

Date : March 22, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19C11-PTH04-1-SCC

Customer identification : Lavandin - France - L2010486R

Type : Essential oil

Source : *Lavandula angustifolia x latifolia* cv. Sumian

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 : Benoit Roger, Ph. D.

Analysis date : March 13, 2019

Checked and approved by :



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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4598 ± 0.0003 (20 °C)

NFT 75-264:2009 - ESSENTIAL OIL OF LAVANDIN SUMIAN

Compound	Min. %	Max. %	Observed %	Complies?
Lavandulyl acetate	0.1	0.5	0.2	Yes
Linalyl acetate	16	25	19	Yes
Hexyl butyrate	0.1	0.5	0.4	Yes
α-Terpineol	0.4	1.3	1.1	Yes
Terpinen-4-ol	0.1	0.5	0.5	Yes
β-Caryophyllene	0.5	2.0	1.3	Yes
Lavandulol	0.1	0.4	0.1	Yes
Borneol	4	7	4.9	Yes
Camphor	5	8	8	Yes
Linalool	37	45	42	Yes
(E)-β-Ocimene	1.5	3.0	1.5	Yes
(Z)-β-Ocimene	2	5	2	Yes
Limonene	0.3	1.0	0.9	Yes
1,8-Cineole	5	10	8.4	Yes
Refractive index	1.4580	1.4640	1.4598	Yes

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
2-Methyl-3-buten-2-ol	0.01	0.01	Aliphatic alcohol
Isovaleral	tr	tr	Aliphatic aldehyde
2-Methylbutyral	tr	tr	Aliphatic aldehyde
Toluene	tr	0.01	Simple phenolic
Methyl hexyl ether	0.03	0.03	Aliphatic ether
(2E)-Hexenal	0.01	8.37*	Aliphatic aldehyde
(3Z)-Hexenol	0.06	0.07	Aliphatic alcohol
Hexanol	0.08	0.08	Aliphatic alcohol
Tricyclene	0.02	0.02	Monoterpene
α -Thujene	0.02	0.02	Monoterpene
α -Pinene	0.36	0.36	Monoterpene
Camphene	0.30*	0.28	Monoterpene
α -Fenchene	[0.30]*	0.02	Monoterpene
β -Pinene	0.48*	0.38	Monoterpene
Sabinene	[0.48]*	0.10	Monoterpene
Octen-3-ol	0.15	0.15	Aliphatic alcohol
Octan-3-one	0.97*	2.40*	Aliphatic ketone
6-Methyl-5-hepten-2-one	[0.97]*	0.01	Aliphatic ketone
Myrcene	0.59	0.58	Monoterpene
Butyl butyrate	0.01	0.01	Aliphatic ester
Octan-3-ol	0.07	0.06	Aliphatic alcohol
α -Phellandrene	0.08*	0.04	Monoterpene
Pseudolimonene	[0.08]*	0.02	Monoterpene
(3Z)-Hexenyl acetate	0.06*		Aliphatic ester
<i>cis</i> -Dehydroxylinalool oxide	[0.06]*	0.14	Monoterpenic ether
Δ^3 -Carene	[0.06]*	0.03	Monoterpene
α -Terpinene	0.03	0.02	Monoterpene
Hexyl acetate	0.12	0.30*	Aliphatic ester
ortho-Cymene	0.01	0.20*	Simple phenolic
para-Cymene	0.20	[0.20]*	Monoterpene
1,8-Cineole	9.31*	[8.37]*	Monoterpenic ether
Limonene	[9.31]*	0.93	Monoterpene
(Z)- β -Ocimene	2.17	2.21*	Monoterpene
(E)- β -Ocimene	1.46	[2.40]*	Monoterpene
γ -Terpinene	0.17	[2.21]*	Monoterpene
<i>cis</i> -Sabinene hydrate	0.09	0.23*	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.12	0.13	Monoterpenic alcohol
Octanol	0.02	[61.19]*	Aliphatic alcohol
α -Pinene oxide analog	0.07	0.19*	Monoterpenic ether
Terpinolene	0.34*	[0.30]*	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	[0.34]*	[0.23]*	Monoterpenic alcohol
<i>trans</i> -Sabinene hydrate	0.04	0.04	Monoterpenic alcohol
Linalool	42.28	61.19*	Monoterpenic alcohol
(Z)-6-Methyl-3,5-heptadien-2-one	0.12	[61.19]*	Aliphatic ketone
Octen-3-yl acetate	0.04	0.21	Aliphatic ester
α -Campholenal	0.23*	[0.23]*	Monoterpenic aldehyde
Unknown	[0.23]*	0.04	Unknown
allo-Ocimene	0.01	0.05	Monoterpene

