

Date : November 13, 2018

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18K09-PTH4-1-CC

Customer identification : May Chang - China - M3010688R

Type : Essential oil

Source : *Litsea cubeba*

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 : Lindsay Girard, B. Sc.

Analysis date : November 13, 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: 1.4835 ± 0.0003 (20 °C)

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	0.02	Aliphatic alcohol
Isovaleral	tr		Aliphatic aldehyde
Toluene	tr	0.02*	Simple phenolic
Unknown	tr	0.01	Unknown
Unknown	tr	0.01	Unknown
Tricyclene	0.01	0.01	Monoterpene
α -Thujene	0.02	[0.02]*	Monoterpene
α -Pinene	0.93	0.92	Monoterpene
Camphene	0.25	0.25	Monoterpene
β -Pinene	1.16*	0.68	Monoterpene
Sabinene	[1.16]*	0.47	Monoterpene
6-Methyl-5-hepten-2-one	0.62	0.59	Aliphatic ketone
Myrcene	0.81	0.80	Monoterpene
6-Methyl-5-hepten-2-ol	0.03	0.03	Aliphatic alcohol
α -Phellandrene	0.03	0.03	Monoterpene
α -Terpinene	0.01	0.01	Monoterpene
para-Cymene	0.02	0.02	Monoterpene
Limonene	11.00*	9.62	Monoterpene
1,8-Cineole	[11.00]*	1.28*	Monoterpenic ether
β -Phellandrene	[11.00]*	[1.28]*	Monoterpene
(Z)- β -Ocimene	0.01	0.01	Monoterpene
(E)- β -Ocimene	0.02	0.01	Monoterpene
2,6-Dimethyl-5-heptenal (melonal)	0.01	0.01	Aliphatic aldehyde
γ -Terpinene	0.03	0.03	Monoterpene
cis-Sabinene hydrate	0.02	0.04	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.01	0.03*	Monoterpenic alcohol
Terpinolene	0.06	0.06	Monoterpene
6,7-Epoxyterpinene	0.01	0.02	Monoterpenic ether
Rosefuran	0.02	0.02	Monoterpenic ether
Linalool	2.44	2.45	Monoterpenic alcohol
cis-Chrysanthemal?	0.01	0.01	Monoterpenic aldehyde
cis-para-Menth-2-en-1-ol	0.02	0.02	Monoterpenic alcohol
cis-Limonene oxide	0.02	[0.03]*	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.02	29.34*	Monoterpenic alcohol
trans-Limonene oxide	0.03	0.02	Monoterpenic ether
trans-Chrysanthemal	0.17*	0.01	Monoterpenic aldehyde
exo-Isocitral	[0.17]*	0.16	Monoterpenic aldehyde
Citronellal	1.28	1.26	Monoterpenic aldehyde
Borneol	0.05	0.50*	Monoterpenic alcohol
Isoneral	0.80	0.77	Monoterpenic aldehyde
Terpinen-4-ol	0.10*	0.10*	Monoterpenic alcohol
Rosefuran oxide	[0.10]*	[0.10]*	Monoterpenic ether
Unknown	0.07	0.07	Oxygenated monoterpene
Isogeranial	1.26	1.22	Monoterpenic aldehyde
α -Terpineol	0.45	[0.50]*	Monoterpenic alcohol
Methyl salicylate	0.02	0.02	Phenolic ester
trans-Isopiperitenol	0.01	0.01*	Monoterpenic alcohol
trans-Piperitol	0.04	0.07*	Monoterpenic alcohol

