Date : August 13, 2019

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 19H12-PTH01-1-CC
Customer identification : Clary Sage Org - France - CC4101812R
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 : Sylvain Mercier, M. Sc., Chimiste
Analysis date : August 12, 2019

Checked and approved by :

Sylvain Mercier, M. Sc., chimiste 2014-005

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Physicochemical data

Physical aspect: Faintly yellow liquid
Refractive index: 1.4579 ± 0.0003 (20 °C)

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

Compound	Min. %	Max. %	Observed %	Complies?
Sclareol	0.4	2.6	0.4	Yes
Germacrene D	1.2	7.5	2.3	Yes
α-Terpineol	1	5	2	Yes
Linalyl acetate	56.0	70.5	64.5	Yes
Linalool	13	24	18	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.

Analysis summary – Consolidated contents

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

Identification	%	Classe
Ethanol	0.01	Aliphatic alcohol
Isovaleral	0.02	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	0.01	Aliphatic alcohol
Toluene	tr	Simple phenolic
Hexanal	tr	Aliphatic aldehyde
(2*E*)-Hexenal	0.04	Aliphatic aldehyde
(3*Z*)-Hexenol	0.05	Aliphatic alcohol
(2*E*)-Hexenol	0.09	Aliphatic alcohol
Hexanol	0.04	Aliphatic alcohol
α-Thujene	tr	Monoterpene
α-Pinene	0.09	Monoterpene
Camphene	0.02	Monoterpene
Benzaldehyde	0.02	Simple phenolic
β-Pinene	0.12	Monoterpene
Sabinene	0.04	Monoterpene
Octen-3-ol	0.06	Aliphatic alcohol
Octan-3-one	0.02	Aliphatic ketone
Myrcene	0.67	Monoterpene
trans-Dehydroxylinalool oxide	0.05	Monoterpenic ether
cis-Dehydroxylinalool oxide	0.05	Monoterpenic ether
para-Cymene	0.03	Monoterpene
Limonene	0.22	Monoterpene
β-Phellandrene	0.03	Monoterpene
(*Z*)-β-Ocimene	0.26	Monoterpene
(*E*)-β-Ocimene	0.40	Monoterpene
γ-Terpinene	0.02	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.03	Monoterpenic alcohol
Terpinolene	0.09	Monoterpene
trans-Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Linalool	17.76	Monoterpenic alcohol
Hotrienol	0.03	Monoterpenic alcohol
Dehydrosabinaketone	0.01	Normonoterpenic ketone
Camphor	0.02	Monoterpenic ketone
Nerol oxide	0.03	Aliphatic ether
Borneol	0.04	Monoterpenic alcohol
Rosefuran oxide	tr	Monoterpenic ether
Terpinen-4-ol	0.03	Monoterpenic alcohol
para-Cymen-8-ol	0.02	Monoterpenic alcohol
α-Terpineol	2.01	Monoterpenic alcohol
Hodiendiol	0.03	Monoterpenic alcohol
Unknown	0.02	Unknown
Linalyl formate	0.38	Monoterpenic ester
Nerol	0.39	Monoterpenic alcohol

