

Date : February 16, 2023

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23B14-PTH04

Customer identification : Rhododendron - Nepal - RJ0106R

Type : Essential oil

Source : *Rhododendron anthopogon*

Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-014  - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Amélie Simard, Analyste

Analysis date : February 14, 2023

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid

Refractive index: 1.4813 ± 0.0003 (20 °C; method PC-MAT-016)

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
2-Methyl-3-pentanone	tr	Aliphatic ketone
Toluene	tr	Simple phenolic
Octane	0.01	Alkane
5-Methyl-3-hexanone	0.03	Aliphatic ketone
4-Methyl-3-hexanone	0.02	Aliphatic ketone
Ethyl 2-methylbutyrate	0.01	Aliphatic ester
Ethyl isovalerate	0.01	Aliphatic ester
Nonane	tr	Alkane
Bornylene	tr	Monoterpene
Tricyclene	0.05	Monoterpene
α -Thujene	0.23	Monoterpene
α -Pinene	28.86	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
6-Methyl-2-heptanone	0.01	Aliphatic ketone
β -Pinene	14.40	Monoterpene
Sabinene	0.12	Monoterpene
Octen-3-ol	0.02	Aliphatic alcohol
Myrcene	1.97	Monoterpene
α -Phellandrene	0.05	Monoterpene
Pseudolimonene	0.01	Monoterpene
Δ^3 -Carene	0.02	Monoterpene
α -Terpinene	0.24	Monoterpene
para-Cymene	0.53	Monoterpene
1,8-Cineole	0.16*	Monoterpenic ether
β -Phellandrene	0.16*	Monoterpene
Limonene	9.38	Monoterpene
(Z)- β -Ocimene	5.33	Monoterpene
2-Heptyl acetate	0.06	Aliphatic ester
(E)- β -Ocimene	1.07	Monoterpene
γ -Terpinene	2.44	Monoterpene
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
para-Cymenene	0.03	Monoterpene
Terpinolene	0.44	Monoterpene
α -Pinene oxide	0.01	Monoterpenic ether
Linalool	0.34	Monoterpenic alcohol
Verbenol analog?	0.01	Monoterpenic alcohol
endo-Fenchol	0.07	Monoterpenic alcohol
Octen-3-yl acetate	0.02	Aliphatic ester
allo-Ocimene	0.16	Monoterpene
trans-Pinocarveol	0.03	Monoterpenic alcohol
Camphene hydrate	0.06	Monoterpenic alcohol

2-Octyl acetate	0.03	Aliphatic ester
Borneol	0.05	Monoterpenic alcohol
Ethyl benzoate	0.02	Phenolic ester
Terpinen-4-ol	0.29	Monoterpenic alcohol
para-Cymen-8-ol	0.01	Monoterpenic alcohol
α -Terpineol	0.43	Monoterpenic alcohol
Methyl salicylate	0.01	Phenolic ester
Myrtenol	0.02	Monoterpenic alcohol
(3Z,5E)-2,6-Dimethylocta-3,5,7-trien-2-ol?	0.02	Monoterpenic alcohol
(3E,5E)-2,6-Dimethylocta-3,5,7-trien-2-ol	0.03	Monoterpenic alcohol
<i>trans</i> -Carveol	0.01	Monoterpenic alcohol
Citronellol	0.03	Monoterpenic alcohol
2-Nonyl acetate	0.01	Aliphatic ester
Unknown	0.08	Unknown
Geraniol	0.03	Monoterpenic alcohol
<i>trans</i> -Ascaridole glycol	0.02	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Bornyl acetate	0.17	Monoterpenic ester
2-Undecanone	0.01	Aliphatic ketone
Bicycloelemene	0.04	Sesquiterpene
α -Cubebene	0.36	Sesquiterpene
Citronellyl acetate	0.19	Monoterpenic ester
Cyclosativene I	0.01	Sesquiterpene
Cyclosativene II	0.02	Sesquiterpene
α -Ylangene	0.13	Sesquiterpene
α -Copaene	0.89	Sesquiterpene
β -Bourbonene	0.24	Sesquiterpene
β -Cubebene	0.04	Sesquiterpene
7-epi-Sesquithujene	0.05	Sesquiterpene
β -Elemene	0.23	Sesquiterpene
α -Funebrene	0.08	Sesquiterpene
4-Phenyl-2-butyl acetate	0.02	Phenylbutanoid ester
α -Gurjunene	0.22	Sesquiterpene
α -Cedrene	0.03	Sesquiterpene
β -Caryophyllene	2.77	Sesquiterpene
β -Copaene	0.03	Sesquiterpene
β -Gurjunene	0.28	Sesquiterpene
α -Maaliene	0.05	Sesquiterpene
Aromadendrene	0.49	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.05	Sesquiterpene
Selina-5,11-diene	0.07	Sesquiterpene
<i>cis</i> -Muurolo-3,5-diene	0.11	Sesquiterpene
Unknown	0.29	Sesquiterpene
α -Humulene	0.46	Sesquiterpene
allo-Aromadendrene	0.51	Sesquiterpene
<i>cis</i> -Muurolo-4(15),5-diene	0.18	Sesquiterpene
(E)- β -Farnesene	0.83	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.67	Sesquiterpene
γ -Muurolole	1.68	Sesquiterpene
α -Amorphene	0.31	Sesquiterpene
Germacrene D	0.13	Sesquiterpene
β -Selinene	0.44	Sesquiterpene

