CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23B02-NSO01
Customer identification : Clary Sage - CS22.250 - Salvia sclarea
Type : Essential oil
Source : *Salvia sclarea*
Customer : Natural Sourcing LLC

ANALYSIS

Method: PC-MAT-014 ✳ISO - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Candide Morin, analyste
Analysis date : February 15, 2023

Checked and approved by :

_____
Alexis St-Gelais, Ph. D., Chimiste 2013-174

MÉTHODE CERTIFIÉE
✳ISO 17025:2017
CERTIFIED METHOD

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4617 ± 0.0003 (20 ℃; method PC-MAT-016)

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

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ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

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

Identification	%	Class
Isovaleral	0.02	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
2-Ethylfuran	0.01	Furan
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Toluene	tr	Simple phenolic
Hexanal	0.01	Aliphatic aldehyde
(2*E*)-Hexenal	0.01	Aliphatic aldehyde
(3*Z*)-Hexenol	0.01	Aliphatic alcohol
(2*E*)-Hexenol	0.01	Aliphatic alcohol
Hexanol	0.02	Aliphatic alcohol
α-Pinene	0.02	Monoterpene
Benzaldehyde	0.01	Simple phenolic
Sabinene	0.01	Monoterpene
β-Pinene	0.02	Monoterpene
Octen-3-ol	0.03	Aliphatic alcohol
Octan-3-one	0.03	Aliphatic ketone
trans-Dehydroxylinalool oxide	0.04	Monoterpenic ether
Myrcene	0.84	Monoterpene
Octanal	0.01	Aliphatic aldehyde
cis-Dehydroxylinalool oxide	0.05	Monoterpenic ether
α-Terpinene	0.02	Monoterpene
para-Cymene	0.02	Monoterpene
Limonene	0.28	Monoterpene
β-Phellandrene	0.01	Monoterpene
(*Z*)-β-Ocimene	0.31	Monoterpene
(*E*)-β-Ocimene	0.58	Monoterpene
γ-Terpinene	0.02	Monoterpene
cis-Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Terpinolene	0.15	Monoterpene
trans-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Linalool	9.65	Monoterpenic alcohol
Hotrienol	0.04	Monoterpenic alcohol
Dehydrosabinaketone	0.01	Normonoterpenic ketone
allo-Ocimene	0.01	Monoterpene
Camphor	0.01	Monoterpenic ketone
Nerol oxide	0.03	Aliphatic ether
Borneol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.02	Monoterpenic alcohol
α-Terpineol	1.34	Monoterpenic alcohol
Hodiendiol (2,6-dimethylocta-3,7-diene-2,6-diol)	0.02	Monoterpenic alcohol
Linalyl formate	0.14	Monoterpenic ester
Nerol	0.29	Monoterpenic alcohol
Unknown	0.01	Unknown
Neral	0.01	Monoterpenic aldehyde

