

**Date :** January 22, 2021

**CERTIFICATE OF ANALYSIS – GC PROFILING**

*SAMPLE IDENTIFICATION*

**Internal code :** 21A15-PTH03


**Customer identification :** Clary Sage - Hungary - CF0113203R

**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 :** Sarah-Eve Tremblay, M. Sc. A., Chimiste

**Analysis date :** January 21, 2021

Checked and approved by :



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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Faintly yellow liquid

**Refractive index:** 1.4588 ± 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	1.1	Yes
Germacrene D	1.2	7.5	1.8	Yes
α-Terpineol	1	5	3	Yes
Linalyl acetate	56.0	70.5	55.9	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
(3Z)-Hexenol	0.07	Aliphatic alcohol
(2E)-Hexenol	0.01	Aliphatic alcohol
Hexanol	0.01	Aliphatic alcohol
$\alpha$ -Pinene	0.62	Monoterpene
Camphene	0.02	Monoterpene
Sabinene	0.01	Monoterpene
$\beta$ -Pinene	0.19	Monoterpene
Octen-3-ol	0.02	Aliphatic alcohol
Myrcene	0.95	Monoterpene
$\alpha$ -Phellandrene	0.06	Monoterpene
Octan-3-ol	0.04	Aliphatic alcohol
Octanal	0.01	Aliphatic aldehyde
<i>cis</i> -Dehydroxylinalool oxide	0.01	Monoterpenic ether
$\alpha$ -Terpinene	0.01	Monoterpene
para-Cymene	0.02	Monoterpene
Limonene	1.18	Monoterpene
$\beta$ -Phellandrene	0.01	Monoterpene
1,8-Cineole	0.02	Monoterpenic ether
(Z)- $\beta$ -Ocimene	0.20	Monoterpene
(E)- $\beta$ -Ocimene	0.31	Monoterpene
$\gamma$ -Terpinene	0.02	Monoterpene
<i>cis</i> -Sabinene hydrate	0.01	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (fur.)	0.04	Monoterpenic alcohol
Terpinolene	0.02	Monoterpene
<i>trans</i> -Linalool oxide (fur.)	0.05	Monoterpenic alcohol
Linalool	22.93	Monoterpenic alcohol
Hotrienol	0.02	Monoterpenic alcohol
Dehydrosabinaketone	0.01	Normonoterpenic ketone
allo-Ocimene	0.01	Monoterpene
Camphor	0.02	Monoterpenic ketone
Borneol	0.02	Monoterpenic alcohol
Terpinen-4-ol	0.02	Monoterpenic alcohol
$\alpha$ -Terpineol	2.57	Monoterpenic alcohol
$\gamma$ -Terpineol	0.01	Monoterpenic alcohol
Hodiendiol	0.02	Monoterpenic alcohol
Linalyl formate	0.05	Monoterpenic ester
Nerol	0.44	Monoterpenic alcohol
Unknown	0.04	Monoterpenic ester
Geraniol	1.28	Monoterpenic alcohol
Linalyl acetate	55.88	Monoterpenic ester
( <i>trans</i> ?) -Linalool oxide acetate (fur.)?	0.10	Monoterpenic ester
Geranial	0.04	Monoterpenic aldehyde
Unknown	0.02	Unknown
Neryl formate	0.06	Monoterpenic ester
Bornyl acetate	0.22	Monoterpenic ester

