

Date : March 24, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 20C23-PTH04

Customer identification : Rosalina - Australia - R20105201R

Type : Essential oil

Source : *Melaleuca ericifolia* ct. Linalool

Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-007 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Sylvain Mercier, M. Sc., Chimiste

Analysis date : March 23, 2020

Checked and approved by :

Alexis St-Gelais, M. Sc., chimiste 2013-174

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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid

Refractive index: 1.4653 ± 0.0003 (20 °C)

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	%	Classe
Ethanol	0.44	Aliphatic alcohol
Isobutyral	0.07	Aliphatic aldehyde
2-Methyl-3-buten-2-ol	0.01	Aliphatic alcohol
Isobutanol	0.01	Aliphatic alcohol
Isovaleral	0.01	Aliphatic aldehyde
3-Methyl-2-butanone	0.05	Aliphatic ketone
2-Methylbutyral	0.02	Aliphatic aldehyde
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
3-Methyl-2-pentanone	0.01	Aliphatic ketone
Octane	0.01	Alkane
(3Z)-Hexenol	0.01	Aliphatic alcohol
Isoamyl acetate	0.01	Aliphatic ester
Isobutyl isobutyrate	0.02	Aliphatic ester
α -Thujene	0.23	Monoterpene
α -Pinene	8.24	Monoterpene
Camphene	0.01	Monoterpene
α -Fenchene	0.01	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
β -Pinene	0.83	Monoterpene
Sabinene	tr	Monoterpene
<i>trans</i> -Dehydroxylinalool oxide	0.05	Monoterpenic ether
Myrcene	0.19	Monoterpene
α -Phellandrene	0.07	Monoterpene
Pseudolimonene	0.04	Monoterpene
<i>cis</i> -Dehydroxylinalool oxide	0.01	Monoterpenic ether
Δ^3 -Carene	0.02	Monoterpene
α -Terpinene	0.59	Monoterpene
para-Cymene	1.97	Monoterpene
Limonene	2.68	Monoterpene
1,8-Cineole	20.23	Monoterpenic ether
(Z)- β -Ocimene	0.02	Monoterpene
(E)- β -Ocimene	0.12	Monoterpene
γ -Terpinene	2.43	Monoterpene
Unknown	0.01	Oxygenated monoterpene
<i>cis</i> -Linalool oxide (fur.)	0.94	Monoterpenic alcohol
<i>trans</i> -Linalool oxide (fur.)	0.74	Monoterpenic alcohol
Terpinolene	0.69	Monoterpene
para-Cymenene	0.03	Monoterpene
Linalool	39.30	Monoterpenic alcohol
Hotrienol	0.02	Monoterpenic alcohol
endo-Fenchol	0.03	Monoterpenic alcohol
<i>cis</i> -para-Menth-2-en-1-ol	0.03	Monoterpenic alcohol
α -Campholenal	0.02	Monoterpenic aldehyde
<i>trans</i> -Pinocarveol	0.05	Monoterpenic alcohol
<i>trans</i> -para-Menth-2-en-1-ol	tr	Monoterpenic alcohol
Camphor	0.03	Monoterpenic ketone

