

Date : 2024-03-15

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

**Internal code :** 24C01-PTH05

**Customer Identification :** Organic Tea Tree - S. Africa - T30119R

**Type :** Essential Oil

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

**Customer :** Plant Therapy

Checked and approved by:

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

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## 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 :** Sylvain Mercier, M. Sc., Chimiste 2014-005

**Date :** 2024-03-12

## PHYSICOCHEMICAL DATA

**Refractive index :**  $1.4776 \pm 0.0003$  (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	0.01	Aliphatic alcohol
Isobutyral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
(3Z)-Hexenol	0.04	Aliphatic alcohol
$\alpha$ -Thujene	0.85	Monoterpene
$\alpha$ -Pinene	2.32	Monoterpene
Camphene	0.01	Monoterpene
$\alpha$ -Fenchene	tr	Monoterpene
$\beta$ -Pinene	0.71	Monoterpene
Sabinene	0.46	Monoterpene
3-Methyl-3-cyclohexenone	0.01	Aliphatic ketone
Myrcene	0.87	Monoterpene
$\alpha$ -Phellandrene	0.36	Monoterpene
Pseudolimonene	0.01	Monoterpene
(3Z)-Hexenyl acetate	0.02	Aliphatic ester
$\alpha$ -Terpinene	10.06	Monoterpene
Carvomenthene	0.01	Aliphatic alcohol
<i>para</i> -Cymene	1.77	Monoterpene
Limonene	0.99	Monoterpene
1,8-Cineole	4.10	Monoterpenic ether
(Z)- $\beta$ -Ocimene	0.01	Monoterpene
(E)- $\beta$ -Ocimene	0.02	Monoterpene
$\gamma$ -Terpinene	20.17	Monoterpene
<i>cis</i> -Sabinene hydrate	0.10	Monoterpenic alcohol
Terpinolene	3.44	Monoterpene
<i>para</i> -Cymenene	0.04	Monoterpene
<i>trans</i> -Sabinene hydrate	0.24	Monoterpenic alcohol
Linalool	0.06	Monoterpenic alcohol
<i>para</i> -Mentha-1,3,8-triene	0.01	Monoterpene
endo-Fenchol	0.01	Monoterpenic alcohol
<i>cis-para</i> -Menth-2-en-1-ol	0.43	Monoterpenic alcohol
Cosmene isomer I	0.03	Monoterpene
<i>trans</i> -Pinocarveol	0.02	Monoterpenic alcohol
<i>trans-para</i> -Menth-2-en-1-ol	0.30	Monoterpenic alcohol
Unknown	0.03	Unknown
$\delta$ -Terpineol	0.01	Monoterpenic alcohol
Terpinen-4-ol	41.74	Monoterpenic alcohol
Dill ether	0.01	Monoterpenic ether
<i>para</i> -Cymen-8-ol	0.04	Monoterpenic alcohol
$\alpha$ -Terpineol	2.89	Monoterpenic alcohol