Unknown	0.10	Unknown
Geranyl formate	0.02	Monoterpenic ester
$\delta$ -Elemene	0.02	Sesquiterpene
Hodiendiol derivative	0.04	Oxygenated monoterpene
$\alpha$ -Terpinyl acetate	0.04	Monoterpenic ester
Unknown	0.02	Monoterpenic ester
Unknown	0.02	Oxygenated monoterpene
Neryl acetate	0.94	Monoterpenic ester
$\alpha$ -Copaene	0.09	Sesquiterpene
1,5-diepi- $\beta$ -Bourbonene	0.01	Sesquiterpene
$\beta$ -Bourbonene	0.02	Sesquiterpene
(Z)-8-Hydroxylinalool?	0.01	Monoterpenic alcohol
Geranyl acetate	2.51	Monoterpenic ester
$\beta$ -Cubebene	0.02	Sesquiterpene
$\beta$ -Elemene	0.20	Sesquiterpene
$\gamma$ -4-Dimethylbenzenebutyral	0.05	Simple phenolic
Isocaryophyllene	0.03	Sesquiterpene
$\beta$ -Caryophyllene	2.98	Sesquiterpene
$\beta$ -Copaene	0.01	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.01	Sesquiterpene
$\alpha$ -Humulene	0.19	Sesquiterpene
Germacrene D	1.77	Sesquiterpene
$\beta$ -Selinene	0.03	Sesquiterpene
Hodiendiol derivative IV	0.03	Oxygenated monoterpene
Bicyclgermacrene	0.09	Sesquiterpene
$\alpha$ -Muurolene	0.06	Sesquiterpene
$\gamma$ -Cadinene	0.05	Sesquiterpene
$\delta$ -Cadinene	0.05	Sesquiterpene
$\beta$ -Sesquiphellandrene	0.02	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	tr	Sesquiterpene
Isocaryophyllene epoxide B	0.01	Sesquiterpenic ether
$\alpha$ -Elemol	0.02	Sesquiterpenic alcohol
1,5-Epoxyalsial-4(14)-ene	tr	Sesquiterpenic ether
Spathulenol	0.02	Sesquiterpenic alcohol
Caryophyllene oxide	0.38	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Guaiol	0.02	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
Torilenol	0.03	Oxygenated sesquiterpene
Hinesol	0.01	Sesquiterpenic alcohol
Unknown	0.02	Unknown
$\tau$ -Cadinol	0.02	Sesquiterpenic alcohol
$\beta$ -Eudesmol	0.02	Sesquiterpenic alcohol
$\alpha$ -Eudesmol	0.03	Sesquiterpenic alcohol
$\alpha$ -Cadinol	0.02	Sesquiterpenic alcohol
Bulnesol	0.03	Sesquiterpenic alcohol
Bulnesol analog	tr	Sesquiterpenic alcohol
Eudesma-4(15),7-dien-1 $\beta$ -ol	0.05	Sesquiterpenic alcohol
Cyclocolorone	0.01	Sesquiterpenic ketone
Unknown	0.01	Unknown
Manoyl oxide	0.04	Diterpenic ether
Manool	tr	Diterpenic alcohol

