

**Date :** June 16, 2020

**CERTIFICATE OF ANALYSIS – GC PROFILING**

**SAMPLE IDENTIFICATION**

**Internal code :** 20F15-PTH07

**Customer identification :** Palmarosa - India - P10106201R

**Type :** Essential oil

**Source :** *Cymbopogon martini*

**Customer :** Plant Therapy

**ANALYSIS**

**Method:** PC-MAT-007 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.

**Analyst :** Sylvain Mercier, M. Sc., Chimiste

**Analysis date :** June 16, 2020

Checked and approved by :

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

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#### PHYSICOCHEMICAL DATA

**Physical aspect:** Faintly yellow liquid

**Refractive index:** 1.4736 ± 0.0003 (20 °C; method PC-MAT-016)

#### NFT 75-234:2011 - OIL OF PALMAROSA

Compound	Min. %	Max. %	Observed %	Complies?
Geranyl caproate	0.4	0.8	0.7	Yes
(2E,6E)-Farnesol	0.2	1.5	0.9	Yes
Nerol	0.2	0.5	0.2	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	7	Yes
Geraniol	72	86	81	Yes
Linalool	1.0	5.5	2.7	Yes
(E)-β-Ocimene	0.5	3.0	1.5	Yes
(Z)-β-Ocimene	0.2	0.6	0.4	Yes
Limonene		1.3	0.1	Yes
Myrcene		0.5	0.2	Yes
<b>Refractive index</b>	1.4700	1.4780	1.4736	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 – CONSOLIDATED CONTENTS

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

Identification	%	Class
Ethanol	tr	Aliphatic alcohol
2-Methyl-3-buten-2-ol	tr	Aliphatic alcohol
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Isoamyl alcohol	0.02	Aliphatic alcohol
Hexanol	tr	Aliphatic alcohol
Isoamyl acetate	tr	Aliphatic ester
2-Heptanone	tr	Aliphatic ketone
Hashishene	tr	Monoterpene
Tricyclene	tr	Monoterpene
6-Methyl-5-hepten-2-one	0.06	Aliphatic ketone
Myrcene	0.18	Monoterpene
<i>trans</i> -Dehydroxylinalool oxide	0.02	Monoterpenic ether
<i>cis</i> -Dehydroxylinalool oxide	0.02	Monoterpenic ether
para-Cymene	0.01	Monoterpene
Limonene	0.10	Monoterpene
1,8-Cineole	tr	Monoterpenic ether
( <i>Z</i> )- $\beta$ -Ocimene	0.44	Monoterpene
( <i>E</i> )- $\beta$ -Ocimene	1.53	Monoterpene
<i>cis</i> -Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Octanol	0.02	Aliphatic alcohol
Terpinolene	0.02	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Rosefuran	0.01	Monoterpenic ether
Linalool	2.70	Monoterpenic alcohol
Nonanal	0.04	Aliphatic aldehyde
Unknown	0.01	Unknown
Camphor	0.01	Monoterpenic ketone
Citronellal	tr	Monoterpenic aldehyde
Nerol oxide	0.01	Aliphatic ether
Terpinen-4-ol	0.01	Monoterpenic alcohol
Menthol	0.01	Monoterpenic alcohol
$\alpha$ -Terpineol	0.03	Monoterpenic alcohol
Decanal	0.03	Aliphatic aldehyde
2,3-Epoxygeranial?	0.01	Monoterpenic aldehyde
Nerol	0.16	Monoterpenic alcohol
Citronellol	0.02	Monoterpenic alcohol
Neral	0.16	Monoterpenic aldehyde
Isoamyl hexanoate	0.02	Aliphatic ester
Geraniol	80.65	Monoterpenic alcohol
Geranial	0.36	Monoterpenic aldehyde
Geranyl formate	0.10	Monoterpenic ester
2,3-Epoxygeraniol?	0.03	Oxygenated monoterpene
Geranic acid	0.02	Aliphatic acid
Neryl acetate	0.01	Monoterpenic ester