ar-Curcumene	0.05	Sesquiterpene
γ-Amorphene	0.23	Sesquiterpene
Valencene	0.40	Sesquiterpene
α-Selinene	0.82	Sesquiterpene
Unknown	0.21	Sesquiterpene
α-Muurolene	2.05	Sesquiterpene
γ-Cadinene	1.76	Sesquiterpene
(3E,6E)-α-Farnesene	0.26	Sesquiterpene
β-Curcumene	0.05	Sesquiterpene
Zonarene	0.71	Sesquiterpene
δ-Cadinene	5.59	Sesquiterpene
trans-Cadina-1,4-diene	0.26	Sesquiterpene
α-Cadinene	0.39	Sesquiterpene
α-Calacorene	0.09	Sesquiterpene
Isocaryophyllene epoxide B	0.02	Sesquiterpenic ether
Palustrol	0.02	Sesquiterpenic alcohol
β-Calacorene	0.01	Sesquiterpene
(E)-Nerolidol	0.11	Sesquiterpenic alcohol
Germacrene D-4-ol	0.11	Sesquiterpenic alcohol
Spathulenol	0.08	Sesquiterpenic alcohol
Caryophyllene oxide	0.05	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Unknown	0.05	Oxygenated sesquiterpene
Viridiflorol	0.03	Sesquiterpenic alcohol
Ledol?	0.07	Oxygenated sesquiterpene
Unknown	0.05	Oxygenated sesquiterpene
10-epi-Cubenol	0.07	Sesquiterpenic alcohol
1-epi-Cubenol	0.14	Sesquiterpenic alcohol
γ-Eudesmol	0.06	Sesquiterpenic alcohol
τ-Cadinol	0.26	Sesquiterpenic alcohol
τ-Muurolol	0.29	Sesquiterpenic alcohol
α-Muurolol	0.14	Sesquiterpenic alcohol
β-Eudesmol	0.06	Sesquiterpenic alcohol
α-Eudesmol	0.08	Sesquiterpenic alcohol
α-Cadinol	0.37	Sesquiterpenic alcohol
cis-Calamenen-10-ol	0.01	Sesquiterpenic alcohol
Shyobunol	0.01	Sesquiterpenic alcohol
α-Bisabolol	0.10	Sesquiterpenic alcohol
Unknown	0.05	Oxygenated sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
Consolidated total	95.01%	

