

Date : May 31, 2022

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 22E24-PTH03

**Customer identification** : Lemon Eucalyptus ORGANIC - Madagascar - E10111R

**Type** : Essential oil

**Source** : *Corymbia citriodora*

**Customer** : Plant Therapy

ANALYSIS

**Method**: PC-MAT-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** : Seydou Ka, Ph. D.

**Analysis date** : May 28, 2022

Checked and approved by :

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Alexis St-Gelais, Ph. D., Chimiste 2013-174

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Clear liquid

**Refractive index:**  $1.4552 \pm 0.0003$  (20 °C; method PC-MAT-016)

*CONCLUSION*

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

## ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

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

Identification	%	Class
3-Methylcyclopentane	0.01	Alkane
Isovaleral	0.03	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
2,4-Dimethyl-3-pentanone	tr	Aliphatic ketone
Unknown	0.03	Unknown
Unknown	0.03	Unknown
Styrene	0.01	Simple phenolic
Isobutyl isobutyrate	0.04	Aliphatic ester
$\alpha$ -Thujene	0.03	Monoterpene
$\alpha$ -Pinene	0.23	Monoterpene
Unknown	0.01	Unknown
$\beta$ -Pinene	0.49	Monoterpene
Sabinene	0.05	Monoterpene
Myrcene	0.19	Monoterpene
$\alpha$ -Phellandrene	0.02	Monoterpene
$\alpha$ -Terpinene	0.02	Monoterpene
2-Methylbutyl isobutyrate	0.01	Aliphatic ester
para-Cymene	0.03	Monoterpene
1,8-Cineole	0.67	Monoterpenic ether
Unknown	0.03	Unknown
Limonene	0.15	Monoterpene
Unknown	0.06	Unknown
(Z)- $\beta$ -Ocimene	0.11	Monoterpene
(E)- $\beta$ -Ocimene	0.04	Monoterpene
Unknown	0.03	Unknown
2,6-Dimethyl-5-heptenal (melonal)	0.12	Aliphatic aldehyde
$\gamma$ -Terpinene	0.15	Monoterpene
Prenyl isobutyrate	0.02	Aliphatic ester
para-Mentha-3,8-diene	0.26	Monoterpene
Terpinolene isomer	0.05	Monoterpene
para-Cymenene	0.01	Monoterpene
Terpinolene	0.18	Monoterpene
Unknown	0.01	Oxygenated monoterpene
Linalool	0.07	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
cis-Rose oxide	0.06	Monoterpenic ether
trans-Rose oxide	0.03	Monoterpenic ether
neo-Isopulegol	0.02	Monoterpenic alcohol
Isopulegol	8.46	Monoterpenic alcohol
Menthone	0.14	Monoterpenic ketone
iso-Isopulegol	4.60	Monoterpenic alcohol
Citronellal	66.34	Monoterpenic aldehyde
neiso-Isopulegol	0.62	Monoterpenic alcohol
Isopulegol isomer	0.18	Monoterpenic alcohol
Terpinen-4-ol	0.05	Monoterpenic alcohol

