

Date : September 26, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19I12-PTH09-1-SCC

Customer identification : Lavender Fine Org - Spain - LM010391R

Type : Essential oil

Source : *Lavandula angustifolia*

Customer : Plant Therapy

ANALYSIS

Method: PC-PA-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 : Lindsay Girard, B. Sc.

Analysis date : September 24, 2019

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: 1.4620 ± 0.0003 (20 °C)

ISO 3515:2004 - OIL OF CLONAL LAVENDER - "OTHER ORIGINS"

Compound	Min. %	Max. %	Observed %	Complies?
α-Terpineol		2.0	0.5	Yes
Lavandulyl acetate		8	4	Yes
Terpinen-4-ol		8	5	Yes
Lavandulol		3.0	0.9	Yes
Linalyl acetate	25	47	30	Yes
Linalool	20	43	33	Yes
Camphor		1.5	0.4	Yes
Octan-3-one		3.0	0.7	Yes
(E)-β-Ocimene	tr	6	4	Yes
(Z)-β-Ocimene	1	10	4	Yes
β-Phellandrene		1.0	0.9*	Yes
1,8-Cineole		3.0		
Limonene		1.0	0.4	Yes
Refractive index	1.4600	1.4660	1.4620	Yes

*Coelute on both columns considered.

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil complies with the ISO standard for "other origins" lavender oil.

ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Classe
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
Isoamyl alcohol	tr	Aliphatic alcohol
Toluene	0.01	Simple phenolic
Butyl acetate	0.02	Aliphatic ester
Methyl hexyl ether	0.07	Aliphatic ether
(2E)-Hexenal	0.01	Aliphatic aldehyde
(3Z)-Hexenol	0.01	Aliphatic alcohol
Tricyclene	0.02	Monoterpene
α -Thujene	0.11	Monoterpene
α -Pinene	0.20	Monoterpene
Camphene	0.13	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
Butyl isobutyrate	0.01	Aliphatic ester
β -Pinene	0.11	Monoterpene
Sabinene	0.04	Monoterpene
Octen-3-ol	0.20	Aliphatic alcohol
Octan-3-one	0.67	Aliphatic ketone
Myrcene	0.47	Monoterpene
Octan-3-ol	0.11	Aliphatic alcohol
Butyl butyrate	0.10	Aliphatic ester
α -Phellandrene	0.04	Monoterpene
Δ^3 -Carene	0.07	Monoterpene
(3Z)-Hexenyl acetate	0.02	Aliphatic ester
α -Terpinene	0.04	Monoterpene
Hexyl acetate	0.37	Aliphatic ester
ortho-Cymene	0.04	Monoterpene
para-Cymene	0.14	Monoterpene
Limonene	0.36	Monoterpene
1,8-Cineole	0.91*	Monoterpenic ether
β -Phellandrene	[0.91]*	Monoterpene
Lavender lactone	0.01	Aliphatic lactone
(Z)- β -Ocimene	3.94	Monoterpene
(E)- β -Ocimene	4.03	Monoterpene
γ -Terpinene	0.16	Monoterpene
cis-Sabinene hydrate	0.08	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.13	Monoterpenic alcohol
Octanol	0.02	Aliphatic alcohol
Terpinolene	0.01	Monoterpene
trans-Linalool oxide (fur.)	0.18	Monoterpenic alcohol
Rosefuran	0.06	Monoterpenic ether
Linalool	33.25	Monoterpenic alcohol
(Z)-6-Methyl-3,5-heptadien-2-one	0.06	Aliphatic ketone
Octen-3-yl acetate	0.68	Aliphatic ester
Unknown	0.03	Unknown
Octan-3-yl acetate	0.09	Aliphatic ester
allo-Ocimene	0.06	Monoterpene

