

Date : March 06, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18B20-PLG9-1-CC

Customer identification : Lime

Type : Essential oil

Source : *Citrus aurantifolia*

Customer : Plant Guru

ANALYSIS

Method: PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Alexis St-Gelais, M. Sc., chimiste

Analysis date : February 23, 2018

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Yellow/green liquid
Refractive index: 1.4775 ± 0.0003 (20 °C)

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Ethanol	0.02	0.01	Aliphatic alcohol
2-Methyl-3-buten-2-ol	tr	0.01	Aliphatic alcohol
Toluene	tr	0.43*	Simple phenolic
(3Z)-Hexenol	tr	tr*	Aliphatic alcohol
Heptanal	0.01	0.01	Aliphatic aldehyde
Tricyclene	0.01	0.01	Monoterpene
α -Thujene	0.42	[0.43]*	Monoterpene
α -Pinene	1.79	1.82	Monoterpene
Camphene	0.08*	0.07	Monoterpene
α -Fenchene	[0.08]*	0.01	Monoterpene
β -Pinene	14.85*	13.26	Monoterpene
Sabinene	[14.85]*	1.79	Monoterpene
6-Methyl-5-hepten-2-one	0.03	0.02	Aliphatic ketone
Myrcene	1.43	1.45	Monoterpene
α -Phellandrene	0.06*	0.05	Monoterpene
Pseudolimonene	[0.06]*	tr	Monoterpene
Octanal	0.02	0.01	Aliphatic aldehyde
Δ^3 -Carene	0.01	0.01	Monoterpene
α -Terpinene	0.33	0.33	Monoterpene
para-Cymene	57.01	1.26	Monoterpene
β -Phellandrene	[57.01]*	0.47	Monoterpene
Limonene	[57.01]*	55.85	Monoterpene
(Z)- β -Ocimene	0.06	10.47*	Monoterpene
(E)- β -Ocimene	0.14	0.16	Monoterpene
γ -Terpinene	10.29	[10.47]*	Monoterpene
cis-Sabinene hydrate	0.03	0.03	Monoterpenic alcohol
cis-Linalool oxide (fur.)	tr	0.03*	Monoterpenic alcohol
Octanol	0.01	tr	Aliphatic alcohol
Fenchone	tr	[tr]*	Aliphatic alcohol
Terpinolene	0.69*	0.69	Monoterpene
para-Cymenene	[0.69]*	0.01	Monoterpene
Linalool	0.12	0.12	Monoterpenic alcohol
Nonanal	tr	0.01	Aliphatic aldehyde
para-Mentha-1,3,8-triene	tr	tr	Monoterpene
endo-Fenchol	0.04	0.05*	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	0.01	0.01	Monoterpenic alcohol
cis-Limonene oxide	0.05*	0.04	Monoterpenic ether
4-Hydroxy-4-methylcyclohex-2-enone	[0.05]*	tr	Aliphatic alcohol
1-Terpineol	0.10*	0.07	Monoterpenic alcohol
trans-Limonene oxide	[0.10]*	[0.03]*	Monoterpenic ether
Epoxyterpinolene	0.03	0.03	Monoterpenic ether
cis- β -Terpineol	0.06	0.07	Monoterpenic alcohol
Citronellal	0.02	0.01	Monoterpenic aldehyde
Borneol	0.09	1.13*	Monoterpenic alcohol
trans- β -Terpineol	0.02*	0.03	Monoterpenic alcohol
Isoneral	[0.02]*	0.01	Monoterpenic aldehyde
Terpinen-4-ol	0.12	0.12	Monoterpenic alcohol