Unknown	0.01	Monoterpenic ester
Neral	0.02	Monoterpenic aldehyde
Geraniol	1.05	Monoterpenic alcohol
Linalyl acetate	64.46	Monoterpenic ester
Geranial	0.06	Monoterpenic aldehyde
Unknown	0.04	Unknown
Neryl formate	0.04	Monoterpenic ester
Bornyl acetate	0.03	Monoterpenic ester
Geranyl formate	0.02	Monoterpenic ester
Carvacrol	0.08	Monoterpenic alcohol
δ-Elemene	0.01	Sesquiterpene
Hodiendiol derivative	0.07	Oxygenated monoterpene
α-Terpinyl acetate	0.03	Monoterpenic ester
α-Cubebene	0.03	Sesquiterpene
Unknown	0.05	Oxygenated monoterpene
Unknown	0.04	Monoterpenic ester
Unknown	0.02	Oxygenated monoterpene
Neryl acetate	0.61	Monoterpenic ester
α-Copaene	0.44	Sesquiterpene
β-Bourbonene	0.11	Sesquiterpene
(*Z*)-8-Hydroxylinalool?	0.02	Monoterpenic alcohol
1,5-diepi-β-Bourbonene	0.01	Sesquiterpene
Geranyl acetate	1.17	Monoterpenic ester
β-Cubebene	0.13	Sesquiterpene
β-Elemene	0.08	Sesquiterpene
β-Caryophyllene	1.68	Sesquiterpene
Coumarin	0.03	Coumarin
β-Copaene	0.05	Sesquiterpene
trans-α-Bergamotene	0.03	Sesquiterpene
α-Humulene	0.13	Sesquiterpene
Germacrene D	2.26	Sesquiterpene
α-Amorphene	0.03	Sesquiterpene
β-Selinene	0.05	Sesquiterpene
Hodiendiol derivative IV	0.21	Oxygenated monoterpene
Bicyclogermacrene	0.28	Sesquiterpene
(*Z*)-α-Bisabolene	0.08	Sesquiterpene
Hodiendiol derivative II	0.05	Oxygenated monoterpene
β-Bisabolene	0.02	Sesquiterpene
(*Z*)-γ-Bisabolene	0.09	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
δ-Cadinene	0.13	Sesquiterpene
Isocaryophyllene epoxide B	0.03	Sesquiterpenic ether
1,5-Epoxysalvial-4(14)-ene	0.02	Sesquiterpenic ether
Spathulenol	0.11	Sesquiterpenic alcohol
Caryophyllene oxide	0.17	Sesquiterpenic ether
Salvial-4(14)-en-1-one	0.03	Aliphatic alcohol
Guaiol	0.11	Sesquiterpenic alcohol
Unknown	0.07	Unknown
Hinesol	0.02	Sesquiterpenic alcohol
τ-Cadinol	0.02	Sesquiterpenic alcohol
β-Eudesmol	0.06	Sesquiterpenic alcohol
α-Eudesmol	0.04	Sesquiterpenic alcohol

α-Cadinol	0.02	Sesquiterpenic alcohol
Cyclocolorenone	0.02	Sesquiterpenic ketone
Phytone	0.01	Terpenic ketone
Sclareoloxide	0.12	Terpenic ether
Geranyl-α-terpinene	0.08	Diterpene
Geranyl-para-cymene	0.04	Diterpene
Manoyl oxide	0.02	Diterpenic ether
13-epi-Manoyl oxide	0.01	Diterpenic ether
Manool	0.03	Diterpenic alcohol
Sclareol	0.40	Diterpenic alcohol
Consolidated total	**98.47%**	

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.

