

Date : 2023-12-08

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23L01-PTH05

Customer Identification : Rhododendron - Nepal - RJ0107R

Type : Essential Oil

Source : *Rhododendron anthopogon*

Customer : Plant Therapy

Checked an approved by:

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 : Benoit Roger, Ph. D.

Date : 2023-12-08

PHYSICOCHEMICAL DATA

Refractive index : 1.4838 ± 0.0003 (20 °C)

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

Analyst : Cindy Caron B. Sc.

Date : 2023-12-01

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
Toluene	0.01	Simple phenolic
Octane	0.02	Alkane
5-Methyl-3-hexanone	0.04	Aliphatic ketone
4-Methyl-3-hexanone	0.02	Aliphatic ketone
Ethyl 2-methylbutyrate	tr	Aliphatic ester
Bornylene	0.01	Monoterpene
Tricyclene	0.05	Monoterpene
α -Thujene	0.23	Monoterpene
α -Pinene	29.99	Monoterpene
5-Methyl-3-heptanone	0.03	Aliphatic ketone
α -Fenchene	0.07	Monoterpene
Camphene	0.30	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
β -Pinene	12.81	Monoterpene
Sabinene	0.21	Monoterpene
Octen-3-ol	0.02	Aliphatic alcohol
Myrcene	1.51	Monoterpene
Pseudolimonene	0.01	Monoterpene
α -Phellandrene	0.04	Monoterpene
Δ^3 -Carene	0.18	Monoterpene
α -Terpinene	0.12	Monoterpene
<i>para</i> -Cymene	1.27	Monoterpene
1,8-Cineole	0.02	Monoterpenic ether
Limonene	8.44	Monoterpene
β -Phellandrene	0.14	Monoterpene
(<i>Z</i>)- β -Ocimene	3.74	Monoterpene
2-Heptyl acetate	0.03	Aliphatic ester
(<i>E</i>)- β -Ocimene	0.75	Monoterpene
γ -Terpinene	1.84	Monoterpene
α -Pinene oxide analog	0.02	Monoterpenic ether
<i>para</i> -Cymenene	0.02	Monoterpene
Terpinolene	0.34	Monoterpene
α -Pinene oxide	0.02	Monoterpenic ether
Linalool	0.30	Monoterpenic alcohol
Verbenol analog?	0.01	Monoterpenic alcohol
endo-Fenchol	0.05	Monoterpenic alcohol
Octen-3-yl acetate	0.01	Aliphatic ester
allo-Ocimene	0.11	Monoterpene
<i>trans</i> -Pinocarveol	0.08	Monoterpenic alcohol
2-Octyl acetate	0.11	Aliphatic ester

Borneol	0.05	Monoterpenic alcohol
Ethyl benzoate	0.01	Phenolic ester
Terpinen-4-ol	0.25	Monoterpenic alcohol
α -Terpineol	0.46	Monoterpenic alcohol
Myrtenol	0.04	Monoterpenic alcohol
(3Z,5E)-2,6-Dimethylocta-3,5,7-trien-2-ol?	0.03	Monoterpenic alcohol
(3E,5E)-2,6-Dimethylocta-3,5,7-trien-2-ol	0.05	Monoterpenic alcohol
<i>trans</i> -Carveol	0.02	Monoterpenic alcohol
Citronellol	0.03	Monoterpenic alcohol
2-Nonyl acetate	0.01	Aliphatic ester
Unknown	0.05	Unknown
Linalyl acetate	0.01	Monoterpenic ester
<i>trans</i> -Ascaridole glycol	0.02	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Bornyl acetate	0.18	Monoterpenic ester
2-Undecanone	0.01	Aliphatic ketone
Bicycloelemene	0.01	Sesquiterpene
α -Cubebene	0.33	Sesquiterpene
Citronellyl acetate	0.23	Monoterpenic ester
α -Ylangene	0.11	Sesquiterpene
α -Copaene	0.81	Sesquiterpene
β -Bourbonene	0.22	Sesquiterpene
β -Cubebene	0.04	Sesquiterpene
β -Elemene	0.20	Sesquiterpene
7-epi-Sesquithujene	0.04	Sesquiterpene
α -Funebrene	0.09	Sesquiterpene
α -Cedrene	0.03	Sesquiterpene
α -Gurjunene	0.20	Sesquiterpene
β -Caryophyllene	2.56	Sesquiterpene
β -Copaene	0.03	Sesquiterpene
β -Gurjunene	0.22	Sesquiterpene
Aromadendrene	0.53	Sesquiterpene
Selina-5,11-diene	0.06	Sesquiterpene
<i>cis</i> -Muuro-la-3,5-diene	0.04	Sesquiterpene
Unknown	0.20	Sesquiterpene
α -Humulene	0.47	Sesquiterpene
allo-Aromadendrene	0.59	Sesquiterpene
<i>cis</i> -Muuro-la-4(15),5-diene	0.23	Sesquiterpene
(E)- β -Farnesene	0.59	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.52	Sesquiterpene
γ -Muuro-lene	1.90	Sesquiterpene
Germacrene D	tr	Sesquiterpene
α -Amorphene	0.29	Sesquiterpene
β -Selinene	1.13	Sesquiterpene
ar-Curcumene	0.09	Sesquiterpene