Isogeranial	0.01	0.01	Monoterpenic aldehyde
para-Cymen-8-ol	0.03	0.03	Monoterpenic alcohol
α -Terpineol	1.05	[1.13]*	Monoterpenic alcohol
Unknown	0.02	0.01	Unknown
γ -Terpineol	0.13	0.11	Monoterpenic alcohol
Decanal	0.03	0.03	Aliphatic aldehyde
<i>trans</i> -Carveol	0.01	0.01	Monoterpenic alcohol
2,3-Epoxyneral?	0.02		Monoterpenic aldehyde
Nerol	0.07	0.09	Monoterpenic alcohol
2,3-Epoxygeranial?	0.05		Monoterpenic aldehyde
<i>cis</i> -Carveol	0.01	0.01	Monoterpenic alcohol
Neral	1.50*	1.44	Monoterpenic aldehyde
Carvone	[1.50]*	0.10*	Monoterpenic ketone
Geraniol	0.10	0.07	Monoterpenic alcohol
<i>trans</i> -Ascaridole glycol	2.29*	tr	Monoterpenic alcohol
Geranial	[2.29]*	2.27	Monoterpenic aldehyde
Unknown	0.01	0.01	Oxygenated monoterpene
<i>cis</i> -Ascaridole glycol?	0.01	0.04	Monoterpenic alcohol
Unknown	0.01	0.01	Monoterpenic alcohol
δ -Elemene	0.04	0.03	Sesquiterpene
Neryl acetate	0.40	1.32*	Monoterpenic ester
α -Copaene	0.01	0.01	Sesquiterpene
β -Bourbonene	0.01	0.01	Sesquiterpene
Geranyl acetate	0.12	0.15	Monoterpenic ester
β -Elemene	0.06	0.87*	Sesquiterpene
Dodecanal	0.02	[0.10]*	Aliphatic aldehyde
β -Caryophyllene	0.36*	[0.87]*	Sesquiterpene
<i>cis</i> - α -Bergamotene	[0.36]*	0.05	Sesquiterpene
α -Santalene	0.02	0.01	Sesquiterpene
β -Copaene	tr	[0.05]*	Sesquiterpene
γ -Elemene	0.52*	0.02	Sesquiterpene
<i>trans</i> - α -Bergamotene	[0.52]*	[0.87]*	Sesquiterpene
α -Humulene	0.05	0.05	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.08*	0.05	Sesquiterpene
β -Santalene	[0.08]*	0.03	Sesquiterpene
Selina-4,11-diene	0.03	0.03	Sesquiterpene
α -Amorphene	0.04	0.04	Sesquiterpene
Germacrene D	0.02	[1.13]*	Sesquiterpene
Unknown	0.05*		Sesquiterpene
β -Selinene	[0.05]*	0.02	Sesquiterpene
δ -Selinene	0.05	0.05	Sesquiterpene
α -Selinene	0.04	0.03	Sesquiterpene
(<i>Z</i>)- α -Bisabolene	0.09	[1.32]*	Sesquiterpene
(3 <i>E</i> ,6 <i>E</i>)- α -Farnesene	1.11*	0.23*	Sesquiterpene
β -Bisabolene	[1.11]*	[1.32]*	Sesquiterpene
(<i>Z</i>)- γ -Bisabolene	0.03	0.01	Sesquiterpene
δ -Cadinene	0.02	0.02	Sesquiterpene
Selina-4(15),7(11)-diene	0.02	0.02	Sesquiterpene
(<i>E</i>)- γ -Bisabolene	0.04	0.04	Sesquiterpene
Selina-3,7(11)-diene	0.02*	tr	Sesquiterpene
Unknown	[0.02]*	[0.23]*	Sesquiterpene
(<i>E</i>)- α -Bisabolene	0.03	0.06	Sesquiterpene

