

Date : 2024-07-12

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 24G10-NPA01

Customer Identification : Lemon Eucalyptus - Brasil - Sample# NPS00155 - Lot# NP0393

Type : Essential Oil

Source : *Eucalyptus citriodora* [syn. *Corymbia citriodora*]

Customer : Nature Packaged

Checked and approved by:

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

Notes: 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 from the first version issued on 2024-07-12 to format it for online publication.

GAS CHROMATOGRAPHIC ANALYSIS

Method : PC-MAT-014 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID

✖ISO

Results : See analysis summary (next page)

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

Date : 2024-07-12

PHYSICOCHEMICAL DATA

Refractive index : 1.4528 ± 0.0003 (20 °C)

Method : PC-MAT-016 - Measure of the refractive index of a liquid.

Analyst : Cindy Caron B. Sc.

Date : 2024-07-11

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
Isovaleral	0.01	Aliphatic aldehyde
2,4-Dimethyl-3-pentanone	tr	Aliphatic ketone
3-Methylcyclopentanol	0.01	Aliphatic alcohol
Unknown	0.02	Unknown
Isobutyl propionate	0.01	Aliphatic ester
Styrene	0.01	Simple phenolic
Isobutyl isobutyrate	0.11	Aliphatic ester
α -Thujene	0.03	Monoterpene
α -Pinene	0.22	Monoterpene
3-Methylcyclohexanone	0.01	Aliphatic ketone
Unknown	0.01	Unknown
Sabinene	0.15	Monoterpene
β -Pinene	0.59	Monoterpene
Myrcene	0.16	Monoterpene
α -Phellandrene	0.02	Monoterpene
α -Terpinene	0.02	Monoterpene
Isoamyl isobutyrate	0.03	Aliphatic ester
2-Methylbutyl isobutyrate	0.02	Aliphatic ester
<i>para</i> -Cymene	0.03	Monoterpene
1,8-Cineole	2.11	Monoterpenic ether
Limonene	0.29	Monoterpene
Unknown	0.03	Unknown
(Z)- β -Ocimene	0.07	Monoterpene
(E)- β -Ocimene	0.05	Monoterpene
2,6-Dimethyl-5-heptenal (melonal)	0.09	Aliphatic aldehyde
γ -Terpinene	0.12	Monoterpene
<i>para</i> -Mentha-3,8-diene	0.06	Monoterpene
Terpinolene isomer	0.01	Monoterpene
<i>para</i> -Cymenene	0.02	Monoterpene
Terpinolene	0.14	Monoterpene
Unknown	0.01	Oxygenated monoterpene
Linalool	0.38	Monoterpenic alcohol
<i>cis</i> -Rose oxide	0.05	Monoterpenic ether
<i>trans</i> -Rose oxide	0.02	Monoterpenic ether
Unknown	0.04	Oxygenated normonoterpene
Isopulegol	3.86	Monoterpenic alcohol
Citronellal	73.59	Monoterpenic aldehyde
Isomenthone	0.02	Monoterpenic ketone
iso-Isopulegol	2.08	Monoterpenic alcohol
neiso-Isopulegol	0.26	Monoterpenic alcohol