Camphor	7.55	7.46	Monoterpenic ketone
Camphene hydrate	0.06	1.56*	Monoterpenic alcohol
Nerol oxide	0.27*	0.02	Aliphatic ether
Hexyl isobutyrate	[0.27]*	[0.19]*	Aliphatic ester
δ-Terpineol	5.25*	0.40*	Monoterpenic alcohol
Borneol	[5.25]*	6.23*	Monoterpenic alcohol
Lavandulol	0.08	[0.40]*	Monoterpenic alcohol
(3E,5Z)-Undeca-1,3,5-triene	0.49*	0.01	Alkene
Terpinen-4-ol	[0.49]*	0.47	Monoterpenic alcohol
Cryptone	0.01	0.01	Normonoterpenic ketone
para-Cymen-8-ol	0.10	0.30*	Monoterpenic alcohol
α-Terpineol	1.06*	[6.23]*	Monoterpenic alcohol
Myrtenal	[1.06]*	0.01	Monoterpenic aldehyde
Hexyl butyrate	0.36	0.36	Aliphatic ester
Verbenone	0.02	0.01	Monoterpenic ketone
Octyl acetate	0.03	0.04	Aliphatic ester
Bornyl formate	0.12	[61.19]*	Monoterpenic ester
Nerol	0.13	0.15*	Monoterpenic alcohol
Hexyl 2-methylbutyrate	0.06	0.04	Aliphatic ester
Neral	0.06	[0.40]*	Monoterpenic aldehyde
Hexyl isovalerate	0.06	0.09	Aliphatic ester
Geraniol	19.15*	[0.30]*	Monoterpenic alcohol
Linalyl acetate	[19.15]*	[61.19]*	Monoterpenic ester
Geranial	0.03	0.06*	Monoterpenic aldehyde
Lavandulyl acetate	0.22	0.22	Monoterpenic ester
Hexyl tiglate	0.14	0.14	Aliphatic ester
Hodiendiol derivative	0.01	0.02	Oxygenated monoterpene
Unknown	0.01	[0.15]*	Oxygenated monoterpene
Unknown	0.01	0.02	Oxygenated monoterpene
Neryl acetate	0.28	0.31	Monoterpenic ester
α-Copaene	0.04	0.03	Sesquiterpene
β-Bourbonene	0.02	0.02	Sesquiterpene
Geranyl acetate	0.46	0.48*	Monoterpenic ester
α-Funebrene	0.05*	0.02*	Sesquiterpene
7-epi-Sesquithujene	[0.05]*	[0.02]*	Sesquiterpene
Hexyl hexanoate	[0.05]*	0.03	Aliphatic ester
Sesquithujene	0.05	[61.19]*	Sesquiterpene
β-Caryophyllene	1.52*	[1.56]*	Sesquiterpene
cis-α-Bergamotene	[1.52]*	0.10	Sesquiterpene
α-Santalene	[1.52]*	0.08	Sesquiterpene
Lavandulyl isobutyrate	0.12	0.13	Monoterpenic ester
Coumarin	0.02	0.13	Coumarin
trans-α-Bergamotene	0.05	[1.56]*	Sesquiterpene
cis-β-Bergamotene?	0.03		Sesquiterpene
α-Humulene	0.10	0.13	Sesquiterpene
Lavandulyl butyrate?	0.02	[0.48]*	Monoterpenic ester
(E)-β-Farnesene	0.35	[0.40]*	Sesquiterpene
Dauca-5,8-diene?	0.03	0.07	Sesquiterpene
Germacrene D	0.22	0.21	Sesquiterpene
trans-β-Bergamotene	0.02	0.03	Sesquiterpene
Isodaucene	0.04	0.03	Sesquiterpene
α-Murolene	0.02	0.02	Sesquiterpene