Germacrene B	0.06	0.07	Sesquiterpene
Caryophyllenyl alcohol	0.02	0.02	Sesquiterpenic alcohol
Caryophyllene oxide	0.04	0.04	Sesquiterpenic ether
Tetradecanal	0.03		Aliphatic aldehyde
10-epi- γ -Eudesmol	0.02	0.02	Sesquiterpenic alcohol
Guaia-6,10(14)-dien-4 β -ol	0.04	0.04	Sesquiterpenic alcohol
Unknown	0.03	0.04	Oxygenated sesquiterpene
Unknown	0.05	0.03	Oxygenated sesquiterpene
α -Bisabolol	0.06*	0.07	Sesquiterpenic alcohol
epi- α -Bisabolol	[0.06]*	0.01	Sesquiterpenic alcohol
Herniarin	0.16	0.14	Coumarin
(2E,6E)-Farnesal	0.02	0.01	Sesquiterpenic aldehyde
Hexadecanal	0.05	0.05	Aliphatic aldehyde
Citropten	0.14	0.14	Furanocoumarin
Palmitic acid	0.17	0.16	Aliphatic acid
Methoxsalene	0.02		Furanocoumarin
Bergapten	0.09		Furanocoumarin
Linoleic acid	0.25	0.20	Aliphatic acid
Oleic acid	[0.25]	0.16	Aliphatic acid
Isopimpinellin	0.13		Furanocoumarin
Oxypeucedanin	0.11		Furanocoumarin
Heraclenin	0.07		Furanocoumarin
Unknown		0.02	Sesquiterpene
Total identified	97.99%	98.45%	

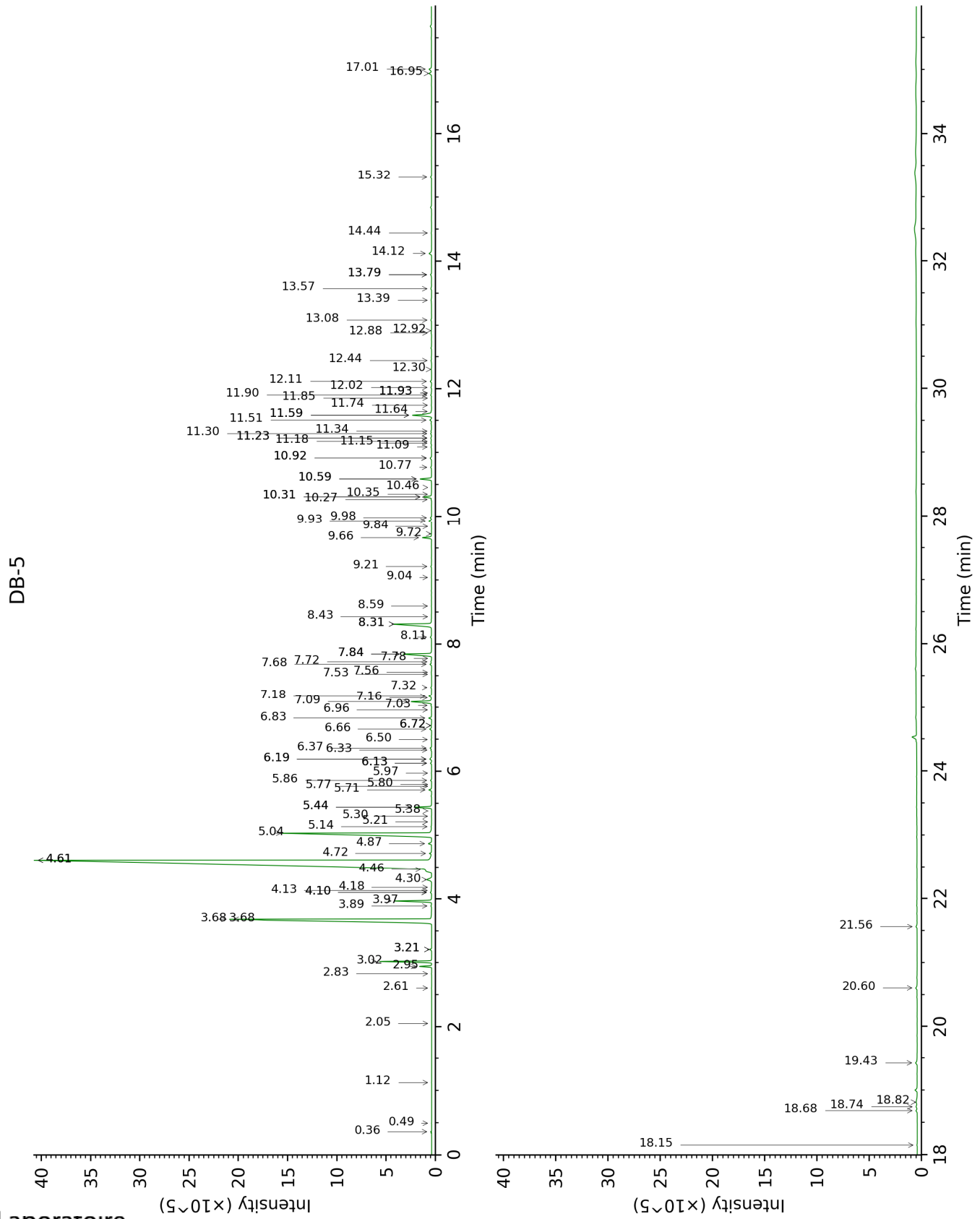
*: Two or more compounds are coeluting on this column

