Date : June 17, 2020

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 20E13-PTH05
Customer identification : Eucalyptus Lemon Organic - Brazil - E10108912R
Type : Essential oil
Source : *Corymbia citriodora*
Customer : Plant Therapy

Analysis

Method: PC-MAT-007 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Fanny Charlier, B. Sc.
Analysis date : May 13, 2020

Checked and approved by :

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

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia. This report is digitally signed, it is only considered valid if the digital signature is intact. The results only describe the samples that were submitted to the assays.

This report is an update of the version first issued on May 14, 2020 to indicatively present comparison to a standard.

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4544 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 3044:1997 - OIL OF EUCALYPTUS CITRIODORA

Compound	Min. %	Max. %	Observed %	Complies?
Citronellal	75		67	No
neo-Isopulegol + isopulegol		10	5	Yes
Refractive index	1.4500	1.4560	1.4544	Yes

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	0.01	Aliphatic aldehyde
2,4-Dimethyl-3-pentanone	tr	Aliphatic ketone
3-Methylcyclopentanol	0.02	Aliphatic alcohol
Ethyl 2-methylbutyrate	tr	Aliphatic ester
Unknown	0.02	Unknown
Unknown	0.02	Unknown
Isobutyl isobutyrate	0.05	Aliphatic ester
α-Thujene	0.03	Monoterpene
α-Pinene	0.35	Monoterpene
Camphene	tr	Monoterpene
Unknown	0.01	Unknown
β-Pinene	0.59	Monoterpene
Sabinene	0.07	Monoterpene
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Myrcene	0.12	Monoterpene
α-Phellandrene	0.01	Monoterpene
α-Terpinene	0.01	Monoterpene
Isoamyl isobutyrate	0.02	Aliphatic ester
2-Methylbutyl isobutyrate	0.01	Aliphatic ester
para-Cymene	0.05	Monoterpene
Unknown	0.03	Unknown
1,8-Cineole	0.74	Monoterpenic ether
Limonene	0.17	Monoterpene
(*Z*)-β-Ocimene	0.09	Monoterpene
(*E*)-β-Ocimene	0.04	Monoterpene
Unknown	0.04	Unknown
2,6-Dimethyl-5-heptenal (melonal)	0.20	Aliphatic aldehyde
γ-Terpinene	0.15	Monoterpene
para-Mentha-3,8-diene	0.05	Monoterpene
Terpinolene isomer	0.01	Monoterpene
Terpinolene	0.06	Monoterpene
trans-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Unknown	0.03	Oxygenated monoterpene
Linalool	0.41	Monoterpenic alcohol
cis-Rose oxide	0.14	Monoterpenic ether
trans-Rose oxide	0.06	Monoterpenic ether
Unknown	0.66	Oxygenated normonoterpene
Isopulegol	4.84	Monoterpenic alcohol
neo-Isopulegol	0.06	Monoterpenic alcohol
Menthone	0.09	Monoterpenic ketone
Citronellal	67.10	Monoterpenic aldehyde
iso-Isopulegol	2.75	Monoterpenic alcohol
Borneol	0.04	Monoterpenic alcohol
neoiso-Isopulegol	0.27	Monoterpenic alcohol

