Date : April 24, 2022

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 22D14-PTH06
Customer identification : Amyris - Haiti - AH0106R
Type : Essential oil
Source : *Amyris balsamifera*
Customer : Plant Therapy

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 : Sylvain Mercier, M. Sc., Chimiste 2014-005
Analysis date : April 21, 2022

Checked and approved by :

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

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Méthode certifiée ISO 17025:2017 Certified method

Laboratoire PhytoChemia

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PHYSICOCHEMICAL DATA

Physical aspect: Light green viscous liquid
Refractive index: 1.5066 ± 0.0003 (20 °C; 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
Toluene	tr	Simple phenolic
Limonene	0.01	Monoterpene
α-Terpineol	0.01	Monoterpenic alcohol
Unknown	0.12	Apocarotenoid
Unknown	0.06	Sesquiterpene
Cyclosativene II	0.01	Sesquiterpene
Unknown	0.14	Sesquiterpene
β-Cubebene	0.02	Sesquiterpene
β-Elemene	0.24	Sesquiterpene
7-epi-Sesquithujene	0.15	Sesquiterpene
Isocaryophyllene	0.03	Sesquiterpene
α-Gurjunene	0.04	Sesquiterpene
Sesquithujene	0.03	Sesquiterpene
β-Caryophyllene	0.12	Sesquiterpene
cis-α-Bergamotene	0.03	Sesquiterpene
α-Santalene	0.04	Sesquiterpene
β-Copaene	0.07	Sesquiterpene
γ-Elemene	0.09	Sesquiterpene
trans-α-Bergamotene	0.07	Sesquiterpene
Unknown	0.04	Sesquiterpene
Sesquisabinene A	0.08	Sesquiterpene
epi-β-Santalene	0.11	Sesquiterpene
Cadina-4,11-diene	0.64	Sesquiterpene
α-Humulene	0.08	Sesquiterpene
Unknown	0.18	Sesquiterpenic ether
allo-Aromadendrene	0.11	Sesquiterpene
Amorpha-4,11-diene	0.36	Sesquiterpene
Muurola-4,11-diene	1.39	Sesquiterpene
Unknown	0.23	Sesquiterpenic ether
Selina-4,11-diene	0.78	Sesquiterpene
Amorpha-4,7(11)-diene?	0.22	Sesquiterpene
β-Selinene	1.98*	Sesquiterpene
Unknown	1.98*	Sesquiterpene
γ-Curcumene	0.65	Sesquiterpene
ar-Curcumene	2.24	Sesquiterpene
Valencene	1.40	Sesquiterpene
Unknown	0.46	Oxygenated sesquiterpene
Unknown	0.49	Oxygenated sesquiterpene
4-epi-*cis*-Dihydroagarofuran	1.43	Sesquiterpenic ether
α-Zingiberene	1.23	Sesquiterpene
α-Muurolene	0.23	Sesquiterpene
(*Z*)-α-Bisabolene	0.12	Sesquiterpene
β-Dihydroagarofuran	0.15	Sesquiterpenic ether
β-Bisabolene	0.72	Sesquiterpene
7-epi-α-Selinene	0.04	Sesquiterpene