(Z)-Myroxide	0.03	Monoterpenic ether
Camphor	0.41	Monoterpenic ketone
(E)-Myroxide	0.03	Monoterpenic ether
Nerol oxide	0.01	Aliphatic ether
Hexyl isobutyrate	0.05	Aliphatic ester
Borneol	0.73	Monoterpenic alcohol
cis-Linalool oxide (pyr.)	0.01	Monoterpenic alcohol
Lavandulol	0.90	Monoterpenic alcohol
Terpinen-4-ol	4.54	Monoterpenic alcohol
Cryptone	0.11	Normonoterpenic ketone
meta-Cymen-8-ol	0.06	Monoterpenic alcohol
para-Cymen-8-ol	0.05	Monoterpenic alcohol
α -Terpineol	0.50	Monoterpenic alcohol
Hodiendiol	0.02	Monoterpenic alcohol
Hexyl butyrate	0.38	Aliphatic ester
Verbenone	0.02	Monoterpenic ketone
Unknown	0.04	Unknown
(3E,5E)-2,6-Dimethylocta-3,5,7-trien-2-ol	0.03	Monoterpenic alcohol
trans-Carveol	0.02	Monoterpenic alcohol
Bornyl formate	0.06	Monoterpenic ester
Nerol	0.01	Monoterpenic alcohol
Hexyl 2-methylbutyrate	0.10	Aliphatic ester
Neral	tr	Monoterpenic aldehyde
Carvone	0.03	Monoterpenic ketone
Hexyl isovalerate	0.05	Aliphatic ester
Geraniol	0.27	Monoterpenic alcohol
Linalyl acetate	30.26	Monoterpenic ester
Geranial	0.03	Monoterpenic aldehyde
Bornyl acetate	0.09	Monoterpenic ester
Lavandulyl acetate	3.54	Monoterpenic ester
Hexyl tiglate	0.06	Aliphatic ester
Hodiendiol derivative	0.04	Oxygenated monoterpene
Unknown	0.02	Oxygenated monoterpene
Unknown	0.03	Oxygenated monoterpene
Neryl acetate	0.21	Monoterpenic ester
α -Copaene	0.01	Sesquiterpene
Daucene	0.01	Sesquiterpene
β -Bourbonene	0.03	Sesquiterpene
Geranyl acetate	0.35	Monoterpenic ester
α -Funebrene	0.03	Sesquiterpene
Hexyl hexanoate	0.06	Aliphatic ester
Isocaryophyllene	0.02	Sesquiterpene
β -Caryophyllene	4.65	Sesquiterpene
α -Santalene	0.32	Sesquiterpene
Coumarin	0.06	Coumarin
trans- α -Bergamotene	0.11	Sesquiterpene
α -Humulene	0.13	Sesquiterpene
Lavandulyl butyrate?	0.08	Monoterpenic ester
(E)- β -Farnesene	1.42	Sesquiterpene
Germacrene D	0.35	Sesquiterpene
trans- β -Bergamotene	0.05	Sesquiterpene
γ -Cadinene	0.16	Sesquiterpene

β -Bisabolene	0.04	Sesquiterpene
δ -Cadinene	0.03	Sesquiterpene
β -Sesquiphellandrene	0.01	Sesquiterpene
Isocaryophyllene epoxide B	0.04	Sesquiterpenic ether
(<i>E</i>)-Nerolidol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide	0.36	Sesquiterpenic ether
Caryophyllene oxide isomer	0.04	Sesquiterpenic ether
Humulene epoxide II	0.01	Sesquiterpenic ether
τ -Cadinol	0.14	Sesquiterpenic alcohol
α -Bisabolol	0.02	Sesquiterpenic alcohol
Herniarin	0.02	Coumarin
Consolidated total	98.43%	