Unknown	0.01	Unknown
Geranyl acetate	7.31	Monoterpenic ester
$\beta$ -Elemene	0.09	Sesquiterpene
$\beta$ -Caryophyllene	1.86	Sesquiterpene
$\alpha$ -Guaiene	0.02	Sesquiterpene
$\alpha$ -Humulene	0.14	Sesquiterpene
Unknown	0.07	Sesquiterpene
$\beta$ -Selinene	0.03	Sesquiterpene
Valencene	0.05	Sesquiterpene
$\alpha$ -Muurolene	0.03	Sesquiterpene
$\gamma$ -Cadinene	0.04	Sesquiterpene
$\delta$ -Cadinene	0.01	Sesquiterpene
$\alpha$ -Elemol	0.01	Sesquiterpenic alcohol
Unknown	0.02	Unknown
Geranyl butyrate	0.17	Monoterpenic ester
( <i>E</i> )-Nerolidol	0.14	Sesquiterpenic alcohol
Caryophyllene oxide isomer	0.03	Sesquiterpenic ether
Caryophyllene oxide	0.20	Sesquiterpenic ether
Humulene epoxide II	0.01	Sesquiterpenic ether
Caryophylladienol II	0.01	Sesquiterpenic alcohol
(3 <i>Z</i> )-Caryophylla-3,8(13)-dien-5 $\beta$ -ol	0.01	Sesquiterpenic alcohol
(2 <i>E</i> ,6 <i>E</i> )-Farnesol	0.91	Sesquiterpenic alcohol
(2 <i>E</i> ,6 <i>E</i> )-Farnesal	0.01	Sesquiterpenic aldehyde
Geranyl caproate	0.71	Monoterpenic ester
(2 <i>E</i> ,6 <i>E</i> )-Farnesyl acetate	0.09	Sesquiterpenic ester
Phytone	0.03	Terpenic ketone
Geranyl caprylate	0.18	Monoterpenic ester
Unknown	0.01	Unknown
Unknown	0.02	Unknown
<b>Consolidated total</b>	<b>99.10%</b>	

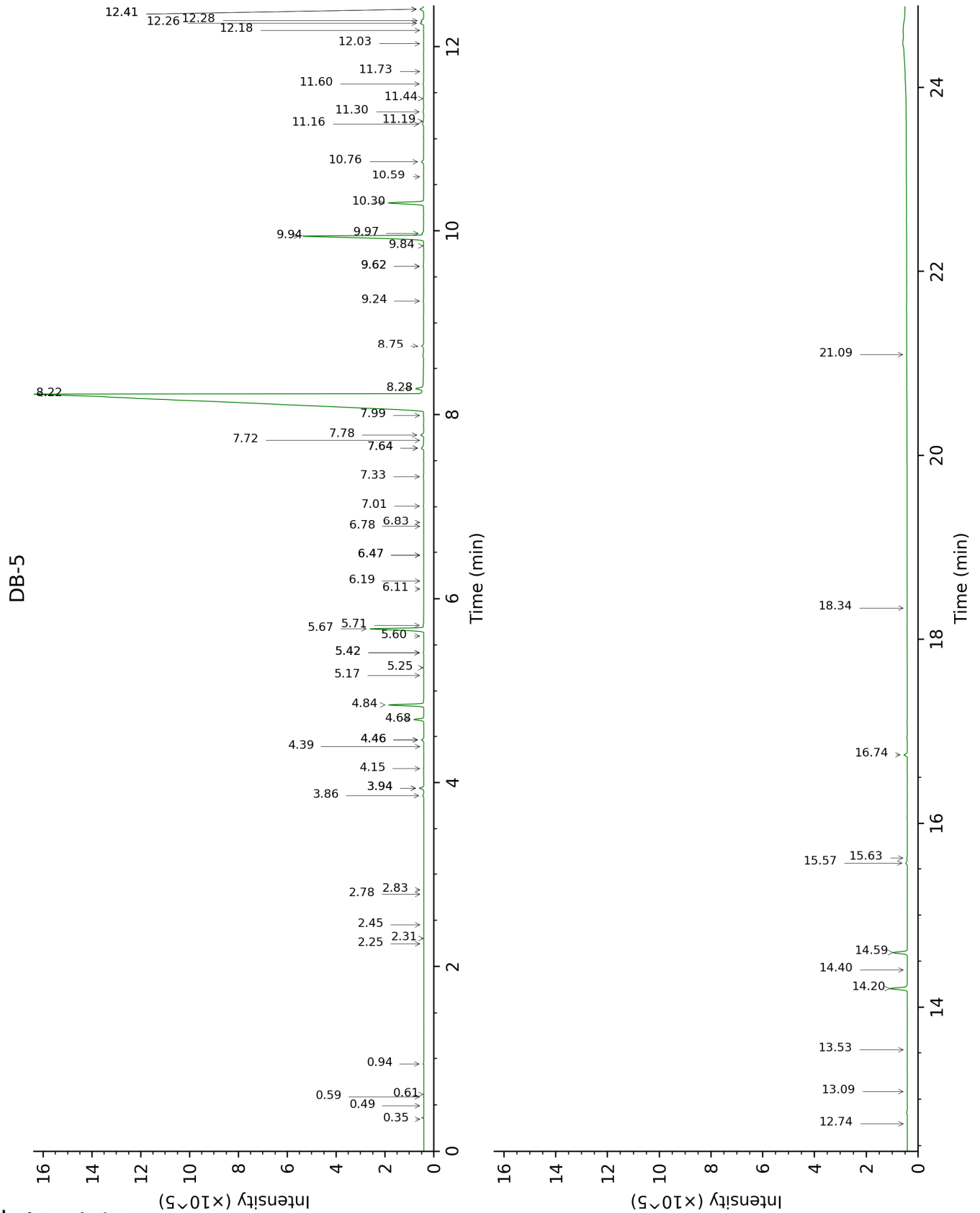
tr: The compound has been detected below 0.005% of total signal.

