

Date : August 07, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19G31-PTH02-1-SCC

Customer identification : Lime Distilled - LL010495R

Type : Essential oil

Source : *Citrus aurantifolia* ct. Distilled

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 05, 2019

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid

Refractive index: 1.4759 ± 0.0003 (20 °C)

ISO 3519:2006 - OIL OF LIME, DISTILLED, MEXICAN TYPE

Compound	Min. %	Max. %	Observed %	Complies?
β-Bisabolene	1.0	1.5	1.0	Yes
(3E,6E)-α-Farnesene	0.6	0.9	0.5	No
trans-α-Bergamotene	0.5	0.9	0.5	Yes
β-Caryophyllene	0.4	0.8	0.3	No
γ-Terpineol	0.7	1.4	1.0	Yes
α-Terpineol	6.0	8.0	6.7	Yes
Borneol	0.5	0.8	0.4	No
endo-Fenchol	0.4	0.8	0.5	Yes
γ-Terpinene	10.0	13.0	12.7	Yes
Limonene	36.0	46.0	46.5	No
para-Cymene	1.5	2.8	2.0	Yes
Myrcene	1.1	1.5	1.2	Yes
β-Pinene	1.0	3.0	2.2	Yes
Sabinene	0.1	0.3	0	No
α-Pinene	0.8	1.3	1.1	Yes
Refractive index	1.4740	1.4770	1.4759	Yes

CONCLUSION

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

ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

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

Identification	%	Classe
Acetone	tr	Aliphatic ketone
Ethanol	0.04	Aliphatic alcohol
Toluene	0.02	Simple phenolic
1-Methylcyclohexa-1,3-diene	0.09	Alkene
3-Methylenecyclohexadiene	0.01	Alkene
Cyclofenchene	0.01	Monoterpene
Nonane	0.03	Alkane
Tricyclene	0.02	Monoterpene
α -Thujene	0.02	Monoterpene
α -Pinene	1.13	Monoterpene
α -Fenchene	0.16	Monoterpene
Camphene	0.43	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
Geranic oxide	0.02	Monoterpenic ether
Sabinene	0.02	Monoterpene
β -Pinene	2.15	Monoterpene
3-Methyl-3-cyclohexenone	0.02	Aliphatic ketone
6-Methyl-5-hepten-2-one	0.02	Aliphatic ketone
<i>trans</i> -Dehydroxylinalool oxide	0.04	Monoterpenic ether
Myrcene	1.20	Monoterpene
Octanal	0.18	Aliphatic aldehyde
α -Phellandrene	0.34	Monoterpene
Δ^3 -Carene	0.01	Monoterpene
α -Terpinene	4.35	Monoterpene
para-Cymene	1.99	Monoterpene
Limonene	46.54	Monoterpene
1,8-Cineole	1.82*	Monoterpenic ether
β -Phellandrene	[1.82]*	Monoterpene
(Z?)-Citroside	0.01	Monoterpenic ether
(Z)- β -Ocimene	0.20	Monoterpene
(E?)-Citroside	0.21	Monoterpenic ether
(E)- β -Ocimene	0.41	Monoterpene
γ -Terpinene	12.72	Monoterpene
<i>cis</i> -Sabinene hydrate	0.04	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Terpinolene	9.23	Monoterpene
Linalool	0.11	Monoterpenic alcohol
Nonanal	0.05	Aliphatic aldehyde
endo-Fenchol	0.48	Monoterpenic alcohol
<i>trans</i> -para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
<i>cis</i> -Limonene oxide	0.02	Monoterpenic ether
1-Terpineol	0.62	Monoterpenic alcohol
<i>trans</i> -Limonene oxide	0.03	Monoterpenic ether
<i>cis</i> - β -Terpineol	0.57	Monoterpenic alcohol
Citronellal	0.05	Monoterpenic aldehyde
Borneol	0.43	Monoterpenic alcohol

