

Date : 2023-11-14

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23J30-NPA01

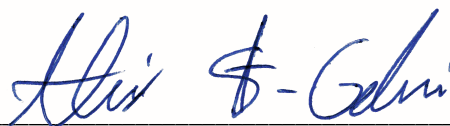
Customer Identification : Cajeput - Melaleuca cajuputi - Indonesia - NPS00112 - Lot # NP0284

Type : Essential Oil

Source : Melaleuca cajuputi

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 2023-11-13 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 : Sylvain Mercier, M. Sc., Chimiste 2014-005

Date : 2023-11-07

PHYSICOCHEMICAL DATA

Refractive index : 1.4683 ± 0.0003 (20 °C)

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

Analyst : Cindy Caron B. Sc.

Date : 2023-10-31

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
2-Butanone	tr	Aliphatic ketone
2-Methyl-3-buten-2-ol	tr	Aliphatic alcohol
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
Isoamyl alcohol	tr	Aliphatic alcohol
2-Methylbutanol	0.01	Aliphatic alcohol
Methyl 2-methylbutyrate	0.02	Aliphatic ester
2,4-Dimethyl-3-pentanone	0.01	Aliphatic ketone
2-Methylbutyl acetate	0.01	Aliphatic ester
α -Thujene	0.38	Monoterpene
α -Pinene	3.21	Monoterpene
Camphene	0.05	Monoterpene
α -Fenchene	0.01	Monoterpene
Benzaldehyde	0.05	Simple phenolic
β -Pinene	1.82	Monoterpene
Sabinene	0.28	Monoterpene
Myrcene	1.30	Monoterpene
Pseudolimonene	0.06	Monoterpene
α -Phellandrene	0.35	Monoterpene
Δ^3 -Carene	0.35	Monoterpene
α -Terpinene	0.85	Monoterpene
Limonene	7.41	Monoterpene
1,8-Cineole	56.41	Monoterpenic ether
<i>para</i> -Cymene	1.92	Monoterpene
(<i>Z</i>)- β -Ocimene	0.04	Monoterpene
(<i>E</i>)- β -Ocimene	0.18	Monoterpene
γ -Terpinene	2.51	Monoterpene
<i>cis</i> -Sabinene hydrate	0.02	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.01	Monoterpenic alcohol
<i>trans</i> -Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Terpinolene	0.99	Monoterpene
<i>para</i> -Cymenene	0.02	Monoterpene
<i>trans</i> -Sabinene hydrate	0.03	Monoterpenic alcohol
Linalool	0.22	Monoterpenic alcohol
<i>para</i> -Mentha-1,3,8-triene	0.01	Monoterpene
<i>cis</i> -Rose oxide	0.02	Monoterpenic ether
endo-Fenchol	0.01	Monoterpenic alcohol
<i>trans</i> -Rose oxide	0.01	Monoterpenic ether

