

Date : January 07, 2021

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 20L31-PTH10


**Customer identification** : Clary Sage - CF0112201R

**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** : January 05, 2021

Checked and approved by :



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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Clear liquid

**Refractive index:** 1.4586 ± 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	1.3	Yes
α-Terpineol	1	5	4	Yes
Linalyl acetate	56.0	70.5	59.1	Yes
Linalool	13	24	22	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	0.01	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
$\alpha$ -Thujene	tr	Monoterpene
$\alpha$ -Pinene	0.10	Monoterpene
Camphene	0.01	Monoterpene
Sabinene	0.02	Monoterpene
$\beta$ -Pinene	0.08	Monoterpene
Octen-3-ol	0.02	Aliphatic alcohol
Octan-3-one	0.01	Aliphatic ketone
Myrcene	0.91	Monoterpene
2-Carene	0.02	Monoterpene
$\alpha$ -Phellandrene	0.07	Monoterpene
<i>cis</i> -Dehydroxylinalool oxide	0.03	Monoterpenic ether
para-Cymene	0.02	Monoterpene
Limonene	0.28	Monoterpene
( <i>Z</i> )- $\beta$ -Ocimene	0.36	Monoterpene
( <i>E</i> )- $\beta$ -Ocimene	0.80	Monoterpene
$\gamma$ -Terpinene	0.01	Monoterpene
<i>cis</i> -Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Terpinolene	0.02	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	0.06	Monoterpenic alcohol
Linalool	21.54	Monoterpenic alcohol
Hotrienol	tr	Monoterpenic alcohol
Dehydrosabinaketone	0.02	Normonoterpenic ketone
allo-Ocimene	0.01	Monoterpene
Camphor	0.05	Monoterpenic ketone
Nerol oxide	0.01	Aliphatic ether
Borneol	0.03	Monoterpenic alcohol
$\delta$ -Terpineol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.01	Monoterpenic alcohol
$\alpha$ -Terpineol	3.59	Monoterpenic alcohol
Hodiendiol	0.02	Monoterpenic alcohol
Linalyl formate	0.48	Monoterpenic ester
Nerol	0.80	Monoterpenic alcohol
Unknown	0.01	Monoterpenic ester
Neral	0.02	Monoterpenic aldehyde
Linalyl acetate	59.06	Monoterpenic ester
Geraniol	1.81	Monoterpenic alcohol
( <i>trans</i> ?) -Linalool oxide acetate (fur.)?	0.06	Monoterpenic ester
Geranial	0.05	Monoterpenic aldehyde
Unknown	0.02	Unknown
Bornyl acetate	0.02	Monoterpenic ester
Neryl formate	0.01	Monoterpenic ester

