

Date : February 02, 2021

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 21B01-PTH05


**Customer identification** : Palmarosa - India - P10108205R

**Type** : Essential oil

**Source** : *Cymbopogon martini*

**Customer** : Plant Therapy

ANALYSIS

**Method**: PC-MAT-014  - 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** : February 02, 2021

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

NFT 75-234:2011 - OIL OF PALMAROSA

Compound	Min. %	Max. %	Observed %	Complies?
Myrcene		0.5	0.2	Yes
Limonene		1.3	0.1	Yes
(Z)- $\beta$ -Ocimene	0.2	0.6	0.4	Yes
(E)- $\beta$ -Ocimene	0.5	3.0	1.8	Yes
Linalool	1.0	5.5	2.7	Yes
Geraniol	72	86	78	Yes
Geranyl acetate	7	16	9	Yes
$\beta$ -Caryophyllene	0.7	2.5	2.1	Yes
Neral		0.5	0.2	Yes
Geranial	0.2	0.6	0.4	Yes
Nerol	0.2	0.5	0.2	Yes
(2E,6E)-Farnesol	0.2	1.5	0.9	Yes
Geranyl caproate	0.4	0.8	0.7	Yes
<b>Refractive index</b>	1.4700	1.4780	1.4736	Yes

CONCLUSION

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

## ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

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

Identification	%	Class
Ethanol	tr	Aliphatic alcohol
Isobutyral	tr	Aliphatic aldehyde
2-Methyl-3-buten-2-ol	0.01	Aliphatic alcohol
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
2-Ethylfuran	0.01	Furan
Isoamyl alcohol	0.01	Aliphatic alcohol
Isoamyl acetate	tr	Aliphatic ester
6-Methyl-5-hepten-2-one	0.06	Aliphatic ketone
Myrcene	0.21	Monoterpene
<i>trans</i> -Dehydroxylinalool oxide	0.02	Monoterpenic ether
$\alpha$ -Phellandrene	0.03	Monoterpene
<i>cis</i> -Dehydroxylinalool oxide	0.02	Monoterpenic ether
para-Cymene	0.01	Monoterpene
Limonene	0.13	Monoterpene
( <i>Z</i> )- $\beta$ -Ocimene	0.43	Monoterpene
( <i>E</i> )- $\beta$ -Ocimene	1.79	Monoterpene
2,6-Dimethyl-5-heptenal (melonal)	0.01	Aliphatic aldehyde
<i>cis</i> -Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Octanol	0.03	Aliphatic alcohol
Terpinolene	0.03	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	0.03	Monoterpenic alcohol
Rosefuran	0.01	Monoterpenic ether
Linalool	2.68	Monoterpenic alcohol
Nonanal	0.02	Aliphatic aldehyde
Citronellal	0.03	Monoterpenic aldehyde
Terpinen-4-ol	0.01	Monoterpenic alcohol
Isogeranial	0.01	Monoterpenic aldehyde
$\alpha$ -Terpineol	0.03	Monoterpenic alcohol
Decanal	0.04	Aliphatic aldehyde
Nerol	0.17	Monoterpenic alcohol
Citronellol	0.04	Monoterpenic alcohol
Neral	0.18	Monoterpenic aldehyde
Geraniol	78.33	Monoterpenic alcohol
Geranial	0.36	Monoterpenic aldehyde
Geranyl formate	0.08	Monoterpenic ester
2,3-Epoxygeraniol?	0.02	Oxygenated monoterpene
Geranic acid	0.03	Aliphatic acid
Neryl acetate	0.02	Monoterpenic ester
Geranyl acetate	8.96	Monoterpenic ester
$\beta$ -Elemene	0.10	Sesquiterpene
$\beta$ -Caryophyllene	2.06	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.02*	Sesquiterpene
$\alpha$ -Guaiene	[0.02]*	Sesquiterpene
$\alpha$ -Humulene	0.13	Sesquiterpene

