

Supplementary Material for the *Special Issue of Molecules*
“Essential Oils as Antimicrobial and Anti-infectious Agents II”

Comparative evaluation of essential oils from medicinal-aromatic plants of Greece: Chemical composition, antioxidant capacity and antimicrobial activity against bacterial fish pathogens

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Table S1. Concentrations of individual chemical compounds detected in the 13 essential oils of the Mediterranean medicinal-aromatic plants under investigation.

No	Compounds ^a	<u>Lamiaceae</u>									<u>Apiaceae</u>			<u>Asteraceae</u>	AI ^d	AI ^g	Identification ^e	Classification ^f
		Pennyroyal ^b	Pennyroyal ^c	Lavender	Greek oregano	Greek sage	Rosemary	Spanish oregano	Savoury	Lemon balm	Fennel	Rock samphire	Wild carrot	Chamomile				
1	α -Thujene							3.5	2.5						924	924	AI, MS	MH
2	α -Pinene					2.9	8.8	1.6	1.8			7.6	20.5		932	932	AI, MS, Co-GC	MH
3	Camphene					3.6	4						1.1		947	946	AI, MS	MH
4	Sabinene											2.9	2.3		969	969	AI, MS	MH
5	β -Pinene					5.4	7.6		1						974	974	AI, MS, Co-GC	MH
6	1-Octen-3-ol							1							981	974	AI, MS	others
7	3-Octanone			2.1											988	979	AI, MS	others
8	Myrcene			1.2	1.2	3.7	1.1	4.6	2.9				6.9		990	988	AI, MS, Co-GC	MH
9	3-Octanol	2													997	988	AI, MS	others
10	α -Terpinene							3.9	3.5						1014	1014	AI, MS	MH
11	p-Cymene				9.6		1.4	11.9	6.5			6.4			1020	1020	AI, MS, Co-GC	MH
12	Sylvestrene							1							1024	1025	AI, MS	MH
13	Limonene	1.2	3.4				1.9					53.3	7.5		1024	1024	AI, MS, Co-GC	MH
14	Eucalyptol					53.2	45								1026	1026	AI, MS, Co-GC	OM
15	<i>cis</i> -Ocimene			2.8								2.3			1032	1032	AI, MS	MH
16	<i>trans</i> -Ocimene			2.9						1.6					1044	1044	AI, MS	MH
17	γ -Terpinene				5.3			20.5	34			21.4			1054	1054	AI, MS, Co-GC	MH
18	Artemisia ketone													1	1056	1056	AI, MS	OM
19	Linalool			39.1				1.1	1.4						1099	1095	AI, MS, Co-GC	OM
20	α -Thujone					2.2									1102	1101	AI, MS, Co-GC	OM
21	1-Octen-3-yl acetate			1.3											1110	1110	AI, MS	others
22	Hexyl acetate			1											1112	1112	AI, MS	others
23	β -Thujone					2.5									1113	1112	AI, MS, Co-GC	OM
24	Camphor					8.1	11.5								1141	1141	AI, MS, Co-GC	OM
25	Citronellal									10.2					1148	1148	AI, MS	OM