Unknown	0.05	Oxygenated monoterpene
<i>cis</i> - α -Dihydroterpineol	0.02	Monoterpenic alcohol
Nerol oxide	0.01	Aliphatic ether
Borneol	0.03	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (pyr.)	0.08	Monoterpenic alcohol
δ -Terpineol	0.07	Monoterpenic alcohol
Terpinen-4-ol	3.76	Monoterpenic alcohol
<i>trans</i> -Linalool oxide (pyr.)	0.01	Monoterpenic alcohol
para-Cymen-8-ol	0.06	Monoterpenic alcohol
α -Terpineol	3.00	Monoterpenic alcohol
<i>cis</i> -Piperitol	0.02	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
<i>trans</i> -Piperitol	0.02	Monoterpenic alcohol
<i>trans</i> -Carveol	0.02	Monoterpenic alcohol
Nerol	0.06	Monoterpenic alcohol
Citronellol	0.05	Monoterpenic alcohol
Carvone	0.04	Monoterpenic ketone
Neral	0.02	Monoterpenic aldehyde
Unknown	0.02	Unknown
Geraniol	0.14	Monoterpenic alcohol
<i>trans</i> -Ascaridole glycol	0.01	Monoterpenic alcohol
Geranial	0.05	Monoterpenic aldehyde
Unknown	tr	Monoterpenic alcohol
Methyl geranate	0.09	Monoterpenic ester
α -Cubebene	0.01	Sesquiterpene
Isoledene	0.12	Sesquiterpene
α -Copaene	0.04	Sesquiterpene
7-Cubebene	0.08	Sesquiterpene
Geranyl acetate	0.03	Monoterpenic ester
β -Elemene	0.02	Sesquiterpene
Phenylethyl isobutyrate	0.01	Phenolic ester
Unknown	0.27	Sesquiterpene
α -Gurjunene	0.26	Sesquiterpene
Unknown	0.04	Sesquiterpene
β -Caryophyllene	0.50	Sesquiterpene
γ -Maaliene	0.09	Sesquiterpene
β -Gurjunene	0.24	Sesquiterpene
α -Maaliene	0.09	Sesquiterpene
Aromadendrene	2.06	Sesquiterpene
Unknown	0.16	Sesquiterpene
<i>trans</i> -Muurolo-3,5-diene	0.04	Sesquiterpene
α -Humulene	0.11	Sesquiterpene
allo-Aromadendrene	0.86*	Sesquiterpene
Valerena-4,7(11)-diene	[0.86]*	Sesquiterpene
<i>cis</i> -Cadina-1(6),4-diene	0.08	Sesquiterpene
γ -Gurjunene	0.11	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.07	Sesquiterpene
Selina-4,11-diene	0.03	Sesquiterpene
β -Selinene	0.19	Sesquiterpene
allo-Aromadendr-9-ene	0.14	Sesquiterpene
δ -Selinene	0.08	Sesquiterpene
α -Selinene	0.02	Sesquiterpene

Bicyclogermacrene	0.37	Sesquiterpene
Viridiflorene	0.45	Sesquiterpene
α -Muurolene	0.06	Sesquiterpene
δ -Guaiene	0.05	Sesquiterpene
γ -Cadinene	0.08	Sesquiterpene
<i>trans</i> -Calamenene	0.04	Sesquiterpene
δ -Cadinene	0.28	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.07	Sesquiterpene
α -Calacorene	0.05	Sesquiterpene
α -Elemol	0.04	Sesquiterpenic alcohol
Epiglobulol	0.08	Sesquiterpenic alcohol
Maaliol	0.02	Sesquiterpenic alcohol
Palustrol	0.08	Sesquiterpenic alcohol
Spathulenol	0.23	Sesquiterpenic alcohol
Caryophyllene oxide	0.17	Sesquiterpenic ether
Globulol	0.38	Sesquiterpenic alcohol
Viridiflorol	0.22	Sesquiterpenic alcohol
Cubeban-11-ol	0.10	Sesquiterpenic alcohol
Ledol	0.17	Sesquiterpenic alcohol
Unknown	0.04	Oxygenated sesquiterpene
Rosifoliol	0.12	Sesquiterpenic alcohol
1-epi-Cubenol	0.04	Sesquiterpenic alcohol
Eremoligenol?	0.02	Sesquiterpenic alcohol
Isospathulenol	0.05	Sesquiterpenic alcohol
Cubenol	0.02	Sesquiterpenic alcohol
τ -Cadinol	0.01	Sesquiterpenic alcohol
α -Muurolol	0.03	Sesquiterpenic alcohol
β -Eudesmol	0.06	Sesquiterpenic alcohol
α -Eudesmol	0.02	Sesquiterpenic alcohol
Methyl eudesmate	0.02	Phenolic ester
Consolidated total	97.12%	

