CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23G21-PTH02
Customer Identification : Tea Tree ORGANIC - South Africa - T30118R
Type : Essential Oil
Source : *Melaleuca alternifolia ct. Terpinen-4-ol (Tea Tree)*
Customer : Plant Therapy

Checked an approved by:

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

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ISO 17025:2017 CERTIFIED METHOD
MÉTHODE CERTIFIÉE

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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 : Amélie Simard, Analyste

Date : 2023-07-26

PHYSICOCHEMICAL DATA

Refractive index : 1.4772 ± 0.0003 (20 ℃)

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

Analyst : Cindy Caron B. Sc.

Date : 2023-07-24

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil complies with the ISO standard for tea tree oil.

Essential Oil, *Melaleuca alternifolia ct. Terpinen-4-ol (Tea Tree)*
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ANALYSIS SUMMARY - CONSOLIDATED CONTENTS

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

Identification	%	Class
Isobutyral	0.03	Aliphatic aldehyde
2-Methylbutyral	0.02	Aliphatic aldehyde
(3*Z*)-Hexenol	0.04	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
α-Thujene	0.84	Monoterpene
α-Pinene	2.28	Monoterpene
α-Fenchene	tr	Monoterpene
Camphene	0.01	Monoterpene
Sabinene	0.44	Monoterpene
β-Pinene	0.72	Monoterpene
3-Methyl-3-cyclohexenone	0.02	Aliphatic ketone
Myrcene	0.90	Monoterpene
α-Phellandrene	0.37	Monoterpene
Pseudolimonene	0.01	Monoterpene
Menthatriene isomer I	0.01	Monoterpene
(3*Z*)-Hexenyl acetate	0.03	Aliphatic ester
α-Terpinene	10.15	Monoterpene
Carvomenthene	0.02	Aliphatic alcohol
para-Cymene	1.49	Monoterpene
β-Phellandrene	0.65	Monoterpene
1,8-Cineole	3.48	Monoterpenic ether
Limonene	0.98	Monoterpene
(*Z*)-β-Ocimene	0.01	Monoterpene
(*E*)-β-Ocimene	0.02	Monoterpene
γ-Terpinene	20.19	Monoterpene
cis-Sabinene hydrate	0.12	Monoterpenic alcohol
Terpinolene	3.46	Monoterpene
para-Cymenene	0.02	Monoterpene
trans-Sabinene hydrate	0.23	Monoterpenic alcohol
Linalool	0.07	Monoterpenic alcohol
para-Mentha-1,3,8-triene	0.01	Monoterpene
end*o*-Fenchol	0.02	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.41	Monoterpenic alcohol
4-Hydroxy-4-methylcyclohex-2-enone	0.02	Aliphatic alcohol
Cosmene isomer I	0.01	Monoterpene
trans-para-Menth-2-en-1-ol	0.07	Monoterpenic alcohol
Unknown	0.10	Oxygenated monoterpene
Camphene hydrate	0.11	Monoterpenic alcohol
Unknown	0.01	Unknown
δ-Terpineol	0.02	Monoterpenic alcohol