<i>cis</i> -Isopiperitenol	0.01	[0.01]*	Monoterpenic alcohol
Nerol	0.74	0.73	Monoterpenic alcohol
Citronellol	1.12	1.14	Monoterpenic alcohol
Neral	29.33	[29.34]*	Monoterpenic aldehyde
Piperitone	0.06	0.08	Monoterpenic ketone
Geraniol	1.03	1.09	Monoterpenic alcohol
Geranial	41.56	41.65*	Monoterpenic aldehyde
Unknown	0.09	0.08	Oxygenated monoterpene
Neric acid	0.06	0.07	Monoterpenic acid
Unknown	0.11	0.08	Unknown
Unknown	0.04	0.16*	Unknown
Geranic acid	0.38	0.41	Aliphatic acid
Unknown	0.14	[0.16]*	Unknown
Geranyl acetate	0.05	0.06	Monoterpenic ester
β -Elemene	0.14	1.36*	Sesquiterpene
β -Caryophyllene	1.23	[1.36]*	Sesquiterpene
α -Humulene	0.12	0.12	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.02	0.02	Sesquiterpene
Bicyclogermacrene	0.05		Sesquiterpene
β -Bisabolene	0.01	[41.65]*	Sesquiterpene
δ -Cadinene	0.02	[0.07]*	Sesquiterpene
Unknown	0.02		Oxygenated sesquiterpene
α -Elemol	0.02	0.02	Sesquiterpenic alcohol
Spathulenol	0.02	0.02	Sesquiterpenic alcohol
Caryophyllene oxide	0.15*	0.12	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.15]*	0.03	Sesquiterpenic ether
Humulene epoxide II	0.02	[0.16]*	Sesquiterpenic ether
Unknown	0.01		Unknown
Unknown	0.02		Unknown
Unknown	0.05		Unknown
Unknown	0.01		Unknown
Unknown	0.04		Unknown
Unknown	0.04		Unknown
Unknown	0.07		Unknown
Total identified	97.92%	98.02%	

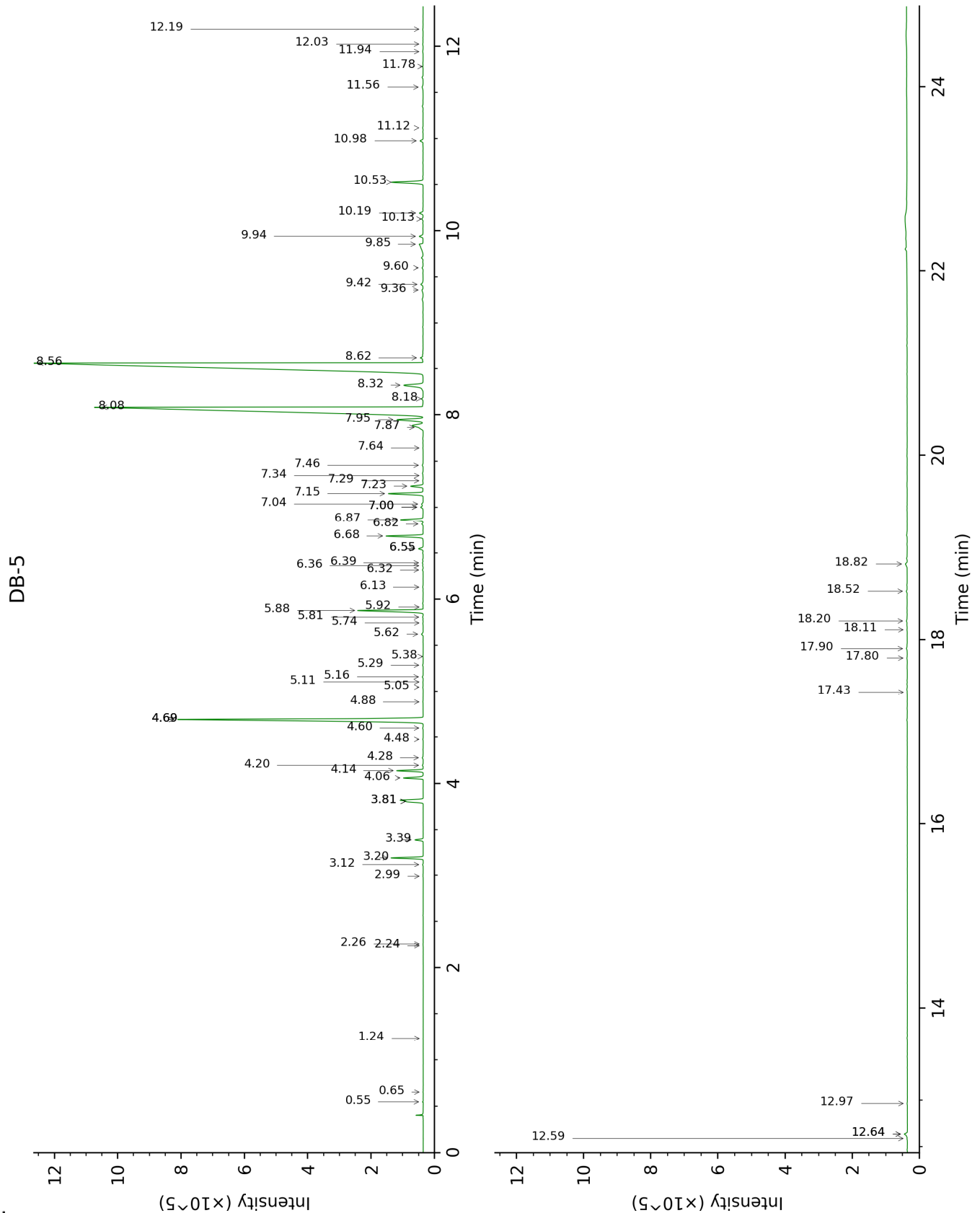
*: Two or more compounds are coeluting on this column

