

Date : February 16, 2021

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 21B15-PTH02


Customer identification : Sandalwood Indian - SA2103209R

Type : Essential oil

Source : *Santalum album*

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 : February 16, 2021

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Light yellow viscous liquid

Refractive index: 1.5070 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 3518:2002 - OIL OF SANDALWOOD

Compound	Min. %	Max. %	Observed %	Complies?
(Z)- α -Santalol	41	55	45	Yes
(Z)- β -Santalol	16	24	20	Yes
Refractive index	1.5030	1.5090	1.5070	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
Tricyclene	tr	Monoterpene
α -Pinene	tr	Monoterpene
Limonene	tr	Monoterpene
Linalool	tr	Monoterpenic alcohol
4-Methylacetophenone	0.02	Simple phenolic
Dihydroalbene	0.01	Terpene derivative
Unknown	0.03	Terpene derivative
Teresantalic acid	0.01	Monoterpenic acid
Unknown	0.01	Terpenic aldehyde
Unknown	0.04	Unknown
Tricycloekasantalal	0.10	Terpenic aldehyde
(1S,5S,6R)-2,6-Dimethylbicyclo[3.1.1]hept-2-ene-6-propanal?	0.03	Terpenic aldehyde
Unknown	0.06	Unknown
7-epi-Sesquithujene	0.03	Sesquiterpene
γ -4-Dimethylbenzenebutyral	0.04	Simple phenolic
α -Cedrene	0.02	Sesquiterpene
Sesquithujene	0.01	Sesquiterpene
β -Cedrene	0.01	Sesquiterpene
α -Santalene	1.09	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.23	Sesquiterpene
Unknown	0.02	Sesquiterpene
epi- β -Santalene	1.12	Sesquiterpene
Geranylacetone	0.01	Monoterpenic ketone
β -Santalene	1.68	Sesquiterpene
β -Acoradiene	0.06	Sesquiterpene
10-epi- β -Acoradiene	0.01	Sesquiterpene
γ -Curcumene	0.06	Sesquiterpene
α -Curcumene	0.37	Sesquiterpene
α -Selinene	tr	Sesquiterpene
Unknown	0.01	Sesquiterpene
β -Bisabolene	0.09	Sesquiterpene
β -Curcumene	0.19	Sesquiterpene
Unknown	0.12	Oxygenated sesquiterpene
β -Sesquiphellandrene	0.03	Sesquiterpene
8,14-Cedranoxide	tr	Sesquiterpenic ether
Unknown	0.12	Sesquiterpene
Unknown	0.05	Sesquiterpene
(<i>E</i>)-Nerolidol	0.06	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
Dendrolasin	0.06	Sesquiterpenic ether
α -Cedrol	0.17	Sesquiterpenic alcohol
Helifolen-12-al A	0.01	Sesquiterpenic aldehyde
Guaiol	0.05	Sesquiterpenic alcohol
Helifolen-12-al B	0.04	Sesquiterpenic aldehyde