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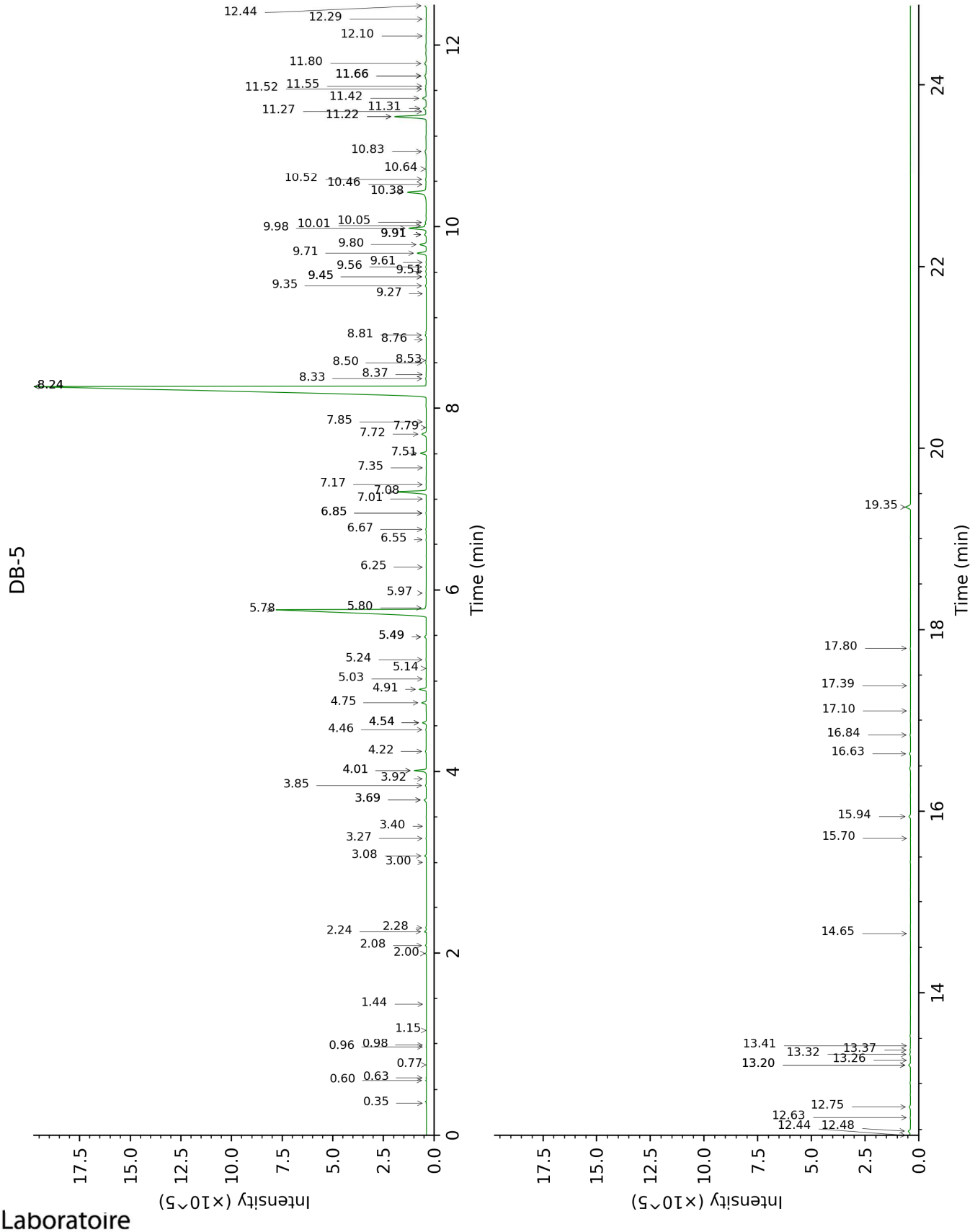
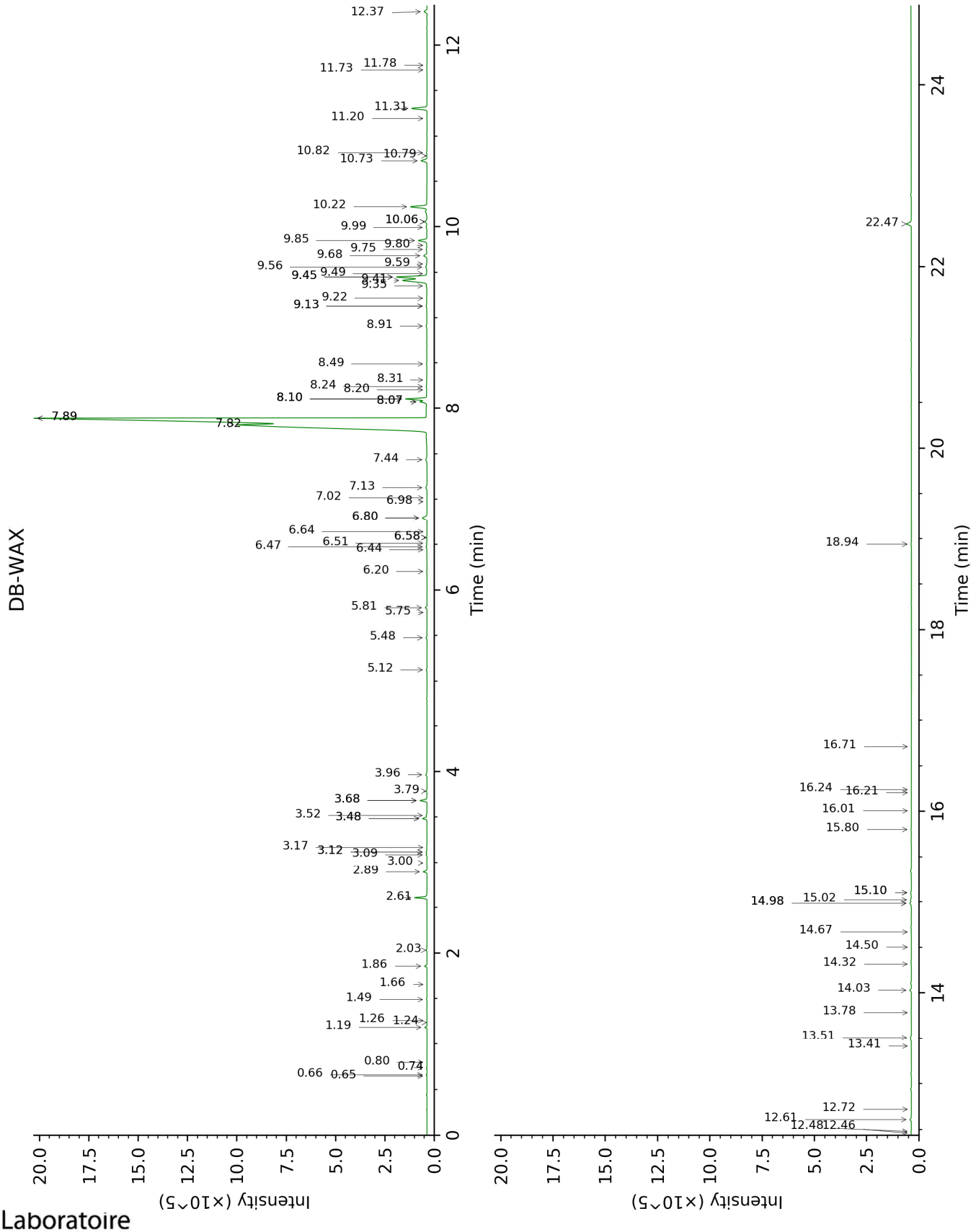

