

**Date :** December 22, 2020

**CERTIFICATE OF ANALYSIS – GC PROFILING**

**SAMPLE IDENTIFICATION**

**Internal code :** 20L16-PTH24


**Customer identification :** Clary Sage - Austria - CF0114208R

**Type :** Essential oil

**Source :** *Salvia sclarea*

**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 :** December 22, 2020

Checked and approved by :



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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Clear liquid

**Refractive index:** 1.4592 ± 0.0003 (20 °C; method PC-MAT-016)

*NFT 75-255:1992 - CLARY SAGE OIL - FRESHLY CRUSHED*

<b>Compound</b>	<b>Min. %</b>	<b>Max. %</b>	<b>Observed %</b>	<b>Complies?</b>
Sclareol	0.4	2.6	0.6	Yes
Germacrene D	1.2	7.5	2.2	Yes
α-Terpineol	1	5	4	Yes
Linalyl acetate	56.0	70.5	52.0	No
Linalool	13	24	23	Yes
<b>Refractive index</b>	1.456	1.466	1.459	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
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Hexanal	tr	Aliphatic aldehyde
(2E)-Hexenal	0.02	Aliphatic aldehyde
(3Z)-Hexenol	0.11	Aliphatic alcohol
(2E)-Hexenol	0.07	Aliphatic alcohol
$\alpha$ -Pinene	0.83	Monoterpene
Camphene	0.02	Monoterpene
$\beta$ -Pinene	0.44	Monoterpene
Sabinene	0.02	Monoterpene
Octen-3-ol	0.01	Aliphatic alcohol
Octan-3-one	0.04	Aliphatic ketone
Myrcene	0.49	Monoterpene
<i>trans</i> -Dehydroxylinalool oxide	0.01	Monoterpenic ether
2-Carene	0.01	Monoterpene
Octan-3-ol	0.10	Aliphatic alcohol
Octanal	0.04	Aliphatic aldehyde
para-Cymene	0.02	Monoterpene
Limonene	0.77	Monoterpene
$\beta$ -Phellandrene	0.01	Monoterpene
1,8-Cineole	0.02	Monoterpenic ether
(Z)- $\beta$ -Ocimene	0.24	Monoterpene
(E)- $\beta$ -Ocimene	0.61	Monoterpene
$\gamma$ -Terpinene	0.02	Monoterpene
<i>cis</i> -Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Terpinolene	0.03	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Linalool	23.22	Monoterpenic alcohol
Camphor	0.03	Monoterpenic ketone
Borneol	0.03	Monoterpenic alcohol
$\delta$ -Terpineol	0.03	Monoterpenic alcohol
$\alpha$ -Terpineol	3.52	Monoterpenic alcohol
Hodiendiol	0.05	Monoterpenic alcohol
Unknown	0.01	Unknown
Linalyl formate	0.11	Monoterpenic ester
Nerol	0.52	Monoterpenic alcohol
Neral	0.10	Monoterpenic aldehyde
Geraniol	1.04	Monoterpenic alcohol
Linalyl acetate	52.03	Monoterpenic ester
( <i>trans</i> ?) -Linalool oxide acetate (fur.)?	0.02	Monoterpenic ester
Geranial	0.24	Monoterpenic aldehyde
Unknown	0.03	Unknown
Bornyl acetate	0.10	Monoterpenic ester
Unknown	0.16	Unknown