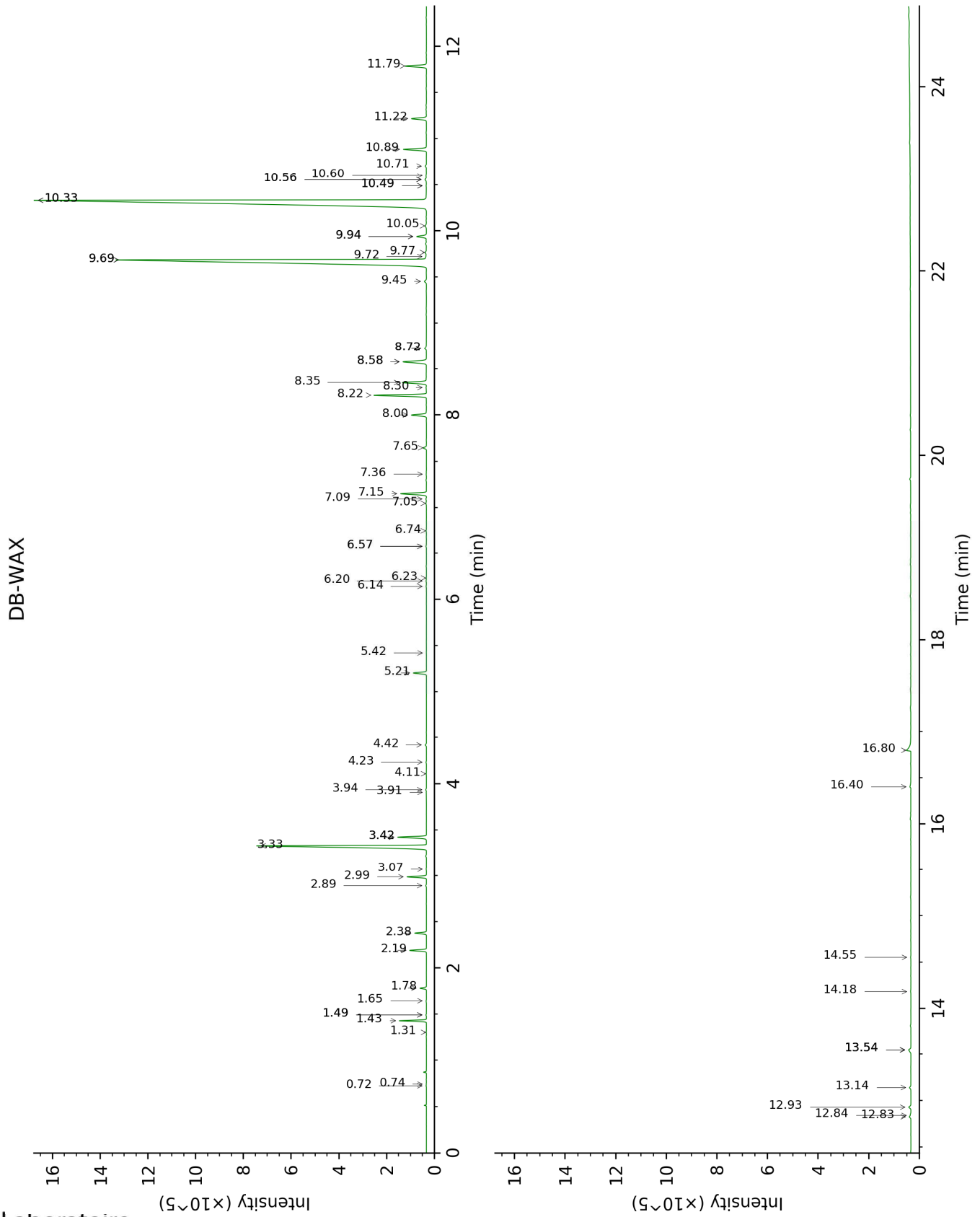
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	0.55	608	0.01	1.65	1016	0.02
Isovaleral	0.65	642	tr			
Toluene	1.24	757	tr	1.49*	1001	0.02
Unknown [m/z 55, 83 (89), 82 (70), 67 (66), 41 (55), 69 (46), 111 (37)... 126 (2)]	2.24	858	tr	0.74	874	0.01
Unknown [m/z 55, 83 (79), 67 (65), 41 (63), 82 (60), 69 (58)... 111 (27), 126 (9)]	2.26	859	tr	0.72	868	0.01
Tricyclene	2.99	916	0.01	1.31	974	0.01
α -Thujene	3.12	925	0.02	1.49*	1001	[0.02]
α -Pinene	3.20	930	0.93	1.43	993	0.92
Camphene	3.39	942	0.25	1.78	1028	0.25
β -Pinene	3.81*†	970	1.16	2.19	1067	0.68
Sabinene	3.81*†	970	[1.16]	2.38	1085	0.47
6-Methyl-5-hepten-2-one	4.06	986	0.62	5.21	1298	0.59
Myrcene	4.14	992	0.81	2.99	1134	0.80
6-Methyl-5-hepten-2-ol	4.20	995	0.03	7.09	1435	0.03
α -Phellandrene	4.28	1001	0.03	2.89	1127	0.03
α -Terpinene	4.48	1013	0.01	3.07	1141	0.01
para-Cymene	4.60	1021	0.02	4.23	1231	0.02
Limonene	4.69*	1027	11.00	3.33	1161	9.62
1,8-Cineole	4.69*	1027	[11.00]	3.42*	1168	1.28
β -Phellandrene	4.69*	1027	[11.00]	3.42*	1168	[1.28]
(Z)- β -Ocimene	4.88	1039	0.01	3.91	1206	0.01
(E)- β -Ocimene	5.05	1049	0.02	4.11	1221	0.01
2,6-Dimethyl-5-heptenal (melonal)	5.10	1053	0.01	5.42	1314	0.01
γ -Terpinene	5.16	1056	0.03	3.94	1208	0.03
cis-Sabinene hydrate	5.29	1064	0.02	7.05	1431	0.04
cis-Linalool oxide (fur.)	5.38	1070	0.01	6.57*	1396	0.03
Terpinolene	5.62	1085	0.06	4.42	1245	0.06
6,7-Epoxymyrcene	5.74	1093	0.01	6.20	1370	0.02
Rosefuran	5.81	1097	0.02	6.14	1365	0.02
Linalool	5.88	1102	2.44	8.22	1519	2.45
cis-Chrysanthemal?	5.92	1104	0.01	6.23	1372	0.01
cis-para-Menth-2-en-1-ol	6.13	1118	0.02	8.30	1525	0.02

