

GC/MS BATCH NUMBER: M30105

ESSENTIAL OIL: MAY CHANG
BOTANICAL NAME: LITSEA CUBEBA
ORIGIN: CHINA

KEY CONSTITUENTS PRESENT IN THIS BATCH OF MAY CHANG OIL	%
GERANIAL	38.8
NERAL	29.8
LIMONENE	11.1
CITRONELLAL	1.6
1,8-CINEOLE + β -PHELLANDRENE	1.7
ISOGERANIAL	1.5
β -CARYOPHYLLENE	1.3
GERANIOL	1.3
α -PINENE	1.2
LINALOOL	1.2
MYRCENE	1.1

Date : May 25, 2018

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18E18-PTH2-1-CC

Customer identification : May Chang - China - M3010576R

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 : Sarah-Eve Tremblay, M. Sc. A., Chimiste

Analysis date : May 25, 2018

Checked and approved by :

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

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This report is digitally signed, it is only considered valid if the digital signature is intact.

PHYSICOCHEMICAL DATA

Physical aspect: Light yellow liquid

Refractive index: 1.4828 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Ethanol	0.09	0.06	Aliphatic alcohol
2-Methyl-3-buten-2-ol	0.01	0.02	Aliphatic alcohol
Isovaleral	tr	0.01	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	1.20	1.21	Monoterpene
Camphene	0.33	0.32	Monoterpene
Sabinene	1.50*	0.61	Monoterpene
β -Pinene	[1.50]*	0.90	Monoterpene
6-Methyl-5-hepten-2-one	0.79*	0.77	Aliphatic ketone
Dehydro-1,8-cineole	[0.79]*	0.04	Monoterpenic ether
Myrcene	1.06	1.07	Monoterpene
6-Methyl-5-hepten-2-ol	0.03	0.03	Aliphatic alcohol
α -Phellandrene	0.03	0.04	Monoterpene
Δ^3 -Carene	tr	0.01	Monoterpene
α -Terpinene	0.01	0.02	Monoterpene
para-Cymene	0.02	0.03	Monoterpene
Limonene	12.63*	11.10	Monoterpene
1,8-Cineole	[12.63]*	1.68*	Monoterpenic ether
β -Phellandrene	[12.63]*	[1.68]*	Monoterpene
(Z)- β -Ocimene	0.01	0.01	Monoterpene
(E)- β -Ocimene	0.01	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	0.02	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.01	0.01	Monoterpenic alcohol
Terpinolene	0.07	0.07	Monoterpene
6,7-Epoxyterpinene	0.01	0.01	Monoterpenic ether
Rosefuran	0.02	0.03	Monoterpenic ether
Linalool	1.18	1.18	Monoterpenic alcohol
cis-Chrysanthemal?	0.01	0.01	Monoterpenic aldehyde
cis-para-Menth-2-en-1-ol	0.02	0.01	Monoterpenic alcohol
cis-Limonene oxide	0.02	0.03	Monoterpenic ether
cis-para-Mentha-2,8-dien-1-ol	0.02	30.01*	Monoterpenic alcohol
trans-Limonene oxide	0.03	0.02	Monoterpenic ether
exo-Isocitral	0.20*	0.14	Monoterpenic aldehyde
trans-Chrysanthemal	[0.20]*	0.01	Monoterpenic aldehyde
Citronellal	1.68	1.66	Monoterpenic aldehyde
Borneol	0.05	0.61*	Monoterpenic alcohol
Isoneral	0.95	0.76	Monoterpenic aldehyde
Terpinen-4-ol	0.11*	0.14	Monoterpenic alcohol
Rosefuran oxide	[0.11]*	0.01	Monoterpenic ether
Unknown	0.08	0.07	Oxygenated monoterpene
Isogeranial	1.53	1.34	Monoterpenic aldehyde
α -Terpineol	0.53	[0.61]*	Monoterpenic alcohol