trans-Isopulegone	0.01	Monoterpenic ketone
Isopulegol isomer	0.07	Monoterpenic alcohol
Terpinen-4-ol	0.03	Monoterpenic alcohol
α-Terpineol	0.09	Monoterpenic alcohol
trans-Pulegol	0.01	Monoterpenic alcohol
Nerol	0.03	Monoterpenic alcohol
Pulegone	0.02	Monoterpenic ketone
Citronellol	5.71	Monoterpenic alcohol
Neral	0.06	Monoterpenic aldehyde
Unknown	0.06	Unknown
Unknown	0.01	Unknown
Geraniol	0.01	Monoterpenic alcohol
Methyl citronellate	0.04	Monoterpenic ester
Geranial	0.02	Monoterpenic aldehyde
Citronellyl formate	0.02	Monoterpenic ester
Benzyl isobutyrate	0.07	Phenolic ester
Citronellic acid	0.47	Monoterpenic acid
8-Hydroxy-neo-menthol	0.61	Monoterpenic alcohol
8-Hydroxymenthol	0.02	Monoterpenic alcohol
Citronellyl acetate	0.42	Monoterpenic ester
Eugenol	0.25	Phenylpropanoid
8-Hydroxy-iso-menthol	0.07	Monoterpenic alcohol
Neryl acetate	0.02	Monoterpenic ester
8-Hydroxy-neoiso-menthol	0.03	Monoterpenic alcohol
β-Bourbonene	0.01	Sesquiterpene
Geranyl acetate	0.02	Monoterpenic ester
β-Elemene	0.01	Sesquiterpene
(*Z*)-Jasmone	0.08	Jasmonate
Benzyl isovalerate	0.01	Phenolic ester
Methyleugenol	0.06	Phenylpropanoid
β-Caryophyllene	0.62	Sesquiterpene
α-Humulene	0.07	Sesquiterpene
Germacrene D	0.04	Sesquiterpene
Isoamyl phenylacetate	0.02	Phenolic ester
Bicyclogermacrene	0.04	Sesquiterpene
δ-Cadinene	0.03	Sesquiterpene
Spathulenol	0.02	Sesquiterpenic alcohol
Caryophyllene oxide	0.07	Sesquiterpenic ether
Humulene epoxide II	0.01	Sesquiterpenic ether
α-Cadinol	0.01	Sesquiterpenic alcohol
Unknown	0.10	Oxygenated diterpene
Unknown	0.13	Oxygenated diterpene
Unknown	0.03	Oxygenated diterpene
Unknown	1.65	Oxygenated diterpene
Unknown	0.24	Oxygenated diterpene
Unknown	0.45	Oxygenated diterpene
Unknown	0.10	Oxygenated diterpene
Unknown	0.03	Oxygenated diterpene
Citronellyl citronellate	0.01	Monoterpenic ester
Unknown	0.03	Oxygenated diterpene
Unknown	0.15	Oxygenated diterpene
Unknown	0.06	Unknown

Unknown	0.09	Unknown
Unknown	0.07	Unknown
Unknown	0.02	Unknown
Unknown	0.02	Oxygenated diterpene
Unknown	0.20	Unknown
Unknown	0.01	Unknown
Unknown	0.85	Unknown
Unknown	0.82	Unknown
Unknown	2.18	Unknown
Consolidated total	**95.96%**	

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.