*: 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

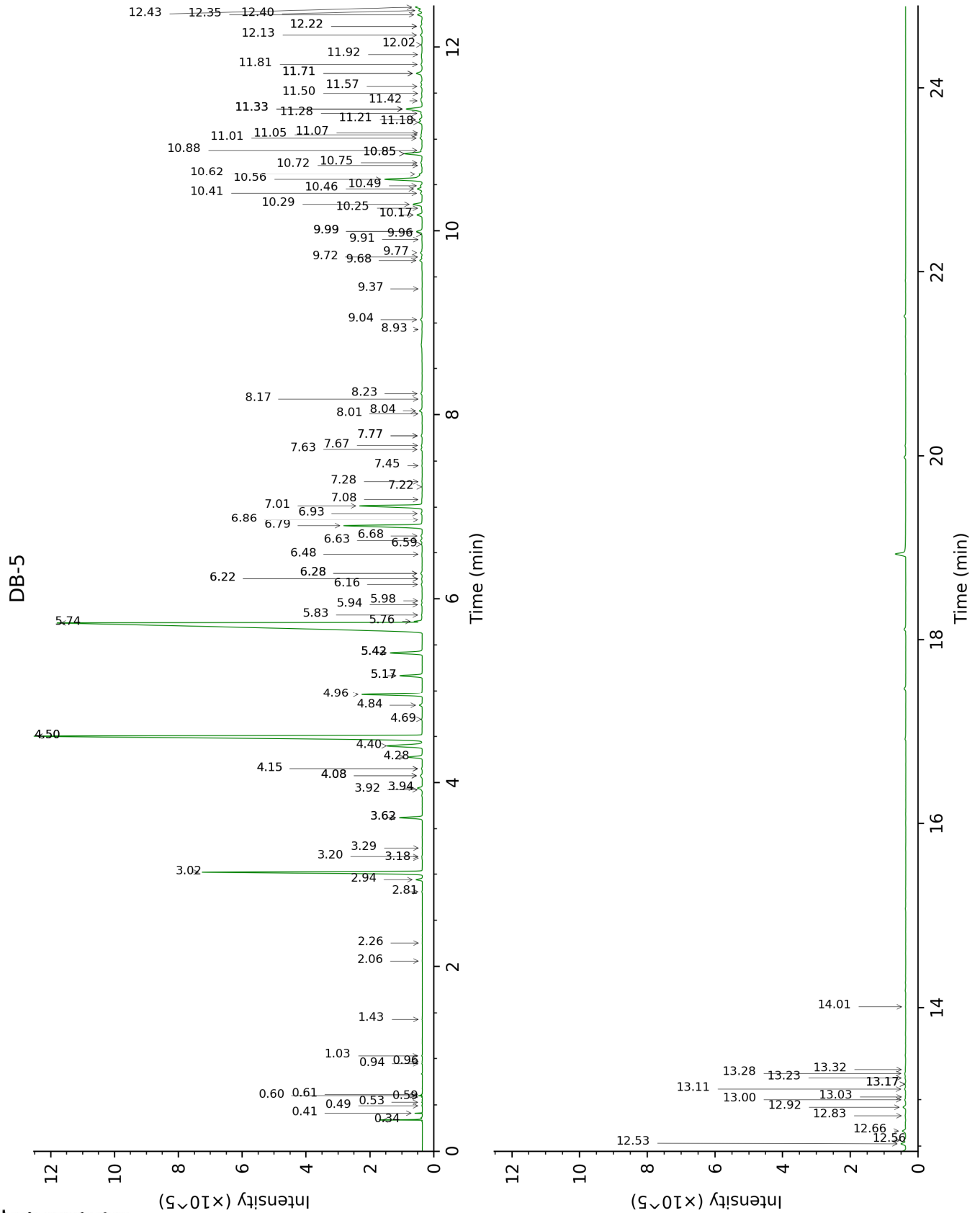
tr: The compound has been detected below 0.005% of total signal.