Unknown	0.02	Unknown
Geranyl formate	0.04	Monoterpenic ester
Hodiendiol derivative	0.06	Oxygenated monoterpene
$\alpha$ -Cubebene	0.02	Sesquiterpene
$\alpha$ -Terpinyl acetate	0.02	Monoterpenic ester
Unknown	0.03	Monoterpenic ester
Unknown	0.07	Oxygenated monoterpene
Neryl acetate	1.07	Monoterpenic ester
$\alpha$ -Copaene	0.41	Sesquiterpene
$\beta$ -Bourbonene	0.07	Sesquiterpene
1,5-diepi- $\beta$ -Bourbonene	0.04	Sesquiterpene
Geranyl acetate	2.14	Monoterpenic ester
$\beta$ -Cubebene	0.09	Sesquiterpene
$\beta$ -Elemene	0.07	Sesquiterpene
$\gamma$ -4-Dimethylbenzenebutyral	0.03	Simple phenolic
Isocaryophyllene	0.01	Sesquiterpene
$\alpha$ -Gurjunene	0.01	Sesquiterpene
$\beta$ -Caryophyllene	1.66	Sesquiterpene
$\beta$ -Copaene	0.02	Sesquiterpene
Coumarin	0.01	Coumarin
<i>trans</i> - $\alpha$ -Bergamotene	0.01	Sesquiterpene
$\alpha$ -Humulene	0.06	Sesquiterpene
$\alpha$ -Amorphene	0.01	Sesquiterpene
Germacrene D	1.30	Sesquiterpene
$\beta$ -Selinene	0.02	Sesquiterpene
Hodiendiol derivative IV	0.09	Oxygenated monoterpene
Bicyclogermacrene	0.13	Sesquiterpene
$\alpha$ -Selinene	0.02	Sesquiterpene
$\alpha$ -Muurolene	0.03	Sesquiterpene
( <i>Z</i> )- $\alpha$ -Bisabolene	0.03	Sesquiterpene
$\beta$ -Bisabolene	0.02	Sesquiterpene
$\gamma$ -Cadinene	tr	Sesquiterpene
$\delta$ -Cadinene	0.10	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.01	Sesquiterpene
Isocaryophyllene epoxide B	0.01	Sesquiterpenic ether
1,5-Epoxy salvial-4(14)-ene	0.01	Sesquiterpenic ether
Spathulenol	0.07	Sesquiterpenic alcohol
Caryophyllene oxide	0.09	Sesquiterpenic ether
Salvial-4(14)-en-1-one	0.02	Aliphatic alcohol
Guaiol	0.01	Sesquiterpenic alcohol
Unknown	0.08	Oxygenated sesquiterpene
Torilenol	0.01	Oxygenated sesquiterpene
Hinesol	0.06	Sesquiterpenic alcohol
$\tau$ -Cadinol	0.01	Sesquiterpenic alcohol
$\beta$ -Eudesmol	0.03	Sesquiterpenic alcohol
$\alpha$ -Eudesmol	0.02	Sesquiterpenic alcohol
Bulnesol	0.01	Sesquiterpenic alcohol
Unknown	0.01	Unknown
Eudesma-4(15),7-dien-1 $\beta$ -ol	0.01	Sesquiterpenic alcohol
Cyclocolorone	0.01	Sesquiterpenic ketone
Unknown	0.02	Unknown
Phytone	0.01	Terpenic ketone

Unknown	0.04	Unknown
Geranyl-para-cymene	0.03	Diterpene
Manool	0.02	Diterpenic alcohol
Sclareol	0.62	Diterpenic alcohol
<b>Consolidated total</b>	<b>99.41%</b>	