<i>cis</i> -Piperitol	0.11	Monoterpenic alcohol
<i>trans</i> -Piperitol	0.17	Monoterpenic alcohol
<i>exo</i> -2-Hydroxycineole	0.03	Monoterpenic alcohol
Nerol	0.03	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
Piperitone	0.03	Monoterpenic ketone
Unknown	0.01	Unknown
<i>cis</i> -Carvenone oxide?	0.01	Monoterpenic ketone
<i>trans</i> -Ascaridole glycol	0.05	Monoterpenic alcohol
Thymol	0.01	Monoterpenic alcohol
Carvacrol	tr	Monoterpenic alcohol
Unknown	0.04	Monoterpenic alcohol
Myrtenyl acetate	0.01	Monoterpenic ester
Bicycloelemene	0.02	Sesquiterpene
$\alpha$ -Cubebene	0.04	Sesquiterpene
Unknown	0.03	Unknown
Isoledene	0.04	Sesquiterpene
$\alpha$ -Copaene	0.07	Sesquiterpene
7-Cubebene	0.04	Sesquiterpene
7-Cubebene epimer?	0.02	Aliphatic alcohol
$\beta$ -Cubebene	0.01	Sesquiterpene
$\beta$ -Elemene	0.03	Sesquiterpene
Unknown	0.02	Sesquiterpene
Methyleugenol	0.03	Phenylpropanoid
$\alpha$ -Gurjunene	0.21	Sesquiterpene
$\beta$ -Maaliene	0.01	Sesquiterpene
$\beta$ -Ylangene	0.02	Sesquiterpene
$\beta$ -Caryophyllene	0.22	Sesquiterpene
$\gamma$ -Maaliene	0.04	Sesquiterpene
$\beta$ -Gurjunene	0.01	Sesquiterpene
$\alpha$ -Maaliene	0.04	Sesquiterpene
Aromadendrene	0.57	Sesquiterpene
Selina-5,11-diene	0.09	Sesquiterpene
Cadina-3,5-diene isomer I?	0.09	Sesquiterpene
<i>trans</i> -Muurolo-3,5-diene	0.10	Sesquiterpene
$\alpha$ -Humulene	0.08	Sesquiterpene
allo-Aromadendrene	0.31	Sesquiterpene
Valerena-4,7(11)-diene	0.01	Sesquiterpene
$\gamma$ -Gurjunene	0.03	Sesquiterpene
Selina-4,11-diene	0.01	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.20	Sesquiterpene
$\gamma$ -Muurolole	0.02	Sesquiterpene
Germacrene D	0.01	Sesquiterpene
$\beta$ -Selinene	0.07	Sesquiterpene
allo-Aromadendr-9-ene	0.06	Sesquiterpene

<i>trans</i> -Muurolo-4(15),5-diene	0.08	Sesquiterpene
δ-Selinene	0.08	Sesquiterpene
Bicyclogermacrene	0.80	Sesquiterpene
α-Selinene	0.06	Sesquiterpene
Viridiflorene	0.53	Sesquiterpene
α-Muurolene	0.11	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
Zonarene	0.18	Sesquiterpene
<i>trans</i> -Calamenene	0.06	Sesquiterpene
δ-Cadinene	0.74	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.13	Sesquiterpene
α-Calacorene	0.01	Sesquiterpene
Epiglobulol	0.07	Sesquiterpenic alcohol
Eudesma-5,7(11)-diene	0.02	Sesquiterpene
Palustrol	0.04	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Spathulenol	0.06	Sesquiterpenic alcohol
Globulol	0.28	Sesquiterpenic alcohol
Gleenol	0.03	Sesquiterpenic alcohol
Viridiflorol	0.14	Sesquiterpenic alcohol
Cubeban-11-ol	0.13	Sesquiterpenic alcohol
Eudesm-5-en-11-ol analog	0.06	Sesquiterpenic alcohol
Ledol	0.05	Sesquiterpenic alcohol
1,10-diepi-Cubenol	0.02	Sesquiterpenic alcohol
Rosifoliol	0.12	Sesquiterpenic alcohol
1-epi-Cubenol	0.18	Sesquiterpenic alcohol
Isospathulenol	0.04	Sesquiterpenic alcohol
Cubenol	0.11	Sesquiterpenic alcohol
α-Muurolol	0.04	Sesquiterpenic alcohol
α-Cadinol	0.02	Sesquiterpenic alcohol
<b>Consolidated total</b>	<b>99.56</b>	