<i>trans</i> -β-Terpineol	0.11	Monoterpenic alcohol
(<i>E</i>)-Ocimenol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.41	Monoterpenic alcohol
Isogeranial	0.01	Monoterpenic aldehyde
para-Cymen-8-ol	0.07	Monoterpenic alcohol
α-Terpineol	6.73	Monoterpenic alcohol
γ-Terpineol	0.99	Monoterpenic alcohol
Decanal	0.08	Aliphatic aldehyde
2,3-Epoxyneral?	0.01	Monoterpenic aldehyde
Nerol	0.01	Monoterpenic alcohol
Carvone	0.02	Monoterpenic ketone
Neral	0.10	Monoterpenic aldehyde
Geraniol	0.02	Monoterpenic alcohol
<i>trans</i> -Ascaridole glycol	0.03	Monoterpenic alcohol
Geranial	0.15	Monoterpenic aldehyde
Unknown	0.03	Oxygenated monoterpene
<i>cis</i> -Ascaridole glycol	0.01	Monoterpenic alcohol
Unknown	0.06	Unknown
Undecanal	0.01	Aliphatic aldehyde
Unknown	0.01	Monoterpenic alcohol
δ-Elemene	0.04	Sesquiterpene
Citronellyl acetate	0.01	Monoterpenic ester
Neryl acetate	0.03	Monoterpenic ester
α-Copaene	0.01	Sesquiterpene
β-Bourbonene	0.01	Sesquiterpene
Geranyl acetate	0.05	Monoterpenic ester
β-Elemene	0.05	Sesquiterpene
Dodecanal	0.05	Aliphatic aldehyde
β-Caryophyllene	0.33	Sesquiterpene
<i>cis</i> -α-Bergamotene	0.04	Sesquiterpene
γ-Elemene	0.01	Sesquiterpene
<i>trans</i> -α-Bergamotene	0.48	Sesquiterpene
α-Humulene	0.07	Sesquiterpene
β-Santalene	0.01	Sesquiterpene
(<i>E</i>)-β-Farnesene	0.08	Sesquiterpene
Germacrene D	0.10	Sesquiterpene
Unknown	0.03	Sesquiterpene
γ-Curcumene	0.06	Sesquiterpene
β-Selinene	0.03	Sesquiterpene
<i>trans</i> -β-Bergamotene	0.02	Sesquiterpene
δ-Selinene	0.20	Sesquiterpene
α-Selinene	0.07	Sesquiterpene
(<i>Z</i>)-α-Bisabolene	0.01	Sesquiterpene
β-Bisabolene	0.97	Sesquiterpene
(3 <i>E</i> ,6 <i>E</i>)-α-Farnesene	0.46	Sesquiterpene
(<i>Z</i>)-γ-Bisabolene	0.06	Sesquiterpene
δ-Cadinene	0.04	Sesquiterpene
Germacrene B	0.05	Sesquiterpene
Caryophyllenyl alcohol	0.06	Sesquiterpenic alcohol
Caryophyllene oxide	0.01	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Tetradecanal?	0.04	Aliphatic aldehyde

10-epi- γ -Eudesmol	0.02	Sesquiterpenic alcohol
Guaia-6,10(14)-dien-4 β -ol	0.03	Sesquiterpenic alcohol
γ -Eudesmol	0.04	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.04	Oxygenated sesquiterpene
α -Bisabolol	0.03	Sesquiterpenic alcohol
Herniarin	0.01	Coumarin
Myristic acid	0.04	Aliphatic acid
Palmitic acid	0.03	Aliphatic acid
<i>cis</i> -Vaccenic acid?	0.01	Aliphatic acid
Stearic acid	0.02	Aliphatic acid
Consolidated total	98.52%	