<i>trans</i> -Pinocarveol	0.02	Monoterpenic alcohol
Camphor	0.07	Monoterpenic ketone
Isopulegol	0.03	Monoterpenic alcohol
Borneol	0.01	Monoterpenic alcohol
δ -Terpineol	0.15	Monoterpenic alcohol
Terpinen-4-ol	0.63	Monoterpenic alcohol
Cryptone	0.01	Normonoterpenic ketone
<i>para</i> -Cymen-8-ol	0.04	Monoterpenic alcohol
α -Terpineol	6.15	Monoterpenic alcohol
<i>exo</i> -2-Hydroxycineole	0.02	Monoterpenic alcohol
Citronellol	0.03	Monoterpenic alcohol
Geraniol	0.02	Monoterpenic alcohol
δ -Terpinyl acetate	0.02	Monoterpenic ester
Unknown	0.03	Monoterpenic alcohol
δ -Elemene	0.04	Sesquiterpene
α -Terpinyl acetate	0.69	Monoterpenic ester
Eugenol	0.03	Phenylpropanoid
α -Ylangene	0.14	Sesquiterpene
α -Copaene	0.06	Sesquiterpene
7-Cubebene	0.03	Sesquiterpene
Geranyl acetate	0.03	Monoterpenic ester
β -Elemene	0.15	Sesquiterpene
α -Gurjunene	0.06	Sesquiterpene
β -Caryophyllene	3.22	Sesquiterpene
β -Copaene	0.02	Sesquiterpene
β -Gurjunene	0.02	Sesquiterpene
γ -Elemene	0.04	Sesquiterpene
Aromadendrene	0.08	Sesquiterpene
α -Guaiene	0.05	Sesquiterpene
6,9-Guaiadiene	0.05	Sesquiterpene
Unknown	0.05	Sesquiterpene
α -Humulene	1.51	Sesquiterpene
allo-Aromadendrene	0.18	Sesquiterpene
Valerena-4,7(11)-diene	0.04	Sesquiterpene
4,5-diepi-Aristolochene	0.03	Sesquiterpene
Unknown	0.03	Sesquiterpene
Selina-4,11-diene	0.21	Sesquiterpene
Unknown	0.19	Sesquiterpene
α -Amorphene	0.25	Sesquiterpene
β -Selinene	1.01	Sesquiterpene
δ -Selinene	0.27	Sesquiterpene
α -Selinene	1.08	Sesquiterpene
Viridiflorene	0.10	Sesquiterpene
δ -Amorphene	0.20	Sesquiterpene
γ -Cadinene	0.10	Sesquiterpene

<i>trans</i> -Calamenene	0.02	Sesquiterpene
δ-Cadinene	0.12	Sesquiterpene
Zonarene	0.04	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.01	Sesquiterpene
Selina-4(15),7(11)-diene	0.08	Sesquiterpene
Selina-4,7(11)-diene?	0.03	Sesquiterpene
α-Calacorene	0.08	Sesquiterpene
Selina-3,7(11)-diene	0.04	Sesquiterpene
Isocaryophyllene epoxide B	0.03	Sesquiterpenic ether
Germacrene B	0.23	Sesquiterpene
Palustrol	0.03	Sesquiterpenic alcohol
β-Calacorene	0.01	Sesquiterpene
Spathulenol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.22	Sesquiterpenic ether
Globulol	0.30	Sesquiterpenic alcohol
Viridiflorol	0.58	Sesquiterpenic alcohol
Guaiol	0.06	Sesquiterpenic alcohol
Ledol	0.09	Sesquiterpenic alcohol
Humulene epoxide II	0.10	Sesquiterpenic ether
Unknown	0.03	Oxygenated sesquiterpene
Isoleptospermone	0.02	Sesquiterpenic ketone
1,10-diepi-Cubenol	0.10	Sesquiterpenic alcohol
Eremoligenol?	0.04	Sesquiterpenic alcohol
Unknown	0.17	Oxygenated sesquiterpene
Caryophylladienol II	0.03	Sesquiterpenic alcohol
Cubenol	0.04	Sesquiterpenic alcohol
τ-Cadinol	0.02	Sesquiterpenic alcohol
β-Eudesmol	0.12	Sesquiterpenic alcohol
Selin-11-en-4α-ol	0.09	Sesquiterpenic alcohol
α-Eudesmol	0.11	Sesquiterpenic alcohol
Bulnesol	0.02	Sesquiterpenic alcohol
(3Z)-Caryophylla-3,8(13)-dien-5β-ol	0.03	Sesquiterpenic alcohol
Juniper camphor	0.01	Sesquiterpenic alcohol
Aromadendrane-4,10-diol	0.01	Sesquiterpenic alcohol
(2E,6E)-Farnesol	0.01	Sesquiterpenic alcohol
Consolidated total	98.73	

