Date : June 18, 2019

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 19F05-PTH05-1-SCC
Customer identification : Clary Sage - Russia - CF010989R
Type : Essential oil
Source : *Salvia sclarea*
Customer : Plant Therapy

Analysis

Method: PC-PA-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 : Benoit Roger, Ph. D.
Analysis date : June 17, 2019

Checked and approved by :

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

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia. This report is digitally signed, it is only considered valid if the digital signature is intact. The results only describe the samples that were submitted to the assays.

Laboratoire PhytoChemia
628 Boulevard du Saguenay Ouest, Saguenay (Qc) G7J 1H4 | www.phytochemia.com

Physicochemical data

Physical aspect: Clear liquid
Refractive index: 1.4581 ± 0.0003 (20 °C)

NF T 75-255:1992 - Clary Sage Oil - Freshly Crushed

Compound	Min. %	Max. %	Observed %	Complies?
Sclareol	0.4	2.6	0.6	Yes
Germacrene D	1.2	7.5	1.9	Yes
α-Terpineol	1	5	3	Yes
Linalyl acetate	56.0	70.5	57.4	Yes
Linalool	13	24	23	Yes
Refractive index	1.456	1.466	1.458	Yes

Conclusion

No adulterant, contaminant or diluent has been detected using this method. The oil complies with the AFNOR standard for freshly crushed clary sage oil.

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com

Analysis summary – Consolidated contents

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

Identification	%	Classe
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Toluene	tr	Simple phenolic
Hexanal	tr	Aliphatic aldehyde
(2*E*)-Hexenal	0.02	Aliphatic aldehyde
(3*Z*)-Hexenol	0.13	Aliphatic alcohol
(2*E*)-Hexenol	0.09	Aliphatic alcohol
α-Pinene	0.56	Monoterpene
α-Fenchene	tr	Monoterpene
Camphene	0.01	Monoterpene
Benzaldehyde	0.03	Simple phenolic
Sabinene	0.01	Monoterpene
β-Pinene	0.32	Monoterpene
Octen-3-ol	0.03	Aliphatic alcohol
Octan-3-one	0.01	Aliphatic ketone
Myrcene	0.55	Monoterpene
trans-Dehydroxylinalool oxide	0.01	Monoterpenic ether
Octan-3-ol	0.05	Aliphatic alcohol
2-Carene	0.01	Monoterpene
Pseudolimonene	0.04	Monoterpene
α-Phellandrene	0.01	Monoterpene
Octanal	0.03	Aliphatic aldehyde
Δ3-Carene	tr	Monoterpene
α-Terpinene	tr	Monoterpene
para-Cymene	0.02	Monoterpene
Limonene	0.65	Monoterpene
(*Z*)-β-Ocimene	0.24	Monoterpene
(*E*)-β-Ocimene	0.53	Monoterpene
γ-Terpinene	0.03	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.06	Monoterpenic alcohol
trans-Linalool oxide (fur.)	0.08	Monoterpenic alcohol
Terpinolene	0.01	Monoterpene
Linalool	23.05	Monoterpenic alcohol
Hotrienol	0.01	Monoterpenic alcohol
Dehydrosabinaketone	0.01	Normonoterpenic ketone
allo-Ocimene	tr	Monoterpene
Camphor	0.02	Monoterpenic ketone
Nerol oxide	tr	Aliphatic ether
Borneol	0.01	Monoterpenic alcohol
δ-Terpineol	0.02	Monoterpenic alcohol
Terpinen-4-ol	0.01	Monoterpenic alcohol
α-Terpineol	3.06	Monoterpenic alcohol
Hodiendiol	0.03	Monoterpenic alcohol
Unknown	0.01	Unknown
Linalyl formate	0.04	Monoterpenic ester