Unknown	0.82	Oxygenated sesquiterpene
Liguloxide analog III	0.15	Sesquiterpenic ether
trans-Calamenene	0.02	Sesquiterpene
β-Sesquiphellandrene	2.19	Sesquiterpene
Unknown	0.05	Oxygenated sesquiterpene
Selina-3,7(11)-diene	1.98	Sesquiterpene
α-Agarofuran	0.74	Sesquiterpenic ether
(*E*)-α-Bisabolene	0.05	Sesquiterpene
α-Elemol	8.42	Sesquiterpenic alcohol
Unknown	0.30	Unknown
(*E*)-Nerolidol	0.65	Sesquiterpenic alcohol
Spathulenol	0.16	Sesquiterpenic alcohol
Caryophyllene oxide	0.02	Sesquiterpenic ether
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
Eudesm-5-en-11-ol analog	0.57	Sesquiterpenic alcohol
Eudesm-5-en-11-ol	0.07	Sesquiterpenic alcohol
Unknown	0.75	Oxygenated sesquiterpene
Humulene epoxide II	0.12	Sesquiterpenic ether
10-epi-γ-Eudesmol	5.52	Sesquiterpenic alcohol
Unknown	1.38	Oxygenated sesquiterpene
γ-Eudesmol	8.14	Sesquiterpenic alcohol
Unknown	0.24	Oxygenated sesquiterpene
Eremoligenol	0.21	Sesquiterpenic alcohol
Hinesol	0.36	Sesquiterpenic alcohol
Agarospirol?	0.87	Sesquiterpenic alcohol
Unknown	0.34	Oxygenated sesquiterpene
β-Eudesmol	3.48	Sesquiterpenic alcohol
α-Eudesmol	3.65	Sesquiterpenic alcohol
Selin-11-en-4α-ol	0.21	Sesquiterpenic alcohol
Valerianol	17.89	Sesquiterpenic alcohol
7-epi-α-Eudesmol	9.50	Sesquiterpenic alcohol
4α-Hydroxydihydroagarofuran	0.14	Sesquiterpenic alcohol
trans-Calamenen-10-ol	0.25	Sesquiterpenic alcohol
Dehydrojinkoh-eremol	0.69	Sesquiterpenic alcohol
Unknown	0.53	Oxygenated sesquiterpene
Unknown	0.31	Oxygenated sesquiterpene
Unknown	0.16	Oxygenated sesquiterpene
(2*E*,6*Z*)-Farnesol	0.08	Sesquiterpenic alcohol
(2*Z*,6*E*)-Farnesol	0.12	Sesquiterpenic alcohol
3β,4β-Oxidoagarofuran?	0.16	Sesquiterpenic ether
Unknown	0.14	Oxygenated sesquiterpene
(2*E*,6*E*)-Farnesol	0.38	Sesquiterpenic alcohol
(6R,7R)-Bisabolone	0.70	Sesquiterpenic ketone
(6S,7R)-Bisabolone	0.51	Sesquiterpenic ketone
Unknown	0.10	Oxygenated sesquiterpene
Drimenol	2.20	Sesquiterpenic alcohol
Cryptomeridiol analog	0.07	Sesquiterpenic alcohol
Cryptomeridiol	0.06	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.11	Oxygenated sesquiterpene

Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.04	Oxygenated sesquiterpene
Carissone analog I	0.02	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
Consolidated total	**92.42%**	