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Terpinen-4-ol	41.36	Monoterpenic alcohol
Dill ether	0.02	Monoterpenic ether
para-Cymen-8-ol	0.03	Monoterpenic alcohol
α-Terpineol	2.88	Monoterpenic alcohol
cis-Piperitol	0.11	Monoterpenic alcohol
trans-Piperitol	0.18	Monoterpenic alcohol
ex*o*-2-Hydroxycineole	0.03	Monoterpenic alcohol
cis-para-Mentha-1(7),8-dien-2-ol	0.01	Monoterpenic alcohol
Nerol	0.04	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Piperitone	0.03	Monoterpenic ketone
Unknown	0.01	Unknown
cis-Carvenone oxide?	0.04	Monoterpenic ketone
trans-Ascaridole glycol	0.04	Monoterpenic alcohol
cis-Ascaridole glycol	0.03	Monoterpenic alcohol
Thymol	0.02	Monoterpenic alcohol
Carvacrol	0.02	Monoterpenic alcohol
Unknown	0.03	Monoterpenic alcohol
Bicycloelemene	0.02	Sesquiterpene
α-Cubebene	0.04	Sesquiterpene
Unknown	0.02	Unknown
Isoledene	0.04	Sesquiterpene
α-Copaene	0.07	Sesquiterpene
7-Cubebene	0.04	Sesquiterpene
7-Cubebene epimer?	0.02	Aliphatic alcohol
β-Elemene	0.03	Sesquiterpene
α-Gurjunene	0.22	Sesquiterpene
Methyleugenol	0.02	Phenylpropanoid
β-Maaliene	0.01	Sesquiterpene
β-Caryophyllene	0.24	Sesquiterpene
γ-Maaliene	0.05	Sesquiterpene
β-Gurjunene	0.01	Sesquiterpene
α-Maaliene	0.05	Sesquiterpene
Aromadendrene	0.58	Sesquiterpene
Selina-5,11-diene	0.10	Sesquiterpene
Cadina-3,5-diene isomer I?	0.09	Sesquiterpene
trans-Muurola-3,5-diene	0.11	Sesquiterpene
α-Humulene	0.08	Sesquiterpene
Valerena-4,7(11)-diene	0.02	Sesquiterpene
all*o*-Aromadendrene	0.30	Sesquiterpene
γ-Gurjunene	0.04	Sesquiterpene
Selina-4,11-diene	0.02	Sesquiterpene
trans-Cadina-1(6),4-diene	0.21	Sesquiterpene
γ-Muurolene	0.03	Sesquiterpene
β-Selinene	0.08	Sesquiterpene

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allo-Aromadendr-9-ene	0.06	Sesquiterpene
δ-Selinene	0.16	Sesquiterpene
Bicyclogermacrene	0.78	Sesquiterpene
Viridiflorene	0.46	Sesquiterpene
α-Selinene	0.06	Sesquiterpene
α-Muurolene	0.12	Sesquiterpene
γ-Cadinene	0.03	Sesquiterpene
trans-Calamenene	0.07	Sesquiterpene
Zonarene	0.18	Sesquiterpene
δ-Cadinene	0.74	Sesquiterpene
trans-Cadina-1,4-diene	0.14	Sesquiterpene
α-Calacorene	0.02	Sesquiterpene
Epiglobulol	0.08	Sesquiterpenic alcohol
Eudesma-5,7(11)-diene	0.02	Sesquiterpene
Maaliol	0.04	Sesquiterpenic alcohol
Unknown	tr	Oxygenated sesquiterpene
Palustrol	0.04	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
Spathulenol	0.06	Sesquiterpenic alcohol
Globulol	0.29	Sesquiterpenic alcohol
Gleenol	0.04	Sesquiterpenic alcohol
Viridiflorol	0.13	Sesquiterpenic alcohol
Cubeban-11-ol	0.15	Sesquiterpenic alcohol
Eudesm-5-en-11-ol analog	0.08	Sesquiterpenic alcohol
Ledol	0.05	Sesquiterpenic alcohol
Rosifoliol	0.13	Sesquiterpenic alcohol
1-epi-Cubenol	0.19	Sesquiterpenic alcohol
Isospathulenol	0.04	Sesquiterpenic alcohol
Cubenol	0.11	Sesquiterpenic alcohol
α-Muurolol	0.04	Sesquiterpenic alcohol
Consolidated total	**99.14**	

