Date : 2024-02-08

Certificate of Analysis - GC Profiling

Sample Identification

Internal code : 24B07-NPA01
Customer Identification : Sandalwood - Australia - NPS00128 - Lot # NP0341
Type : Essential Oil
Source : *Santalum spicatum*
Customer : Nature Packaged

Checked an approved by:

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

Notes: 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.

This report is an update from the first version issued on 2024-02-08 to format it for online publication.

Méthode certifiée ISO 17025:2017 Certified method

Laboratoire PhytoChemia

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Gas Chromatographic Analysis

Method : PC-MAT-014 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID
ISO
Results : See analysis summary (next page)
Analyst : Sylvain Mercier, M. Sc., Chimiste 2014-005
Date : 2024-02-08

Physicochemical data

Refractive index : 1.5058 ± 0.0003 (20 °C)
Method : PC-MAT-016 - Measure of the refractive index of a liquid.
Analyst : Cindy Caron B. Sc.
Date : 2024-02-08

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
Furfural	0.01	Furan
Santene	0.06	Normonoterpene
Unknown	0.01	Normonoterpene
Tricyclene	0.01	Monoterpene
Limonene	0.01	Monoterpene
para-Cymenene	0.01	Monoterpene
4-Methylacetophenone	0.01	Simple phenolic
Unknown	0.02	Terpene derivative
Teresantalic acid	0.18	Monoterpenic acid
Unknown	0.03	Terpenic aldehyde
Tricycloekasantalal	0.02	Terpenic aldehyde
(1S,5S,6R)-2,6-Dimethylbicyclo[3.1.1]hept-2-ene-6-propanal?	0.03	Terpenic aldehyde
7-epi-Sesquithujene	0.04	Sesquiterpene
γ-4-Dimethylbenzenebutyral	0.03	Simple phenolic
α-Cedrene	0.22	Sesquiterpene
Sesquithujene	0.08	Sesquiterpene
cis-α-Bergamotene	0.07	Sesquiterpene
β-Cedrene	0.04	Sesquiterpene
α-Santalene	0.81	Sesquiterpene
trans-α-Bergamotene	0.29	Sesquiterpene
Unknown	0.02	Sesquiterpene
epi-β-Santalene	0.47	Sesquiterpene
Geranylacetone	0.03	Monoterpenic ketone
α-Acoradiene	0.12	Sesquiterpene
(*E*)-β-Farnesene	0.22	Sesquiterpene
β-Santalene	0.73	Sesquiterpene
10-epi-β-Acoradiene	0.10	Sesquiterpene
γ-Curcumene	0.38	Sesquiterpene
Unknown	0.06	Sesquiterpene
β-Selinene	0.04	Sesquiterpene
ar-Curcumene	0.39	Sesquiterpene
Unknown	0.12	Sesquiterpene
Unknown	0.14	Sesquiterpene
α-Alaskene	0.10	Sesquiterpene
β-Bisabolene	0.23	Sesquiterpene
(3*E*,6*E*)-α-Farnesene	0.09	Sesquiterpene
β-Curcumene	0.85	Sesquiterpene
β-Sesquiphellandrene	0.18	Sesquiterpene
(*E*)-γ-Bisabolene	0.05	Sesquiterpene