Nerol	0.46	Monoterpenic alcohol
Unknown	0.01	Unknown
Unknown	0.03	Monoterpenic ester
Neral	0.07	Monoterpenic aldehyde
Linalyl acetate	57.37	Monoterpenic ester
Geraniol	0.86	Monoterpenic alcohol
Geranial	0.11	Monoterpenic aldehyde
Unknown	0.01	Unknown
Neryl formate	0.01	Monoterpenic ester
Bornyl acetate	0.31	Monoterpenic ester
Thymol	0.01	Monoterpenic alcohol
Geranyl formate	0.07	Monoterpenic ester
δ-Elemene	0.02	Sesquiterpene
Hodiendiol derivative	0.03	Oxygenated monoterpene
α-Terpinyl acetate	0.02	Monoterpenic ester
α-Cubebene	0.07	Sesquiterpene
Unknown	0.03	Monoterpenic ester
Unknown	0.06	Oxygenated monoterpene
Neryl acetate	1.08	Monoterpenic ester
Geranyl acetate	2.35	Monoterpenic ester
β-Cubebene	0.02	Sesquiterpene
β-Elemene	0.11	Sesquiterpene
α-Gurjunene	0.02	Sesquiterpene
β-Caryophyllene	2.34	Sesquiterpene
β-Copaene	0.03	Sesquiterpene
Coumarin	0.02	Coumarin
trans-α-Bergamotene	0.01	Sesquiterpene
α-Humulene	0.06	Sesquiterpene
9-epi-β-Caryophyllene	0.01	Sesquiterpene
α-Amorphene	0.01	Sesquiterpene
Germacrene D	1.87	Sesquiterpene
β-Selinene	0.03	Sesquiterpene
Hodiendiol derivative IV	tr	Oxygenated monoterpene
α-Selinene	0.01	Sesquiterpene
Bicyclogermacrene	tr	Sesquiterpene
α-Muurolene	0.08	Sesquiterpene
γ-Cadinene	0.01	Sesquiterpene
trans-Calamenene	0.02	Sesquiterpene
δ-Cadinene	0.06	Sesquiterpene
β-Sesquiphellandrene	0.05	Sesquiterpene
Caryophyllene oxide	0.04	Sesquiterpenic ether
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
Salvial-4(14)-en-1-one	0.01	Aliphatic alcohol
Guaiol	0.08	Sesquiterpenic alcohol
Hinesol	0.02	Sesquiterpenic alcohol
τ-Cadinol	0.01	Sesquiterpenic alcohol
α-Cadinol	0.04	Sesquiterpenic alcohol
α-Eudesmol	0.16	Sesquiterpenic alcohol
Unknown	0.09	Unknown
Bulnesol	0.01	Sesquiterpenic alcohol
Phytone	tr	Terpenic ketone
Sclareoloxide	0.01	Terpenic ether

Manool	0.01	Diterpenic alcohol
Sclareol	0.55	Diterpenic alcohol
Consolidated total	**98.63%**	