*: 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

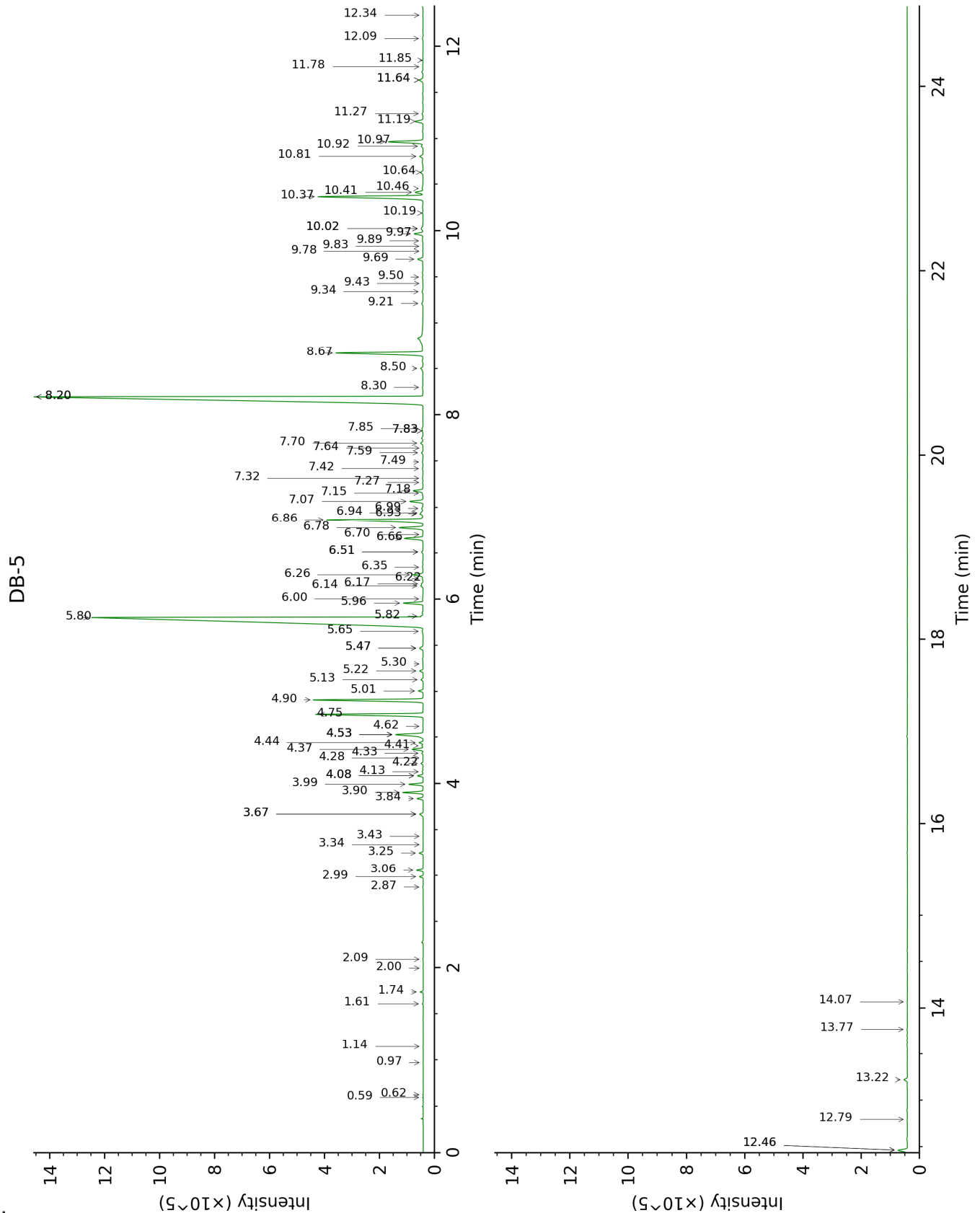
tr: The compound has been detected below 0.005% of total signal.