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

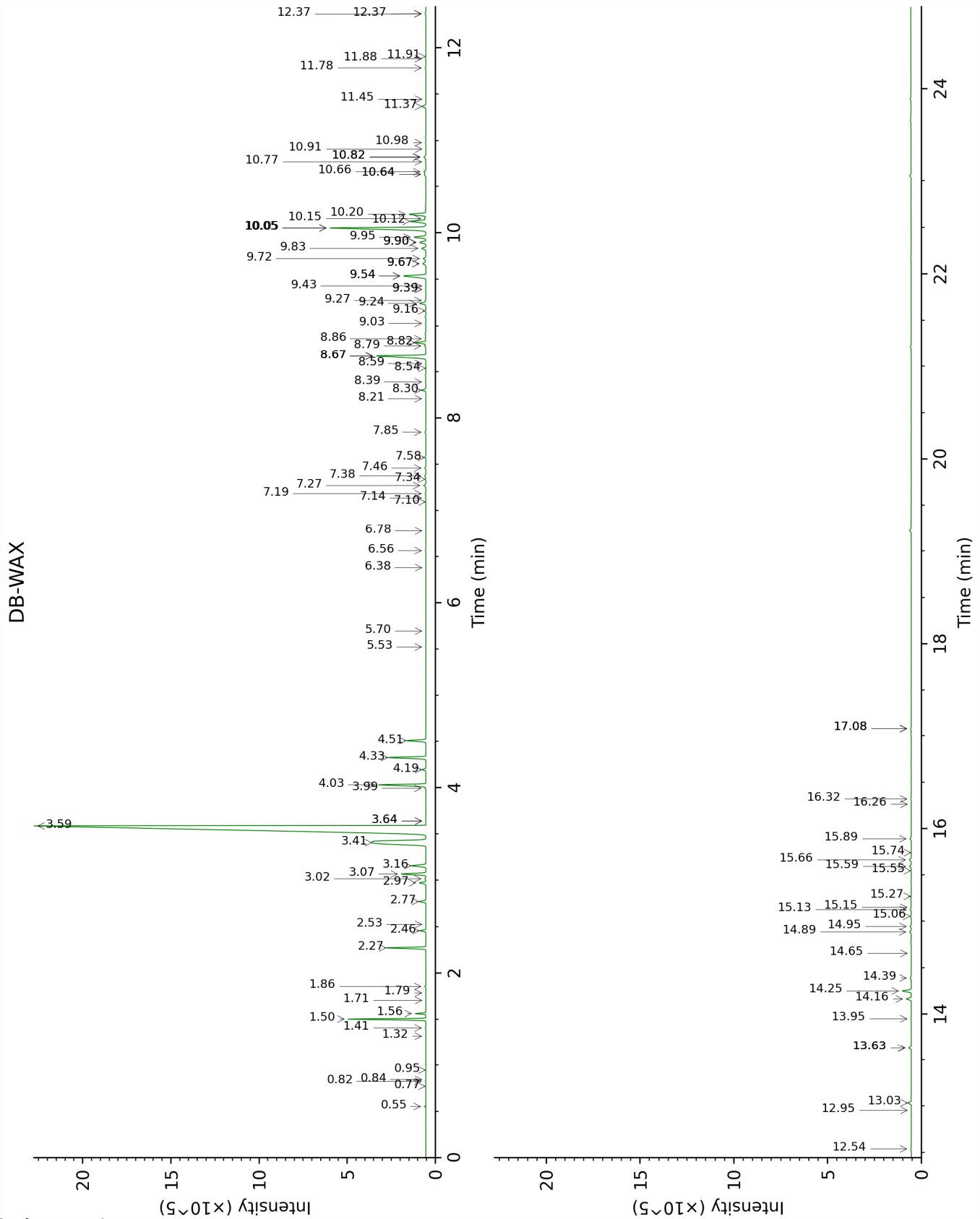
Note: no correction factor was applied

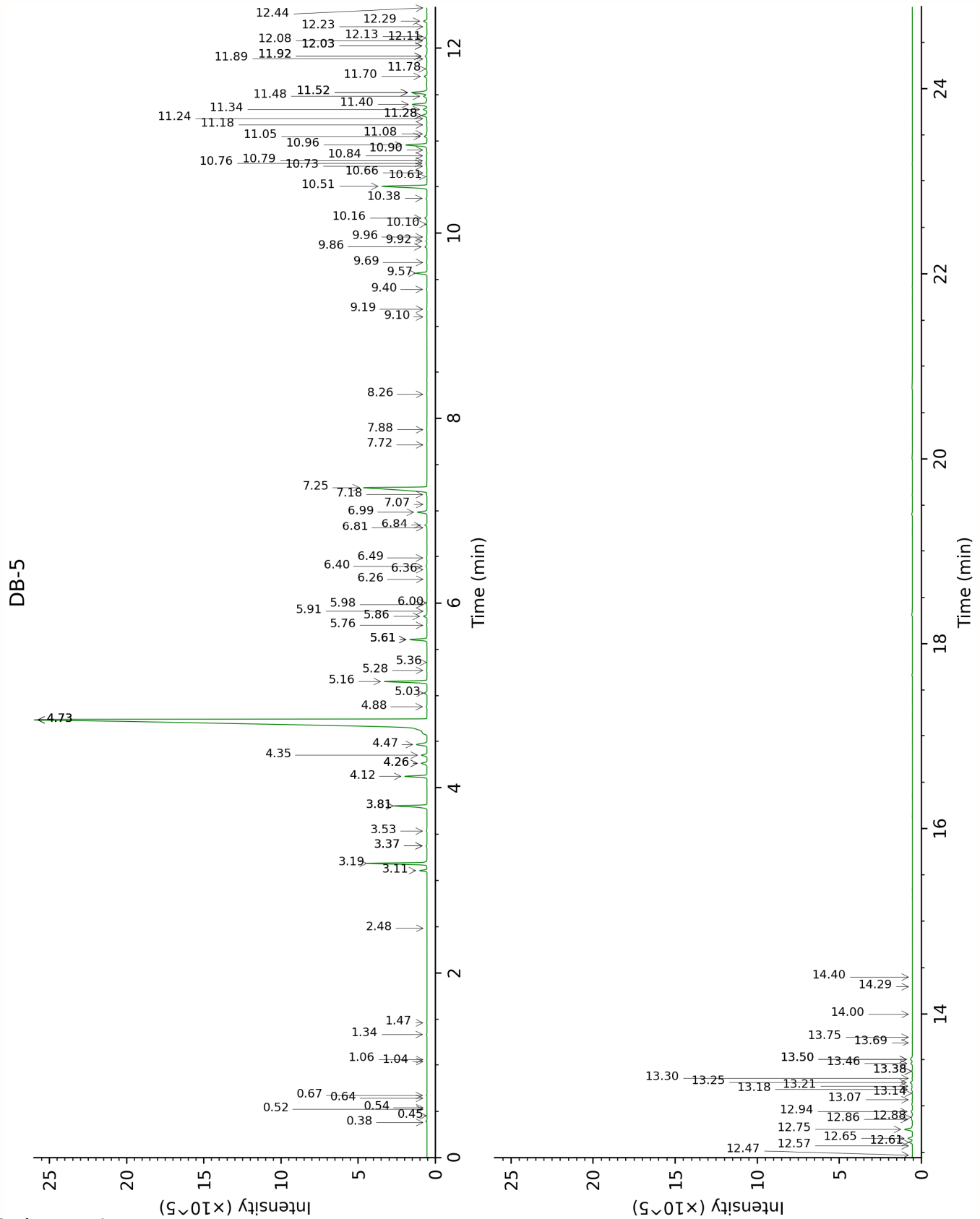
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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		
	0.95	909.6	tr	0.38	501.8	tr
Isobutyral	0.55	779.5	0.03	0.45	539.1	tr
2-Butanone	0.77	863.8	0.01	0.52	596.8	tr
2-Methyl-3-buten-2-ol	1.71	1014.4	tr	0.54	608.1	tr
Isovaleral	0.84	888.0	0.01	0.64	642.4	0.01
2-Methylbutyral	0.82	881.3	0.01	0.67	652.5	0.01
Isoamyl alcohol	3.64*	1176.9	[0.01]	1.04	734.3	tr
2-Methylbutanol	3.64*	1176.9	[0.01]	1.06	737.3	0.01
Methyl 2-methylbutyrate	1.41	979.2	0.02	1.34	775.5	0.02
2,4-Dimethyl-3-pentanone	1.32	965.8	0.01	1.46	792.7	0.01
2-Methylbutyl acetate	2.53	1091.6	0.01	2.48	881.4	0.01
α-Thujene	1.56	1001.0	0.38	3.11	927.0	0.38
α-Pinene	1.50	993.7	3.04	3.19	932.2	3.21
Camphene	1.86	1028.5	0.05	3.37*	944.5	[0.06]
α-Fenchene	1.79	1021.9	0.01	3.37*	944.5	[0.06]