26	Menthone	3.5	2.8														1148	1148	AI, MS	OM
27	Isomenthone	5.2															1162	1158	AI, MS	OM
28	Borneol					4.3											1163	1165	AI, MS, Co-GC	OM
29	Terpinen-4-ol		2.9				1										1174	1174	AI, MS, Co-GC	OM
30	α -Terpineol					1.9											1186	1186	AI, MS, Co-GC	OM
31	Citronellol								1.8								1223	1223	AI, MS	OM
32	Thymol methyl ether								4.1								1232	1232	AI, MS	OM
33	Pulegone	47.6	87.2														1233	1233	AI, MS	OM
34	Neral									6.5							1235	1235	AI, MS	OM
35	Carvacrol methyl ether							1.8									1246	1241	AI, MS	OM
36	Piperitone	2															1249	1249	AI, MS	OM
37	Linalool acetate		31.5														1254	1254	AI, MS	OM
38	Methyl citronellate									2.3							1257	1257	AI, MS	OM
39	Geranial									8.8							1264	1264	AI, MS	OM
40	<i>trans</i> -Anethole								95								1282	1282	AI, MS	OM
41	Bornyl acetate					3	1.9										1287	1287	AI, MS, Co-GC	OM
42	Lavandulyl acetate		3														1288	1288	AI, MS	OM
43	Thymol			2.1													1289	1289	AI, MS, Co-GC	OM
44	Carvacrol			72			42	32.8									1301	1298	AI, MS	OM
45	α -longipinene									5.2							1346	1350	AI, MS	SH
46	Piperitenone	33															1347	1340	AI, MS	OM
47	α -Copaene									2.4							1374	1374	AI, MS	SH
48	β -Bourbonene									1.5							1387	1387	AI, MS	SH
49	β -Caryophyllene		3.1		7.5	3.7	3.4	6.9	27.7								1417	1417	AI, MS, Co-GC	SH
50	γ -Elemene														6.1		1434	1434	AI, MS	SH
51	α -Caryophyllene				1				2.2								1446	1452	AI, MS, Co-GC	SH
52	<i>trans</i> - β -Farnesene		1.8						1.2						12.6		1454	1454	AI, MS	SH
53	γ -Muurolene								12.6								1478	1478	AI, MS	SH
54	α -Cedrene									3.7							1479	1481	AI, MS	SH
55	Germacrene D		1.8												3.8		1484	1484	AI, MS	SH
56	Isoeugenol methyl ether									14.8							1499	1500	AI, MS	OM

57	α -(<i>E,E</i>)-Farnesene	1.8		1.3	1505	1505	AI, MS	SH
58	γ -Cadinene	1.6			1513	1513	AI, MS	SH
59	δ -Cadinene	2.9			1518	1522	AI, MS	SH
60	Caryophyllene oxide	2.7			1578	1582	AI, MS, Co-GC	OS
61	β -Himachalene		21.6		1647	1652	AI, MS	SH
62	α -Cadinol	1			1652	1652	AI, MS	OS
63	α -Bisabolol oxide B			23.3	1656	1656	AI, MS	OS
64	α -Bisabolone oxide A			16.3	1684	1684	AI, MS	OS
65	Chamazulene			16.3	1730	1730	AI, MS	SH
66	α -Bisabolol oxide A			11.7	1748	1748	AI, MS	OS
67	(<i>Z</i>)-Spiroether			4.8	1879	1879	AI, MS	others

^a Compounds are listed in order of elution from an HP-5 MS capillary column

^b Pennyroyal oil from Ikaria

^c Pennyroyal oil from Thessaloniki

^d Arithmetic indices (AI) determined on a HP-5 MS capillary column using a homologous series of n-alkanes (C9-C25)

^e Identification method: AI=Arithmetic Index, MS=mass spectrum, Co-GC=Coinjection with authentic compound