Geranyl formate	0.02	Monoterpenic ester
Carvacrol	0.06	Monoterpenic alcohol
Hodiendiol derivative	0.05	Oxygenated monoterpene
$\alpha$ -Terpinyl acetate	0.07	Monoterpenic ester
Unknown	0.01	Oxygenated monoterpene
Neryl acetate	0.83	Monoterpenic ester
$\alpha$ -Copaene	0.11	Sesquiterpene
(Z)-8-Hydroxylinalool?	0.03	Monoterpenic alcohol
$\beta$ -Bourbonene	0.02	Sesquiterpene
Geranyl acetate	2.08	Monoterpenic ester
$\beta$ -Elemene	0.01	Sesquiterpene
$\beta$ -Cubebene	0.04	Sesquiterpene
$\gamma$ -4-Dimethylbenzenebutyral	0.01	Simple phenolic
$\beta$ -Caryophyllene	2.66	Sesquiterpene
$\beta$ -Copaene	0.01	Sesquiterpene
Coumarin	0.02	Coumarin
$\alpha$ -Humulene	0.06	Sesquiterpene
(E)- $\beta$ -Farnesene	0.01	Sesquiterpene
Germacrene D	2.19	Sesquiterpene
$\alpha$ -Amorphene	0.04	Sesquiterpene
$\beta$ -Selinene	0.05	Sesquiterpene
Hodiendiol derivative IV	0.04	Oxygenated monoterpene
$\alpha$ -Selinene	0.03	Sesquiterpene
Bicyclogermacrene	0.01	Sesquiterpene
$\alpha$ -Murolene	0.11	Sesquiterpene
$\gamma$ -Cadinene	0.15	Sesquiterpene
$\delta$ -Cadinene	0.11	Sesquiterpene
$\beta$ -Sesquiphellandrene	0.06	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.08	Sesquiterpene
$\alpha$ -Calacorene	0.08	Sesquiterpene
Isocaryophyllene epoxide B	0.02	Sesquiterpenic ether
$\alpha$ -Elemol	0.04	Sesquiterpenic alcohol
Spathulenol	0.05	Sesquiterpenic alcohol
Caryophyllene oxide	0.03	Sesquiterpenic ether
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
Salvial-4(14)-en-1-one	0.02	Aliphatic alcohol
Guaiol	0.14	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
Hinesol	0.04	Sesquiterpenic alcohol
$\tau$ -Cadinol	0.04	Sesquiterpenic alcohol
$\beta$ -Eudesmol	0.03	Sesquiterpenic alcohol
$\alpha$ -Eudesmol	0.03	Sesquiterpenic alcohol
$\alpha$ -Cadinol	0.04	Sesquiterpenic alcohol
Bulnesol	0.11	Sesquiterpenic alcohol
Cyclocolorenone	0.01	Sesquiterpenic ketone
Phytone	0.01	Terpenic ketone
Sclareoloxide	0.01	Terpenic ether
Unknown	0.01	Unknown
Geranyl-para-cymene	0.02	Diterpene
Manoyl oxide	0.01	Diterpenic ether
Manool	0.01	Diterpenic alcohol
Sclareol	0.60	Diterpenic alcohol

<b>Consolidated total</b>	<b>95.58%</b>	
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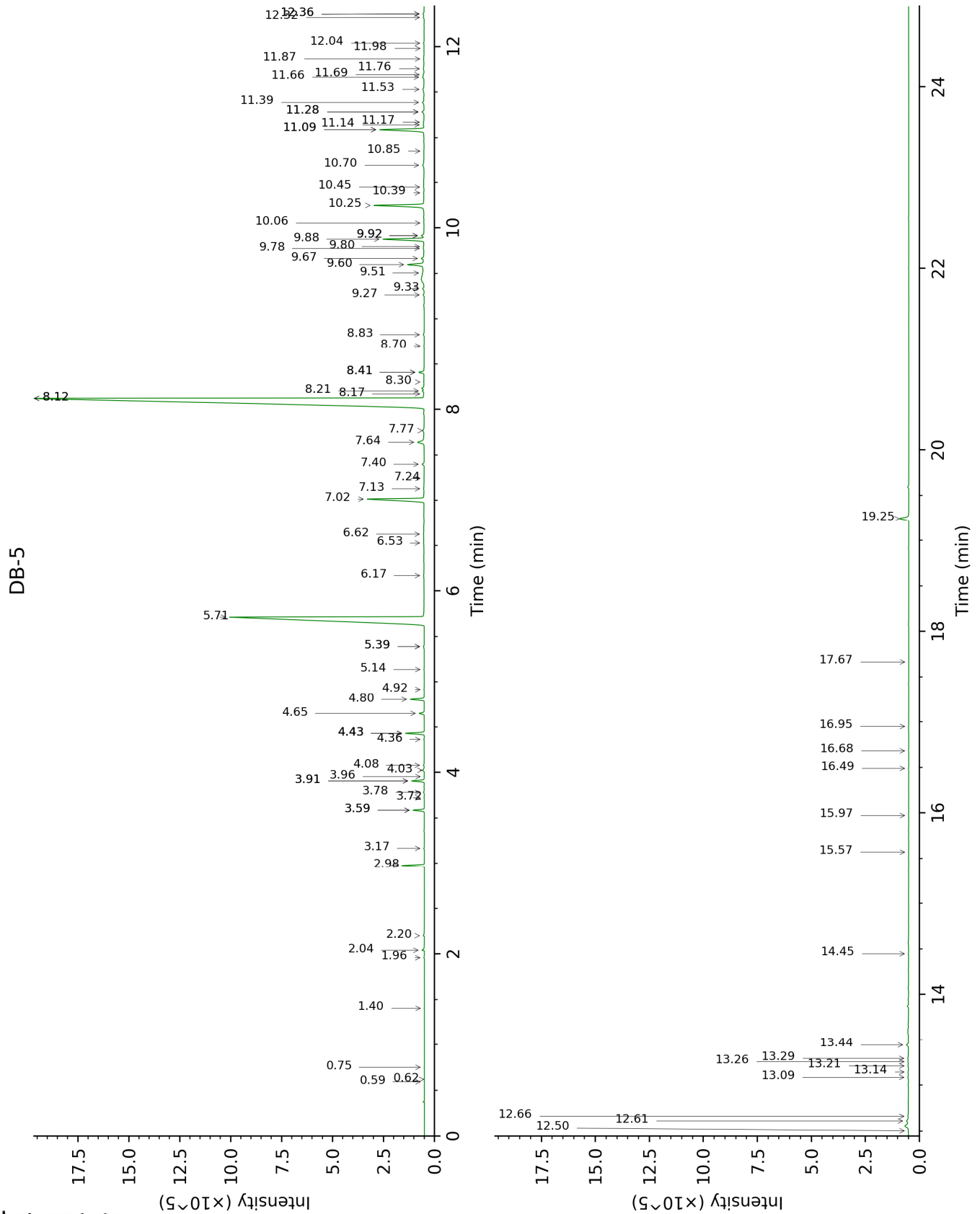
tr: The compound has been detected below 0.005% of total signal.