*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total
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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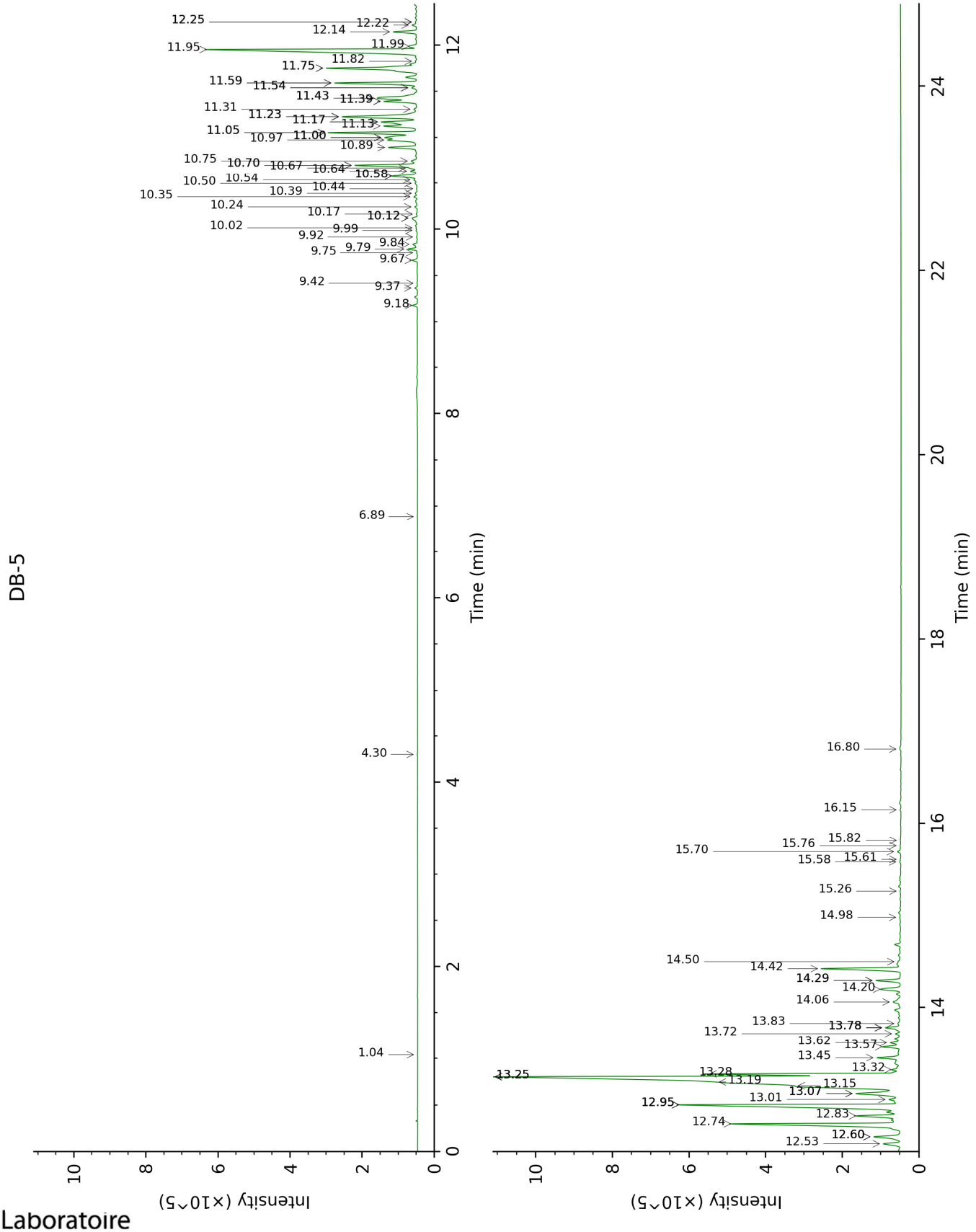
DB-5
Time (min)
Intensity (×10^5)
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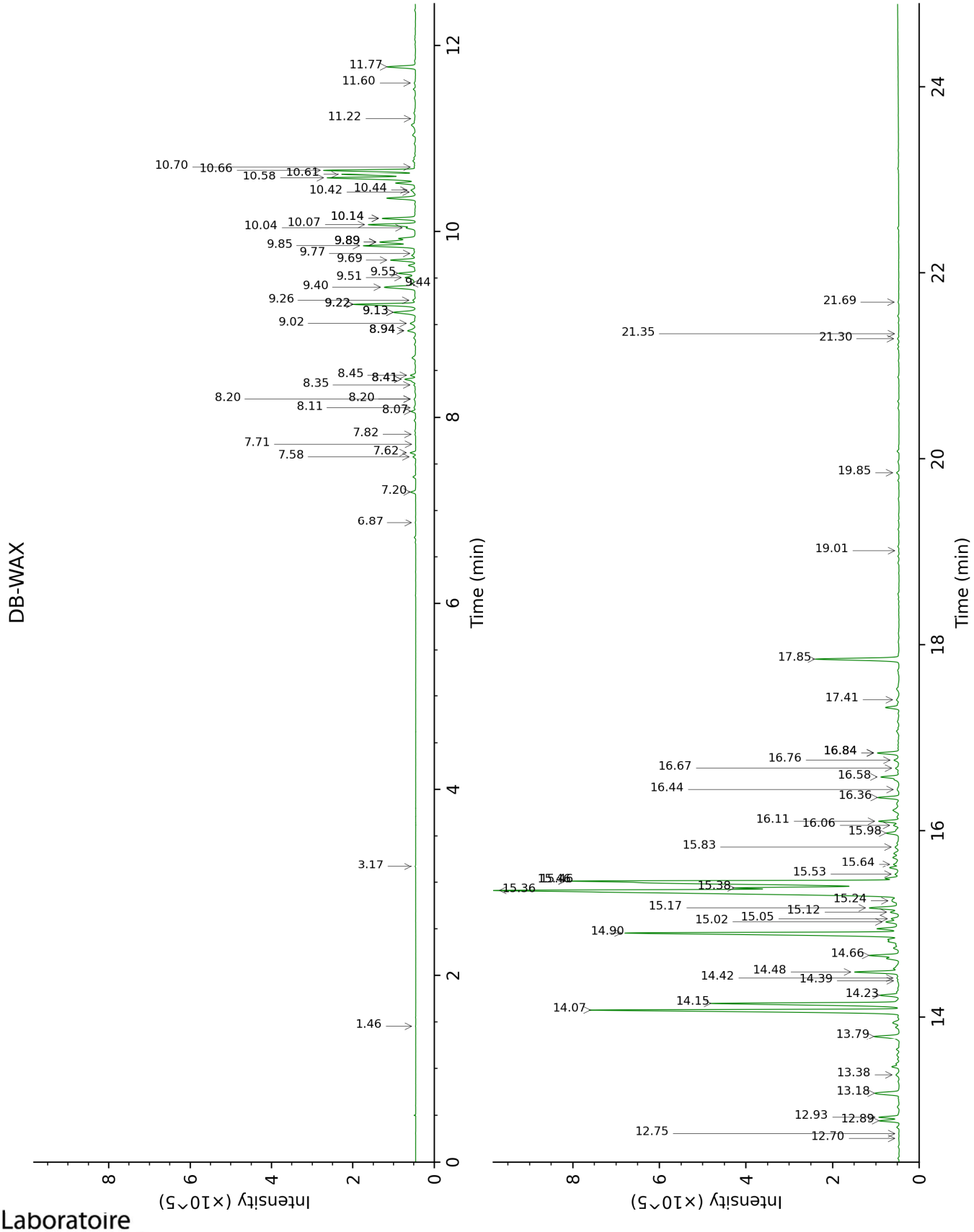
12.22
12.14
11.99
11.95
11.82
11.75
11.59
11.54
11.43
11.39
11.31
11.23
11.17
11.13
11.05
11.00
10.97
10.89
10.75
10.70
10.67
10.64
10.58
10.54
10.50
10.44
10.39
10.35
10.24
10.17
10.12
10.02
9.99
9.92
9.84
9.79
9.75
9.67
9.42
9.37
9.18
6.89
4.30
1.04
16.80
16.15
15.82
15.76
15.70
15.61
15.58
15.26
14.98
14.50
14.42
14.29
14.20
14.06
13.83
13.78
13.72
13.62
13.57
13.45
13.32
13.28
13.25
13.19
13.15
13.07
13.01
12.95
12.83
12.74
12.60
12.53