Selina-4,11-diene	0.02	Sesquiterpene
Germacrene D	0.01	Sesquiterpene
$\beta$ -Selinene	0.03	Sesquiterpene
Unknown	0.01	Sesquiterpene
Valencene	0.05	Sesquiterpene
$\alpha$ -Muurolene	0.02	Sesquiterpene
7-epi- $\alpha$ -Selinene	0.04	Sesquiterpene
$\delta$ -Cadinene	0.03	Sesquiterpene
$\alpha$ -Elemol	0.01	Sesquiterpenic alcohol
Unknown	0.01	Unknown
Geranyl butyrate	0.17	Monoterpenic ester
( <i>E</i> )-Nerolidol	0.14	Sesquiterpenic alcohol
Caryophyllene oxide	0.18	Sesquiterpenic ether
Caryophyllene oxide isomer	0.02	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	0.02	Sesquiterpenic alcohol
(2 <i>E</i> ,6 <i>E</i> )-Farnesol	0.89	Sesquiterpenic alcohol
(2 <i>E</i> ,6 <i>E</i> )-Farnesal	0.01	Sesquiterpenic aldehyde
Geranyl caproate	0.67	Monoterpenic ester
(2 <i>E</i> ,6 <i>E</i> )-Farnesyl acetate	0.11	Sesquiterpenic ester
Phytone	0.02	Terpenic ketone
Geranyl caprylate	0.17	Monoterpenic ester
Unknown	0.05	Unknown
Unknown	0.02	Unknown
<b>Consolidated total</b>	<b>98.96%</b>	

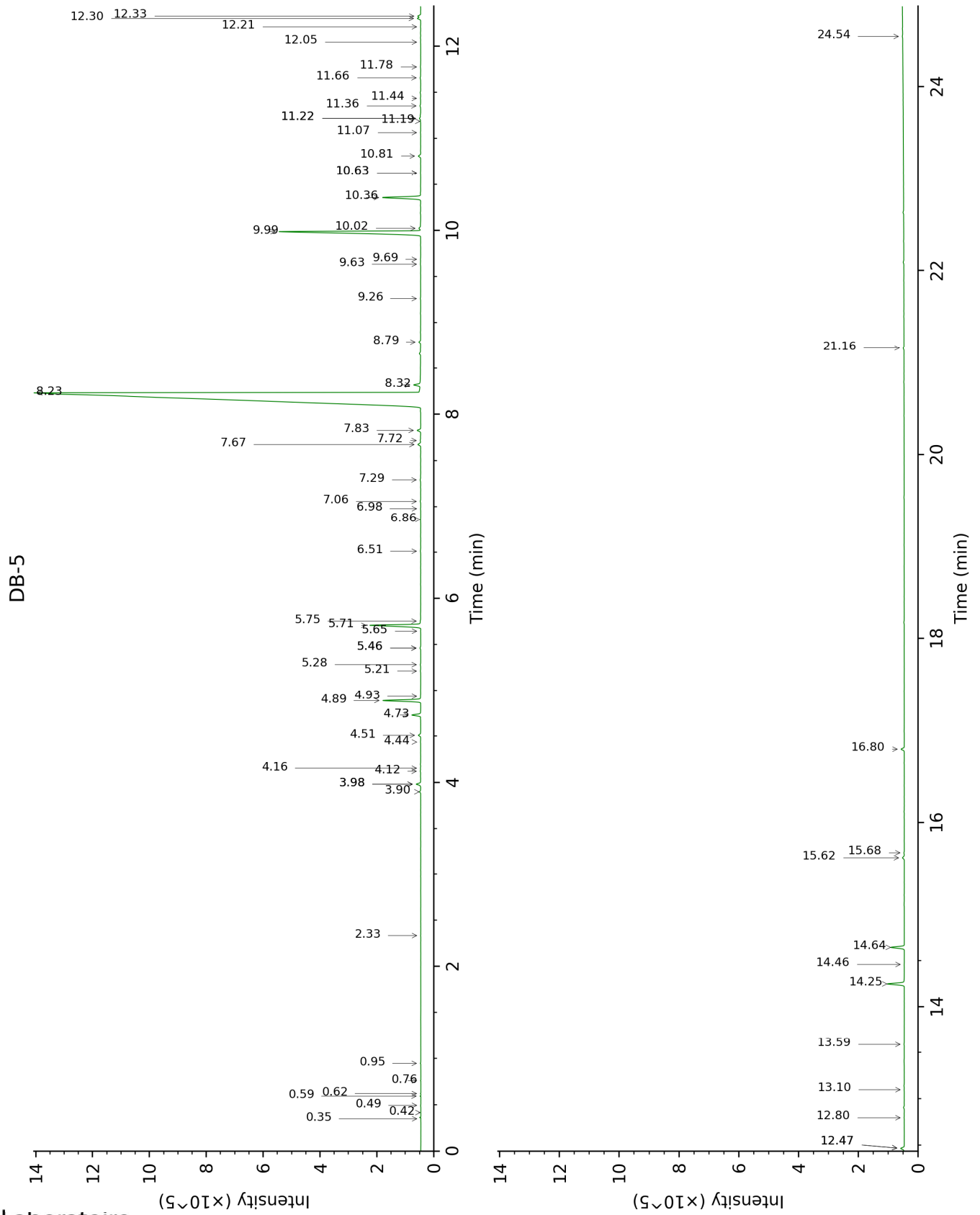
\*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered  
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total  
tr: The compound has been detected below 0.005% of total signal.