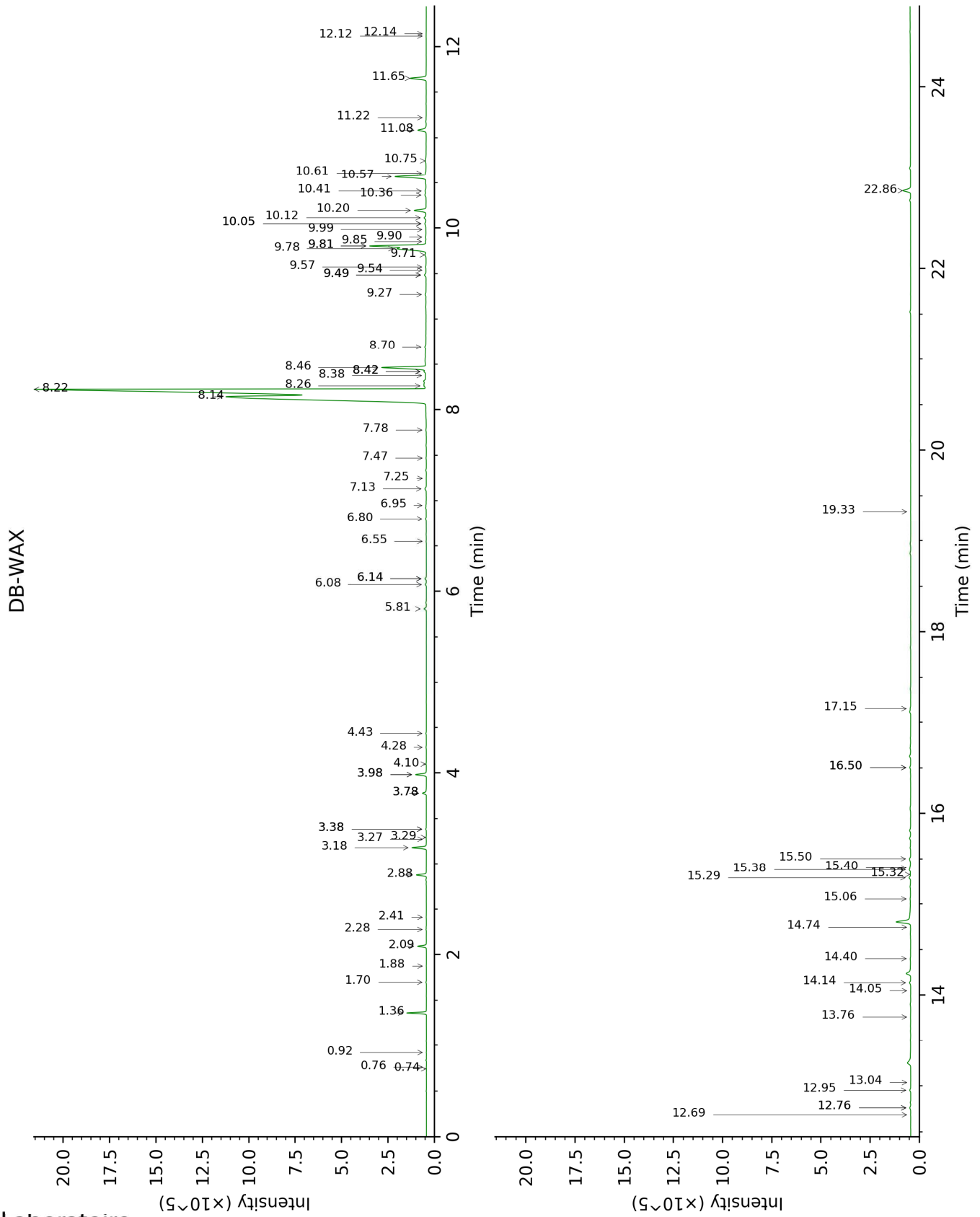
Note: no correction factor was applied

**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	%
Isovaleral	0.59	639	tr	0.76	888	tr
2-Methylbutyral	0.62	650	tr	0.74	882	tr
2-Ethylfuran	0.75	708	tr	0.92	919	tr
Hexanal	1.40	805	tr	1.88	1044	0.01
(2E)-Hexenal	1.96	852	0.02	3.38*	1174	0.03
(3Z)-Hexenol	2.04	859	0.11	5.81	1350	0.14
(2E)-Hexenol	2.20	872	0.07	6.14*	1373	0.08
α-Pinene	2.98	930	0.83	1.36	991	0.79
Camphene	3.17	943	0.02	1.70	1026	0.02
β-Pinene	3.59*	970	0.46	2.09	1066	0.44
Sabinene	3.59*	970	[0.46]	2.28	1084	0.02
Octen-3-ol	3.72	979	0.01	6.80	1422	0.03
Octan-3-one	3.78	983	0.04	3.98*	1220	0.60
Myrcene	3.91*	992	0.52	2.88	1134	0.49
<i>trans</i> -Dehydroxylinalool oxide	3.91*	992	[0.52]	3.38*	1174	[0.03]
2-Carene	3.96	995	0.01	2.41	1097	0.01
Octan-3-ol	4.02	1000	0.10	6.08	1369	0.06
Octanal	4.08	1003	0.04	4.44	1253	0.03
para-Cymene	4.36	1021	0.02	4.10	1228	0.02
Limonene	4.43*	1025	0.80	3.18	1158	0.77
β-Phellandrene	4.43*	1025	[0.80]	3.27	1165	0.01