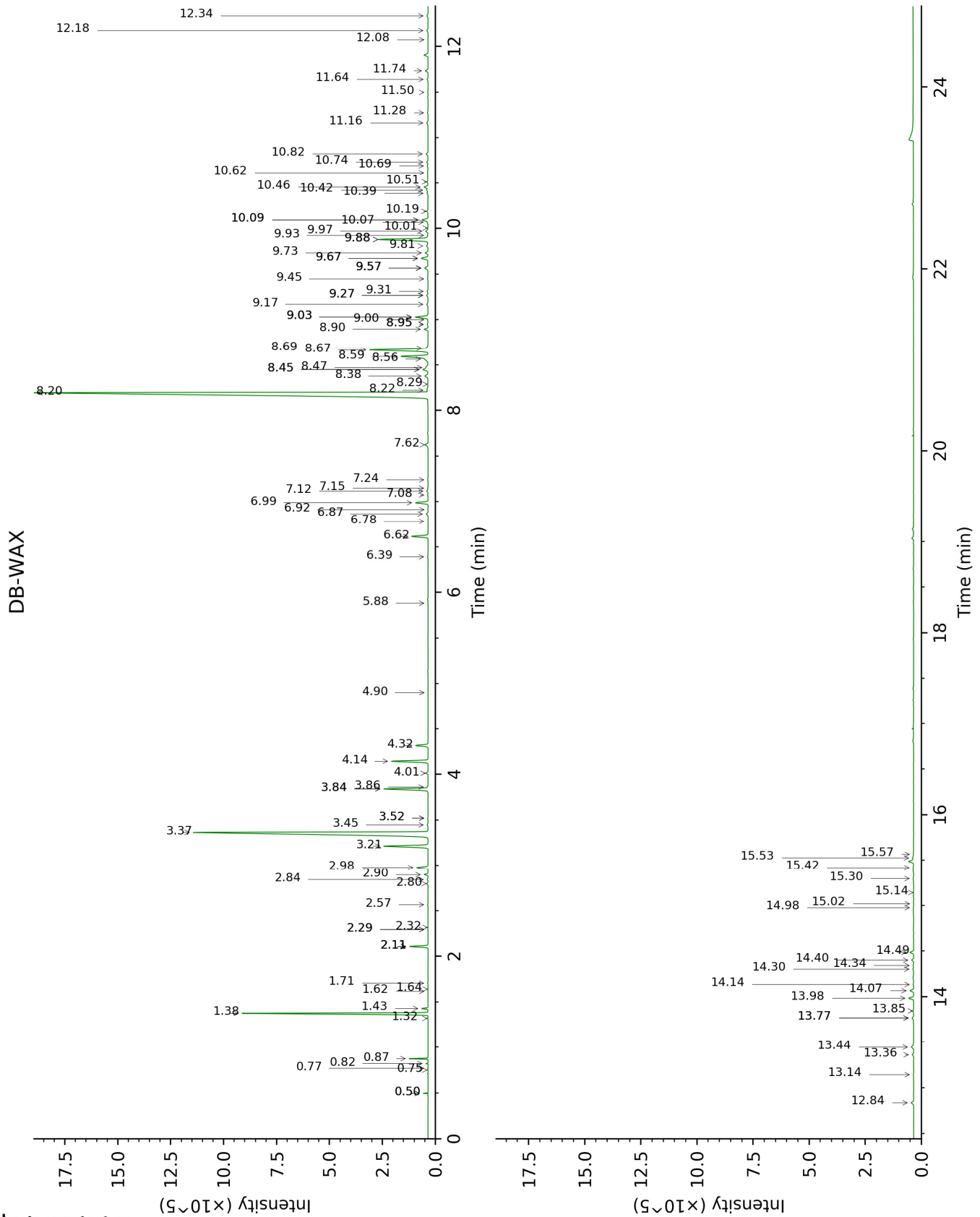
Note: no correction factor was applied

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.





FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethanol	0.34	521	0.44	0.87	905	0.47
Isobutyral	0.41	528	0.07	0.50*	774	0.08
2-Methyl-3-buten-2-ol	0.49	586	0.01	1.64	1017	tr
Isobutanol	0.53	615	0.01	2.11*	1064	0.86
Isovaleral	0.59	639	0.01	0.77	886	0.01
3-Methyl-2-butanone	0.60	645	0.05	0.82	896	0.05
2-Methylbutyral	0.61	651	0.02	0.75	878	0.02
Isoamyl alcohol	0.94	737	0.01	3.52*	1180	0.02
2-Methylbutanol	0.96	740	tr	3.52*	1180	[0.02]
3-Methyl-2-pentanone	1.03	749	0.01	1.32	981	0.02
Octane	1.43	805	0.01	0.50*	774	[0.08]
(3Z)-Hexenol	2.06	858	0.01	5.88	1350	0.02
Isoamyl acetate	2.26	874	0.01	2.32	1085	0.01
Isobutyl isobutyrate	2.81	917	0.02	2.11*	1064	[0.86]
α-Thujene	2.94	925	0.23	1.43	996	0.22
α-Pinene	3.02	930	8.24	1.38	990	8.10
Camphene	3.18†	941	0.03	1.71	1024	0.01
α-Fenchene	3.20†	942	[0.03]	1.62	1014	0.01
Thuja-2,4(10)-diene	3.29	948	0.01	2.29*	1082	0.02
β-Pinene	3.62*	970	0.86	2.11*	1064	[0.86]
Sabinene	3.62*	970	[0.86]	2.29*	1082	[0.02]
<i>trans</i> -Dehydroxylinalool oxide	3.92†	990	0.22	3.45	1174	0.05
Myrcene	3.94†	991	[0.22]	2.90	1131	0.19
α-Phellandrene	4.08*	1000	0.11	2.80	1124	0.07
Pseudolimonene	4.08*	1000	[0.11]	2.84	1127	0.04
<i>cis</i> -Dehydroxylinalool oxide	4.15*	1005	0.03	3.86†	1205	[2.47]
Δ3-Carene	4.15*	1005	[0.03]	2.57	1105	0.02
α-Terpinene	4.28	1013	0.59	2.98	1138	0.58
para-Cymene	4.40	1020	1.97	4.14	1225	1.98
Limonene	4.50*	1027	23.11	3.21	1156	2.68
1,8-Cineole	4.50*	1027	[23.11]	3.36	1168	20.23
(Z)-β-Ocimene	4.69	1039	0.02	3.84*†	1203	2.47
(E)-β-Ocimene	4.84	1048	0.12	4.01	1216	0.12
γ-Terpinene	4.96	1056	2.43	3.84*†	1203	[2.47]
Unknown [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.17*	1069	0.94	4.90	1279	0.01