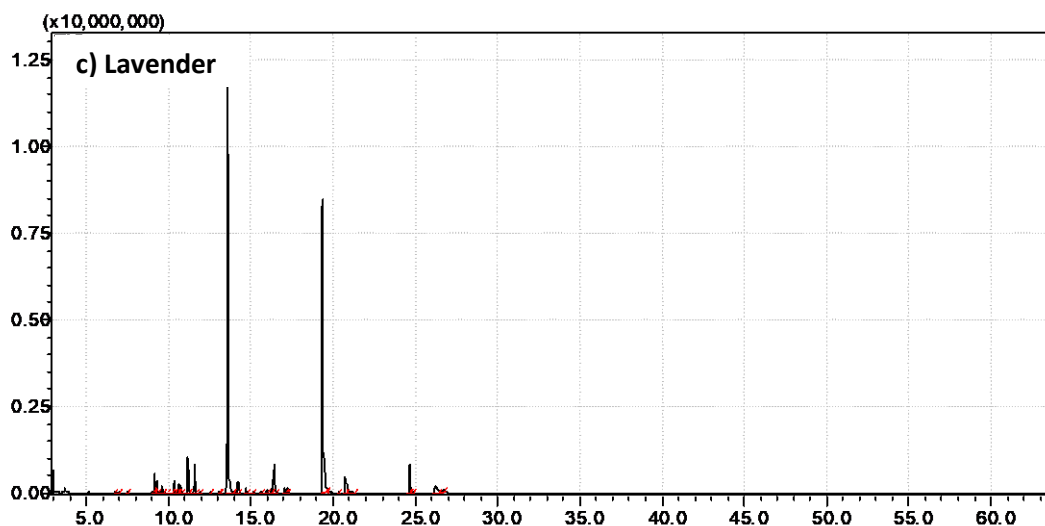
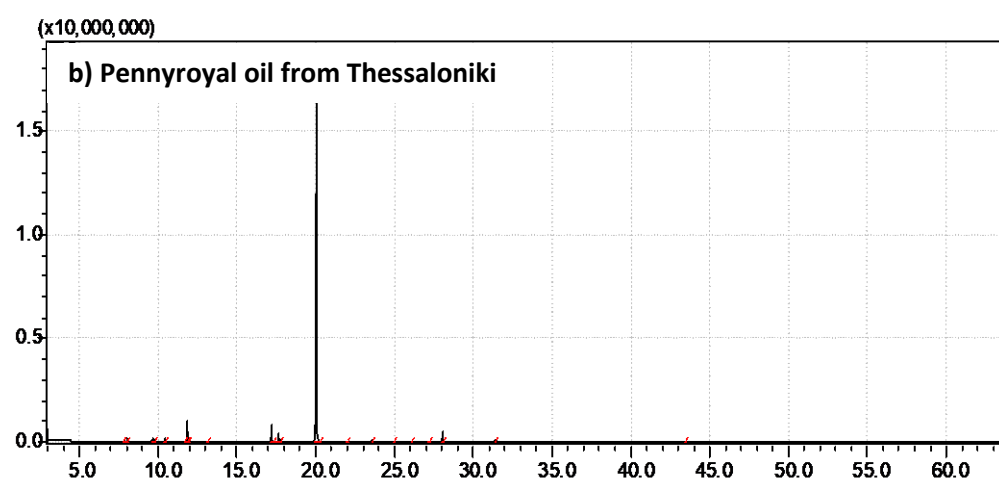
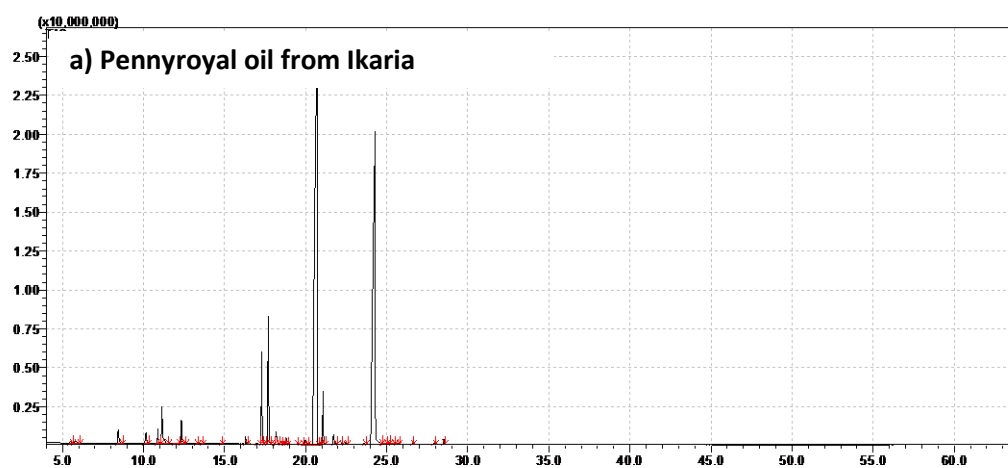
^f MH denotes monoterpene hydrocarbons, OM denotes oxygenated monoterpenes, SH denotes sesquiterpene hydrocarbons and OS denotes oxygenated sesquiterpenes

