

Date : March 15, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18C14-PTH3-1-CC

Customer identification : HoneyBell - 116694

Type : Essential oil

Source : Blend of oils

Customer : Plant Therapy

ANALYSIS

Method: PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Sylvain Mercier, M. Sc., Chimiste

Analysis date : March 15, 2018

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Light yellow liquid

Refractive index: 1.4718 ± 0.0003 (20 °C)

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Ethyl acetate	tr	tr	Aliphatic ester
Isoamyl alcohol	0.01	0.01*	Aliphatic alcohol
Hexanal	0.01	0.01	Aliphatic aldehyde
Ethyl butyrate	0.03		Aliphatic ester
(2E)-Hexenal	0.01	[0.01]*	Aliphatic aldehyde
α -Thujene	tr	tr	Monoterpene
α -Pinene	0.46	0.46	Monoterpene
Camphene	0.01	0.01	Monoterpene
Sabinene	0.37*	0.27	Monoterpene
β -Pinene	[0.37]*	0.10	Monoterpene
Myrcene	1.71	1.73	Monoterpene
α -Phellandrene	0.02	0.02	Monoterpene
Octanal	0.26	0.25	Aliphatic aldehyde
Δ^3 -Carene	0.07	0.07	Monoterpene
α -Terpinene	0.02	0.03	Monoterpene
Limonene	91.98*	93.05	Monoterpene
para-Cymene	[91.98]*	0.03	Monoterpene
1,8-Cineole	[91.98]*	0.24	Monoterpenic ether
(Z)- β -Ocimene	0.01	0.01	Monoterpene
(E)- β -Ocimene	0.03	0.03	Monoterpene
γ -Terpinene	0.04	0.05	Monoterpene
cis-Sabinene hydrate	0.01	0.01	Monoterpenic alcohol
Octanol	0.09	0.09	Aliphatic alcohol
Terpinolene	0.04	0.04	Monoterpene
Linalool	0.42	0.43*	Monoterpenic alcohol
Nonanal	0.06	0.05	Aliphatic aldehyde
endo-Fenchol	tr	tr	Monoterpenic alcohol
trans-para-Mentha-2,8-dien-1-ol	0.02	0.02	Monoterpenic alcohol
cis-Limonene oxide	0.04	0.04	Monoterpenic ether
trans-Limonene oxide	0.06*	0.03	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	[0.06]*	0.02	Monoterpenic alcohol
(E)-Myroxide	tr	0.02*	Monoterpenic ether
Menthone	0.02	0.02	Monoterpenic ketone
Citronellal	0.04	0.06*	Monoterpenic aldehyde
Isomenthone	0.01	[0.06]*	Monoterpenic ketone
Terpinen-4-ol	0.02	0.01	Monoterpenic alcohol
trans-para-Mentha-1(7),8-dien-2-ol	0.01	0.02*	Monoterpenic alcohol
para-Cymen-8-ol	0.01	0.02*	Monoterpenic alcohol
α -Terpineol	0.09	0.10*	Monoterpenic alcohol
Unknown	0.01	[0.43]*	Unknown
Ethyl octanoate	0.03	0.02	Aliphatic ester
Decanal	0.30	0.29	Aliphatic aldehyde
Octyl acetate	0.02	[0.02]*	Aliphatic ester
trans-Carveol	0.03	[0.02]*	Monoterpenic alcohol
cis-para-Mentha-1(7),8-dien-2-ol	0.01	0.01	Monoterpenic alcohol
cis-Carveol	0.01	0.17*	Monoterpenic alcohol
Citronellol	0.02	0.04	Monoterpenic alcohol
Neral	0.08*	0.05	Monoterpenic aldehyde