γ-Amorphene	0.23	Sesquiterpene
α-Selinene	0.91	Sesquiterpene
Valencene	0.15	Sesquiterpene
Unknown	0.22	Sesquiterpene
α-Muurolene	2.63	Sesquiterpene
β-Curcumene	0.42	Sesquiterpene
γ-Cadinene	2.97	Sesquiterpene
(3E,6E)-α-Farnesene	0.25	Sesquiterpene
trans-Calamenene	0.31	Sesquiterpene
δ-Cadinene	6.83	Sesquiterpene
Zonarene	1.12	Sesquiterpene
trans-Cadina-1,4-diene	0.30	Sesquiterpene
α-Cadinene	0.56	Sesquiterpene
α-Calacorene	0.15	Sesquiterpene
Isocaryophyllene epoxide B	0.06	Sesquiterpenic ether
Palustrol	0.03	Sesquiterpenic alcohol
(E)-Nerolidol	0.12	Sesquiterpenic alcohol
Spathulenol	0.19	Sesquiterpenic alcohol
Germacrene D-4-ol	0.19	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.09	Sesquiterpenic ether
Caryophyllene oxide	0.26	Sesquiterpenic ether
Unknown	0.06	Oxygenated sesquiterpene
Viridiflorol	0.03	Sesquiterpenic alcohol
Ledol	0.09	Sesquiterpenic alcohol
Unknown	0.11	Oxygenated sesquiterpene
10-epi-Cubenol	0.12	Sesquiterpenic alcohol
1-epi-Cubenol	0.25	Sesquiterpenic alcohol
γ-Eudesmol	0.07	Sesquiterpenic alcohol
τ-Cadinol	0.47	Sesquiterpenic alcohol
τ-Muurolol	0.55	Sesquiterpenic alcohol
β-Eudesmol	0.11	Sesquiterpenic alcohol
α-Muurolol	0.23	Sesquiterpenic alcohol
α-Eudesmol	0.12	Sesquiterpenic alcohol
α-Cadinol	0.67	Sesquiterpenic alcohol
cis-Calamenen-10-ol	0.05	Sesquiterpenic alcohol
trans-Calamenen-10-ol	0.05	Sesquiterpenic alcohol
α-Bisabolol	0.09	Sesquiterpenic alcohol
Unknown	0.07	Oxygenated sesquiterpene
Unknown	0.05	Oxygenated sesquiterpene
Unknown	0.08	Oxygenated sesquiterpene
Consolidated total	97.26	