1,8-Cineole	4.43*	1025	[0.80]	3.29	1167	0.02
(Z)-β-Ocimene	4.65	1039	0.24	3.78*	1205	0.23
(E)-β-Ocimene	4.80	1048	0.61	3.98*	1220	[0.60]
γ-Terpinene	4.92	1056	0.02	3.78*	1205	[0.23]
<i>cis</i> -Linalool oxide (fur.)	5.14	1069	0.02	6.55	1403	0.01
Terpinolene	5.39*	1085	0.05	4.28	1242	0.03
<i>trans</i> -Linalool oxide (fur.)	5.39*	1085	[0.05]	6.95	1433	0.02
Linalool	5.71	1106	23.22	8.14†	1523	75.25
Camphor	6.17	1135	0.03	7.25	1455	0.01
Borneol	6.53	1158	0.03	9.81*	1654	3.63
δ-Terpineol	6.62	1164	0.03	9.49*	1628	0.12
α-Terpineol	7.02	1190	3.52	9.81*	1654	[3.63]
Hodiendiol	7.13	1197	0.05	12.76*	1907	0.08
Unknown [m/z 43, 71 (66), 59 (52), 41 (47), 68 (46)...]	7.24	1204	0.01	6.14*	1373	[0.08]
Linalyl formate	7.40	1215	0.11	8.42*	1544	0.11
Nerol	7.64	1231	0.52	11.08	1760	0.58
Neral	7.77	1240	0.10	9.49*	1628	[0.12]
Geraniol	8.12*	1264	55.67	11.65	1809	1.04
Linalyl acetate	8.12*	1264	[55.67]	8.22†	1529	[75.25]
( <i>trans</i> ?) -Linalool oxide acetate (fur.)?	8.17	1268	0.02	8.70	1565	0.07
Geranial	8.20	1270	0.24	10.12	1679	0.16