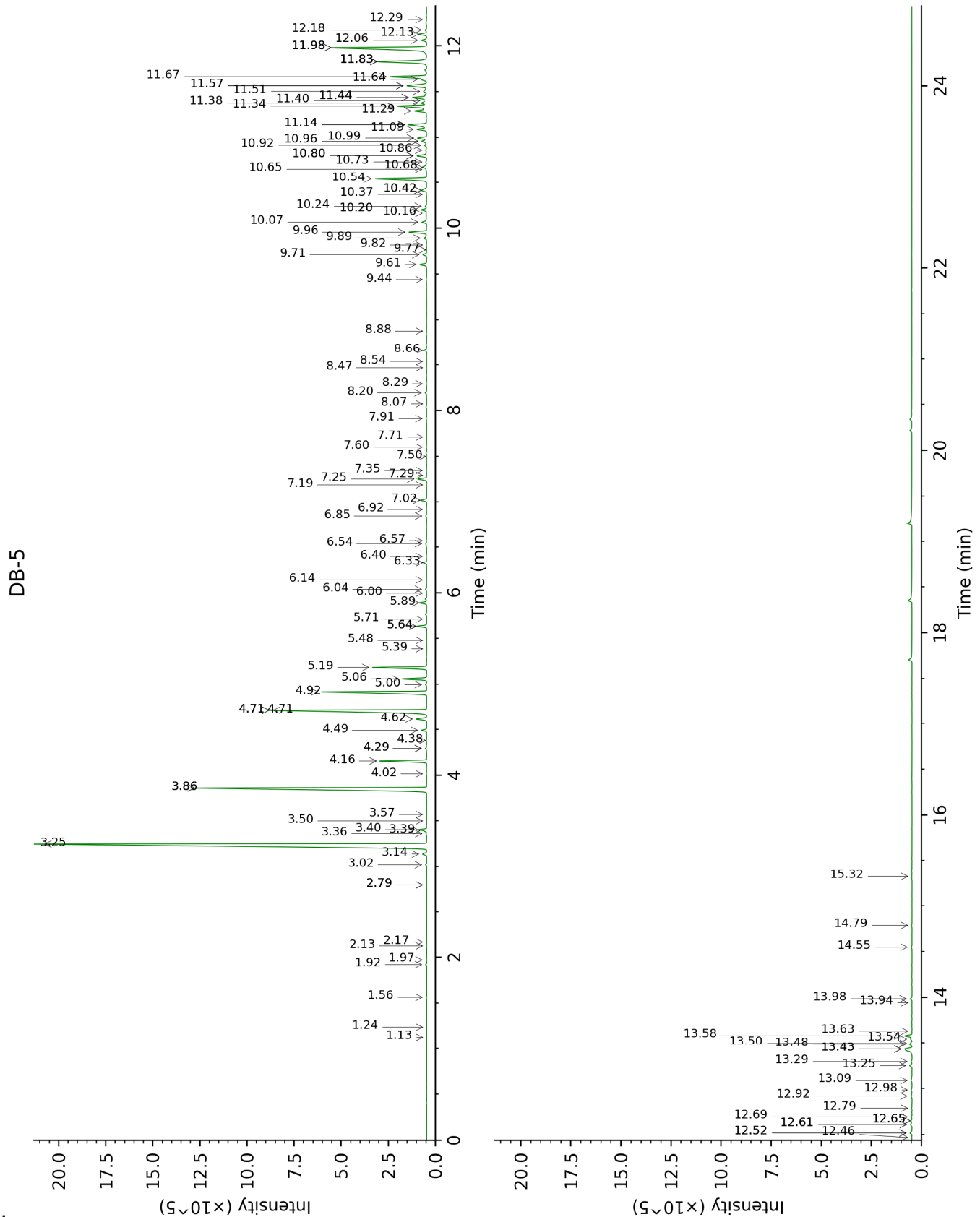
*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