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

Note: no correction factor was applied

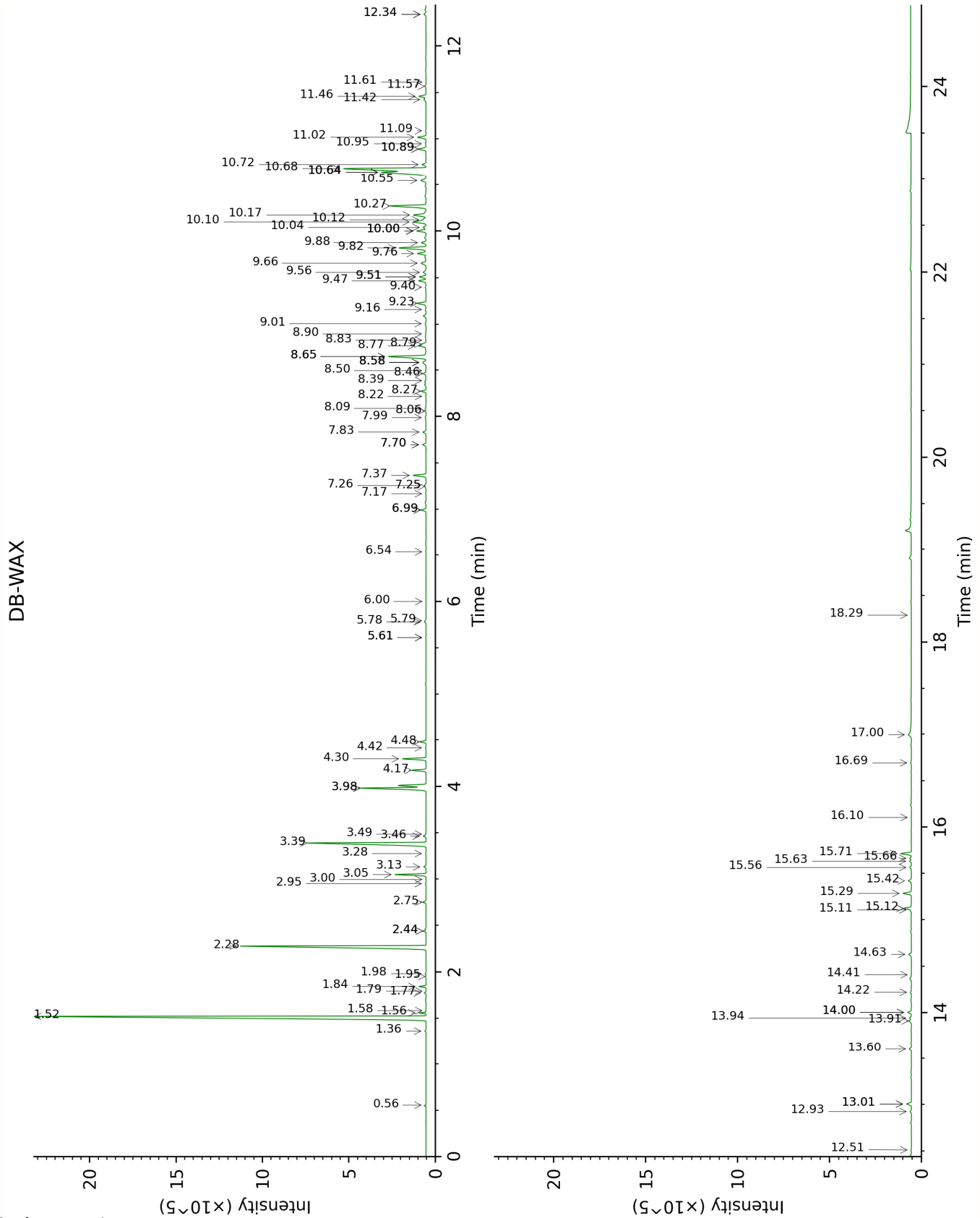
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm is set to prioritize data from the most standard DB-5 column, and smallest values so as to avoid