Sclareol	1.06	Diterpenic alcohol
<b>Consolidated total</b>	<b>98.96%</b>	

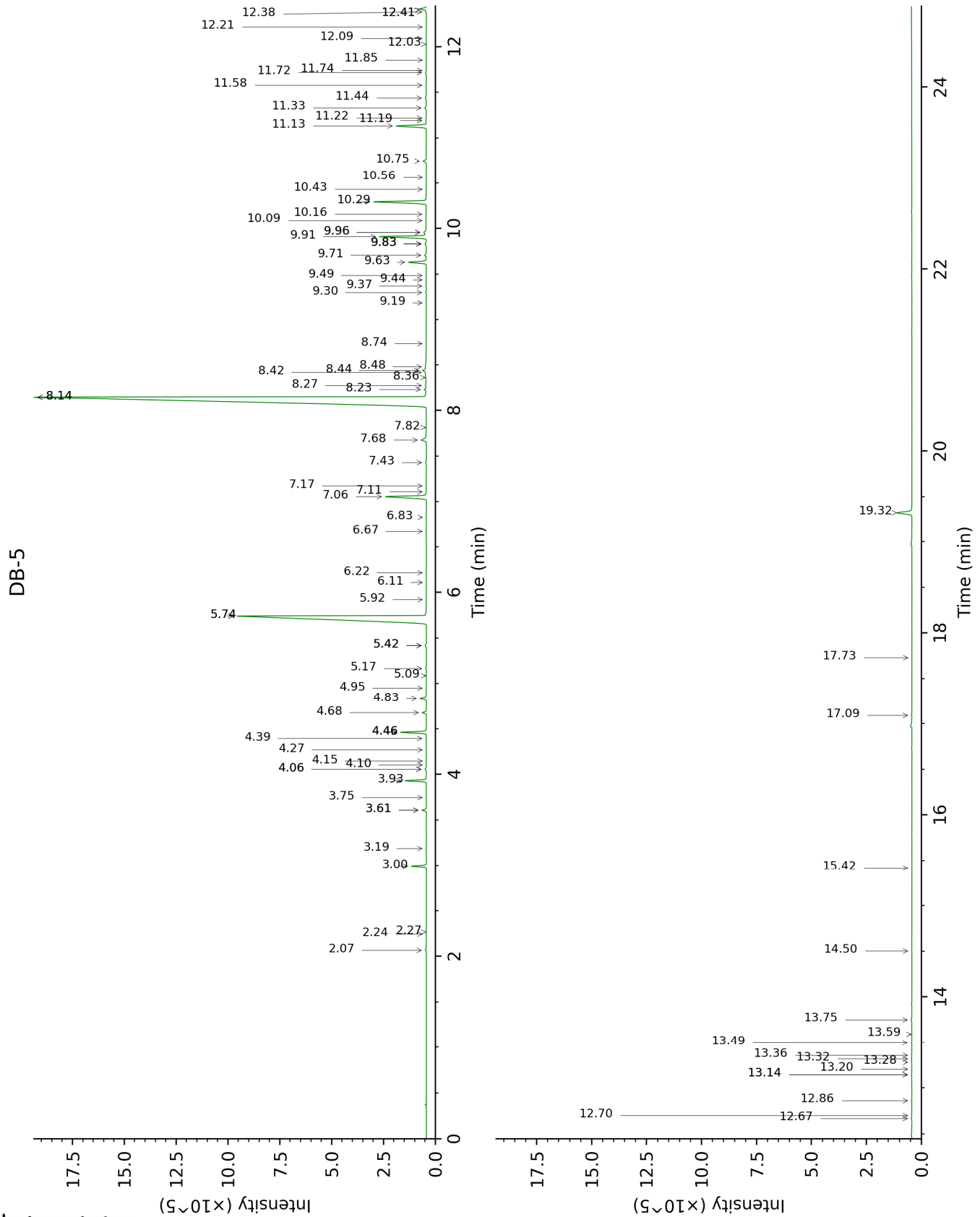
tr: The compound has been detected below 0.005% of total signal.

