ESSENTIAL OIL CONTENT AS A DETERMINANT OF SENSORY FEATURES OF PEPPERMINT TEA *MENTHA PIPERITA*

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ABSTRACT

Mint (*Mentha pipperita*) has been used as medicine and food product for many years. This work report the essential oil content in 8 different samples of mint from Tricity market, and its influence on sensory features of those products. The results showed that the peppermint oil content and the sensory features as: aroma of raw material, aroma and flavour of infusion in the investigated samples varied. The higher content of mint oil determines the higher sensory evaluation of dried raw material and infusion. Also, a statistically significant effect (p = 0,005) of producer for all tested parameters and positive and significant correlation between essential oil content and sensory features were found.

Key words: peppermint, peppermint oil, sensory features

INTRODUCTION

One-component herbal tea – peppermint tea is simple herbal medicine, ordered in a pharmacy without a doctor's prescription, as well as popular beverage due to its aromatic advantages.

The quality of mint infusion is determined mainly by quality of raw-material, growing conditions, harvesting, handling and storage after harvest. These factors are directly reflected on the quantity and quality of active substances present in raw material [8].

Other factors that determine the high quality of infusion are conditions of extraction. Among these are: water temperature, the amount of water, the brewing time, the fragmentation and the amount of raw material.

The native plant is peppermint *Mentha piperita* Hudson family *Lamiaceae* formerly *Labiateae*. Peppermint is a hybrid obtained by crossing two species: *Mentha viridis L.* and *Mentha aquatica L.* [12].

Peppermint (*Mentha piperita L.*) is extensively cultivated both in tropical countries and in Europe. In Poland mainly cultivated variety is Santocka. The raw material are herbal leaves and peppermint herbs. The main and most important active ingredient in raw material is peppermint essential oil – *Oleum Menthae piperitae*, which accumulates in the leaves in an amount up to 2.9% [6, 9].

MINT ESSENTIAL OIL

Essential oils extracted from different parts of a plant are used as flavouring substances in food, fragrances in cosmetics and perfumes and other chemical products for the scenting and flavouring. Their ability to generate a flavour or/and aroma is most important.

Essential oil is one of a class volatile oils composed of a mixture of complex hydrocarbons (usually terpenes) and other chemicals extracted from a plant, usually by a method of distillation [13].

In the *Lamiaceae* (formerly *Labiatae*) family, essential oils are mainly produced in secretory structures known as glandular trichomes, of which there are two main kinds, peltate and capitate (or glandular scales and glandular hairs). The volatiles are secreted into the cuticular space where they accumulate [10].

So far, about 150 ingredients of chemical composition of mint essential oils were identified. The main ingredients are l-menthol, menthone, menthyl acetate, menthofuran and other isomers of menthol and menthone in smaller amounts [4].

Many results [5, 11] confirm the influence of factors related to the cultivation of the content of essential oils.

It was found that peppermint oil composition is varied and depends on the phase of vegetative growth of the plant. Young plant oil has a high content of terpene hydrocarbons and menthone, while in the older plant decreases the amount of menthone and the amount of l-menthol increases [4, 11].

Approximately, 2000 tons of word essential oils obtained from *Mentha* species being the second most important essential oil plants after *Citrus* species [7].

Polish Pharmacopoeia [3] recommends obtaining oil and leaves of the species *Menta piperita* (*L.*) Hudson *Labiatae*.

The objectives of this study are (1) determination of mint oil content in different mint teas from market, (2) evaluation of sensory features, such as the aroma of dried raw material, aroma and flavor of infusion, (3) evaluation of the relationship between these parameters and essential oil content in these product.

MATERIAL AND METHOD

Eight samples of peppermint tea purchased from the Tricity market in 2013 were determined. Tested herbal teas consisted of 100% of the peppermint leaves or herb. They were products of popular Polish producers: Biofix, EcoVitea, Herbapol (Zielnik Apteczny, Zielnik Polski), Malwa, Posti, Sir Roger, Vitax. 7 from 8 peppermint tea were Polish origin. Before the analysis samples were coded (numbered from 1 to 8).

Peppermint oil content
The content of peppermint oil was determined by water distillation of dried raw material at the Deryng apparatus according to Polish Pharmacopeia VI [3]. Analyses were carried out in triplicate.

Sensory analyses
Sensory analyses were made in dried raw material – aroma and in infusion aroma and flavour. Research was conducted in 10 point scale (where 1 is the weakest and 10 the strongest aroma / flavour). Sensory evaluation were taken by 10 panelists with proven high sensory sensitivity.