Unknown	0.12	Oxygenated sesquiterpene
Rosifoliol	0.01	Sesquiterpenic alcohol
α -Acorenol	0.04	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
β -Acorenol	0.17	Sesquiterpenic alcohol
10-epi- β -Acorenol?	0.02	Sesquiterpenic alcohol
β -Eudesmol	0.04	Sesquiterpenic alcohol
Unknown	0.34	Oxygenated sesquiterpene
α -Bisabolol oxide B, epimer 1	0.19	Sesquiterpenic alcohol
α -Bisabolol oxide B, epimer 2	0.03	Sesquiterpenic alcohol
Unknown	0.20	Oxygenated sesquiterpene
Unknown	0.38	Oxygenated sesquiterpene
Bulnesol	0.18	Sesquiterpenic alcohol
Unknown	0.54	Oxygenated sesquiterpene
β -Bisabolol	0.54	Sesquiterpenic alcohol
epi-Cyclosantalal	0.17	Sesquiterpenic aldehyde
(<i>E</i>)- α -Santalal	1.58	Sesquiterpenic aldehyde
(<i>Z</i>)- α -Santalol	45.47	Sesquiterpenic alcohol
(<i>E</i>)- α -Santalol	0.39	Sesquiterpenic alcohol
(<i>Z</i>)- α - <i>trans</i> -Bergamotol	5.80	Sesquiterpenic alcohol
Unknown	0.43	Oxygenated sesquiterpene
(<i>Z</i>)-epi- β -Santalol	4.37	Sesquiterpenic alcohol
(<i>E</i>)- α - <i>trans</i> -Bergamotol	0.35	Sesquiterpenic alcohol
(<i>Z</i>)- β -Santalol	20.19	Sesquiterpenic alcohol
Unknown	0.09	Oxygenated sesquiterpene
Unknown	0.24	Oxygenated sesquiterpene
(<i>Z</i>)-Nuciferol	1.91	Sesquiterpenic alcohol
Unknown	0.98	Oxygenated sesquiterpene
(2 <i>E</i> ,6 <i>E</i>)-Farnesal	0.52	Sesquiterpenic aldehyde
(<i>E</i>)- β -Santalol	1.63	Sesquiterpenic alcohol
Curcumen-12-ol analog	0.21	Sesquiterpenic alcohol
(<i>Z</i>)- β -Curcumen-12-ol	0.38	Sesquiterpenic alcohol
(<i>Z</i>)-Lanceol	2.20	Sesquiterpenic alcohol
(<i>Z</i>)- α -Santalyl acetate	0.06	Sesquiterpenic ester
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.10	Oxygenated sesquiterpene
Bisabola-2,7(<i>Z</i>),10(<i>Z</i>)-trien-13-ol?	0.19	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.12	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.08	Oxygenated sesquiterpene
Unknown	0.01	Unknown
Consolidated total	96.52%	