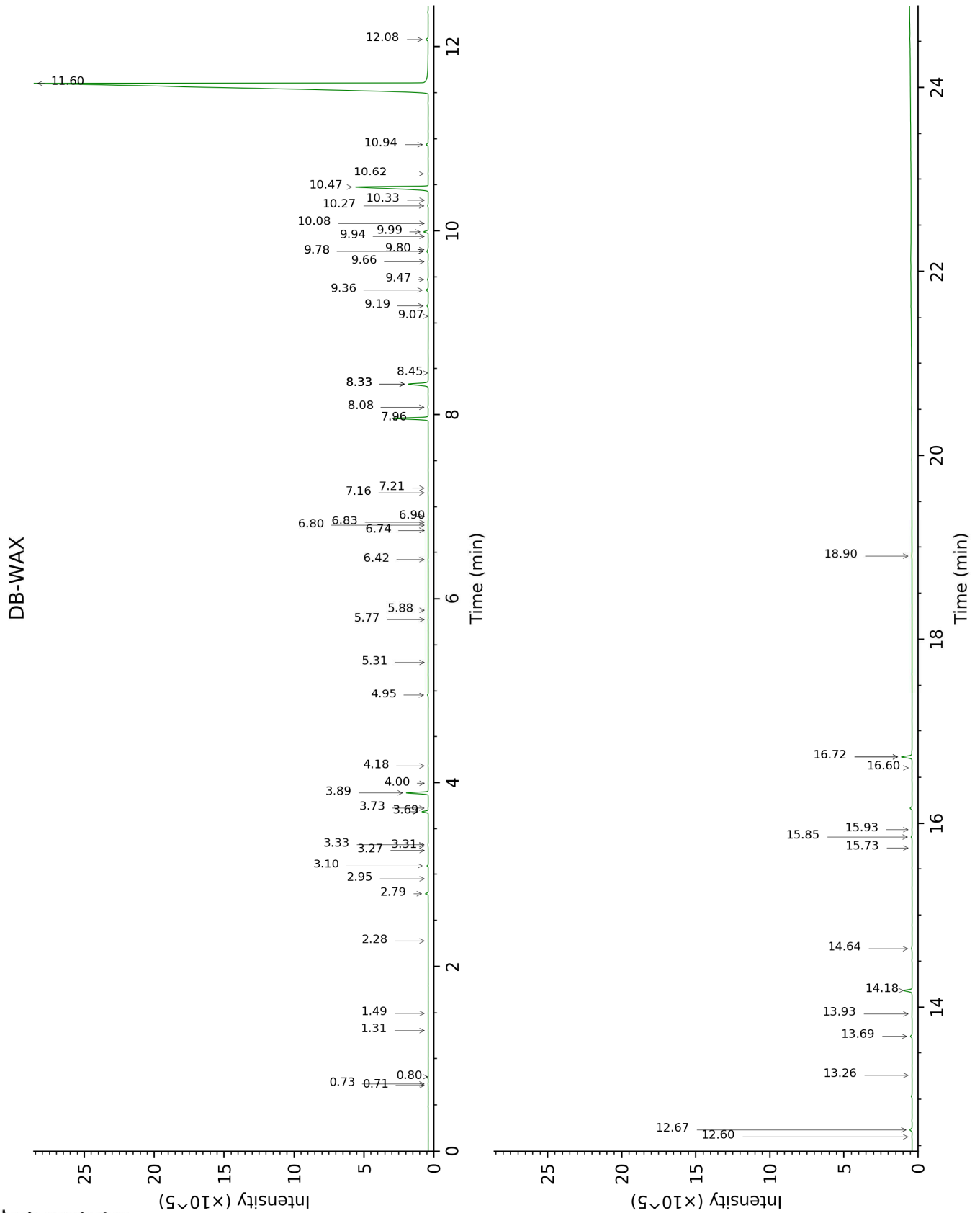
Note: no correction factor was applied

**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	%
Ethanol	0.35	522	tr	0.80	907	tr
2-Methyl-3-buten-2-ol	0.49	588	tr	1.49	1011	0.01
Isovaleral	0.59	641	0.01	0.73	884	0.01
2-Methylbutyral	0.61	652	tr	0.71	878	tr
Isoamyl alcohol	0.94	737	0.02	3.33	1174	0.02
Hexanol	2.25	874	tr	5.31	1317	0.01
Isoamyl acetate	2.31	878	tr	2.28	1089	0.01
2-Heptanone	2.45	890	tr	2.95	1144	tr
Hashishene	2.78	915	tr	1.31	988	tr
Tricyclene	2.83	918	tr			
6-Methyl-5-hepten-2-one	3.86	986	0.06	4.95	1296	0.06
Myrcene	3.94*	991	0.20	2.79	1132	0.18
<i>trans</i> -Dehydroxylinalool oxide	3.94*	991	[0.20]	3.32	1173	0.02
<i>cis</i> -Dehydroxylinalool oxide	4.15	1005	0.02	3.72	1205	0.02
para-Cymene	4.39	1020	0.01	4.00	1225	0.01
Limonene	4.46*	1025	0.11	3.10	1156	0.10
1,8-Cineole	4.46*	1025	[0.11]	3.27	1169	tr