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Linalyl acetate	64.92	Monoterpenic ester
Geraniol	0.75	Monoterpenic alcohol
Geranial	0.04	Monoterpenic aldehyde
Neryl formate	0.02	Monoterpenic ester
Bornyl acetate	0.01	Monoterpenic ester
Geranyl formate	0.04	Monoterpenic ester
Hodiendiol derivative	0.05	Oxygenated monoterpene
α-Cubebene	0.05	Sesquiterpene
α-Terpinyl acetate	0.03	Monoterpenic ester
Unknown	0.02	Oxygenated monoterpene
Unknown	0.03	Oxygenated monoterpene
Neryl acetate	0.67	Monoterpenic ester
α-Copaene	1.82	Sesquiterpene
β-Bourbonene	0.24	Sesquiterpene
1,5-diepi-β-Bourbonene	0.03	Sesquiterpene
Geranyl acetate	1.22	Monoterpenic ester
β-Cubebene	0.39	Sesquiterpene
β-Elemene	0.17	Sesquiterpene
γ-4-Dimethylbenzenebutyral	0.06	Simple phenolic
β-Caryophyllene	2.56	Sesquiterpene
β-Copaene	0.09	Sesquiterpene
trans-α-Bergamotene	0.03	Sesquiterpene
α-Humulene	0.12	Sesquiterpene
9-epi-β-Caryophyllene	0.02	Sesquiterpene
α-Amorphene	0.11	Sesquiterpene
Germacrene D	5.79	Sesquiterpene
β-Selinene	0.04	Sesquiterpene
Hodiendiol derivative IV	0.13	Oxygenated monoterpene
Bicyclogermacrene	0.78	Sesquiterpene
α-Selinene	0.01	Sesquiterpene
α-Muurolene	0.04	Sesquiterpene
(*Z*)-α-Bisabolene	0.11	Sesquiterpene
Germacrene A	0.04	Sesquiterpene
β-Bisabolene	0.01	Sesquiterpene
Cubebol	0.05	Sesquiterpenic alcohol
(3*E*,6*E*)-α-Farnesene	0.10	Sesquiterpene
γ-Cadinene	0.14	Sesquiterpene
δ-Cadinene	0.42	Sesquiterpene
trans-Cadina-1,4-diene	0.01	Sesquiterpene
1,5-Epoxysalvial-4(14)-ene	0.07	Sesquiterpenic ether
Spathulenol	0.26	Sesquiterpenic alcohol
Caryophyllene oxide	0.42	Sesquiterpenic ether
Caryophyllene oxide isomer	0.04	Sesquiterpenic ether
Salvial-4(14)-en-1-one	0.08	Aliphatic alcohol
Guaiol	0.02	Sesquiterpenic alcohol
Unknown	0.04	Oxygenated sesquiterpene
Torilenol	0.08	Oxygenated sesquiterpene
Hinesol	0.06	Sesquiterpenic alcohol
Unknown	0.08	Unknown
β-Eudesmol	0.13	Sesquiterpenic alcohol
α-Eudesmol	0.08	Sesquiterpenic alcohol
Bulnesol	0.02	Sesquiterpenic alcohol