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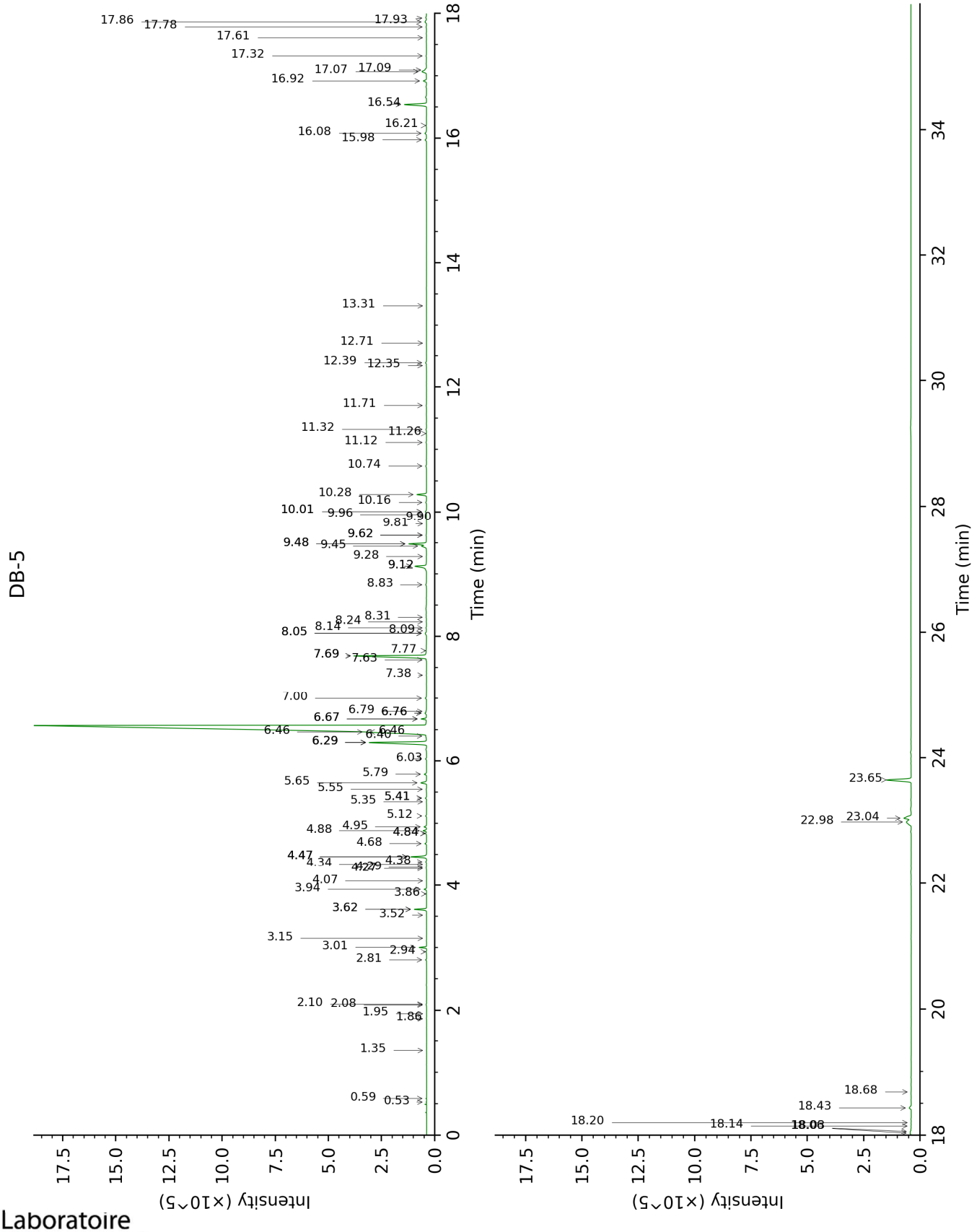
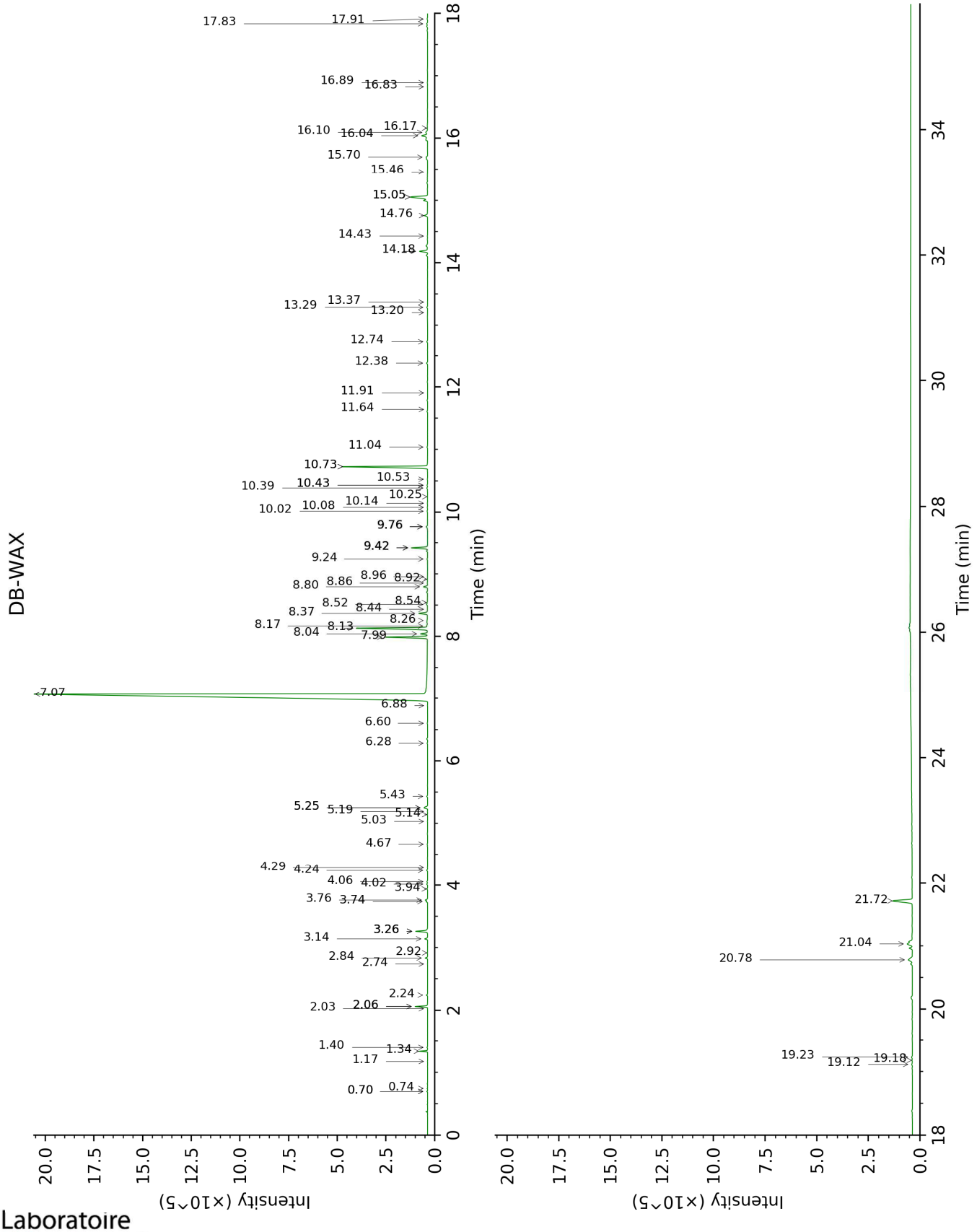

