

Date : August 01, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19G31-PTH01-1-SCC

Customer identification : Lime - LA010795R

Type : Essential oil

Source : *Citrus aurantifolia*

Customer : Plant Therapy

ANALYSIS

Method: PC-PA-014 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Lindsay Girard, B. Sc.

Analysis date : August 01, 2019

Checked and approved by :

Alexis St-Gelais, M. Sc., chimiste 2013-174

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PHYSICOCHEMICAL DATA

Physical aspect: Dark yellowish green liquid

Refractive index: 1.4826 ± 0.0003 (20 °C)

ISO 3809:2004 - OIL OF LIME, COLD-PRESSED, MEXICAN TYPE - TYPE A

Compound	Min. %	Max. %	Observed %	Complies?
β-Bisabolene	1.0	1.5	1.8	No
(3E,6E)-α-Farnesene	0.75	1.75	0.82	Yes
trans-α-Bergamotene	1.0	1.9	1.2	Yes
β-Caryophyllene	0.5	1.5	0.8	Yes
Geranyl acetate	0.2	0.4	0.2	Yes
Neryl acetate	0.10	0.35	0.61	No
Geranial	2.0	3.0	2.4	Yes
Neral	1.2	2.0	1.5	Yes
Decanal	0.05	0.30	0.11	Yes
α-Terpineol	0.2	0.6	0.2	Yes
Terpinen-4-ol	0.2	0.6	0.1	No
γ-Terpinene	8.0	11.0	11.0	Yes
Limonene	42.0	50.0	47.0	Yes
para-Cymene		0.5	0.3	Yes
Myrcene	1.0	2.0	1.3	Yes
β-Pinene	18.0	24.0	18.5	Yes
Sabinene	1.8	4.0	2.1	Yes
α-Pinene	2.0	3.0	2.0	Yes
Refractive index	1.4820	1.4860	1.4826	Yes

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil marginally does not comply with the ISO standard for cold-pressed type A lime oil.

ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Classe
Bornylene	0.01	Monoterpene
Tricyclene	0.01	Monoterpene
α -Thujene	0.43	Monoterpene
α -Pinene	2.01	Monoterpene
Camphene	0.09	Monoterpene
Thuja-2,4(10)-diene	tr	Monoterpene
β -Pinene	18.49	Monoterpene
Sabinene	2.07	Monoterpene
3-Methyl-3-cyclohexenone	tr	Aliphatic ketone
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Myrcene	1.26	Monoterpene
Octanal	0.02	Aliphatic aldehyde
α -Phellandrene	0.05	Monoterpene
Δ^3 -Carene	tr	Monoterpene
α -Terpinene	0.24	Monoterpene
para-Cymene	0.25	Monoterpene
Limonene	46.96	Monoterpene
1,8-Cineole	0.03*	Monoterpenic ether
β -Phellandrene	[0.03]*	Monoterpene
(Z)- β -Ocimene	0.10	Monoterpene
(E)- β -Ocimene	0.24	Monoterpene
γ -Terpinene	11.01	Monoterpene
cis-Sabinene hydrate	0.04	Monoterpenic alcohol
Terpinolene	0.50	Monoterpene
trans-Sabinene hydrate	0.04	Monoterpenic alcohol
Linalool	0.12	Monoterpenic alcohol
Nonanal	0.02	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol
cis-Limonene oxide	0.01	Monoterpenic ether
1-Terpineol	0.02	Monoterpenic alcohol
Citronellal	0.04	Monoterpenic aldehyde
Borneol	0.01	Monoterpenic alcohol
α -Phellandren-8-ol	0.02	Monoterpenic alcohol
(E)-Ocimenol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.09	Monoterpenic alcohol
para-Cymen-8-ol	0.02	Monoterpenic alcohol
α -Terpineol	0.19	Monoterpenic alcohol
γ -Terpineol	0.01	Monoterpenic alcohol
Decanal	0.11	Aliphatic aldehyde
2,3-Epoxyneral?	0.02	Monoterpenic aldehyde
Nerol	0.09	Monoterpenic alcohol
2,3-Epoxygeranial?	0.04	Monoterpenic aldehyde
Neral	1.46	Monoterpenic aldehyde
Geraniol	0.04	Monoterpenic alcohol
trans-Ascaridole glycol	0.03	Monoterpenic alcohol
Geranial	2.36	Monoterpenic aldehyde
Unknown	0.02	Oxygenated monoterpene