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

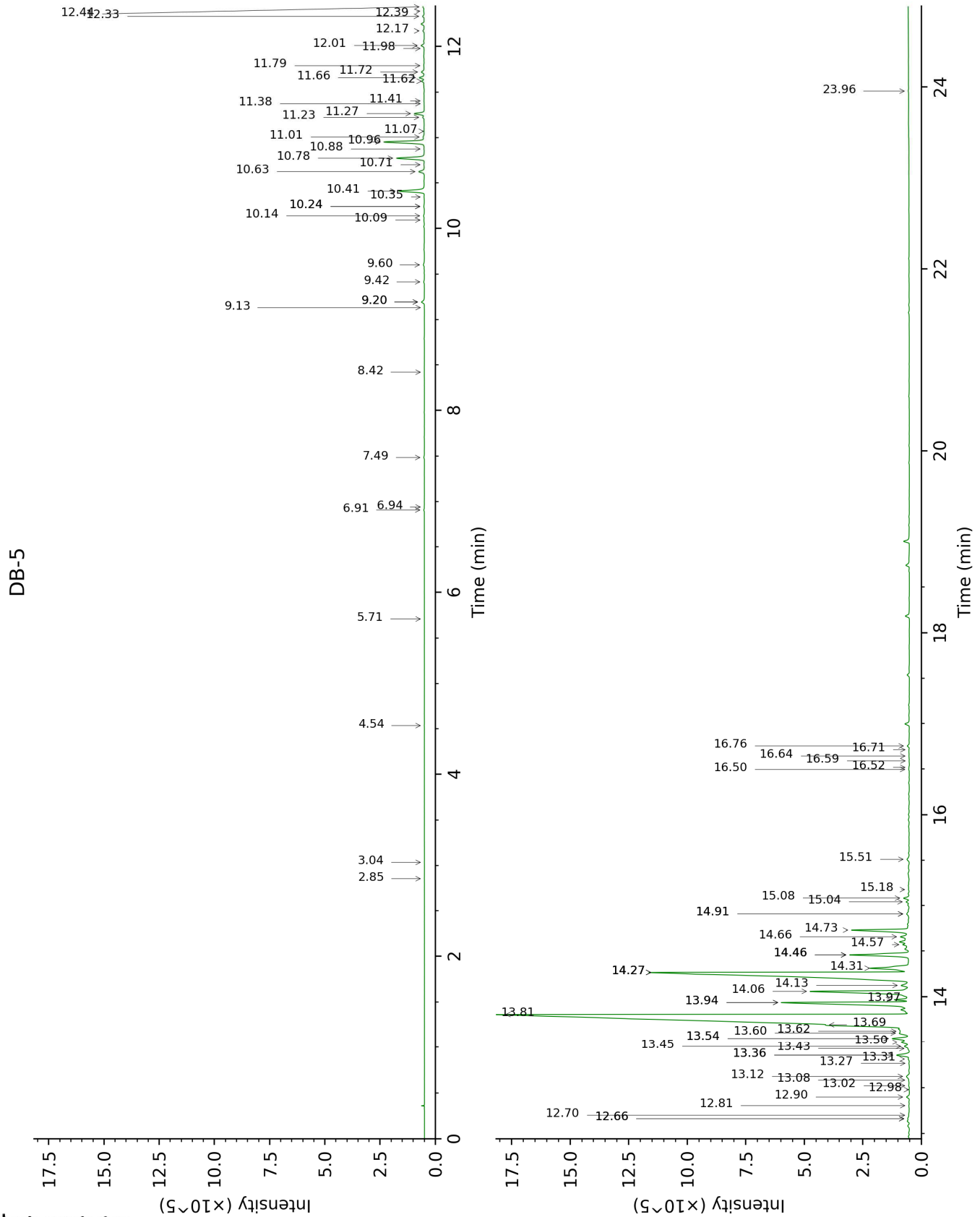
Note: no correction factor was applied

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

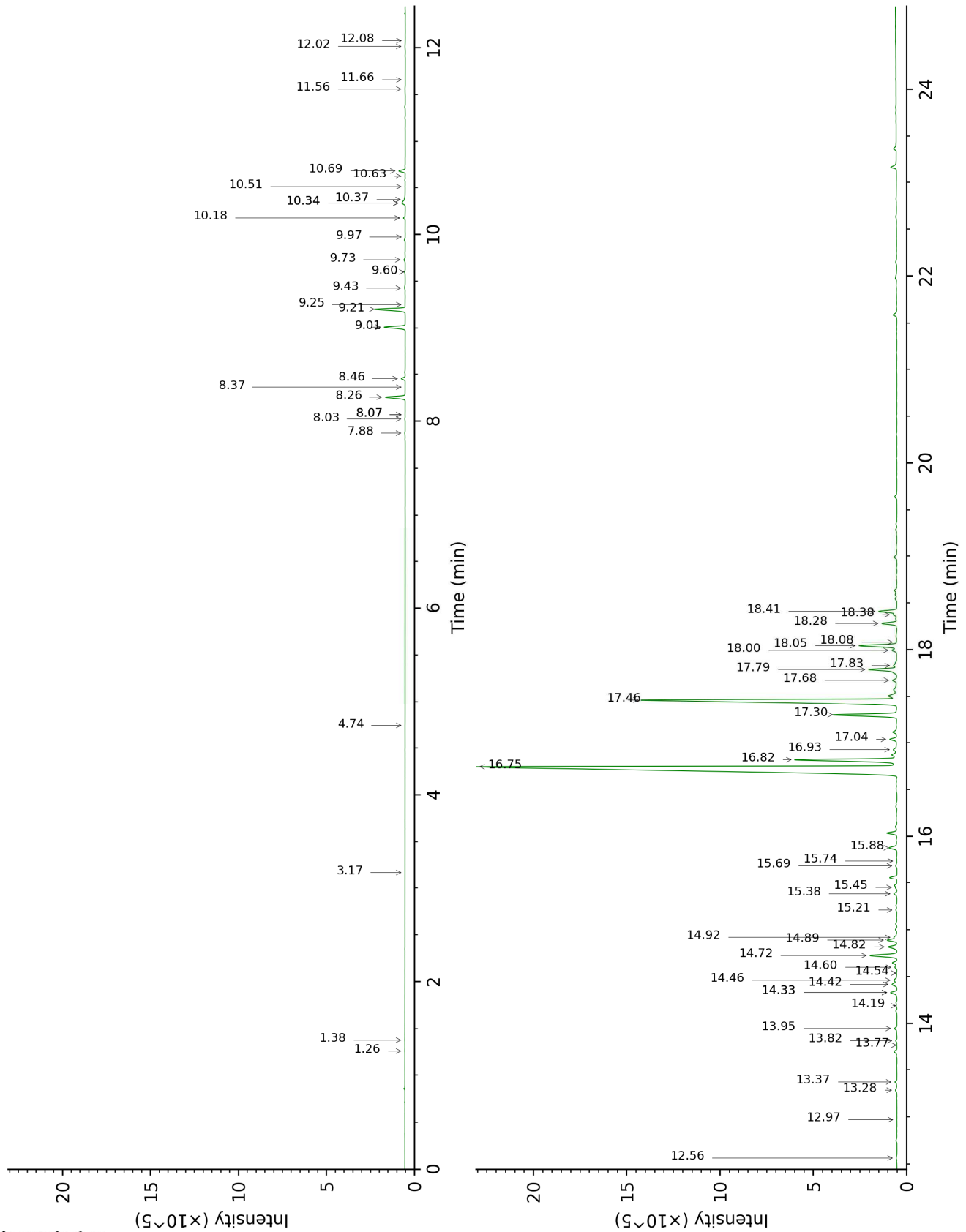
between columns, the algorithm is set to prioritize data from the most standard DB-5 column, and smallest values so as to avoid overestimating individual content. This process is semi-automatic. Advanced users are invited to consult the "Full analysis data" table after the chromatograms in this report 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-WAX