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8,14-Cedranoxide	0.04	Sesquiterpenic ether
(*E*)-α-Bisabolene	0.10	Sesquiterpene
(*E*)-Nerolidol	2.97	Sesquiterpenic alcohol
Unknown	0.07	Oxygenated sesquiterpene
Unknown	0.11	Oxygenated sesquiterpene
Dendrolasin	1.56	Sesquiterpenic ether
Unknown	0.12	Oxygenated sesquiterpene
Helifolen-12-al A	0.07	Sesquiterpenic aldehyde
Unknown	0.06	Oxygenated sesquiterpene
α-Cedrol	0.19	Sesquiterpenic alcohol
Guaiol	0.09	Sesquiterpenic alcohol
Helifolen-12-al B	0.08	Sesquiterpenic aldehyde
Unknown	0.17	Oxygenated sesquiterpene
Rosifoliol	0.11	Sesquiterpenic alcohol
Unknown	0.24	Oxygenated sesquiterpene
α-Acorenol	0.12	Sesquiterpenic alcohol
Unknown	0.07	Oxygenated sesquiterpene
γ-Eudesmol	0.21	Sesquiterpenic alcohol
10-epi-β-Acorenol?	0.12	Sesquiterpenic alcohol
β-Eudesmol	0.19	Sesquiterpenic alcohol
Unknown	0.22	Oxygenated sesquiterpene
α-Bisabolol oxide B, epimer 1	0.28	Sesquiterpenic alcohol
α-Bisabolol oxide B, epimer 2	0.07	Sesquiterpenic alcohol
Unknown	0.26	Oxygenated sesquiterpene
Bulnesol	0.31	Sesquiterpenic alcohol
epi-β-Bisabolol	0.31	Sesquiterpenic alcohol
(*E*)-α-Santalal	0.69	Sesquiterpenic aldehyde
β-Bisabolol	1.77	Sesquiterpenic alcohol
epi-Cyclosantalal	0.28	Sesquiterpenic aldehyde
(*Z*)-α-Santalol	16.38	Sesquiterpenic alcohol
epi-α-Bisabolol	6.90	Sesquiterpenic alcohol
(*Z*)-α-*trans*-Bergamotol	3.03	Sesquiterpenic alcohol
(*E*)-α-Santalol	0.56	Sesquiterpenic alcohol
Unknown	0.30	Oxygenated sesquiterpene
Lanceoloxide isomer I	0.17	Sesquiterpenic ether
(*Z*)-epi-β-Santalol	1.45	Sesquiterpenic alcohol
(*E*)-α-*trans*-Bergamotol	1.01	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
(*Z*)-β-Santalol	5.48	Sesquiterpenic alcohol
(*Z*)-Nuciferol	7.57	Sesquiterpenic alcohol
(2*E*,6*E*)-Farnesol	9.22	Sesquiterpenic alcohol
(*Z*)-γ-Curcumen-12-ol	6.00	Sesquiterpenic alcohol
(2*E*,6*E*)-Farnesal	0.38	Sesquiterpenic aldehyde
(*E*)-β-Santalol	0.98	Sesquiterpenic alcohol
Unknown	0.53	Oxygenated sesquiterpene

Unknown	1.82	Oxygenated sesquiterpene
Curcumen-12-ol analog	0.15	Sesquiterpenic alcohol
Unknown	1.15	Oxygenated sesquiterpene
(*Z*)-β-Curcumen-12-ol	6.76	Sesquiterpenic alcohol
(*Z*)-Lanceol	2.85	Sesquiterpenic alcohol
12-Hydroxy-(*Z*)-sesquicineole	0.16	Sesquiterpenic alcohol
Unknown	1.11	Oxygenated sesquiterpene
Unknown	0.58	Oxygenated sesquiterpene
Unknown	0.35	Unknown
Unknown	0.09	Oxygenated sesquiterpene
Bisabola-2,7(*Z*),10(*Z*)-trien-13-ol?	0.87	Oxygenated sesquiterpene
Unknown	0.32	Oxygenated sesquiterpene
Unknown	0.07	Oxygenated sesquiterpene
Unknown	0.11	Oxygenated sesquiterpene
Unknown	0.07	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
(2*E*,6*E*)-Farnesyl acetate	0.10	Sesquiterpenic ester
Unknown	0.12	Oxygenated sesquiterpene
Unknown	0.06	Oxygenated sesquiterpene
Unknown	0.06	Oxygenated sesquiterpene
Unknown	0.04	Oxygenated sesquiterpene
Consolidated total	**94.11**	

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

Bracketed value ([xx]): A bracketed percent value indicate that two or more compound percentage could not be solved due to coelution.