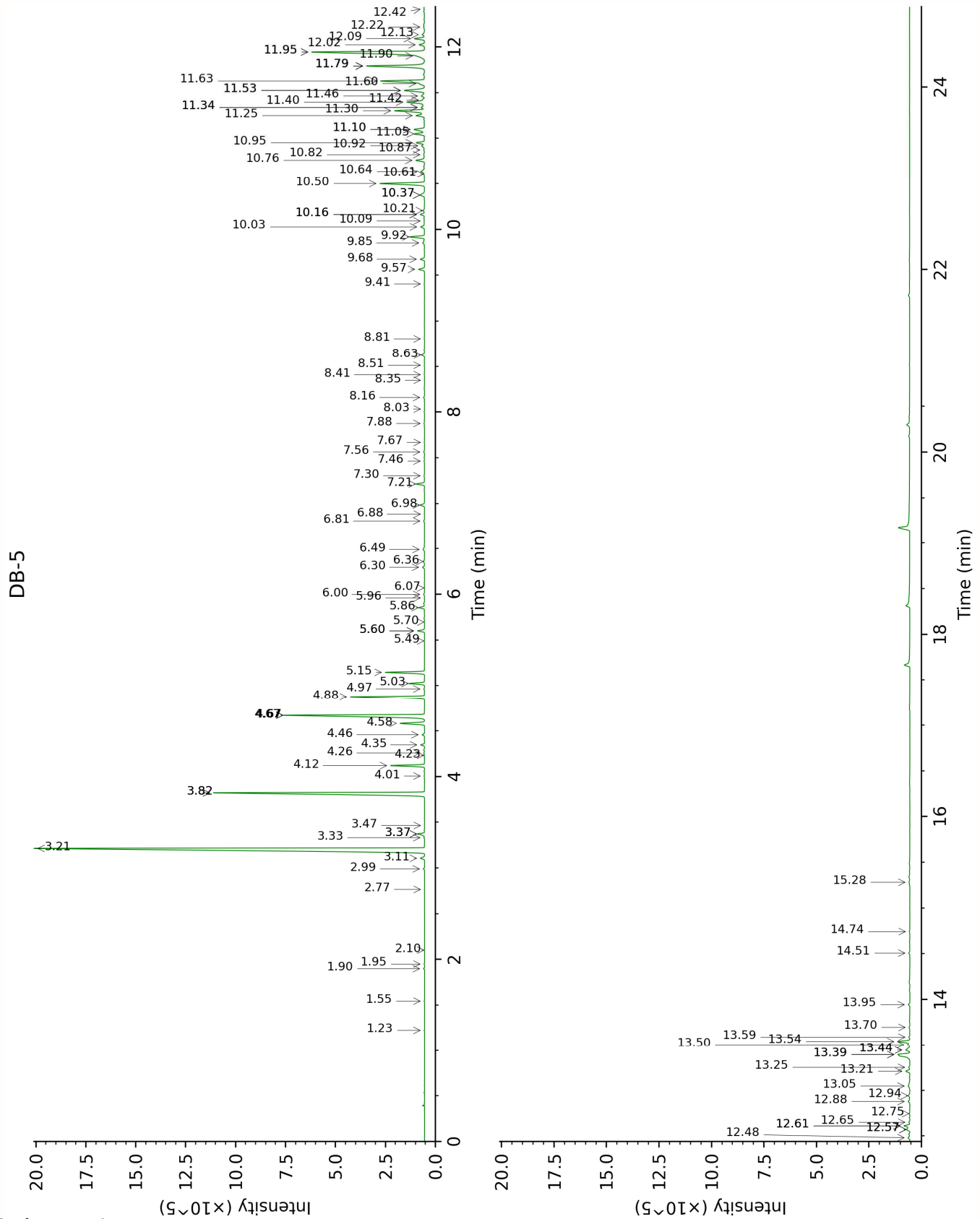
overestimating individual content. This process is semi-automatic. Advanced users are invited to consult the "Full analysis data" table after the chromatograms in this report to access the full untreated data and perform their own calculations if needed.