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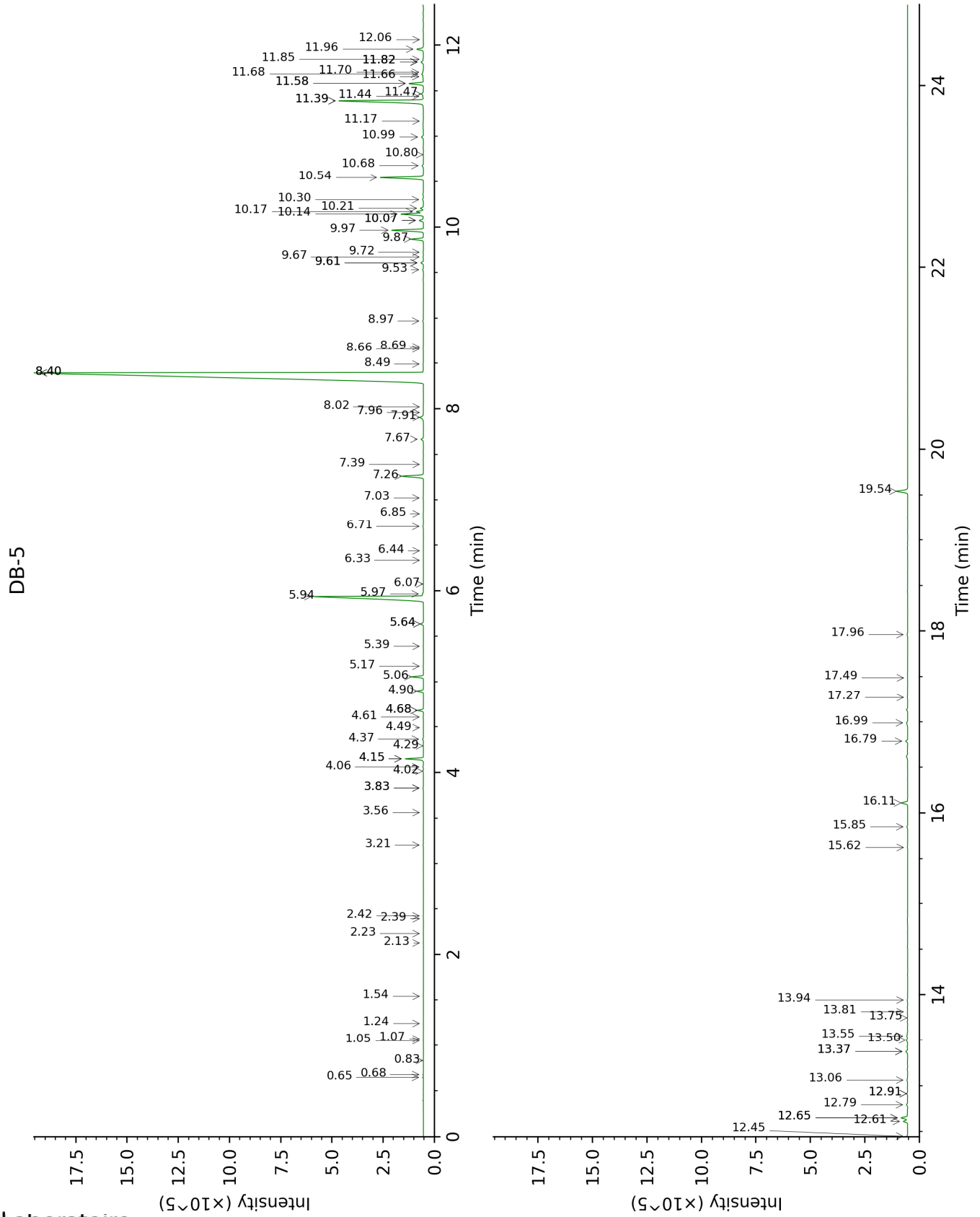|		
(1βH)-Guai-9-en-11-ol?	0.02	Sesquiterpenic alcohol
Eudesma-4(15),7-dien-1β-ol	0.03	Sesquiterpenic alcohol
Unknown	0.02	Unknown
Phytone	0.05	Terpenic ketone
Sclareoloxide	0.38	Terpenic ether
Unknown	0.12	Unknown
Geranyl-para-cymene	0.11	Diterpene
Manoyl oxide	0.03	Diterpenic ether
13-epi-Manoyl oxide	0.01	Diterpenic ether
Manool	0.04	Diterpenic alcohol
Sclareol	0.76	Diterpenic alcohol
Consolidated total	**98.29%**	