Carvone	[0.08]*	0.02	Monoterpenic ketone
Geraniol	0.01	[0.02]*	Monoterpenic alcohol
(2E)-Decenal	tr	tr	Aliphatic aldehyde
Perillaldehyde	0.01	0.01	Monoterpenic aldehyde
Geranial	0.08	0.08*	Monoterpenic aldehyde
Limonen-10-ol	0.01	0.01	Monoterpenic alcohol
2-Hydroxypiperitone	0.01		Monoterpenic alcohol
Undecanal	0.01	0.02	Aliphatic aldehyde
<i>cis</i> -para-Mentha-2,8-diene-1-hydroperoxide	0.02		Monoterpenic peroxide
(2E,4E)-Decadienal	0.01	0.01	Aliphatic aldehyde
<i>trans</i> -para-Mentha-2,8-diene-1-hydroperoxide	0.01		Monoterpenic peroxide
para-Mentha-1,8-diene-4-hydroperoxide	0.01		Monoterpenic peroxide
Limonene hydroperoxide IV	0.01		Monoterpenic peroxide
<i>trans</i> -para-Mentha-6,8-diene-2-hydroperoxide	0.01		Monoterpenic peroxide
α-Copaene	0.03	0.03	Sesquiterpene
Geranyl acetate	0.06*	0.04	Monoterpenic ester
<i>cis</i> -β-Elemene	[0.06]*	0.01	Sesquiterpene
Ethyl decanoate	0.19	0.19	Aliphatic ester
Dodecanal	0.04	0.06	Aliphatic aldehyde
β-Caryophyllene	0.05	0.06*	Sesquiterpene
β-Copaene	0.02	0.02	Sesquiterpene
<i>trans</i> -α-Bergamotene	0.01	[0.06]*	Sesquiterpene
α-Humulene	0.01	0.01	Sesquiterpene
(E)-β-Farnesene	0.01	0.01	Sesquiterpene
γ-Murolene	tr	tr	Sesquiterpene
Germacrene D	0.02	0.02	Sesquiterpene
5-epi-Aristolochene?	0.02	[0.10]*	Sesquiterpene
Valencene	0.14	0.12	Sesquiterpene
α-Murolene	0.01	[0.08]*	Sesquiterpene
(3Z,6E)-α-Farnesene	0.01	0.01	Sesquiterpene
β-Bisabolene	0.01	0.01	Sesquiterpene
γ-Cadinene	0.02	0.01	Sesquiterpene
δ-Cadinene	0.04	0.03	Sesquiterpene
α-Elemol	0.01	tr	Sesquiterpenic alcohol
Germacrene D-4-ol	0.01*	tr	Sesquiterpenic alcohol
Spathulenol	[0.01]*	tr	Sesquiterpenic alcohol
Caryophyllene oxide	0.01	0.01	Sesquiterpenic ether
Ethyl dodecanoate	0.13	[0.17]*	Aliphatic ester
β-Sinensal	0.02	0.02	Sesquiterpenic aldehyde
α-Sinensal	0.01	0.01	Sesquiterpenic aldehyde
Nootkatone	0.02	0.02	Sesquiterpenic ketone
Ethyl palmitate	0.07	0.08	Aliphatic ester
Ethyl linoleate	0.01	0.01	Aliphatic ester
Ethyl oleate?	0.03		Aliphatic ester
Ethyl stearate?	tr		Aliphatic acid
Isoauraptene	0.01		Coumarin
Meranzin	0.02		Coumarin
Auraptene	0.07		Coumarin

α -Tocopherol?	0.03		Tocopherol
Tangeretin	0.07		Flavonoid
3,5,6,7,8,3',4'-Heptamethoxyflavone?	0.25		Flavonoid
3,3',4',5,6,7,8-Heptamethoxyflavone	0.16		Flavonoid
Total identified	98.24%	98.85%	