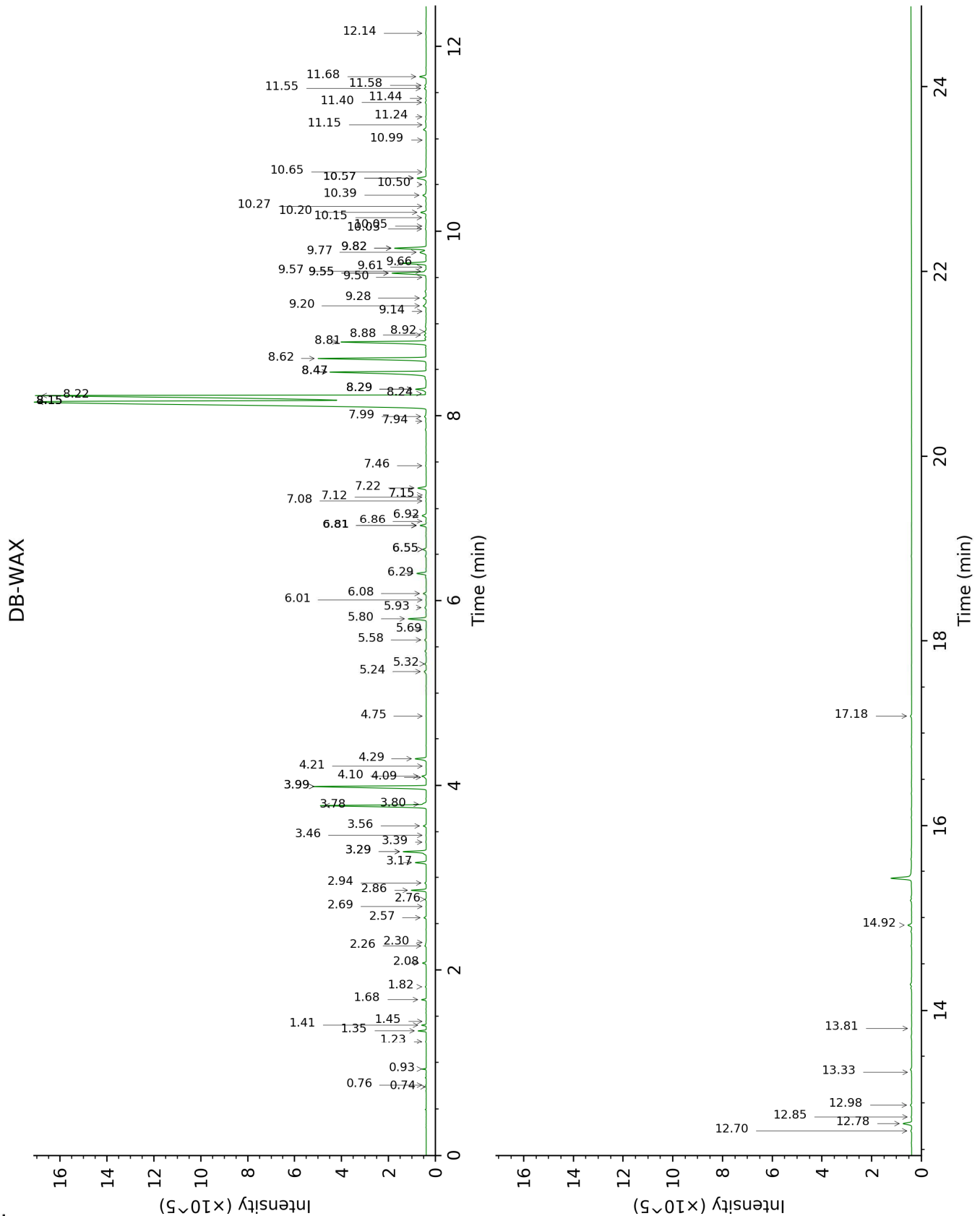
Note: no correction factor was applied

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	%
Isovaleral	0.60	641	0.01	0.76	891	0.01
2-Methylbutyral	0.62	651	0.01	0.74	884	0.01
Isoamyl alcohol	0.97	736	tr	3.39	1175	0.02
Toluene	1.14	760	0.01	1.45	1005	0.01
Butyl acetate	1.61	817	0.02	1.82	1042	0.02
Methyl hexyl ether	1.74	828	0.07	0.93	925	0.08
(2E)-Hexenal	2.00	848	0.01	3.46	1181	0.02
(3Z)-Hexenol	2.09	856	0.01	5.69	1344	0.02
Tricyclene	2.87	917	0.02	1.23	973	0.02
α-Thujene	2.99	924	0.11	1.41	1001	0.11
α-Pinene	3.06	929	0.20	1.35	992	0.20
Camphene	3.25	942	0.13	1.68	1028	0.12
Thuja-2,4(10)-diene	3.34	948	0.01	2.30	1088	0.01
Butyl isobutyrate	3.43	953	0.01	2.69	1121	0.01
β-Pinene	3.67*	969	0.15	2.08	1067	0.11
Sabinene	3.67*	969	[0.15]	2.26	1085	0.04
Octen-3-ol	3.84	980	0.20	6.81*	1425	0.21
Octan-3-one	3.90	985	0.67	3.99*	1220	4.70
Myrcene	3.99	991	0.47	2.86	1134	0.48
Octan-3-ol	4.08*	997	0.19	6.08	1372	0.11
Butyl butyrate	4.08*	997	[0.19]	3.56	1189	0.10
α-Phellandrene	4.13	1000	0.04	2.76	1126	0.03
Δ3-Carene	4.22	1006	0.07	2.57	1111	0.08
(3Z)-Hexenyl acetate	4.28	1009	0.02	4.75	1275	0.01
α-Terpinene	4.33	1012	0.04	2.94	1140	0.05
Hexyl acetate	4.37	1015	0.37	4.29	1242	0.43
ortho-Cymene	4.41	1018	0.04	4.09	1227	0.04
para-Cymene	4.44	1020	0.14	4.10	1228	0.15
Limonene	4.53*	1025	1.27	3.17	1158	0.36
1,8-Cineole	4.53*	1025	[1.27]	3.29*	1167	0.81
β-Phellandrene	4.53*	1025	[1.27]	3.29*	1167	[0.81]
Lavender lactone	4.62	1031	0.01	9.14	1601	0.01
(Z)-β-Ocimene	4.75	1039	3.94	3.78	1205	4.03
(E)-β-Ocimene	4.90	1049	4.03	3.99*	1220	[4.70]
γ-Terpinene	5.01	1055	0.16	3.80	1206	0.12
cis-Sabinene hydrate	5.13	1063	0.08	6.81*	1425	[0.21]
cis-Linalool oxide (fur.)	5.22	1069	0.13	6.55*	1406	0.13
Octanol	5.30	1074	0.02	8.15*†	1525	63.59
Terpinolene	5.47*	1085	0.18	4.21	1236	0.01
trans-Linalool oxide (fur.)	5.47*	1085	[0.18]	6.92	1433	0.18
Rosefuran	5.65	1096	0.06	5.93	1361	0.06
Linalool	5.80	1106	33.25	8.15*†	1525	[63.59]