Isopulegol isomer	0.08	Monoterpenic alcohol
Terpinen-4-ol	0.04	Monoterpenic alcohol
Isopulegol isomer?	0.01	Monoterpenic alcohol
α -Terpineol	0.12	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Nerol	0.04	Monoterpenic alcohol
Citronellol	7.12	Monoterpenic alcohol
Neral	0.08	Monoterpenic aldehyde
Unknown	0.08	Unknown
Geraniol	0.11	Monoterpenic alcohol
Methyl citronellate	0.08	Monoterpenic ester
Geranial	0.02	Monoterpenic aldehyde
Isopulegyl acetate	0.02	Monoterpenic ester
Unknown	0.01	Unknown
Benzyl isobutyrate	0.01	Phenolic ester
Citronellic acid	0.32	Monoterpenic acid
8-Hydroxy-neo-menthol	0.42	Monoterpenic alcohol
8-Hydroxymenthol	0.02	Monoterpenic alcohol
8-Hydroxy-iso-menthol	0.10	Monoterpenic alcohol
Citronellyl acetate	0.96	Monoterpenic ester
Eugenol	0.09	Phenylpropanoid
Neryl acetate	0.01	Monoterpenic ester
8-Hydroxy-neoiso-menthol	0.01	Monoterpenic alcohol
Geranyl acetate	0.02	Monoterpenic ester
β -Elemene	0.02	Sesquiterpene
(Z)-Jasmone	0.05	Jasmonate
Methyleugenol	0.04	Phenylpropanoid
β -Caryophyllene	0.54	Sesquiterpene
α -Humulene	0.02	Sesquiterpene
allo-Aromadendrene	0.01	Sesquiterpene
(E)- β -Farnesene	0.01	Sesquiterpene
γ -Murolene	0.01	Sesquiterpene
Germacrene D	0.04	Sesquiterpene
Isoamyl phenylacetate	0.02	Phenolic ester
trans-Sabinyl 2-methylbutyrate	0.02	Monoterpenic ester
Bicyclogermacrene	0.03	Sesquiterpene
α -Murolene	0.03	Sesquiterpene
γ -Cadinene	0.03	Sesquiterpene
δ -Cadinene	0.11	Sesquiterpene
α -Cadinene	0.01	Sesquiterpene
Germacrene B	0.01	Sesquiterpene
Spathulenol	0.02	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Caryophyllene oxide	0.02	Sesquiterpenic ether
τ -Cadinol	0.02	Sesquiterpenic alcohol

β-Eudesmol	0.01	Sesquiterpenic alcohol
7-epi-α-Eudesmol	0.02	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated diterpene
Unknown	0.01	Oxygenated diterpene
Unknown	0.03	Oxygenated diterpene
Unknown	0.01	Oxygenated diterpene
Unknown	0.01	Oxygenated diterpene
Unknown	0.72	Oxygenated diterpene
Unknown	0.03	Oxygenated diterpene
Unknown	0.02	Oxygenated diterpene
Unknown	0.19	Oxygenated diterpene
Unknown	0.02	Oxygenated diterpene
Unknown	0.02	Oxygenated diterpene
Unknown	0.01	Unknown
Unknown	0.02	Unknown
Unknown	0.02	Oxygenated diterpene
Unknown	0.04	Unknown
Unknown	0.02	Oxygenated diterpene
Unknown	0.03	Unknown
Unknown	0.05	Unknown
Unknown	0.04	Unknown
Unknown	0.02	Oxygenated diterpene
Unknown	0.01	Unknown
Unknown	0.19	Unknown
Unknown	0.08	Unknown
Unknown	0.19	Unknown
Unknown	0.92	Unknown
Consolidated total	98.35	