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

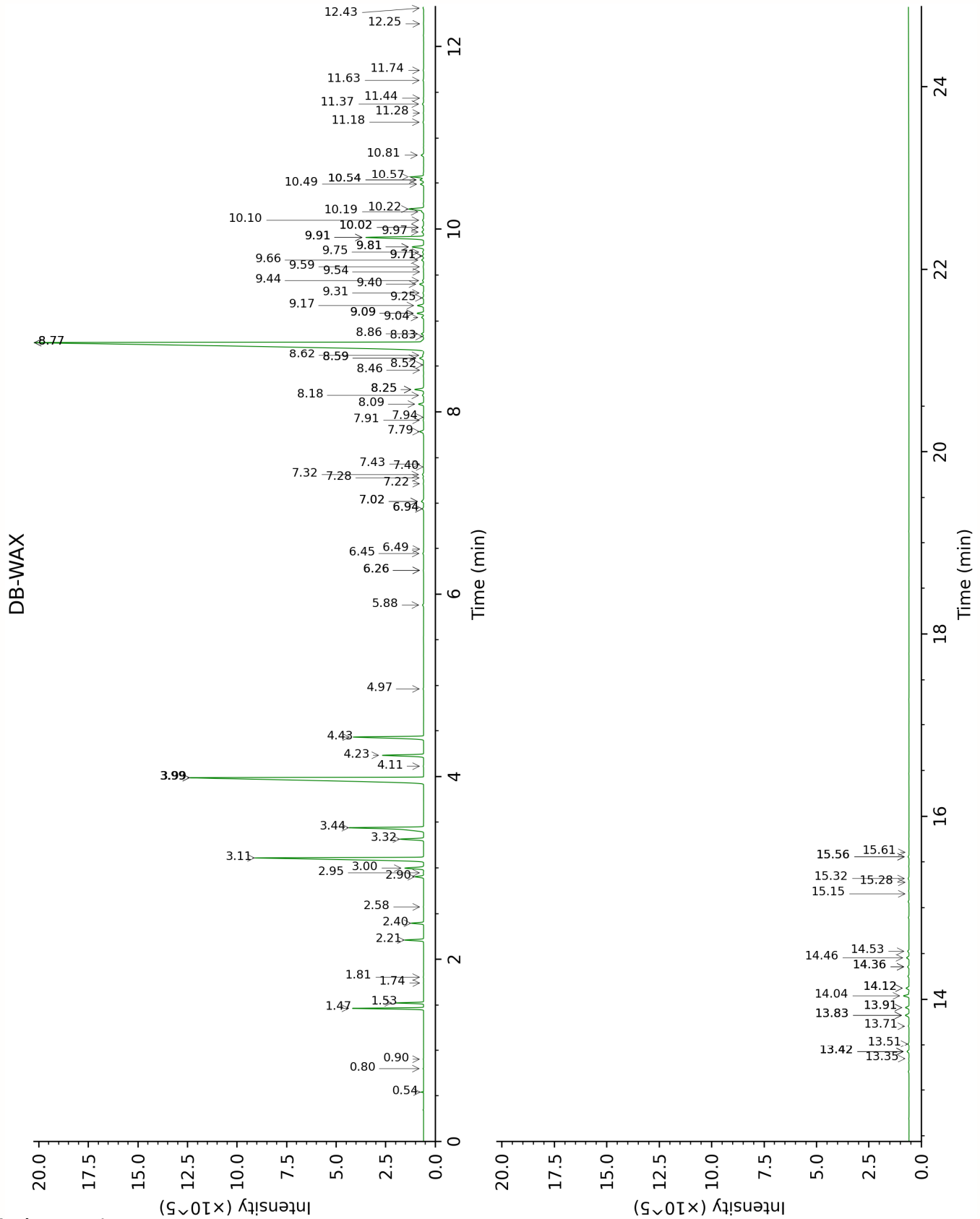
Note: no correction factor was applied

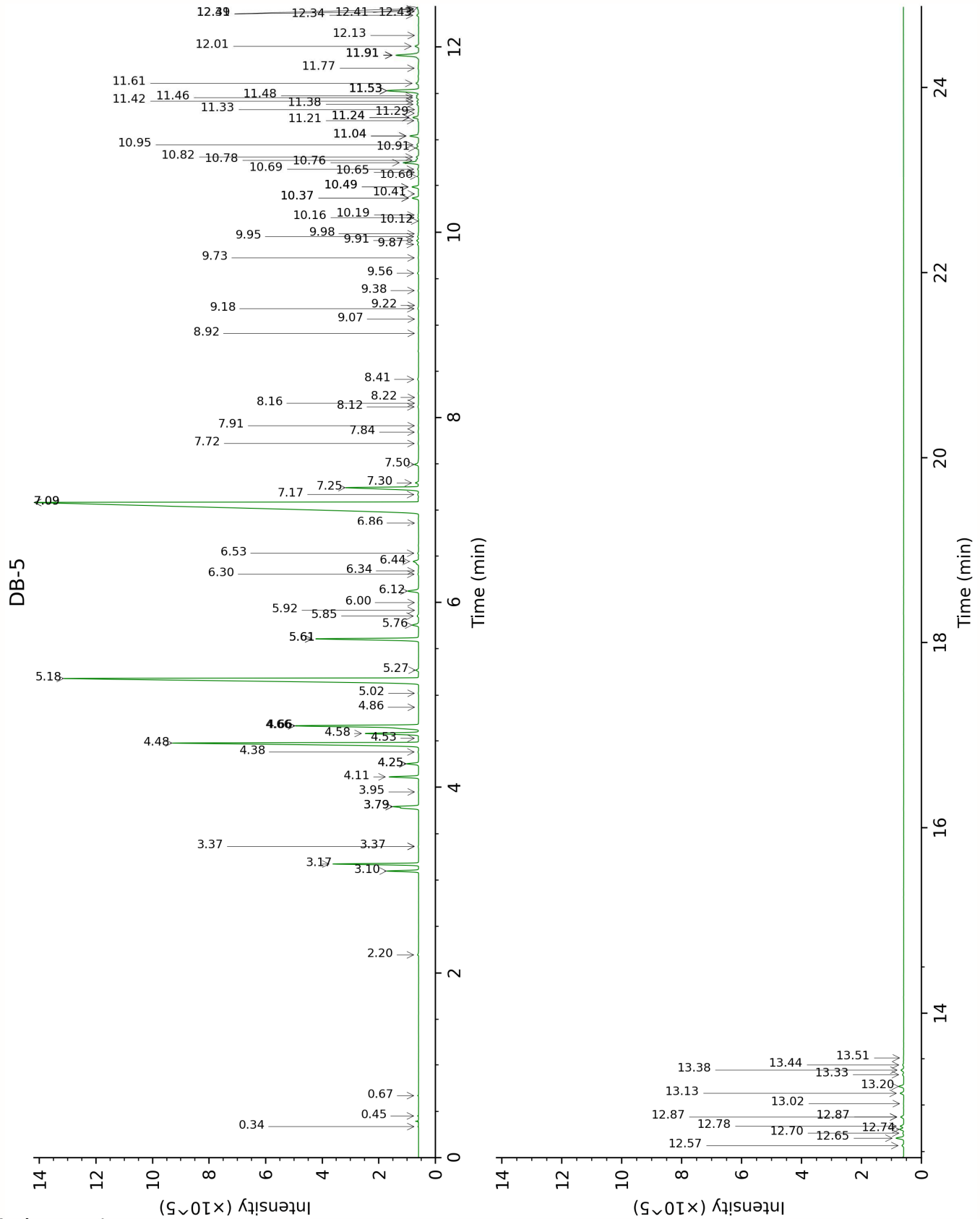
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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		
	0.90	908.2	0.01	0.34	500.8	0.01
Isobutylal	0.54	778.1	0.04	0.45	536.0	0.01
2-Methylbutylal	0.80	878.4	0.01	0.67	651.0	0.01
(3Z)-Hexenol	5.88	1343.6	0.06	2.20	857.7	0.04
$\alpha$ -Thujene	1.53	1001.7	0.84	3.10	926.6	0.85
$\alpha$ -Pinene	1.47	992.8	2.30	3.18	931.6	2.32
Camphene	1.81	1028.7	0.01	3.36*	944.1	[0.02]
$\alpha$ -Fenchene	1.74	1022.7	tr	3.36*	944.1	[0.02]
$\beta$ -Pinene	2.21	1067.0	0.71	3.79*	972.3	[1.18]