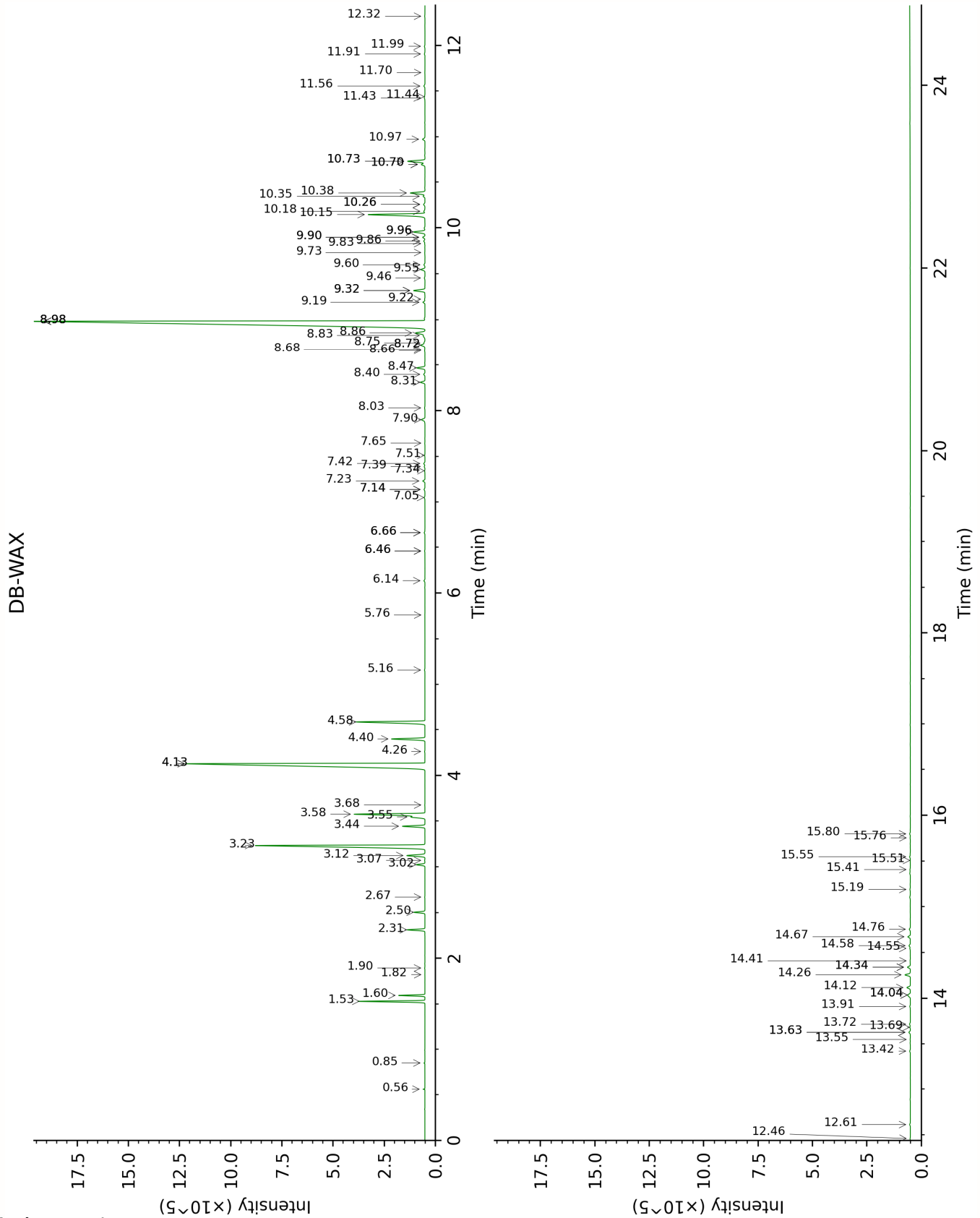tr: The compound has been detected below 0.005% of the total signal