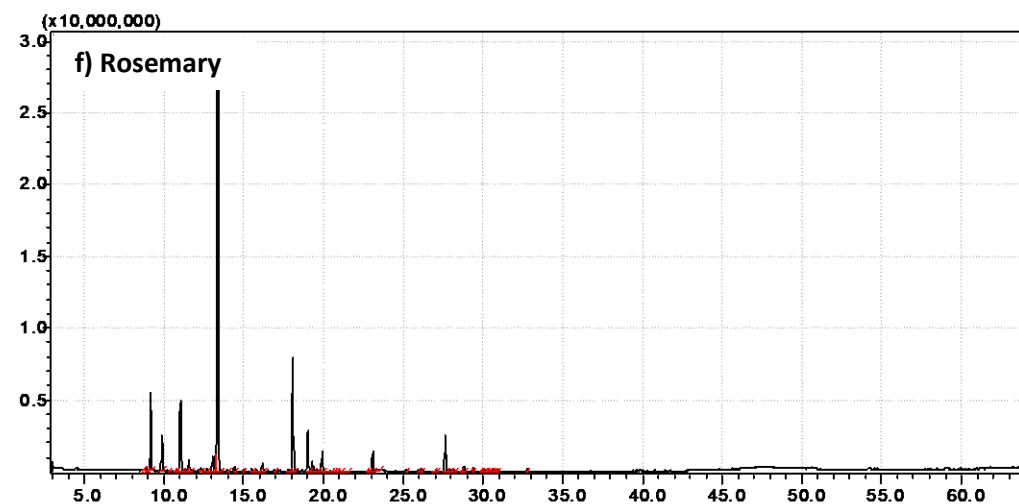
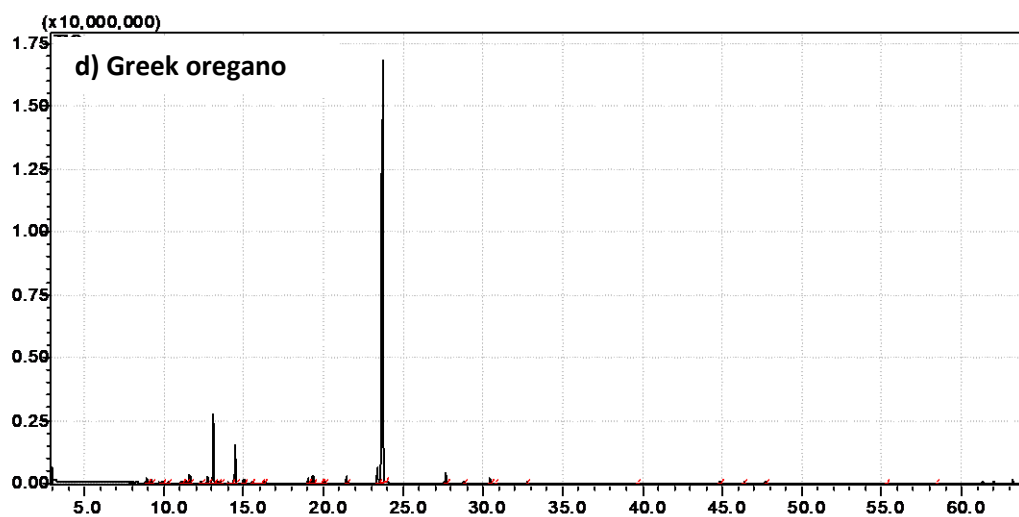
^g Arithmetic indices (AI) from literature data