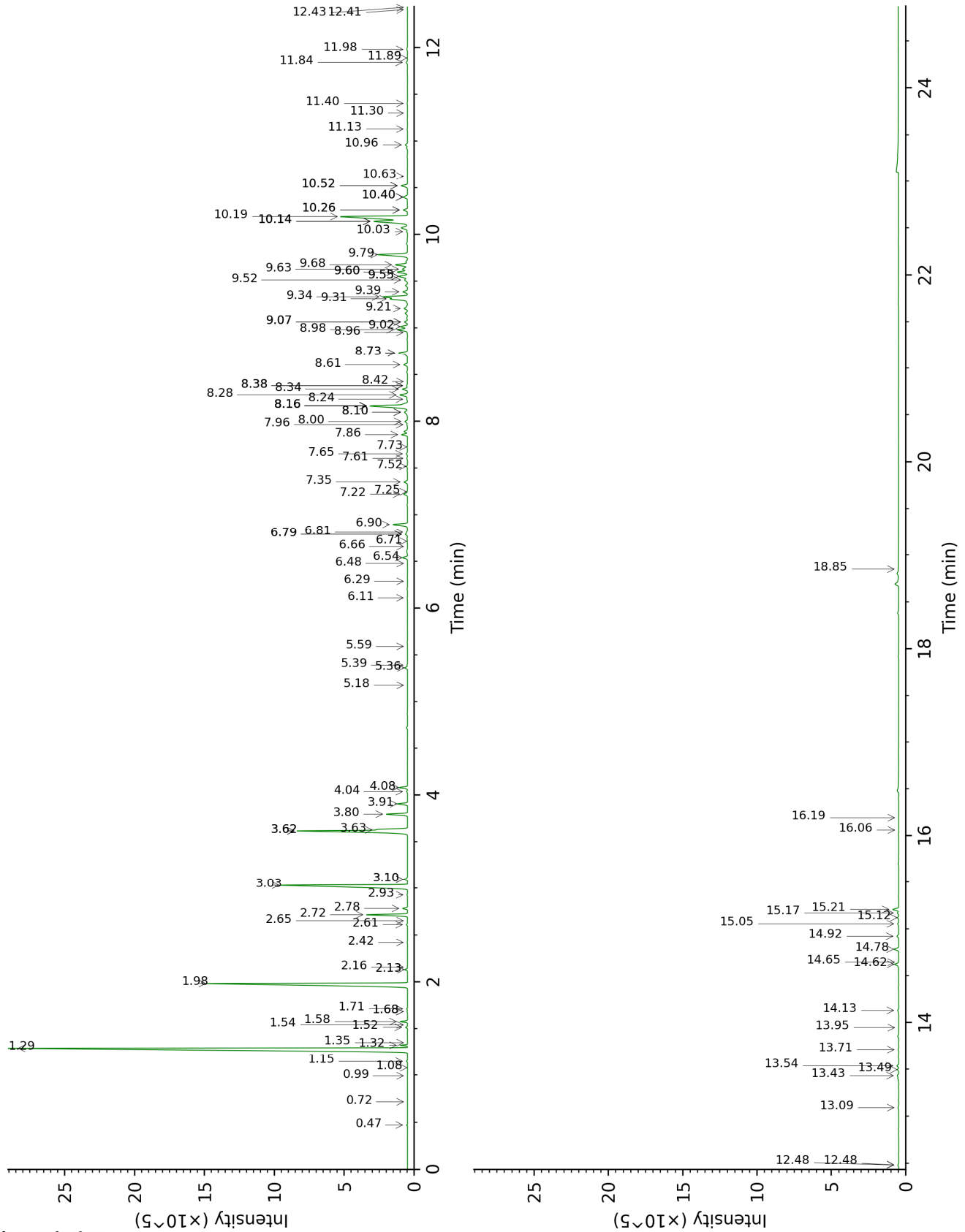
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

This page was intentionally left blank. The following pages present the complete data of the analysis.