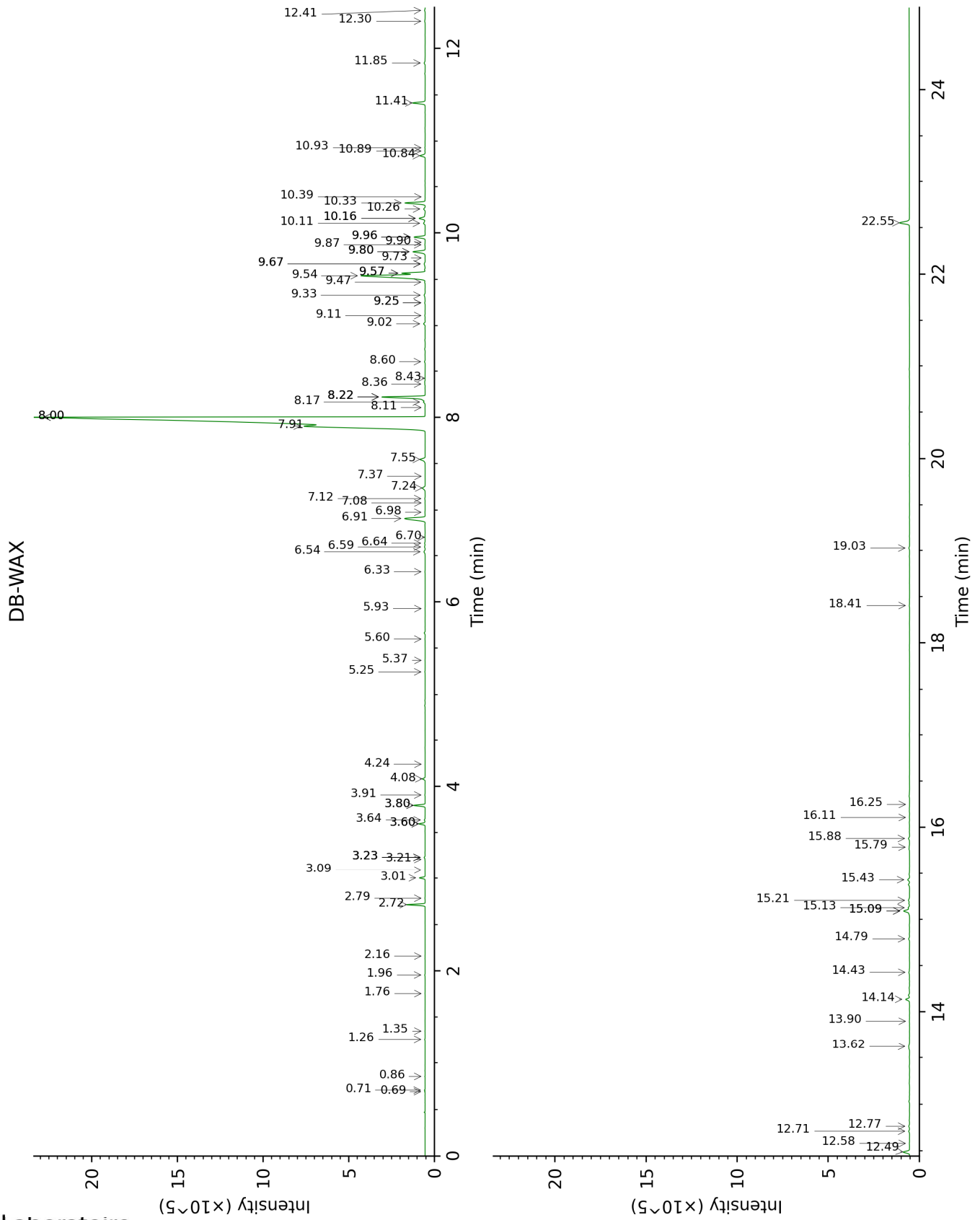tr: The compound has been detected below 0.005% of total signal.

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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This page was intentionally left blank. The following pages present the complete data of the analysis.