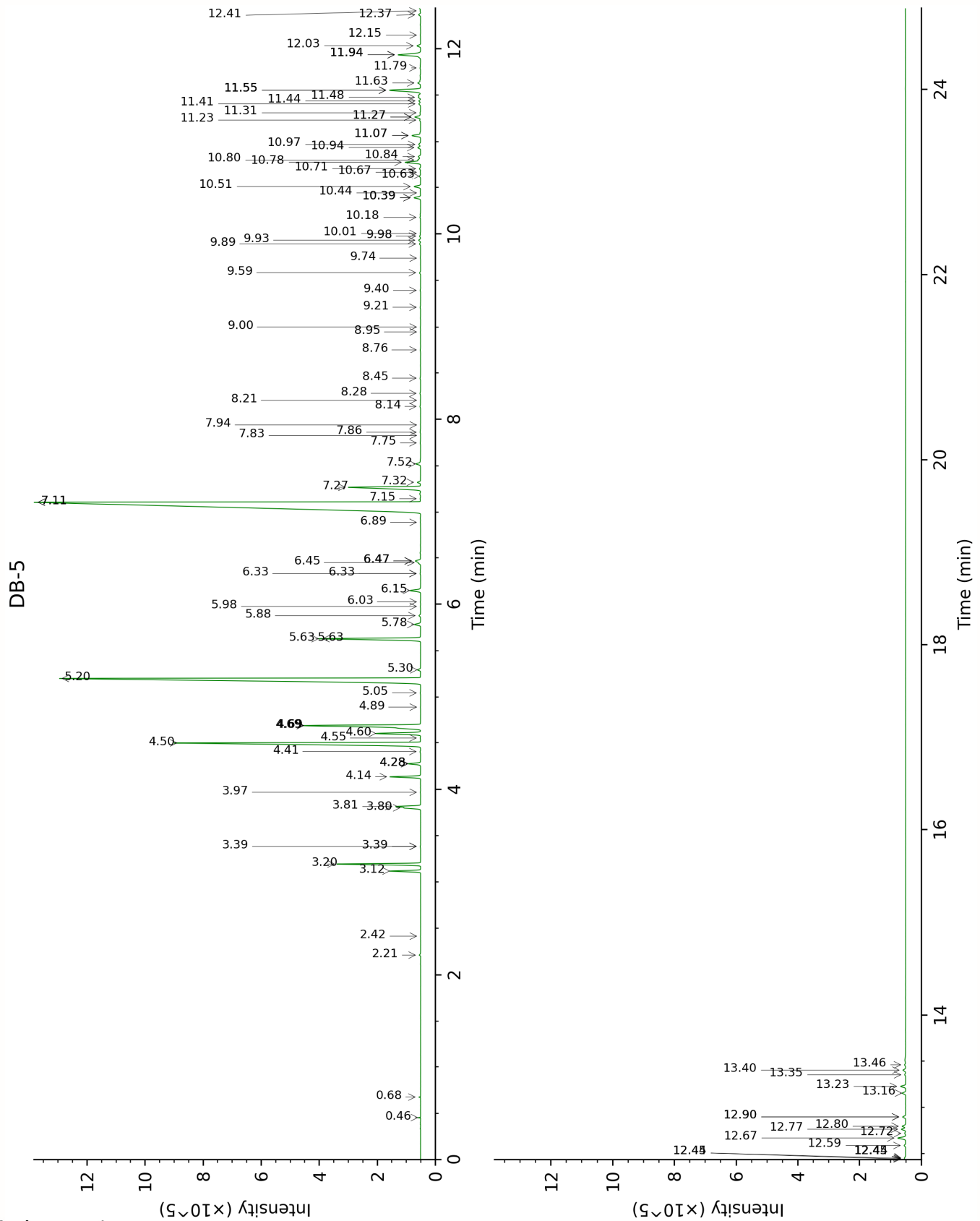Note: no correction factor was applied

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.