DB-WAX



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
2-Methyl-3-pentanone	1.13	743	tr	1.08	958	tr
Toluene	1.24	758	tr	1.35	1001	tr
Octane	1.56	802	0.01	0.47	785	0.02
5-Methyl-3-hexanone	1.92	832	0.03	1.71	1039	0.03
4-Methyl-3-hexanone	1.97	836	0.02	1.68*	1036	0.02
Ethyl 2-methylbutyrate	2.13	849	0.01	1.54	1021	tr
Ethyl isovalerate	2.17	852	0.01	1.68*	1036	[0.02]
Nonane	2.79*	903	0.01	0.72	891	tr
Bornylene	2.79*	903	[0.01]	0.99	942	tr
Tricyclene	3.02	918	0.05	1.15	970	0.04
α -Thujene	3.14	926	0.23	1.32	998	0.22
α -Pinene	3.25	933	28.86	1.29	995	28.98
5-Methyl-3-heptanone	3.36	941	0.03	2.93	1150	0.03
α -Fenchene	3.39†	943	0.39	1.52	1018	0.07
Camphene	3.40†	944	[0.39]	1.58	1025	0.30
Thuja-2,4(10)-diene	3.50	950	0.01	2.16	1085	0.02
6-Methyl-2-heptanone	3.57	954	0.01	3.62*†	1207	7.83
β -Pinene	3.86*	973	14.42	1.98	1067	14.40
Sabinene	3.86*	973	[14.42]	2.13	1082	0.12
Octen-3-ol	4.02	984	0.02	6.48	1414	0.01
Myrcene	4.16	993	1.97	2.72	1133	1.97
α -Phellandrene	4.29*	1002	0.08	2.61	1124	0.05
Pseudolimonene	4.29*	1002	[0.08]	2.65	1128	0.01
Δ^3 -Carene	4.38	1007	0.02	2.42	1109	0.02
α -Terpinene	4.49	1014	0.24	2.78	1139	0.23
para-Cymene	4.62	1022	0.53	3.91	1229	0.52
1,8-Cineole	4.71*	1028	9.54	3.10*	1164	0.21
β -Phellandrene	4.71*	1028	[9.54]	3.10*	1164	[0.21]
Limonene	4.71*	1028	[9.54]	3.03	1159	9.38
(Z)- β -Ocimene	4.92	1041	5.33	3.62*†	1207	[7.83]
2-Heptyl acetate	5.00	1046	0.06	4.04	1239	0.05
(E)- β -Ocimene	5.06	1050	1.07	3.80	1220	1.08
γ -Terpinene	5.19	1058	2.44	3.63†	1208	[7.83]
cis-Linalool oxide (fur.)	5.39	1070	0.01	6.29	1400	0.01
Octanol	5.48	1076	0.01	7.96	1526	0.05
para-Cymenene	5.64*	1086	0.46	6.11	1387	0.03
Terpinolene	5.64*	1086	[0.46]	4.08	1242	0.44
α -Pinene oxide	5.71	1090	0.01	5.18	1320	0.01
Linalool	5.89	1102	0.34	7.86	1518	0.33

