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Analysis of *Lavandula angustifolia* compounds obtained by different extraction types by GC-MS technique

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Introduction

Lavandula angustifolia is a medicinal plant with important benefits for human body, having antimicrobial and antioxidants activities. Scientifical data detalied the fact that lavender extract presented favorable characteristics to health, such as being antibacterial, antifungal, antidepressive or anticancer properties.

The aim of this study was to establish the eficiency of extraction methods by identification and determination of compounds extracted from lavender plant. It were used different types of extraction: ultrasound (50°C/2hrs) and magnetic agitation (ambient temp./24hrs), in pure ethanol and hydroalcoholic mixture (ethanol:ultrapure water=50:50 v/v).

Methodology

It was utilised a GC-MS cromatograph equipment for detection and quantitative determination of lavender compounds extracted (ex. eucalyptol, linalool, camphor, terpinenol, linalylacetat, etc), an Elite-5MS (5% diphenyl methyl polysiloxane stationary phase) column and a linalool standard. Were established the optimal GC-MS separation parameters.

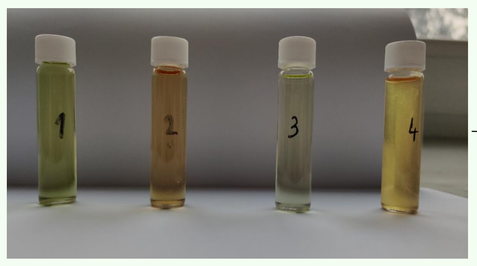
GC-MS Perkin Elmer

Gas chromatograph parameters	
Injection mode	Split
Injection port temperature	200 °C
Injection volume	2 µl
Column: - stationary phase	Elite-5MS (5% diphenyl methyl polysiloxane)
- size	60 m x 0.32 mm x 0.25 µm film thickness of stationary phase
- temp. program	60 °C (10 min.), 2 °C/min, to 180 °C, 5 min
Carrier gas	helium, constant flow = 1 mL/min
Mass-spectrometer parameters	
Ion source temperature	230 °C
GC-MS interface temperature	250 °C
Energy electrons	70 eV
Electronic Impact (EI) ion source in acquisition mode	TIC
Multiplier	500 eV
Library	NIST Mass Spectral Library

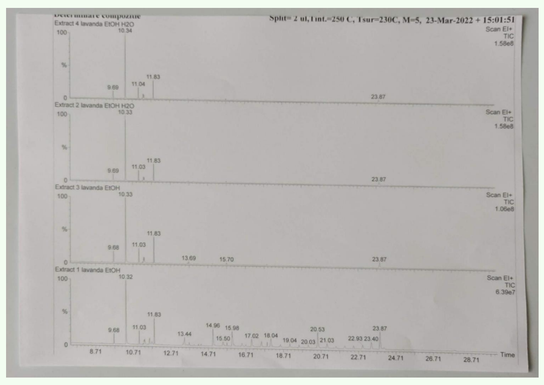
Results

1g lavender

Sample/ *Lavandula angustifolia*	Extraction method	Extraction solvent	Temp (°C)	Time (h)
L1	Magnetic agitation (M)	EtOH	20	24
L2	Magnetic agitation	Hydroalc. mixture	20	24
L3	Ultrasound bath (U)	EtOH	50	2
L4	Ultrasound bath	Hydroalc. mixture	50	2



Lavender extract solutions



GC-MS chromatogram

No.	tR (min)	Identified compounds	Conc. %			
			Extract 1	Extract 2	Extract 3	Extract 4
1	9.660	Eucalyptol	2.41	5.41	7.33	7.25
2	10.306	Linalool	17.33	51.77	45.10	51.59
3	11.011	2-Bornanone	3.44	9.22	9.73	9.45
4	11.226	Butanoic acid, hexyl ester	0.26	0.55	0.79	0.73
5	11.271	Endo-borneol	1.43	3.81	4.01	3.95
6	11.331	Terpinen-4-ol	1.58	3.40	4.30	3.77
7	11.551	Hexanedioic acid, bis(2-ethylhexyl) ester	2.52	0.49	0.29	0.55
8	11.696	Hexanedioic acid, bis(2-ethylhexyl) ester (izomer)	1.20		0.28	0.22
9	11.811	Linalyl acetate	6.03	14.18	15.11	13.51
10	13.457	Hexanedioic acid, dioctyl ester	5.37			
11	13.687	Caryophyllene	1.17	1.36	2.62	1.25
12	14.987	Hexanedioic acid, dioctyl ester (izomer)	8.55	0.31	0.40	0.32
13	15.703	Alpha-bisabolol	1.01	1.27	1.15	1.29
14	15.968	Hexanedioic acid, dioctyl ester (izomer)	8.66			
15	16.498	Hexanedioic acid, dioctyl ester (izomer)	2.03	0.70		
16	16.708	Phthalic acid, butyl undecyl ester	0.87			
17	17.018	Hexanedioic acid, dioctyl ester (izomer)	4.59			
18	17.543	Hexanedioic acid, dioctyl ester (izomer)	3.46			
19	17.849	Dibutyl phthalate	1.47	1.02	0.98	0.82
20	18.044	Hexanedioic acid, dioctyl ester (izomer)	6.02	0.24		
21	20.53	Hexanedioic acid, dioctyl ester (izomer)	9.20			
22	21.03	Hexanedioic acid, dioctyl ester (izomer)	3.01			
23	22.931	Hexanedioic acid, dioctyl ester (izomer)	2.44			
24	23.401	Hexanedioic acid, dioctyl ester (izomer)	4.54			
25	24.081	Heptadecane, 2,6,10,14-tetramethyl	1.39			

Conclusions

In conclusion, it was observed that lavender sample extracted in ethanol, thru magnetic aggitation, at room temperature is a more efficient method than the others, because it were observed more compounds (over 20) than in the others laveder extracts samples (approx. 15)

Quantitative determination of the identified compounds was performed by internal standardization with response factors considered equal to unity.

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