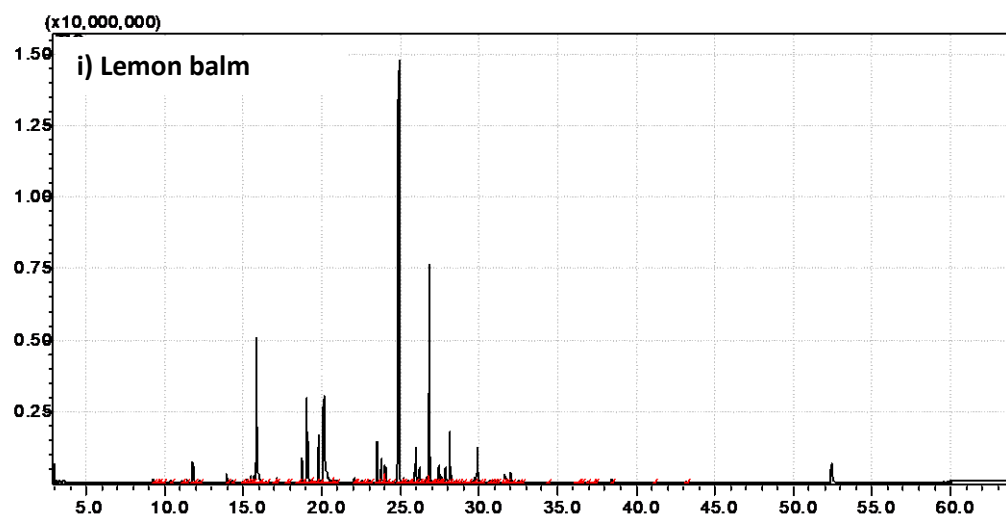
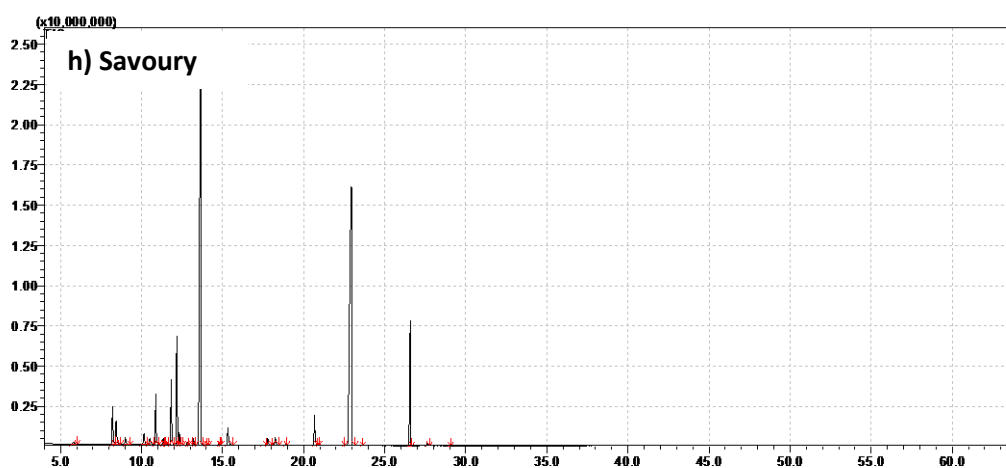
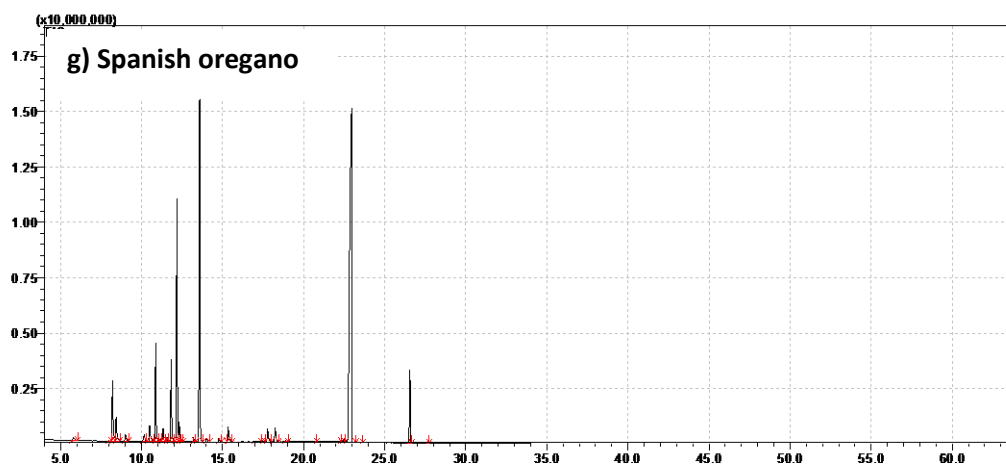
Table S2. Comparison of the major components detected in each essential oil of the studied Mediterranean medicinal-aromatic plants with those reported in the literature.

