



# Comparative phytochemical analysis of the essential oils of *Piper nigrum* L. from four different countries



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## Introduction

The aim of this study is to obtain, qualitative and semi-quantitative analysis of essential oil of black pepper (*Piper nigrum* L.) from various geographic origins. By comparing the obtained residues, it will determine whether and to what extent the origin affects the qualitative and quantitative composition of the individual components of the black pepper oil.

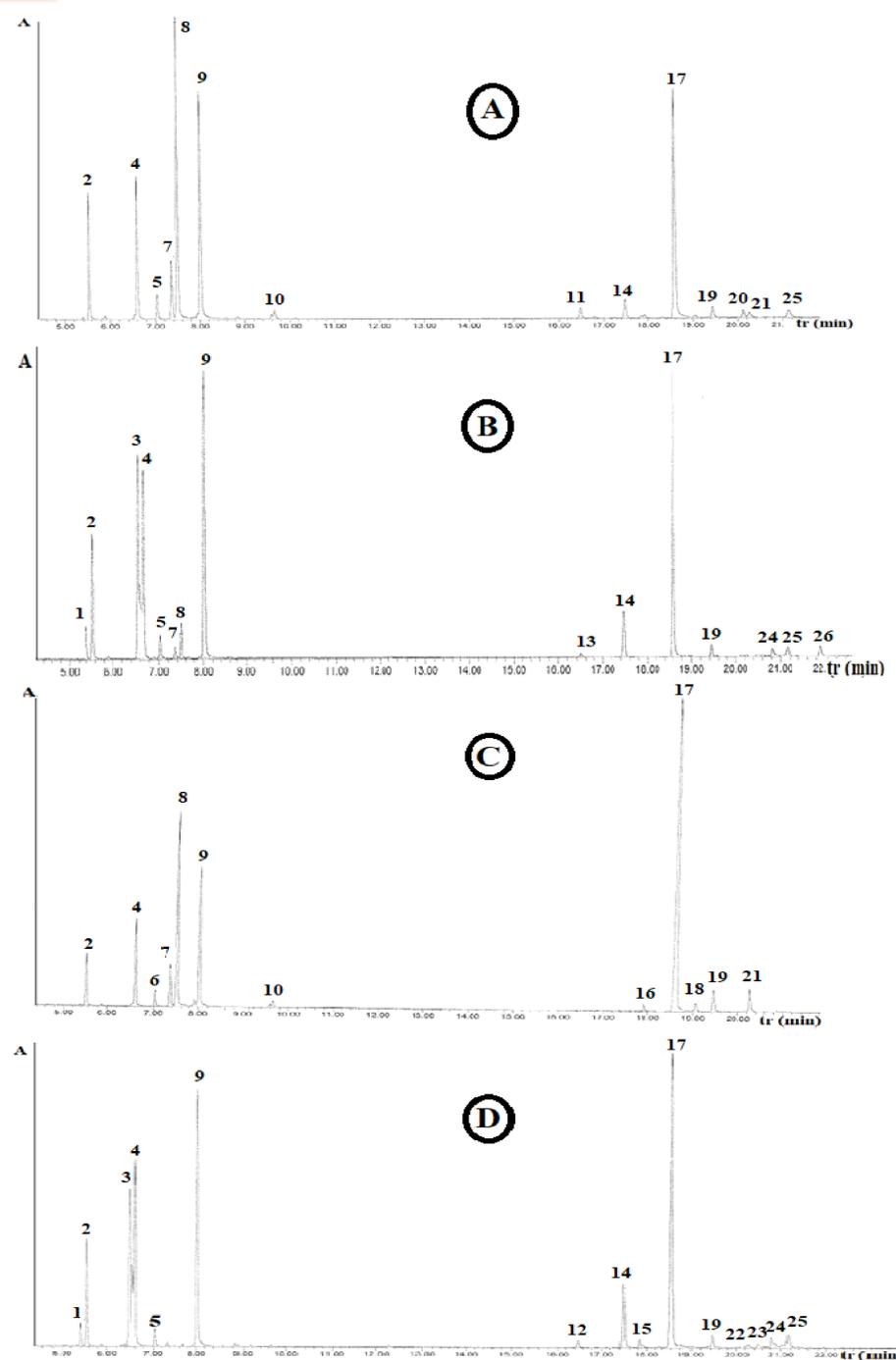
## Material and methods

Samples with a declaration of origin from Vietnam, Brazil, Indonesia, and Poland and were purchased at local stores. The essential oil is isolated by the method of distillation with water vapor from crushed fruits of black pepper. The qualitative and semi-quantitative analysis of the oil was performed by the method of gas chromatography coupled to mass spectrometry (GC-MS).

## Results

**Table 1.** Percentage distribution of identified compounds from all four samples of investigated essential oils

Compounds	% Relative abundance			
	Vietnam (A)	Brazil (B)	Indonesia (C)	Poland (D)
1. $\alpha$ -thujene	/	2.03	/	1.63
2. $\alpha$ -pinene	8.20	7.68	4.06	7.08
3. $\beta$ -phellandrene	/	14.46	/	11.43
4. $\beta$ -pinene	10.33	12.65	7.46	13.10
5. $\beta$ -terpinene	1.94	1.53	/	1.32
6. 2-norpinen	/	/	1.47	/
7. $\alpha$ -phellandrene	5.04	0.92	4.00	/
8. 3-carene	23.13	2.61	17.25	/
9. D-limonene	18.35	22.17	13.10	21.37
10. terpinolene	0.88	/	0.75	/
11. 4-carene	1.23	/	/	/
12. $\alpha$ -terpilene	/	/	/	0.68
13. $\gamma$ -pironene	/	0.56	/	/
14. $\alpha$ -copaene	1.92	4.33	/	6.45
15. $\beta$ -cubebene	/	/	/	0.77
16. $\beta$ -elemene	/	/	0.84	/
17. $\beta$ -caryophyllene	24.51	27.00	41.29	30.94
18. azulene	/	/	0.99	/
19. $\alpha$ -caryophyllene	1.13	1.08	2.49	1.28
20. germacrene D	0.76	/	/	/
21. $\alpha$ -selinene	0.58	/	2.76	/
22. $\beta$ -eudesmane	/	/	/	0.51
23. isodene	/	/	/	0.37
24. bisabolene	/	1.12	/	1.32
25. cadinene	1.16	1.22	/	1.77
26. $\gamma$ -elemene	/	0.64	/	/



**Figure 1.** Chromatograms of essential oils from A-Vietnam; B-Brasil; C-Indonesia; D-Poland;

## Conclusion

The qualitative composition of pepper oil, as well as the relative representation of individual components of the oil largely depends on the geographical origin of the drug. Differences in the qualitative and quantitative composition of essential oils of pepper can potentially reflect on the manifestation of the biological effects of the oil. The presence of active compounds such as caryophyllene, 3-carene, limonene and pinene place this oil as an important part of modern medicine.