α-Terpineol	0.09	Monoterpenic alcohol
<i>trans</i> -Pulegol	0.02	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Nerol	0.04	Monoterpenic alcohol
Citronellol	3.74	Monoterpenic alcohol
Pulegone	tr	Monoterpenic ketone
Neral	0.03	Monoterpenic aldehyde
Geraniol	0.11	Monoterpenic alcohol
Methyl citronellate	0.01	Monoterpenic ester
Geranial	0.02	Monoterpenic aldehyde
Benzyl isobutyrate	0.03	Phenolic ester
Citronellic acid	0.51	Monoterpenic acid
8-Hydroxy-neo-menthol	0.93	Monoterpenic alcohol
Citronellyl acetate	0.53	Monoterpenic ester
Eugenol	0.08	Phenylpropanoid
8-Hydroxy-iso-menthol	0.51	Monoterpenic alcohol
Neryl acetate	0.01	Monoterpenic ester
Geranyl acetate	0.06	Monoterpenic ester
β-Elemene	0.01	Sesquiterpene
Benzyl isovalerate	0.05	Phenolic ester
( <i>Z</i> )-Jasmone	0.03	Jasmonate
β-Caryophyllene	1.24	Sesquiterpene
α-Humulene	0.07	Sesquiterpene
allo-Aromadendrene	0.01	Sesquiterpene
Germacrene D	0.06	Sesquiterpene
Isoamyl phenylacetate	0.01	Phenolic ester
Bicyclogermacrene	0.05	Sesquiterpene
Germacrene A	0.01	Sesquiterpene