Methyl salicylate	0.02	0.02*	Phenolic ester
<i>trans</i> -Isopiperitenol	0.13	0.09*	Monoterpenic alcohol
<i>trans</i> -Piperitol	0.03	[0.09]*	Monoterpenic alcohol
<i>cis</i> -Isopiperitenol	0.01	0.01	Monoterpenic alcohol
Nerol	0.42	0.49	Monoterpenic alcohol
Citronellol	0.22	0.21	Monoterpenic alcohol
Neral	29.82	[30.01]*	Monoterpenic aldehyde
Piperitone	0.05	0.05	Monoterpenic ketone
Geraniol	1.32	1.33	Monoterpenic alcohol
Geranial	38.80	39.05*	Monoterpenic aldehyde
Unknown	0.11	0.08	Oxygenated monoterpene
Citronellic acid	0.07	0.07	Monoterpenic acid
Unknown	0.09	0.11*	Unknown
Unknown	0.04	0.08	Unknown
Neric acid	0.03	0.06	Monoterpenic acid
Geranic acid	0.40	0.41	Aliphatic acid
α -Copaene	0.14*	0.02	Sesquiterpene
Unknown	[0.14]*	0.06*	Unknown
Geranyl acetate	0.05	0.06	Monoterpenic ester
β -Elemene	0.16	1.48*	Sesquiterpene
β -Caryophyllene	1.34	[1.48]*	Sesquiterpene
α -Humulene	0.14	0.14	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.02	[30.01]*	Sesquiterpene
Bicyclogermacrene	0.02	0.01	Sesquiterpene
β -Bisabolene	0.02	[39.05]*	Sesquiterpene
δ -Cadinene	0.02	[0.02]*	Sesquiterpene
Unknown	0.01		Oxygenated sesquiterpene
α -Elemol	0.01	0.03	Sesquiterpenic alcohol
Spathulenol	0.01	0.01	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.16*	[0.11]*	Sesquiterpenic ether
Caryophyllene oxide	[0.16]*	0.13	Sesquiterpenic ether
Humulene epoxide II	0.02	[0.06]*	Sesquiterpenic ether
Unknown	0.03		Unknown
Unknown	0.02		Unknown
Total identified	97.70%	97.90%	

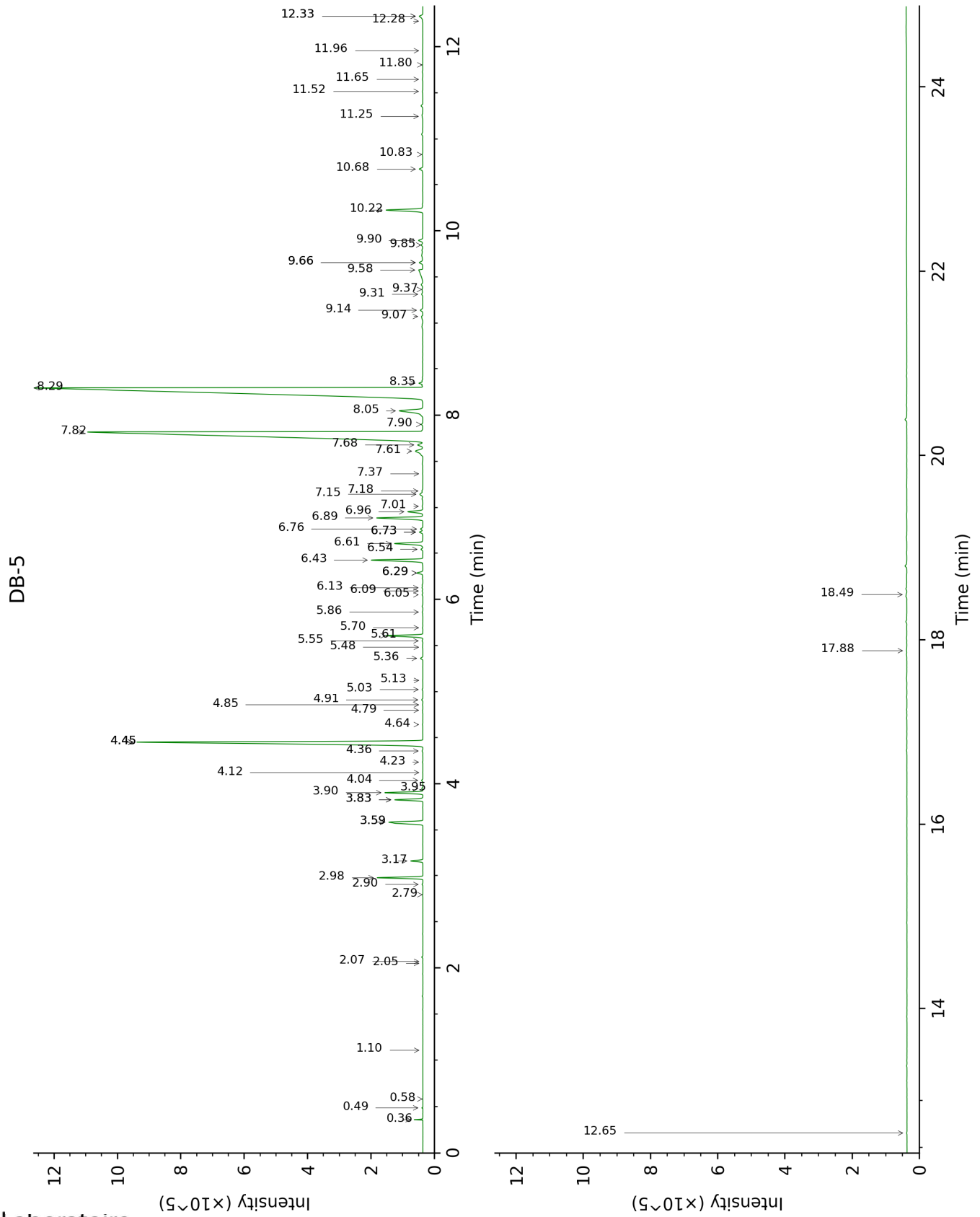
*: Two or more compounds are coeluting on this column