(Z)-6-Methyl-3,5-heptadien-2-one	5.82	1107	0.06	8.22†	1530	[63.59]

Octen-3-yl acetate	5.96	1116	0.68	5.80	1352	0.66
Unknown [m/z 82, 81 (72), 43 (64), 54 (32), 41 (20)...]	6.00	1119	0.03	9.50	1631	0.01
Octan-3-yl acetate	6.14	1128	0.09	5.24	1310	0.10
allo-Ocimene	6.17	1130	0.06	5.58	1335	0.06
(Z)-Myroxide	6.22	1133	0.03	6.86	1429	0.02
Camphor	6.26	1136	0.41	7.22	1456	0.34
(E)-Myroxide	6.35	1142	0.03	7.08	1445	0.02
Nerol oxide	6.51*	1152	0.06	6.81*	1425	[0.21]
Hexyl isobutyrate	6.51*	1152	[0.06]	5.32	1316	0.05
Borneol	6.66	1162	0.73	9.82*	1656	1.23
cis-Linalool oxide (pyr.)	6.70	1165	0.01	10.27	1692	0.02
Lavandulol	6.78	1170	0.90	9.66	1643	0.92
Terpinen-4-ol	6.86	1176	4.54	8.62	1561	4.46
Cryptone	6.93	1180	0.11	9.20	1606	0.15
meta-Cymen-8-ol	6.94	1181	0.06	11.55	1800	0.07
para-Cymen-8-ol	6.99	1184	0.05	11.58	1803	0.06
α-Terpineol	7.06	1189	0.50	9.82*	1656	[1.23]
Hodiendiol	7.15	1195	0.02	12.85	1916	0.02
Hexyl butyrate	7.18	1197	0.38	6.29	1388	0.34
Verbenone	7.27	1202	0.02	9.61	1639	0.01
Unknown [m/z 43, 71 (66), 59 (52), 41 (47), 68 (46)...]	7.32	1206	0.04	6.01	1367	0.02
(3E,5E)-2,6-Dimethylocta-3,5,7-trien-2-ol	7.42	1213	0.03	11.40	1788	0.04
trans-Carveol	7.49	1218	0.02	11.44	1791	0.02
Bornyl formate	7.59	1225	0.06	7.99	1513	0.07
Nerol	7.64	1228	0.01	10.99	1753	0.01
Hexyl 2-methylbutyrate	7.70	1232	0.10	6.55*	1406	[0.13]
Neral	7.83*	1241	0.03	9.55*	1634	1.42
Carvone	7.83*	1241	[0.03]	10.06	1675	0.03
Hexyl isovalerate	7.85	1243	0.05	6.81*	1425	[0.21]
Geraniol	8.20*	1265	31.03	11.68	1812	0.27
Linalyl acetate	8.20*	1265	[31.03]	8.15*†	1525	[63.59]
Geranial	8.30	1272	0.03	10.02	1673	0.03
Bornyl acetate	8.50	1286	0.09	8.29*	1536	0.41
Lavandulyl acetate	8.67	1297	3.54	8.81	1576	3.55
Hexyl tiglate	9.21	1334	0.06	8.88	1581	0.07
Hodiendiol derivative	9.34	1343	0.04	12.98	1928	0.05
Unknown [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	9.43	1349	0.02	11.16	1767	0.01
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81	9.50	1354	0.03	11.24	1774	0.02