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Tricyclene	2.85	918	tr	1.26	972	tr
α -Pinene	3.04	930	tr	1.38	992	tr
Limonene	4.54	1027	tr	3.17	1155	tr
Linalool	5.71	1102	tr	8.07*	1516	0.01
4-Methylacetophenone	6.91	1180	0.02	10.51	1710	0.01
Dihydroalbene	6.94	1182	0.01	4.74	1272	tr
Unknown [m/z 93, 91 (89), 94 (85), 105 (60)... 176? (10)]	7.49	1218	0.03	9.25	1608	0.01
Teresantalic acid	8.42	1283	0.01	15.74	2190	0.01
Unknown [m/z 121, 93 (77), 79 (43), 91 (43), 145 (35)... 178 (8)]	9.14	1327	0.01			
Unknown [m/z 112, 97 (31), 43 (29), 109 (22), 67 (16)...]	9.20*	1332	0.14			
Tricycloekasantalal	9.20*	1332	[0.14]	10.34*	1695	0.29
(1S,5S,6R)-2,6-Dimethylbicyclo[3.1.1]hept-2-ene-6-propanal?	9.42	1347	0.03	10.37	1698	0.07
Unknown [m/z 93, 160 (81), 91 (58), 94 (53), 134 (53)...]	9.60	1360	0.06			
7-epi-Sesquithujene	10.09	1395	0.03	7.88	1500	0.03
γ -4-Dimethylbenzenebutyral	10.14	1398	0.04			
α -Cedrene	10.24*	1405	0.03	8.03	1512	0.02
Sesquithujene	10.24*	1405	[0.03]	8.07*	1516	[0.01]
β -Cedrene	10.35	1413	0.01	8.37	1538	tr
α -Santalene	10.41	1418	1.09	8.26	1530	1.08
<i>trans</i> - α -Bergamotene	10.63	1434	0.23	8.46	1545	0.20
Unknown [m/z 93, 91 (80), 79 (68), 123 (68), 121 (56)... 204 (3)]	10.71	1440	0.02			
epi- β -Santalene	10.78	1445	1.12	9.01	1588	1.12
Geranylacetone	10.88	1453	0.01	11.66	1807	tr
β -Santalene	10.96	1458	1.68	9.20	1604	1.67
β -Acoradiene	11.01	1462	0.06	9.43	1622	0.06
10-epi- β -Acoradiene	11.07	1467	0.01	9.60	1636	0.05
γ -Curcumene	11.23	1478	0.06	9.73	1646	0.07
ar-Curcumene	11.27	1481	0.37	10.69	1724	0.33
α -Selinene	11.38	1489	tr	9.98	1666	tr
Unknown [m/z 119, 105 (51), 91 (31), 132 (30), 121 (26), 145 (23), 134 (20)... 204 (2)]	11.41	1492	0.01	12.08	1844	0.01
β -Bisabolene	11.62	1508	0.09	10.18	1682	0.10
β -Curcumene	11.66	1511	0.19	10.34*	1695	[0.29]
Unknown [m/z 121, 93 (56), 91 (12), 94 (11), 122 (10)...220]	11.72	1516	0.12	13.37	1961	0.11