<i>cis</i> -Limonene oxide	6.32	1130	0.02	6.57*	1396	[0.03]
<i>cis</i> -para-Mentha-2,8-dien-1-ol	6.36	1133	0.02	9.69*	1634	29.34
<i>trans</i> -Limonene oxide	6.39	1135	0.03	6.74	1409	0.02
<i>trans</i> -Chrysanthemal	6.55*	1145	0.17	7.36	1454	0.01
exo-Isocitral	6.55*	1145	[0.17]	7.65	1476	0.16
Citronellal	6.68	1154	1.28	7.15	1439	1.26
Borneol	6.82	1162	0.05	9.94*	1654	0.50
Isoneral	6.87	1166	0.80	8.00	1502	0.77
Terpinen-4-ol	7.00*	1174	0.10	8.72*	1558	0.10
Rosefuran oxide	7.00*	1174	[0.10]	8.72*	1558	[0.10]
Unknown [m/z 84, 83 (74), 137 (56), 41 (47), 93 (43), 108 (40)... 152 (2)]	7.04	1177	0.07	9.77	1640	0.07
Isogeranial	7.15	1184	1.26	8.35	1529	1.22
α -Terpineol	7.23	1189	0.45	9.94*	1654	[0.50]
Methyl salicylate	7.29	1193	0.02	10.60	1708	0.02
<i>trans</i> -Isopiperitenol	7.34	1197	0.01	10.49*	1699	0.01
<i>trans</i> -Piperitol	7.46	1204	0.04	10.56*	1704	0.07
<i>cis</i> -Isopiperitenol	7.64	1217	0.01	10.49*	1699	[0.01]
Nerol	7.87	1232	0.74	11.22	1760	0.73
Citronellol	7.95	1238	1.12	10.89	1732	1.14
Neral	8.08	1247	29.33	9.69*	1634	[29.34]
Piperitone	8.18	1253	0.06	10.05	1663	0.08
Geraniol	8.32	1263	1.03	11.79	1809	1.09
Geranial	8.56	1280	41.56	10.33*	1686	41.65
Unknown [m/z 43, 69 (77), 41 (70), 109 (54)... 152 (6)]	8.62	1284	0.09	13.14	1930	0.08
Neric acid	9.36	1329	0.06	16.40	2248	0.07
Unknown [m/z 82, 59 (44), 41 (43), 95 (31), 43 (29), 81 (24)...]	9.42	1334	0.11	12.83	1901	0.08
Unknown [m/z 110, 95 (98), 109 (40), 43 (35), 111 (32)... 153 (13)...]	9.60	1346	0.04	13.54*	1967	0.16
Geranic acid	9.85	1365	0.38	16.80	2289	0.41
Unknown [m/z 81, 59 (94), 41 (74), 85 (40), 43 (55)...]	9.94	1371	0.14	13.54*	1967	[0.16]
Geranyl acetate	10.13	1384	0.05	10.71	1717	0.06
β -Elemene	10.19	1389	0.14	8.58*	1546	1.36
β -Caryophyllene	10.52	1413	1.23	8.58*	1546	[1.36]
α -Humulene	10.98	1447	0.12	9.45	1615	0.12
(<i>E</i>)- β -Farnesene	11.12	1458	0.02	9.72	1637	0.02