β -Bisabolene	0.02	[0.06]*	Sesquiterpene
Lavandulyl isovalerate	0.15*	0.07*	Monoterpenic ester
γ -Cadinene	[0.15]*	0.13	Sesquiterpene
δ -Cadinene	0.04*	0.05	Sesquiterpene
β -Sesquiphellandrene	[0.04]*	[0.07]*	Sesquiterpene
Isocaryophyllene epoxide B	0.01	0.01	Sesquiterpenic ether
Caryophyllene oxide	0.06*	0.05	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.06]*	0.01	Sesquiterpenic ether
τ -Cadinol	0.05	0.05	Sesquiterpenic alcohol
α -Bisabolol	0.06	0.07	Sesquiterpenic alcohol
Total identified	99.18%	98.72%	

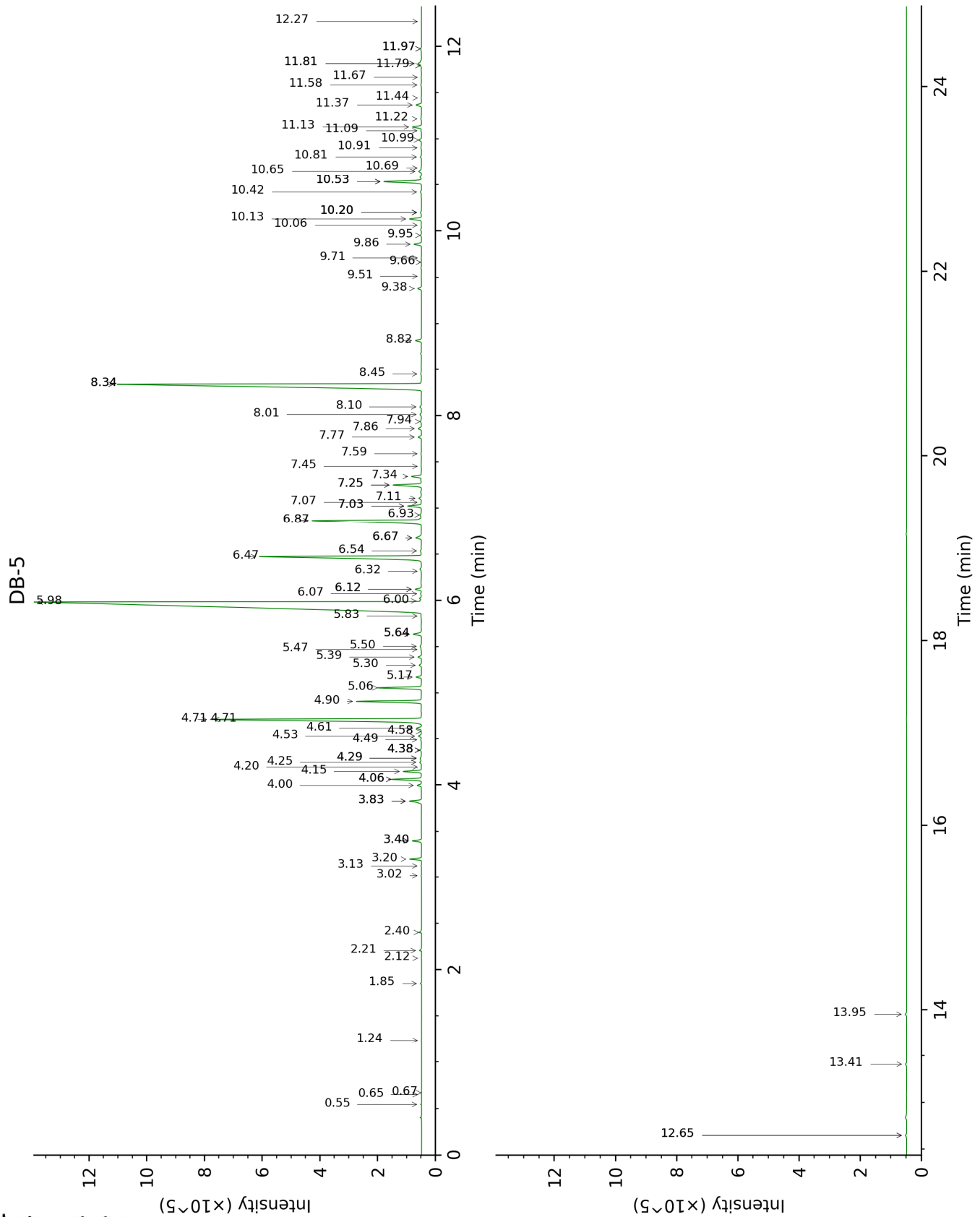
*: Two or more compounds are coeluting on this column