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

Toluene	Column DB-WAX			Column DB-5		
	1.58	1004.3	tr	1.23	759.1	0.01
Octane	0.56	783.3	0.02	1.55	803.1	0.02
5-Methyl-3-hexanone	1.98	1041.8	0.04	1.90	833.0	0.04
4-Methyl-3-hexanone	1.95	1039.1	0.02	1.95	837.1	0.02
Ethyl 2-methylbutyrate	1.79	1024.1	tr	2.10	849.6	tr
Bornylene				2.77	904.0	0.01
Tricyclene	1.36	973.8	0.05	2.99	919.0	0.05
α -Thujene	1.56	1002.0	0.23	3.11	926.6	0.23
α -Pinene	1.52	997.7	29.78	3.22	933.7	29.99
5-Methyl-3-heptanone	3.28	1151.3	0.03	3.33	941.4	0.03
α -Fenchene	1.78	1022.3	0.07	3.37*	944.1	[0.38]
Camphene	1.84	1028.9	0.30	3.37*	944.1	[0.38]
Thuja-2,4(10)-diene	2.44*	1085.3	[0.13]	3.47	950.2	0.01
β -Pinene	2.28	1069.9	12.81	3.82*	973.7	[13.02]
Sabinene	2.44*	1085.3	[0.13]	3.82*	973.7	[13.02]
Octen-3-ol	6.99*	1421.4	[0.30]	4.01	985.8	0.02
Myrcene	3.05	1134.1	1.51	4.12	993.3	1.51
Pseudolimonene	3.00	1130.1	0.01	4.23	1000.6	0.01
α -Phellandrene	2.95	1126.7	0.03	4.26	1002.4	0.04
Δ 3-Carene	2.75	1111.5	0.17	4.35	1008.1	0.18
α -Terpinene	3.13	1140.4	0.12	4.46	1015.0	0.12
<i>para</i> -Cymene	4.30	1226.8	1.26	4.58	1022.7	1.27
1,8-Cineole	3.49	1167.2	0.02	4.67*	1028.3	[8.66]
Limonene	3.39	1159.9	8.44	4.67*	1028.3	[8.66]
β -Phellandrene	3.46	1165.5	0.14	4.67*	1028.3	[8.66]
(<i>Z</i>)- β -Ocimene	3.98*	1204.4	[5.55]	4.88	1041.2	3.74
2-Heptyl acetate	4.42	1235.2	0.03	4.97	1046.7	0.03
(<i>E</i>)- β -Ocimene	4.17	1218.1	0.74	5.03	1050.4	0.75
γ -Terpinene	3.98*	1204.4	[5.55]	5.15	1058.1	1.84
α -Pinene oxide analog	5.61*	1321.9	[0.03]	5.49	1079.6	0.02
<i>para</i> -Cymenene	6.54	1388.0	0.02	5.60*	1086.4	[0.36]
Terpinolene	4.48	1239.9	0.34	5.60*	1086.4	[0.36]
α -Pinene oxide	5.61*	1321.9	[0.03]	5.70	1092.4	0.02
Linalool	8.27	1516.8	0.29	5.86	1102.3	0.30
Verbenol analog?	8.50	1533.9	0.02	5.96	1109.0	0.01
endo-Fenchol	8.58*	1540.6	[0.33]	6.00	1111.5	0.05