β-Sesquiphellandrene	11.79	1521	0.03	10.63	1720	0.01
8,14-Cedranoxide	11.98	1536	tr	11.56	1799	0.03
Unknown [m/z 121, 93 (91), 79 (57), 91 (25), 43 (23), 77 (18)...202 (8)]	12.01	1538	0.12	13.95	2014	0.13
Unknown [m/z 121, 93 (79), 79 (51), 91 (21), 77 (16), 43 (15)...202 (5)]	12.17	1551	0.05			
(E)-Nerolidol	12.33	1564	0.06	13.82	2002	0.06
Unknown [m/z 43, 125 (78), 107 (43), 132 (34), 67 (31)...220 (3)]	12.40	1568	0.03	12.02	1838	0.05
Dendrolasin	12.44	1572	0.06	12.56	1887	0.05
α-Cedrol	12.66*†	1590	0.18	14.33*	2051	0.38
Helifolen-12-al A	12.66*†	1590	[0.18]	12.97	1924	0.01
Guaiol	12.70	1592	0.05	14.19	2038	0.04
Helifolen-12-al B	12.81	1601	0.04	13.28	1952	0.12
Unknown [m/z 81, 41 (40), 69 (36), 138 (27), 43 (26), 110 (25)...222 (1)]	12.90	1608	0.12			
Rosifoliol	12.98	1615	0.01	14.42	2059	0.34
α-Acorenol	13.02	1618	0.04	14.54	2071	0.02
Unknown [m/z 41, 91 (78), 67 (76), 119 (70), 55 (61)...220 (7)]	13.08	1624	0.03	13.77	1998	0.01
β-Acorenol	13.12	1627	0.17	14.92	2108	0.16
10-epi-β-Acorenol?	13.27	1639	0.02			
β-Eudesmol	13.31	1642	0.04	15.45	2161	0.06
Unknown [m/z 91, 43 (89), 93 (84), 81 (81), 105 (79), 79 (70), 67 (68), 41 (68)...]	13.36*	1646	0.53			
α-Bisabolol oxide B, epimer 1	13.36*	1646	[0.53]	14.46	2064	0.19
α-Bisabolol oxide B, epimer 2	13.43	1652	0.03	14.60	2077	0.11
Unknown [m/z 93, 121 (97), 91 (30), 92 (27), 79 (26), 94 (21), 105 (19), 122 (18)...222 (9)]	13.45	1654	0.20			
Unknown [m/z 121, 93 (96), 95 (96), 41 (65), 82 (63), 69 (62), 67 (59)...222 (8)]	13.50†	1658	1.10	14.33*	2051	[0.38]
Bulnesol	13.54*†	1661	[1.10]	15.38	2154	0.18
Unknown [m/z 67, 119 (70), 82 (42), 91 (37), 95 (36), 121 (34), 93 (32)...]	13.54*†	1661	[1.10]	14.82	2098	0.54
β-Bisabolol	13.60†	1666	0.71	14.89	2105	0.54
epi-Cyclosantalal	13.62†	1668	[0.71]			
(E)-α-Santalal	13.69†	1674	47.74	14.72	2089	1.58
(Z)-α-Santalol	13.81†	1683	[47.74]	16.75	2294	45.47
(E)-α-Santalol	13.94*	1694	5.74	17.04	2325	0.39
(Z)-α-trans-Bergamotol	13.94*	1694	[5.74]	16.82	2302	5.80