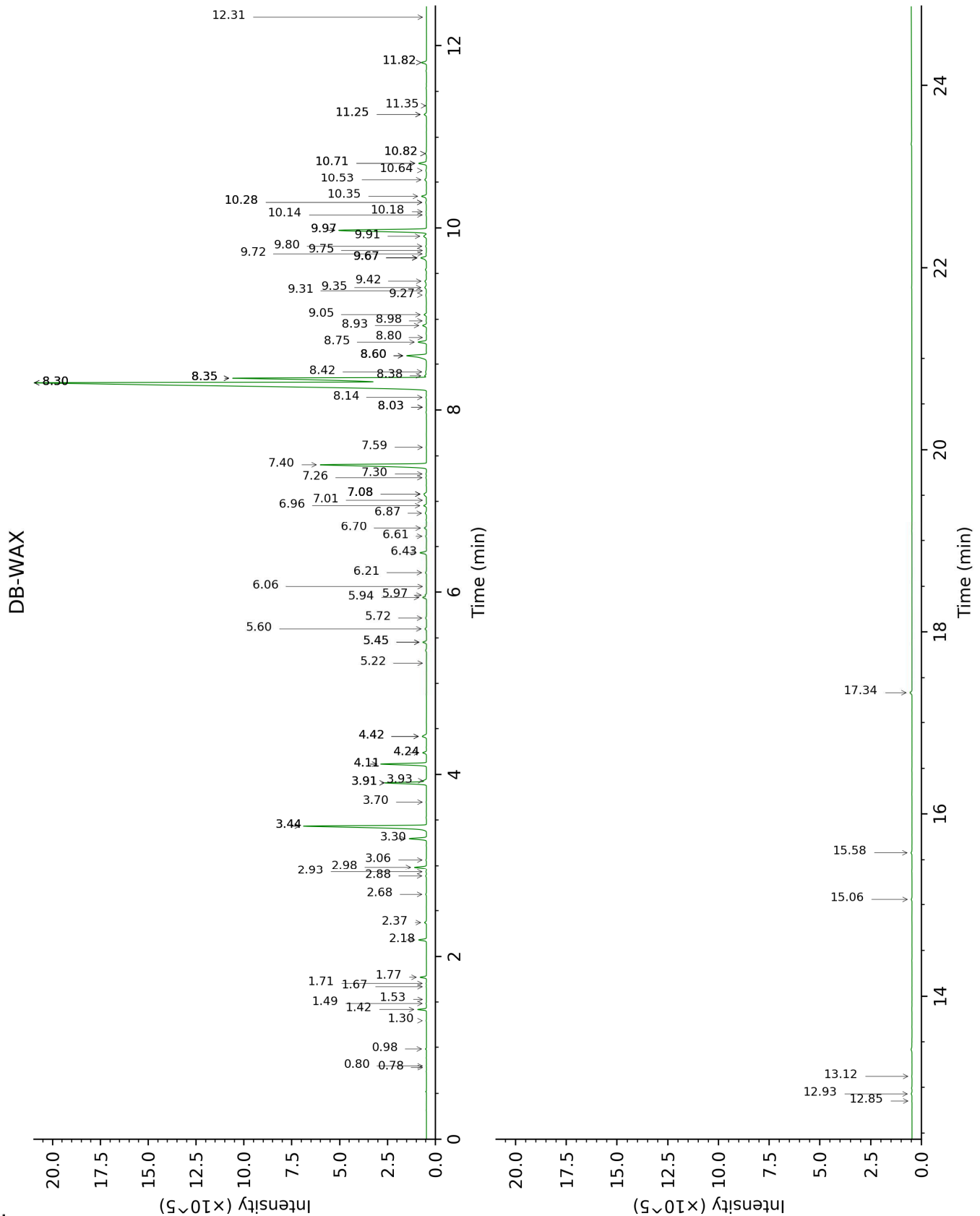
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	%
2-Methyl-3-buten-2-ol	0.54	608	0.01	1.67	1017	0.01
Isovaleral	0.65	642	tr	0.80	890	tr
2-Methylbutyral	0.67	648	tr	0.78	883	tr
Toluene	1.24	757	tr	1.53	1003	0.01
Methyl hexyl ether	1.85	825	0.03	0.98	921	0.03
(2E)-Hexenal	2.12	847	0.01	3.44*	1169	8.37
(3Z)-Hexenol	2.21	854	0.06	5.97	1352	0.07
Hexanol	2.40	870	0.08	5.60	1326	0.08
Tricyclene	3.02	917	0.02	1.30	972	0.02
α-Thujene	3.13	924	0.02	1.49	999	0.02
α-Pinene	3.20	929	0.36	1.42	992	0.36
Camphene	3.40*	942	0.30	1.77	1027	0.28
α-Fenchene	3.40*	942	[0.30]	1.71	1020	0.02
β-Pinene	3.83*	970	0.48	2.18	1067	0.38
Sabinene	3.83*	970	[0.48]	2.37	1085	0.10
Octen-3-ol	4.00	981	0.15	6.96	1424	0.15
Octan-3-one	4.06*	986	0.97	4.11*	1219	2.40
6-Methyl-5-hepten-2-one	4.06*	986	[0.97]	5.22	1299	0.01
Myrcene	4.15	991	0.59	2.98	1134	0.58
Butyl butyrate	4.20	994	0.01	3.70	1189	0.01
Octan-3-ol	4.25	998	0.07	6.22	1370	0.06
α-Phellandrene	4.29*	1001	0.08	2.88	1126	0.04
Pseudolimonene	4.29*	1001	[0.08]	2.93	1130	0.02
(3Z)-Hexenyl acetate	4.38*	1006	0.06			
cis-Dehydroxylinalool oxide	4.38*	1006	[0.06]	3.93	1206	0.14
Δ ³ -Carene	4.38*	1006	[0.06]	2.68	1111	0.03
α-Terpinene	4.49	1014	0.03	3.06	1140	0.02
Hexyl acetate	4.53	1016	0.12	4.42*	1241	0.30
ortho-Cymene	4.58	1019	0.01	4.24*	1228	0.20
para-Cymene	4.61	1021	0.20	4.24*	1228	[0.20]
1,8-Cineole	4.71*	1027	9.31	3.44*	1169	[8.37]
Limonene	4.71*	1027	[9.31]	3.30	1158	0.93
(Z)-β-Ocimene	4.90	1040	2.17	3.91*	1204	2.21
(E)-β-Ocimene	5.06	1049	1.46	4.11*	1219	[2.40]
γ-Terpinene	5.17	1056	0.17	3.91*	1204	[2.21]
cis-Sabinene hydrate	5.30	1064	0.09	7.08*	1433	0.23
cis-Linalool oxide (fur.)	5.39	1070	0.12	6.70	1405	0.13
Octanol	5.47	1075	0.02	8.35*†	1528	[61.19]
α-Pinene oxide analog	5.50	1078	0.07	5.45*	1315	0.19
Terpinolene	5.64*	1086	0.34	4.42*	1241	[0.30]