Verbenol analog?	6.00	1108	0.01	8.10*	1536	0.29
endo-Fenchol	6.04	1111	0.07	8.16*	1541	3.00
Octen-3-yl acetate	6.14	1118	0.02	5.59	1350	0.01
allo-Ocimene	6.33	1130	0.16	5.36	1333	0.15
<i>trans</i> -Pinocarveol	6.40	1134	0.03	8.96	1603	0.02
Camphene hydrate	6.54	1143	0.06	8.24	1547	0.06
2-Octyl acetate	6.57	1145	0.03	5.39	1336	0.03
Borneol	6.85	1162	0.05	9.55*	1652	0.62
Ethyl benzoate	6.92	1167	0.02	9.07*	1612	0.19
Terpinen-4-ol	7.02	1173	0.29	8.34	1555	0.31
para-Cymen-8-ol	7.19	1184	0.01	11.30	1798	0.01
α -Terpineol	7.25	1188	0.43	9.55*	1652	[0.62]
Methyl salicylate	7.29	1191	0.01	10.26*	1710	0.27
Myrtenol	7.35	1194	0.02	10.63	1741	0.02
(3 <i>Z</i> ,5 <i>E</i>)-2,6-Dimethylocta-3,5,7-trien-2-ol?	7.50	1204	0.02	10.96	1769	0.15
(3 <i>E</i> ,5 <i>E</i>)-2,6-Dimethylocta-3,5,7-trien-2-ol	7.60	1211	0.03	11.13	1783	0.02
<i>trans</i> -Carveol	7.71	1218	0.01			
Citronellol	7.91	1231	0.03	10.52*	1732	0.41
2-Nonyl acetate	8.07	1242	0.01	6.79*	1437	0.14
Unknown [m/z 68, 43 (71), 82 (59), 67 (52), 95 (24), 81 (24)...]	8.20	1250	0.08	7.25	1472	0.03
Geraniol	8.29	1257	0.03	11.40	1807	0.03
<i>trans</i> -Ascaridole glycol	8.47	1268	0.02	13.95	2040	0.01
Unknown [m/z 41, 43 (84), 72 (81), 97 (90), 95 (60)... 150 (4)]	8.54	1273	0.01	12.48*	1903	0.06
Bornyl acetate	8.66	1282	0.17	8.00	1528	0.17
2-Undecanone	8.88	1296	0.01	8.38*	1558	0.06
Bicycloelemene	9.44	1335	0.04	6.81	1439	0.05
α -Cubebene	9.61	1347	0.36	6.54	1419	0.31
Citronellyl acetate	9.71	1354	0.19	9.21	1624	0.27
Cyclosativene I	9.77	1358	0.01	6.66	1428	0.01
Cyclosativene II	9.82	1362	0.02	6.71	1432	0.03
α -Ylangene	9.89	1367	0.13	6.79*	1437	[0.14]
α -Copaene	9.96	1371	0.89	6.90	1446	0.91
β -Bourbonene	10.07	1379	0.24	7.22	1470	0.25
β -Cubebene	10.16	1386	0.04	7.52	1492	0.06
7-epi-Sesquithujene	10.20*	1389	0.28	7.60	1498	0.05

β-Elemene	10.20*	1389	[0.28]	8.16*	1541	[3.00]
α-Funebrene	10.24	1391	0.08	7.65	1502	0.08
4-Phenyl-2-butyl acetate	10.37	1400	0.02			
α-Gurjunene	10.42*	1404	0.36	7.35	1479	0.22
α-Cedrene	10.42*	1404	[0.36]	7.73	1508	0.03
β-Caryophyllene	10.54	1413	2.77	8.16*	1541	[3.00]
β-Copaene	10.65	1421	0.03	8.16*	1541	[3.00]
β-Gurjunene	10.68	1423	0.28	8.10*	1536	[0.29]
α-Maaliene	10.73	1427	0.05	8.38*	1558	[0.06]
Aromadendrene	10.80*	1432	0.55	8.28	1550	0.49
<i>trans</i> -α-Bergamotene	10.80*	1432	[0.55]	8.16*	1541	[3.00]
Selina-5,11-diene	10.86	1437	0.07	8.42	1561	0.02
<i>cis</i> -Muuro-la-3,5-diene	10.92	1441	0.11	8.73*	1586	0.68
Unknown [m/z 91, 161 (92), 105 (85), 119 (63), 133 (53), 79 (49), 204 (46)]	10.96	1444	0.29	8.60	1576	0.24
α-Humulene	11.00	1447	0.46	9.02	1608	0.44
allo-Aromadendrene	11.09	1454	0.51	8.73*	1586	[0.68]
<i>cis</i> -Muuro-la-4(15),5-diene	11.14*	1457	1.11	9.07*	1612	[0.19]
(<i>E</i>)-β-Farnesene	11.14*	1457	[1.11]	9.31†	1632	2.51
<i>trans</i> -Cadina-1(6),4-diene	11.29	1469	0.67	8.98	1605	0.66
γ-Muuro-lene	11.34	1473	1.68	9.34†	1634	[2.51]
α-Amorphene	11.38	1475	0.31	9.39	1638	0.30
Germacrene D	11.40	1477	0.13	9.52	1648	0.23
β-Selinene	11.44*	1480	0.81	9.60*	1655	0.66
ar-Curcumene	11.44*	1480	[0.81]	10.40*	1721	0.31
γ-Amorphene	11.50	1484	0.23	9.60*	1655	[0.66]
Valencene	11.57*	1489	1.32	9.63	1658	0.40
α-Selinene	11.57*	1489	[1.32]	9.68	1662	0.82
Unknown [m/z 161, 105 (77), 204 (73), 119 (65), 189 (57), 91 (53)]	11.64	1494	0.21	10.14*	1699	2.68
α-Muuro-lene	11.67	1496	2.05	9.79	1670	2.00
γ-Cadinene	11.83*	1509	2.97	10.14*	1699	[2.68]
(3 <i>E</i> ,6 <i>E</i>)-α-Farnesene	11.83*	1509	[2.97]	10.26*	1710	[0.27]
β-Curcumene	11.83*	1509	[2.97]	10.03	1690	0.05
Zonarene	11.98*	1521	6.31	10.14*	1699	[2.68]
δ-Cadinene	11.98*	1521	[6.31]	10.19	1704	5.59
<i>trans</i> -Cadina-1,4-diene	12.06	1527	0.26	10.40*	1721	[0.31]

