

Comprehensive Study of Volatile Compounds of Tea

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Introduction

- Tea leaves come from an evergreen shrub *Camellia sinensis*.
- According to the method of refining is distinguished five main groups of the refined types of tea: white tea, yellow tea, green tea, oolong tea, and black tea (Driem 2019).
- Tea leaves contain thousands of chemical compounds such as polyphenols, amino acids, enzymes, pigments, carbohydrates, methylxanthines, minerals, and volatiles (Gebely 2015).
- Volatile compounds make up only about 0.01 % of the weight of dry tea leaves but their complex is made up of hundreds of different substances (Kim et al. 2016, Zhang et al. 2019).
- For example, the study of Xu & Chen (2002) identified more than 600 volatile compounds in green tea.
- The content of these volatile compounds is influenced by a wide range of conditions such as cultivation, storage, or used refining process.

Results and conclusion

- The cheap teas contain a higher content of acids. It is because of the relatively high content of Palmitoleic acid and Linoleic acid in wooden particles which are a part of these teas.
- Volatiles occurring in the largest amount in all tea groups are alcohols.
- In the cheap teas was not identified Vitamin E whose highest content was found in the expensive teas.
- The substance with the highest content is Phytol. The highest content of these volatile was identified in the very expensive teas.
- By SPME method were extracted mainly volatile substances with low and medium molecular weight. For the extraction of volatiles with heavier molecular weight, the Hydrodistillation and the Soxhlet extraction methods have proved to be more suitable.



Figure 1. Very cheap green tea with a clearly visible content of woody parts, tea tree twigs



Figure 2. Green tea from the category of expensive teas

Methods

- Overall, 18 Vietnam green teas of different price categories were bought on street markets in Vietnam. (200g each)
- Teas were divided into 4 groups according to the price.

- The volatiles was extracted by the three methods; Hydrodistillation, SPME, and Soxhlet extraction.
- The volatiles was analysed by Gas chromatography–Mass spectrometry.

Price [VND/1000]*	Category
1-25	Cheap
26-65	Affordable
66-110	Expensive
110<	Very Expensive

*1000 VND = 0.044USD

Table 1. Price categories of teas analysed in this work (price per 200g)

Componds	Tea group			
	Cheap	Affordable	Expensive	Very Expensive
%total				
Alkanes	2.87	2.81	2.57	4.50
Alkenes	1.32	8.14	9.42	6.72
Alcohols	69.98	35.39	49.51	65.79
Aldehyds	4.00	6.70	6.29	1.67
Ketones	7.61	22.68	13.84	9.14
Acids	7.71	0.24	0.17	0.18
Esters	5.42	14.50	14.44	6.07
Others	1.08	9.54	3.77	5.94

Table 2. Groups of substances and their percentage representation in all price groups of analyzed teas

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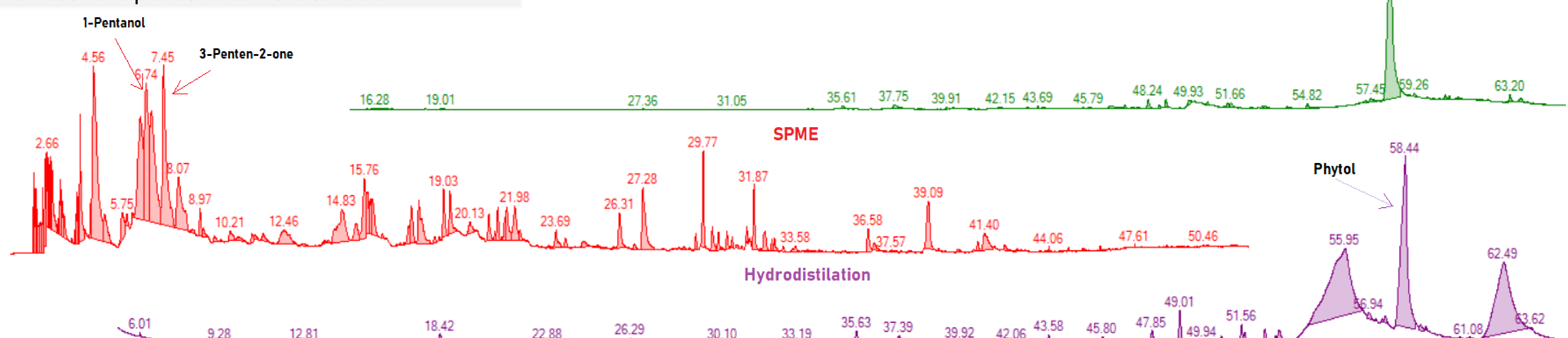


Figure 3. Different results of GC/MS analysis of tea "Trà xanh Thái Nguyên" using different extraction methods; Hydrodistillation, Soxhlet extraction, and Solid-phase microextraction (SPME)

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