Extraction, Chemical Composition Analysis, Antibacterial Activity Evaluation and Perfume Formulation of Essential Oil from Wild and Commercial Cinnamomum spp.

Hathairada Vajesatja

Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

Abstract

Essential oils from commercial and wild cinnamon (Cinnamomum spp.) were obtained using hydrodistillation method. The extraction yield of commercial cinnamon essential oil was 1.107%, whereas that of wild cinnamon was 1.201%. GC–MS analysis identified 16 chemical constituents in commercial cinnamon oil, accounting for 98.86% of the total peak area, while 30 constituents were identified in wild cinnamon oil, accounting for 98.48%, based on similarity indices ≥90% with the Wiley W9N11 database. The major component in both samples was (*E*)-cinnamaldehyde, representing 84.49% in commercial cinnamon and 59.75% in wild cinnamon. The IR spectra of both essential oils showed similar characteristic patterns. Antimicrobial activity was tested using agar diffusion method by measuring the clear zones against *B. cereus* (B358, 4AC), *S. aureus, C. albicans, E. coli*, and *S. enterica*. Both essential oils effectively inhibited microbial growth; however, wild cinnamon showed stronger activity than commercial cinnamon. After 24 hours, the clear zone diameters of wild cinnamon ranged from 22.15 - 63.88 mm, while those of commercial cinnamon ranged from 17.13 - 51.05 mm. After 48 hours, the clear zone ranged from 15.60 - 57.53 mm for wild cinnamon and 12.08 - 40.30 mm for commercial cinnamon. From the satisfaction questionnaire on perfume formulations with cinnamon essential oil (n = 21), 9 participants (42.86%) preferred the perfume without cinnamon oil. Six participants (28.57%) preferred the formulation containing wild cinnamon oil, 4 participants (19.05%) preferred the formulation containing both wild and commercial cinnamon oils, and 2 participants (9.52%) preferred the formulation containing commercial cinnamon essential oil.

Introduction

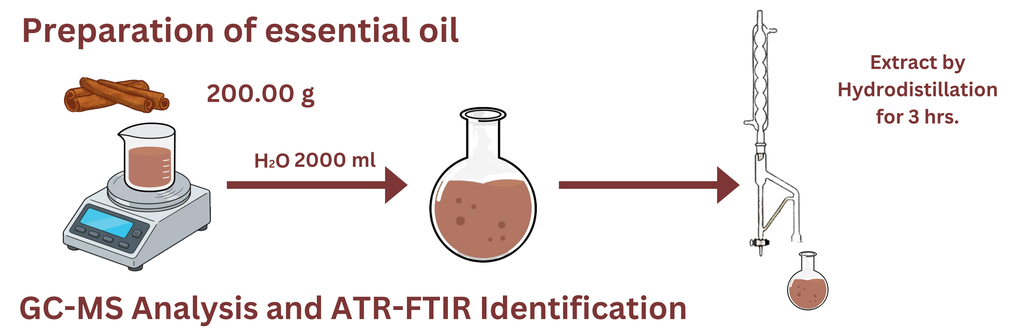
Cinnamon (Cinnamomum spp.) is a small evergreen herbal tree with a distinctive aromatic scent. It belongs to the family Lauraceae. Cinnamon is commonly native to countries such as Sri Lanka, China, and Indonesia. The bark and leaves of the plant are commonly used, particularly the bark, which is used as spice for cooking. It is often used to reduce the strong odor of meat in dishes. Cinnamon has been used in traditional medicine as a remedy for relieving flatulence, reducing fatigue, and as an ingredient in aromatic herbal medicines. It is also widely applied in the beauty industry, such as in cosmetics and perfumes.

Objective

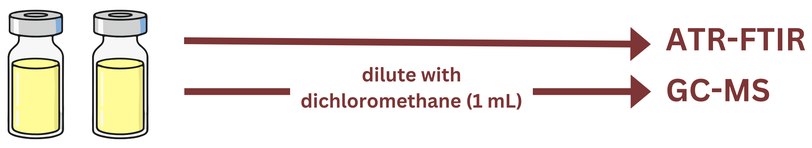
1.To extract essential oils from commercial and wild cinnamon using hydrodistillation method.
2. To analyze the chemical composition in the obtained essential oils.
3.To evaluate antibacterial activity of the essential oil.
4.To develop products from the essential oils.