α-Cadinene	12.13	1532	0.39	10.52*	1732	[0.41]
α-Calacorene	12.18	1536	0.09	11.84	1846	0.08
Isocaryophyllene epoxide B	12.29	1545	0.02	11.89	1850	0.01
Palustrol	12.46	1559	0.02	11.98	1858	0.06
β-Calacorene	12.52*	1563	0.12	12.41	1896	0.01
(E)-Nerolidol	12.52*	1563	[0.12]	13.54	2001	0.11
Germacrene D-4-ol	12.61*	1570	0.11	13.43	1991	0.11
Spathulenol	12.61*	1570	[0.11]	14.13	2058	0.08
Caryophyllene oxide	12.65*	1573	0.07	12.48*	1903	[0.06]
Caryophyllene oxide isomer	12.65*	1573	[0.07]	12.43	1898	0.01
Unknown [m/z 109, 43 (95), 81 (81), 93 (76), 69 (75), 95 (74), 107 (71)... 204 (22), 220 (6)]	12.69	1576	0.05			
Viridiflorol	12.79	1584	0.03	13.71	2018	0.04
Ledol?	12.92	1594	0.07	13.09	1959	0.06
Unknown [m/z 149, 43 (95), 93 (84), 177 (66), 109 (62), 67 (60)...220 (11)]	12.98	1600	0.05			
10-epi-Cubenol	13.09	1608	0.07			
1-epi-Cubenol	13.25	1621	0.14	13.49	1997	0.08
γ-Eudesmol	13.29	1625	0.06	14.65	2108	0.02
τ-Cadinol	13.43*	1636	0.66	14.62	2106	0.26
τ-Muurolol	13.43*	1636	[0.66]	14.78	2122	0.29
α-Muurolol	13.48	1640	0.14	14.92	2136	0.12
β-Eudesmol	13.50	1642	0.06	15.12	2156	0.07
α-Eudesmol	13.54	1645	0.08	15.05	2149	0.08
α-Cadinol	13.58	1648	0.37	15.21	2165	0.36
cis-Calamenen-10-ol	13.63	1652	0.01	16.19	2266	0.02
Shyobunol	13.94	1678	0.01	16.06	2253	0.01
α-Bisabolol	13.98	1682	0.10	15.17	2161	0.08
Unknown [m/z 91, 175 (93), 105 (76), 79 (73), 133 (69), 107 (60)...218 (33)]	14.55	1729	0.05			
Unknown [m/z 91, 177 (75), 79 (68), 105 (65), 93 (62), 159 (60)...220 (16)]	14.79	1750	0.03			
Unknown [m/z 43, 41 (72), 95	15.32	1796	0.03	18.85	2562	0.03

(69), 81 (66), 67 (55), 55 (52), 79 (52), 69 (50)... 238 (1)]		
Total identified	95.74%	94.63%
Total reported	96.52%	94.92%

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not 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