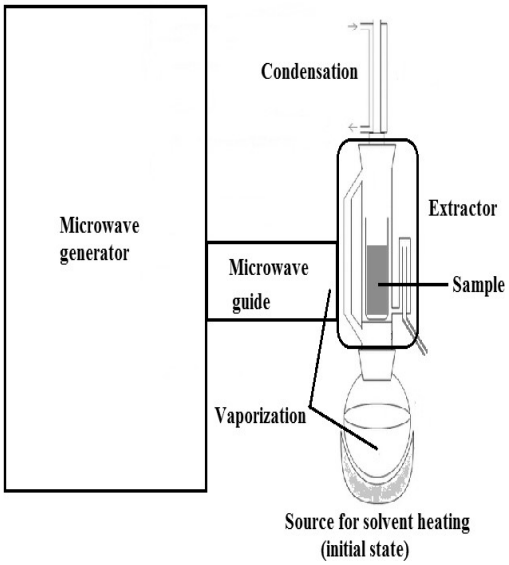

Fig. 1. System designed for the extraction of volatile oils [12]

Next, we will present the experimental results for the initial (150W) value of the high frequency electromagnetic field and for the most suitable microwave power value (500W) for extracting the essential oil.

Table 1

Sample weight – initial experiment

	Initially
Cartridge weight for samples [gr.]	4,90
Test sample weight [gr.]	50,00
Solvent used - ethyl alcohol [ml.]	500,00
Cartridge + sample value [gr.]	54.90

Initial measurements are shown in table 1, and the experimental results for 150W of the high frequency electromagnetic field are shown in table 2 and figures 2 to 5. The quantity of samples subjected to the experiments was measured with a digital balance and the same amount of experimental material and the same amount of solvent (ethylalcohol).

Table 2

Extraction of volatile oils fromthymol using ethyl alcohol as solvent, initial power of microwaves 150w

Syphoning no.	Timp [min.]	Micro wave power [W]	Initial temp. [°C]	Final temp. [°C]	Obt oil [ml]
Syphoning no.1	225	150	15,9	79,3	179
Syphoning no.2	215		62,3	79,1	170
Syphoning no.3	190		62,2	79,0	163
Syphoning no.4	172		62,3	79,2	151
Syphoning no.5	168		62,2	79,1	133

The initial and final temperatures of both the experimental material and the solvent were monitored with fiber optics, this method was adopted to monitor the temperature during the high frequency electromagnetic field emission.

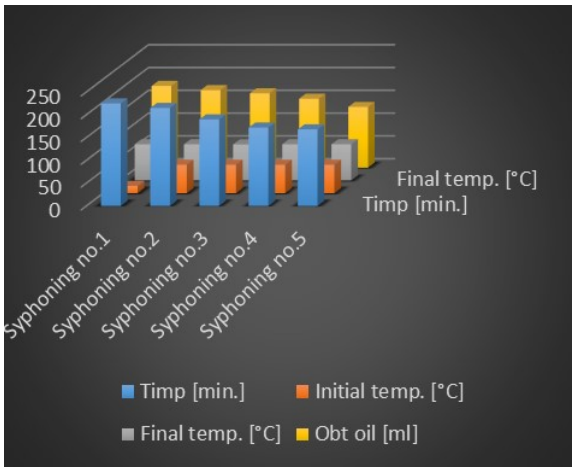

Fig. 2. Extraction of volatile oils from thymol using ethyl alcohol as solvent, initial power of microwaves 150W

Remarks:

- The final temperature does not affect the quality of the extracted oil;

-At the initial 150W power level, the amount of extracted oil is acceptable at the expense of the times the experiment was subjected to.

Table 3

Extraction of volatile oils fromthymol using ethyl alcohol as solvent, initial power of microwaves 500w

Syphoning no.	Timp [min.]	Micro wave power [W]	Initial temp. [°C]	Final temp. [°C]	Obt oil [ml]
Syphoning no.1	175	500	14,7	79,3	224
Syphoning no.2	167		62,5	78,7	212
Syphoning no.3	154		62,3	78,4	197
Syphoning no.4	145		62,2	77,9	171
Syphoning no.5	137		62,1	77,5	158

Remarks:

-The times for the experiments must be shorter;

-The final temperature is maintained within normal limits anddoes not affect the quality of the extract;

-The experimental data showed that at this power the extracted oil quantity was maximum and was not affected by the high frequency electromagnetic radiation, at a powergreater than 500W a deterioration was observed.