<i>cis</i> -Ascaridole glycol	0.01	Monoterpenic alcohol
Undecanal	0.02	Aliphatic aldehyde
δ -Elemene	0.27	Sesquiterpene
Citronellyl acetate	0.02	Monoterpenic ester
Neryl acetate	0.61	Monoterpenic ester
Geranyl acetate	0.19	Monoterpenic ester
β -Elemene	0.18	Sesquiterpene
Dodecanal	0.08	Aliphatic aldehyde
β -Caryophyllene	0.77	Sesquiterpene
<i>cis</i> - α -Bergamotene	0.14	Sesquiterpene
γ -Elemene	0.05	Sesquiterpene
<i>trans</i> - α -Bergamotene	1.24	Sesquiterpene
α -Humulene	0.12	Sesquiterpene
β -Santalene	0.01	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.19	Sesquiterpene
Germacrene D	0.18	Sesquiterpene
β -Selinene	0.04	Sesquiterpene
<i>trans</i> - β -Bergamotene	0.01	Sesquiterpene
α -Selinene	0.06	Sesquiterpene
(<i>Z</i>)- α -Bisabolene	0.11	Sesquiterpene
(<i>Z</i>)- γ -Bisabolene	0.09	Sesquiterpene
β -Bisabolene	1.75	Sesquiterpene
(3 <i>E</i> ,6 <i>E</i>)- α -Farnesene	0.82	Sesquiterpene
δ -Cadinene	0.05	Sesquiterpene
(<i>E</i>)- α -Bisabolene	0.04	Sesquiterpene
Germacrene B	0.37	Sesquiterpene
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Caryophyllene oxide	0.03	Sesquiterpenic ether
γ -Eudesmol	0.04	Sesquiterpenic alcohol
Unknown	0.01	Sesquiterpenic alcohol
Unknown	0.06	Oxygenated sesquiterpene
Unknown	0.05	Oxygenated sesquiterpene
α -Bisabolol	0.08	Sesquiterpenic alcohol
Herniarin	0.17	Coumarin
Myristic acid	0.15	Aliphatic acid
Citropten	0.24	Furanocoumarin
Palmitic acid	0.07	Aliphatic acid
Bergapten	0.10	Furanocoumarin
Linoleic acid	0.04	Aliphatic acid
<i>cis</i> -Vaccenic acid?	0.03	Aliphatic acid
Stearic acid	0.04	Aliphatic acid
Isopimpinellin	0.15	Furanocoumarin
Oxypeucedanin	0.01	Furanocoumarin
Heraclenin	0.10	Furanocoumarin
Acetone	tr	Aliphatic ketone
Consolidated total	97.37%	

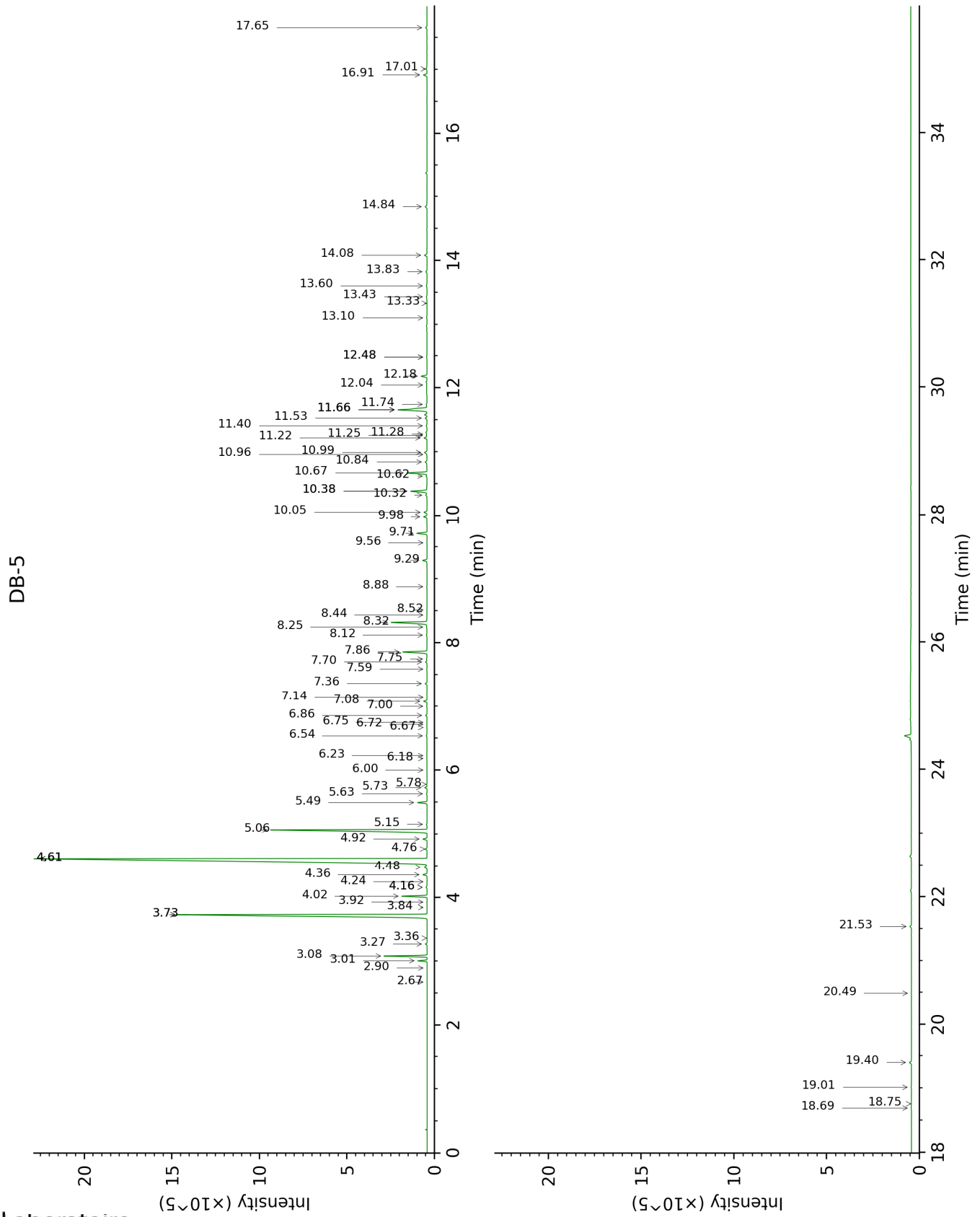
*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total
tr: The compound has been detected below 0.005% of total signal.