DB-5
Time (min)
Intensity (×10^5)
12.44
12.29
12.10
11.80
11.66
11.52
11.55
11.42
11.27
11.31
11.22
10.83
10.64
10.52
10.46
10.38
9.98
10.01
10.05
9.91
9.80
9.71
9.56
9.61
9.51
9.45
9.35
9.27
8.81
8.76
8.50
8.53
8.33
8.37
8.24
7.85
7.72
7.79
7.51
7.35
7.17
7.08
7.01
6.85
6.67
6.55
6.25
5.97
5.78
5.80
5.49
5.24
5.14
5.03
4.91
4.75
4.54
4.46
4.22
4.01
3.92
3.85
3.69
3.40
3.27
3.08
3.00
2.24
2.28
2.08
2.00
1.44
1.15
0.96
0.98
0.77
0.60
0.63
0.35
19.35
17.80
17.39
17.10
16.84
16.63
15.94
15.70
14.65
13.41
13.37
13.32
13.26
13.20
12.75
12.63
12.44
12.48


DB-WAX
Time (min)
Intensity (×10^5)
12.37
11.73
11.78
11.31
11.20
10.82
10.73
10.79
10.22
9.99
10.06
9.85
9.75
9.80
9.68
9.56
9.59
9.45
9.49
9.41
9.35
9.13
9.22
8.91
8.49
8.31
8.24
8.20
8.10
8.07
7.89
7.82
7.44
7.13
7.02
6.98
6.80
6.64
6.58
6.47
6.51
6.44
6.20
5.81
5.75
5.48
5.12
3.96
3.79
3.68
3.52
3.48
3.17
3.12
3.09
3.00
2.89
2.61
2.03
1.86
1.66
1.49
1.19
1.26
1.24
0.80
0.74
0.66
0.65
22.47
18.94
16.71
16.24
16.21
16.01
15.80
14.98
15.02
15.10
14.67
14.50
14.32
14.03
13.78
13.51
13.41
12.72
12.61
12.48
12.46