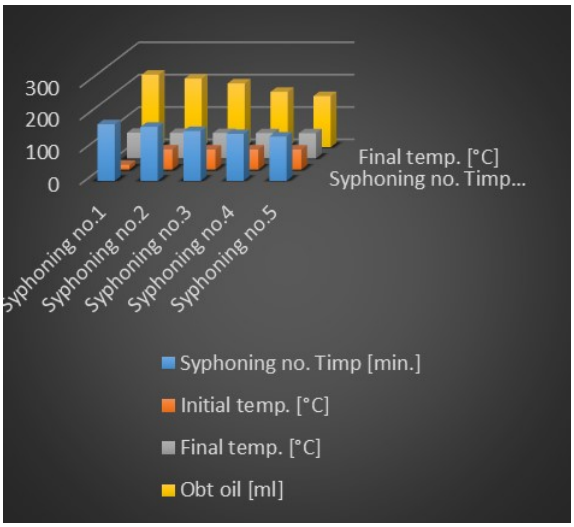

Fig. 3. Extraction of volatile oils from thymol using ethyl alcohol as solvent, initial power of microwaves 500w

The amount of oil extracted at 500W is considerably higher in all five syphonings, which is important is that the color is more intense and in the spectral analysis the oil extracted at the higher value of the microwaves differs from the extracted at lower values, being of better quality.

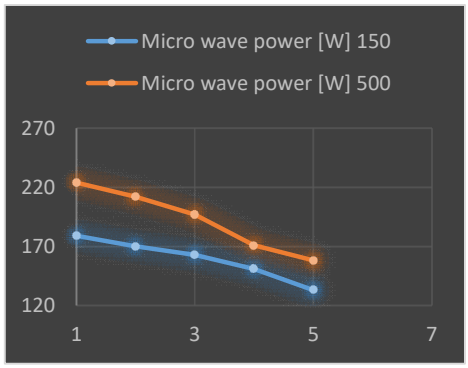

Fig. 4. Report power - obtained oil

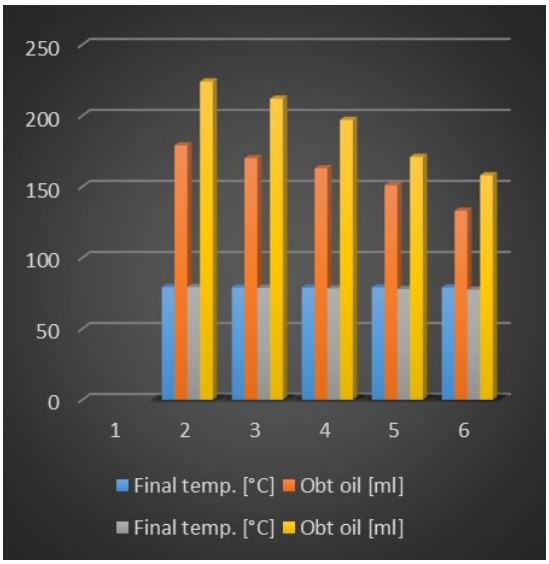

Fig. 5. Report power – final temperature

CONCLUSIONS

Based on the results of the studies carried out, the following conclusions were drawn:

- After analyzing the results obtained, we can say that as longas the extraction times are large enough, it is recommended to use high power values until the temperature in the experimental material reaches the maximum admissible value;

- As can be seen from the analysis of the experimental results, the amount of the resulting oil is much higher using the high frequency electromagnetic field and the ethyl alcohol, which can be improved by using higher concentrations;

- During the experiments, oscillations of reflected power were found. The phenomenon is accentuated at high temperature values, indicating changes in dielectricpermissivity and

loss factor, while affecting the quality of extracted oil;

- The applicator has been successfully used to couple microwave energy to the seed sample and the following parameters are monitored during drying: microwave power,

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