Unknown [m/z 43, 93 (68), 41 (61), 69 (58), 125 (54), 107 (50)...]	13.97	1697	0.43			
(Z)-epi-β-Santalol	14.06	1704	4.37	17.30	2353	3.65
(E)-α-trans-Bergamotol	14.13	1710	0.35	17.83	2411	0.25
(Z)-β-Santalol	14.27*	1722	20.05	17.46	2370	20.19
Unknown [m/z 43, 189 (94), 81 (65), 93 (62), 95 (53), 119 (49)... 207 (43)...]	14.27*	1722	[20.05]	15.69	2184	0.09
Unknown [m/z 119, 91 (31), 105 (29), 41 (25), 133 (23), 158 (21)...]	14.27*	1722	[20.05]	16.93	2313	0.24
(Z)-Nuciferol	14.31	1726	1.91	18.28	2460	0.80
Unknown [m/z 91, 93 (65), 79 (57), 105 (49), 119 (47), 121 (44)...218 (1)]	14.46*	1739	2.41	18.41	2474	0.98
(2E,6E)-Farnesal	14.46*	1739	[2.41]	15.88	2204	0.52
(E)-β-Santalol	14.46*	1739	[2.41]	17.79	2406	1.63
Curcumen-12-ol analog	14.57	1748	0.21	17.68	2393	0.22
(Z)-β-Curcumen-12-ol	14.66	1756	0.38	18.00	2429	0.27
(Z)-Lanceol	14.73	1762	2.20	18.05	2434	2.08
(Z)-α-Santalyl acetate	14.91*	1777	0.12	15.21	2137	0.06
Unknown [m/z 93, 119 (89), 91 (63), 79 (63), 132 (53), 41 (52)... 236 (3)]	14.91*	1777	[0.12]	18.08	2438	0.02
Unknown [m/z 107, 93 (96), 79 (90), 55 (78), 41 (76)... 236 (6)]	15.04	1789	0.10			
Bisabola-2,7(Z),10(Z)-trien-13-ol?	15.08	1792	0.19	18.38	2470	0.17
Unknown [m/z 119, 105 (78), 145 (60), 91 (50), 121 (44), 93 (38)... 216 (7)]	15.18	1800	0.02			
Unknown [m/z 119, 43 (61), 132 (49), 105 (35), 141 (32)...]	15.51	1831	0.12			
Unknown [m/z 93, 43 (99), 109 (95), 68 (80), 95 (77), 81 (69), 110 (68)...220 (7)]	16.50	1921	0.02			
Unknown [m/z 93, 109 (98), 43 (97), 68 (83), 95 (74), 110 (72), 81 (71)...220 (8)]	16.52	1923	0.01			
Unknown [m/z 95, 109 (98), 43 (83), 93 (60), 41 (54), 67 (48), 81 (48)...220 (4)]	16.59	1930	0.01			
Unknown [m/z 218, 176 (91), 146 (37), 161 (30), 133 (27), 147 (20)...]	16.64	1935	0.02			
Unknown [m/z 43, 107 (24), 93 (23), 125 (23), 95 (23), 119 (23)...220 (1)]	16.71	1942	0.02			

Unknown [m/z 93, 94 (86), 91 (48), 121 (42), 79 (42), 107 (37)...218 (2)]	16.76	1946	0.08	
Unknown [m/z 93, 121 (96), 94 (81), 91 (46), 203 (41), 122 (40)...]	23.96	2742	0.01	
Total identified		92.88%		90.52%
Total reported		95.61%		92.72%

*: 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