*: 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

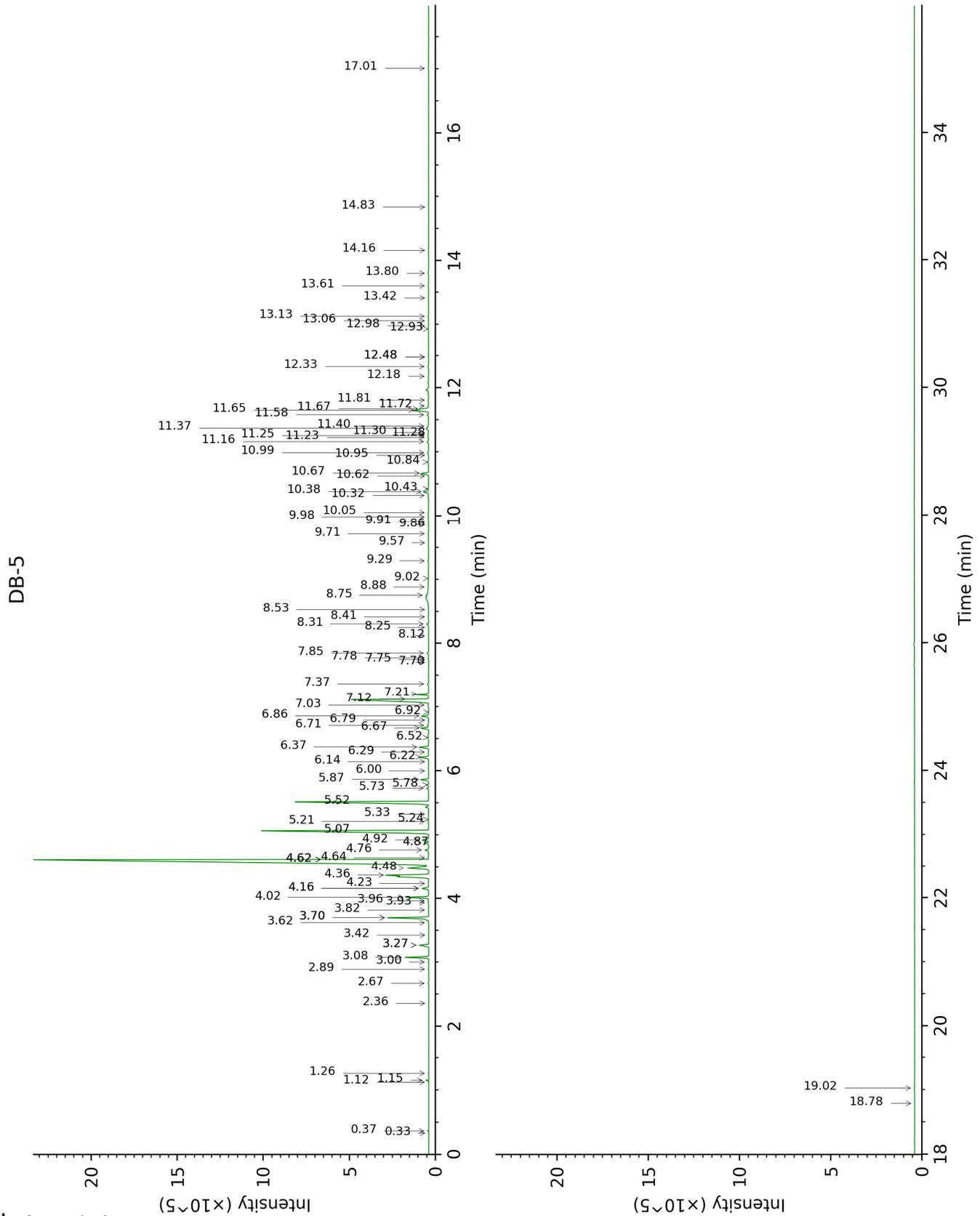
tr: The compound has been detected below 0.005% of total signal.