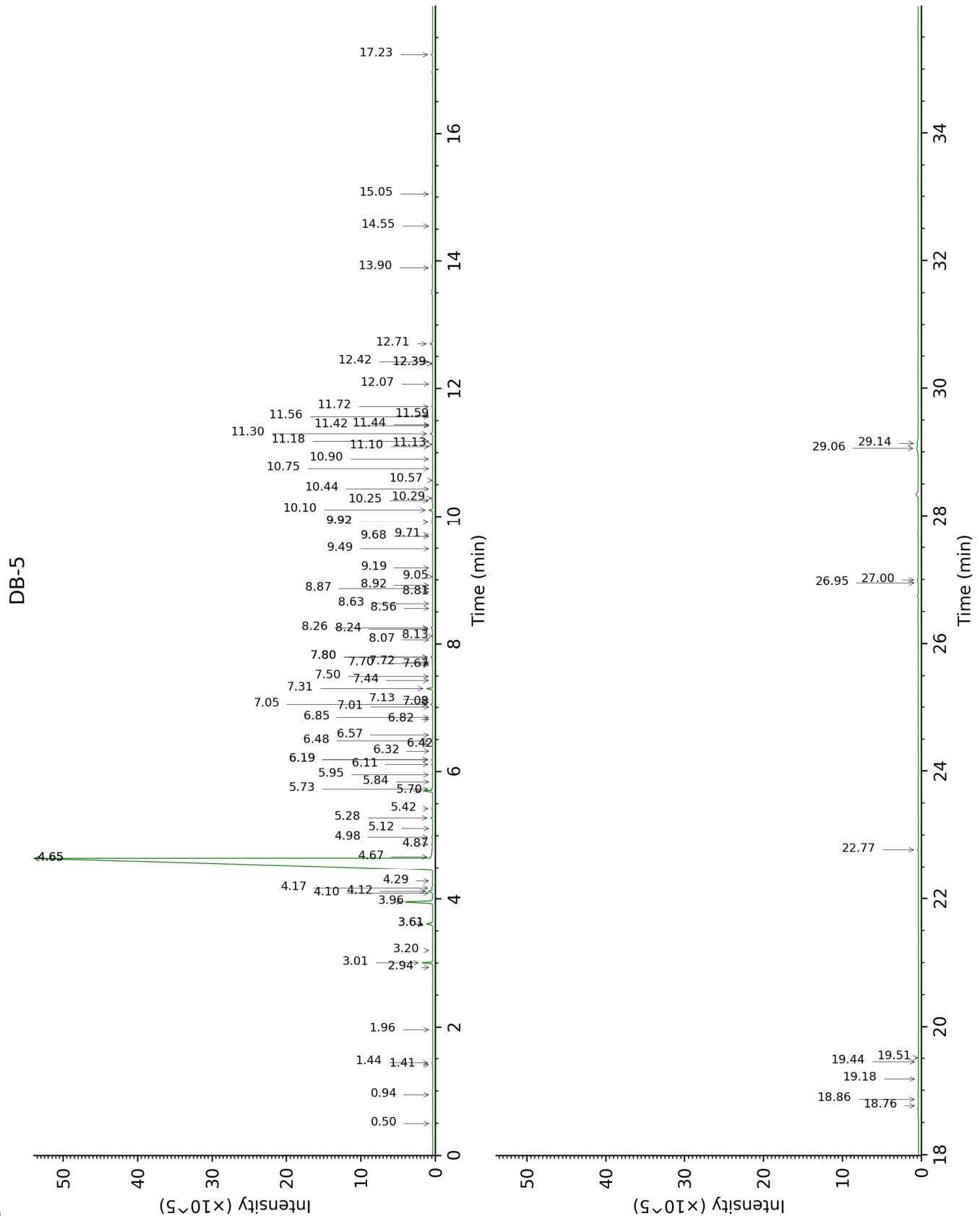
*: Two or more compounds are coeluting on this column