Benzaldehyde	7.58	1462.0	0.06	3.53	955.0	0.05
β-Pinene	2.27	1067.8	1.82	3.80*	972.8	[2.10]
Sabinene	2.46	1085.1	0.28	3.80*	972.8	[2.10]
Myrcene	3.07	1133.8	1.30	4.12	993.7	1.30
Pseudolimonene	3.02	1129.9	0.06	4.26*	1002.9	[0.41]
α-Phellandrene	2.97	1126.5	0.35	4.26*	1002.9	[0.41]
Δ ³ -Carene	2.77	1111.4	0.35	4.35	1008.6	0.35
α-Terpinene	3.16	1140.5	0.86	4.47	1015.7	0.85
Limonene	3.41	1159.3	7.41	4.73*	1032.3	[65.95]
1,8-Cineole	3.59	1172.9	56.41	4.73*	1032.3	[65.95]
para-Cymene	4.32	1226.6	1.92	4.73*	1032.3	[65.95]
(Z)-β-Ocimene	3.99	1203.1	0.04	4.88	1041.1	0.04
(E)-β-Ocimene	4.19	1217.3	0.18	5.03	1050.8	0.18
γ-Terpinene	4.03	1205.8	2.51	5.16	1058.6	2.51
cis-Sabinene hydrate	7.14	1429.9	0.03	5.28	1066.1	0.02
cis-Linalool oxide (fur.)	6.78	1403.5	0.01	5.36	1071.5	0.01
trans-Linalool oxide (fur.)	7.10	1426.8	0.01	5.61*	1086.8	[1.03]
Terpinolene	4.51	1239.5	0.99	5.61*	1086.8	[1.03]
para-Cymenene	6.56	1388.2	0.02	5.61*	1086.8	[1.03]
trans-Sabinene hydrate	8.21	1509.0	0.02	5.76	1096.4	0.03