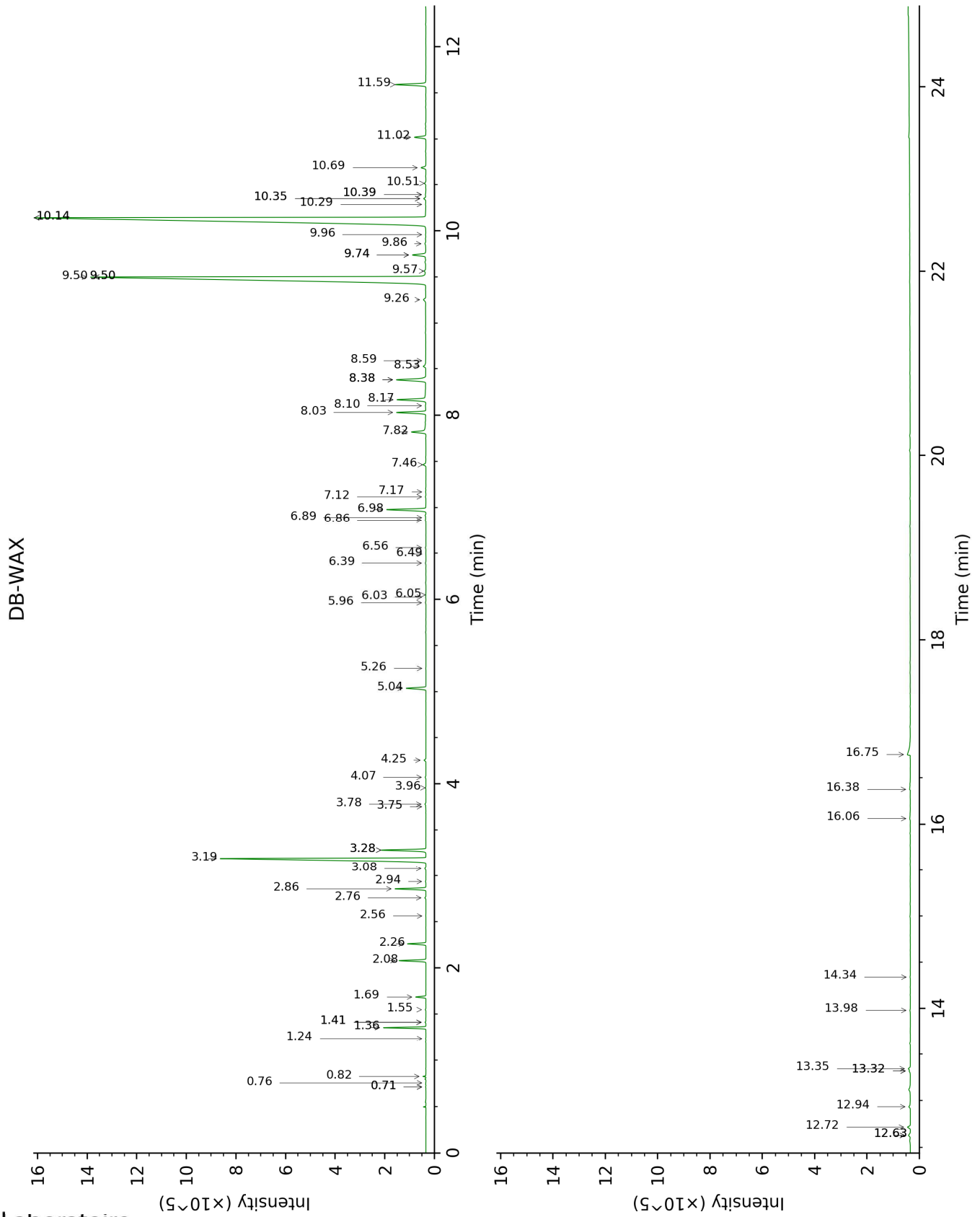
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	%
Ethanol	0.36	498	0.09	0.82	908	0.06
2-Methyl-3-buten-2-ol	0.49	607	0.01	1.55	1018	0.02
Isovaleral	0.58	640	tr	0.76	888	0.01
Toluene	1.10	755	tr	1.41*	1004	0.02
Unknown [m/z 55, 83 (89), 82 (70), 67 (66), 41 (55), 69 (46), 111 (37)... 126 (2)]	2.05	857	tr	0.71*	872	0.01
Unknown [m/z 55, 83 (79), 67 (65), 41 (63), 82 (60), 69 (58)... 111 (27), 126 (9)]	2.07	858	tr	0.71*	872	[0.01]
Tricyclene	2.79	917	0.01	1.24	975	0.01
α -Thujene	2.90	924	0.02	1.41*	1004	[0.02]
α -Pinene	2.98	929	1.20	1.36	995	1.21
Camphene	3.17	942	0.33	1.69	1031	0.32
Sabinene	3.59*	970	1.50	2.26	1088	0.61
β -Pinene	3.59*	970	[1.50]	2.08	1070	0.90
6-Methyl-5-hepten-2-one	3.83*	986	0.79	5.04	1299	0.77
Dehydro-1,8-cineole	3.83*	986	[0.79]	3.08	1154	0.04
Myrcene	3.90	992	1.06	2.86	1137	1.07
6-Methyl-5-hepten-2-ol	3.95	995	0.03	6.86	1431	0.03
α -Phellandrene	4.04	1000	0.03	2.76	1130	0.04
Δ^3 -Carene	4.12	1006	tr	2.56	1114	0.01
α -Terpinene	4.23	1013	0.01	2.94	1143	0.02
para-Cymene	4.36	1021	0.02	4.07	1230	0.03
Limonene	4.45*	1027	12.63	3.19	1163	11.10
1,8-Cineole	4.45*	1027	[12.63]	3.28*	1170	1.68
β -Phellandrene	4.45*	1027	[12.63]	3.28*	1170	[1.68]
(Z)- β -Ocimene	4.64	1039	0.01	3.75	1207	0.01
(E)- β -Ocimene	4.80	1049	0.01	3.96	1221	0.01
2,6-Dimethyl-5-heptenal (melonal)	4.85	1052	0.01	5.26	1315	0.01
γ -Terpinene	4.91	1056	0.03	3.78	1209	0.03
cis-Sabinene hydrate	5.03	1063	0.02	6.89	1434	0.02
cis-Linalool oxide (fur.)	5.13	1070	0.01	6.49	1404	0.01
Terpinolene	5.36	1085	0.07	4.26	1243	0.07
6,7-Epoxymyrcene	5.48	1092	0.01	6.05	1372	0.01
Rosefuran	5.55	1097	0.02	5.96	1366	0.03
Linalool	5.61	1100	1.18	8.03	1519	1.18