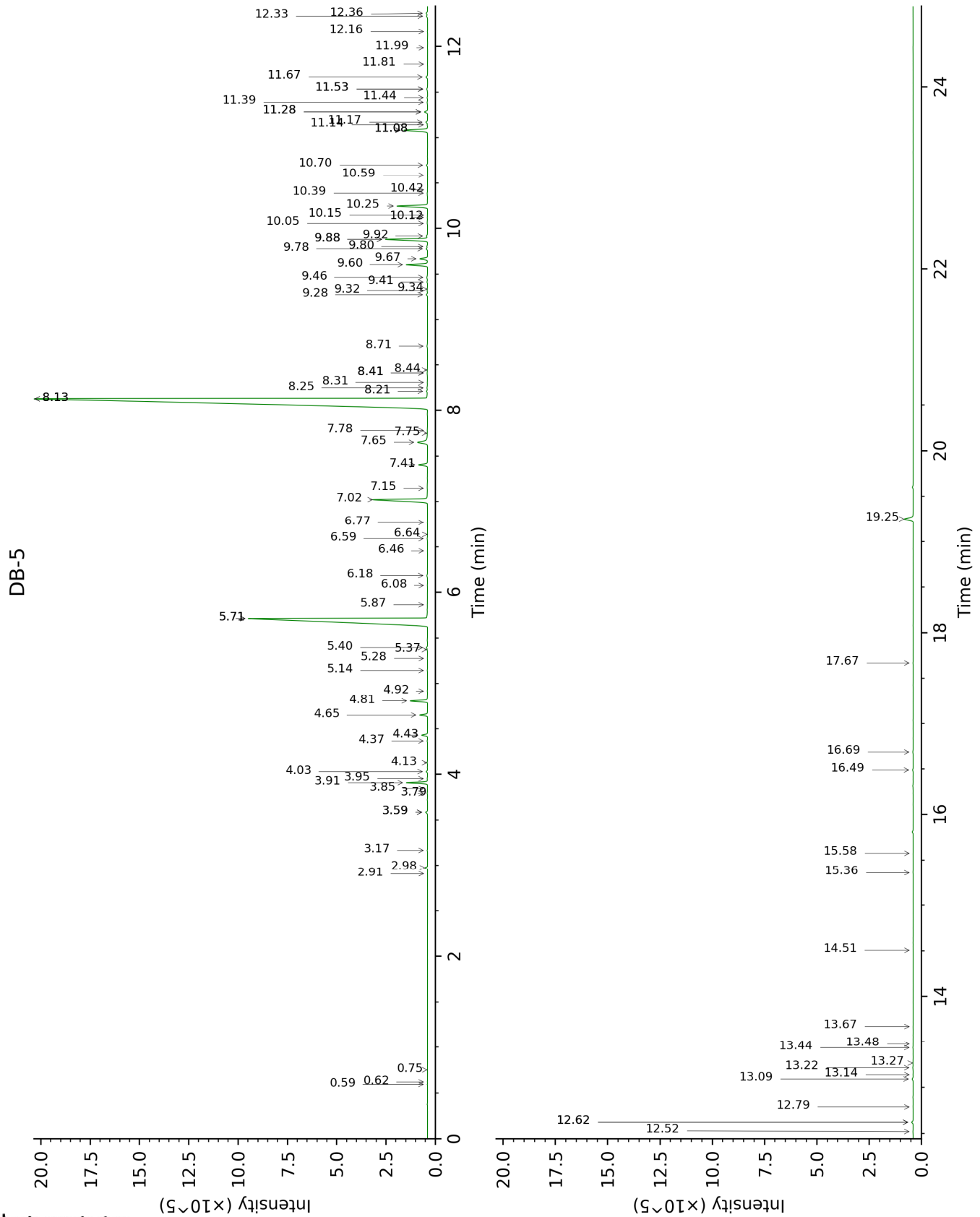
tr: The compound has been detected below 0.005% of total signal.