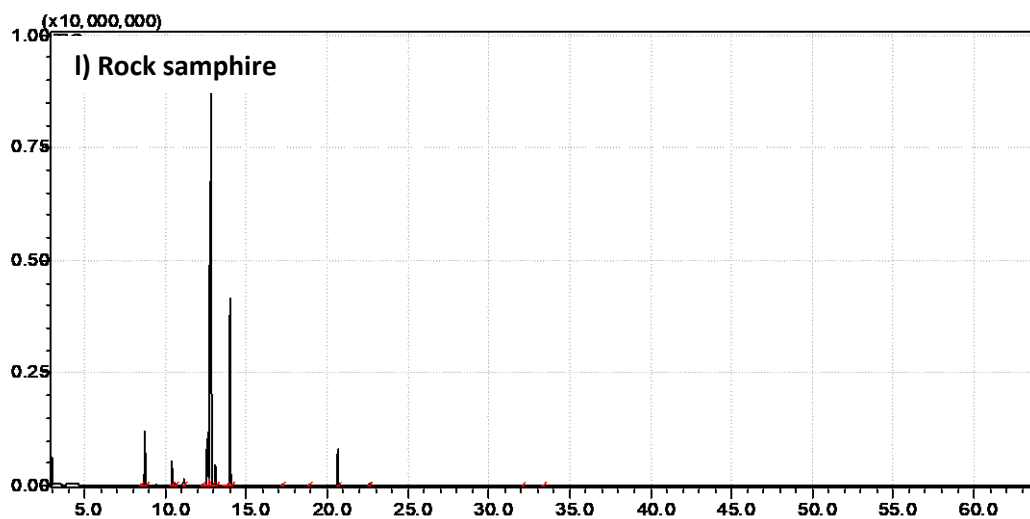
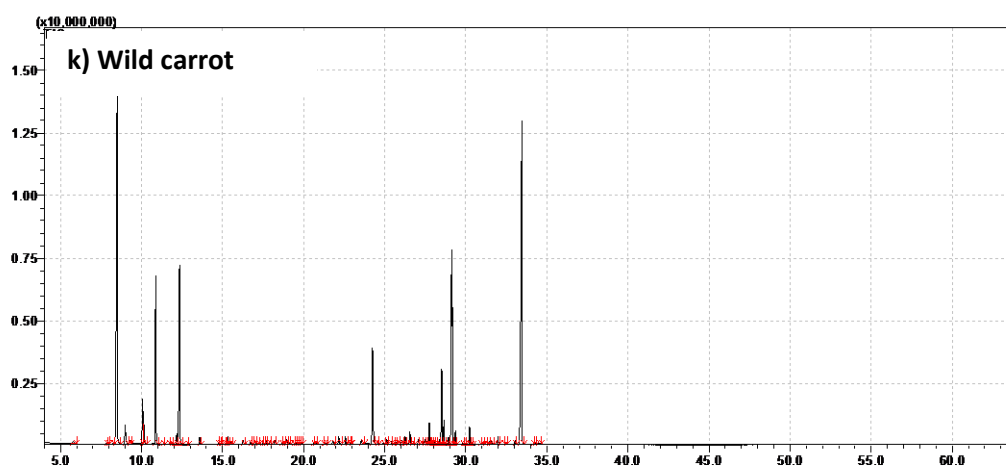
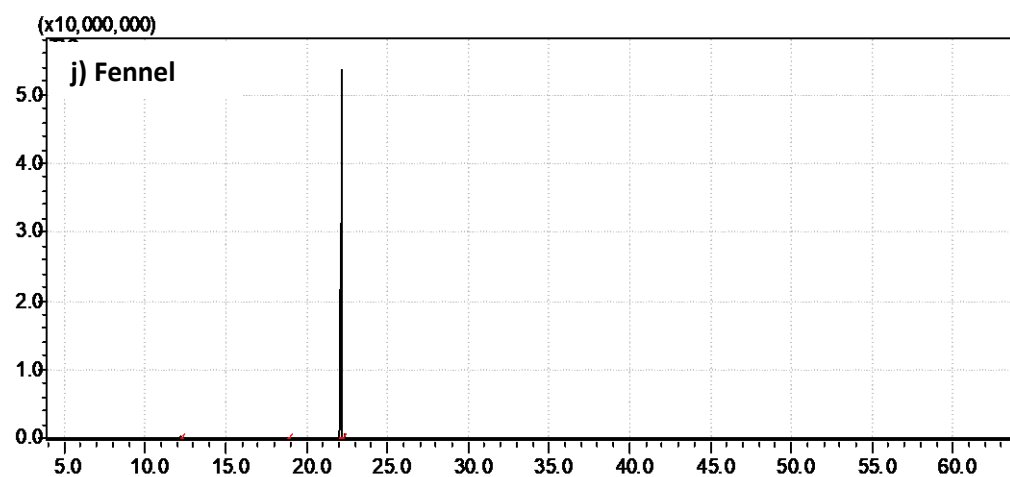
Common plant name	Compound	Literature
Pennyroyal	pulegone (69.22%); menthone (18.98%)	[1]
	pulegone (40.98%); menthone (21.164%)	[2]
	pulegone (19.89%); eucalyptol (19.38%); piperitenone (15.14%)	[3]
	pulegone (47.6%-87.2%); piperitenone (n.d.-33%)	<i>present study</i>
Lavender	linalool acetate (37.63%); linalool (36.26%)	[4]
	linalool acetate (30.99%); linalool (23.13%)	[5]
	linalool (30.5%-39.8%); linalool acetate (26.7%-37.9%)	[6]
	linalool (39.1%); linalool acetate (31.5%)	<i>present study</i>
Greek oregano	carvacrol (2.3%-93.8%); thymol (0.2%-90.2%); γ -terpinene (0.1%-16.4%); p-cymene (2.2%-15.8%)	[7]
	thymol (45.22%); carvacrol (33.05%); p-cymene (7.35%)	[8]
	carvacrol (1.7%-69.6%); thymol (0.2%-42.8%); p-cymene (17.3%-51.3%);	[9]
	carvacrol (72%); p-cymene (9.6%); γ -terpinene (5.3%)	<i>present study</i>
Greek sage	eucalyptol (46.0%-58.9%); camphor (0.7%-5.8%)	[10]
	eucalyptol (78%); α -thujone (4.2%)	[11]
	eucalyptol (43.10%); camphor (18.34%)	[8]
	eucalyptol (53.2%); camphor (8.1%)	<i>present study</i>
Rosemary	eucalyptol (48.3%-58.7%); borneol (8.8%-10.4%); a-pinene (7.9%-9.9%)	[10]
	eucalyptol (88.9%); a-pinene (2.7%); camphor (2.4%)	[11]
	a-pinene (23.55%); camphor (22.03%); eucalyptol (21.36%)	[12]
	a-pinene (13.7%-24.6%); bornyl acetate (11.3%-17.0%); verbenone (4.4%-24.9%)	[13]
	eucalyptol (45.0%); camphor (11.5%); a-pinene (8.8%)	<i>present study</i>
Spanish oregano	carvacrol (66.2%-75.2%); γ -terpinene (3.4%-11.2%); p-cymene (7.3%-8.4%)	[14]
	carvacrol (65.2%); p-cymene (12.28%); γ -terpinene (5.62%)	[12]
	carvacrol (74.27%-75.51%); p-cymene (7.29%-9.10%); γ -terpinene (4.14%-4.83%)	[15]
	carvacrol (42%); γ -terpinene (20.5%); p-cymene (11.9%)	<i>present study</i>
Savoury	γ -terpinene (34.06%); carvacrol (23.07%); thymol (18.82%); p-cymene (7.58%)	[16]

