

Date : 2024-03-04

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 24C01-NPA01

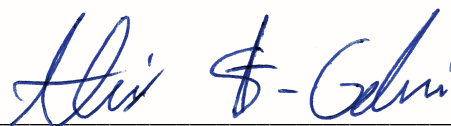
Customer Identification : Tea Tree - Zambia - NPS00138 - Lot: NP0367

Type : Essential Oil

Source : *Melaleuca alternifolia* ct. *Terpinen-4-ol* (Tea Tree)

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 2024-03-04 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 : 2024-03-04

PHYSICOCHEMICAL DATA

Refractive index : 1.4782 ± 0.0003 (20 °C)

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

Analyst : Cindy Caron B. Sc.

Date : 2024-03-01

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
Ethanol	tr	Aliphatic alcohol
Isobutyral	tr	Aliphatic aldehyde
Isobutanol	tr	Aliphatic alcohol
2-Methylbutyral	tr	Aliphatic aldehyde
(3Z)-Hexenol	0.02	Aliphatic alcohol
α -Thujene	1.01	Monoterpene
α -Pinene	2.71	Monoterpene
Camphene	0.01	Monoterpene
α -Fenchene	tr	Monoterpene
Sabinene	0.11	Monoterpene
β -Pinene	0.79	Monoterpene
3-Methyl-3-cyclohexenone	0.01	Aliphatic ketone
Myrcene	0.88	Monoterpene
α -Phellandrene	0.50	Monoterpene
Pseudolimonene	0.01	Monoterpene
(3Z)-Hexenyl acetate	0.01	Aliphatic ester
α -Terpinene	11.02	Monoterpene
<i>para</i> -Cymene	2.36	Monoterpene
Limonene	0.97	Monoterpene
1,8-Cineole	3.35	Monoterpenic ether
(Z)- β -Ocimene	0.01	Monoterpene
(E)- β -Ocimene	0.02	Monoterpene
γ -Terpinene	22.95	Monoterpene
<i>cis</i> -Sabinene hydrate	0.04	Monoterpenic alcohol
<i>para</i> -Cymenene	0.04	Monoterpene
Terpinolene	3.90	Monoterpene
<i>trans</i> -Sabinene hydrate	0.04	Monoterpenic alcohol
Linalool	0.07	Monoterpenic alcohol
endo-Fenchol	0.01	Monoterpenic alcohol
<i>cis-para</i> -Menth-2-en-1-ol	0.08	Monoterpenic alcohol
4-Hydroxy-4-methylcyclohex-2-enone	0.03	Aliphatic alcohol
1-Terpineol	0.04	Monoterpenic alcohol
<i>trans-para</i> -Menth-2-en-1-ol	0.07	Monoterpenic alcohol
Unknown	0.01	Unknown
Unknown	0.02	Oxygenated monoterpene
δ -Terpineol	0.01	Monoterpenic alcohol
Terpinen-4-ol	36.53	Monoterpenic alcohol
<i>para</i> -Cymen-8-ol	0.04	Monoterpenic alcohol
α -Terpineol	2.14	Monoterpenic alcohol
<i>cis</i> -Piperitol	0.04	Monoterpenic alcohol