Bicyclogermacrene	11.56	1491	0.05			
β-Bisabolene	11.78	1508	0.01	10.33*	1686	[41.65]
δ-Cadinene	11.94	1520	0.02	10.56*	1704	[0.07]
Unknown [m/z 69, 41 (80), 82 (63), 43 (57), 98 (54)... 220 (t)]	12.03	1527	0.02			
α-Elemol	12.19	1540	0.02	14.18	2027	0.02
Spathulenol	12.59	1572	0.02	14.55	2063	0.02
Caryophyllene oxide	12.64*†	1575	0.15	12.93	1910	0.12
Caryophyllene oxide isomer	12.64*†	1575	[0.15]	12.84	1902	0.03
Humulene epoxide II	12.97	1601	0.02	13.54*	1967	[0.16]
Unknown [m/z 41, 69 (95), 109 (41), 95 (39), 55 (36), 121 (36)...]	17.43	1998	0.01			
Unknown [m/z 69, 41 (90), 95 (49), 109 (43), 219 (43), 55 (30)...]	17.80	2034	0.02			
Unknown [m/z 69, 41 (94), 81 (42), 109 (39), 107 (33), 43 (31)...]	17.90	2044	0.05			
Unknown [m/z 69, 41 (73), 81 (55), 109 (26), 95 (25), 94 (20)...]	18.11	2064	0.01			
Unknown [m/z 69, 41 (73), 55 (46), 95 (40), 109 (39), 91 (39)...]	18.20	2074	0.04			
Unknown [m/z 69, 41 (64), 81 (32), 109 (23), 94 (19), 95 (18)...]	18.52	2106	0.04			
Unknown [m/z 69, 41 (38), 151 (36), 123 (34), 82 (24), 43 (23), 109 (21)...]	18.82	2136	0.07			
Total identified		97.92%			98.02%	
Total reported		98.63%			98.26%	

*: 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