Octen-3-yl acetate	6.00	1349.7	0.01	6.07	1116.0	0.01
allo-Ocimene	5.78	1334.1	0.10	6.30	1130.4	0.11
<i>trans</i> -Pinocarveol	9.40	1603.8	0.05	6.36	1134.4	0.08
2-Octyl acetate	5.80	1335.0	0.02	6.49	1142.8	0.11
Borneol	10.00*	1652.6	[0.60]	6.81	1163.1	0.05
Ethyl benzoate	9.51*	1612.8	[0.44]	6.88	1167.9	0.01
Terpinen-4-ol	8.79	1556.5	0.23	6.98	1174.2	0.25
α -Terpineol	10.00*	1652.6	[0.60]	7.22	1188.9	0.46
Myrtenol	11.09	1742.1	0.03	7.30	1194.7	0.04
(3Z,5E)-2,6-Dimethylocta-3,5,7-trien-2-ol?	11.42	1770.4	0.17	7.46	1204.9	0.03
(3E,5E)-2,6-Dimethylocta-3,5,7-trien-2-ol	11.57	1782.5	0.06	7.56	1211.5	0.05
<i>trans</i> -Carveol	11.61	1786.4	0.01	7.67	1218.5	0.02
Citronellol	10.95	1730.2	0.04	7.88	1232.4	0.03
2-Nonyl acetate	7.17	1434.4	0.04	8.03	1242.9	0.01
Unknown RHAN I [m/z 68, 43 (71), 82 (59), 67 (52), 95 (24), 81 (24)...]	7.70*	1473.4	[0.23]	8.16	1251.4	0.05
Linalyl acetate	8.39	1525.7	0.02	8.35	1264.0	0.01
<i>trans</i> -Ascaridole glycol	14.41	2040.3	0.02	8.41	1268.1	0.02
Unknown TIDI I [m/z 41, 43 (84), 72 (81), 97 (90), 95 (60)... 150 (4)]	13.01*	1909.5	[0.33]	8.51	1275.0	0.01
Bornyl acetate	8.46	1531.4	0.18	8.63	1282.6	0.18
2-Undecanone	8.83	1559.7	0.02	8.81	1294.6	0.01
Bicycloelemene	7.25	1440.1	0.05	9.41	1336.2	0.01
α -Cubebene	6.99*	1421.4	[0.30]	9.57	1347.5	0.33
Citronellyl acetate	9.66	1624.6	0.40	9.68	1355.2	0.23
α -Ylangene	7.26	1441.0	0.10	9.85	1367.7	0.11
α -Copaene	7.37	1449.0	0.81	9.92	1372.4	0.81
β -Bourbonene	7.70*	1473.4	[0.23]	10.03	1380.0	0.22
β -Cubebene	7.99	1495.0	0.06	10.09	1384.6	0.04
β -Elemene	8.65*	1545.6	[2.65]	10.16*	1389.5	[0.24]
7-epi-Sesquithujene	8.06	1500.3	0.04	10.16*	1389.5	[0.24]
α -Funebrene	8.09	1502.5	0.06	10.20	1392.5	0.09

α -Cedrene	8.22	1512.6	0.03	10.37*	1404.4	[0.33]
α -Gurjunene	7.83	1483.5	0.20	10.37*	1404.4	[0.33]
β -Caryophyllene	8.65*	1545.6	[2.65]	10.50	1413.8	2.56
β -Copaene	8.58*	1540.6	[0.33]	10.61	1421.9	0.03
β -Gurjunene	8.58*	1540.6	[0.33]	10.64	1423.9	0.22
Aromadendrene	8.77	1555.0	0.49	10.76	1433.2	0.53
Selina-5,11-diene	8.90	1564.9	0.03	10.82	1437.7	0.06
<i>cis</i> -Muuro-la-3,5-diene	9.16	1585.1	0.06	10.87	1441.6	0.04
Unknown BOCA IV [m/z 91, 161 (92), 105 (85), 119 (63), 133 (53), 79 (49), 204 (46)]	9.01	1573.5	0.06	10.92	1445.0	0.20
α -Humulene	9.51*	1612.8	[0.44]	10.95	1447.5	0.47
allo-Aromadendrene	9.23	1590.2	0.61	11.05	1454.7	0.59
<i>cis</i> -Muuro-la-4(15),5-diene	9.56	1616.7	0.23	11.10*	1458.2	[0.75]
(<i>E</i>)- β -Farnesene	9.76	1633.0	0.59	11.10*	1458.2	[0.75]
<i>trans</i> -Cadin-1(6),4-diene	9.47	1609.4	0.50	11.25	1469.5	0.52
γ -Muuro-lene	9.82	1637.9	1.86	11.30	1473.5	1.90
Germacrene D	10.00*	1652.6	[0.60]	11.34*	1476.2	[0.22]
α -Amorphene	9.88	1642.4	0.29	11.34*	1476.2	[0.22]
β -Selinene	10.10	1660.4	1.05	11.40	1480.5	1.13
ar-Curcumene	10.89*	1725.4	[0.51]	11.42	1482.1	0.09
γ -Amorphene	10.04	1655.6	0.18	11.46	1485.5	0.23
α -Selinene	10.17	1666.4	0.91	11.52*	1490.0	[1.37]
Valencene	10.12	1662.3	0.15	11.52*	1490.0	[1.37]
Unknown SWGL III [m/z 161, 105 (77), 204 (73), 119 (65), 189 (57), 91 (53)]	10.64*	1704.2	[3.79]	11.60	1495.6	0.22
α -Muuro-lene	10.27	1674.2	2.48	11.63	1497.7	2.63
β -Curcumene	10.55	1696.4	0.42	11.79*	1510.1	[3.63]
γ -Cadinene	10.64*	1704.2	[3.79]	11.79*	1510.1	[3.63]
(3 <i>E</i> ,6 <i>E</i>)- α -Farnesene	10.72	1711.4	0.25	11.79*	1510.1	[3.63]
<i>trans</i> -Calamenene	11.46	1773.5	0.46	11.90	1518.8	0.31
δ -Cadinene	10.68	1707.7	6.83	11.94*	1522.1	[7.95]