<i>trans</i> -Piperitol	0.07	Monoterpenic alcohol
exo-2-Hydroxycineole	0.01	Monoterpenic alcohol
Nerol	0.02	Monoterpenic alcohol
<i>cis</i> -Carvenone oxide?	0.01	Monoterpenic ketone
Thymol	0.09	Monoterpenic alcohol
Carvacrol	0.03	Monoterpenic alcohol
Unknown	0.01	Monoterpenic alcohol
Bicycloelemene	0.01	Sesquiterpene
α -Cubebene	0.06	Sesquiterpene
Unknown	0.02	Unknown
Isoledene	0.10	Sesquiterpene
α -Copaene	0.12	Sesquiterpene
7-Cubebene	0.09	Sesquiterpene
7-Cubebene epimer?	0.04	Aliphatic alcohol
β -Elemene	0.03	Sesquiterpene
Unknown	0.05	Sesquiterpene
α -Gurjunene	0.42	Sesquiterpene
Methyleugenol	0.05	Phenylpropanoid
β -Caryophyllene	0.51	Sesquiterpene
γ -Maaliene	0.08	Sesquiterpene
β -Gurjunene	0.02	Sesquiterpene
α -Maaliene	0.08	Sesquiterpene
Aromadendrene	1.30	Sesquiterpene
Selina-5,11-diene	0.18	Sesquiterpene
Cadina-3,5-diene isomer I?	0.18	Sesquiterpene
<i>trans</i> -Muuroala-3,5-diene	0.11	Sesquiterpene
α -Humulene	0.13	Sesquiterpene
allo-Aromadendrene	0.54	Sesquiterpene
Valerena-4,7(11)-diene	0.04	Sesquiterpene
γ -Gurjunene	0.06	Sesquiterpene
Selina-4,11-diene	0.02	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.29	Sesquiterpene
γ -Muurolene	0.03	Sesquiterpene
(1S,2S,4S)- <i>para</i> -Menthane-1,2,4-triol	0.06	Monoterpenic alcohol
β -Selinene	0.11	Sesquiterpene
allo-Aromadendr-9-ene	0.11	Sesquiterpene
δ -Selinene	0.04	Sesquiterpene
α -Selinene	0.14	Sesquiterpene
Epizonarene	tr	Sesquiterpene
Viridiflorene	1.10	Sesquiterpene
Bicyclogermacrene	0.33	Sesquiterpene
α -Muurolene	0.12	Sesquiterpene
γ -Cadinene	0.04	Sesquiterpene
<i>trans</i> -Calamenene	0.05	Sesquiterpene
δ -Cadinene	0.83	Sesquiterpene

Zonarene	0.22	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.14	Sesquiterpene
α -Calacorene	0.01	Sesquiterpene
Epiglobulol	0.06	Sesquiterpenic alcohol
Eudesma-5,7(11)-diene	0.02	Sesquiterpene
Maaliol	0.03	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
Spathulenol	0.05	Sesquiterpenic alcohol
Caryophyllene oxide	0.01	Sesquiterpenic ether
Globulol	0.25	Sesquiterpenic alcohol
Gleenol	0.02	Sesquiterpenic alcohol
Viridiflorol	0.11	Sesquiterpenic alcohol
Cubeban-11-ol	0.09	Sesquiterpenic alcohol
Ledol	0.03	Sesquiterpenic alcohol
Eudesm-5-en-11-ol analog	0.06	Sesquiterpenic alcohol
1,10-diepi-Cubenol	0.01	Sesquiterpenic alcohol
Rosifoliol	0.10	Sesquiterpenic alcohol
1-epi-Cubenol	0.11	Sesquiterpenic alcohol
Isospathulenol	0.08	Sesquiterpenic alcohol
Cubenol	0.07	Sesquiterpenic alcohol
α -Muurolol	0.03	Sesquiterpenic alcohol
Consolidated total	99.14	