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Essential Oil, *Melaleuca alternifolia ct. Terpinen-4-ol (Tea Tree)*

Internal code: 23G21-PTH02   Tea Tree ORGANIC - South Africa - T30118R

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DB-WAX

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DB-5

Intensity (×10^5)

Time (min)

Intensity (×10^5)

Time (min)

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FULL ANALYSIS DATA

	Column DB-WAX			Column DB-5		
Isobutyral						
	0.56	780.5	0.03	0.46	537.7	0.03
2-Methylbutyral	0.85	882.6	0.02	0.68	651.7	0.02
(3*Z*)-Hexenol	6.14	1349.6	0.05	2.21	857.7	0.04
Hexanol	5.76	1322.7	tr	2.42	874.5	0.01
α-Thujene	1.60	996.9	0.84	3.12	926.4	0.84
α-Pinene	1.53	990.6	2.30	3.20	931.4	2.28
α-Fenchene	1.82	1018.4	tr	3.39*	943.9	[0.02]
Camphene	1.90	1025.3	0.01	3.39*	943.9	[0.02]
Sabinene	2.50	1083.4	0.44	3.80*†	971.1	[0.42]
β-Pinene	2.31	1065.1	0.72	3.82*†	972.1	[0.74]
3-Methyl-3-cyclohexenone	6.46*	1372.9	[0.02]	3.97	982.2	0.02
Myrcene	3.12	1132.8	0.91	4.14	993.2	0.90
α-Phellandrene	3.02	1125.0	0.37	4.28*	1002.4	[0.40]
Pseudolimonene	3.07	1128.6	0.01	4.28*	1002.4	[0.40]
Menthatriene isomer I	3.68	1175.5	0.01	4.28*	1002.4	[0.40]
(3*Z*)-Hexenyl acetate	5.16	1284.8	0.03	4.41	1010.6	0.03
α-Terpinene	3.23	1141.2	10.20	4.50	1016.4	10.15
Carvomenthene	2.67	1097.8	0.01	4.55	1019.8	0.02
para-Cymene	4.40	1229.1	1.50	4.60	1022.8	1.49
β-Phellandrene	3.55	1165.4	0.65	4.69*	1028.1	[5.09]
1,8-Cineole	3.58	1167.7	3.48	4.69*	1028.1	[5.09]
Limonene	3.44	1157.5	0.98	4.69*	1028.1	[5.09]
(*Z*)-β-Ocimene	4.13*	1209.4	[20.29]	4.89	1040.5	0.01
(*E*)-β-Ocimene	4.26	1219.1	0.02	5.05	1050.6	0.02
γ-Terpinene	4.13*	1209.4	[20.29]	5.20	1060.3	20.19
cis-Sabinene hydrate	7.23	1429.6	0.11	5.30	1066.1	0.12
Terpinolene	4.58	1242.7	3.46	5.63*	1087.0	[3.49]
para-Cymenene	6.66*	1387.3	[0.04]	5.63*	1087.0	[3.49]
trans-Sabinene hydrate	8.31	1510.2	0.23	5.78	1096.6	0.23
Linalool	8.40	1516.9	0.07	5.88	1102.5	0.07
para-Mentha-1,3,8-triene	6.46*	1372.9	[0.02]	5.98	1108.8	0.01
endo-Fenchol	8.68	1538.2	0.01	6.03	1112.0	0.02
cis-para-Menth-2-en-1-ol	8.47	1522.4	0.42	6.15	1119.8	0.41
4-Hydroxy-4-methylcyclohex-2-enone	14.41	2026.3	0.02	6.33*	1131.4	[0.02]