( <i>Z</i> )- $\beta$ -Ocimene	4.68	1039	0.44	3.69	1202	0.43
( <i>E</i> )- $\beta$ -Ocimene	4.84	1049	1.53	3.89	1218	1.52
<i>cis</i> -Linalool oxide (fur.)	5.17	1069	0.02	6.42	1398	0.02
Octanol	5.25	1074	0.02	8.08	1523	0.04
Terpinolene	5.42*	1085	0.03	4.18	1239	0.02
<i>trans</i> -Linalool oxide (fur.)	5.42*	1085	[0.03]	6.80	1426	0.01
Rosefuran	5.60	1096	0.01	5.88	1358	0.01
Linalool	5.67	1101	2.70	7.96	1513	2.72
Nonanal	5.71	1104	0.04	5.77	1351	0.02
Unknown [m/z 95, 123 (73), 67 (64), 82 (54), 41 (47), 55 (27)...]	6.11	1129	0.01			
Camphor	6.19	1135	0.01	7.16	1452	0.02
Citronellal	6.47*	1153	0.01	6.90	1433	tr
Nerol oxide	6.47*	1153	[0.01]	6.74	1421	0.01
Terpinen-4-ol	6.78	1173	0.01	8.45	1551	tr
Menthol	6.83	1176	0.01	9.07	1600	0.01
$\alpha$ -Terpineol	7.01	1188	0.03	9.66	1648	0.03
Decanal	7.33	1209	0.03	7.21	1456	0.01
2,3-Epoxygeranial?	7.64*	1231	0.17			
Nerol	7.64*	1231	[0.17]	10.94	1754	0.16



