

# Comparison of peppermint teas in regard to essential oil content and its composition

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## Summary

Peppermint, a medicinal plant with a history going back to the time of Egyptian pharaohs, is used in phytotherapy today and, unequivocally, will be used in the future. Mint herb, widely used in the preparation of herbal teas, is very popular in many countries, especially in West Germany and North Africa. Dried *Menthae piperitae* herba is a marketable good. The annual consumption of peppermint herb comes to thousands of tons. GC analyses of dry peppermint raw material of different origin obtained in the market have demonstrated considerable variance in medically effective components. In addition, the constituents of peppermint essential oil differed from those of herbal teas. Quality of herb raw material is important in production of the pharmaceutical and cosmetic products, what was showed in dissimilar pharmacodynamic effects.

*Key words:* essential oil, qualitative-quantitative characteristics, peppermint, tea

## INTRODUCTION

Peppermint (*Mentha × piperita* L.), a representative of widespread *Lamiaceae* family, belongs to the oldest and traditional useful medicinal and culinary herbs. This aromatic plant is indigenous to England. It has also been extensively cultivated in various parts of Europe and throughout the United States. The whole plant has a peculiar, aromatic, diffusive odour and an agreeable, warm, burning, bitter taste followed by a feeling of coolness during inhalation. These properties are more marked in the fresh than in the dried plant and both the odour and taste may be

reserved for a long time. The entire herb is medicinal (peppermint dry leaves and leafed shoot tops are the material described in pharmacopoeia) usually used as a component of herb teas and mixtures. However, the peppermint essential oil (*Menthae piperitae aetheroleum*), is a widespread component applied in cosmetics, pharmaceuticals and in food industry.

Peppermint is a powerful diffusible stimulant. Medicines made of this herb may be applied both externally and internally. Peppermint flowering tops and leaves give an aromatic stimulant with anodyne, antispasmodic, carminative, cholagogue, refrigerant, stomachic and tonic properties.

Peppermint tea or essential oil can be taken for treating of nervousness, insomnia, cramps, coughs, migraine, poor digestion, heartburn, nausea, abdominal pains and other problems such as headache and vomiting due to nervous causes [1, 2].

Common on many tables throughout Europe, peppermint tea offers a delicate flavour with a fresh aroma reminiscent of menthol. Obviously, the flavour of peppermint tea depends mainly on elusive aromas of the herbal plant parts dependent on the characteristic quantity and composition of the essential oil. Today, most stores, pharmacies and groceries offer a wide variety of peppermint teas. The raw peppermint used for processing of these teas originates from a number of different localities and sources [3] and raises a question about the quality of the teas and remedies listed in the *European Pharmacopoeia*. The present research investigated qualitative and quantitative characteristics encountered in peppermint raw material used for herbal tea production and commonly sold in the market stores or chains in Slovakia.

## MATERIAL AND METHODS

### Plant material

Samples of peppermint (*Mentha × piperita* L.) tea consisting of peppermint herb (*Menthae piperitae herba*) were collected and used in these investigations. The collected herbal tea samples were chosen to be representative of those available at pharmacies and groceries in many countries around the world. Using a modified distillation apparatus of Cooching & Middleton [4], the essential oil of 2 g of flowers from the tea bags was extracted by hydro distillation with capture of the oil in n-hexane.

### Chromatography

Composition of peppermint essential oil by capillary GC analysis [5] was determined using a Hewlett-Packard 5890 Series II with FID, a split-split less system for injection, an HP-5 (50 m long x 0.20 mm i.d.) for constituent separation, and nitrogen (as a carrier gas). The operating conditions were an injection temperatu-

re of 150°C, a detector temperature of 250°C and a temperature program beginning at 90°C (0 min), 10°C min<sup>-1</sup> to 150°C (5 min), 5°C min<sup>-1</sup> to 180°C (3 min), then 7°C min<sup>-1</sup> to a final isothermal 280°C for 25 min. The carrier gas flow velocity was 274 mm.s<sup>-1</sup>; auxiliary gases were nitrogen at 30 ml.min<sup>-1</sup>, hydrogen at 30 ml.min<sup>-1</sup> and air at 400 ml.min<sup>-1</sup>. Sample sizes were 1.0 µl and a manual injection was used. Peak areas and retention times were measured by electronic integration with a Hewlett-Packard 3396 Series II integrator.