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

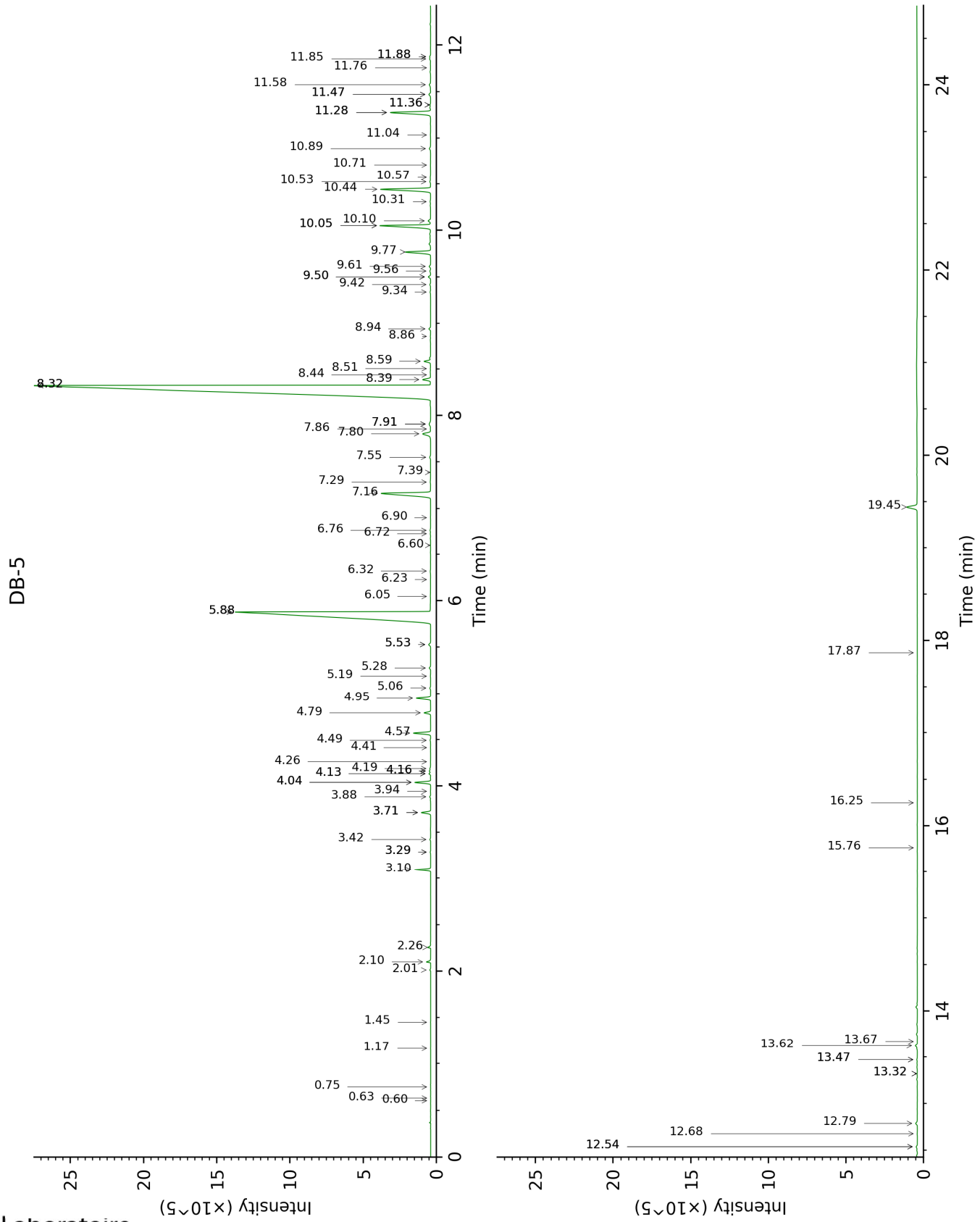
Note: no correction factor was applied

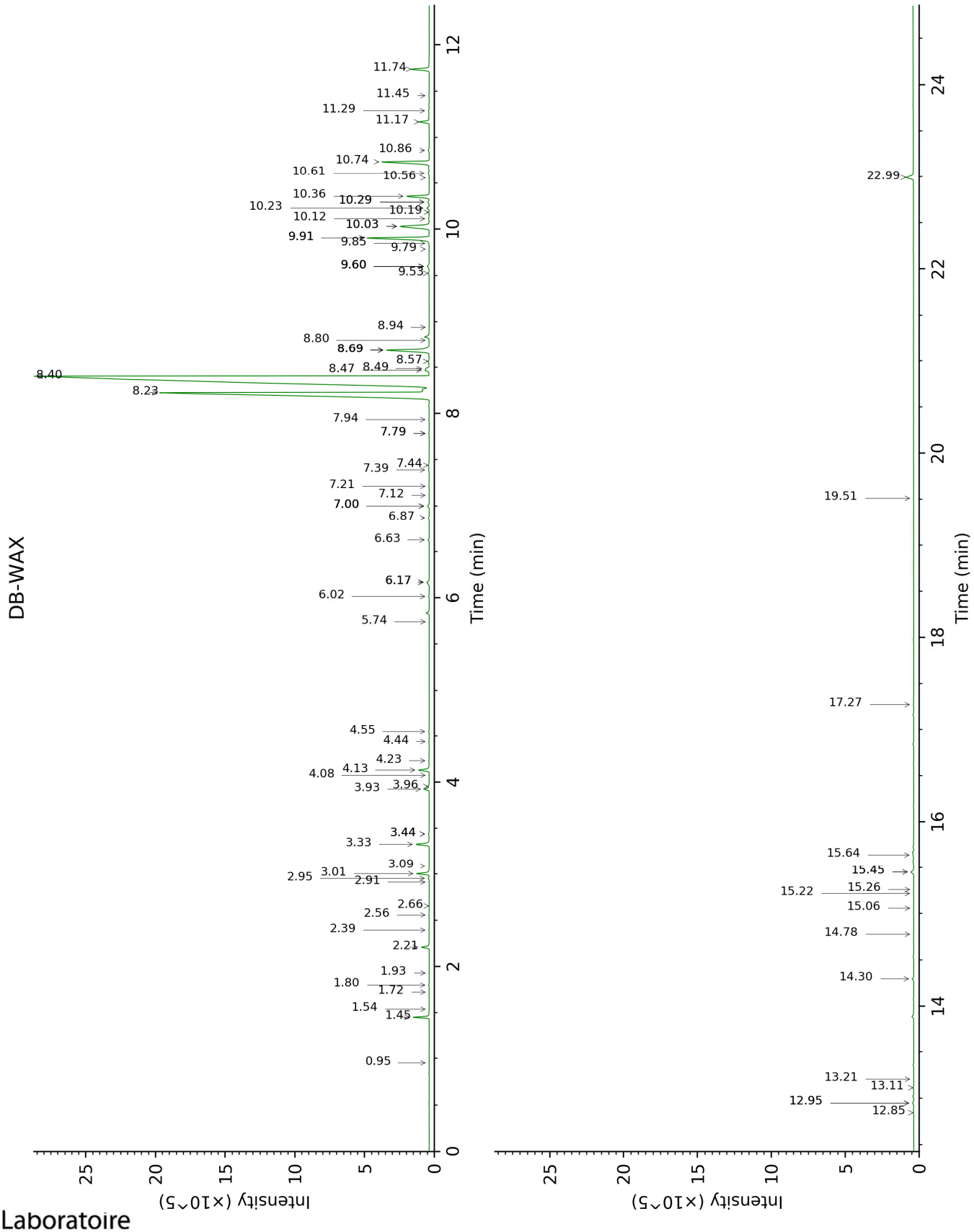
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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.

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com


DB-5
Time (min)
Intensity (×10^5)
11.85
11.88
11.76
11.58
11.47
11.28
11.36
11.04
10.89
10.71
10.53
10.57
10.44
10.31
10.05
10.10
9.77
9.61
9.56
9.50
9.42
9.34
8.94
8.86
8.59
8.51
8.44
8.39
8.32
7.91
7.86
7.80
7.55
7.39
7.29
7.16
6.90
6.76
6.72
6.60
6.32
6.23
6.05
5.88
5.53
5.28
5.19
5.06
4.95
4.79
4.57
4.49
4.41
4.26
4.19
4.13
4.16
4.04
3.94
3.88
3.71
3.42
3.29
3.10
2.26
2.10
2.01
1.45
1.17
0.75
0.63
0.60
19.45
17.87
16.25
15.76
13.67
13.62
13.47
13.32
12.79
12.68
12.54


DB-WAX
Time (min)
Intensity (×10^5)
11.74
11.45
11.29
11.17
10.86
10.74
10.61
10.56
10.36
10.29
10.23
10.19
10.12
10.03
9.91
9.85
9.79
9.60
9.53
8.94
8.80
8.69
8.57
8.47
8.49
8.40
8.23
7.94
7.79
7.39
7.44
7.21
7.12
7.00
6.87
6.63
6.17
6.02
5.74
4.55
4.44
4.23
4.08
4.13
3.93
3.96
3.44
3.33
3.09
2.95
3.01
2.91
2.66
2.56
2.39
2.21
1.93
1.80
1.72
1.54
1.45
0.95
22.99
19.51
17.27
15.64
15.45
15.22
15.26
15.06
14.78
14.30
13.21
13.11
12.95
12.85