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

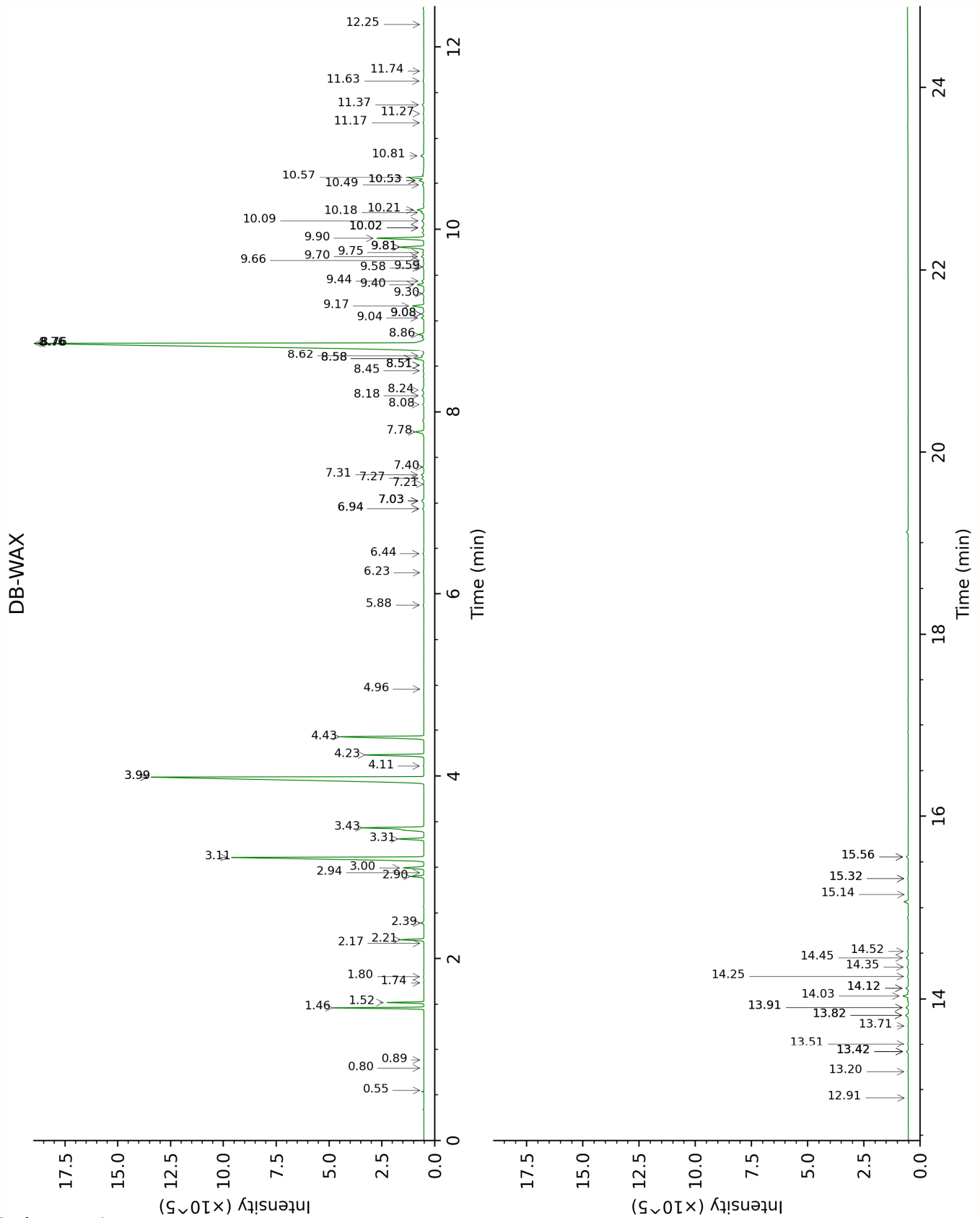
Note: no correction factor was applied

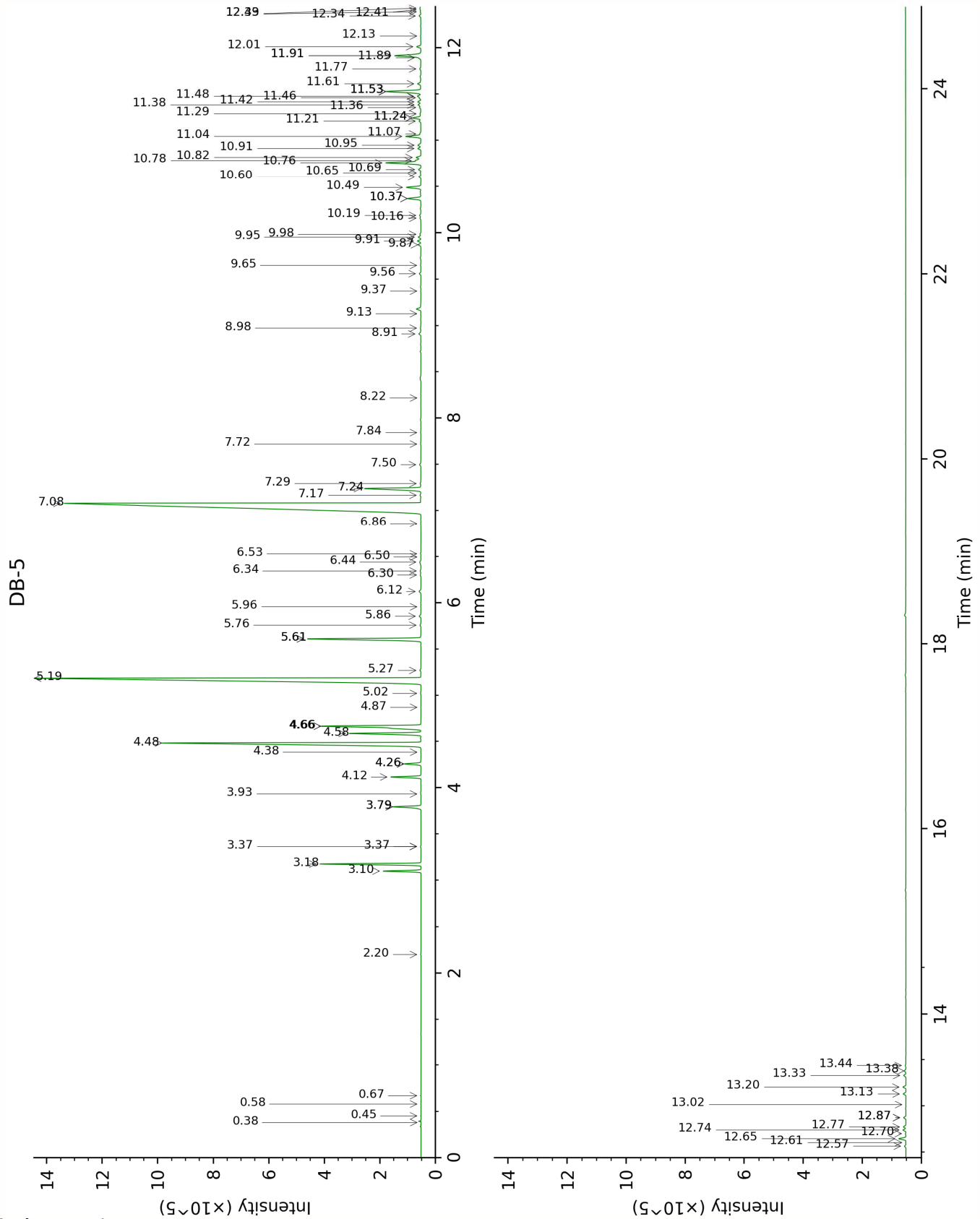
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

Ethanol	Column DB-WAX			Column DB-5		
	0.88	905.6	tr	0.38	501.0	tr
Isobutylal	0.55	784.8	tr	0.45	536.7	tr
Isobutanol	2.17	1062.9	tr	0.58	620.5	tr
2-Methylbutylal	0.80	877.3	tr	0.67	651.0	tr
(3Z)-Hexenol	5.88	1343.3	0.03	2.20	858.2	0.02
α -Thujene	1.52	1001.0	1.01	3.10	926.7	1.01
α -Pinene	1.46	992.3	2.70	3.18	931.7	2.71
Camphene	1.80	1028.4	0.01	3.37*	944.2	[0.02]
α -Fenchene	1.74	1022.1	tr	3.37*	944.2	[0.02]
Sabinene	2.39	1083.9	0.11	3.79*	972.3	[0.90]
β -Pinene	2.21	1066.6	0.79	3.79*	972.3	[0.90]
3-Methyl-3-cyclohexenone	6.23	1368.9	0.01	3.93	981.4	0.01
Myrcene	3.00	1133.5	0.88	4.12	993.5	0.88
α -Phellandrene	2.90	1126.3	0.50	4.26*	1002.8	[0.52]
Pseudolimonene	2.94	1129.5	0.01	4.26*	1002.8	[0.52]
(3Z)-Hexenyl acetate	4.96	1278.7	tr	4.38	1010.8	0.01