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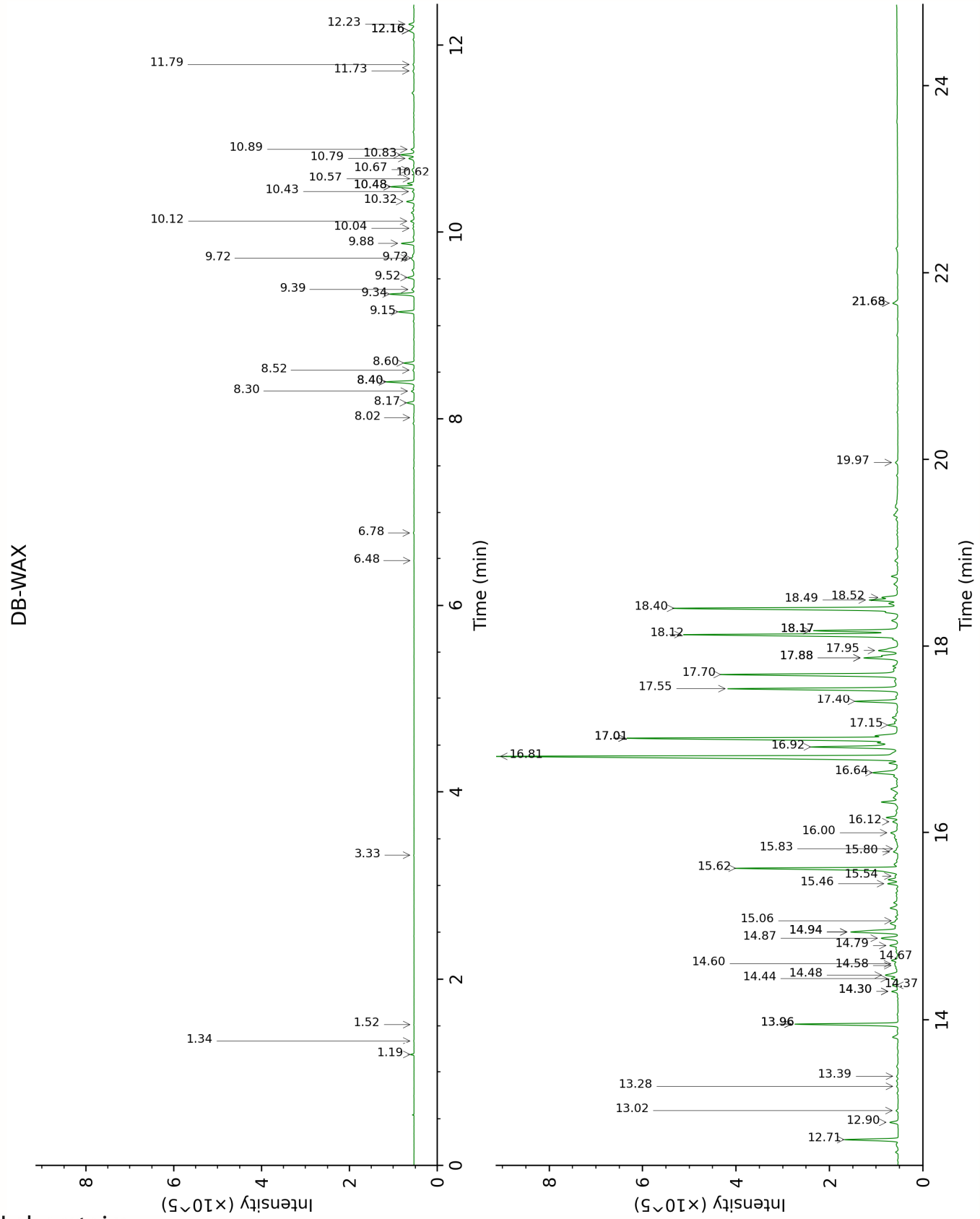
DB-WAX
Time (min)
Intensity (×10^5)
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12.16
11.79
11.73
10.89
10.79
10.83
10.67
10.62
10.57
10.48
10.43
10.32
10.12
10.04
9.88
9.72
9.72
9.52
9.39
9.34
9.15
8.60
8.52
8.40
8.30
8.17
8.02
6.78
6.48
3.33