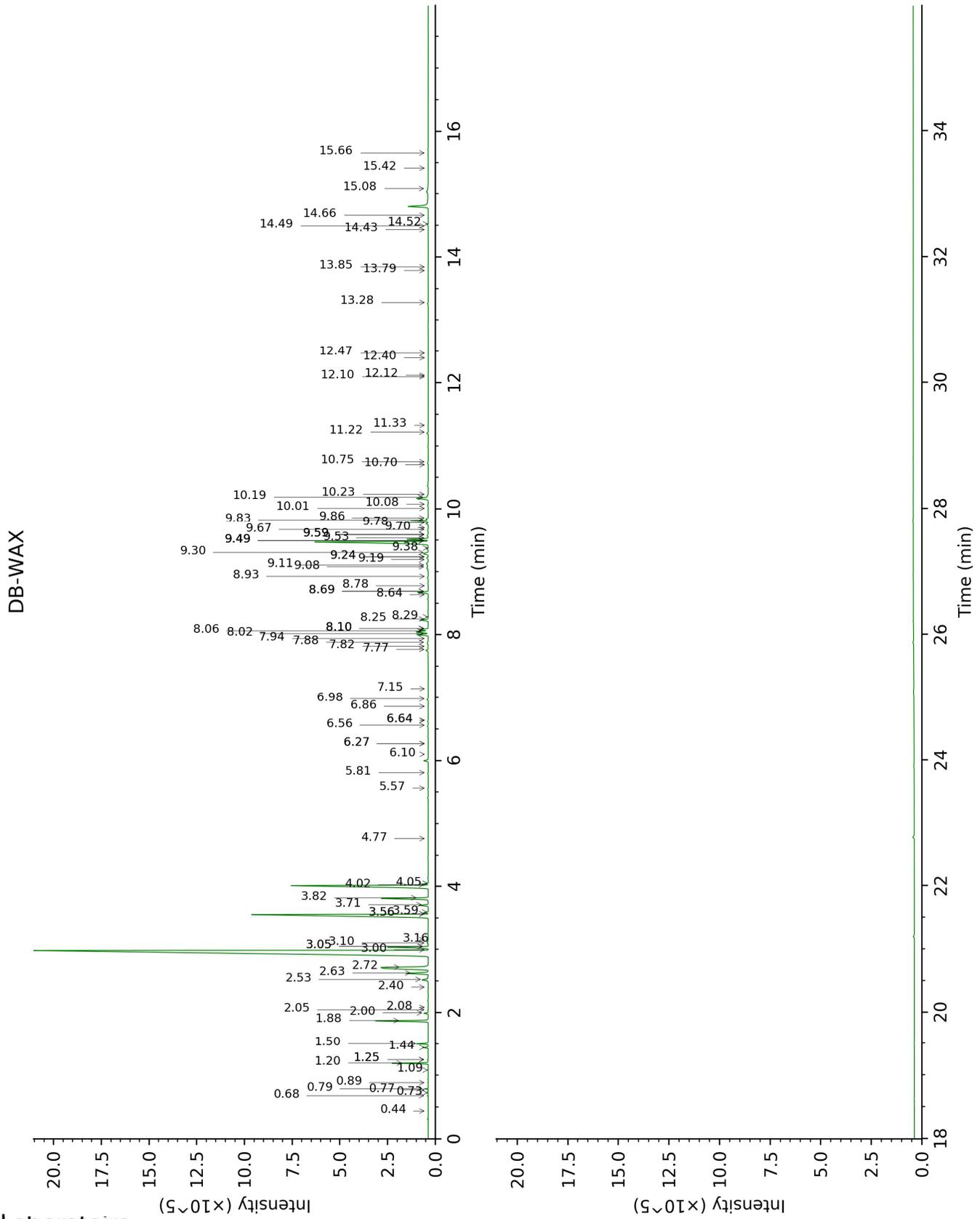
Note: no correction factor was applied

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	%
Acetone	0.33	517	tr	0.44	784	tr
Ethanol	0.37	517	0.04	0.73	906	0.04
Toluene	1.12	756	0.02	1.25*	1001	0.02
1-Methylcyclohexa-1,3-diene	1.15	760	0.09	0.79	918	0.09
3-Methylenecyclohexadiene	1.26	775	0.01	0.89	935	0.01
Cyclofenchene	2.36	878	0.01	0.77	915	tr
Nonane	2.67	903	0.03	0.68	895	0.02
Tricyclene	2.89	918	0.02	1.09	972	0.02
α -Thujene	3.00	925	0.02	1.25*	1001	[0.02]
α -Pinene	3.08	930	1.13	1.20	992	1.13
α -Fenchene	3.27*	942	0.61	1.44	1021	0.16
Camphene	3.27*	942	[0.61]	1.50	1027	0.43
Thuja-2,4(10)-diene	3.42	952	0.01	2.08	1088	0.01
Geranic oxide	3.62	965	0.02	2.00	1079	0.18
Sabinene	3.70*	970	2.30	2.05	1084	0.02
β -Pinene	3.70*	970	[2.30]	1.88	1066	2.15
3-Methyl-3-cyclohexenone	3.82	978	0.02	5.81	1374	0.04
6-Methyl-5-hepten-2-one	3.93	986	0.02	4.77	1301	0.01
<i>trans</i> -Dehydroxylinalool oxide	3.96	988	0.04	3.10	1174	0.04
Myrcene	4.02	992	1.20	2.63	1135	1.21
Octanal	4.16*	1001	0.44	4.05	1246	0.18
