

Date : April 09, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19D08-PTH02-1-SCC

Customer identification : Palmarosa Organic - India - PK010191

Type : Essential oil

Source : *Cymbopogon martini*

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 : April 08, 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: 1.4729 ± 0.0003 (20 °C)

NFT 75-234:2011 - OIL OF PALMAROSA

Compound	Min. %	Max. %	Observed %	Complies?
Geranyl caproate	0.4	0.8	0.8	Yes
(2E,6E)-Farnesol	0.2	1.5	0.8	Yes
Nerol	0.2	0.5	0.4	Yes
Geranial	0.2	0.6	0.4	Yes
Neral		0.5	0.2	Yes
β-Caryophyllene	0.7	2.5	1.9	Yes
Geranyl acetate	7	16	10	Yes
Geraniol	72	86	76	Yes
Linalool	1.0	5.5	2.7	Yes
(E)-β-Ocimene	0.5	3.0	1.9	Yes
(Z)-β-Ocimene	0.2	0.6	0.6	Yes
Limonene		1.3	0.3	Yes
Myrcene		0.5	0.3	Yes
Refractive index	1.4700	1.4780	1.4729	Yes

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil complies with the AFNOR standard for palmarosa oil.

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Ethanol	0.01	0.02	Aliphatic alcohol
2-Methyl-3-buten-2-ol	tr	tr	Aliphatic alcohol
Isovaleral	0.01	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	tr	Aliphatic aldehyde
Isoamyl alcohol	0.03	0.03	Aliphatic alcohol
(3Z)-Hexenol	0.01	0.01	Aliphatic alcohol
Hexanol	0.01		Aliphatic alcohol
Isoamyl acetate	0.01	0.01	Aliphatic ester
2-Heptanone	0.01	0.01	Aliphatic ketone
Sabinene	0.01	0.01	Monoterpene
6-Methyl-5-hepten-2-one	0.09	0.09	Aliphatic ketone
Myrcene	0.31*	0.28	Monoterpene
<i>trans</i> -Dehydroxylinalool oxide	[0.31]*	0.05	Monoterpenic ether
α -Phellandrene	0.03	tr	Monoterpene
<i>cis</i> -Dehydroxylinalool oxide	0.02	0.02*	Monoterpenic ether
para-Cymene	0.01		Monoterpene
Limonene	0.28*	0.26	Monoterpene
1,8-Cineole	[0.28]*	0.02	Monoterpenic ether
(Z)- β -Ocimene	0.65	0.64	Monoterpene
(E)- β -Ocimene	1.87	1.87	Monoterpene
γ -Terpinene	0.01	[0.02]*	Monoterpene
<i>cis</i> -Linalool oxide (fur.)	0.02	0.03	Monoterpenic alcohol
Octanol	0.02	0.02	Aliphatic alcohol
Terpinolene	0.05*	0.04	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	[0.05]*	0.02	Monoterpenic alcohol
Rosefuran	0.01	0.01	Monoterpenic ether
Linalool	2.66	2.61	Monoterpenic alcohol
Nonanal	0.03	0.02	Aliphatic aldehyde
Unknown	0.02		Unknown
Citronellal	0.03*	0.03	Monoterpenic aldehyde
Nerol oxide	[0.03]*	0.02	Aliphatic ether
Menthol	0.04	0.04	Monoterpenic alcohol
Terpinen-4-ol	0.01	0.01	Monoterpenic alcohol
Isogeranial	0.01	0.02	Monoterpenic aldehyde
α -Terpineol	0.03	0.03*	Monoterpenic alcohol
Nerol	0.35	0.37	Monoterpenic alcohol
Citronellol	0.09	0.10	Monoterpenic alcohol
Neral	0.19	0.21	Monoterpenic aldehyde
Isoamyl hexanoate	0.01	0.01	Aliphatic ester
Geraniol	76.42	76.09	Monoterpenic alcohol
Geranial	0.39	0.33	Monoterpenic aldehyde
Geranyl formate	0.11	0.15*	Monoterpenic ester
2,3-Epoxygeraniol?	0.01		Oxygenated monoterpene
Geranic acid	0.02	0.03	Aliphatic acid
Unknown	0.04		Unknown
Neryl acetate	0.07	0.06	Monoterpenic ester
Unknown	0.02		Unknown
Geranyl acetate	9.70	9.57	Monoterpenic ester