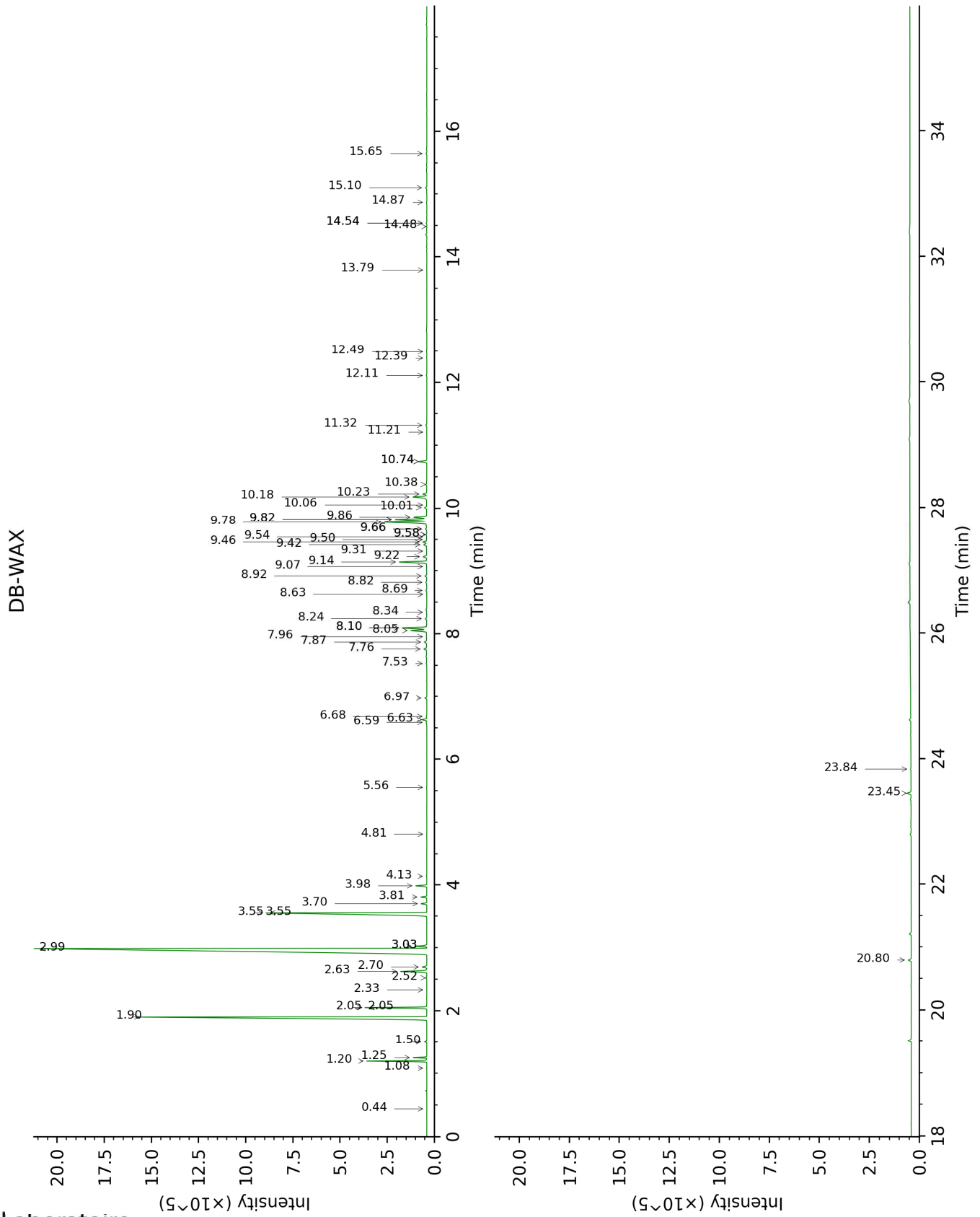
Note: no correction factor was applied

About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm is set to prioritize data from the most standard DB-5 column, and smallest values so as to avoid overestimating individual content. This process is semi-automatic. Advanced users are invited to consult the "Full analysis data" table after the chromatograms in this report to access the full untreated data and perform their own calculations if needed.

Unknowns: Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

This page was intentionally left blank. The following pages present the complete data of the analysis.





FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Bornylene	2.68	903	0.01			
Tricyclene	2.90	918	0.01	1.08	971	0.01
α -Thujene	3.01	925	0.43	1.25	1001	0.44
α -Pinene	3.08	930	2.01	1.20	992	2.05
Camphene	3.27	942	0.09	1.50	1027	0.09
Thuja-2,4(10)-diene	3.36	948	tr	2.05*	1085	2.43
β -Pinene	3.73*	973	20.56	1.90	1069	18.49
Sabinene	3.73*	973	[20.56]	2.05*	1085	[2.43]
3-Methyl-3-cyclohexenone	3.84	980	tr			
6-Methyl-5-hepten-2-one	3.92	986	0.01	4.81	1302	0.01
Myrcene	4.02	992	1.26	2.63	1135	1.29