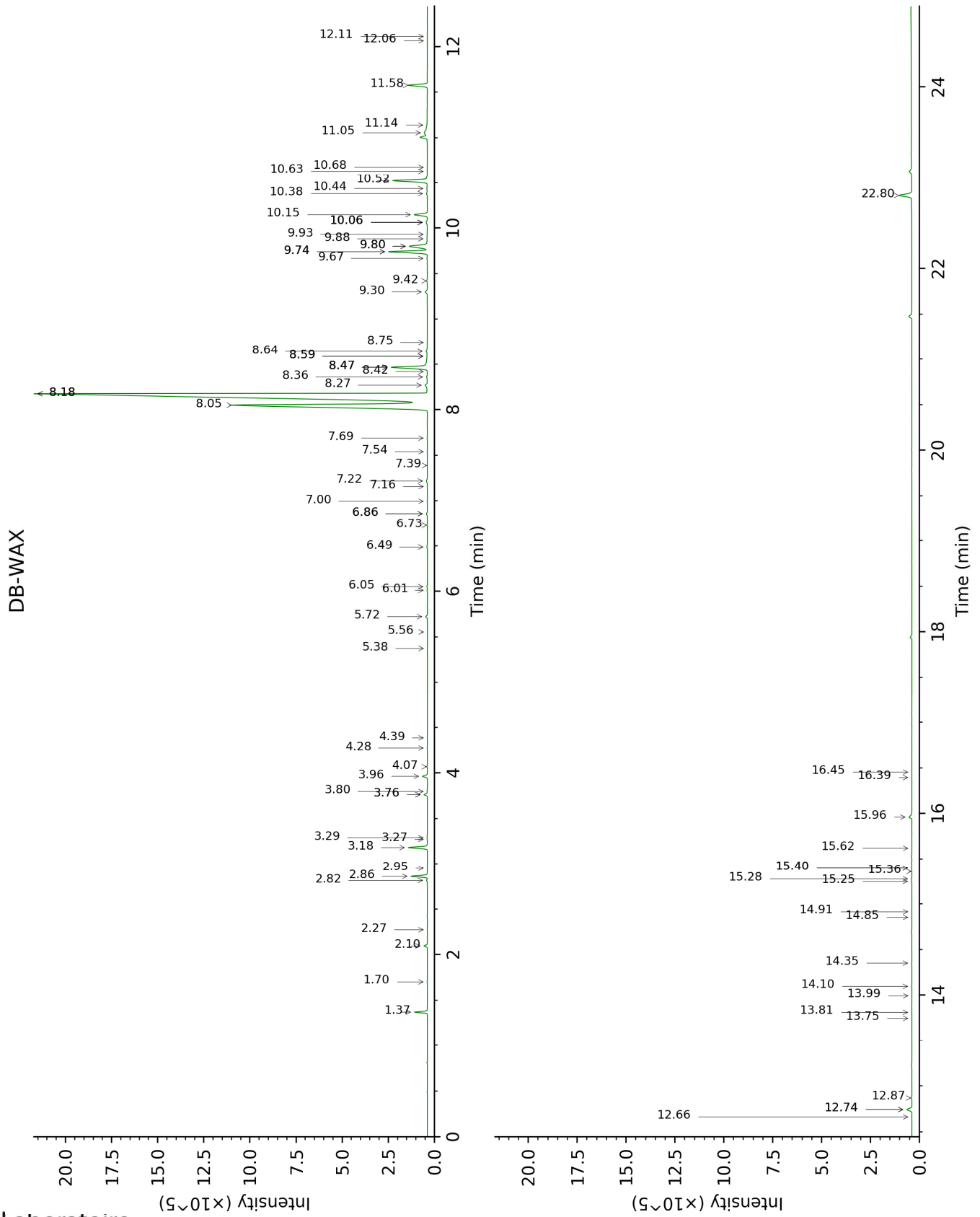
Note: no correction factor was applied

**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	%
(3Z)-Hexenol	2.07	858	0.07	5.72	1347	0.11
(2E)-Hexenol	2.24	873	0.01	6.01	1368	0.02
Hexanol	2.27	875	0.01	5.38	1322	0.01
$\alpha$ -Pinene	3.00	929	0.62	1.37	995	0.61
Camphene	3.19	941	0.02	1.70	1029	0.02
Sabinene	3.61*	969	0.21	2.27	1086	0.01
$\beta$ -Pinene	3.61*	969	[0.21]	2.10	1068	0.19
Octen-3-ol	3.75	979	0.02	6.73	1420	0.02
Myrcene	3.93	991	0.95	2.86	1134	0.96
$\alpha$ -Phellandrene	4.06*	999	0.08	2.82	1131	0.06
Octan-3-ol	4.06*	999	[0.08]	6.05	1370	0.04
Octanal	4.10	1002	0.01	4.39	1252	0.01
<i>cis</i> -Dehydroxylinalool oxide	4.15	1005	0.01	3.76*	1206	0.21
$\alpha$ -Terpinene	4.27	1013	0.01	2.95	1142	0.01
para-Cymene	4.39	1021	0.02	4.07	1228	0.04
Limonene	4.46*	1025	1.20	3.18	1160	1.18
$\beta$ -Phellandrene	4.46*	1025	[1.20]	3.27	1167	0.01
1,8-Cineole	4.46*	1025	[1.20]	3.29	1168	0.02
(Z)- $\beta$ -Ocimene	4.68	1039	0.20	3.76*	1206	[0.21]
(E)- $\beta$ -Ocimene	4.83	1048	0.31	3.96	1220	0.31
$\gamma$ -Terpinene	4.95	1056	0.02	3.80	1208	0.02