α -Phellandrene	4.16*	1001	[0.44]	2.53	1127	0.34
Δ 3-Carene	4.23	1006	0.01	2.40	1117	0.01
α -Terpinene	4.36	1014	4.35	2.72	1142	4.38
para-Cymene	4.48	1021	1.99	3.82	1229	1.97
Limonene	4.62*	1030	48.36	3.00	1165	46.54
1,8-Cineole	4.62*	1030	[48.36]	3.05*	1169	1.73
β -Phellandrene	4.62*	1030	[48.36]	3.05*	1169	[1.73]
(<i>Z</i>)-Citroxide	4.64	1032	0.01	3.16	1178	0.01
(<i>Z</i>)- β -Ocimene	4.76	1039	0.20	3.59	1212	0.19
(<i>E</i>)-Citroxide	4.87	1046	0.21	3.56*	1210	12.91
(<i>E</i>)- β -Ocimene	4.92	1049	0.41	3.71	1221	0.42
γ -Terpinene	5.07	1058	12.72	3.56*	1210	[12.91]
<i>cis</i> -Sabinene hydrate	5.21	1067	0.04	6.56	1429	0.05
<i>cis</i> -Linalool oxide (fur.)	5.24	1069	0.01	6.27*	1407	0.01
Octanol	5.32	1075	0.01	7.94	1534	0.02
Terpinolene	5.52	1087	9.23	4.02	1245	8.93
Linalool	5.73	1100	0.11	7.77	1520	0.15
Nonanal	5.78	1104	0.05	5.56	1356	0.04
endo-Fenchol	5.87	1109	0.48	8.10*	1546	0.46
<i>trans</i> -para-Mentha-2,8-dien-1-ol	6.00	1118	0.01	8.64	1588	0.01
<i>cis</i> -Limonene oxide	6.14	1127	0.02	6.10	1395	0.01
1-Terpineol	6.22	1132	0.62	8.02	1540	0.57