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethanol	0.35	517	0.01	0.74	908	0.01
Isovaleral	0.60	640	0.02	0.66	887	0.02
2-Methylbutyral	0.63	651	0.01	0.65	880	0.01
2-Ethylfuran	0.77	705	tr	0.80	919	tr
Isoamyl alcohol	0.96	735	0.01	3.12*	1174	0.05
2-Methylbutanol	0.98	737	0.01	3.12*	1174	[0.05]
Toluene	1.15	760	tr	1.26	1002	tr
Hexanal	1.44	800	tr	1.66	1043	tr
(2*E*)-Hexenal	2.00	848	0.04	3.17	1179	0.04
(3*Z*)-Hexenol	2.08	855	0.05	5.48	1350	0.07
(2*E*)-Hexenol	2.24	867	0.09	5.81	1374	0.11
Hexanol	2.28	871	0.04	5.12	1324	0.04
α-Thujene	3.00	925	tr	1.24	999	tr
α-Pinene	3.08	930	0.09	1.19	990	0.09
Camphene	3.27	942	0.02	1.49	1026	0.03
Benzaldehyde	3.40	951	0.02	7.02	1463	0.01
β-Pinene	3.69*	970	0.16	1.86	1064	0.12
Sabinene	3.69*	970	[0.16]	2.03	1083	0.04
Octen-3-ol	3.85	980	0.06	6.47	1423	0.06
Octan-3-one	3.92	985	0.02	3.68*	1219	0.43
Myrcene	4.01*	991	0.70	2.61	1133	0.67
trans-Dehydroxylinalool oxide	4.01*	991	[0.70]	3.09	1172	0.05
cis-Dehydroxylinalool oxide	4.22	1005	0.05	3.52	1207	0.05
para-Cymene	4.46	1020	0.03	3.78	1227	0.04
Limonene	4.54*	1025	0.23	2.89	1156	0.22
β-Phellandrene	4.54*	1025	[0.23]	3.00	1165	0.03
(*Z*)-β-Ocimene	4.76	1039	0.26	3.48*	1204	0.26
(*E*)-β-Ocimene	4.91	1048	0.40	3.68*	1219	[0.43]
γ-Terpinene	5.02	1056	0.02	3.48*	1204	[0.26]
cis-Sabinene hydrate	5.14	1063	0.01	6.58*	1430	0.03
cis-Linalool oxide (fur.)	5.24	1069	0.03	6.20	1402	0.02
Terpinolene	5.48*	1085	0.11	3.96	1240	0.09
trans-Linalool oxide (fur.)	5.48*	1085	[0.11]	6.58*	1430	[0.03]
Linalool	5.78†	1104	17.79	7.82†	1524	82.84
Hotrienol	5.80†	1105	[17.79]	8.49	1576	0.03
Dehydrosabinaketone	5.97	1116	0.01	8.31	1562	0.01
Camphor	6.25	1134	0.02	6.80*	1447	0.44
Nerol oxide	6.55	1154	0.03	6.51	1426	0.04
Borneol	6.66	1161	0.04	9.45*	1653	2.24
Rosefuran oxide	6.85*	1173	0.04	8.20	1554	tr
Terpinen-4-ol	6.85*	1173	[0.04]	8.24	1557	0.03
para-Cymen-8-ol	7.01	1184	0.02	11.20	1800	0.02
α-Terpineol	7.08	1189	2.01	9.45*	1653	[2.24]