<i>cis</i> -Chrysanthemal?	5.70	1106	0.01	6.03	1370	0.01
<i>cis</i> -para-Menth-2-en-1-ol	5.86	1117	0.02	8.10	1525	0.01
<i>cis</i> -Limonene oxide	6.05	1129	0.02	6.39	1397	0.03
<i>cis</i> -para-Mentha-2,8-dien-1-ol	6.09	1131	0.02	9.50*	1635	30.01
<i>trans</i> -Limonene oxide	6.13	1134	0.03	6.56	1409	0.02
exo-Isocitral	6.29*	1144	0.20	7.46	1476	0.14
<i>trans</i> -Chrysanthemal	6.29*	1144	[0.20]	7.17	1454	0.01
Citronellal	6.43	1153	1.68	6.98	1440	1.66
Borneol	6.54	1160	0.05	9.74*	1655	0.61
Isoneral	6.60	1164	0.95	7.82	1503	0.76
Terpinen-4-ol	6.73*	1172	0.11	8.53	1558	0.14
Rosefuran oxide	6.73*	1172	[0.11]	8.59	1563	0.01
Unknown [m/z 84, 83 (74), 137 (56), 41 (47), 93 (43), 108 (40)... 152 (2)]	6.76	1174	0.08	9.57	1640	0.07
Isogeranial	6.89	1183	1.53	8.17	1530	1.34
α -Terpineol	6.96	1187	0.53	9.74*	1655	[0.61]
Methyl salicylate	7.02	1191	0.02	10.39*	1708	0.02
<i>trans</i> -Isopiperitenol	7.15	1199	0.13	10.35*	1704	0.09
<i>trans</i> -Piperitol	7.18	1201	0.03	10.35*	1704	[0.09]
<i>cis</i> -Isopiperitenol	7.37	1214	0.01	10.29	1699	0.01
Nerol	7.61	1230	0.42	11.02	1762	0.49
Citronellol	7.68	1235	0.22	10.69	1734	0.21
Neral	7.82	1244	29.82	9.50*	1635	[30.01]
Piperitone	7.90	1250	0.05	9.86	1665	0.05
Geraniol	8.05	1260	1.32	11.59	1810	1.33
Geranial	8.30	1276	38.80	10.14*	1687	39.05
Unknown [m/z 43, 69 (77), 41 (70), 109 (54)... 152 (6)]	8.35	1280	0.11	12.94	1932	0.08
Citronellic acid	9.08	1330	0.07	16.06	2238	0.07
Unknown [m/z 82, 59 (44), 41 (43), 95 (31), 43 (29), 81 (24)...]	9.14	1335	0.09	12.63*	1903	0.11
Unknown [m/z 110, 95 (98), 109 (40), 43 (35), 111 (32)... 153 (13)...]	9.32	1347	0.04	13.34	1970	0.08
Neric acid	9.37	1351	0.03	16.38	2271	0.06
Geranic acid	9.58	1365	0.40	16.75	2310	0.41
α -Copaene	9.66*	1371	0.14	7.12	1450	0.02
Unknown [m/z 81, 59 (94), 41 (74), 85	9.66*	1371	[0.14]	13.32*	1967	0.06