<i>cis</i> -Linalool oxide (fur.)	5.17*	1069	[0.94]	6.62	1402	0.94
<i>trans</i> -Linalool oxide (fur.)	5.42*	1084	1.45	6.99	1430	0.74
Terpinolene	5.42*	1084	[1.45]	4.32	1237	0.69
para-Cymenene	5.42*	1084	[1.45]	6.39	1386	0.03
Linalool	5.74†	1105	39.75	8.20†	1520	39.33
Hotrienol	5.76†	1106	[39.75]	8.95*	1578	0.06
endo-Fenchol	5.82	1111	0.03	8.47†	1541	[0.56]
<i>cis</i> -para-Menth-2-en-1-ol	5.94	1118	0.03	8.22†	1522	[39.33]
α-Campholenal	5.98	1121	0.02	7.08	1436	0.02
<i>trans</i> -Pinocarveol	6.16	1132	0.05	9.27*	1603	0.10
<i>trans</i> -para-Menth-2-en-1-ol	6.22*	1136	0.03	9.03*†	1584	[0.86]
Camphor	6.22*	1136	[0.03]	7.24	1449	0.03
Unknown [m/z 83, 55 (69), 41 (60), 71 (59), 81 (57), 95 (56), 69 (56)...154 (3)]	6.28*	1140	0.07			
<i>cis</i> -α-Dihydroterpineol	6.28*	1140	[0.07]	8.29	1528	0.02
Nerol oxide	6.48	1154	0.01	6.92	1425	0.01
Borneol	6.59	1160	0.03	9.88*	1652	3.20
<i>cis</i> -Linalool oxide (pyr.)	6.63	1163	0.08	10.39	1693	0.07
δ-Terpineol	6.68	1166	0.07	9.57*	1627	0.27
Terpinen-4-ol	6.79	1174	3.76	8.67	1556	3.68
<i>trans</i> -Linalool oxide (pyr.)	6.86	1178	0.01	10.69	1719	0.06
para-Cymen-8-ol	6.93	1183	0.06	11.64	1799	0.06
α-Terpineol	7.02	1188	3.00	9.88*	1652	[3.20]
<i>cis</i> -Piperitol	7.08	1193	0.02	9.67*	1636	0.47
Unknown [m/z 84, 41 (83), 83 (79), 91 (76), 93 (67), 119 (64), 137 (63), 109 (54), 108 (54)... 152 (4)]	7.22	1202	0.01			
<i>trans</i> -Piperitol	7.28	1206	0.02	10.51	1704	0.09
<i>trans</i> -Carveol	7.45	1217	0.02	11.50	1786	0.02
Nerol	7.63	1230	0.06	11.16	1758	0.10
Citronellol	7.67	1232	0.05	10.82	1730	0.16
Carvone	7.77*	1240	0.06	10.07	1668	0.04
Neral	7.77*	1240	[0.06]	9.57*	1627	[0.27]
Unknown [m/z 69, 41 (75), 109 (35), 95 (34), 55 (28), 43 (27), 110 (26)...]	8.01	1256	0.02			
Geraniol	8.04	1258	0.14	11.74	1807	0.17
<i>trans</i> -Ascaridole	8.17	1267	0.01	14.34	2044	0.04

glycol						
Geranial	8.23	1271	0.05	10.19	1677	0.09
Unknown [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	8.93	1315	tr	15.14	2121	0.01
Methyl geranate	9.04	1323	0.09	9.81	1647	0.11
α-Cubebene	9.37	1346	0.01	6.78	1415	0.01
Isoledene	9.68	1368	0.12	6.87	1421	0.11
α-Copaene	9.72	1371	0.04	7.15	1442	0.03
7-Cubebene	9.76	1374	0.08	7.12	1440	0.08
Geranyl acetate	9.91	1384	0.03	10.62	1713	0.08
β-Elemene	9.96	1388	0.02	8.45*†	1540	0.56
Phenylethyl isobutyrate	10.00*	1390	0.28	12.08	1837	0.01
Unknown [m/z 93, 122 (98), 161 (98), 107 (86), 95 (46), 105 (72)... 204 (34)]	10.00*	1390	[0.28]			
α-Gurjunene	10.17	1403	0.26	7.62	1477	0.24
Unknown [m/z 119, 107 (86), 105 (85), 93 (78), 189 (66), 81 (65), 121 (64)... 204 (23)]	10.25	1408	0.04			
β-Caryophyllene	10.29	1412	0.50	8.45*†	1540	[0.56]
γ-Maaliene	10.41	1420	0.09	8.56	1549	0.22
β-Gurjunene	10.46	1424	0.24	8.38	1534	0.27
α-Maaliene	10.49	1426	0.09	8.69	1558	0.09
Aromadendrene	10.56	1432	2.06	8.59	1551	1.85
Unknown [m/z 161, 105 (69), 119 (42), 91 (41), 204 (38)]	10.62	1436	0.16	8.90	1574	0.22
<i>trans</i> -Muurolo-3,5-diene	10.72	1443	0.04	8.95*	1578	[0.06]
α-Humulene	10.75	1446	0.11	9.31	1607	0.06
allo-Aromadendrene	10.85*	1453	0.86	9.03*†	1584	[0.86]
Valerena-4,7(11)-diene	10.85*	1453	[0.86]	9.00†	1582	0.86
<i>cis</i> -Cadina-1(6),4-diene	10.88	1456	0.08	9.03*†	1584	[0.86]
γ-Gurjunene	11.01	1466	0.11	9.17	1596	0.10
<i>trans</i> -Cadina-1(6),4-diene	11.05	1468	0.07	9.27*	1603	[0.10]
Selina-4,11-diene	11.07	1470	0.03	9.45	1618	0.04
β-Selinene	11.18	1478	0.19	9.97	1660	0.17
allo-Aromadendr-9-ene	11.22	1481	0.14	9.57*	1627	[0.27]
δ-Selinene	11.28	1486	0.08	9.73	1641	0.18
α-Selinene	11.33*	1489	0.94	10.01	1662	0.02