1.52
1.34
1.19
21.68
19.97
18.52
18.49
18.40
18.17
18.12
17.95
17.88
17.70
17.55
17.40
17.15
17.01
16.92
16.81
16.64
16.12
16.00
15.83
15.80
15.62
15.54
15.46
15.06
14.94
14.87
14.79
14.67
14.60
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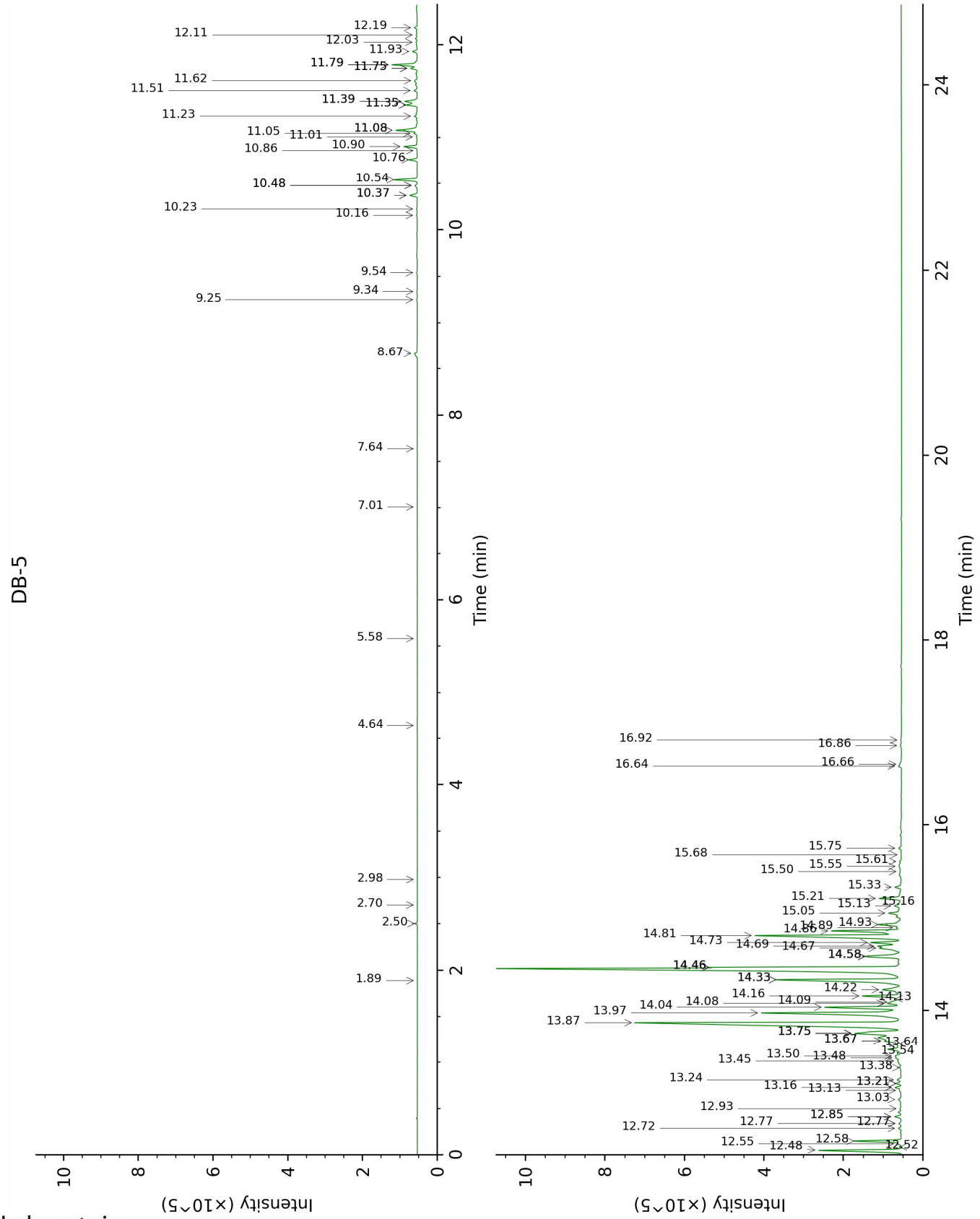
14.48
14.44
14.37
14.30
13.96
13.39
13.28
13.02
12.90
12.71