(40), 43 (55)...						
Geranyl acetate	9.85	1385	0.05	10.51	1718	0.06
β-Elemene	9.90	1388	0.16	8.38*	1547	1.48
β-Caryophyllene	10.22	1412	1.34	8.38*	1547	[1.48]
α-Humulene	10.68	1445	0.14	9.26	1615	0.14
(E)-β-Farnesene	10.83	1457	0.02	9.50*	1635	[30.01]
Bicyclogermacrene	11.25	1488	0.02	9.96	1673	0.01
β-Bisabolene	11.52	1508	0.02	10.14*	1687	[39.05]
δ-Cadinene	11.65	1519	0.02	10.39*	1708	[0.02]
Unknown [m/z 69, 41 (80), 82 (63), 43 (57), 98 (54)... 220 (t)]	11.80	1531	0.01			
α-Elemol	11.96	1543	0.01	13.98	2030	0.03
Spathulenol	12.28	1568	0.01	14.34	2064	0.01
Caryophyllene oxide isomer	12.33*	1572	0.16	12.63*	1903	[0.11]
Caryophyllene oxide	12.33*	1572	[0.16]	12.72	1911	0.13
Humulene epoxide II	12.65	1598	0.02	13.32*	1967	[0.06]
Unknown [m/z 69, 41 (73), 55 (46), 95 (40), 109 (39), 91 (39)...	17.88	2069	0.03			
Unknown [m/z 69, 41 (38), 151 (36), 123 (34), 82 (24), 43 (23), 109 (21)...	18.49	2131	0.02			
Total identified		97.70%			97.90%	
Total reported		98.09%			98.14%	

*: 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