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DB-5

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DB-WAX

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.65	640	0.02	0.71	888	0.02
2-Methylbutyral	0.68	650	0.01	0.69	881	0.01
2-Ethylfuran	0.83	701	0.01	0.86	918	0.01
Isoamyl alcohol	1.05	732	0.01	3.23*†	1176	[0.05]
2-Methylbutanol	1.07	736	tr	3.23*†	1176	[0.05]
Toluene	1.24	759	tr	1.35	1001	0.01
Hexanal	1.54	799	0.01	1.76	1043	tr
(2*E*)-Hexenal	2.13	849	0.01	3.21†	1174	0.05
(3*Z*)-Hexenol	2.23	857	0.01	5.60	1350	0.01
(2*E*)-Hexenol	2.39	870	0.01	5.93	1374	0.01
Hexanol	2.42	873	0.02	5.25	1325	0.02
α-Pinene	3.21	930	0.02	1.26	990	0.02
Benzaldehyde	3.56	954	0.01	7.08	1459	0.01
Sabinene	3.83*	971	0.03	2.16	1086	0.01
β-Pinene	3.83*	971	[0.03]	1.96	1064	0.02
Octen-3-ol	4.02	984	0.03	6.54	1419	0.10
Octan-3-one	4.06	987	0.03	3.80*	1220	0.59
trans-Dehydroxylinalool oxide	4.15*	992	0.89	3.23*†	1176	[0.05]
Myrcene	4.15*	992	[0.89]	2.72	1133	0.84
Octanal	4.29	1002	0.01	4.24	1254	0.01
cis-Dehydroxylinalool oxide	4.37	1006	0.05	3.64	1208	0.05
α-Terpinene	4.49	1014	0.02	2.79	1139	0.01
para-Cymene	4.61	1022	0.02	3.91	1229	0.02
Limonene	4.68*	1026	0.29	3.01	1157	0.28
β-Phellandrene	4.68*	1026	[0.29]	3.09	1164	0.01
(*Z*)-β-Ocimene	4.90	1040	0.31	3.60*	1205	0.33
(*E*)-β-Ocimene	5.06	1050	0.58	3.80*	1220	[0.59]
γ-Terpinene	5.17	1057	0.02	3.60*	1205	[0.33]
cis-Linalool oxide (fur.)	5.39	1070	0.02	6.33	1403	0.02
Terpinolene	5.64*	1086	0.15	4.08	1242	0.15
trans-Linalool oxide (fur.)	5.64*	1086	[0.15]	6.70	1431	0.01
Linalool	5.94†	1104	9.69	7.91†	1522	74.63
Hotrienol	5.97†	1106	[9.69]	8.60	1575	0.04
Dehydrosabinaketone	6.07	1113	0.01	8.42	1562	0.01
allo-Ocimene	6.33	1130	0.01	5.37	1334	0.01
Camphor	6.44	1136	0.01	6.98	1451	0.03
Nerol oxide	6.71	1153	0.03	6.64	1426	0.04
Borneol	6.85	1162	0.01	9.57*†	1653	[7.23]
Terpinen-4-ol	7.02	1174	0.02	8.36	1557	0.02
α-Terpineol	7.26	1189	1.34	9.57*†	1653	[7.23]
Hodiendiol (2,6-dimethylocta-3,7-diene-2,6-diol)	7.39	1197	0.02	12.58	1912	0.02
Linalyl formate	7.67	1215	0.14	8.17	1542	0.11
Nerol	7.91	1231	0.29	10.84	1759	0.33

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Compound	RT	RI	%	RT	RI	%
Unknown [m/z 43, 93 (49), 41 (22), 80 (22), 69 (17), 121 (14)...]	7.96	1235	0.01	7.37	1480	0.01
Neral	8.02	1239	0.01	9.25*	1627	0.03
Linalyl acetate	8.40*†	1264	65.67	8.00*†	1529	[74.63]
Geraniol	8.40*†	1264	[65.67]	11.41	1808	0.75
Geranial	8.49	1270	0.04	9.87	1678	0.02
Neryl formate	8.66	1281	0.02	9.25*	1627	[0.03]
Bornyl acetate	8.68	1283	0.01	8.00*†	1529	[74.63]
Geranyl formate	8.97	1302	0.04	9.67*	1661	0.10
Hodiendiol derivative	9.53	1341	0.05	12.71	1924	0.06
α-Cubebene	9.61*	1347	0.14	6.60	1423	0.05
α-Terpinyl acetate	9.61*	1347	[0.14]	9.47	1645	0.03
Unknown [m/z 43, 79 (47), 71 (31), 94 (27), 81 (23), 41 (22)... 197 (0)]	9.67	1351	0.02	10.89	1763	0.02
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.72	1355	0.03	10.93	1766	0.02
Neryl acetate	9.87	1365	0.67	9.96*	1684	0.67
α-Copaene	9.97	1372	1.82	6.91	1446	1.82
β-Bourbonene	10.07*	1379	0.24	7.24	1471	0.24
1,5-diepi-β-Bourbonene	10.07*	1379	[0.24]	7.12	1462	0.03
Geranyl acetate	10.14†	1384	1.61	10.33	1715	1.22
β-Cubebene	10.17†	1386	[1.61]	7.55	1494	0.39
β-Elemene	10.21	1389	0.17	8.22*	1546	2.75
γ-4-Dimethylbenzenebutyral	10.30	1396	0.06			
β-Caryophyllene	10.54	1413	2.56	8.22*	1546	[2.75]
β-Copaene	10.68	1423	0.09	8.11	1537	0.02
trans-α-Bergamotene	10.80	1432	0.03	8.22*	1546	[2.75]
α-Humulene	10.99	1447	0.12	9.02	1608	0.10
9-epi-β-Caryophyllene	11.17	1460	0.02	9.11	1616	0.03
α-Amorphene	11.39*	1476	5.89	9.33	1633	0.11
Germacrene D	11.39*	1476	[5.89]	9.54†	1650	7.23
β-Selinene	11.44	1480	0.04	9.67*	1661	[0.10]
Hodiendiol derivative IV	11.47	1482	0.13			
Bicyclogermacrene	11.58*	1490	0.86	9.80*	1671	0.82
α-Selinene	11.58*	1490	[0.86]	9.73	1666	0.01
α-Muurolene	11.66	1496	0.04	9.80*	1671	[0.82]
(*Z*)-α-Bisabolene	11.68	1498	0.11	9.96*	1684	[0.67]
Germacrene A	11.70	1499	0.04	10.16*	1701	0.45
β-Bisabolene	11.82*†	1508	0.19	9.90	1680	0.01
Cubebol	11.82*†	1508	[0.19]	12.30	1886	0.05
(3*E*,6*E*)-α-Farnesene	11.82*†	1508	[0.19]	10.26	1710	0.10
γ-Cadinene	11.84†	1510	[0.19]	10.11	1696	0.14
δ-Cadinene	11.96	1519	0.42	10.16*	1701	[0.45]
trans-Cadina-1,4-diene	12.06	1527	0.01	10.39	1721	0.01
1,5-Epoxysalvial-4(14)-ene	12.45	1558	0.07	11.85	1846	0.08
Spathulenol	12.61†	1570	0.69	14.14	2059	0.26
Caryophyllene oxide	12.65*†	1573	[0.69]	12.49	1904	0.42