β-Elemene	0.07	1.84*	Sesquiterpene
β-Caryophyllene	1.88	[1.84]*	Sesquiterpene
α-Guaiene	0.02	[1.84]*	Sesquiterpene
α-Humulene	0.14	0.11	Sesquiterpene
Germacrene D	0.01	[0.03]*	Sesquiterpene
Unknown	0.06	0.07	Sesquiterpene
β-Selinene	0.03	0.03	Sesquiterpene
Valencene	0.05	[0.15]*	Sesquiterpene
α-Muurolene	0.02	0.01	Sesquiterpene
α-Elemol	0.01	0.05	Sesquiterpenic alcohol
Unknown	0.01		Unknown
Geranyl butyrate	0.17	0.24	Monoterpenic ester
(E)-Nerolidol	0.09	0.09	Sesquiterpenic alcohol
Caryophyllene oxide	0.18*	0.17	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.18]*	0.01	Sesquiterpenic ether
Humulene epoxide II	0.01	0.02	Sesquiterpenic ether
Precocene II	0.01	0.01	Chromane
(3Z)-Caryophylla-3,8(13)-dien-5β-ol	0.01	0.78*	Sesquiterpenic alcohol
(2E,6Z)-Farnesol	0.13	0.05	Sesquiterpenic alcohol
(2E,6E)-Farnesol	0.76	[0.78]*	Sesquiterpenic alcohol
(2E,6E)-Farnesal	0.01	0.01	Sesquiterpenic aldehyde
Geranyl caproate	0.77	0.80	Monoterpenic ester
(2E,6E)-Farnesyl acetate	0.09	0.09	Sesquiterpenic ester
Phytone	0.02	0.02	Terpenic ketone
Geranyl caprylate	0.16		Monoterpenic ester
Unknown	0.01		Monoterpenic ester
Decanal		0.01	Aliphatic aldehyde
Total identified	98.30%	97.50%	