Linalool	8.30	1516.1	0.22	5.86	1102.5	0.22
<i>para</i> -Mentha-1,3,8-triene	6.38	1375.1	0.01	5.91	1105.9	0.01
<i>cis</i> -Rose oxide	5.52	1314.6	0.02	5.98	1110.4	0.02
<i>endo</i> -Fenchol	8.59	1538.1	0.02	6.00	1111.6	0.01
<i>trans</i> -Rose oxide	5.70	1326.8	0.01	6.26	1127.8	0.01
<i>trans</i> -Pinocarveol	9.43	1602.8	0.02	6.36	1134.5	0.02
Camphor	7.46	1453.6	0.06	6.40	1136.7	0.07
Isopulegol	8.39	1522.9	0.05	6.49	1142.5	0.03
Borneol	10.05*	1652.8	[6.29]	6.81	1163.3	0.01
δ -Terpineol	9.72	1626.4	0.15	6.84	1165.2	0.15
Terpinen-4-ol	8.82	1555.8	0.58	6.99	1174.4	0.63
Cryptone	9.39*	1599.9	[0.03]	7.07	1179.8	0.01
<i>para</i> -Cymen-8-ol	11.78	1796.5	0.04	7.18	1186.5	0.04
α -Terpineol	10.05*	1652.8	[6.29]	7.25	1191.2	6.15
<i>exo</i> -2-Hydroxycineole	11.91	1807.3	0.01	7.72	1221.4	0.02
Citronellol	10.98	1728.7	0.03	7.88	1232.3	0.03
Geraniol	11.88	1805.2	0.03	8.26	1257.8	0.02
δ -Terpinyl acetate	9.39*	1599.9	[0.03]	9.10	1314.4	0.02
Unknown MEAL I [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	15.27	2118.5	0.02	9.18	1320.2	0.03
δ -Elemene	7.19	1433.4	0.04	9.40	1335.2	0.04
α -Terpinyl acetate	9.95	1644.9	0.69	9.57	1347.4	0.69
Eugenol	15.06	2097.1	0.06	9.69	1355.5	0.03
α -Ylangene	7.27	1439.8	0.13	9.86	1367.4	0.14
α -Copaene	7.38	1447.4	0.07	9.92	1371.8	0.06
7-Cubebene	7.34	1444.8	0.03	9.96	1374.8	0.03
Geranyl acetate	10.82*	1715.6	[0.16]	10.10	1384.4	0.03
β -Elemene	8.67*	1544.3	[3.34]	10.16	1389.1	0.15
α -Gurjunene	7.85	1482.0	0.06	10.38	1404.0	0.06
β -Caryophyllene	8.67*	1544.3	[3.34]	10.50	1413.6	3.22
β -Copaene	8.67*	1544.3	[3.34]	10.61	1421.6	0.02
β -Gurjunene	8.54	1534.2	0.01	10.66	1424.9	0.02
γ -Elemene	9.27	1590.5	0.04	10.73	1430.3	0.04
Aromadendrene	8.78	1553.1	0.07	10.76	1432.6	0.08
α -Guaiene	8.67*	1544.3	[3.34]	10.79	1434.6	0.05
6,9-Guaiadiene	8.86	1559.0	0.05	10.84	1438.7	0.05
Unknown BOCA IV [m/z 91, 161 (92), 105 (85), 119 (63), 133 (53), 79 (49), 204 (46)]	9.03	1571.7	0.03	10.90	1443.3	0.05