DB-5
Time (min)
Intensity (×10^5)
17.86
17.78
17.93
17.61
17.32
17.07
17.09
16.92
16.54
16.21
16.08
15.98
13.31
12.71
12.39
12.35
11.71
11.32
11.26
11.12
10.74
10.28
10.16
10.01
9.96
9.90
9.81
9.62
9.48
9.45
9.28
9.12
8.83
8.31
8.24
8.14
8.09
8.05
7.77
7.69
7.63
7.38
7.00
6.79
6.76
6.67
6.46
6.40
6.46
6.29
6.03
5.79
5.65
5.55
5.41
5.35
5.12
4.95
4.88
4.84
4.68
4.47
4.38
4.34
4.29
4.22
4.07
3.94
3.86
3.62
3.52
3.15
3.01
2.94
2.81
2.10
2.08
1.95
1.86
1.35
0.59
0.53
23.65
23.04
22.98
18.68
18.43
18.20
18.14
18.08


DB-WAX
Time (min)
Intensity (×10^5)
17.83
17.91
16.89
16.83
16.10
16.04
16.17
15.70
15.46
15.05
14.76
14.43
14.18
13.29
13.37
13.20
12.74
12.38
11.91
11.64
11.04
10.73
10.39
10.43
10.53
10.25
10.02
10.08
10.14
9.76
9.42
9.24
8.80
8.86
8.96
8.92
8.37
8.52
8.44
8.54
8.17
8.13
8.26
8.04
7.99
7.07
6.88
6.60
6.28
5.43
5.25
5.19
5.14
5.03
4.67
4.29
4.24
4.06
4.02
3.94
3.76
3.74
3.26
3.14
2.84
2.92
2.74
2.24
2.03
2.06
1.40
1.34
1.17
0.70
0.74
21.72
21.04
20.78
19.23
19.12
19.18

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
3-Methylcyclopentane	0.53	614	0.01			
Isovaleral	0.59	640	0.01	0.74	886	0.01
2,4-Dimethyl-3-pentanone	1.35	794	tr	1.17	962	0.01
3-Methylcyclopentanol	1.86	842	0.02	5.14	1301	0.02
Ethyl 2-methylbutyrate	1.94	849	tr			
Unknown [m/z 55, 83 (89), 82 (70), 67 (66), 41 (55), 69 (46), 111 (37)... 126 (2)]	2.08	860	0.02	0.70*	868	0.03
Unknown [m/z 55, 83 (79), 67 (65), 41 (63), 82 (60), 69 (58)... 111 (27), 126 (9)]	2.10	861	0.02	0.70*	868	[0.03]
Isobutyl isobutyrate	2.81	917	0.05	2.06*	1064	0.64
α-Thujene	2.94	925	0.03	1.40	998	0.03
α-Pinene	3.01	930	0.35	1.34	989	0.34
Camphene	3.15	939	tr			
Unknown [m/z 99, 81 (98), 55 (51), 43 (42), 41 (34)... 109? (2)]	3.52	964	0.01	2.03	1060	0.01
β-Pinene	3.62*	970	0.68	2.06*	1064	[0.64]
Sabinene	3.62*	970	[0.68]	2.24	1082	0.07
6-Methyl-5-hepten-2-one	3.86	986	0.01	5.03	1296	0.02
Myrcene	3.94	991	0.12	2.84	1131	0.13
α-Phellandrene	4.07	1000	0.01	2.74	1124	0.01
α-Terpinene	4.27	1013	0.01	2.92	1138	0.01
Isoamyl isobutyrate	4.29	1014	0.02	3.26*	1165	0.77
2-Methylbutyl isobutyrate	4.34	1017	0.01	3.26*	1165	[0.77]
para-Cymene	4.38	1020	0.05	4.06	1225	0.05
Unknown [m/z 59, 43 (11), 109 (10), 41 (10), 127 (8)...]	4.47*	1025	0.98	6.28	1383	0.03
1,8-Cineole	4.47*	1025	[0.98]	3.26*	1165	[0.77]
Limonene	4.47*	1025	[0.98]	3.14	1155	0.17
(*Z*)-β-Ocimene	4.68	1038	0.09	3.74	1202	0.08
(*E*)-β-Ocimene	4.84*	1048	0.07	3.94	1216	0.04
Unknown [m/z 125, 69 (75), 41 (34), 55 (25), 93 (22)... 140 (3)]	4.84*	1048	[0.07]	4.67	1270	0.04
2,6-Dimethyl-5-heptenal (melonal)	4.88	1051	0.20	5.25*	1309	0.33