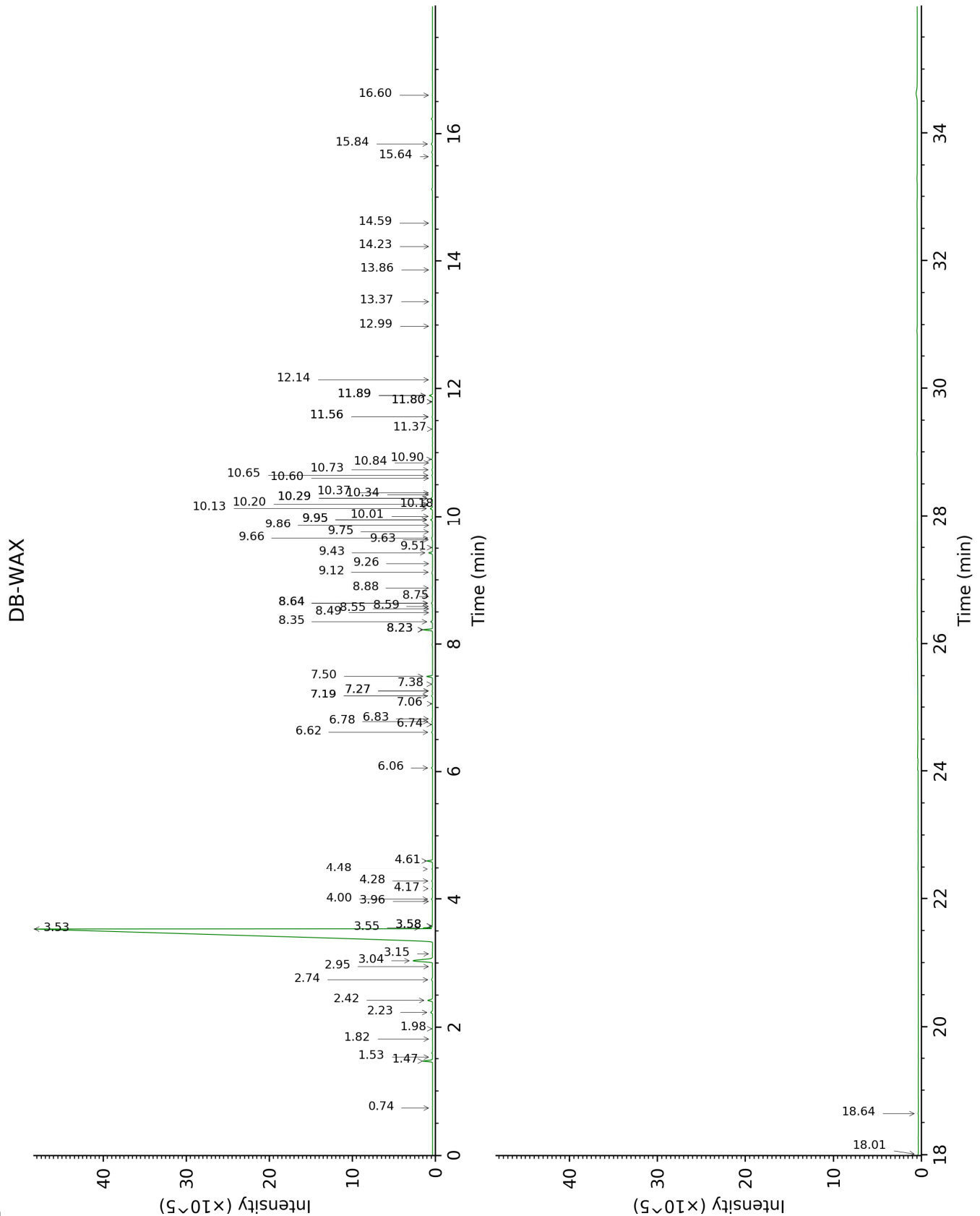
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethyl acetate	0.50	608	tr	0.74	865	tr
Isoamyl alcohol	0.94	727	0.01	3.58*	1178	0.01
Hexanal	1.41	795	0.01	1.98	1045	0.01
Ethyl butyrate	1.44	800	0.03			
(2E)-Hexenal	1.96	845	0.01	3.58*	1178	[0.01]
α -Thujene	2.94	922	tr	1.53	1002	tr
α -Pinene	3.01	927	0.46	1.46	995	0.46
Camphene	3.20	940	0.01	1.82	1030	0.01
Sabinene	3.61*	967	0.37	2.42	1088	0.27
β -Pinene	3.61*	967	[0.37]	2.23	1070	0.10
Myrcene	3.96	990	1.71	3.04	1137	1.73
α -Phellandrene	4.10	1000	0.02	2.95	1130	0.02
Octanal	4.12	1001	0.26	4.61	1253	0.25
Δ 3-Carene	4.18	1005	0.07	2.74	1114	0.07
α -Terpinene	4.28	1012	0.02	3.15	1145	0.03
Limonene	4.65*	1034	91.98	3.53	1175	93.05
para-Cymene	4.65*	1034	[91.98]	4.28	1230	0.03
1,8-Cineole	4.65*	1034	[91.98]	3.55	1176	0.24
(Z)- β -Ocimene	4.67	1036	0.01	3.96	1207	0.01
(E)- β -Ocimene	4.87	1048	0.03	4.17	1221	0.03
γ -Terpinene	4.98	1055	0.04	4.00	1209	0.05
cis-Sabinene hydrate	5.12	1064	0.01	7.06	1429	0.01