(21)... 197 (0)]						
Neryl acetate	9.69	1367	0.21	10.20	1687	0.22
α -Copaene	9.78	1373	0.01	7.15	1450	0.02
Daucene	9.83	1377	0.01	7.12	1448	0.02
β -Bourbonene	9.89	1381	0.03	7.46	1473	0.03
Geranyl acetate	9.97	1387	0.35	10.57*	1718	0.41
α -Funebrene	10.02*	1390	0.11	7.94	1509	0.03
Hexyl hexanoate	10.02*	1390	[0.11]	8.92	1584	0.06
Isocaryophyllene	10.19	1402	0.02	8.24	1532	0.03
β -Caryophyllene	10.37	1415	4.65	8.47*	1550	4.59
α -Santalene	10.42	1418	0.32	8.29*	1536	[0.41]
Coumarin	10.46	1422	0.06	17.18	2346	0.06
<i>trans</i> - α - Bergamotene	10.64	1435	0.11	8.47*	1550	[4.59]
α -Humulene	10.81	1448	0.13	9.28	1613	0.12
Lavandulyl butyrate?	10.92	1456	0.08	10.57*	1718	[0.41]
(<i>E</i>)- β -Farnesene	10.97	1460	1.42	9.55*	1634	[1.42]
Germacrene D	11.19	1476	0.35	9.77	1652	0.33
<i>trans</i> - β - Bergamotene	11.27	1482	0.05	9.57	1636	0.05
γ -Cadinene	11.64*	1509	0.20	10.39	1702	0.16
β -Bisabolene	11.64*	1509	[0.20]	10.15	1683	0.04
δ -Cadinene	11.78	1520	0.03	10.50	1712	0.02
β - Sesquiphellandrene	11.85	1526	0.01	10.65	1724	0.01
Isocaryophyllene epoxide B	12.08	1544	0.04	12.14	1853	0.04
(<i>E</i>)-Nerolidol	12.34	1564	0.01	13.81	2004	0.02
Caryophyllene oxide	12.46*	1574	0.42	12.78	1910	0.36
Caryophyllene oxide isomer	12.46*	1574	[0.42]	12.70	1902	0.04
Humulene epoxide II	12.79	1599	0.01	13.33	1960	0.01
τ -Cadinol	13.22	1634	0.14	14.92	2112	0.15
α -Bisabolol	13.77	1679	0.02			
Herniarin	14.07	1704	0.02			
Total identified		98.80%			97.82%	
Total reported		98.91%			97.88%	

*: 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