γ-Terpinene	4.95	1055	0.15	3.76	1204	0.15
para-Mentha-3,8-diene	5.12	1066	0.05	4.02	1222	0.06
Terpinolene isomer	5.35	1081	0.01	4.28	1242	0.01
Terpinolene	5.40*	1084	0.07	4.24	1238	0.06
trans-Linalool oxide (fur.)	5.40*	1084	[0.07]	6.88	1428	0.01
Unknown [m/z 67, 82 (79), 81 (34), 41 (32), 55 (16)... 152 (5)]	5.55	1093	0.03	5.19	1304	0.01
Linalool	5.65	1100	0.41	8.04	1514	0.43
cis-Rose oxide	5.79	1109	0.14	5.25*	1309	[0.33]
trans-Rose oxide	6.03	1124	0.06	5.43	1322	0.06
Unknown [m/z 41, 69 (87), 82 (66), 67 (55), 109 (46)... 142 (18)]	6.30*	1142	4.78	9.42*†	1622	1.13
Isopulegol	6.30*	1142	[4.78]	8.14	1522	4.84
neo-Isopulegol	6.30*	1142	[4.78]	8.17	1524	0.06
Menthone	6.40	1148	0.09	6.60	1406	0.03
Citronellal	6.46*†	1152	71.91	7.07	1441	67.10
iso-Isopulegol	6.46*†	1152	[71.91]	7.99	1510	2.75
Borneol	6.67*	1166	0.31	9.76*	1649	0.13
neoiso-Isopulegol	6.67*	1166	[0.31]	8.80	1573	0.27
trans-Isopulegone	6.76*†	1172	0.17	8.96	1585	0.01
Isopulegol isomer	6.76*†	1172	[0.17]	8.52	1551	0.07
Terpinen-4-ol	6.79†	1174	[0.17]	8.54	1553	0.03
α-Terpineol	7.00	1188	0.09	9.76*	1649	[0.13]
trans-Pulegol	7.38	1213	0.01	10.08	1675	0.02
Nerol	7.63	1230	0.03	11.04	1756	0.05
Pulegone	7.69*	1234	5.72	8.92	1582	0.02
Citronellol	7.69*	1234	[5.72]	10.73*	1730	5.81
Neral	7.77	1240	0.06	9.42*†	1622	[1.13]
Unknown [m/z 59, 41 (62), 43 (51), 97 (42), 69 (37)...]	8.05*	1259	0.14	10.39	1701	0.06
Unknown [m/z 59, 41 (68), 43 (53), 97 (44), 69 (35)...]	8.05*	1259	[0.14]	10.43*	1704	0.04
Geraniol	8.09	1262	0.01	11.64	1807	0.01
Methyl citronellate	8.14	1265	0.04	8.26	1531	0.03
Geranial	8.24	1272	0.02	10.14	1681	0.02
Citronellyl formate	8.31	1277	0.02	8.86	1577	0.02
Benzyl isobutyrate	8.83	1308	0.07	10.73*	1730	[5.81]
Citronellic acid	9.12*	1329	1.07	16.10†	2229	[1.00]
8-Hydroxy-neo-menthol	9.12*	1329	[1.07]	14.18	2039	0.61
8-Hydroxymenthol	9.28	1340	0.02			
Citronellyl acetate	9.45	1352	0.42	9.42*†	1622	[1.13]
Eugenol	9.48*	1354	1.14	14.76	2094	0.25
8-Hydroxy-iso-menthol	9.48*	1354	[1.14]	15.05*	2124	1.72