Methodology

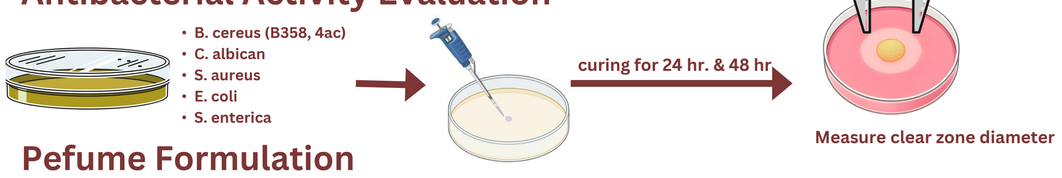
Preparation of essential oil



GC-MS Analysis and ATR-FTIR Identification



Antibacterial Activity Evaluation



Pefume Formulation



Conclusion

1.The essential oil extraction yield from commercial type was 1.107% while from wild type was 1.201%
2.The essential oil from commercial cinnamon contained 16 compound, with (*E*)-Cinnamaldehyde, *trans*-Cinnamyl acetate and *L*-Borneol were the top three components.
3.The essential oil from wild cinnamon contained 30 compound, with (*E*)-Cinnamaldehyde, *L*-alpha-pinene and *trans*-Cinnamyl acetate were the top three components.
4.The FT-IR spectrum of both essential oil had similar characterized
5.The essential oil from wild type is more effective antimicrobial agent than the commercial type.
6. After 24 hours, both cinnamon samples showed decreased antimicrobial inhibitory activity
7. From the satisfaction questionnaire on perfume formulations with cinnamon essential oil, the panelists preferred perfume formulation 4 > formulation 2 > formulation 3 > formulation 1

Result and Discussion

Extraction

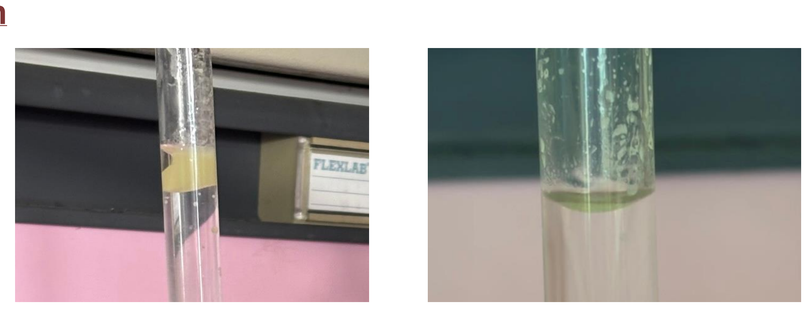


Figure 1 (a) essential oil from commertial cinnamon (b) essential oil from wild cinnamon

GC-MS Analysis

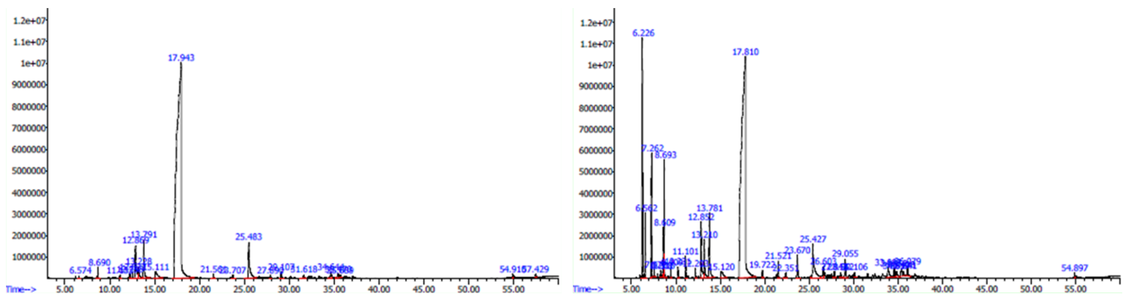


Figure 2 GC-MS Chromatogram composition of essential oil from (a) commercial cinnamon (b) wild cinnamon