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

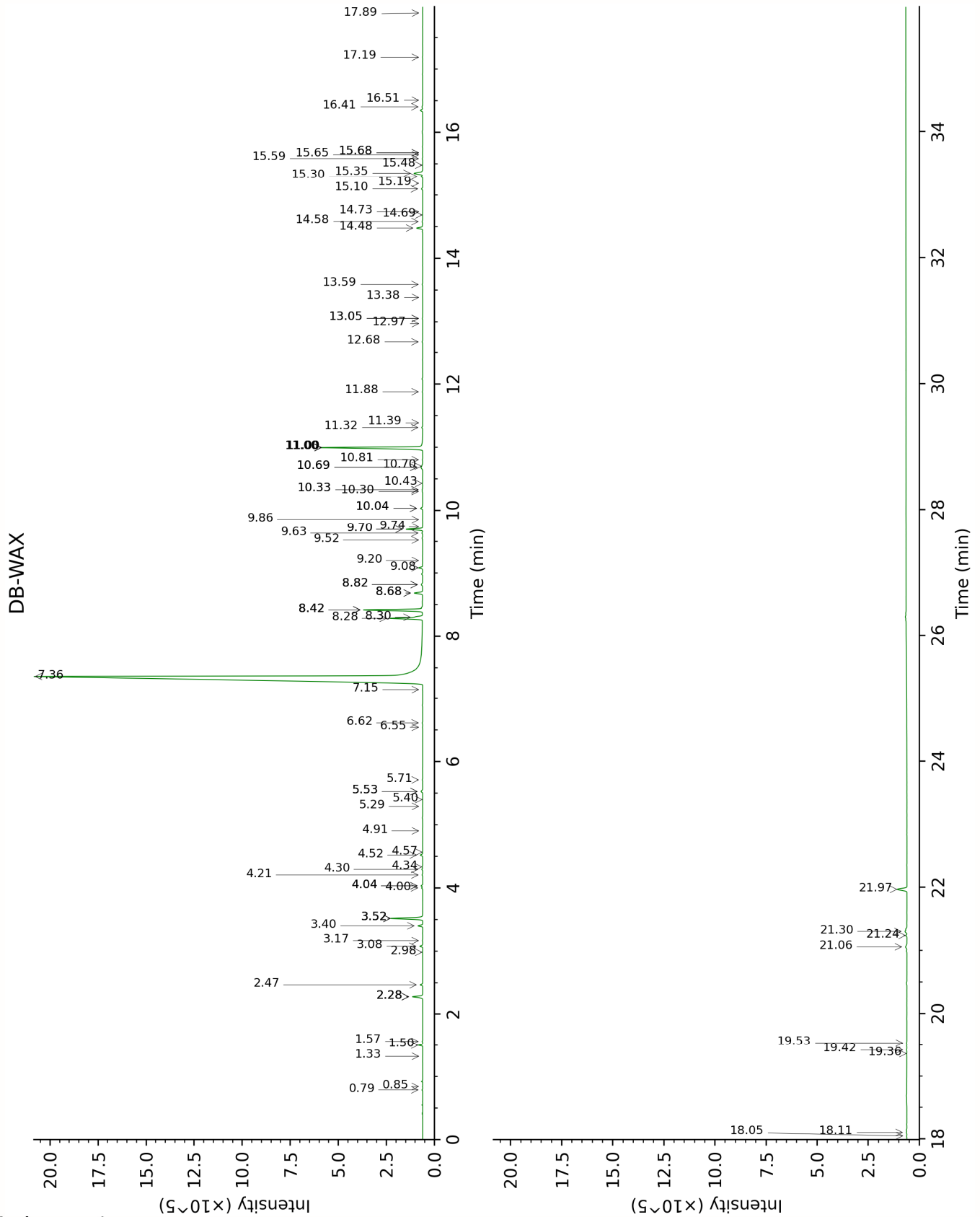
Note: no correction factor was applied

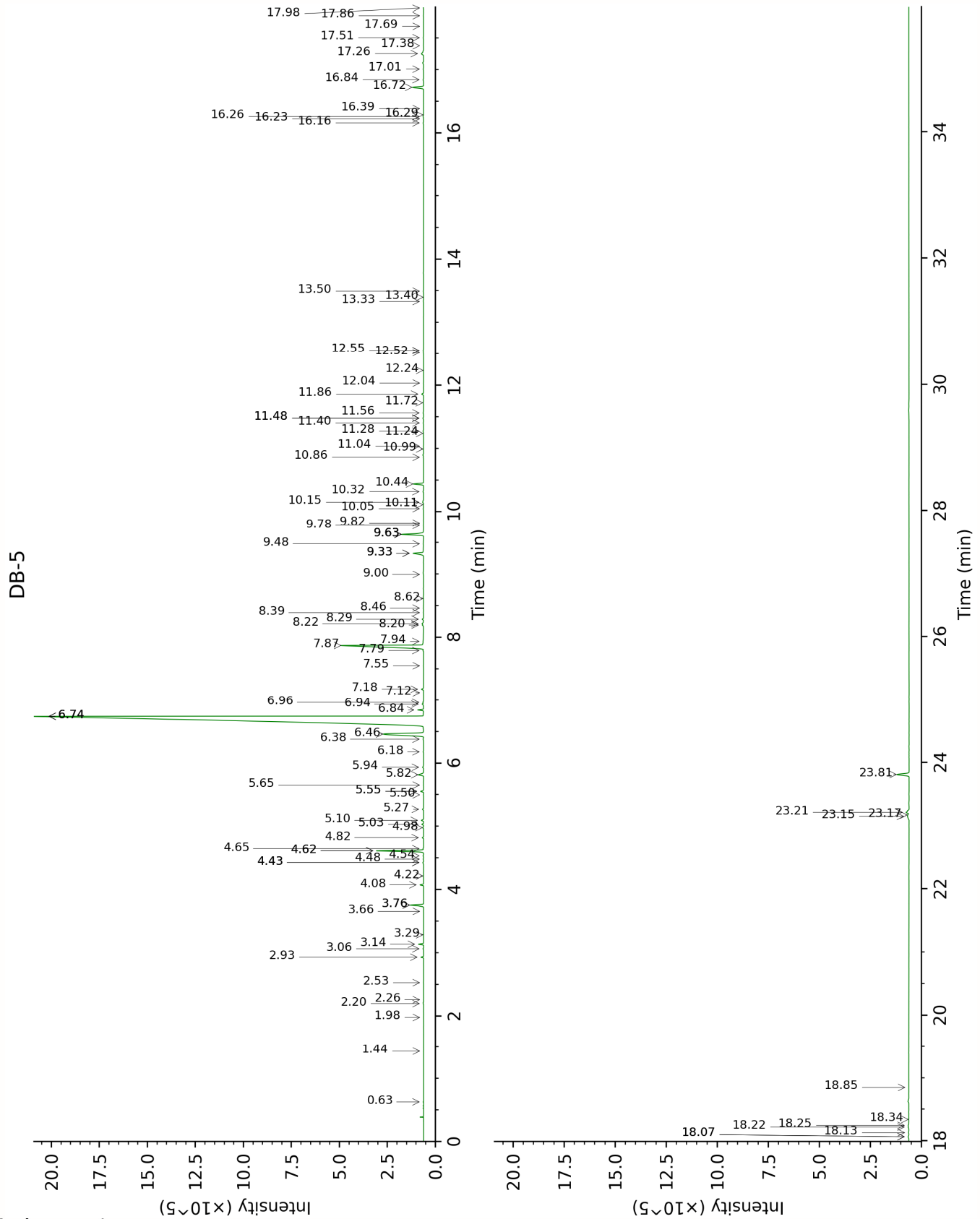
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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.

Bracketed value ([xx]): A bracketed percent value indicate that two or more compound percentage could not be solved due to coelution.