Zonarene	10.64*	1704.2	[3.79]	11.94*	1522.1	[7.95]
<i>trans</i> -Cadina-1,4-diene	10.89*	1725.4	[0.51]	12.02	1528.3	0.30
α -Cadinene	11.02	1736.2	0.56	12.09	1533.6	0.56
α -Calacorene	12.34*	1850.3	[0.13]	12.14	1537.0	0.15
Isocaryophyllene epoxide B	12.34*	1850.3	[0.13]	12.22	1543.5	0.06
Palustrol	12.51	1865.2	0.03	12.42	1559.3	0.03
(<i>E</i>)-Nerolidol	14.00*	2001.4	[0.24]	12.48	1564.1	0.12
Spathulenol	14.63	2061.3	0.19	12.57*	1571.2	[0.25]
Germacrene D-4-ol	13.91	1992.7	0.19	12.57*	1571.2	[0.25]
Caryophyllene oxide isomer	12.93	1902.0	0.09	12.61*	1574.3	[0.36]
Caryophyllene oxide	13.01*	1909.5	[0.33]	12.61*	1574.3	[0.36]
Unknown HEBR VI [m/z 109, 43 (95), 81 (81), 93 (76), 69 (75), 95 (74), 107 (71)... 204 (22), 220 (6)]				12.65	1577.4	0.06
Viridiflorol	14.22	2022.2	0.07	12.75	1584.9	0.03
Ledol	13.60	1964.3	0.13	12.88	1595.3	0.09
Unknown RHAN III [m/z 149, 43 (95), 93 (84), 177 (66), 109 (62), 67 (60)...220 (11)]				12.94	1600.2	0.11
10- <i>epi</i> -Cubenol	13.94	1995.5	0.13	13.05	1608.7	0.12
1- <i>epi</i> -Cubenol	14.00*	2001.4	[0.24]	13.21	1622.1	0.25
γ -Eudesmol	15.11	2107.8	0.07	13.25	1625.6	0.07
τ -Cadinol	15.12	2109.4	0.47	13.39*	1637.2	[1.18]
τ -Muurolol	15.29	2125.6	0.55	13.39*	1637.2	[1.18]
β -Eudesmol	15.63	2160.2	0.11	13.44*	1641.4	[0.33]
α -Muurolol	15.42	2139.1	0.23	13.44*	1641.4	[0.33]
α -Eudesmol	15.56	2153.5	0.12	13.50	1646.4	0.12
α -Cadinol	15.72	2168.4	0.66	13.54	1649.4	0.67
<i>cis</i> -Calamenen-10-ol	16.69	2268.9	0.06	13.59	1653.4	0.05
<i>trans</i> -Calamenen-10-ol	17.00	2300.6	0.50	13.70	1662.3	0.05
α -Bisabolol	15.66	2163.4	0.10	13.95	1682.8	0.09
Unknown RHAN	16.10	2207.8	0.02	14.51	1730.5	0.07

IV [m/z 91, 175 (93), 105 (76), 79 (73), 133 (69), 107 (60)...218 (33)]						
Unknown RHAN V [m/z 91, 177 (75), 79 (68), 105 (65), 93 (62), 159 (60)...220 (16)]	18.29	2442.0	0.02	14.74	1750.9	0.05
Unknown SCMO VIII [m/z 43, 41 (72), 95 (69), 81 (66), 67 (55), 55 (52), 79 (52), 69 (50)... 238 (1)]				15.28	1797.6	0.08
Total reported		96.29%			97.61%	

*: 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