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Compound	R.T.	R.I.	%	R.T.	R.I.	%
Caryophyllene oxide isomer	12.65*†	1573	[0.69]	12.42	1897	0.04
Salvial-4(14)-en-1-one	12.79	1584	0.08	12.76	1929	0.06
Guaiol	12.92*	1594	0.06	13.90	2036	0.02
Unknown [m/z 91, 119 (91), 79 (86), 93 (85), 41 (74), 107 (68), 105 (67), 134 (65)... 220 (1)]	12.92*	1594	[0.06]			
Torilenol	13.06	1606	0.08	15.21	2164	0.09
Hinesol	13.37*	1631	0.13	14.79	2123	0.06
Unknown [m/z 43, 93 (89), 91 (88), 79 (87), 123 (76), 81 (75)...]	13.37*	1631	[0.13]	13.62	2009	0.08
β-Eudesmol	13.50	1642	0.13	15.13	2156	0.09
α-Eudesmol	13.55	1646	0.08	15.09*	2153	0.47
Bulnesol	13.75	1662	0.02	15.09*	2153	[0.47]
(1βH)-Guai-9-en-11-ol?	13.82	1668	0.02	15.43	2187	0.12
Eudesma-4(15),7-dien-1β-ol	13.94	1678	0.03	15.79	2224	0.03
Unknown [m/z 123, 191 (88), 81 (86), 41 (86), 151 (80), 91 (76)...]	15.62	1823	0.02	18.41	2510	0.02
Phytone	15.85	1844	0.05	14.43	2087	0.05
Sclareoloxide	16.11	1868	0.38			
Unknown [m/z 109, 132 (88), 157 (76), 119 (66), 91 (57), 105 (55)...]	16.79	1930	0.12			
Geranyl-para-cymene	16.99	1949	0.11	15.88	2234	0.08
Manoyl oxide	17.27	1976	0.03	16.25	2272	0.01
13-epi-Manoyl oxide	17.49	1997	0.01	16.11	2258	0.02
Manool	17.96	2044	0.04	19.03	2582	0.05
Sclareol	19.54	2204	0.76	22.56	3030	0.75
Total identified	**98.05%**			**97.80%**		
Total reported	**98.24%**			**97.95%**		

*: 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

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