γ-Cadinene	tr	Sesquiterpene
δ-Cadinene	0.01	Sesquiterpene
Germacrene B	0.01	Sesquiterpene
Spathulenol	tr	Sesquiterpenic alcohol
Caryophyllene oxide	0.03	Sesquiterpenic ether
Unknown	0.12	Oxygenated diterpene
Unknown	0.14	Oxygenated diterpene
Unknown	0.04	Oxygenated diterpene
Unknown	2.33	Oxygenated diterpene
Unknown	0.07	Oxygenated diterpene
Unknown	0.13	Oxygenated diterpene
Unknown	0.20	Oxygenated diterpene
Unknown	0.14	Oxygenated diterpene
Unknown	0.51	Oxygenated diterpene
Unknown	0.03	Oxygenated diterpene
Unknown	0.05	Oxygenated diterpene
Unknown	0.02	Unknown
Unknown	0.06	Oxygenated diterpene
Unknown	0.22	Oxygenated diterpene
Unknown	0.11	Unknown
Unknown	0.02	Unknown
Unknown	0.05	Unknown
Unknown	0.05	Unknown
Unknown	0.04	Unknown

Unknown	0.02	Oxygenated diterpene
Unknown	tr	Oxygenated diterpene
Unknown	0.02	Unknown
Unknown	0.37	Unknown
Unknown	0.46	Unknown
Unknown	0.42	Unknown
<b>Consolidated total</b>	<b>97.68%</b>	

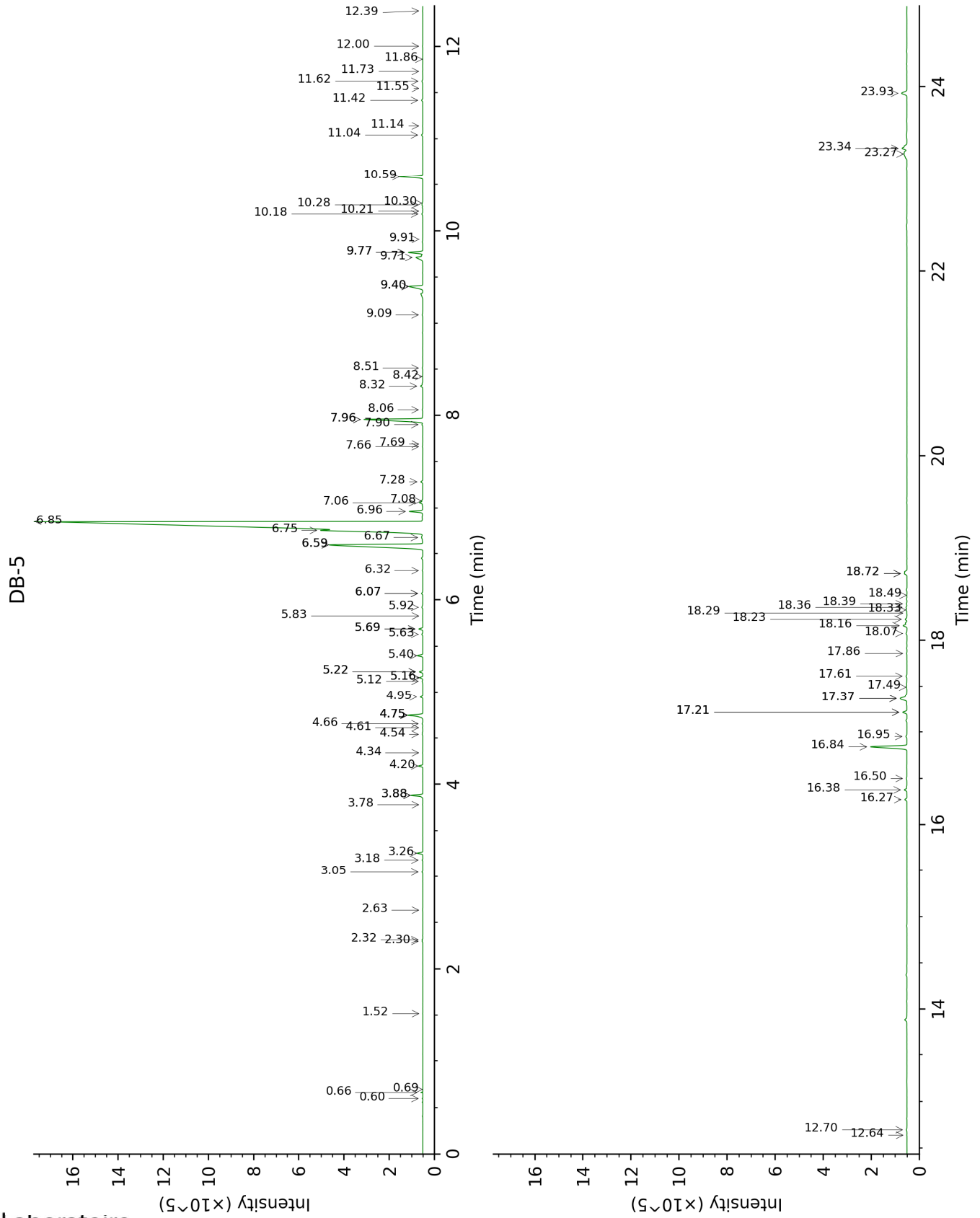
tr: The compound has been detected below 0.005% of total signal.