α -Terpinene	3.11	1142.2	11.01	4.48	1017.0	11.02
<i>para</i> -Cymene	4.23	1226.3	2.36	4.58	1023.4	2.36
Limonene	3.31	1157.6	0.97	4.66*	1028.3	[4.35]
1,8-Cineole	3.43	1167.0	3.35	4.66*	1028.3	[4.35]
(Z)- β -Ocimene	3.99*	1208.9	[22.93]	4.87	1041.0	0.01
(E)- β -Ocimene	4.11	1217.6	0.02	5.02	1050.9	0.02
γ -Terpinene	3.99*	1208.9	[22.93]	5.19	1061.1	22.95
<i>cis</i> -Sabinene hydrate	7.03*	1427.0	[0.12]	5.27	1066.4	0.04
<i>para</i> -Cymenene	6.44	1383.9	0.04	5.61*	1087.7	[3.93]
Terpinolene	4.43	1240.6	3.90	5.61*	1087.7	[3.93]
<i>trans</i> -Sabinene hydrate	8.08	1505.7	0.04	5.76	1096.9	0.04
Linalool	8.18	1513.3	0.07	5.86	1102.9	0.07
endo-Fenchol	8.51*	1539.2	[0.05]	5.96	1109.4	0.01
<i>cis-para</i> -Menth-2-en-1-ol	8.24	1518.1	0.11	6.12	1119.9	0.08
4-Hydroxy-4-methylcyclohex-2-enone	14.25	2032.2	0.04	6.30	1131.3	0.03
1-Terpineol	8.45	1534.6	0.04	6.34	1134.0	0.04
<i>trans-para</i> -Menth-2-en-1-ol	9.08*	1583.3	[0.10]	6.44	1140.1	0.07
Unknown MEAL II [m/z 109, 124 (45),	7.03*	1427.0	[0.12]	6.50	1143.6	0.01