DB-5
12.11
12.19
12.03
11.93
11.79
11.75
11.62
11.51
11.39
11.35
11.23
11.05
11.01
11.08
10.86
10.90
10.76
10.48
10.54
10.37
10.23
10.16
9.54
9.34
9.25
8.67
7.64
7.01
5.58
4.64
2.98
2.70
2.50
1.89
Time (min)
Intensity (×10^5)
16.92
16.86
16.64
16.66
15.68
15.75
15.50
15.55
15.61
15.33
15.21
15.13
15.16
15.05
14.89
14.93
14.86
14.81
14.73
14.69
14.67
14.58
14.46
14.33
14.22
14.16
14.13
14.09
14.04
14.08
13.97
13.87
13.75
13.67
13.64
13.54
13.50
13.48
13.45
13.38
13.24
13.21
13.16
13.13
13.03
12.93
12.85
12.77
12.72
12.58
12.55
12.48
12.52
Time (min)
Intensity (×10^5)

FULL ANALYSIS DATA

	Column DB-WAX			Column DB-5		
Furfural	6.78	1408.2	0.02	1.89	832.6	0.01
Santene	1.19	951.1	0.06	2.50	883.0	0.06
Unknown ABBA I [m/z 79, 93 (66), 94 (52), 91 (39), 77 (37), 122 (31)]	1.52	1000.2	tr	2.70	899.4	0.01
Tricyclene	1.34	973.9	0.01	2.98	918.7	0.01
Limonene	3.33	1158.7	0.01	4.64	1026.9	0.01
para-Cymenene	6.48	1386.7	0.01	5.58	1085.9	0.01
4-Methylacetophenone	10.62	1708.1	0.02	7.01	1176.5	0.01
Unknown SASP II [m/z 93, 91 (89), 94 (85), 105 (60)... 176? (10)]	9.39	1607.7	0.08	7.64	1217.2	0.02
Teresantalic acid	15.80	2184.4	0.19	8.67	1285.9	0.18
Unknown SASP III [m/z 121, 93 (77), 79 (43), 91 (43), 145 (35)... 178 (8)]				9.25	1325.9	0.03
Tricycloekasantalal	10.43	1692.4	0.05	9.34	1332.2	0.02
(1S,5S,6R)-2,6-Dimethylbicyclo[3.1.1]hept-2-ene-6-propanal?	10.48*	1696.6	[0.69]	9.54	1346.4	0.03
7-epi-Sesquithujene	8.02	1500.7	0.03	10.16	1389.8	0.04
γ-4-Dimethylbenzenebutyral				10.23	1394.7	0.03
α-Cedrene	8.17	1512.9	0.22	10.37*	1404.9	[0.31]
Sesquithujene	8.30	1522.6	0.08	10.37*	1404.9	[0.31]
cis-α-Bergamotene	8.40*	1530.4	[0.86]	10.48*	1412.9	[0.12]
β-Cedrene	8.52	1540.1	0.04	10.48*	1412.9	[0.12]
α-Santalene	8.40*	1530.4	[0.86]	10.54	1417.5	0.81
trans-α-Bergamotene	8.60	1546.0	0.29	10.76	1433.9	0.29
Unknown SASP IV [m/z 93, 91 (80), 79 (68), 123 (68), 121 (56)... 204 (3)]				10.86	1441.3	0.02
epi-β-Santalene	9.15	1589.0	0.46	10.90	1444.5	0.47
Geranylacetone	11.79	1808.1	0.03	11.01	1452.2	0.03
α-Acoradiene	9.52	1618.0	0.22	11.05	1455.2	0.12
(*E*)-β-Farnesene	9.72*	1634.9	[0.14]	11.08*	1457.6	[0.95]
β-Santalene	9.34	1603.7	0.73	11.08*	1457.6	[0.95]
10-epi-β-Acoradiene	9.72*	1634.9	[0.14]	11.23	1468.9	0.10
γ-Curcumene	9.88	1647.6	0.38	11.35*	1477.9	[0.44]
Unknown SASP V [m/z 119, 91 (24), 105 (16), 121 (16), 93 (15), 117 (15), 41 (14), 132 (14)... 204 (4)]				11.35*	1477.9	[0.44]