Sabinene	2.40	1084.4	0.46	3.79*	972.3	[1.18]
3-Methyl-3-cyclohexenone	6.26*	1371.0	[0.02]	3.95	982.7	0.01
Myrcene	3.00	1133.8	0.87	4.11	993.4	0.87
$\alpha$ -Phellandrene	2.90	1126.6	0.36	4.26*	1002.7	[0.38]
Pseudolimonene	2.95	1129.8	0.01	4.26*	1002.7	[0.38]
(3Z)-Hexenyl acetate	4.97	1279.1	0.03	4.38	1010.8	0.02
$\alpha$ -Terpinene	3.11	1142.3	10.02	4.48	1016.8	10.06
Carvomenthene	2.58	1101.3	0.01	4.53	1020.0	0.01
<i>para</i> -Cymene	4.23	1226.4	1.77	4.58	1023.3	1.77
Limonene	3.32	1157.9	0.99	4.66*	1028.4	[5.12]
1,8-Cineole	3.44	1167.5	4.10	4.66*	1028.4	[5.12]
(Z)- $\beta$ -Ocimene	3.99*	1208.8	[20.10]	4.86	1040.9	0.01
(E)- $\beta$ -Ocimene	4.11	1217.9	0.02	5.02	1050.8	0.02
$\gamma$ -Terpinene	3.99*	1208.8	[20.10]	5.18	1060.8	20.17