DB-WAX
Intensity (×10^5)
Time (min)
11.77
11.60
11.22
10.70
10.66
10.58
10.61
10.42
10.44
10.14
10.04
10.07
9.89
9.85
9.77
9.69
9.55
9.51
9.40
9.44
9.26
9.22
9.13
9.02
8.94
8.45
8.41
8.35
8.20
8.20
8.11
8.07
7.82
7.71
7.58
7.62
7.20
6.87
3.17
1.46
21.69
21.35
21.30
19.85
19.01
17.85
17.41
16.84
16.76
16.67
16.58
16.44
16.36
16.11
16.06
15.98
15.83
15.64
15.53
15.36
15.38
15.24
15.17
15.12
15.02
15.05
14.90
14.66
14.48
14.42
14.39
14.23
14.15
14.07
13.79
13.38
13.18
12.93
12.89
12.75
12.70

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Toluene	1.04	759	tr	1.46	1002	tr
Limonene	4.30	1026	0.01	3.17	1158	0.01
α-Terpineol	6.89	1191	0.01	9.76	1650	0.03
Unknown [m/z 177, 107 (57), 81 (55), 95 (50), 41 (34), 93 (34), 123 (32)... 192 (23)]	9.18	1346	0.12	7.20	1454	0.13
Unknown [m/z 123, 81 (45), 107 (30), 79 (28), 41 (28)... 204 (5)]	9.37	1359	0.06			
Cyclosativene II	9.42	1362	0.01	6.87	1429	0.01
Unknown [m/z 189, 105 (79), 91 (73), 107 (67), 93 (65), 133 (65)... 204 (38)]	9.67	1380	0.14	7.62	1484	0.13
β-Cubebene	9.75	1386	0.02	7.71	1491	0.01
β-Elemene	9.79	1388	0.24	8.41*†	1544	0.36
7-epi-Sesquithujene	9.84	1392	0.15	7.82	1499	0.02
Isocaryophyllene	9.92	1398	0.03	8.10	1521	0.06
α-Gurjunene	9.99	1403	0.04	7.58	1481	0.06
Sesquithujene	10.02	1405	0.03	8.07	1518	0.11
β-Caryophyllene	10.12*	1413	0.24	8.41*†	1544	[0.36]
cis-α-Bergamotene	10.12*	1413	[0.24]	8.20*	1528	0.07
α-Santalene	10.17	1416	0.04	8.20*	1528	[0.07]
β-Copaene	10.24	1422	0.07	8.35	1540	0.05
γ-Elemene	10.35	1430	0.09	9.02	1590	0.19
trans-α-Bergamotene	10.39	1433	0.07	8.45	1547	0.13
Unknown [m/z 121, 93 (80), 91 (25), 79 (20), 77 (16), 119 (15)... 202 (3)]	10.44	1436	0.04			
Sesquisabinene A	10.50	1441	0.08	9.14*	1600	0.72
epi-β-Santalene	10.54	1444	0.11	8.94*	1584	0.27
Cadina-4,11-diene	10.58*	1446	0.81	9.14*	1600	[0.72]
α-Humulene	10.58*	1446	[0.81]	9.26	1610	0.08
Unknown [m/z 109, 81 (84), 207 (73), 43 (55), 41 (52), 69 (48), 55 (47), 124 (39)]	10.64	1451	0.18	9.44	1624	0.12
allo-Aromadendrene	10.67	1453	0.11	8.94*	1584	[0.27]
Amorpha-4,11-diene	10.70*	1456	1.75	9.51	1630	0.36
Muurola-4,11-diene	10.70*	1456	[1.75]	9.22*	1607	1.61
Unknown [m/z 109, 207 (91), 81 (91), 43 (79), 41 (71), 69 (57), 55 (54), 124 (47)]	10.75	1459	0.23	9.55	1633	0.45
Selina-4,11-diene	10.89	1470	0.78	9.40	1621	1.04
Amorpha-4,7(11)-diene?	10.97†	1476	2.20	9.22*	1607	[1.61]
β-Selinene	11.00*†	1478	[2.20]	9.85†	1657	3.04