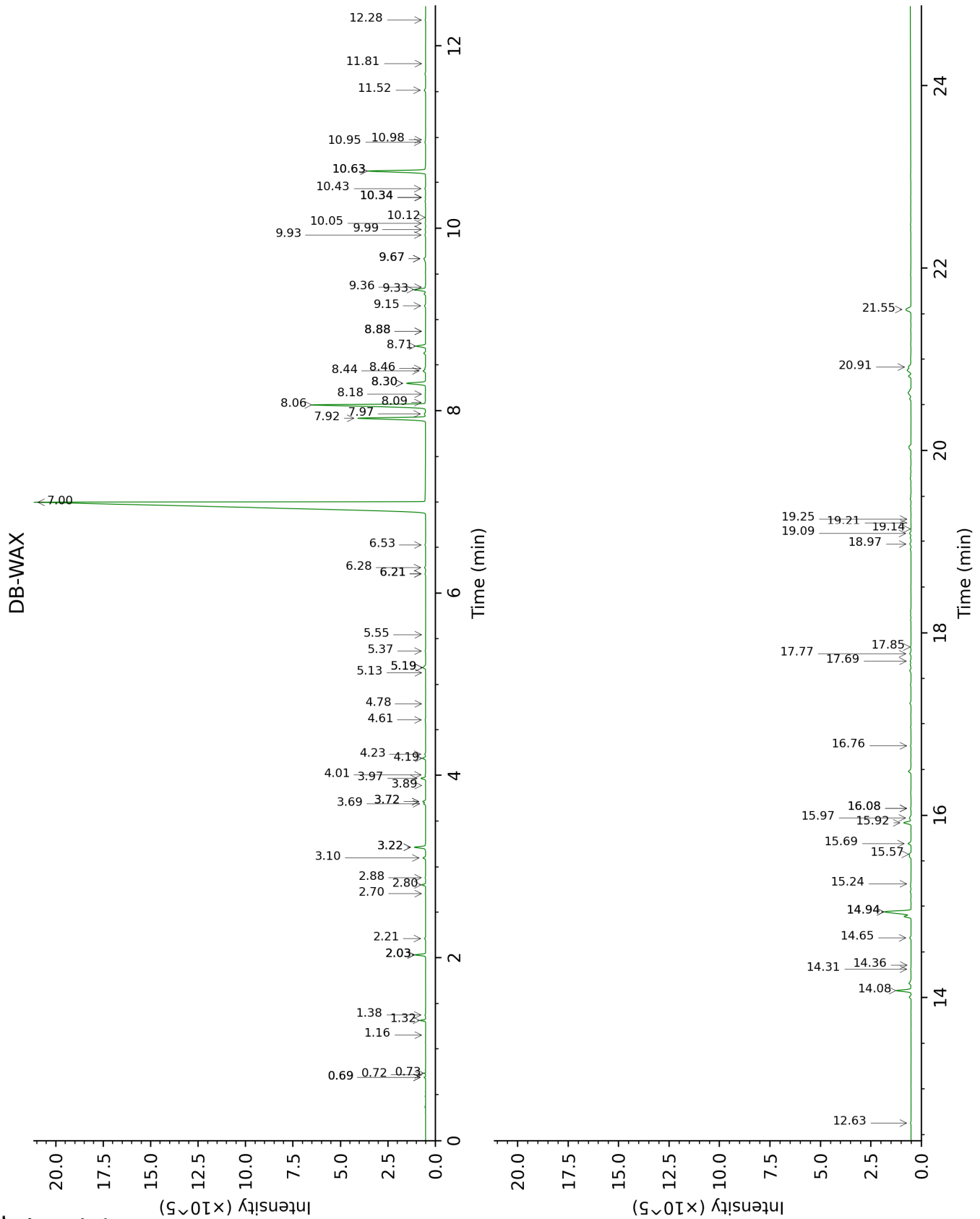
Note: no correction factor was applied

**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	%
3-Methylcyclopentane	0.60	622	0.01			
Isovaleral	0.66	643	0.03	0.74	884	0.03
2-Methylbutyral	0.70	653	tr	0.72	877	tr
2,4-Dimethyl-3-pentanone	1.52	792	tr	1.16	961	0.01
Unknown [m/z 55, 83 (89), 82 (70), 67 (66), 41 (55), 69 (46), 111 (37)... 126 (2)]	2.30	859	0.03	0.69*	867	0.05
Unknown [m/z 55, 83 (79), 67 (65), 41 (63), 82 (60), 69 (58)... 111 (27), 126 (9)]	2.32	860	0.03	0.69*	867	[0.05]
Styrene	2.64	886	0.01	3.72*	1204	0.16
Isobutyl isobutyrate	3.05	916	0.04	2.03*	1064	0.53
$\alpha$ -Thujene	3.18	925	0.03	1.38	998	0.03
$\alpha$ -Pinene	3.26	930	0.23	1.32	988	0.23
Unknown [m/z 99, 81 (98), 55 (51), 43 (42), 41 (34)... 109? (2)]	3.78	964	0.01	2.03*	1064	[0.53]
$\beta$ -Pinene	3.88*	971	0.55	2.03*	1064	[0.53]
Sabinene	3.88*	971	[0.55]	2.21	1081	0.05
Myrcene	4.20	992	0.19	2.80	1131	0.19
$\alpha$ -Phellandrene	4.34	1001	0.02	2.70	1124	0.01
$\alpha$ -Terpinene	4.54	1014	0.02	2.88	1137	0.02
2-Methylbutyl isobutyrate	4.61	1018	0.01	3.22*	1164	0.68
para-Cymene	4.66	1021	0.03	4.01	1225	0.03
1,8-Cineole	4.75*	1027	0.88	3.22*	1164	[0.68]
Unknown [m/z 59, 43 (11), 109 (10), 41 (10), 127 (8)...]	4.75*	1027	[0.88]	6.21*	1384	0.04
Limonene	4.75*	1027	[0.88]	3.10	1155	0.15
Unknown [m/z 59, 43 (12), 109 (11), 41 (10), 127 (8)...]	4.75*	1027	[0.88]	6.28	1389	0.06
(Z)- $\beta$ -Ocimene	4.95	1040	0.11	3.69	1202	0.11
(E)- $\beta$ -Ocimene	5.12	1050	0.04	3.89	1217	0.02
Unknown [m/z 125, 69 (75), 41 (34), 55 (25), 93 (22)... 140 (3)]	5.16*	1053	0.15	4.61	1269	0.03
2,6-Dimethyl-5-heptenal (melonal)	5.16*	1053	[0.15]	5.19*	1311	0.21
$\gamma$ -Terpinene	5.22*	1057	0.16	3.72*	1204	[0.16]