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Cosmene isomer I	6.66*	1387.3	[0.04]	6.33*	1131.4	[0.02]
trans-para-Menth-2-en-1-ol	9.32*	1587.7	[0.59]	6.45	1138.9	0.07
Unknown PLOR I [m/z 109, 43 (73), 71 (54), 124 (51), 69 (37), 41 (35)...152 (5)]				6.47*	1140.0	[0.23]
Camphene hydrate	8.83	1550.1	0.11	6.47*	1140.0	[0.23]
Unknown MEAL II [m/z 109, 124 (45), 119 (41), 43 (35), 91 (28), 95 (25)...]	7.14*	1422.7	[0.05]	6.47*	1140.0	[0.23]
δ-Terpineol	9.83	1628.7	0.02	6.89	1167.0	0.02
Terpinen-4-ol	8.98*	1562.0	[41.59]	7.11*	1180.8	[41.38]
Dill ether	7.65	1460.2	0.02	7.11*	1180.8	[41.38]
para-Cymen-8-ol	11.91	1800.7	0.04	7.15	1183.3	0.03
α-Terpineol	10.15	1654.1	3.01	7.27	1191.1	2.88
cis-Piperitol	9.90*	1634.2	[0.12]	7.32	1194.5	0.11
trans-Piperitol	10.74*	1702.0	[0.92]	7.52	1207.3	0.18
ex*o*-2-Hydroxycineole	11.99	1808.1	0.03	7.75	1222.4	0.03
cis-para-Mentha-1(7),8-dien-2-ol	12.32	1836.7	0.02	7.83	1227.8	0.01
Nerol	11.43	1759.9	0.05	7.86	1230.1	0.04
Unknown CIAU II [m/z 137, 152 (28), 43 (25), 91 (24), 109 (23), 119 (19)]	11.70	1783.1	0.01	7.94	1235.3	0.01
Piperitone	10.26*	1663.0	[0.09]	8.14	1248.6	0.03
Unknown PLOR IV [m/z 43, 82 (79), 109 (69), 110 (65), 95 (38), 41 (36)...]				8.21	1253.0	0.01
cis-Carvenone oxide?				8.28	1258.0	0.04
trans-Ascaridole glycol	14.55	2039.0	0.03	8.45	1269.0	0.04
cis-Ascaridole glycol	15.19	2100.5	0.03	8.76	1289.8	0.03
Thymol	15.51	2131.6	0.01	8.95	1302.7	0.02
Carvacrol	15.76	2155.7	0.02	9.00	1306.3	0.02
Unknown MEAL I [m/z 97, 112 (92),	15.41	2121.8	0.03	9.22	1321.3	0.03

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83 (62), 43 (44), 41 (25)... 170? (4)]

Compound	RT	RI	%	RT	RI	%
Bicycloelemene	7.34	1437.9	0.02	9.40	1334.0	0.02
α-Cubebene	7.05	1416.2	0.04	9.59	1347.4	0.04
Unknown EUGL I [m/z 43, 95 (62), 107 (45), 110 (41), 55 (28), 67 (25)...]	14.34*	2019.7	[0.15]	9.74	1358.3	0.02
Isoledene	7.14*	1422.7	[0.05]	9.89	1369.1	0.04
α-Copaene	7.42	1443.7	0.07	9.93	1371.9	0.07
7-Cubebene	7.39	1441.2	0.04	9.98	1375.0	0.04
7-Cubebene epimer?	7.51	1450.3	0.02	10.01	1376.9	0.02
β-Elemene	8.72*	1542.0	[0.25]	10.18	1389.1	0.03
α-Gurjunene	7.90	1479.1	0.22	10.39*	1404.0	[0.25]
Methyleugenol	13.68	1958.7	0.02	10.39*	1404.0	[0.25]
β-Maaliene	8.03	1488.6	0.02	10.44	1407.9	0.01
β-Caryophyllene	8.72*	1542.0	[0.25]	10.51	1412.9	0.24
γ-Maaliene	8.75	1543.7	0.05	10.63	1421.8	0.05
β-Gurjunene	8.66	1537.1	0.02	10.67	1424.9	0.01
α-Maaliene	8.98*	1562.0	[41.59]	10.71	1427.7	0.05
Aromadendrene	8.86	1552.3	0.58	10.78	1432.9	0.58
Selina-5,11-diene	8.98*	1562.0	[41.59]	10.80	1434.7	0.10
Cadina-3,5-diene isomer I?				10.84	1437.5	0.09
trans-Muurola-3,5-diene	9.19	1577.9	0.10	10.94	1444.7	0.11
α-Humulene	9.60	1610.3	0.06	10.97	1447.2	0.08
Valerena-4,7(11)-diene	9.22	1580.4	0.02	11.07*	1454.3	[0.32]
allo-Aromadendrene	9.32*	1587.7	[0.59]	11.07*	1454.3	[0.32]
γ-Gurjunene	9.46	1598.7	0.03	11.23	1466.7	0.04
Selina-4,11-diene	9.73	1620.9	0.02	11.27*	1469.1	[0.23]
trans-Cadina-1(6),4-diene	9.55	1606.1	0.21	11.27*	1469.1	[0.23]
γ-Muurolene	9.90*	1634.2	[0.12]	11.31	1472.5	0.03
β-Selinene	10.18	1657.0	0.07	11.41	1479.6	0.08
allo-Aromadendr-9-ene	9.86	1631.0	0.07	11.44	1482.0	0.06
δ-Selinene	9.96*	1639.0	[0.62]	11.48†	1484.9	0.09
Bicyclogermacrene	10.38	1673.0	0.78	11.56*	1490.6	[1.39]
Viridiflorene	9.96*	1639.0	[0.62]	11.56*	1490.6	[1.39]
α-Selinene	10.26*	1663.0	[0.09]	11.56*	1490.6	[1.39]
α-Muurolene	10.34	1670.1	0.09	11.63	1496.4	0.12