α-Humulene	9.54*	1611.5	[1.61]	10.96	1447.3	1.51
allo-Aromadendrene	9.24	1588.1	0.37	11.05	1454.1	0.18
Valerena-4,7(11)-diene	9.16	1582.0	0.03	11.08	1456.1	0.04
4,5-diepi-Aristolochene	9.67*	1622.0	[0.24]	11.18	1463.4	0.03
Unknown NAJA VII [m/z 159, 145 (22), 91 (17),, 187 (16)... 202 (12)]	9.90*	1640.4	[0.39]	11.24	1468.4	0.03
Selina-4,11-diene	9.67*	1622.0	[0.24]	11.28*	1470.9	[0.41]
Unknown MECA II [m/z 161, 91 (97), 105 (76), 119 (61), 41 (55)... 204 (44)]	9.54*	1611.5	[1.61]	11.28*	1470.9	[0.41]
α-Amorphene	9.83	1635.2	0.25	11.34	1475.8	0.25
β-Selinene	10.12*†	1658.5	[1.04]	11.40	1479.8	1.01
δ-Selinene	9.90*	1640.4	[0.39]	11.48	1486.3	0.27
α-Selinene	10.20	1664.6	1.08	11.52*	1489.3	[1.18]
Viridiflorene	9.90*	1640.4	[0.39]	11.52*	1489.3	[1.18]
δ-Amorphene	10.15*†	1661.0	[0.07]	11.70	1502.2	0.20
γ-Cadinene	10.64*	1700.0	[0.13]	11.78	1508.5	0.10
trans-Calamenene	11.45	1768.0	0.01	11.89	1516.9	0.02
δ-Cadinene	10.66	1702.4	0.12	11.92*	1519.2	[0.16]
Zonarene	10.64*	1700.0	[0.13]	11.92*	1519.2	[0.16]
trans-Cadina-1,4-diene	10.91	1722.9	0.01	12.03*	1527.9	[0.09]
Selina-4(15),7(11)-diene	10.82*	1715.6	[0.16]	12.03*	1527.9	[0.09]
Selina-4,7(11)-diene?	10.77	1711.2	0.03	12.08	1532.2	0.03
α-Calacorene	12.37*	1847.8	[0.07]	12.11	1534.6	0.08
Selina-3,7(11)-diene	10.82*	1715.6	[0.16]	12.13	1535.7	0.04
Isocaryophyllene epoxide B	12.37*	1847.8	[0.07]	12.23	1544.1	0.03
Germacrene B	11.37	1761.4	0.25	12.29	1548.8	0.23
Palustrol	12.54	1862.7	0.05	12.44	1560.2	0.03
β-Calacorene	12.95	1899.6	0.01	12.47	1562.4	0.01
Spathulenol	14.66	2058.5	0.01	12.57	1570.5	0.01
Caryophyllene oxide	13.03	1907.0	0.22	12.61	1573.5	0.22
Globulol	14.16	2011.5	0.30	12.65	1576.8	0.30
Viridiflorol	14.25	2019.7	0.53	12.75	1584.4	0.58