<i>cis</i> -Sabinene hydrate	7.02*	1426.7	[0.13]	5.27	1066.4	0.10
Terpinolene	4.43	1240.7	3.44	5.61*	1087.5	[3.48]
<i>para</i> -Cymenene	6.45	1384.2	0.04	5.61*	1087.5	[3.48]
<i>trans</i> -Sabinene hydrate	8.09	1506.2	0.25	5.76	1096.8	0.24
Linalool	8.18	1513.6	0.06	5.85	1102.8	0.06
<i>para</i> -Mentha-1,3,8-triene	6.26*	1371.0	[0.02]	5.92	1106.8	0.01
endo-Fenchol	8.52	1539.5	0.03	6.00	1112.1	0.01
<i>cis-para</i> -Menth-2-en-1-ol	8.25*	1518.6	[0.45]	6.12	1120.0	0.43
Cosmene isomer I	6.49	1387.7	0.01	6.30	1131.5	0.03
<i>trans</i> -Pinocarveol	9.31	1601.0	0.04	6.34	1133.9	0.02
<i>trans-para</i> -Menth-2-en-1-ol	9.08*	1583.8	[0.32]	6.44	1140.4	0.30
Unknown MEAL II [m/z 109, 124 (45),	6.94*	1420.6	[0.06]	6.53	1146.0	0.03