Octanal	4.16*	1001	0.06	4.13	1253	0.02
α -Phellandrene	4.16*	1001	[0.06]	2.52	1126	0.05
Δ^3 -Carene	4.24	1006	tr	2.33	1111	0.01
α -Terpinene	4.36	1014	0.24	2.70	1140	0.25
para-Cymene	4.48	1021	0.25	3.81	1228	0.27
Limonene	4.61*	1030	46.99	2.99	1164	46.96
1,8-Cineole	4.61*	1030	[46.99]	3.03*	1167	0.47
β -Phellandrene	4.61*	1030	[46.99]	3.03*	1167	[0.47]
(Z)- β -Ocimene	4.76	1039	0.10	3.55*	1209	11.20
(E)- β -Ocimene	4.92	1049	0.24	3.70	1220	0.26
γ -Terpinene	5.06	1058	11.01	3.55*	1209	[11.20]
cis-Sabinene hydrate	5.15	1064	0.04	6.59	1431	0.06
Terpinolene	5.49	1085	0.50	3.98	1242	0.51
trans-Sabinene hydrate	5.63	1094	0.04	7.53	1502	0.04
Linalool	5.73	1100	0.12	7.76	1520	0.15
Nonanal	5.78	1103	0.02	5.56	1356	0.02
trans-para-Mentha-2,8-dien-1-ol	6.00	1118	0.02	8.63	1587	0.01
cis-Limonene oxide	6.18	1130	0.01			
1-Terpineol	6.23	1133	0.02	7.96	1535	0.01
Citronellal	6.54	1153	0.04	6.68	1438	0.04
Borneol	6.67	1161	0.01	9.50	1657	0.02
α -Phellandren-8-ol	6.72	1164	0.02	9.82*	1684	1.77
(E)-Ocimenol	6.75	1166	0.01			
Terpinen-4-ol	6.86	1174	0.09	8.24	1557	0.08
para-Cymen-8-ol	7.00	1183	0.02	11.21	1801	0.02
α -Terpineol	7.08	1188	0.19	9.42	1651	0.21
γ -Terpineol	7.14	1192	0.01	9.54	1661	0.01