Hodiendiol	7.16	1194	0.03	12.48	1914	0.03
Unknown [m/z 43, 71 (66), 59 (52), 41 (47), 68 (46)...]	7.35	1206	0.02	5.75	1370	tr
Linalyl formate	7.51	1217	0.38	8.07*†	1544	1.65
Nerol	7.72	1231	0.39	10.73	1760	0.44
Unknown [m/z 121, 43 (93), 41 (37), 107 (35), 67 (33), 136 (32)... 154 (1)]	7.79	1236	0.01			
Neral	7.85	1241	0.02	9.13*	1627	0.07
Geraniol	8.24*	1268	65.50	11.31	1810	1.05
Linalyl acetate	8.24*	1268	[65.50]	7.89*†	1530	[82.84]
Geranial	8.33	1274	0.06	9.75	1678	0.06
Unknown [m/z 121, 43 (75), 95 (57), 41 (34), 93 (33), 69 (28)...]	8.37	1277	0.04			
Neryl formate	8.50	1286	0.04	9.13*	1627	[0.07]
Bornyl acetate	8.53	1288	0.03	7.89*†	1530	[82.84]
Geranyl formate	8.76	1304	0.02	9.59	1665	0.02
Carvacrol	8.81	1307	0.08	14.98*	2155	0.14
δ-Elemene	9.27	1334	0.01	6.64	1435	tr
Hodiendiol derivative	9.35	1340	0.07	12.61	1926	0.10
α-Terpinyl acetate	9.45*	1347	0.06	9.35	1645	0.03
α-Cubebene	9.45*	1347	[0.06]	6.44	1420	0.03
Unknown [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	9.51	1351	0.05	10.82	1768	0.05
Unknown [m/z 43, 121 (52), 93 (48), 79 (33), 41 (30), 136 (26), 81 (25)...]	9.56	1355	0.04			
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.61	1358	0.02	10.79	1765	0.02
Neryl acetate	9.71	1366	0.61	9.85	1686	0.62
α-Copaene	9.80	1372	0.44	6.80*	1447	[0.44]
β-Bourbonene	9.91*	1380	0.14	7.13	1472	0.11
(*Z*)-8-Hydroxylinalool?	9.91*	1380	[0.14]	13.41	2001	0.02
1,5-diepi-β-Bourbonene	9.91*	1380	[0.14]	6.98	1460	0.01
Geranyl acetate	9.98†	1385	1.27	10.22	1717	1.17
β-Cubebene	10.01†	1387	[1.27]	7.44	1495	0.13
β-Elemene	10.05	1390	0.08	8.07*†	1544	[1.65]
β-Caryophyllene	10.38	1414	1.68	8.10*†	1546	[1.65]
Coumarin	10.46	1420	0.03	16.71	2334	0.02
β-Copaene	10.52	1424	0.05	8.10*†	1546	[1.65]
trans-α-Bergamotene	10.64	1433	0.03	8.10*†	1546	[1.65]
α-Humulene	10.83	1447	0.13	8.91	1610	0.06
Germacrene D	11.22*	1476	2.33	9.41	1650	2.26

α-Amorphene	11.22*	1476	[2.33]	9.22	1634	0.03
β-Selinene	11.27	1480	0.05	9.49	1656	0.03
Hodiendiol derivative IV	11.31	1483	0.21			
Bicyclogermacrene	11.42	1491	0.28	9.68	1672	0.24
(*Z*)-α-Bisabolene	11.52	1499	0.08	9.99	1698	0.06
Hodiendiol derivative II	11.55	1501	0.05	12.46	1913	0.02
β-Bisabolene	11.66*	1510	0.18	9.80	1682	0.02
(*Z*)-γ-Bisabolene	11.66*	1510	[0.18]	9.56	1662	0.09
γ-Cadinene	11.66*	1510	[0.18]	10.06*	1703	0.15
δ-Cadinene	11.80	1520	0.13	10.06*	1703	[0.15]
Isocaryophyllene epoxide B	12.10	1544	0.03	11.73	1847	0.03
1,5-Epoxysalvial-4(14)-ene	12.29	1559	0.02	11.78	1852	0.01
Spathulenol	12.44	1570	0.11	14.03	2060	0.12
Caryophyllene oxide	12.48	1574	0.17	12.37	1904	0.24
Salvial-4(14)-en-1-one	12.63	1586	0.03	12.72	1937	0.02
Guaiol	12.75	1595	0.11	13.78	2037	0.02
Unknown [m/z 43, 93 (89), 91 (88), 79 (87), 123 (76), 81 (75)...]	13.20*	1632	0.13	13.51	2010	0.07
Hinesol	13.20*	1632	[0.13]	14.67	2123	0.02
τ-Cadinol	13.26	1637	0.02	14.50	2106	0.02
β-Eudesmol	13.32	1642	0.06	15.02	2158	0.07
α-Eudesmol	13.37	1646	0.04	14.98*	2155	[0.14]
α-Cadinol	13.41	1650	0.02	15.10*	2166	0.08
Cyclocolorenone	14.65	1754	0.02	16.21	2280	0.01
Phytone	15.70	1848	0.01	14.32	2088	0.02
Sclareoloxide	15.94	1870	0.12			
Geranyl-α-terpinene	16.63	1933	0.08	15.10*	2166	[0.08]
Geranyl-para-cymene	16.84	1953	0.04	15.80	2238	0.05
Manoyl oxide	17.10	1978	0.02	16.24	2284	0.01
13-epi-Manoyl oxide	17.39	2005	0.01	16.01	2260	0.02
Manool	17.80	2046	0.03	18.94	2585	0.03
Sclareol	19.35	2204	0.40	22.47	3030	0.42
Total identified		**98.33%**			**98.11%**	
Total reported		**98.51%**			**98.25%**	

*: 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