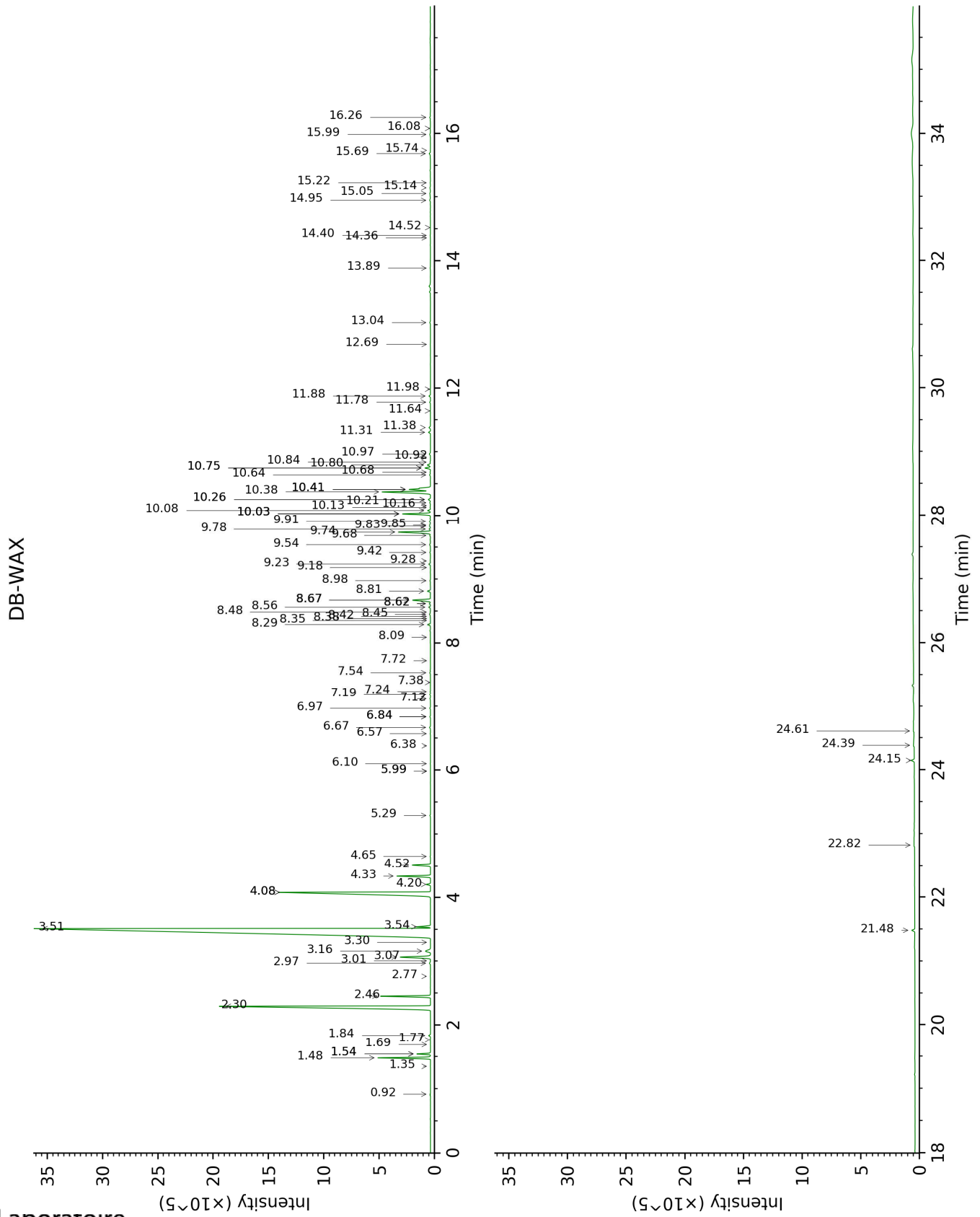
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethanol	0.36	495	0.02	0.92	905	0.01
2-Methyl-3-buten-2-ol	0.49	605	tr	1.69	1016	0.01
Toluene	1.12	753	tr	1.54*	1002	0.43
(3Z)-Hexenol	2.05	851	tr	5.98*	1347	tr
Heptanal	2.61	898	0.01	3.30	1153	0.01
Tricyclene	2.83	913	0.01	1.35	975	0.01
α -Thujene	2.95	921	0.42	1.54*	1002	[0.43]
α -Pinene	3.02	926	1.79	1.48	996	1.82
Camphene	3.21*	938	0.08	1.84	1030	0.07
α -Fenchene	3.21*	938	[0.08]	1.77	1024	0.01
β -Pinene	3.68*	970	14.85	2.30	1073	13.26
Sabinene	3.68*	970	[14.85]	2.46	1088	1.79
6-Methyl-5-hepten-2-one	3.89	983	0.03	5.29	1297	0.02
Myrcene	3.97	989	1.43	3.07	1135	1.45
α -Phellandrene	4.10*	998	0.06	2.97	1128	0.05
Pseudolimonene	4.10*	998	[0.06]	3.01	1131	tr
Octanal	4.13	1000	0.02	4.65	1252	0.01
Δ 3-Carene	4.18	1003	0.01	2.76	1112	0.01
α -Terpinene	4.30	1010	0.33	3.16	1142	0.33