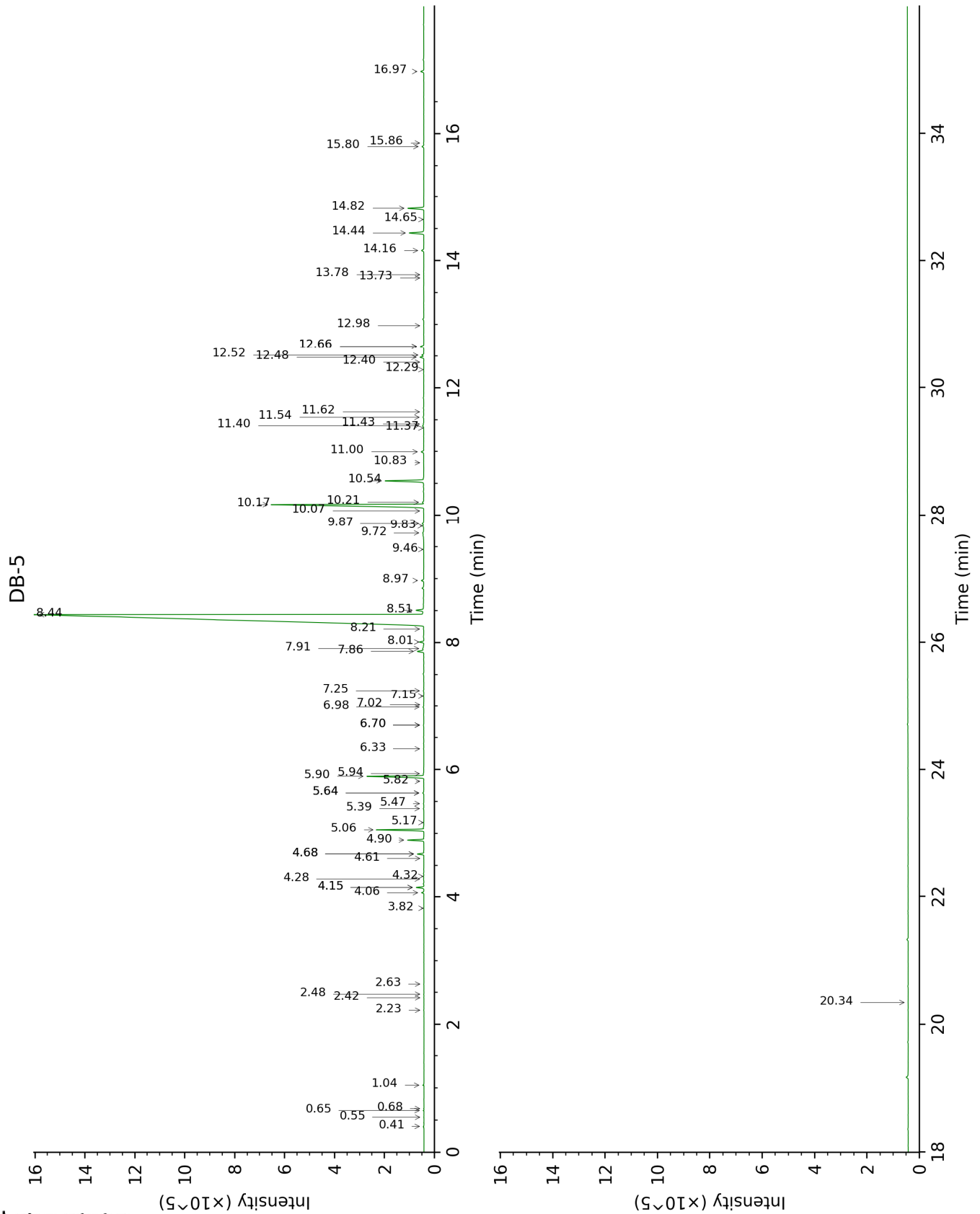
*: Two or more compounds are coeluting on this column