ATR-FTIR identification

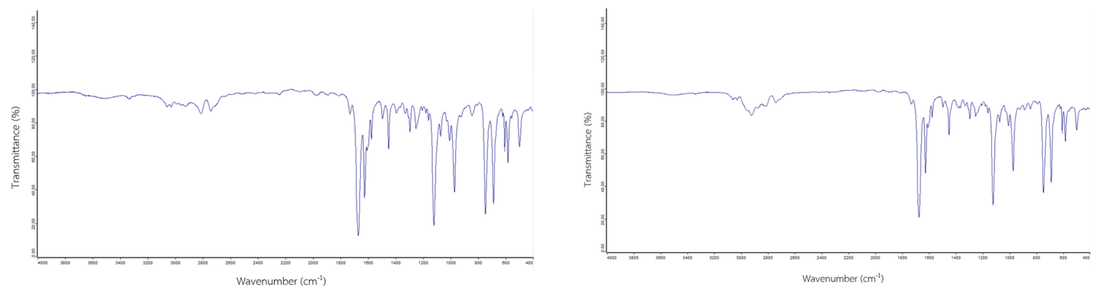


Figure 3 FT-IR Spectrum of essential oil from (a) commercial cinnamon (b) wild cinnamon

Antibacterial Activity Evaluation

Bacteria	clear zone diameter (mm)							
	24 hr.				48 hr.			
	1	2	3	average	1	2	3	average
B. cereus B358	26.30	27.20	29.00	27.50	23.30	19.60	24.00	22.30
B. cereus 4AC	24.65	24.90	24.40	24.65	18.00	14.40	14.40	15.60
C. albican	74.05	62.70	54.90	63.88	46.10	55.30	71.20	57.53
E. coli	20.00	19.25	16.35	18.53	20.50	14.85	16.40	17.25
S. enterica	29.00	28.05	30.50	29.18	23.30	24.50	26.10	24.63
S. aureus	31.85	34.60	32.90	33.12	20.50	22.25	22.45	21.73

Table 1 Clear zone diameter of essential oil from wild cinnamon

Bacteria	clear zone diameter (mm)							
	24 hr.				48 hr.			
	1	2	3	average	1	2	3	average
B. cereus B358	23.80	27.70	27.45	26.32	18.05	19.70	20.80	19.52
B. cereus 4AC	14.10	17.85	15.70	15.88	14.65	10.20	12.70	12.52
C. albican	50.70	50.00	52.45	51.05	42.45	38.15	-	40.30
E. coli	20.90	16.35	14.15	17.13	11.35	10.50	14.40	12.08
S. enterica	19.65	25.35	26.70	23.90	19.60	21.50	14.55	18.55
S. aureus	28.80	30.45	23.80	27.68	14.40	13.35	10.25	12.67

Table 2 Clear zone diameter of essential oil from commertial cinnamon

Perfume Testing

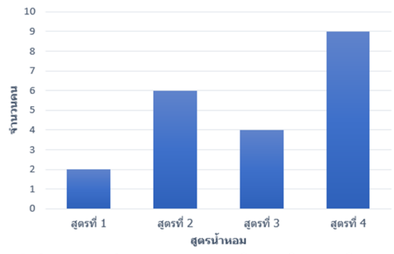


Figure 4 Comparison graph of perfume formula test

Perfume Formula	Perfume ingredient (%)			
	Frangrace base	cinnamon essential oil	Musk config	Ethyl alcohol DEB 96%
1	33.00	commertial (6.00)	4.00	57.00
2	30.39	wild (2.94)	4.90	61.76
3	35.35	commertial : wild (2.02: 2.02)	5.05	55.56
4	33.00	0.00	5.00	62.00

Table 3 Perfume Fomula

Reference

[1] Behbahani, B. A., Falah, F., Arab, F. L., Vasiee, M., & Yazdi, F. T. Chemical composition and antioxidant, antimicrobial, and antiproliferative activities of Cinnamomum zeylanicum bark essential oil. 2020;2020:8 page.
[2] Sim, J.X.F., Khazandi, M., Pi, H., Venter, H., Trott, D.J., & Deo, P. Antimicrobial effects of cinnamon essential oil and cinnamaldehyde combined with EDTA against canine otitis externa pathogens 2019;127:99-108

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