para-Cymene	4.46†	1020	57.01	4.33	1229	1.26
β -Phellandrene	4.61*†	1030	[57.01]	3.54	1172	0.47
Limonene	4.61*†	1030	[57.01]	3.51	1169	55.85
(Z)- β -Ocimene	4.72	1037	0.06	4.08*	1211	10.47
(E)- β -Ocimene	4.87	1046	0.14	4.20	1220	0.16
γ -Terpinene	5.04	1056	10.29	4.08*	1211	[10.47]
cis-Sabinene hydrate	5.14	1063	0.03	7.12	1429	0.03
cis-Linalool oxide (fur.)	5.21	1068	tr	6.84*	1408	0.03
Octanol	5.30	1073	0.01	8.38	1523	tr
Fenchone	5.38	1078	tr	5.98*	1347	[tr]
Terpinolene	5.44*	1082	0.69	4.52	1242	0.69
para-Cymenene	5.44*	1082	[0.69]	6.57	1388	0.01
Linalool	5.71	1099	0.12	8.29	1516	0.12
Nonanal	5.77	1102	tr	6.10	1355	0.01
para-Mentha-1,3,8-triene	5.80	1104	tr	6.38	1375	tr
endo-Fenchol	5.86	1108	0.04	8.62*	1541	0.05
trans-para-Mentha-2,8-dien-1-ol	5.97	1116	0.01	9.18	1584	0.01
cis-Limonene oxide	6.13*	1125	0.05	6.67	1396	0.04
4-Hydroxy-4-methylcyclohex-2-enone	6.13*	1125	[0.05]	14.36	2033	tr