Guaiol	14.39	2033.0	0.08	12.86	1592.8	0.06
Ledol	13.63*	1961.6	[0.16]	12.88	1594.6	0.09
Humulene epoxide II	13.63*	1961.6	[0.16]	12.94	1599.4	0.10
Unknown MECA V [m/z 179, 161 (66), 119 (44), 95 (38), 105 (35)... 204 (24), 222 (1)]	14.89	2080.5	0.11	13.07	1609.7	0.03
Isoleptospermone	15.74	2165.5	0.01	13.14	1615.5	0.02
1,10-diepi-Cubenol	13.63*	1961.6	[0.16]	13.18	1618.9	0.10
Eremoligenol?	15.13	2104.2	0.07	13.21	1621.7	0.04
Unknown MECA IV [m/z 161, 43 (74), 105 (57), 121 (45), 81 (43)... 204 (31)...]	14.94	2086.2	0.07	13.25	1625.0	0.17
Caryophylladienol II	16.32	2224.6	0.05	13.30	1628.7	0.03
Cubenol	13.95	1991.1	0.04	13.38*	1635.1	[0.05]
τ -Cadinol	15.15	2106.7	0.02	13.38*	1635.1	[0.05]
β -Eudesmol	15.66	2157.7	0.13	13.46	1642.0	0.12
Selin-11-en-4 α -ol	15.89	2180.3	0.09	13.50*	1645.6	[0.22]
α -Eudesmol	15.59	2150.7	0.11	13.50*	1645.6	[0.22]
Bulnesol	15.55	2146.1	0.02	13.69	1661.0	0.02
(3Z)-Caryophylla-3,8(13)-dien-5 β -ol	17.08*	2303.9	[0.06]	13.75	1666.0	0.03
Juniper camphor	16.26	2218.8	0.01	14.00	1686.4	0.01
Aromadendrane-4,10-diol	17.08*	2303.9	[0.06]	14.30	1711.2	0.01
(2E,6E)-Farnesol	17.08*	2303.9	[0.06]	14.40	1720.2	0.01
Total reported		98.43%			98.95%	

*: 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