Citronellol	7.72	1236	0.02	10.62	1727	0.03
Neral	7.78	1240	0.16	9.36	1623	0.18
Isoamyl hexanoate	7.99	1255	0.02	6.83	1428	0.02
Geraniol	8.22†	1271	81.10	11.60	1811	80.65
Geranial	8.28†	1275	[81.10]	9.99	1674	0.36
Geranyl formate	8.75	1308	0.10	9.80	1659	0.02
2,3-Epoxygeraniol?	9.24	1338	0.03			
Geranic acid	9.62*	1364	0.05	16.60	2292	0.02
Neryl acetate	9.62*	1364	[0.05]	10.08	1682	0.01
Unknown [m/z 43, 41 (25), 67 (24), 109 (23), 93 (20), 69 (19)...]	9.84	1380	0.01			
Geranyl acetate	9.94	1387	7.31	10.47	1714	7.32
β-Elemene	9.97	1389	0.09	8.33*	1542	1.88
β-Caryophyllene	10.30	1413	1.86	8.33*	1542	[1.88]
α-Guaiene	10.58	1434	0.02	8.33*	1542	[1.88]
α-Humulene	10.76	1447	0.14	9.19	1609	0.12
Unknown [m/z 189, 133 (75), 91 (71), 105 (69), 93 (44)... 204 (33)]	11.16	1477	0.07	9.47	1632	0.08
β-Selinene	11.19	1480	0.03	9.78*	1657	0.13
Valencene	11.30	1487	0.05	9.78*	1657	[0.13]
α-Muurolene	11.44	1498	0.03	9.94	1670	0.02
γ-Cadinene	11.60	1510	0.04	10.27	1697	0.06
δ-Cadinene	11.73	1520	0.01	10.33	1702	0.01
α-Elemol	12.03	1544	0.01	13.93	2023	0.02
Unknown [m/z 59, 68 (63), 43 (31), 67 (27), 81 (27), 94 (25), 69 (23), 41 (22), 84 (20)...]	12.18	1556	0.02			
Geranyl butyrate	12.26	1562	0.17	12.08	1853	0.18
(E)-Nerolidol	12.28	1564	0.14	13.69	2000	0.14
Caryophyllene oxide isomer	12.41*	1574	0.22	12.60	1899	0.03
Caryophyllene oxide	12.41*	1574	[0.22]	12.67	1906	0.20
Humulene epoxide II	12.74	1600	0.01	13.26	1960	0.01
Caryophylladienol II	13.08	1628	0.01	15.93	2222	0.02
(3Z)-Caryophylla-3,8(13)-dien-5β-ol	13.53	1665	0.01	16.72*	2304	0.92
(2E,6E)-Farnesol	14.20	1721	0.91	16.72*	2304	[0.92]
(2E,6E)-Farnesal	14.40	1739	0.01	15.73	2201	0.02
Geranyl caproate	14.59	1755	0.71	14.18	2048	0.73
(2E,6E)-Farnesyl acetate	15.57	1842	0.09	15.85	2214	0.09

Phytone	15.63	1847	0.03	14.64	2092	0.08
Geranyl caprylate	16.74	1951	0.18			
Unknown [m/z 69, 41 (37), 81 (23), 95 (19), 109 (18)...]	18.34	2108	0.01	18.90	2547	0.03
Unknown [m/z 69, 81 (54), 95 (26), 41 (20), 82 (16), 123 (16)...]	21.09	2406	0.02			
<b>Total identified</b>		<b>99.06%</b>			<b>98.78%</b>	
<b>Total reported</b>		<b>99.20%</b>			<b>98.89%</b>	

\*: 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