Unknown [m/z 189, 91 (95), 105 (93), 133 (84), 119 (75), 41 (59), 93 (46)... 204 (33)]	11.00*†	1478	[2.20]	9.89*†	1660	[3.04]
γ-Curcumene	11.05*	1482	2.31	9.69	1645	0.65
ar-Curcumene	11.05*	1482	[2.31]	10.66	1724	2.24
Valencene	11.13†	1487	2.35	9.89*†	1660	[3.04]
Unknown [m/z 71, 69 (84), 93 (82), 109 (82), 41 (72), 43 (69), 81 (66), 55 (56), 79 (49)... 189 (37), 204 (3), 207 (3)]	11.17*†	1490	[2.35]	12.89	1918	0.46
Unknown [m/z 71, 93 (86), 109 (84), 69 (77), 41 (75), 43 (72), 81 (63), 55 (54), 79 (51)... 189 (36), 204 (3), 207 (2)]	11.17*†	1490	[2.35]	12.93	1921	0.49
4-epi-*cis*-Dihydroagarofuran	11.23*	1495	2.89	9.89*†	1660	[3.04]
α-Zingiberene	11.23*	1495	[2.89]	10.07	1675	1.23
α-Muurolene	11.23*	1495	[2.89]	10.04	1672	0.23
(*Z*)-α-Bisabolene	11.31	1501	0.12	10.14*	1680	0.84
β-Dihydroagarofuran	11.39*†	1507	2.68	10.44	1705	0.15
β-Bisabolene	11.39*†	1507	[2.68]	10.14*	1680	[0.84]
7-epi-α-Selinene	11.43*†	1510	[2.68]	10.42	1704	0.04
Unknown [m/z 136, 121, (59), 93 (55), 80 (51), 81 (50), 71 (44), 123 (40)... 204 (3), 207 (1)]	11.43*†	1510	[2.68]	13.18	1944	0.82
Liguloxide analog III	11.54*	1519	0.18			
trans-Calamenene	11.54*	1519	[0.18]	11.22	1770	0.02
β-Sesquiphellandrene	11.59*	1523	2.24	10.58†	1716	4.46
Unknown [m/z 124, 109 (77), 123 (62), 105 (56), 91 (56), 41 (55), 43 (51), 205 (50)... 220 (21)]	11.59*	1523	[2.24]	11.60	1803	0.05
Selina-3,7(11)-diene	11.75*	1536	2.72	10.61†	1720	[4.46]
α-Agarofuran	11.75*	1536	[2.72]	11.77	1818	0.74
(*E*)-α-Bisabolene	11.82	1541	0.05	10.70	1727	0.03
α-Elemol	11.95	1551	8.42	14.08	2028	8.39
Unknown [m/z 123, 81 (30), 93 (19), 121 (17), 43 (16), 95 (14)...]	11.99	1554	0.30			
(*E*)-Nerolidol	12.14	1566	0.65	13.79	2001	0.79
Spathulenol	12.22	1572	0.16	14.42	2061	0.06
Caryophyllene oxide	12.25*	1575	0.06	12.75	1905	0.02
Caryophyllene oxide isomer	12.25*	1575	[0.06]	12.70	1900	0.02
Eudesm-5-en-11-ol analog	12.53	1597	0.57	14.23	2043	0.50
Eudesm-5-en-11-ol	12.60*	1602	0.97	14.39	2058	0.07
Unknown [m/z 59, 91 (59), 105 (53), 93 (48), 161 (46),	12.60*	1602	[0.97]	14.66	2084	0.75