<i>trans</i> -Linalool oxide (fur.)	5.64*	1086	[0.34]	7.08*	1433	[0.23]
<i>trans</i> -Sabinene hydrate	5.83	1098	0.04	8.14	1512	0.04
Linalool	5.98	1108	42.28	8.30*†	1524	61.19
(<i>Z</i>)-6-Methyl-3,5-heptadien-2-one	6.00	1108	0.12	8.35*†	1528	[61.19]
Octen-3-yl acetate	6.07	1114	0.04	5.94	1350	0.21
α -Campholenal	6.12*	1117	0.23	7.08*	1433	[0.23]
Unknown [m/z 82, 81 (72), 43 (64), 54 (32), 41 (20)...]	6.12*	1117	[0.23]	9.80	1642	0.04
allo-Ocimene	6.32	1129	0.01	5.72	1334	0.05
Camphor	6.47	1139	7.55	7.40	1457	7.46
Camphene hydrate	6.54	1143	0.06	8.60*	1547	1.56
Nerol oxide	6.68*	1152	0.27	7.01	1428	0.02
Hexyl isobutyrate	6.68*	1152	[0.27]	5.45*	1315	[0.19]
δ -Terpineol	6.87*	1165	5.25	9.67*	1632	0.40
Borneol	6.87*	1165	[5.25]	9.98*	1656	6.23
Lavandulol	6.93	1169	0.08	9.67*	1632	[0.40]
(3 <i>E</i> ,5 <i>Z</i>)-Undeca-1,3,5-triene	7.03*	1175	0.49	6.06	1359	0.01
Terpinen-4-ol	7.03*	1175	[0.49]	8.75	1559	0.47
Cryptone	7.07	1178	0.01	9.31	1603	0.01
para-Cymen-8-ol	7.11	1181	0.10	11.82*	1811	0.30
α -Terpineol	7.25*	1190	1.06	9.98*	1656	[6.23]
Myrtenal	7.25*	1190	[1.06]	8.80	1563	0.01
Hexyl butyrate	7.34	1196	0.36	6.43	1385	0.36
Verbenone	7.45	1203	0.02	9.75	1638	0.01
Octyl acetate	7.59	1212	0.03	7.26	1446	0.04
Bornyl formate	7.77	1224	0.12	8.30*†	1524	[61.19]
Nerol	7.86	1230	0.13	11.25*	1762	0.15
Hexyl 2-methylbutyrate	7.94	1236	0.06	6.61	1398	0.04
Neral	8.01	1241	0.06	9.67*	1632	[0.40]
Hexyl isovalerate	8.10	1246	0.06	6.87	1418	0.09
Geraniol	8.34*	1263	19.15	11.82*	1811	[0.30]
Linalyl acetate	8.34*	1263	[19.15]	8.35*†	1528	[61.19]
Geranial	8.45	1271	0.03	10.28*	1681	0.06
Lavandulyl acetate	8.82	1296	0.22	8.93	1573	0.22
Hexyl tiglate	9.38	1330	0.14	9.05	1582	0.14
Hodiendiol derivative	9.51	1340	0.01	13.12	1927	0.02
Unknown [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	9.66	1350	0.01	11.25*	1762	[0.15]
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.71	1354	0.01	11.34	1770	0.02
Neryl acetate	9.86	1364	0.28	10.35	1686	0.31