Octanol	5.28	1074	0.09	8.35	1526	0.09
Terpinolene	5.42	1083	0.04	4.48	1243	0.04
Linalool	5.70	1101	0.42	8.23*	1516	0.43
Nonanal	5.73	1102	0.06	6.06	1356	0.05
endo-Fenchol	5.84	1110	tr	8.55	1541	tr
trans-para-Mentha-2,8-dien-1-ol	5.95	1117	0.02	9.12	1585	0.02
cis-Limonene oxide	6.11	1127	0.04	6.62	1396	0.04
trans-Limonene oxide	6.19*	1132	0.06	6.78	1408	0.03
cis-para-Mentha-2,8-dien-1-ol	6.19*	1132	[0.06]	9.63	1626	0.02
(E)-Myroxide	6.32	1140	tr	7.27*	1445	0.02
Menthone	6.42	1147	0.02	6.83	1412	0.02
Citronellal	6.48	1151	0.04	7.19*	1438	0.06
Isomenthone	6.57	1156	0.01	7.19*	1438	[0.06]
Terpinen-4-ol	6.82	1172	0.02	8.75	1556	0.01
trans-para-Mentha-1(7),8-dien-2-ol	6.85	1174	0.01	11.56*	1786	0.02
para-Cymen-8-ol	7.01	1184	0.01	11.80*	1806	0.02
α -Terpineol	7.05	1187	0.09	9.95*	1652	0.10
Unknown [m/z 121, 79 (61), 93 (55), 94 (40), 91 (39), 84 (37)...]	7.08	1189	0.01	8.23*	1516	[0.43]
Ethyl octanoate	7.13	1192	0.03	6.74	1405	0.02
Decanal	7.31	1204	0.30	7.50	1461	0.29
Octyl acetate	7.44	1212	0.02	7.27*	1445	[0.02]