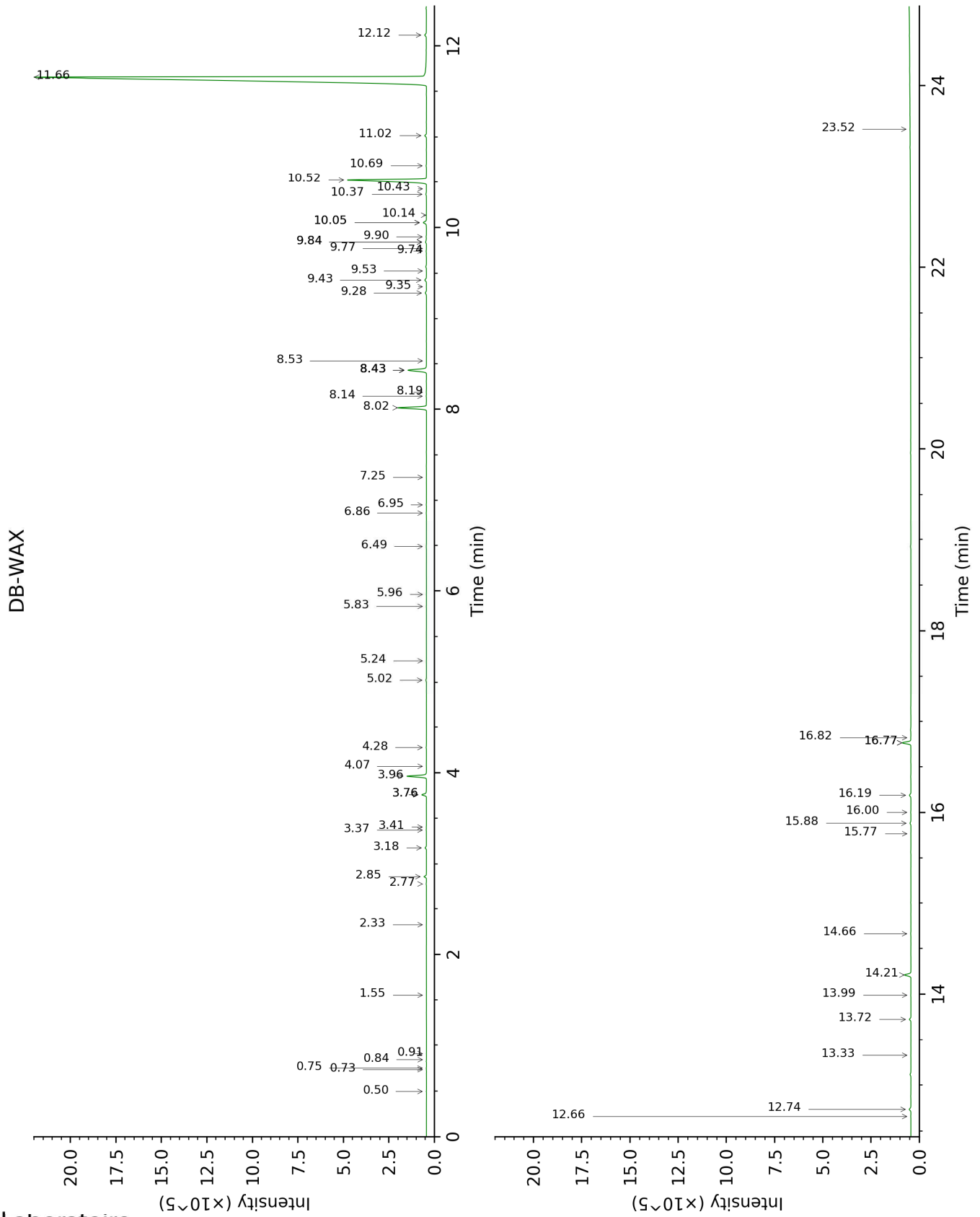
Note: no correction factor was applied

**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	0.84	908	tr
Isobutyral	0.42	538	tr	0.50	782	0.01
2-Methyl-3-buten-2-ol	0.49	588	0.01	1.56	1015	0.01
Isovaleral	0.59	640	0.01	0.75	885	0.01
2-Methylbutyral	0.62	652	0.01	0.73	879	0.01
2-Ethylfuran	0.76	710	0.01	0.91	919	0.01
Isoamyl alcohol	0.95	737	0.01	3.41	1178	0.02
Isoamyl acetate	2.34	879	tr	2.33	1091	tr
6-Methyl-5-hepten-2-one	3.90	987	0.06	5.02	1298	0.06
Myrcene	3.98*	993	0.23	2.85	1134	0.21
<i>trans</i> -Dehydroxylinalool oxide	3.98*	993	[0.23]	3.37	1175	0.02
$\alpha$ -Phellandrene	4.12	1002	0.03	2.77	1128	0.02
<i>cis</i> -Dehydroxylinalool oxide	4.16	1004	0.02	3.76*	1205	0.46
<i>para</i> -Cymene	4.44	1022	0.01	4.07	1228	0.02
Limonene	4.51	1026	0.13	3.18	1160	0.12
( <i>Z</i> )- $\beta$ -Ocimene	4.73	1040	0.43	3.76*	1205	[0.46]
( <i>E</i> )- $\beta$ -Ocimene	4.89	1050	1.79	3.96	1220	1.81