α-Copaene	9.95	1371	0.04	7.30	1449	0.03
β-Bourbonene	10.06	1379	0.02	7.59	1471	0.02
Geranyl acetate	10.13	1384	0.46	10.72*	1717	0.48
α-Funebrene	10.20*	1388	0.05	8.03*	1504	0.02
7-epi-Sesquithujene	10.20*	1388	[0.05]	8.03*	1504	[0.02]
Hexyl hexanoate	10.20*	1388	[0.05]	8.98	1577	0.03
Sesquithujene	10.42	1404	0.05	8.30*†	1524	[61.19]
β-Caryophyllene	10.53*	1413	1.52	8.60*	1547	[1.56]
cis-α-Bergamotene	10.53*	1413	[1.52]	8.38	1530	0.10
α-Santalene	10.53*	1413	[1.52]	8.42	1533	0.08
Lavandulyl isobutyrate	10.65	1421	0.12	9.42	1611	0.13
Coumarin	10.69	1424	0.02	17.34	2347	0.13
trans-α-Bergamotene	10.81	1433	0.05	8.60*	1547	[1.56]
cis-β-Bergamotene?	10.91	1440	0.03			
α-Humulene	10.99	1447	0.10	9.35	1606	0.13
Lavandulyl butyrate?	11.09	1454	0.02	10.72*	1717	[0.48]
(E)-β-Farnesene	11.13	1457	0.35	9.67*	1632	[0.40]
Dauca-5,8-diene?	11.22	1464	0.03	9.27	1599	0.07
Germacrene D	11.37	1475	0.22	9.91	1651	0.21
trans-β-Bergamotene	11.44	1480	0.02	9.72	1635	0.03
Isodaucene	11.58	1491	0.04	10.18	1672	0.03
α-Murolene	11.67	1497	0.02	10.14	1670	0.02
β-Bisabolene	11.79	1507	0.02	10.28*	1681	[0.06]
Lavandulyl isovalerate	11.82*	1508	0.15	10.82*	1726	0.07
γ-Cadinene	11.82*	1508	[0.15]	10.53	1701	0.13
δ-Cadinene	11.97*	1521	0.04	10.64	1710	0.05
β-Sesquiphellandrene	11.97*	1521	[0.04]	10.82*	1726	[0.07]
Isocaryophyllene epoxide B	12.27	1544	0.01	12.31	1854	0.01
Caryophyllene oxide	12.65*	1574	0.06	12.93	1910	0.05
Caryophyllene oxide isomer	12.65*	1574	[0.06]	12.85	1902	0.01
τ-Cadinol	13.41	1636	0.05	15.06	2112	0.05
α-Bisabolol	13.95	1681	0.06	15.58	2163	0.07
Total identified		99.18%			98.72%	
Total reported		99.20%			98.79%	

*: Two or more compounds are coeluting on this column

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