## Constituent identification

Major constituents of the extracted essential oils were identified by comparison of retention times with known standards.

## RESULTS AND DISCUSSION

In this study, the quality and curative effect were investigated by a qualitative-quantitative analysis of peppermint herbal teas of various origins. The tested peppermint teas, representing selections from 10 processing companies located in 3 countries (tab. 1), were those available at pharmacies and groceries in many countries around the world [5].

Table 1.

Essential oil content in raw material from peppermint tea bags

peppermint product and source	essential oil level [%]
Místral – Original Herbal Peppermint Tea (Baliarne obchodu Co., Poprad, Slovakia)	0.75
Flosana Karrimor KSB Letitude Event Peppermint Herbal Tea (MTF Ltd. – Przedsiębiorstwo Produkcji Herbat, Dobrzyca, Poland)	0.60
Belin - Herbal Peppermint Tea (Poznań, Poland, importer: Frape Slovensko Ltd. Trnava, Slovakia)	0.50
Mäta pieporná (Baliarne obchodu Co., Poprad, Slovakia)	0.60
Fytopharma – Herbal Tea of Peppermint (Fytopharma Co., Malacky, Slovakia)	0.63
Tea CZ Natur – Herbal Peppermint Tea (Leros Ltd. Prague, Czech Republic)	0.45
Vitax – Peppermint Leaf (MTF Ltd., Dobrzyca, Poland)	0.55
Klember, Herbal Tea – Peppermint (Klember Ltd., Dunajská Streda, Slovakia)	0.35
Teekanne – Peppermint Tea (Teekanne Ltd., Kraków, Poland)	0.85
Herbex – Peppermint (Herbex Ltd., Vinica, Slovakia)	0.25

Essential oil levels in tea samples ranged from 0.25 to 0.75% of dry weight (tab. 1). Samples with values <0.5% of essential oil were below pharmacopoeia's requirements for peppermint herb tissue and extracts to have essential oil concentration from 0.5 to 2.5%. The low levels of essential oils measured in 3 of 10 samples could not be associated with herbs from any particular country.

In pharmaceutical and cosmetic industry, the drug from the peppermint plant populations of different origin and therapeutic quality is processed [6]. The evidence that supports this claim is the result of the amount of the peppermint essential oil isolated with water vapour from the herb material present in teabags.

In all cases (with an exception of peppermint tea produced by Slovakian Baliarne obchodu, Co. Poprad and Polish Teekanne Kraków), the essential oil contents were highest. Proportional content of the essential oil of cultivated peppermint would be expected to be over 1.5%.

Peppermint oil has more than 200 chemical compounds, notably: menthol, menthone, methyl-acetate, iso-menthone, piperitol and pulegone [7]. The concentration of various constituents in the oil of peppermint raw material obtained from teabags differed in various samples (tab. 2). The Commission E Monograph *Menthae piperitae herba* gives an accounting of peppermint herb and the main constituent of essential oil – menthol [8]. Our study confirmed considerable differences in the qualitative-quantitative composition of peppermint essential oil in various herb teas. The maximum phytotherapeutic levels of essential oil in the peppermint drug constituents were associated with the peppermint tea supplied by Fytopharma Ltd., Malacky, Slovakia, in which the content of menthol was 63.0%. Along with the differences in essential oil levels, these differences in constituent levels may explain differences in pharmacological actions of herbal teas [6]. The lowest phytotherapeutic characteristics were determined in “Herbex-Peppermint” produced by Slovakian company Herbex Ltd. in Vinica and Tea CZ Natur, Leros Ltd., Prague, Czech Republic. In these cases the content of menthol was 35.5 and 32.5%. In other peppermint teas, proportional representation of menthol in essential oil ranged from 40.0 to 45.0%. Exceptionally high levels of menthone (30.0%) were found in Teekanne – Peppermint Tea (Teekanne Ltd., Kraków, Poland).

Table 2.