β-Selinene	10.04	1660.6	0.04	11.39*	1480.8	[0.58]
ar-Curcumene	10.83	1725.9	0.39	11.39*	1480.8	[0.58]
Unknown SASP VI [m/z 119, 105 (51), 91 (31), 132 (30), 121 (26), 145 (23), 134 (20)... 204 (2)]	12.16*	1840.1	[0.21]	11.51	1489.5	0.12
Unknown SASP VII [m/z 119, 93 (52), 105 (38), 91 (33), 41 (31), 79 (25)... 204 (2)]	12.16*	1840.1	[0.21]	11.62	1497.4	0.14
α-Alaskene	10.12	1666.8	0.10	11.75*	1507.4	[0.25]
β-Bisabolene	10.32	1683.8	0.23	11.75*	1507.4	[0.25]
(3*E*,6*E*)-α-Farnesene	10.67	1712.4	0.09	11.79*	1510.4	[0.94]
β-Curcumene	10.48*	1696.6	[0.69]	11.79*	1510.4	[0.94]
β-Sesquiphellandrene	10.79	1722.6	0.17	11.93	1521.7	0.18
(*E*)-γ-Bisabolene	10.57	1703.6	0.02	12.03	1529.4	0.05
8,14-Cedranoxide	11.73	1802.0	0.04	12.11	1535.6	0.04
(*E*)-α-Bisabolene	10.89	1730.8	0.09	12.19	1541.8	0.10
(*E*)-Nerolidol	13.96*	2004.0	[2.90]	12.48	1565.0	2.97
Unknown SASP VIII [m/z 43, 125 (78), 107 (43), 132 (34), 67 (31)... 220 (3)]	12.16*	1840.1	[0.21]	12.52	1567.9	0.07
Unknown SASP IX [m/z 43, 125 (91), 107 (39), 41 (24), 67 (24), 93 (21)... 220 (4)]	12.23	1846.3	0.17	12.55	1570.6	0.11
Dendrolasin	12.71	1889.4	1.52	12.58	1573.0	1.56
Unknown COGU XII [m/z 93, 121 (68), 123 (45), 91 (41), 119 (32), 79 (30)...220 (9)]				12.72	1583.7	0.12
Helifolen-12-al A	13.02	1917.6	0.07	12.77*	1587.8	[0.14]
Unknown SAUN II [m/z 119, 105 (38), 218 (37), 91 (35), 135 (34), 84 (31), 132 (29)]	13.28	1941.6	0.06	12.77*	1587.8	[0.14]
α-Cedrol	14.37	2043.8	0.19	12.85*	1593.5	[0.28]
Guaiol	14.30*	2037.6	[0.21]	12.85*	1593.5	[0.28]
Helifolen-12-al B	13.39	1951.6	0.07	12.93	1600.3	0.08
Unknown SASP X [m/z 81, 41 (40), 69 (36), 138 (27), 43 (26), 110 (25)... 222 (1)]				13.03	1608.3	0.17
Rosifoliol	14.44	2050.7	0.23	13.13	1616.4	0.11
Unknown SAUN IV [m/z 110, 68 (85), 109 971), 95 (67), 67 (56), 81 (53)... 220 (9)...]	12.90	1906.0	0.27	13.16	1619.0	0.24