Laboratoire
PhytoChemia

Plus que des analyses... des conseils

119 (41), 43 (35), 91 (28), 95 (25)...] Unknown CICA III [m/z 109, 41 (49), 124 (41), 43 (31), 95 (28), 84 (22)... 152 (7)]	6.94*	1420.5	[0.06]	6.53	1145.8	0.02
δ -Terpineol	9.59	1624.1	0.04	6.86	1166.9	0.01
Terpinen-4-ol	8.76*†	1558.3	[37.76]	7.08	1181.0	36.53
<i>para</i> -Cymen-8-ol	11.63	1793.8	0.04	7.17	1186.5	0.04
α -Terpineol	9.90	1649.6	2.12	7.24	1191.2	2.14
<i>cis</i> -Piperitol	9.66	1629.8	0.02	7.29	1194.6	0.04
<i>trans</i> -Piperitol	10.49	1696.9	0.07	7.50	1207.7	0.07
<i>exo</i> -2- Hydroxycineole	11.74	1803.1	0.02	7.72	1222.6	0.01
Nerol	11.17	1755.0	0.03	7.84	1230.8	0.02
<i>cis</i> -Carvenone oxide?				8.22	1255.8	0.01
Thymol	15.32*	2136.7	[0.04]	8.91	1302.4	0.09
Carvacrol	15.56*	2160.4	[0.08]	8.98	1306.6	0.03
Unknown MEAL I [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	15.14	2119.2	0.01	9.13	1317.5	0.01
Bicycloelemene	7.21	1440.6	0.01	9.37	1334.6	0.01
α -Cubebene	6.94*	1420.5	[0.06]	9.56	1347.8	0.06
Unknown EUGL I [m/z 43, 95 (62), 107 (45), 110 (41), 55 (28), 67 (25)...]	14.12*	2019.8	[0.11]	9.65	1354.1	0.02
Isoledene	7.03*	1427.0	[0.12]	9.87	1369.7	0.10
α -Copaene	7.31	1448.3	0.12	9.91	1372.5	0.12
7-Cubebene	7.27	1445.4	0.09	9.95	1375.5	0.09
7-Cubebene epimer?	7.40	1454.6	0.04	9.98	1377.6	0.04
β -Elemene	8.58*	1544.9	[0.50]	10.16	1389.9	0.03
Unknown EUGL IV [m/z 93, 122 (98), 161 (98), 107 (86), 95 (46), 105 (72)... 204 (34)]				10.19	1391.9	0.05
α -Gurjunene	7.78	1483.3	0.42	10.37*	1404.7	[0.47]
Methyleugenol	13.42*	1954.3	[0.08]	10.37*	1404.7	[0.47]
β -Caryophyllene	8.58*	1544.9	[0.50]	10.49	1413.6	0.51
γ -Maaliene	8.62	1547.3	0.10	10.60	1422.2	0.08