Decanal	7.36	1207	0.11	6.97	1460	0.10
2,3-Epoxyneral?	7.59	1223	0.02			
Nerol	7.70	1230	0.09	10.74*	1761	0.45
2,3-Epoxygeranial?	7.75	1234	0.04			
Neral	7.86	1241	1.46	9.14	1628	1.49
Geraniol	8.12	1259	0.04	11.32	1811	0.07
<i>trans</i> -Ascaridole glycol	8.25	1268	0.03	13.79	2038	0.01
Geranial	8.32	1273	2.36	9.78	1680	2.36
Unknown [m/z 95, 67 (45), 41 (42), 110 (42), 43 (41), 59 (36)]	8.44	1281	0.02	12.11	1881	0.03
<i>cis</i> -Ascaridole glycol	8.52	1287	0.01	14.48	2104	0.01
Undecanal	8.88	1307	0.02	8.34	1565	0.02
δ -Elemene	9.29	1336	0.27	6.63	1434	0.26
Citronellyl acetate	9.56	1355	0.02	9.07	1622	0.01
Neryl acetate	9.72	1366	0.61	9.86	1687	0.74
Geranyl acetate	9.98	1385	0.19	10.23	1718	0.21
β -Elemene	10.05	1390	0.18	8.10*†	1546	[2.19]
Dodecanal	10.32	1409	0.08	9.66*	1671	0.07
β -Caryophyllene	10.38*	1414	1.05	8.10*†	1546	[2.19]
<i>cis</i> - α -Bergamotene	10.38*	1414	[1.05]	7.87	1528	0.14
γ -Elemene	10.62	1431	0.05	8.69	1592	0.05
<i>trans</i> - α -Bergamotene	10.67	1435	1.24	8.06†	1542	2.19
α -Humulene	10.84	1448	0.12	8.92	1610	0.10
β -Santalene	10.96	1457	0.01	8.82	1602	0.08
(<i>E</i>)- β -Farnesene	10.99	1459	0.19	9.22	1635	0.23
Germacrene D	11.22	1476	0.18	9.46	1654	0.21
β -Selinene	11.25	1479	0.04	9.58*	1664	0.05
<i>trans</i> - β -Bergamotene	11.28	1480	0.01	9.31	1642	0.01
α -Selinene	11.40	1490	0.06	9.58*	1664	[0.05]
(<i>Z</i>)- α -Bisabolene	11.53	1499	0.11	10.01	1699	0.13
(<i>Z</i>)- γ -Bisabolene	11.66*†	1509	2.66	9.66*	1671	[0.07]
β -Bisabolene	11.66*†	1509	[2.66]	9.82*	1684	[1.77]
(3 <i>E</i> ,6 <i>E</i>)- α -Farnesene	11.66*†	1509	[2.66]	10.18	1714	0.82
δ -Cadinene	11.74	1516	0.05	10.06	1703	0.01
(<i>E</i>)- α -Bisabolene	12.04	1540	0.04	10.38	1730	0.05
Germacrene B	12.18	1550	0.37	10.74*	1761	[0.45]
Caryophyllene oxide isomer	12.48*	1574	0.04	12.39	1906	0.01
Caryophyllene	12.48*	1574	[0.04]	12.49	1915	0.03

oxide						
γ-Eudesmol	13.10	1624	0.04	14.54*	2110	0.04
Unknown						
cadinol analog						
II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109)40)... 204 (35), 222 (2)]	13.33	1643	0.01	14.87	2143	0.03
Unknown [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]	13.43	1651	0.06	14.54*	2110	[0.04]
Unknown [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222]	13.60	1666	0.05	15.65	2222	0.05
α-Bisabolol	13.83	1684	0.08	15.10	2166	0.09
Herniarin	14.08	1705	0.17	20.80	2811	0.18
Myristic acid	14.84	1771	0.15			
Citropten	16.91	1960	0.24	23.45	3166	0.26
Palmitic acid	17.01	1969	0.07			
Bergapten	17.65	2031	0.10			
Linoleic acid	18.69	2135	0.04	23.84	3220	0.02
cis-Vaccenic acid?	18.75	2142	0.03			
Stearic acid	19.01	2169	0.04			
Isopimpinellin	19.40	2209	0.15			
Oxypeucedanin	20.49	2327	0.01			
Heraclenin	21.53	2445	0.10			
Acetone				0.44	786	tr
Total identified		97.36%			97.74%	
Total reported		97.49%			97.85%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total

†: Peaks apexes were resolved, but peaks overlapped and were summed for analysis

tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

R.T.: Retention time (minutes)

R.I.: Retention index