Prenyl isobutyrate	5.22*	1057	[0.16]	4.78	1282	0.02
para-Mentha-3,8-diene	5.40	1068	0.26	3.97	1222	0.26
Terpinolene isomer	5.63	1083	0.05	4.23	1242	0.05
para-Cymenene	5.69*	1086	0.19	6.21*	1384	[0.04]
Terpinolene	5.69*	1086	[0.19]	4.19	1238	0.18
Unknown [m/z 67, 82 (79), 81 (34), 41 (32), 55 (16)... 152 (5)]	5.83	1095	0.01	5.13	1307	tr
Linalool	5.92	1101	0.07	7.97	1514	0.08
Unknown [m/z 111, 69 (70), 41 (68), 55 (53), 43 (51)... 154 (7)]	6.07*	1111	0.07	5.55	1336	0.01
cis-Rose oxide	6.07*	1111	[0.07]	5.19*	1311	[0.21]
trans-Rose oxide	6.32	1127	0.03	5.37	1324	0.03
neo-Isopulegol	6.60*	1145	8.48	8.09	1524	0.02
Isopulegol	6.60*	1145	[8.48]	8.06	1522	8.46
Menthone	6.67	1150	0.14	6.53	1407	0.04
iso-Isopulegol	6.75†	1155	71.88	7.92	1510	4.60
Citronellal	6.85†	1161	[71.88]	7.00	1442	66.34
neoiso-Isopulegol	6.96	1169	0.62	8.71	1572	0.58
Isopulegol isomer	7.06	1175	0.18	8.44	1551	0.16
Terpinen-4-ol	7.08	1176	0.05	8.46	1553	0.04
α-Terpineol	7.28	1189	0.09	9.67*	1648	0.17
trans-Pulegol	7.66	1214	0.02	9.93	1669	0.05
Unknown [m/z 69, 55 (65), 43 (47), 41 (44), 83 (42), 75 (37), 125 (36)... 154 (1)]	7.69	1216	0.01			
Nerol	7.90	1231	0.04	10.95	1755	0.05
Citronellol	7.96*	1235	3.72	10.63*	1728	3.77
Pulegone	7.96*	1235	[3.72]	8.88*	1585	0.01
Neral	8.06	1242	0.03	9.36	1623	0.02
Geraniol	8.32	1259	0.11	11.52	1803	0.09
Methyl citronellate	8.42	1266	0.01	8.18	1531	0.01
Geranial	8.51	1273	0.02	10.06	1680	0.03
Benzyl isobutyrate	9.09	1308	0.03	10.63*	1728	[3.77]
Citronellic acid	9.40*	1330	0.97	15.92	2221	0.51
8-Hydroxy-neo-menthol	9.40*	1330	[0.97]	14.08	2038	0.93
Citronellyl acetate	9.71	1352	0.53	9.33	1621	0.73
Eugenol	9.77*	1356	0.73	14.65	2093	0.08
8-Hydroxy-iso-menthol	9.77*	1356	[0.73]	14.94*†	2121	2.84
Neryl acetate	9.91	1366	0.01	10.12	1685	0.01
Geranyl acetate	10.18	1385	0.06	10.43	1711	0.05
β-Elemene	10.21	1387	0.01	8.30*	1540	1.26
Benzyl isovalerate	10.28	1392	0.05	11.81	1829	tr
(Z)-Jasmone	10.30	1393	0.03	12.28	1871	0.02
β-Caryophyllene	10.59	1414	1.24	8.30*	1540	[1.26]