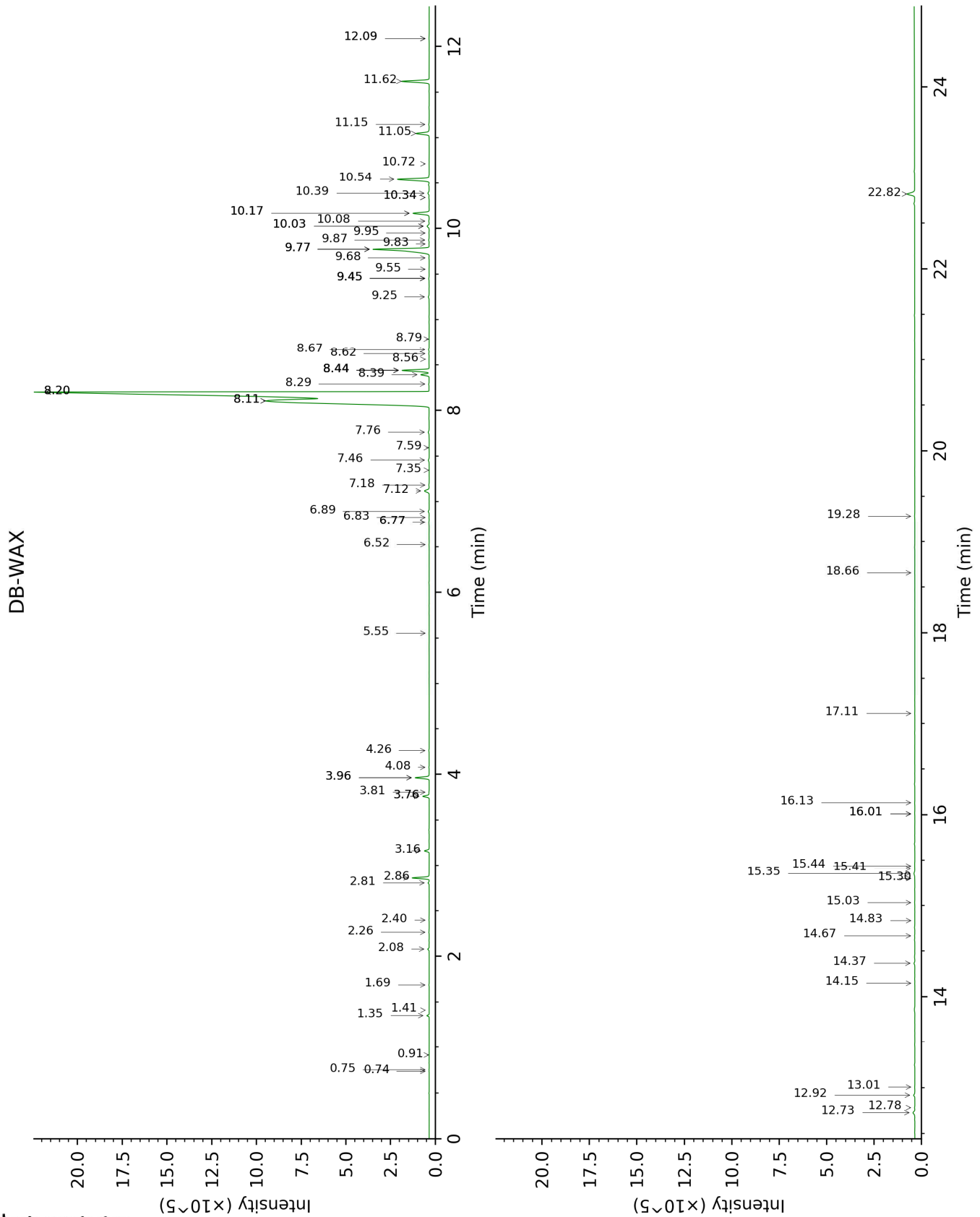
Note: no correction factor was applied

**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	%
Isovaleral	0.59	639	0.01	0.75	886	0.01
2-Methylbutyral	0.62	651	tr	0.74	879	tr
2-Ethylfuran	0.75	709	tr	0.91	918	tr
$\alpha$ -Thujene	2.91	926	tr	1.41	998	tr
$\alpha$ -Pinene	2.98	930	0.10	1.35	989	0.10
Camphene	3.17	943	0.01	1.69	1025	0.02
Sabinene	3.59*	970	0.10	2.26	1083	0.02
$\beta$ -Pinene	3.59*	970	[0.10]	2.08	1064	0.08
Octen-3-ol	3.79	984	0.02	6.77*	1420	0.04
Octan-3-one	3.84	988	0.01	3.96*	1218	0.81
Myrcene	3.91	992	0.91	2.86	1132	0.92
2-Carene	3.95	995	0.02	2.40	1096	0.01
$\alpha$ -Phellandrene	4.03	1000	0.07	2.80	1128	0.06
<i>cis</i> -Dehydroxylinalool oxide	4.13	1006	0.03	3.80	1207	0.02
para-Cymene	4.37	1021	0.02	4.08	1227	0.02
Limonene	4.43	1025	0.28	3.16	1156	0.28
( <i>Z</i> )- $\beta$ -Ocimene	4.65	1039	0.36	3.76*	1203	0.38
( <i>E</i> )- $\beta$ -Ocimene	4.81	1049	0.80	3.96*	1218	[0.81]
$\gamma$ -Terpinene	4.92	1056	0.01	3.76*	1203	[0.38]
<i>cis</i> -Linalool oxide (fur.)	5.14	1070	0.01	6.52	1401	0.01