<i>trans</i> -Carveol	7.50	1216	0.03	11.56*	1786	[0.02]
<i>cis</i> -para-Mentha-1(7),8-dien-2-ol	7.68	1228	0.01	12.14	1836	0.01
<i>cis</i> -Carveol	7.70	1230	0.01	11.89*	1815	0.17
Citronellol	7.72	1231	0.02	10.90	1730	0.04
Neral	7.80*	1236	0.08	9.66	1628	0.05
Carvone	7.80*	1236	[0.08]	10.20	1672	0.02
Geraniol	8.07	1255	0.01	11.80*	1806	[0.02]
(2 <i>E</i>)-Decenal	8.13	1258	tr	9.26	1596	tr
Perillaldehyde	8.24	1266	0.01	10.84	1725	0.01
Geranial	8.26	1267	0.08	10.29*	1679	0.08
Limonen-10-ol	8.56	1287	0.01	13.37	1947	0.01
2-Hydroxypiperitone	8.63	1292	0.01			
Undecanal	8.81	1304	0.01	8.88	1566	0.02
<i>cis</i> -para-Mentha-2,8-diene-1-hydroperoxide	8.87	1308	0.02			
(2 <i>E</i> ,4 <i>E</i>)-Decadienal	8.92	1312	0.01	11.37	1770	0.01
<i>trans</i> -para-Mentha-2,8-diene-1-hydroperoxide	9.05	1321	0.01			
para-Mentha-1,8-diene-4-hydroperoxide	9.19	1331	0.01			
Limonene hydroperoxide IV	9.49	1352	0.01			
<i>trans</i> -para-Mentha-6,8-diene-2-hydroperoxide	9.68	1366	0.01			
α-Copaene	9.72	1368	0.03	7.38	1452	0.03
Geranyl acetate	9.92*	1382	0.06	10.73	1716	0.04
<i>cis</i> -β-Elemene	9.92*	1382	[0.06]	8.49	1537	0.01
Ethyl decanoate	10.10	1396	0.19	9.43	1609	0.19
Dodecanal	10.25	1406	0.04	10.18	1670	0.06
β-Caryophyllene	10.29	1409	0.05	8.64*	1548	0.06
β-Copaene	10.44	1420	0.02	8.59	1544	0.02
<i>trans</i> -α-Bergamotene	10.57	1430	0.01	8.64*	1548	[0.06]
α-Humulene	10.75	1443	0.01	9.51	1616	0.01
(<i>E</i>)-β-Farnesene	10.90	1454	0.01	9.75	1636	0.01
γ-Murolene	11.10	1469	tr	9.86	1644	tr
Germacrene D	11.13	1472	0.02	10.01	1656	0.02
5-epi-Aristolochene?	11.18	1475	0.02	9.95*	1652	[0.10]
Valencene	11.30	1484	0.14	10.13	1666	0.12
α-Murolene	11.42	1493	0.01	10.29*	1679	[0.08]
(3 <i>Z</i> ,6 <i>E</i>)-α-Farnesene	11.44	1494	0.01	10.37	1686	0.01
β-Bisabolene	11.56	1504	0.01	10.34	1683	0.01
γ-Cadinene	11.58	1506	0.02	10.60	1705	0.01
δ-Cadinene	11.72	1516	0.04	10.65	1708	0.03
α-Elemol	12.07	1544	0.01	14.23	2028	tr
Germacrene D-4-ol	12.39*	1569	0.01	13.86	1993	tr
Spathulenol	12.39*	1569	[0.01]	14.59	2063	tr
Caryophyllene oxide	12.42	1571	0.01	12.99	1912	0.01
Ethyl dodecanoate	12.71	1594	0.13	11.89*	1815	[0.17]
β-Sinensal	13.90	1691	0.02	15.64	2167	0.02
α-Sinensal	14.55	1747	0.01	16.60	2265	0.01
Nootkatone	15.05	1790	0.02	18.01	2417	0.02

Ethyl palmitate	17.23	1992	0.07	15.84	2186	0.08
Ethyl linoleate	18.76	2145	0.01	18.64	2488	0.01
Ethyl oleate?	18.86	2155	0.03			
Ethyl stearate?	19.18	2188	tr			
Isoauraptene	19.44	2216	0.01			
Meranzin	19.51	2223	0.02			
Auraptene	22.77	2596	0.07			
α-Tocopherol?	26.95	3135	0.03			
Tangeretin	27.00	3141	0.07			
3,5,6,7,8,3',4'- Heptamethoxyflavone?	29.06	3325	0.25			
3,3',4',5,6,7,8- Heptamethoxyflavone	29.14	3330	0.16			
Total identified		98.24%			98.85%	
Total reported		98.25%			98.85%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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