α-Humulene	11.04	1448	0.07	9.15	1607	0.07
allo-Aromadendrene	11.14	1455	0.01	8.88*	1585	[0.01]
Germacrene D	11.42	1476	0.06	9.67*	1648	[0.17]
Isoamyl phenylacetate	11.55	1486	0.01			
Bicyclogermacrene	11.62	1491	0.05	9.99	1674	0.03
Germacrene A	11.73	1499	0.01	10.34*	1703	0.02
γ-Cadinene	11.86	1510	tr	10.34*	1703	[0.02]
δ-Cadinene	12.00	1520	0.01	10.34*	1703	[0.02]
Germacrene B	12.39	1551	0.01	10.98	1757	0.01
Spathulenol	12.64	1571	tr	14.31	2060	0.03
Caryophyllene oxide	12.70	1575	0.03	12.63	1902	0.03
Unknown [m/z 69, 41 (48), 81 (36), 121 (34), 83 (32), 55 (30)... 290 (t)]	16.27	1881	0.12			
Unknown [m/z 165, 69 (87), 205 (72), 81 (67), 41 (65)... 290 (4)]	16.38	1890	0.14	14.36	2064	tr
Unknown [m/z 165, 205 (96), 69 (72), 41 (61), 81 (49)... 290 (6)]	16.50	1901	0.04			
Unknown [m/z 81, 137 (85), 95 (48), 69 (44)... 308? (t)]	16.84	1934	2.33	14.94*†	2121	[2.84]
Unknown [m/z 137, 81 (81), 95 (41), 183 (38)...]	16.95	1944	0.07	15.24	2152	0.03
Unknown [m/z 81, 93 (59), 205 (55), 121 (50), 41 (43)... 290 (8)]	17.22*	1969	0.24	15.58	2186	0.13
Unknown [m/z 81, 205 (66), 69 (58), 41 (56), 93 (56), 121 (47)... 290 (9)]	17.22*	1969	[0.24]	15.69	2197	0.20
Unknown [m/z 81, 137 (60), 69 (47), 95 (41), 41 (39), 55 (25)... 308? (t)]	17.37*	1984	0.65	15.97	2227	0.14
Unknown [m/z 81, 137 (94), 95 (46), 69 (38), 41 (36)...]	17.37*	1984	[0.65]	16.08*	2238	0.02
Unknown [m/z 81, 137 (70), 95 (46), 69 (45), 41 (39), 55 (29)...]	17.49	1996	0.03	16.08*	2238	[0.02]

Unknown [m/z 41, 69 (98), 55 (55), 81 (46), 109 (46)... 290 (8)]	17.61	2007	0.05	16.76	2310	0.03
Unknown [m/z 69, 41 (96), 55 (53), 109 (48), 95 (43), 67 (35)...]	17.86	2031	0.02			
Unknown [m/z 69, 81 (88), 43 (85), 95 (60)... 308 (t)]	18.07	2053	0.06	19.09	2570	0.09
Unknown [m/z 81, 95 (49), 69 (48), 137 (47), 43 (36)... 308 (1)]	18.16	2061	0.22	19.21	2584	0.01
Unknown [m/z 81, 137 (48), 95 (39), 69 (34), 41 (26)...]	18.23	2068	0.11	17.77	2420	0.08
Unknown [m/z 69, 81 (56), 83 (52), 41 (39), 95 (42), 55 (27)...]	18.29	2074	0.02	17.69	2411	0.05
Unknown [m/z 69, 81 (63), 83 (56), 41 (39), 95 (31)...]	18.33	2078	0.05	17.85	2428	0.03
Unknown [m/z 81, 137 (50), 69 (41), 95 (40)...]	18.36	2081	0.05			
Unknown [m/z 81, 137 (55), 69 (50), 95 (41), 41 (40), 59 (31)... 306? (t)]	18.39	2084	0.04			
Unknown [m/z 223, 69 (83), 43 (82), 81 (62), 139 (54), 41 (51)... 293 (7), 308 (t)]	18.49	2094	0.02	18.97	2557	0.08
Unknown [m/z 81, 43 (94), 69 (68), 95 (55), 41 (55), 55 (46)... 293 (8), 308 (1)]	18.72*	2117	0.15	19.14	2576	tr
Unknown [m/z 69, 81 (71), 41 (47), 83 (44), 95 (43), 43 (41)... 293 (2)...]	18.72*	2117	[0.15]	19.25	2590	0.02
Unknown [m/z 81, 69 (73), 137 (60), 95 (45), 83 (41)...]	23.27	2628	0.37			
Unknown [m/z 81, 69 (67), 137 (56), 95 (40), 83 (38)...]	23.34	2636	0.46	20.91	2793	0.23

Unknown [m/z 69, 83 (59), 81 (56), 137 (48), 41 (29), 139 (28)...]	23.93	2710	0.42	21.55	2875	0.55
<b>Total identified</b>	<b>93.57%</b>			<b>94.31%</b>		
<b>Total reported</b>	<b>98.28%</b>			<b>96.08%</b>		

\*: 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