	thymol (57.3%-64%); γ -terpinene (7.2%-9.8%); p-cymene (6.3%-9.8%)	[17]
	carvacrol (5.2%-66.5%); thymol (0.1%-65.6%); γ -terpinene (4.4%-22.6%); p-cymene (5.5%-14.8%)	[18]
	γ -terpinene (34%); carvacrol (32.8%); p-cymene (6.5%)	<i>present study</i>
Lemon balm	geranial (44.2%); neral (30.2%); citronellal (6.3%)	[19]
	(E)-citral (37.2%); neral (23.9%); citronellal (20.3%)	[20]
	β -caryophyllene (27.7%); γ -muurolene (12.6%); citronellal (10.2%)	<i>present study</i>
Fennel	trans-anethole (68.53%); chavicol methyl ether (10.42%)	[21]
	trans-anethole (70.13%-76.37%); fenchone (10.04%-14.17%)	[22]
	trans-anethole (81.63%-87.85%); chavicol methyl ether (4.19%-5.53%)	[23]
	trans-anethole (95%)	<i>present study</i>
Wild carrot	α -pinene (7.05%-51.23%); sabinene (2.68%-36.39%); α -muurolene (0.24%-10.97%)	[24]
	carotol (66.78%); daucene (8.74%)	[25]
	isoeugenol methyl ether (33.0%); α -pinene (24.9%); elemicin (11.4%)	[26]
	β -himachalene (21.6%); α -pinene (20.5%); isoeugenol methyl ether (14.8%)	<i>present study</i>
Rock samphire	limonene (57.5%-74.2%); sabinene (8.1%-13.4%); γ -terpinene (4.6%-13.8%)	[27]
	γ -terpinene (22.54%-43.29%); methyl thymyl ether (20.13%-34.29%); dillapiol (2.39%-41.35%); p-cymene (4.83%-22.08%)	[28]
	sabinene (26.9%); limonene (24.2%); γ -terpinene (19.3%)	[29]
	limonene (53.3%); γ -terpinene (21.4%); α -pinene (7.6%)	<i>present study</i>
Chamomile	α -bisabolol oxide B (15.58%-35.63%); α -bisabolol oxide A (17.46%-35.38%); chamazulene (15.83%-19.27%); 8-isobutyryloxy isobornyl isobutyrate (11.15%-14.03%)	[30]
	trans- β -farnesene (29.8%); (E,E)- α -farnesene (9.3%); α -bisabolol oxide A (7.0%); chamazulene (6.4%)	[31]
	trans- β -farnesene (24.19%); guaiazulene (10.57%); α -bisabolol oxide A (10.21%); α -farnesene (8.70%)	[32]
	α -bisabolol oxide B (23.3%); α -bisabolone oxide A (16.3%); chamazulene (16.3%); trans- β -farnesene (12.6%); α -bisabolol oxide A (11.7%)	<i>present study</i>