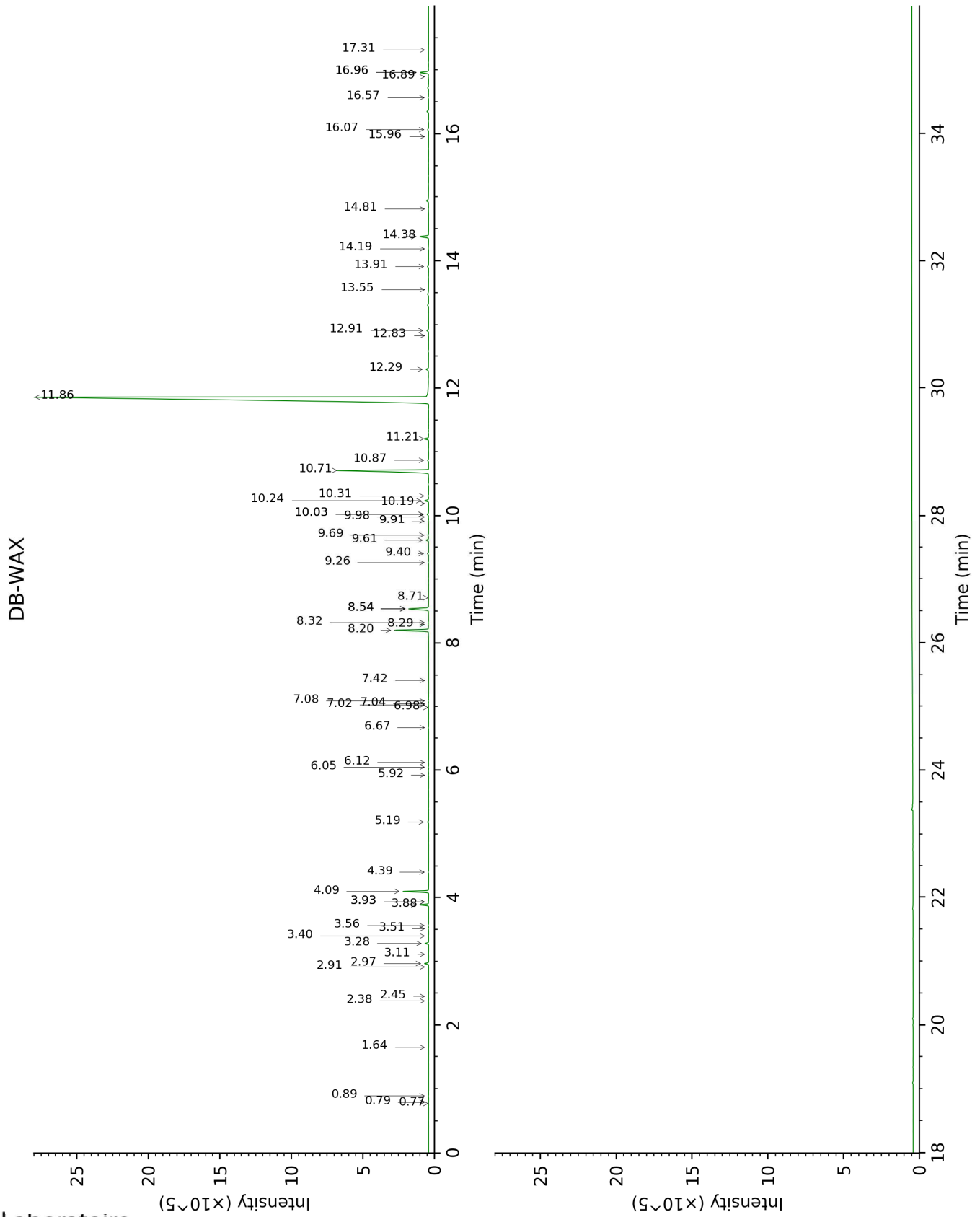
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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	0.40	501	0.01	0.89	906	0.02
2-Methyl-3-buten-2-ol	0.55	608	tr	1.64	1014	tr
Isovaleral	0.65	642	0.01	0.79	887	0.01
2-Methylbutyral	0.68	652	0.01	0.77	880	tr
Isoamyl alcohol	1.04	731	0.03	3.51	1175	0.03
(3Z)-Hexenol	2.22	856	0.01	5.92	1349	0.01
Hexanol	2.42	871	0.01			
Isoamyl acetate	2.48	876	0.01	2.45	1093	0.01
2-Heptanone	2.63	889	0.01	3.11	1144	0.01
Sabinene	3.82	970	0.01	2.38	1086	0.01
6-Methyl-5-hepten-2-one	4.06	986	0.09	5.19	1297	0.09
Myrcene	4.15*	991	0.31	2.97	1133	0.28
<i>trans</i> -Dehydroxylinalool oxide	4.15*	991	[0.31]	3.56	1178	0.05
α -Phellandrene	4.28	1000	0.03	2.91	1128	tr
<i>cis</i> -Dehydroxylinalool oxide	4.32	1003	0.02	3.93*	1206	0.02
para-Cymene	4.61	1021	0.01			
Limonene	4.68*†	1026	0.28	3.28	1157	0.26
1,8-Cineole	4.68*†	1026	[0.28]	3.40	1166	0.02
(Z)- β -Ocimene	4.90	1039	0.65	3.88	1203	0.64
(E)- β -Ocimene	5.06	1049	1.87	4.09	1218	1.87
γ -Terpinene	5.17	1056	0.01	3.93*	1206	[0.02]
<i>cis</i> -Linalool oxide (fur.)	5.39	1070	0.02	6.67	1402	0.03
Octanol	5.47	1075	0.02	8.32	1526	0.02
Terpinolene	5.64*	1086	0.05	4.40	1239	0.04
<i>trans</i> -Linalool oxide (fur.)	5.64*	1086	[0.05]	7.04	1430	0.02
Rosefuran	5.82	1097	0.01	6.12	1363	0.01
Linalool	5.90	1102	2.66	8.20	1517	2.61
Nonanal	5.94	1105	0.03	6.05	1358	0.02
Unknown [m/z 95, 123 (73), 67 (64), 82 (54), 41 (47), 55 (27)...]	6.33	1130	0.02			
Citronellal	6.70*	1154	0.03	7.08	1433	0.03
Nerol oxide	6.70*	1154	[0.03]	6.98	1426	0.02
Menthol	6.98	1172	0.04	9.26	1598	0.04
Terpinen-4-ol	7.02	1175	0.01	8.71	1556	0.01
Isogeranial	7.15	1183	0.01	8.29	1524	0.02
α -Terpineol	7.25	1190	0.03	9.92*	1651	0.03
Nerol	7.86	1231	0.35	11.21	1758	0.37
Citronellol	7.91	1234	0.09	10.87	1730	0.10