α-Acorenol	14.60	2066.0	0.12	13.20*	1622.5	[0.20]
Unknown SAOF VI [m/z 41, 91 (78), 67 (76), 119 (70), 55 (61)... 220 (7)]	13.96*	2004.0	[2.90]	13.20*	1622.5	[0.20]
γ-Eudesmol	15.06	2110.5	0.08	13.24	1625.7	0.21
10-epi-β-Acorenol?				13.38	1636.7	0.12
β-Eudesmol	15.54	2158.4	0.11	13.45	1642.6	0.19
Unknown SASP XI [m/z 91, 43 (89), 93 (84), 81 (81), 105 (79), 79 (70), 67 (68), 41 (68)...]				13.48	1645.4	0.22
α-Bisabolol oxide B, epimer 1	14.58†	2064.1	0.10	13.50	1647.1	0.28
α-Bisabolol oxide B, epimer 2	14.67	2072.4	0.05	13.54	1650.4	0.07
Unknown SAAL V [m/z 121, 93 (96), 95 (96), 41 (65), 82 (63), 69 (62), 67 (59)... 222 (8)]	14.48	2054.3	0.56	13.64	1658.2	0.26
Bulnesol	15.46	2150.3	0.31	13.67*	1660.9	[0.63]
epi-β-Bisabolol	14.94*	2098.7	[2.07]	13.67*	1660.9	[0.63]
(*E*)-α-Santalal	14.87	2092.3	0.69	13.75*	1667.7	[2.74]
β-Bisabolol	14.94*	2098.7	[2.07]	13.75*	1667.7	[2.74]
epi-Cyclosantalal	14.79	2084.7	0.28	13.75*	1667.7	[2.74]
(*Z*)-α-Santalol	16.81	2289.8	15.70	13.87	1677.2	16.38
epi-α-Bisabolol	15.62	2166.8	5.51	13.97	1686.0	6.90
(*Z*)-α-*trans*-Bergamotol	16.92	2300.3	3.04	14.04	1691.0	3.03
(*E*)-α-Santalol	17.15	2325.5	0.34	14.08	1694.5	0.56
Unknown SASP XII [m/z 43, 93 (68), 41 (61), 69 (58), 125 (54), 107 (50)...]				14.09	1695.6	0.30
Lanceoloxide isomer I	14.30*	2037.6	[0.21]	14.13	1698.6	0.17
(*Z*)-epi-β-Santalol	17.40	2352.9	1.38	14.16	1701.1	1.45
(*E*)-α-*trans*-Bergamotol	17.95	2412.8	0.96	14.22	1706.7	1.01
Unknown SASP XIV [m/z 43, 189 (94), 81 (65), 93 (62), 95 (53), 119 (49)... 207 (43)...]	15.83	2187.6	0.03	14.33*	1716.0	[5.97]
(*Z*)-β-Santalol	17.55	2368.3	5.48	14.33*	1716.0	[5.97]
(*Z*)-Nuciferol	18.40	2463.2	7.57	14.46*†	1727.5	[3.21]
(2*E*,6*E*)-Farnesol	17.01*†	2310.4	[9.83]	14.46*†	1727.5	[3.21]
(*Z*)-γ-Curcumen-12-ol	17.70	2384.6	6.00	14.46*†	1727.5	[3.21]
(2*E*,6*E*)-Farnesal	16.00	2205.0	0.38	14.58*	1737.8	[1.90]
(*E*)-β-Santalol	17.88*	2403.9	[1.13]	14.58*	1737.8	[1.90]
Unknown SAAL X [m/z 91, 93 (65), 79 (57), 105 (49),	18.52	2476.0	0.53	14.58*	1737.8	[1.90]