Octanol	5.28	1078	0.01	8.20*†	1527	[80.26]
Terpinolene	5.37	1084	0.02	4.26	1240	0.02
<i>trans</i> -Linalool oxide (fur.)	5.40	1086	0.06	6.90	1429	0.07
Linalool	5.71*	1106	21.54	8.11*†	1520	80.26
Hotrienol	5.71*	1106	[21.54]	8.79	1572	tr
Dehydrosabinaketone	5.86	1115	0.02	8.62	1560	0.03
allo-Ocimene	6.08	1129	0.01	5.55	1331	0.01
Camphor	6.18	1136	0.05	7.18	1450	0.03
Nerol oxide	6.46	1153	0.01	6.83	1424	0.01
Borneol	6.59	1162	0.03	9.77*	1651	4.96
$\delta$ -Terpineol	6.64	1165	0.01	9.45*	1625	0.04
Terpinen-4-ol	6.77	1174	0.01	8.56	1555	0.02
$\alpha$ -Terpineol	7.02	1190	3.59	9.77*	1651	[4.96]
Hodiendiol	7.15	1198	0.02	12.78	1909	0.02
Linalyl formate	7.40	1215	0.48	8.39	1542	0.49
Nerol	7.65	1232	0.80	11.05	1757	0.89
Unknown [m/z 121, 43 (93), 41 (37), 107 (35), 67 (33), 136 (32)... 154 (1)]	7.75	1239	0.01			
Neral	7.78	1241	0.02	9.45*	1625	[0.04]
Linalyl acetate	8.13*	1264	60.88	8.20*†	1527	[80.26]
Geraniol	8.13*	1264	[60.88]	11.62	1806	1.81
( <i>trans</i> ?) -Linalool oxide acetate (fur.)?	8.21	1270	0.06	8.67	1563	0.04
Geranial	8.25	1273	0.05	10.08	1676	0.03