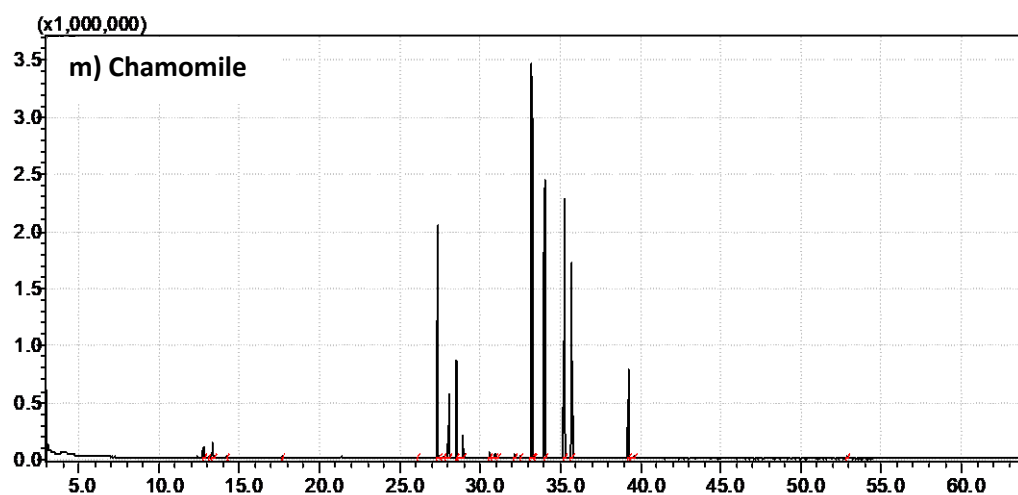


Figure S1. GC-MS chromatograms of a) pennyroyal from Ikaria, b) pennyroyal from Thessaloniki, c) lavender, d) Greek oregano, e) Greek sage, f) rosemary, g) Spanish oregano, h) savoury, i) lemon balm, j) fennel, k) wild carrot, l) rock samphire, and m) chamomile essential oils analyzed in the present study. Red colored arrows represent the identified peaks.

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