<i>trans</i> -Limonene oxide	6.29	1137	0.03	6.27*	1407	[0.01]
<i>cis</i> - β -Terpineol	6.37	1142	0.57	8.69*	1592	0.55
Citronellal	6.52	1152	0.05	6.64*	1435	0.03
Borneol	6.67	1162	0.43	9.49*	1657	6.93
<i>trans</i> - β -Terpineol	6.71	1164	0.11	9.24*	1636	0.10
(<i>E</i>)-Ocimenol	6.79	1170	0.01			
Terpinen-4-ol	6.86	1174	0.41	8.25	1558	0.40
Isogeranial	6.92	1178	0.01	7.82	1524	0.03
para-Cymen-8-ol	7.03	1185	0.07	11.22	1802	0.07
α -Terpineol	7.12	1191	6.73	9.49*	1657	[6.93]
γ -Terpineol	7.20	1197	0.99	9.53	1660	1.00
Decanal	7.37	1207	0.08	6.98	1461	0.08
2,3-Epoxyneral?	7.70	1230	0.01			
Nerol	7.75	1233	0.01	10.70	1758	0.01
Carvone	7.78	1236	0.02	9.70	1674	0.01
Neral	7.85	1241	0.10	9.08	1623	0.09
Geraniol	8.12	1259	0.02	11.33	1812	0.03
<i>trans</i> -Ascaridole glycol	8.25	1268	0.03	13.84	2043	0.01
Geranial	8.31	1272	0.15	9.78	1680	0.16
Unknown [m/z 95, 67 (45), 41 (42), 110 (42), 43 (41), 59 (36)]	8.41	1280	0.03	12.10	1880	0.01
<i>cis</i> -Ascaridole glycol	8.53	1288	0.01	14.43	2100	0.01
Unknown [m/z 112, 97 (93), 83 (60), 43 (46), 41 (20), 69 (19)...]	8.75	1303	0.06			
Undecanal	8.88	1307	0.01	8.29	1560	0.01
Unknown [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	9.02	1316	0.01	14.66	2122	0.01
δ -Elemene	9.29	1336	0.04	6.64*	1435	[0.03]
Citronellyl acetate	9.57	1356	0.01	9.11	1625	0.08
Neryl acetate	9.71	1366	0.03	9.86	1687	0.10
α -Copaene	9.86	1376	0.01	6.86	1452	0.01
β -Bourbonene	9.91	1380	0.01	7.15	1473	0.01
Geranyl acetate	9.98	1385	0.05	10.24	1718	0.06
β -Elemene	10.05	1390	0.05	8.10*	1546	[0.46]
Dodecanal	10.32	1409	0.05	9.59*	1665	0.07
β -Caryophyllene	10.38	1414	0.33	8.10*	1546	[0.46]
<i>cis</i> - α -Bergamotene	10.42	1417	0.04	7.88	1529	0.11
γ -Elemene	10.62	1432	0.01	8.69*	1592	[0.55]
<i>trans</i> - α -Bergamotene	10.67	1435	0.48	8.06	1543	0.70
α -Humulene	10.84	1448	0.07	8.93	1611	0.05
β -Santalene	10.95	1456	0.01	8.78	1599	0.01
(<i>E</i>)- β -Farnesene	10.99	1459	0.08	9.24*	1636	[0.10]
Germacrene D	11.16	1472	0.10	9.49*	1657	[6.93]
Unknown [m/z 91, 93 (92), 105 (71), 77 (69), 79 (68), 133 (63)... 204 (32)]	11.23	1477	0.03	9.49*	1657	[6.93]
γ -Curcumene	11.25	1479	0.06	9.38	1647	0.07
β -Selinene	11.28	1480	0.03	9.59*	1665	[0.07]
<i>trans</i> - β -Bergamotene	11.30	1482	0.02	9.19	1632	0.01

δ-Selinene	11.37	1488	0.20	9.30	1642	0.33
α-Selinene	11.40	1490	0.07	9.67	1671	0.04
(Z)-α-Bisabolene	11.58†	1503	1.13	10.01	1699	0.01
β-Bisabolene	11.65†	1509	[1.13]	9.83	1684	0.97
(3E,6E)-α-Farnesene	11.67	1510	0.46	10.19	1714	0.78
(Z)-γ-Bisabolene	11.72	1514	0.06	9.59*	1665	[0.07]
δ-Cadinene	11.81	1521	0.04	10.08	1705	0.05
Germacrene B	12.18	1550	0.05	10.75	1762	0.05
Caryophyllenyl alcohol	12.33	1562	0.06	13.28	1989	0.05
Caryophyllene oxide	12.48*	1574	0.02	12.47	1914	0.01
Caryophyllene oxide isomer	12.48*	1574	[0.02]	12.40	1907	0.01
Tetradecanal?	12.93	1610	0.04	12.12	1882	0.01
10-epi-γ-Eudesmol	12.98	1614	0.02	13.79	2037	0.01
Guaia-6,10(14)-dien-4β-ol	13.06	1620	0.03	15.42	2198	0.01
γ-Eudesmol	13.13	1626	0.04	14.52	2109	0.05
Unknown [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]	13.42	1650	0.01	14.49	2106	0.01
Unknown [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222]	13.60	1666	0.04	15.66	2223	0.02
α-Bisabolol	13.80	1682	0.03	15.08	2165	0.02
Herniarin	14.16	1712	0.01			
Myristic acid	14.83	1770	0.04			
Palmitic acid	17.01	1969	0.03			
cis-Vaccenic acid?	18.78	2145	0.01			
Stearic acid	19.02	2170	0.02			
Total identified		98.54%			97.66%	
Total reported		98.73%			97.70%	

*: 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