Statistical analyses
The data obtained was subject to analysis of variance (ANOVA). Significance of the different origin/producer and their sensory features and essential oil content was determined using STATISTICA^{TM}10 (Statsoft Inc., Tulusa, OK, USA, 2011).

In order to satisfy ANOVA assumption data was transformed, followed by Leven test. A probability value of $p<0.05$ was considered significant.

Correlation was calculated between the sensory evaluation parameters and the content of peppermint oil.

Mean values were reported along with standard deviation from replication.

RESULTS AND DISCUSSION

According to Pharmacopeia [3] pharmaceutical useful material (mint leaves or herbs) should have mint oil content on the level not less than 1.2% (v / m).

Determined content of essential oils, given in Table 1, ranged from 0.63 to 1.82%.

Only 25% of investigated samples meet the requirements of Pharmacopeia. The highest oil content was observed in sample number 1–1.82% and the lowest 0.57% in sample number 4. The analysis of variance ANOVA showed a statistically significant effect of peppermint producer on essential oil content ($F = 152,4348$, $p = 0.00$).

Table 1. Average and standard deviation of the essential oil content in investigated samples [%]

No. of sample	Essential oil content [%]
1	1.82±0.076
2	1.03±0.057
3	0.63±0.115
4	0.57±0.057
5	1.75±0.050
6	1.12±0.029
7	0.77±0,058
8	0.68±0.076

Essential oil content in the species *Menta piperita* (*L.*) determined by other authors also varied. Adaszyńska et al. [1] determined peppermint oil in the tested peppermint 'Asia' on the level of 2.1%.

The results obtained in this study are comparable to those determined by Gruszczyk [5]. The mint leaves from organic farming have mint oil content at the level of 1,25–2,30%, and from conventional one 0,75–1,89%.

The results of sensory evaluation of tested samples are shown in Table 2.

Flavour of dried raw material, aroma and flavour of the infusion were determined. It was found that the sensory characteristic of different samples of peppermint tea vary and depends on the producer.

The notes of all investigated features ranged from about 3.0 to maximum 7.8 in the 10 points scale. Results shows that among 8 different peppermint tea sample number 1 possess the higher overall rate - 7.56 points. Sample number 5 registered very similar acceptance. The lowest evaluation was determined in sample number 4 (3.4 points).

There was observed significant difference between all investigated samples.

Table. 2. Sensory evaluation of raw material and infusions of investigated peppermint tea

No. of sample	Sensory features*			
	Aroma of raw material	Aroma of infusion	Flavour of infusion	Overall average rate
1	7.3±0.675	7.8±0.919	7.6±1.265	7.56
2	3.4±1.646	4.5±0.972	2.9±0.994	3.60
3	5.1±1.370	7.1±1.912	5.9±1.449	6.03
4	3.0±1.541	4.2±1.549	3.0±1.155	3.40
5	7.1±1.449	7.1±1.792	7.5±1.080	7.23
6	6.3±1.252	4.6±0.966	5.2±0.919	5.36
7	4.4±1.646	5.7±1.703	4.8±1.398	4.96
8	3.8±1.549	3.3±1.059	3.8±1.229	3.63

* mean ± standard deviation

The results of ANOVA analysis showed also a statistically significant influence of peppermint tea variety – producer on:

−   aroma of dried raw material, (F = 15,1071, p = 0.000),
−   aroma of the infusion (F = 13,4041, p = 0.000),
−   flavour of the infusion (F = 23,5416, p = 0.000).

According to literature [2] sensory analysis of product like peppermint tea is related to the concentration of essential oil. It was observed that the higher notes in sensory evaluation (for infusions and raw material) comply with the high essential oil concentration.

Correlation analysis showed (Tab. 3) that the content of mint oil is positive and significantly correlated with sensory features (p = 0,005).

Table. 3. The correlation between sensory parameters and oil content
in investigated samples of mint tea

Parameters of samples:	Pearson's correlation coefficient
Aroma of raw material/mint oil content	0,64481
Aroma of infusion/mint oil content	0,45889
Flavour of infusion/mint oil content	0,64112

CONCLUSIONS

The obtained results showed that the peppermint oil content and the sensory features as: aroma of raw material, aroma and flavor of infusion vary between the investigated samples.

In particular, origin (producer) of peppermint tea has statistically significant influence for all examined parameters.

The essential oil content ranged from 0.63 to 1.82%. Only 2 from 8 investigated samples meet the requirements of the Pharmacopoeia, and can be recommended as a herbal medicine without a prescription.

The sensory features are significantly affected by essential oil content. The samples with the highest essential oil content obtain the highest notes in sensory analyses. All variables were positive, significantly correlated.

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