2,6-Dimethyl-5-heptenal (melonal)	4.93	1053	0.01	5.24	1312	0.01
<i>cis</i> -Linalool oxide (fur.)	5.21	1071	0.02	6.49	1402	0.02
Octanol	5.28	1075	0.03	8.14	1527	0.03
Terpinolene	5.46*	1086	0.04	4.28	1243	0.03
<i>trans</i> -Linalool oxide (fur.)	5.46*	1086	[0.04]	6.86	1430	0.03
Rosefuran	5.65	1098	0.01	5.96	1364	0.01
Linalool	5.71	1102	2.68	8.02	1517	2.69
Nonanal	5.76	1105	0.02	5.83	1355	0.02
Citronellal	6.51	1154	0.03	6.95	1437	0.02
Terpinen-4-ol	6.86	1177	0.01	8.53	1557	0.01
Isogeranial	6.98	1185	0.01	8.19	1530	0.02
$\alpha$ -Terpineol	7.06	1190	0.03	9.74	1653	0.04
Decanal	7.29	1206	0.04	7.26	1459	0.01
Nerol	7.67	1232	0.17	11.02	1760	0.18
Citronellol	7.72	1235	0.04	10.69	1731	0.05
Neral	7.83	1243	0.18	9.42	1628	0.20
Geraniol	8.23	1271	78.33	11.66	1814	78.22
Geranial	8.32	1277	0.36	10.06*	1679	0.38
Geranyl formate	8.79	1304	0.08	9.84*	1662	0.12
2,3-Epoxygeraniol?	9.26	1338	0.02			