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Compound	R.T.	R.I.	%	R.T.	R.I.	%
γ-Cadinene	10.70*	1699.1	[0.20]	11.80	1508.7	0.03
trans-Calamenene	11.56	1770.7	0.07	11.94*	1519.8	[1.00]
Zonarene	10.70*	1699.1	[0.20]	11.94*	1519.8	[1.00]
δ-Cadinene	10.74*	1702.0	[0.92]	11.94*	1519.8	[1.00]
trans-Cadina-1,4-diene	10.98	1722.1	0.14	12.03	1527.3	0.14
α-Calacorene	12.46	1848.9	0.02	12.15	1536.3	0.02
Epiglobulol	13.63*	1953.8	[0.08]	12.37	1553.6	0.08
Eudesma-5,7(11)-diene	11.44	1761.1	0.02	12.41	1557.0	0.02
Maaliol	13.42	1934.4	0.04	12.44*	1559.4	[0.04]
Unknown MEAL III [m/z 161, 109 (98), 82 (93), 43 (72), 105 (68), 93 (59), 69 (56), 119 (55)... 222 (7)]	13.63*	1953.8	[0.08]	12.44*	1559.4	[0.04]
Palustrol	12.61	1862.3	0.04	12.45*	1560.0	[0.05]
Unknown MEAL IV [m/z 107, 163 (88), 59 (60), 93 (49), 43 (47), 81 (46... 204 (5)...]	13.55	1946.7	0.01	12.45*	1560.0	[0.05]
Spathulenol	14.76	2058.7	0.06	12.59	1571.0	0.06
Globulol	14.26	2011.9	0.29	12.67	1577.3	0.29
Gleenol	13.91	1979.4	0.03	12.72	1581.2	0.04
Viridiflorol	14.34*	2019.7	[0.15]	12.77*†	1584.8	[0.15]
Cubeban-11-ol	14.04*	1991.1	[0.20]	12.80*†	1587.3	[0.13]
Eudes*m*-5-en-11-ol analog	14.58	2041.9	0.08	12.90*	1595.1	[0.11]
Ledol	13.72	1961.8	0.05	12.90*	1595.1	[0.11]
Rosifoliol	14.67	2051.0	0.13	13.16	1615.9	0.13
1-epi-Cubenol	14.12	1998.8	0.19	13.23	1621.9	0.19
Isospathulenol	15.80	2159.9	0.04	13.35	1632.2	0.04
Cubenol	14.04*	1991.1	[0.20]	13.40	1636.3	0.11
α-Muurolol	15.55	2135.5	0.04	13.46	1641.0	0.04
Total reported		99.35%			99.23%	

*: 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

Laboratoire PhytoChemia

Plus que des analyses... des conseils