1-Terpineol	6.19*	1129	0.10	8.56	1537	0.07
<i>trans</i> -Limonene oxide	6.19*	1129	[0.10]	6.84*	1408	[0.03]
Epoxyterpinolene	6.33	1138	0.03	6.97	1418	0.03
<i>cis</i> - β -Terpineol	6.36	1140	0.06	9.24	1588	0.07
Citronellal	6.50	1149	0.02	7.24	1437	0.01
Borneol	6.66	1159	0.09	10.03*	1652	1.13
<i>trans</i> - β -Terpineol	6.72*	1163	0.02	9.85	1638	0.03
Isoneral	6.72*	1163	[0.02]	8.09	1500	0.01
Terpinen-4-ol	6.83	1170	0.12	8.81	1556	0.12
Isogeranial	6.96	1178	0.01	8.42	1526	0.01
<i>para</i> -Cymen-8-ol	7.03	1183	0.03	11.78	1798	0.03
α -Terpineol	7.09	1187	1.05	10.03*	1652	[1.13]
Unknown [m/z 121, 79 (61), 93 (55), 94 (40), 91 (39), 84 (37)...]	7.16	1191	0.02	8.35	1521	0.01
γ -Terpineol	7.18	1192	0.13	10.08	1657	0.11
Decanal	7.32	1202	0.03	7.54	1459	0.03
<i>trans</i> -Carveol	7.53	1215	0.01	11.64	1786	0.01
2,3-Epoxyneral?	7.56	1217	0.02			
Nerol	7.68	1226	0.07	11.31	1758	0.09
2,3-Epoxygeranial?	7.72	1228	0.05			
<i>cis</i> -Carveol	7.78	1232	0.01	11.98	1816	0.01
Neral	7.84*	1236	1.50	9.74	1629	1.44
Carvone	7.84*	1236	[1.50]	10.26*	1671	0.10
Geraniol	8.11	1254	0.10	11.88	1807	0.07
<i>trans</i> -Ascaridole glycol	8.31*	1268	2.29	14.52	2049	tr
Geranial	8.31*	1268	[2.29]	10.38	1680	2.27
Unknown [m/z 95, 67 (45), 41 (42), 110 (42), 43 (41), 59 (36)]	8.43	1275	0.01	12.69	1879	0.01
<i>cis</i> -Ascaridole glycol?	8.59	1286	0.01	15.05	2100	0.04
Unknown [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	9.04	1317	0.01	15.22	2117	0.01
δ -Elemene	9.21	1329	0.04	7.19	1434	0.03
Neryl acetate	9.66	1361	0.40	10.41*	1683	1.32
α -Copaene	9.72	1365	0.01	7.38	1448	0.01
β -Bourbonene	9.84	1374	0.01	7.72	1473	0.01
Geranyl acetate	9.93	1380	0.12	10.80	1715	0.15
β -Elemene	9.98	1383	0.06	8.67*	1545	0.87
Dodecanal	10.27	1404	0.02	10.26*	1671	[0.10]
β -Caryophyllene	10.31*	1407	0.36	8.67*	1545	[0.87]
<i>cis</i> - α -Bergamotene	10.31*	1407	[0.36]	8.45	1528	0.05
α -Santalene	10.35	1410	0.02	8.48	1531	0.01