Laboratoire  
**PhytoChemia**

Plus que des analyses... des conseils

119 (41), 43 (35), 91 (28), 95 (25)...						
$\delta$ -Terpineol	9.59	1624.1	0.04	6.86	1167.2	0.01
Terpinen-4-ol	8.77*	1559.0	[42.22]	7.09*	1181.3	[41.75]
Dill ether	7.43	1457.1	0.01	7.09*	1181.3	[41.75]
<i>para</i> -Cymen-8-ol	11.63	1794.0	0.04	7.17	1186.8	0.04
$\alpha$ -Terpineol	9.91*	1650.1	[2.92]	7.25	1191.5	2.89
<i>cis</i> -Piperitol	9.66	1630.0	0.10	7.30	1194.8	0.11
<i>trans</i> -Piperitol	10.49	1697.3	0.16	7.50	1207.6	0.17
<i>exo</i> -2- Hydroxycineole	11.74	1803.4	0.03	7.72	1222.7	0.03
Nerol	11.18	1755.3	0.04	7.84	1230.9	0.03
Unknown CIAU II [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	11.44	1777.6	0.02	7.91	1235.5	0.02
Piperitone	10.02*	1659.0	[0.10]	8.12	1249.1	0.03
Unknown PLOR IV [m/z 43, 82 (79), 109 (69), 110 (65), 95 (38), 41 (36)...				8.16	1251.7	0.01
<i>cis</i> -Carvenone oxide?				8.22	1255.9	0.01
<i>trans</i> -Ascaridole glycol	14.36*	2042.6	[0.08]	8.41	1268.9	0.05
Thymol	15.28	2132.7	0.01	8.92	1302.5	0.01
Carvacrol	15.56*	2160.7	[0.05]	9.07	1313.1	tr
Unknown MEAL I [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	15.15	2120.1	0.01	9.18	1320.9	0.04
Myrtenyl acetate	9.75	1637.2	0.06	9.22	1323.5	0.01
Bicycloelemene	7.22	1441.1	0.02	9.38	1334.7	0.02
$\alpha$ -Cubebene	6.94*	1420.6	[0.06]	9.56	1347.8	0.04
Unknown EUGL I [m/z 43, 95 (62), 107 (45), 110 (41), 55 (28), 67 (25)...	14.12*	2020.2	[0.15]	9.73	1359.4	0.03
Isoledene	7.02*	1426.7	[0.13]	9.87	1369.6	0.04
$\alpha$ -Copaene	7.32	1448.6	0.07	9.91	1372.5	0.07
7-Cubebene	7.28	1445.9	0.04	9.95	1375.5	0.04
7-Cubebene epimer?	7.40	1454.8	0.02	9.98	1377.6	0.02
$\beta$ -Cubebene	7.94	1495.3	0.01	10.12	1387.3	0.01
$\beta$ -Elemene	8.59*	1545.2	[0.25]	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	1391.8	0.02
Methyleugenol	13.42*	1954.6	[0.10]	10.37*	1404.7	[0.24]
$\alpha$ -Gurjunene	7.79	1483.6	0.21	10.37*	1404.7	[0.24]
$\beta$ -Maaliene	7.91	1492.8	0.03	10.41	1408.0	0.01
$\beta$ -Ylangene	8.25*	1518.6	[0.45]	10.49*	1413.5	[0.24]
$\beta$ -Caryophyllene	8.59*	1545.2	[0.25]	10.49*	1413.5	[0.24]
$\gamma$ -Maaliene	8.62	1547.6	0.06	10.60	1422.2	0.04
$\beta$ -Gurjunene	8.46	1535.0	0.02	10.65	1425.7	0.01
$\alpha$ -Maaliene	8.83	1564.2	0.03	10.68	1428.2	0.04
Aromadendrene	8.77*	1559.0	[42.22]	10.76	1433.4	0.57
Selina-5,11-diene	8.86	1566.4	0.10	10.78	1435.4	0.09
Cadina-3,5-diene isomer I?				10.82	1438.0	0.09
<i>trans</i> -Muuro-la-3,5- diene	9.04	1580.3	0.10	10.91	1445.2	0.10
$\alpha$ -Humulene	9.44	1611.9	0.06	10.95	1447.8	0.08
allo- Aromadendrene	9.17	1590.4	0.31	11.04*	1454.9	[0.32]
Valerena-4,7(11)- diene	9.08*	1583.8	[0.32]	11.04*	1454.9	[0.32]
$\gamma$ -Gurjunene	9.25	1596.9	0.06	11.21	1467.2	0.03
Selina-4,11-diene	9.54	1619.7	0.01	11.24*	1469.6	[0.22]
<i>trans</i> -Cadina- 1(6),4-diene	9.40	1608.8	0.20	11.24*	1469.6	[0.22]
$\gamma$ -Muuro-lene	9.71*	1633.7	[0.07]	11.29	1473.0	0.02
Germacrene D	9.91*	1650.1	[2.92]	11.33	1476.0	0.01
$\beta$ -Selinene	9.97	1654.9	0.10	11.38	1480.2	0.07
allo-Aromadendr- 9-ene	9.71*	1633.7	[0.07]	11.42	1482.8	0.06
<i>trans</i> -Muuro-la- 4(15),5-diene	10.02*	1659.0	[0.10]	11.46	1485.6	0.08
$\delta$ -Selinene	9.81*	1641.7	[0.61]	11.48	1487.0	0.08
Bicyclogermacrene	10.22	1675.3	0.80	11.53*	1491.1	[1.37]
$\alpha$ -Selinene	10.10	1665.4	0.06	11.53*	1491.1	[1.37]
Viridiflorene	9.81*	1641.7	[0.61]	11.53*	1491.1	[1.37]
$\alpha$ -Muuro-lene	10.19	1672.9	0.08	11.61	1497.1	0.11
$\gamma$ -Cadinene	10.54*	1701.1	[0.20]	11.77	1509.4	0.02
Zonarene	10.54*	1701.1	[0.20]	11.91*	1520.4	[0.99]
<i>trans</i> -Calamenene	11.37	1772.1	0.06	11.91*	1520.4	[0.99]
$\delta$ -Cadinene	10.58	1704.2	0.74	11.91*	1520.4	[0.99]
<i>trans</i> -Cadina-1,4-	10.82	1724.6	0.13	12.01	1527.9	0.13