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





FULL ANALYSIS DATA

Isovaleral	Column DB-WAX			Column DB-5		
	0.85	886.3	0.01	0.63	641.4	0.01
2,4-Dimethyl-3-pentanone	1.33	965.0	0.01	1.44	792.3	tr
3-Methylcyclopentanol	5.29	1299.4	0.01	1.98	842.2	0.01
Unknown COCI II [m/z 55, 83 (79), 67 (65), 41 (63), 82 (60), 69 (58)... 111 (27), 126 (9)]	0.79	867.6	0.03	2.20	860.5	0.02
Isobutyl propionate				2.26	865.5	0.01
Styrene	4.04*	1205.5	[0.10]	2.53	887.9	0.01
Isobutyl isobutyrate	2.28*	1067.7	[0.72]	2.93	918.0	0.11
α -Thujene	1.57	999.8	0.03	3.06	926.8	0.03
α -Pinene	1.50	992.7	0.22	3.14	931.6	0.22
3-Methylcyclohexanone	4.91	1266.5	0.01	3.29	941.5	0.01
Unknown COCI III [m/z 99, 81 (98), 55 (51), 43 (42), 41 (34)... 109? (2)]	2.28*	1067.7	[0.72]	3.66	966.0	0.01
Sabinene	2.47	1085.6	0.15	3.76*	972.6	[0.74]
β -Pinene	2.28*	1067.7	[0.72]	3.76*	972.6	[0.74]
Myrcene	3.08	1134.0	0.17	4.08	993.7	0.16
α -Phellandrene	2.98	1126.8	0.01	4.22	1003.1	0.02
α -Terpinene	3.17	1140.7	0.02	4.43*	1016.4	[0.05]
Isoamyl isobutyrate	3.52*	1167.4	[2.18]	4.43*	1016.4	[0.05]
2-Methylbutyl isobutyrate	3.52*	1167.4	[2.18]	4.48	1019.8	0.02
<i>para</i> -Cymene	4.34	1226.6	0.03	4.54	1023.2	0.03
1,8-Cineole	3.52*	1167.4	[2.18]	4.62*	1028.2	[2.40]
Limonene	3.40	1158.5	0.29	4.62*	1028.2	[2.40]
Unknown COCI XLIV [m/z 59, 43 (12), 109 (11), 41 (10), 127 (8)...]	6.62	1392.6	0.03	4.65	1030.2	0.03
(Z)- β -Ocimene	4.00	1203.1	0.07	4.82	1041.1	0.07
(E)- β -Ocimene	4.21	1217.6	0.04	4.98	1051.1	0.05
2,6-Dimethyl-5-heptenal (melonal)	5.53*	1316.0	[0.15]	5.03	1054.4	0.09
γ -Terpinene	4.04*	1205.5	[0.10]	5.10	1058.3	0.12
<i>para</i> -Mentha-3,8-diene	4.30	1223.8	0.06	5.27	1069.3	0.06
Terpinolene isomer	4.57	1242.9	0.02	5.50	1083.6	0.01
<i>para</i> -Cymenene	6.55	1387.7	0.02	5.56*	1087.1	[0.16]

Laboratoire
PhytoChemia

Plus que des analyses... des conseils

Terpinolene	4.52	1239.7	0.14	5.56*	1087.1	[0.16]
Unknown COCI VI [m/z 67, 82 (79), 81 (34), 41 (32), 55 (16)... 152 (5)]	5.40	1307.1	0.01	5.65	1093.3	0.01
Linalool	8.30	1516.3	0.40	5.82	1103.6	0.38
cis-Rose oxide	5.53*	1316.0	[0.15]	5.94	1111.1	0.05
trans-Rose oxide	5.71	1329.0	0.03	6.18	1126.7	0.02
Unknown COCI VIII [m/z 41, 69 (87), 82 (66), 67 (55), 109 (46)... 142 (18)]	9.63	1619.4	0.05	6.38	1139.5	0.04
Isopulegol	8.42*	1525.2	[3.94]	6.46	1144.7	3.86
Citronellal	7.36	1446.9	73.59	6.74*	1162.6	[76.00]
Isomenthone	7.15	1431.7	0.02	6.74*	1162.6	[76.00]
iso-Isopulegol	8.28	1515.0	2.08	6.74*	1162.6	[76.00]
neoiso-Isopulegol	9.08	1576.1	0.27	6.84	1169.1	0.26
Isopulegol isomer	8.82*	1555.7	[0.14]	6.94	1175.1	0.08
Terpinen-4-ol	8.82*	1555.7	[0.14]	6.96	1176.9	0.04
Isopulegol isomer?				7.12	1187.0	0.01
α-Terpineol	10.04*	1651.5	[0.15]	7.18	1190.7	0.12
Unknown COCI IX [m/z 69, 55 (65), 43 (47), 41 (44), 83 (42), 75 (37), 125 (36)... 154 (1)]				7.55	1214.9	0.01
Nerol	11.32	1756.8	0.07	7.79	1231.1	0.04
Citronellol	11.00*	1730.3	[7.36]	7.87	1236.4	7.12
Neral	9.70*	1624.3	[1.04]	7.94	1240.7	0.08
Unknown COCI XI [m/z 59, 41 (62), 43 (51), 97 (42), 69 (37)...]	10.70	1705.5	0.08	8.20	1258.0	0.08
Geraniol	11.88	1804.9	0.03	8.22	1259.5	0.11
Methyl citronellate	8.42*	1525.2	[3.94]	8.29	1264.2	0.08
Geranial	10.33*	1675.0	[0.04]	8.39	1271.2	0.02
Isopulegyl acetate	8.42*	1525.2	[3.94]	8.46	1276.0	0.02
Unknown COCI XII [m/z 85, 41 (23), 67 (21), 82 (16), 43 (10)... 170? (1)]	13.05*	1908.4	[0.03]	8.62	1286.2	0.01
Benzyl isobutyrate	11.00*	1730.3	[7.36]	9.00	1312.1	0.01
Citronellic acid				9.33*	1335.7	[0.75]
8-Hydroxy-neo- menthol	14.48	2041.4	0.42	9.33*	1335.7	[0.75]
8-Hydroxymenthol				9.48	1346.3	0.02