Geranic acid	9.63	1364	0.03	16.82	2312	0.02
Neryl acetate	9.69	1368	0.02	10.14	1686	0.03
Geranyl acetate	9.99	1389	8.96	10.52	1718	8.91
β-Elemene	10.02	1392	0.10	8.43*	1549	2.13
β-Caryophyllene	10.36	1416	2.06	8.43*	1549	[2.13]
<i>trans</i> -α-Bergamotene	10.63*	1436	0.02	8.43*	1549	[2.13]
α-Guaiene	10.63*	1436	[0.02]	8.43*	1549	[2.13]
α-Humulene	10.81	1450	0.13	9.28	1616	0.14
Selina-4,11-diene	11.07	1469	0.02	9.35	1622	0.02
Germacrene D	11.19	1478	0.01	9.77	1656	0.01
β-Selinene	11.22*	1480	0.07	9.84*	1662	[0.12]
Unknown [m/z 189, 133 (75), 91 (71), 105 (69), 93 (44)... 204 (33)]	11.22*	1480	[0.07]	9.52	1636	0.01
Valencene	11.36	1490	0.05	9.90	1666	0.04
α-Muurolene	11.44	1497	0.02	10.06*	1679	[0.38]
7-epi-α-Selinene	11.66	1514	0.04	10.37	1704	0.08
δ-Cadinene	11.78	1523	0.03	10.43	1709	0.02
α-Elemol	12.05	1544	0.01	13.99	2028	0.02
Unknown [m/z 59, 68 (63), 43 (31), 67 (27), 81 (27), 94 (25), 69 (23), 41 (22), 84 (20)...]	12.21	1557	0.01			
Geranyl butyrate	12.30	1564	0.17	12.12	1856	0.19
( <i>E</i> )-Nerolidol	12.33	1566	0.14	13.72	2002	0.15
Caryophyllene oxide	12.47*	1577	0.21	12.74	1911	0.18
Caryophyllene oxide isomer	12.47*	1577	[0.21]	12.66	1904	0.02
Humulene epoxide II	12.80	1603	0.01	13.33	1965	0.01
Caryophylladienol II	13.10	1628	0.01	16.00	2227	0.02
(3 <i>Z</i> )-Caryophylla-3,8(13)-dien-5β-ol	13.59	1668	0.02	16.76*	2306	0.90
(2 <i>E</i> ,6 <i>E</i> )-Farnesol	14.25	1724	0.89	16.76*	2306	[0.90]
(2 <i>E</i> ,6 <i>E</i> )-Farnesal	14.46	1742	0.01	15.77	2203	0.01
Geranyl caproate	14.64	1758	0.67	14.21	2049	0.67
(2 <i>E</i> ,6 <i>E</i> )-Farnesyl acetate	15.62	1845	0.11	15.88	2215	0.10
Phytone	15.68	1850	0.02	14.66	2092	0.03
Geranyl caprylate	16.80	1954	0.17	16.19	2246	0.17
Unknown [m/z 69, 81 (54), 95 (26), 41 (20), 82 (16), 123 (16)...]	21.16	2410	0.05			
Unknown [m/z 69, 81 (64), 95 (29), 137 (19), 41 (19)...]	24.54	2827	0.02	23.52	3124	0.02

<b>Total identified</b>	<b>98.89%</b>	<b>98.77%</b>
<b>Total reported</b>	<b>98.97%</b>	<b>98.80%</b>

\*: Two or more compounds are coeluting on this column

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

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