<i>cis</i> -Sabinene hydrate	5.09	1065	0.01	6.86*	1429	0.08
<i>cis</i> -Linalool oxide (fur.)	5.17	1070	0.04	6.49	1402	0.05
Terpinolene	5.42*	1086	0.07	4.28	1244	0.02
<i>trans</i> -Linalool oxide (fur.)	5.42*	1086	[0.07]	6.86*	1429	[0.08]
Linalool	5.74*	1107	22.94	8.05†	1518	77.29
Hotrienol	5.74*	1107	[22.94]	8.75	1572	0.02
Dehydrosabinaketone	5.92	1118	0.01	8.59*†	1560	[2.97]
allo-Ocimene	6.11	1131	0.01	5.56	1335	tr
Camphor	6.22	1138	0.02	7.16	1451	0.01
Borneol	6.67	1165	0.02	9.74*	1652	2.60
Terpinen-4-ol	6.83	1176	0.02	8.59*†	1560	[2.97]
$\alpha$ -Terpineol	7.06	1190	2.57	9.74*	1652	[2.60]
$\gamma$ -Terpineol	7.11	1193	0.01	9.80*	1657	1.74
Hodiendiol	7.18	1197	0.02	12.74*	1910	0.41
Linalyl formate	7.43	1214	0.05	8.36	1542	0.06
Nerol	7.68	1231	0.44	11.06	1761	0.46
Unknown [m/z 121, 43 (93), 41 (37), 107 (35), 67 (33), 136 (32)... 154 (1)]	7.82	1240	0.04			
Geraniol	8.14*	1262	57.16	11.58	1806	1.28
Linalyl acetate	8.14*	1262	[57.16]	8.18*†	1528	[77.29]
( <i>trans</i> ?) -Linalool oxide acetate (fur.)?	8.23	1268	0.10	8.64	1564	0.12
Geranial	8.27	1270	0.04	10.06*	1678	0.12