Neryl acetate	9.62*	1364	0.04	10.25	1689	0.02
8-Hydroxy-neoiso-menthol	9.62*	1364	[0.04]			
β-Bourbonene	9.81	1377	0.01			
Geranyl acetate	9.90	1384	0.02	10.53	1712	0.03
β-Elemene	9.96	1388	0.01	8.44	1545	0.01
(*Z*)-Jasmone	10.01*	1391	0.11	12.38	1873	0.08
Benzyl isovalerate	10.01*	1391	[0.11]	11.91	1831	0.01
Methyleugenol	10.16	1402	0.06	13.29	1955	0.05
β-Caryophyllene	10.28	1411	0.62	8.37	1540	0.63
α-Humulene	10.74	1445	0.07	9.24	1608	0.04
Germacrene D	11.12	1473	0.04	9.76*	1649	[0.13]
Isoamyl phenylacetate	11.26	1484	0.02	13.20	1947	0.01
Bicyclogermacrene	11.32	1489	0.04	10.02	1670	0.04
δ-Cadinene	11.71	1518	0.03	10.43*	1704	[0.04]
Spathulenol	12.34	1568	0.02	14.43	2063	0.02
Caryophyllene oxide	12.39	1572	0.07	12.74	1904	0.06
Humulene epoxide II	12.72	1597	0.01	13.37	1963	0.01
α-Cadinol	13.31	1646	0.01	15.46	2164	0.01
Unknown [m/z 81, 69 (87), 93 (74), 121 (71), 41 (70), 205 (47)... 290 (18)]	15.98	1878	0.10			
Unknown [m/z 69, 41 (48), 81 (36), 121 (34), 83 (32), 55 (30)... 290 (t)]	16.08	1888	0.13			
Unknown [m/z 165, 205 (96), 69 (72), 41 (61), 81 (49)... 290 (6)]	16.21	1899	0.03			
Unknown [m/z 81, 137 (85), 95 (48), 69 (44)... 308? (t)]	16.54	1931	1.65	15.05*	2124	[1.72]
Unknown [m/z 81, 93 (59), 205 (55), 121 (50), 41 (43)... 290 (8)]	16.92	1967	0.24	15.70	2188	0.12
Unknown [m/z 81, 137 (60), 69 (47), 95 (41), 41 (39), 55 (25)... 308? (t)]	17.07	1981	0.45	16.04†	2224	1.00
Unknown [m/z 81, 137 (94), 95 (46), 69 (38), 41 (36)...]	17.09	1984	0.10	16.17	2236	0.02
Unknown [m/z 41, 69 (98), 55 (55), 81 (46), 109 (46)... 290 (8)]	17.32	2005	0.03	16.89	2312	0.03
Citronellyl citronellate	17.61	2034	0.01	16.83	2305	0.02
Unknown [m/z 69, 81 (88), 43 (85), 95	17.78	2051	0.03	19.18	2567	0.03

(60)... 308 (t)]						
Unknown [m/z 81, 95 (49), 69 (48), 137 (47), 43 (36)... 308 (1)]	17.86	2059	0.15	19.23	2572	0.07
Unknown [m/z 81, 137 (48), 95 (39), 69 (34), 41 (26)...]	17.93	2066	0.06	17.83	2414	0.07
Unknown [m/z 69, 81 (63), 83 (56), 41 (39), 95 (31)...]	18.03	2076	0.09	17.91	2423	0.04
Unknown [m/z 81, 137 (50), 69 (41), 95 (40)...]	18.06	2079	0.07			
Unknown [m/z 81, 137 (55), 69 (50), 95 (41), 41 (40), 59 (31)... 306? (t)]	18.14	2087	0.02			
Unknown [m/z 223, 69 (83), 43 (82), 81 (62), 139 (54), 41 (51)... 293 (7), 308 (t)]	18.20	2093	0.02	19.12	2559	0.06
Unknown [m/z 69, 81 (71), 41 (47), 83 (44), 95 (43), 43 (41)... 293 (2)...]	18.43	2116	0.20			
Unknown [m/z 69, 41 (86), 95 (59), 55 (47), 82 (43) 109 (41)...]	18.68	2142	0.01			
Unknown [m/z 81, 69 (73), 137 (60), 95 (45), 83 (41)...]	22.98	2631	0.85	20.78	2759	0.57
Unknown [m/z 81, 69 (70), 137 (56), 95 (43), 83 (36)...]	23.04	2638	0.82	21.04	2790	0.57
Unknown [m/z 69, 83 (59), 81 (56), 137 (48), 41 (29), 139 (28)...]	23.65	2715	2.18	21.72	2876	2.18
Total identified		**90.95%**			**89.60%**	
Total reported		**98.26%**			**94.53%**	

*: 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