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.60	639	tr			
2-Methylbutyral	0.63	649	tr			
2-Ethylfuran	0.75	695	tr	0.95	918	tr
Toluene	1.16	760	tr	1.54	1004	tr
Hexanal	1.45	799	tr	1.93	1041	tr
(2*E*)-Hexenal	2.01	847	0.02	3.44*	1170	0.03
(3*Z*)-Hexenol	2.10	854	0.13	6.02	1351	0.03
(2*E*)-Hexenol	2.26	867	0.09	6.17*†	1363	0.14
α-Pinene	3.10	929	0.56	1.45	995	0.55
α-Fenchene	3.29*	941	0.02	1.72	1021	tr
Camphene	3.29*	941	[0.02]	1.80	1029	0.01
Benzaldehyde	3.42	950	0.03	7.44	1457	0.06
Sabinene	3.72*	969	0.35	2.39	1086	0.01
β-Pinene	3.72*	969	[0.35]	2.21	1068	0.32
Octen-3-ol	3.88	981	0.03	6.87	1414	0.03
Octan-3-one	3.94	984	0.01	4.08	1218	tr
Myrcene	4.04*	991	0.57	3.01	1136	0.55
trans-Dehydroxylinalool oxide	4.04*	991	[0.57]	3.44*	1170	[0.03]
Octan-3-ol	4.13*	997	0.06	6.17*†	1363	[0.14]
2-Carene	4.13*	997	[0.06]	2.56	1101	0.01
Pseudolimonene	4.16*	999	0.05	2.95	1132	0.04
α-Phellandrene	4.16*	999	[0.05]	2.91	1128	0.01
Octanal	4.19	1000	0.03	4.55	1254	0.02
Δ3-Carene	4.26	1005	tr	2.66	1108	tr
α-Terpinene	4.41	1015	tr	3.09	1142	tr
para-Cymene	4.49	1020	0.02	4.23	1230	0.02
Limonene	4.57	1024	0.65	3.33	1161	0.62
(*Z*)-β-Ocimene	4.79	1038	0.24	3.93	1207	0.22
(*E*)-β-Ocimene	4.95	1048	0.53	4.13	1223	0.50
γ-Terpinene	5.06	1055	0.03	3.96	1210	0.04
cis-Sabinene hydrate	5.19	1063	0.01	7.12	1432	0.02
cis-Linalool oxide (fur.)	5.28	1069	0.06	6.63	1396	0.05
trans-Linalool oxide (fur.)	5.53*	1085	0.09	7.00*	1424	0.09
Terpinolene	5.53*	1085	[0.09]	4.44	1246	0.01
Linalool	5.88*	1107	23.00	8.23	1516	23.05
Hotrienol	5.88*	1107	[23.00]	8.94	1572	0.01
Dehydrosabinaketone	6.05	1118	0.01	8.80	1561	0.01
allo-Ocimene	6.23	1129	tr	5.74	1332	tr
Camphor	6.32	1135	0.02	7.39	1453	0.03
Nerol oxide	6.60	1153	tr	7.00*	1424	[0.09]
Borneol	6.72	1161	0.01	9.91*	1650	3.20
δ-Terpineol	6.76	1163	0.02	9.60*	1625	0.12
Terpinen-4-ol	6.90	1173	0.01	8.69*	1552	2.48
α-Terpineol	7.16	1190	3.06	9.91*	1650	[3.20]