Unknown [m/z 121, 43 (75), 95 (57), 41 (34), 93 (33), 69 (28)...]	8.36	1276	0.02			
Neryl formate	8.42	1280	0.06	9.42	1626	0.05
Bornyl acetate	8.44	1281	0.22	8.27	1535	0.22
Unknown [m/z 43, 121 (74), 93 (42), 95 (38), 107 (29), 41 (29), 136 (28)...]	8.48	1284	0.10			
Geranyl formate	8.74	1302	0.02	9.88	1663	0.04
$\delta$ -Elemene	9.19	1333	0.02	7.00	1439	0.02
Hodiendiol derivative	9.30	1341	0.04	12.87	1922	0.05
$\alpha$ -Terpinyl acetate	9.37	1346	0.04	9.67	1646	0.04
Unknown [m/z 43, 121 (52), 93 (48), 79 (33), 41 (30), 136 (26), 81 (25)...]	9.44	1350	0.02			
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.49	1354	0.02	11.14	1768	0.08
Neryl acetate	9.63	1364	0.94	10.15	1685	0.93
$\alpha$ -Copaene	9.71	1370	0.09	7.22	1456	0.09
1,5-diepi- $\beta$ -Bourbonene	9.83*	1378	0.09	7.39	1468	0.01
$\beta$ -Bourbonene	9.83*	1378	[0.09]	7.54	1480	0.02
(Z)-8-Hydroxylinalool?	9.83*	1378	[0.09]	13.75	2004	0.01
Geranyl acetate	9.91	1384	2.51	10.52	1716	2.45
$\beta$ -Cubebene	9.96*	1387	0.22	7.69	1491	0.02
$\beta$ -Elemene	9.96*	1387	[0.22]	8.47*†	1551	2.97
$\gamma$ -4-Dimethylbenzenebutyral	10.09	1396	0.05			
Isocaryophyllene	10.16	1401	0.03	8.18*†	1528	[77.29]
$\beta$ -Caryophyllene	10.29	1411	2.98	8.47*†	1551	[2.97]
$\beta$ -Copaene	10.43	1421	0.01	8.42	1547	0.01
<i>trans</i> - $\alpha$ -Bergamotene	10.56	1431	0.01	8.47*†	1551	[2.97]
$\alpha$ -Humulene	10.75	1445	0.19	9.30	1616	0.16
Germacrene D	11.13	1473	1.77	9.80*	1657	[1.74]
$\beta$ -Selinene	11.19	1478	0.03	9.93	1667	0.05
Hodiendiol derivative IV	11.22	1480	0.03			
Bicyclogermacrene	11.33	1488	0.09	10.06*	1678	[0.12]
$\alpha$ -Muurolene	11.44	1496	0.06	10.06*	1678	[0.12]
$\gamma$ -Cadinene	11.58	1506	0.05	10.38	1704	0.08
$\delta$ -Cadinene	11.72	1517	0.05	10.44	1709	0.07
$\beta$ -Sesquiphellandrene	11.74	1519	0.02	10.63	1725	0.02
<i>trans</i> -Cadina-1,4-diene	11.85	1528	tr	10.68	1729	0.01
Isocaryophyllene epoxide B	12.03	1542	0.01	12.11	1854	0.02
$\alpha$ -Elemol	12.09	1546	0.02	13.99	2028	tr
1,5-Epoxysalvia-4(14)-ene	12.22	1556	tr	12.06	1849	0.01
Spathulenol	12.38	1569	0.02	14.35	2063	0.03
Caryophyllene oxide	12.41*	1572	0.39	12.74*	1910	[0.41]
Caryophyllene oxide isomer	12.41*	1572	[0.39]	12.66	1903	0.01
Guaiol	12.67	1592	0.02	14.10	2038	0.03

Unknown [m/z 91, 119 (91), 79 (86), 93 (85), 41 (74), 107 (68), 105 (67), 134 (65)... 220 (1)]	12.70	1594	0.01			
Torilenol	12.86	1607	0.03	15.40*	2167	0.04
Hinesol	13.14*	1630	0.03	14.92	2118	0.01
Unknown [m/z 43, 93 (89), 91 (88), 79 (87), 123 (76), 81 (75)...]	13.14*	1630	[0.03]	13.81	2010	0.02
τ-Cadinol	13.20	1635	0.02	14.85	2112	0.02
β-Eudesmol	13.28	1642	0.02	15.36	2163	0.01
α-Eudesmol	13.32	1644	0.03	15.28	2155	0.03
α-Cadinol	13.36	1648	0.02	15.40*	2167	[0.04]
Bulnesol	13.50	1659	0.03	15.25	2152	0.03
Bulnesol analog	13.59	1667	tr	15.62	2190	0.01
Eudesma-4(15),7-dien-1β-ol	13.75	1680	0.05	15.96	2226	0.26
Cyclocolorenone	14.50	1744	0.01	16.40	2271	0.02
Unknown [m/z 123, 191 (88), 81 (86), 41 (86), 151 (80), 91 (76)...]	15.42	1824	0.01			
Manoyl oxide	17.09	1979	0.04	16.46	2277	0.02
Manool	17.73	2041	tr			
Sclareol	19.32	2204	1.06	22.80	3055	1.05
<b>Total identified</b>		<b>98.78%</b>			<b>97.06%</b>	
<b>Total reported</b>		<b>99.00%</b>			<b>97.17%</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