diene						
$\alpha$ -Calacorene	12.25	1848.5	0.02	12.13	1537.1	0.01
Epiglobulol	13.42*	1954.6	[0.10]	12.34	1554.1	0.07
Eudesma-5,7(11)-diene	11.28	1763.8	0.02	12.39	1557.5	0.02
Palustrol	12.43	1864.1	0.04	12.42*†	1559.7	[0.04]
Unknown MEAL III [m/z 161, 109 (98), 82 (93), 43 (72), 105 (68), 93 (59), 69 (56), 119 (55)... 222 (7)]	13.42*	1954.6	[0.10]	12.42*†	1559.7	[0.04]
Unknown MEAL IV [m/z 107, 163 (88), 59 (60), 93 (49), 43 (47), 81 (46... 204 (5)...]	13.34	1947.5	0.01	12.43*†	1560.8	[0.04]
Spathulenol	14.53	2059.0	0.07	12.57	1571.5	0.06
Globulol	14.04	2012.1	0.28	12.65	1577.8	0.28
Gleenol	13.71	1980.9	0.03	12.70	1582.0	0.03
Viridiflorol	14.12*	2020.2	[0.15]	12.74	1585.2	0.14
Cubeban-11-ol	13.83*	1991.9	[0.22]	12.78	1588.0	0.13
Eudesm-5-en-11-ol analog	14.36*	2042.6	[0.08]	12.87*	1595.7	[0.11]
Ledol	13.51	1962.9	0.05	12.87*	1595.7	[0.11]
1,10-diepi- Cubenol	13.91*	1999.8	[0.18]	13.02	1607.1	0.02
Rosifoliol	14.46	2052.1	0.13	13.13	1616.3	0.12
1-epi-Cubenol	13.91*	1999.8	[0.18]	13.20	1622.4	0.18
Isospathulenol	15.56*	2160.7	[0.05]	13.33	1632.9	0.04
Cubenol	13.83*	1991.9	[0.22]	13.38	1636.9	0.11
$\alpha$ -Muurolol	15.32	2136.9	0.05	13.44	1641.5	0.04
$\alpha$ -Cadinol	15.61	2165.6	0.01	13.51	1647.8	0.02
Total reported		99.23%			99.59%	

\*: 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