8-Hydroxy-iso-menthol	15.30	2121.1	0.10	9.63*	1357.0	[1.31]
Citronellyl acetate	9.70*	1624.3	[1.04]	9.63*	1357.0	[1.31]
Eugenol	15.10	2101.3	0.09	9.63*	1357.0	[1.31]
Neryl acetate	10.43	1683.2	0.02	9.78	1367.1	0.01
8-Hydroxy-neoiso-menthol	15.48	2139.6	0.02	9.82	1370.0	0.01
Geranyl acetate	10.81	1714.1	0.03	10.05	1386.3	0.02
β -Elemene	8.68*	1545.6	[0.60]	10.11	1390.7	0.02
(Z)-Jasmone	12.68	1875.2	0.04	10.15	1393.4	0.05
Methyleugenol	13.59	1957.6	0.03	10.32	1405.4	0.04
β -Caryophyllene	8.68*	1545.6	[0.60]	10.44	1414.4	0.54
α -Humulene	9.52	1610.5	0.01	10.86	1445.8	0.02
allo-Aromadendrene	9.20	1584.9	0.02	10.99	1455.7	0.01
(E)- β -Farnesene	9.74	1627.4	0.01	11.04	1458.9	0.01
γ -Muurolene	9.86	1637.1	0.02	11.24	1474.0	0.01
Germacrene D	10.04*	1651.5	[0.15]	11.28	1476.7	0.04
Isoamyl phenylacetate	13.38	1938.8	0.01	11.40	1486.3	0.02
<i>trans</i> -Sabinyl 2-methylbutyrate	11.00*	1730.3	[7.36]	11.48*	1491.9	[0.04]
Bicyclogermacrene	10.30	1672.8	0.03	11.48*	1491.9	[0.04]
α -Muurolene	10.33*	1675.0	[0.04]	11.56	1498.1	0.03
γ -Cadinene	10.69*	1704.2	[0.19]	11.72	1510.4	0.03
δ -Cadinene	10.69*	1704.2	[0.19]	11.86	1521.2	0.11
α -Cadinene	11.00*	1730.3	[7.36]	12.04	1534.9	0.01
Germacrene B	11.39	1763.0	0.01	12.24	1550.7	0.01
Spathulenol	14.69	2061.2	0.02	12.52	1573.1	0.02
Caryophyllene oxide isomer	12.97	1901.0	0.01	12.55*	1575.7	[0.03]
Caryophyllene oxide	13.05*	1908.4	[0.03]	12.55*	1575.7	[0.03]
τ -Cadinol	15.19	2110.0	0.02	13.33	1638.6	0.02
β -Eudesmol	15.68*	2159.1	[0.02]	13.40	1644.2	0.01
7-epi- α -Eudesmol	15.68*	2159.1	[0.02]	13.50	1652.0	0.02
Unknown COCI XVIII [m/z 81, 69 (87), 93 (74), 121 (71), 41 (70), 205 (47)... 290 (18)]				16.16	1884.4	0.03
Unknown COCI XIX [m/z 69, 41 (48), 81 (36), 121 (34), 83 (32), 55 (30)... 290 (t)]				16.23	1890.3	0.01
Unknown COCI XX [m/z 81, 93 (70), 121 (64), 69 (64), 41 (56),	14.58	2051.1	0.06	16.26	1893.6	0.03