Unknown [m/z 121, 43 (75), 95 (57), 41 (34), 93 (33), 69 (28)...]	8.31	1277	0.02			
Bornyl acetate	8.41*	1284	0.04	8.29	1534	0.02
Neryl formate	8.41*	1284	[0.04]	9.45*	1625	[0.04]
Unknown [m/z 43, 121 (74), 93 (42), 95 (38), 107 (29), 41 (29), 136 (28)...]	8.44	1286	0.02			
Geranyl formate	8.71	1300	0.04	9.87	1659	0.05
Hodiendiol derivative	9.28	1340	0.06	12.92	1922	0.09
$\alpha$ -Cubebene	9.32	1343	0.02	6.77*	1420	[0.04]
$\alpha$ -Terpinyl acetate	9.34	1344	0.02	9.68	1643	0.02
Unknown [m/z 43, 121 (52), 93 (48), 79 (33), 41 (30), 136 (26), 81 (25)...]	9.41	1350	0.03			
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.46	1354	0.07	11.15	1765	0.03
Neryl acetate	9.60	1364	1.07	10.17*	1683	1.10
$\alpha$ -Copaene	9.67	1368	0.41	7.12	1446	0.39
$\beta$ -Bourbonene	9.78	1376	0.07	7.46	1470	0.07
1,5-diepi- $\beta$ -Bourbonene	9.80	1378	0.04	7.35	1462	tr
Geranyl acetate	9.88*	1384	2.19	10.54	1714	2.14
$\beta$ -Cubebene	9.88*	1384	[2.19]	7.76	1493	0.09
$\beta$ -Elemene	9.92	1386	0.07	8.44*	1546	1.66
$\gamma$ -4-Dimethylbenzenebutyral	10.06	1396	0.03			
Isocaryophyllene	10.12	1401	0.01	8.11*†	1520	[80.26]
$\alpha$ -Gurjunene	10.15	1402	0.01	7.59	1480	0.01
$\beta$ -Caryophyllene	10.25	1410	1.66	8.44*	1546	[1.66]
$\beta$ -Copaene	10.39	1421	0.02	8.44*	1546	[1.66]
Coumarin	10.42	1423	0.01	17.11	2338	0.01
<i>trans</i> - $\alpha$ -Bergamotene	10.59	1436	0.01	8.44*	1546	[1.66]
$\alpha$ -Humulene	10.70	1444	0.06	9.25	1609	0.07
$\alpha$ -Amorphene	11.08*	1473	1.32	9.55	1633	0.01
Germacrene D	11.08*	1473	[1.32]	9.77*	1651	[4.96]
$\beta$ -Selinene	11.14	1478	0.02	9.83	1656	0.02
Hodiendiol derivative IV	11.17	1480	0.09			
Bicyclgermacrene	11.28*	1488	0.17	10.03*	1672	0.16
$\alpha$ -Selinene	11.28*	1488	[0.17]	9.95	1666	0.02
$\alpha$ -Muurolene	11.39	1496	0.03	10.03*	1672	[0.16]
( <i>Z</i> )- $\alpha$ -Bisabolene	11.44	1500	0.03	10.34*	1697	0.03
$\beta$ -Bisabolene	11.53*	1507	0.06	10.17*	1683	[1.10]
$\gamma$ -Cadinene	11.53*	1507	[0.06]	10.34*	1697	[0.03]
$\delta$ -Cadinene	11.67	1518	0.10	10.39	1701	0.11
<i>trans</i> -Cadina-1,4-diene	11.81	1529	0.01	10.72	1729	0.01
Isocaryophyllene epoxide B	11.99	1543	0.01	12.09*	1847	0.03
1,5-Epoxysalvial-4(14)-ene	12.16	1557	0.01	12.09*	1847	[0.03]
Spathulenol	12.33	1570	0.07	14.37	2058	0.07
Caryophyllene oxide	12.36	1573	0.09	12.73	1904	0.17

Salvial-4(14)-en-1-one	12.52	1585	0.02	13.01	1930	0.02
Guaiol	12.62*	1593	0.08	14.15	2037	0.01
Unknown [m/z 91, 119 (91), 79 (86), 93 (85), 41 (74), 107 (68), 105 (67), 134 (65)... 220 (1)]	12.62*	1593	[0.08]			
Torilenol	12.79	1606	0.01	15.44	2164	0.01
Hinesol	13.09	1632	0.06	15.03	2123	0.02
τ-Cadinol	13.14	1636	0.01	14.83	2103	0.01
β-Eudesmol	13.22	1642	0.03	15.41	2161	0.01
α-Eudesmol	13.27	1646	0.02	15.35	2155	0.10
Bulnesol	13.44	1660	0.01	15.30	2149	0.01
Unknown [m/z 81, 41 (46), 79 (46), 93 (39), 91 (33), 107 (33)... 206 (8)]	13.48	1663	0.01			
Eudesma-4(15),7-dien-1β-ol	13.67	1680	0.01	16.01*	2222	0.02
Cyclocolorenone	14.51	1751	0.01	16.01*	2222	[0.02]
Unknown [m/z 123, 191 (88), 81 (86), 41 (86), 151 (80), 91 (76)...]	15.36	1825	0.02	18.66	2510	0.01
Phytone	15.58	1845	0.01	14.67	2087	0.02
Unknown [m/z 109, 132 (88), 157 (76), 119 (66), 91 (57), 105 (55)...]	16.49	1928	0.04			
Geranyl-para-cymene	16.69	1947	0.03	16.13	2235	0.02
Manool	17.67	2041	0.02	19.28	2582	0.02
Sclareol	19.25	2200	0.62	22.82	3028	0.62
<b>Total identified</b>		<b>99.22%</b>			<b>98.76%</b>	
<b>Total reported</b>		<b>99.44%</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

†: 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