Qualitative and quantitative characteristics of essential oil from peppermint herbal teas

peppermint product and source	menthol	menthone	methyl- acetate	iso- menthone	piperitol	pulegone
	----- % of essential oil component -----					
Mistral – Original Herbal Peppermint Tea (Slovakia)	40.0	24.0	8.0	5.0	≥3.0	≥2.0
Flosana – Peppermint Herbal Tea (Poland)	45.0	19.5	7.5	5.0	4.0	≥1.5
Belin – Herbal Peppermint Tea (Slovakia)	40.5	22.0	12.0	5.0	≥3.0	≥1.5
Mäta pieporná (Slovakia)	38.0	22.0	12.0	4.5	≥2.5	≥3.0
Fytopharma – Herbal Tea of Peppermint (Slovakia)	63.0	7.5	7.5	1.5	4.0	≥1.5
Tea CZ Natur – Herbal Peppermint Tea (Czech Rep.)	35.5	24.0	9.0	4.5	≥1.0	5.0
Vitax – Peppermint Leaf (Poland)	45.0	20.5	9.0	5.0	≥3.0	≥0.5
Klember, Herbal Tea – Peppermint (Slovakia)	43.0	20.5	7.5	5.0	≥3.0	≥3.0
Teekanne – Peppermint Tea (Poland)	35.0	30.0	7.5	6.0	≥2.5	≥1.5
Herbex – Peppermint (Slovakia)	32.5	10.5	6.5	2.0	9.0	≥1.5

In the pharmaceutical and cosmetic industry, peppermint herbal drugs of different origin and diverse therapeutic quality are processed and utilized [3]. While peppermint herb has been used in Europe and North Africa as a tea for a long time, recently a rapid growth of demand for peppermint leaves has been noted in other regions. Anyway, Page and Stearn [9] advise that after pouring boiling water on peppermint for making tea, the mixture should not be allowed to stew for more than 5 to 10 minutes before straining, as an unpleasant flavour can arise.

The first extensive study comparing chamomile tea qualities – the essential oil contents and its composition (main substances:  $\pm$ - $\alpha$ -bisabolol and chamazulene) was published in 2006 [10]. The results confirmed the consumers' sense that manufacturers use very different raw materials.

After all, the major influence of genetic factors (chemotypes) and the environment have an important effect on essential oil accumulation and composition of these aromatic plants. The environmental control is modified by plant ontogeny and many other factors outside the scope of a review, such as light intensity, day length, temperature, nutrition and irrigation, intraspecific interactions, population dynamics, parasites, diseases, pest control and interspecific (weed) competition. Also harvest management seems to be very important, as well as post-harvest conservation (mainly drying) and storage of herbal raw material.

## CONCLUSIONS

The analysis of medicinal quality of some peppermint herbal teas sold in different countries confirmed that herbal drug of different origin had dissimilar phytotherapeutic quality. Considerable differences in content and composition of essential oil of tested peppermint herb teas were determined. The maximum phytotherapeutic amount of peppermint was observed in the tea supplied by a Slovak producer. In contrast, all other suppliers peppermint herb teas used a raw material of lower quality measured with use of the quantity of essential oil and the oil constituent – menthol.

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## PORÓWNANIE HERBAT Z MIĘTY PIEPRZOWEJ POD WZGLĘDEM ZAWARTOŚCI I SKŁADU OLEJKÓW ETERYCZNYCH

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### Streszczenie

Mięta pieprzowa, roślina lecznicza, której historia sięga czasów faraonów, jest współcześnie używana w ziołolecznictwie i oczywiście będzie używana w przyszłości. Ziela mięty używa się szeroko do przygotowania herbat ziołowych, jest bardzo popularna w wielu krajach, szczególnie na zachodzie Niemiec i w północnej Afryce. Ziele mięty pieprzowej jest ważnym surowcem handlowym. Roczne spożycie ziela mięty pieprzowej wynosi kilka tysięcy ton. Analiza GC suchej masy surowca różnego pochodzenia uzyskanego z herbat dostępnych na rynku ukazały istotne różnice w zawartości składników o znaczeniu leczniczym. Jakość jest ważna w przypadku użycia ziół jako surowca do produkcji herbat, leków i kosmetyków, co znajduje odbicie w różnych wynikach prowadzonych badań farmakodynamicznych.

**Słowa kluczowe:** olejki eteryczne, charakterystyka jakościowo-ilościowa, mięta pieprzowa, herbata