β -Gurjunene	8.51*	1539.2	[0.05]	10.65	1425.6	0.02
α -Maaliene	8.76*†	1558.3	[37.76]	10.69	1428.4	0.08
Aromadendrene	8.76*†	1558.3	[37.76]	10.76	1433.7	1.30
Selina-5,11-diene	8.86	1565.9	0.20	10.78	1435.4	0.18
Cadina-3,5-diene isomer I?				10.82	1438.1	0.18
<i>trans</i> -Muuro-la-3,5-diene	9.04	1579.9	0.11	10.91	1445.3	0.11
α -Humulene	9.44	1611.6	0.09	10.95	1447.9	0.13
allo-Aromadendrene	9.17	1590.1	0.52	11.04	1455.0	0.54
Valerena-4,7(11)-diene	9.08*	1583.3	[0.10]	11.07	1456.9	0.04
γ -Gurjunene	9.30	1600.6	0.07	11.21	1467.2	0.06
Selina-4,11-diene	9.58	1623.2	0.02	11.24*	1469.8	[0.32]
<i>trans</i> -Cadina-1(6),4-diene	9.40	1608.4	0.29	11.24*	1469.8	[0.32]
γ -Muuro-lene	9.75	1636.9	0.07	11.29	1473.1	0.03
(1S,2S,4S)- <i>para</i> -Menthane-1,2,4-triol				11.36	1478.1	0.06
β -Selinene	10.02*	1658.9	[0.11]	11.38	1480.3	0.11
allo-Aromadendr-9-ene	9.70	1633.3	0.12	11.42	1482.7	0.11
δ -Selinene	9.81*	1641.7	[1.14]	11.46	1486.0	0.04
α -Selinene	10.09	1665.0	0.09	11.48	1487.2	0.14
Epizonarene	10.02*	1658.9	[0.11]	11.53*	1491.0	[1.40]
Viridiflorene	9.81*	1641.7	[1.14]	11.53*	1491.0	[1.40]
Bicyclogermacrene	10.21	1674.6	0.33	11.53*	1491.0	[1.40]
α -Muuro-lene	10.18	1672.3	0.11	11.61	1497.2	0.12
γ -Cadinene	10.53*	1700.7	[0.23]	11.77	1509.3	0.04
<i>trans</i> -Calamenene	11.37	1771.8	0.07	11.89	1518.7	0.05
δ -Cadinene	10.57	1703.9	0.83	11.92*	1520.5	[1.05]
Zonarene	10.53*	1700.7	[0.23]	11.92*	1520.5	[1.05]
<i>trans</i> -Cadina-1,4-diene	10.81	1724.2	0.14	12.01	1528.1	0.14
α -Calacorene	12.25	1848.3	0.02	12.13	1537.1	0.01
Epiglobulol	13.42*	1954.3	[0.08]	12.34	1554.1	0.06
Eudesma-5,7(11)-diene	11.27	1763.5	0.02	12.39	1557.7	0.02
Maaliol	13.20	1933.8	0.03	12.42	1559.7	0.03
Unknown MEAL III [m/z 161, 109 (98), 82 (93), 43 (72), 105 (68), 93 (59),	13.42*	1954.3	[0.08]	12.43	1560.7	0.03

69 (56), 119 (55)...						
222 (7)]						
Spathulenol	14.52	2058.6	0.06	12.57	1571.6	0.05
Caryophyllene oxide	12.91	1907.1	0.01	12.60	1574.6	0.01
Globulol	14.03	2011.6	0.25	12.65	1577.9	0.25
Gleenol	13.71	1980.8	0.02	12.70	1582.2	0.02
Viridiflorol	14.12*	2019.8	[0.11]	12.74	1585.2	0.11
Cubeban-11-ol	13.82*	1991.6	[0.15]	12.77	1587.9	0.09
Ledol	13.51	1962.5	0.03	12.87*	1595.7	[0.08]
Eudesm-5-en-11-ol analog	14.35	2042.2	0.06	12.87*	1595.7	[0.08]
1,10-diepi- Cubenol	13.91*	1999.5	[0.11]	13.02	1606.8	0.01
Rosifoliol	14.45	2051.7	0.11	13.13	1616.3	0.10
1-epi-Cubenol	13.91*	1999.5	[0.11]	13.20	1622.4	0.11
Isospathulenol	15.56*	2160.4	[0.08]	13.33	1632.8	0.08
Cubenol	13.82*	1991.6	[0.15]	13.38	1636.9	0.07
α -Muurolol	15.32*	2136.7	[0.04]	13.44	1641.7	0.03
Total reported		98.63%			99.11%	

*: 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