Neral	8.01	1241	0.19	9.61	1627	0.21
Isoamyl hexanoate	8.21	1254	0.01	7.02	1428	0.01
Geraniol	8.44	1270	76.42	11.86	1814	76.09
Geranial	8.51	1274	0.39	10.24	1677	0.33
Geranyl formate	8.97	1306	0.11	10.03*	1660	0.15
2,3-Epoxygeraniol?	9.46	1336	0.01			
Geranic acid	9.72	1354	0.02	16.89	2299	0.03
Unknown [m/z 81, 59 (99), 41 (82), 85 (79), 43 (74), 71 (60)...]	9.83	1362	0.04			
Neryl acetate	9.87	1365	0.07	10.31	1683	0.06
Unknown [m/z 43, 41 (25), 67 (24), 109 (23), 93 (20), 69 (19)...]	10.07	1379	0.02			
Geranyl acetate	10.17	1386	9.70	10.71	1717	9.57
β -Elemene	10.21	1389	0.07	8.54*	1542	1.84
β -Caryophyllene	10.54	1413	1.88	8.54*	1542	[1.84]
α -Guaiene	10.83	1434	0.02	8.54*	1542	[1.84]
α -Humulene	11.00	1447	0.14	9.40	1610	0.11
Germacrene D	11.37	1475	0.01	9.92*	1651	[0.03]
Unknown [m/z 189, 133 (75), 91 (71), 105 (69), 93 (44)... 204 (33)]	11.40	1478	0.06	9.69	1633	0.07
β -Selinene	11.43	1480	0.03	9.98	1657	0.03
Valencene	11.54	1488	0.05	10.03*	1660	[0.15]
α -Muurolene	11.62	1494	0.02	10.19	1674	0.01
α -Elemol	12.29	1546	0.01	14.19	2027	0.05
Unknown [m/z 59, 68 (63), 43 (31), 67 (27), 81 (27), 94 (25), 69 (23), 41 (22), 84 (20)...]	12.40	1555	0.01			
Geranyl butyrate	12.48	1561	0.17	12.29	1853	0.24
(E)-Nerolidol	12.52	1564	0.09	13.91	2001	0.09
Caryophyllene oxide	12.66*	1575	0.18	12.91	1908	0.17
Caryophyllene oxide isomer	12.66*	1575	[0.18]	12.83	1901	0.01
Humulene epoxide II	12.98	1600	0.01	13.55	1967	0.02
Precocene II	13.73	1662	0.01	17.31	2344	0.01
(3Z)-Caryophylla-3,8(13)-dien-5 β -ol	13.78	1666	0.01	16.96*	2306	0.78
(2E,6Z)-Farnesol	14.16	1698	0.13	16.57	2265	0.05
(2E,6E)-Farnesol	14.44	1721	0.76	16.96*	2306	[0.78]
(2E,6E)-Farnesal	14.65	1740	0.01	15.96	2202	0.01
Geranyl caproate	14.82	1755	0.77	14.38	2046	0.80

(2E,6E)-Farnesyl acetate	15.80	1841	0.09	16.07	2213	0.09
Phytone	15.86	1846	0.02	14.81	2087	0.02
Geranyl caprylate	16.97	1950	0.16			
Unknown [m/z 69, 81 (47), 109 (33), 41 (26), 95 (19), 137 (18)...]	20.34	2293	0.01			
Decanal				7.42	1458	0.01
Total identified		98.30%			97.50%	
Total reported		98.46%			97.57%	

*: 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