205 (50)... 290 (19)] Unknown COCI XXI [m/z 165, 69 (87), 205 (72), 81 (67), 41 (65)... 290 (4)]	14.74	2065.9	0.01	16.29	1896.0	0.01
Unknown COCI XXII [m/z 165, 205 (96), 69 (72), 41 (61), 81 (49)... 290 (6)]				16.39	1905.0	0.01
Unknown COCI XXIII [m/z 81, 137 (85), 95 (48), 69 (44)... 308? (t)]	15.35	2126.6	0.79	16.72	1937.0	0.72
Unknown COCI XXIV [m/z 137, 81 (81), 95 (41), 183 (38)...]	15.65	2155.8	0.02	16.84	1948.5	0.03
Unknown COCI XXV [m/z 69, 81 (53), 41 (51), 137 (39), 121 (33)...]	15.59	2149.8	0.04	17.01	1964.4	0.02
Unknown COCI XXVIII [m/z 81, 137 (94), 95 (46), 69 (38), 41 (36)...]	16.41	2233.5	0.07	17.26	1987.7	0.19
Unknown COCI XXIX [m/z 81, 137 (70), 95 (46), 69 (45), 41 (39), 55 (29)...]	16.51	2244.4	0.02	17.38	1999.6	0.02
Unknown COCI XXX [m/z 41, 69 (98), 55 (55), 81 (46), 109 (46)... 290 (8)]	17.19	2316.1	0.02	17.51	2011.9	0.02
Unknown COCI LXIII [m/z 69, 41 (95), 55 (57), 109 (46), 95 (45), 67 (34)...]				17.69	2029.8	0.01
Unknown COCI XXXII [m/z 81, 137 (68), 95 (44), 43 (40), 69 (39), 183 (35)...]	17.90	2392.2	0.01	17.86	2046.5	0.02
Unknown COCI XXXIII [m/z 69, 81 (88), 43 (85), 95 (60)... 308 (t)]	19.42	2565.7	0.02	17.98	2059.1	0.02
Unknown COCI XXXIV [m/z 81, 137 (48), 95 (39), 69 (34), 41 (26)...]	18.11	2415.8	0.04	18.07*	2067.5	[0.06]
Unknown COCI XXXV	19.53	2578.9	0.02	18.07*	2067.5	[0.06]

[m/z 81, 95 (49), 69 (48), 137 (47), 43 (36)... 308 (1)]						
Unknown COCI XXXVI [m/z 69, 81 (56), 83 (52), 41 (39), 95 (42), 55 (27)...]	18.05	2409.6	0.02	18.13	2074.0	0.03
Unknown COCI XXXVIII [m/z 81, 137 (50), 69 (41), 95 (40)...]				18.22	2082.9	0.05
Unknown COCI XXXIX [m/z 81, 137 (55), 69 (50), 95 (41), 41 (40), 59 (31)... 306? (t)]				18.25	2085.5	0.04
Unknown COCI XL [m/z 223, 69 (83), 43 (82), 81 (62), 139 (54), 41 (51)... 293 (7), 308 (t)]	19.36	2558.7	0.01	18.34	2094.8	0.02
Unknown COCI LIII [m/z 69, 41 (86), 95 (59), 55 (47), 82 (43) 109 (41)...]				18.85	2146.9	0.01
Unknown COCI XLVI [m/z 81, 69 (83), 137 (61), 95 (50), 83 (45)...]	21.06	2765.3	0.17	23.15	2634.6	0.19
Unknown COCI XLVII [m/z 81, 69 (73), 137 (60), 95 (45), 83 (41)...]	21.24	2787.9	0.08	23.17	2637.4	0.08
Unknown COCI XLIX [m/z 81, 69 (67), 137 (56), 95 (40), 83 (38)...]	21.30	2796.2	0.20	23.21	2642.6	0.19
Unknown COCI L [m/z 69, 83 (59), 81 (56), 137 (48), 41 (29), 139 (28)...]	21.97	2881.7	0.92	23.81	2718.0	0.92
Total reported		98.08%			98.82%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, only the first one is 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