Hodiendiol	7.28	1197	0.03	12.95*	1912	0.06
Unknown [m/z 43, 71 (66), 59 (52), 41 (47), 68 (46)...]	7.39	1204	0.01	6.17*†	1363	[0.14]
Linalyl formate	7.55	1215	0.04	8.57	1543	0.05
Nerol	7.80	1233	0.46	11.17	1755	0.45
Unknown [m/z 43, 93 (49), 41 (22), 80 (22), 69 (17), 121 (14)...]	7.86	1236	0.01	7.79*	1482	0.02
Unknown [m/z 121, 43 (93), 41 (37), 107 (35), 67 (33), 136 (32)... 154 (1)]	7.91*	1240	0.10			
Neral	7.91*	1240	[0.10]	9.60*	1625	[0.12]
Linalyl acetate	8.32*†	1268	58.71	8.40	1530	57.37
Geraniol	8.32*†	1268	[58.71]	11.74	1804	0.86
Geranial	8.39†	1272	[58.71]	10.23	1676	0.11
Unknown [m/z 121, 43 (75), 95 (57), 41 (34), 93 (33), 69 (28)...]	8.44	1276	0.01			
Neryl formate	8.51	1281	0.01	9.60*	1625	[0.12]
Bornyl acetate	8.58	1286	0.31	8.47†	1535	0.34
Thymol	8.86	1300	0.01	15.26	2132	0.01
Geranyl formate	8.94	1306	0.07	10.03*	1660	1.94
δ-Elemene	9.34	1334	0.02	7.22	1440	0.03
Hodiendiol derivative	9.42	1339	0.03	13.11	1927	0.02
α-Terpinyl acetate	9.50*	1345	0.09	9.85	1645	0.02
α-Cubebene	9.50*	1345	[0.09]	7.00*	1424	[0.09]
Unknown [m/z 43, 121 (52), 93 (48), 79 (33), 41 (30), 136 (26), 81 (25)...]	9.56	1350	0.03			
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.61	1353	0.06	11.29	1765	0.04
Neryl acetate	9.77	1364	1.08	10.36	1686	1.09
Geranyl acetate	10.05*	1384	2.37	10.74	1718	2.35
β-Cubebene	10.05*	1384	[2.37]	7.94	1494	0.02
β-Elemene	10.10	1387	0.11	8.69*	1552	[2.48]
α-Gurjunene	10.31	1402	0.02	7.79*	1482	[0.02]
β-Caryophyllene	10.44	1412	2.34	8.69*	1552	[2.48]
β-Copaene	10.53	1418	0.03	8.49†	1537	[0.34]
Coumarin	10.57	1422	0.02	17.27	2338	0.02
trans-α-Bergamotene	10.71	1432	0.01	8.69*	1552	[2.48]
α-Humulene	10.89	1445	0.06	9.52	1619	0.05
9-epi-β-Caryophyllene	11.04	1456	0.01	9.60*	1625	[0.12]
α-Amorphene	11.28*	1474	1.93	9.79	1640	0.01
Germacrene D	11.28*	1474	[1.93]	10.03*	1660	[1.94]
β-Selinene	11.36*	1480	0.02	10.12	1667	0.03
Hodiendiol derivative	11.36*	1480	[0.02]			

IV						
α-Selinene	11.47*	1488	0.08	10.18	1672	0.01
Bicyclogermacrene	11.47*	1488	[0.08]	10.30*	1681	0.08
α-Muurolene	11.58	1496	0.08	10.30*	1681	[0.08]
γ-Cadinene	11.76	1510	0.01	10.56	1703	tr
trans-Calamenene	11.85†	1517	0.08	11.45	1779	0.02
δ-Cadinene	11.88*†	1519	[0.08]	10.61	1707	0.06
β-Sesquiphellandrene	11.88*†	1519	[0.08]	10.86	1729	0.05
Caryophyllene oxide	12.54*	1571	0.06	12.95*	1912	[0.06]
Caryophyllene oxide isomer	12.54*	1571	[0.06]	12.85	1902	0.02
Salvial-4(14)-en-1-one	12.68	1582	0.01	13.21	1935	0.01
Guaiol	12.79	1590	0.08	14.30	2038	0.07
Hinesol	13.32*	1633	0.02	15.22	2127	0.02
τ-Cadinol	13.32*	1633	[0.02]	15.06	2111	0.01
α-Cadinol	13.47*	1646	0.03	15.64	2170	0.04
α-Eudesmol	13.47*	1646	[0.03]	15.45*	2151	0.17
Unknown [m/z 81, 41 (46), 79 (46), 93 (39), 91 (33), 107 (33)... 206 (8)]	13.62	1658	0.09			
Bulnesol	13.67	1662	0.01	15.45*	2151	[0.17]
Phytone	15.76	1842	tr	14.78	2084	0.01
Sclareoloxide	16.25	1886	0.01			
Manool	17.87	2040	0.01	19.51	2588	0.01
Sclareol	19.44	2200	0.55	22.99	3021	0.47
Total identified		**98.66%**			**98.20%**	
Total reported		**98.87%**			**98.23%**	

*: 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