Unknown [m/z 121, 43 (75), 95 (57), 41 (34), 93 (33), 69 (28)...]	8.30	1276	0.03			
Bornyl acetate	8.41*	1284	0.26	8.26	1532	0.10
Unknown [m/z 43, 121 (74), 93 (42), 95 (38), 107 (29), 41 (29), 136 (28)...]	8.41*	1284	[0.26]			
Geranyl formate	8.70	1304	0.02	9.85	1658	0.04
Carvacrol	8.83	1308	0.06	15.40	2160	0.05
Hodiendiol derivative	9.27	1340	0.05	12.95	1925	0.07
$\alpha$ -Terpinyl acetate	9.33	1344	0.07	9.71	1646	0.08
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.51	1357	0.01	11.22	1772	0.01
Neryl acetate	9.60	1363	0.83	10.20	1685	0.77
$\alpha$ -Copaene	9.67	1368	0.11	7.13	1446	0.11
(Z)-8-Hydroxylinalool?	9.78	1376	0.03	13.76	2000	0.02
$\beta$ -Bourbonene	9.80	1378	0.02	7.47	1472	0.03
Geranyl acetate	9.88	1383	2.08	10.57	1716	2.05
$\beta$ -Elemene	9.92*	1386	0.14	8.42*	1544	[0.11]
$\beta$ -Cubebene	9.92*	1386	[0.14]	7.78	1494	0.04
$\gamma$ -4-Dimethylbenzenebutyral	10.06	1396	0.01			
$\beta$ -Caryophyllene	10.25	1410	2.66	8.46	1547	2.68
$\beta$ -Copaene	10.39	1421	0.01	8.38	1541	0.03
Coumarin	10.45	1425	0.02	17.15	2342	0.04
$\alpha$ -Humulene	10.70	1444	0.06	9.27	1611	0.07
(E)- $\beta$ -Farnesene	10.85	1456	0.01	9.54	1632	0.01
Germacrene D	11.09*	1473	2.48	9.78	1651	2.19
$\alpha$ -Amorphene	11.09*	1473	[2.48]	9.58	1635	0.04
$\beta$ -Selinene	11.14	1477	0.05	9.90	1662	0.05
Hodiendiol derivative IV	11.17	1480	0.04			
$\alpha$ -Selinene	11.28*	1488	0.14	9.99	1668	0.03
Bicyclogermacrene	11.28*	1488	[0.14]	10.05*	1674	0.12
$\alpha$ -Muurolene	11.39	1496	0.11	10.05*	1674	[0.12]
$\gamma$ -Cadinene	11.53	1507	0.15	10.36	1699	0.10
$\delta$ -Cadinene	11.66	1517	0.11	10.41	1703	0.09
$\beta$ -Sesquiphellandrene	11.69	1520	0.06	10.61	1720	0.05
<i>trans</i> -Cadina-1,4-diene	11.76	1525	0.08	10.75	1732	0.10
$\alpha$ -Calacorene	11.86	1533	0.08	12.12	1850	0.02
Isocaryophyllene epoxide B	11.98	1542	0.02	12.14	1852	0.01
$\alpha$ -Elemol	12.04	1547	0.04	14.05	2028	0.01
Spathulenol	12.32	1569	0.05	14.40	2061	0.07
Caryophyllene oxide	12.36*	1572	0.07	12.76*	1907	[0.08]
Caryophyllene oxide isomer	12.36*	1572	[0.07]	12.69	1900	0.02
Salvial-4(14)-en-1-one	12.50	1584	0.02	13.04	1933	0.01
Guaiol	12.61	1592	0.14	14.14	2036	0.09
Unknown [m/z 91, 119 (91), 79 (86), 93 (85), 41	12.66	1596	0.03			

(74), 107 (68), 105 (67), 134 (65)... 220 (1)]						
Hinesol	13.09	1631	0.04	15.06	2126	0.04
τ-Cadinol	13.14	1636	0.04			
β-Eudesmol	13.21	1641	0.03	15.38	2158	0.10
α-Eudesmol	13.26	1645	0.03	15.32	2152	0.02
α-Cadinol	13.29	1648	0.04	15.50	2170	0.11
Bulnesol	13.44	1660	0.11	15.29	2149	0.09
Cyclocolorone	14.45	1746	0.01	16.50*	2273	0.07
Phytone	15.57	1844	0.01	14.74	2094	0.01
Sclareoloxide	15.97	1881	0.01			
Unknown [m/z 109, 132 (88), 157 (76), 119 (66), 91 (57), 105 (55)...]	16.49	1928	0.01			
Geranyl-para-cymene	16.68	1947	0.02			
Manoyl oxide	16.95	1972	0.01	16.50*	2273	[0.07]
Manool	17.67	2041	0.01	19.33	2587	0.02
Sclareol	19.24	2199	0.60	22.86	3033	0.58
<b>Total identified</b>		<b>98.61%</b>			<b>95.12%</b>	
<b>Total reported</b>		<b>98.70%</b>			<b>95.13%</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