119 (47), 121 (44)...218 (1)]						
Unknown SAUN VII [m/z 119, 93 (73), 110 (64), 111 (62), 95 (50), 81 (45), 109 943), 105 (43)... 220 (17), 238 (20)]	17.01*†	2310.4	[9.83]	14.67*†	1745.6	[1.10]
Curcumen-12-ol analog	17.88*	2403.9	[1.13]	14.69*†	1747.4	[0.87]
Unknown SAUN VIII [m/z 119, 93 (70), 111 (61), 110 (60), 109 (45), 95 (43)... 220 (17), 238 (16)]	16.64	2271.7	1.12	14.73	1750.8	1.15
(*Z*)-β-Curcumen-12-ol	18.12	2431.7	7.40	14.81	1757.3	6.76
(*Z*)-Lanceol	18.17*	2436.5	[2.57]	14.86	1761.7	2.85
12-Hydroxy-(*Z*)-sesquicineole				14.89	1764.7	0.16
Unknown SASP XV [m/z 93, 107 (80), 43 (74), 91 (55), 41 (49), 79 (48), 119 (48)... 236 (3)]				14.93	1767.6	1.11
Unknown SASP XVI [m/z 93, 119 (89), 91 (63), 79 (63), 132 (53), 41 (52)... 236 (3)]	18.17*	2436.5	[2.57]	15.05	1778.3	0.58
Unknown EUCA V [m/z 159, 43 (40), 202 (21), 91 (19), 79 (18), 131 (17)...]				15.13	1785.1	0.35
Unknown SASP XVII [m/z 107, 93 (96), 79 (90), 55 (78), 41 (76)... 236 (6)]				15.16	1787.6	0.09
Bisabola-2,7(*Z*),10(*Z*)-trien-13-ol?	18.49	2473.1	0.90	15.21	1792.0	0.87
Unknown SASP XIX [m/z 119, 105 (78), 145 (60), 91 (50), 121 (44), 93 (38)... 216 (7)]	19.97	2644.3	0.10	15.33	1802.5	0.32
Unknown SASP XX [m/z 119, 145 (62), 105 (52), 91 (52), 121 (38)...]				15.50	1817.7	0.07
Unknown SASP XXI [m/z 43, 81 (61), 41 (49), 93 (47), 119 (39), 141 (35)...]				15.55	1822.7	0.11
Unknown SASP XXII [m/z 119, 43 (61), 132 (49), 105 (35), 141 (32)...]				15.61	1827.6	0.07
Unknown SASP XXIII [m/z 141, 43 (87), 123 (55), 81				15.68	1834.1	0.02

(37)... 236 (t)]						
(2*E*,6*E*)-Farnesyl acetate	16.12	2217.2	0.19	15.75	1840.5	0.10
Unknown SAAU III [m/z 93, 43 (99), 109 (95), 68 (80), 95 (77), 81 (69), 110 (68)...220 (7)]	21.68*	2855.1	[0.21]	16.64	1921.7	0.12
Unknown SAAU II [m/z 93, 109 (98), 43 (97), 68 (83), 95 (74), 110 (72), 81 (71)...220 (8)]	21.68*	2855.1	[0.21]	16.66	1923.7	0.06
Unknown SAAU VII [m/z 43, 107 (23), 119 (23), 93 (22), 125 (22), 132 (22)...220 (1)]				16.86	1942.9	0.06
Unknown SAAU VIII [m/z 93, 94 (86), 91 (48), 121 (42), 79 (42), 107 (37)...218 (2)]				16.92	1948.5	0.04
Total reported		87.31%			94.64%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, only the first one is 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