β -Copaene	10.46	1418	tr	8.62*	1541	[0.05]
γ -Elemene	10.59*	1428	0.52	9.28	1592	0.02
<i>trans</i> - α -Bergamotene	10.59*	1428	[0.52]	8.67*	1545	[0.87]
α -Humulene	10.77	1441	0.05	9.54	1613	0.05
(<i>E</i>)- β -Farnesene	10.92*	1452	0.08	9.78	1633	0.05
β -Santalene	10.92*	1452	[0.08]	9.42	1603	0.03
Selina-4,11-diene	11.09	1465	0.03	9.68	1624	0.03
α -Amorphene	11.15	1469	0.04	9.83	1637	0.04
Germacrene D	11.18	1471	0.02	10.03*	1652	[1.13]
Unknown [m/z 91, 93 (92), 105 (71), 77 (69), 79 (68), 133 (63)... 204 (32)]	11.23*	1475	0.05			
β -Selinene	11.23*	1475	[0.05]	10.13	1660	0.02
δ -Selinene	11.30	1480	0.05	9.91	1643	0.05
α -Selinene	11.34	1483	0.04	10.21	1666	0.03
(<i>Z</i>)- α -Bisabolene	11.51	1496	0.09	10.41*	1683	[1.32]
(3 <i>E</i> ,6 <i>E</i>)- α -Farnesene	11.59*	1502	1.11	10.75*	1711	0.23
β -Bisabolene	11.59*	1502	[1.11]	10.41*	1683	[1.32]
(<i>Z</i>)- γ -Bisabolene	11.64	1506	0.03	10.16	1663	0.01
δ -Cadinene	11.74	1514	0.02	10.68	1706	0.02
Selina-4(15),7(11)-diene	11.85	1522	0.02	10.84	1719	0.02
(<i>E</i>)- γ -Bisabolene	11.90	1526	0.04	10.64	1702	0.04
Selina-3,7(11)-diene	11.93*	1529	0.02	10.92	1725	tr
Unknown [m/z 189, 204 (92), 161 (65), 133 (51), 105 (51), 91 (51), 119 (45)]	11.93*	1529	[0.02]	10.75*	1711	[0.23]
(<i>E</i>)- α -Bisabolene	12.02	1536	0.03	10.97	1730	0.06
Germacrene B	12.11	1543	0.06	11.38	1764	0.07
Caryophyllenyl alcohol	12.30	1558	0.02	13.89	1988	0.02
Caryophyllene oxide	12.44	1568	0.04	13.04	1910	0.04
Tetradecanal	12.88	1603	0.03			
10-epi- γ -Eudesmol	12.92	1606	0.02	14.40	2037	0.02
Guaia-6,10(14)-dien-4 β -ol	13.08	1620	0.04	15.99	2194	0.04
Unknown [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]	13.39	1645	0.03	15.14	2109	0.04
Unknown [m/z 69, 95 (100), 41 (89), 109 (68), 67	13.57	1660	0.05	16.26	2221	0.03

(61)...222]						
α-Bisabolol	13.79*	1678	0.06	15.69	2163	0.07
epi-α-Bisabolol	13.79*	1678	[0.06]	15.74	2168	0.01
Herniarin	14.12	1706	0.16	21.48	2819	0.14
(2E,6E)-Farnesal	14.44	1733	0.02	16.08	2203	0.01
Hexadecanal	15.32	1809	0.05	14.95	2090	0.05
Citropten	16.94	1959	0.14	24.15	3176	0.14
Palmitic acid	17.01	1966	0.17	22.82	2994	0.16
Methoxsalene	18.15	2077	0.02			
Bergapten	18.68	2131	0.09			
Linoleic acid	18.74†	2137	0.25	24.61	3243	0.20
Oleic acid	18.82†	2144	[0.25]	24.38	3210	0.16
Isopimpinellin	19.42	2208	0.13			
Oxypeucedanin	20.60	2336	0.11			
Heraclenin	21.56	2444	0.07			
Unknown [m/z 41, 69 (90), 79 (78), 93 (72), 91 (70)...204]				8.98	1569	0.02
Total identified		97.99%			98.45%	
Total reported		98.10%			98.58%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified 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