Bicyclogermacrene	11.33*	1489	[0.94]	10.09*	1670	0.43
Viridiflorene	11.33*	1489	[0.94]	9.67*	1636	[0.47]
α-Muurolene	11.42	1496	0.06	10.09*	1670	[0.43]
δ-Guaiene	11.50	1502	0.05	9.93	1656	0.03
γ-Cadinene	11.57	1508	0.08	10.42	1696	0.11
<i>trans</i> -Calamenene	11.71*	1519	0.33	11.28	1768	0.04
δ-Cadinene	11.71*	1519	[0.33]	10.46	1699	0.28
<i>trans</i> -Cadina-1,4-diene	11.81	1526	0.07	10.74	1722	0.09
α-Calacorene	11.92	1535	0.05	12.18	1846	0.09
α-Elemol	12.02	1543	0.04	14.14	2024	0.03
Epiglobulol	12.13	1551	0.08	13.36	1952	0.09
Maaliol	12.22*	1559	0.12	13.14	1932	0.02
Palustrol	12.22*	1559	[0.12]	12.34	1860	0.08
Spathulenol	12.35	1568	0.23	14.49	2057	0.22
Caryophyllene oxide	12.40	1572	0.17	12.84	1904	0.16
Globulol	12.43	1575	0.38	13.98	2010	0.30
Viridiflorol	12.53	1582	0.22	14.07	2017	0.22
Cubeban-11-ol	12.56	1585	0.10	13.77*	1989	0.11
Ledol	12.66	1593	0.17	13.44	1959	0.21
Unknown [m/z 94, 91 (83), 105 (78), 79 (75), 107 (62), 120 (58)... 218 (11)]	12.83	1606	0.04	14.30	2040	0.05
Rosifoliol	12.92	1614	0.12	14.40	2049	0.12
1-epi-Cubenol	13.00	1620	0.04	13.85	1996	0.05
Eremoligenol?	13.03	1623	0.02	14.98	2104	0.01
Isospathulenol	13.11	1630	0.05	15.57	2163	0.03
Cubenol	13.17*	1634	0.03	13.77*	1989	[0.11]
τ-Cadinol	13.17*	1634	[0.03]	15.02	2109	0.01
α-Muurolol	13.23	1640	0.03	15.30	2136	0.05
β-Eudesmol	13.28	1644	0.06	15.53	2159	0.09
α-Eudesmol	13.32	1647	0.02	15.42	2148	0.05
Methyl eudesmate	14.01	1704	0.02			
Total identified		97.58%			96.87%	
Total reported		97.86%			97.17%	

*: 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