79 (39), 123 (37)... 204 (12), 222 (1)]						
Humulene epoxide II	12.60*	1602	[0.97]	13.38	1962	0.12
10-epi-γ-Eudesmol	12.74	1614	5.52	14.15	2035	5.23
Unknown [m/z 161, 59 (59), 81 (50), 204 (49), 93 (36), 189 (34)... 220 (t)]	12.83	1621	1.38	14.48	2067	1.13
γ-Eudesmol	12.95*	1631	8.43	14.90	2108	8.14
Unknown [m/z 105, 161 (51), 91 (36), 59 (30), 147 (29), 189 (24), 204 (23)... 218 (t)]	12.95*	1631	[8.43]	15.12	2130	0.24
Eremoligenol	12.95*	1631	[8.43]	15.05	2123	0.21
Hinesol	13.00	1636	0.36	15.02	2120	0.42
Agarospirol?	13.07*	1641	1.93	15.17	2135	0.87
Unknown [m/z 105, 59 (72), 161 (65), 147 (64), 91 (54), 43 (34), 189 (34)... 204 (30), 220 (1)]	13.07*	1641	[1.93]	15.24	2142	0.34
β-Eudesmol	13.15	1648	3.48	15.46*	2163	13.19
α-Eudesmol	13.19†	1651	31.39	15.38	2156	3.65
Selin-11-en-4α-ol	13.25*†	1656	[31.39]	15.64	2182	0.21
Valerianol	13.25*†	1656	[31.39]	15.36	2154	17.89
7-epi-α-Eudesmol	13.25*†	1656	[31.39]	15.46*	2163	[13.19]
4α-Hydroxydihydroagarofuran	13.28†	1658	[31.39]	15.53	2171	0.14
trans-Calamenen-10-ol	13.32	1662	0.25	16.84*	2307	0.59
Dehydrojinkoh-eremol	13.45	1673	0.69	16.36	2256	0.53
Unknown [m/z 109, 81 (67), 69 (64), 41 (63), 95 (46), 67 (35)... 207 (15)...]	13.57	1682	0.53	16.58	2279	0.47
Unknown [m/z 69, 41 (90), 123 (74), 122 (51)... 206 (14), 218 (2)]	13.62	1686	0.31	15.83	2201	0.15
Unknown [m/z 69, 41 (59), 118 (33), 43 (32), 55 (31)... 234? (t)]	13.72	1694	0.16	16.76	2298	0.16
(2*E*,6*Z*)-Farnesol	13.78*	1700	0.52	16.44	2265	0.08
(2*Z*,6*E*)-Farnesol	13.78*	1700	[0.52]	16.67	2289	0.12
3β,4β-Oxidoagarofuran?	13.78*	1700	[0.52]	16.06	2225	0.16
Unknown [m/z 81, 136 (77), 109 (68), 121 (61), 41 (48), 93 (41), 79 (35), 107 (34), 123 (30)... 222 (1)]	13.83	1704	0.14	16.84*	2307	[0.59]
(2*E*,6*E*)-Farnesol	14.06	1724	0.38	16.84*	2307	[0.59]
(6R,7R)-Bisabolone	14.20	1736	0.70	15.98	2217	0.39
(6S,7R)-Bisabolone	14.29*	1744	0.71	16.10	2230	0.51
Unknown [m/z 137, 81 (78), 41 (74), 95 (74), 69 (55), 91 (51)... 222 (8)]	14.29*	1744	[0.71]	17.41	2368	0.10
Drimenol	14.42	1755	2.20	17.85	2417	2.19
Cryptomeridiol analog	14.50	1762	0.07	19.01	2550	0.01

Cryptomeridiol	14.98	1803	0.06	19.85	2650	0.07
Unknown [m/z 177, 43 (51), 138 (40), 59 (40), 205 (32)... 238 (5)]	15.26	1829	0.03			
Unknown [m/z 59, 43 (75), 121 (73), 105 (68), 107 (57), 177 (55), 123 (46)... 220 (39), 236 (1)]	15.58	1858	0.03	21.30	2830	0.04
Unknown [m/z 43, 109 (77), 69 (65), 41 (60), 55 (51), 95 (44), 135 (43)... 207 (19)...]	15.61	1861	0.02			
Unknown [m/z 59, 45 (92), 43 (70), 177 (58), 121 (58), 220 (57)... 236 (3)]	15.70	1869	0.11	21.69	2880	0.03
Unknown [m/z 43, 59 (60), 123 (45), 176 (40)... 208 (10)...]	15.76	1874	0.03			
Unknown [m/z 43, 109 (75), 59 (55), 41 (51), 69 (48), 152 (42)... 236 (5)]	15.82	1880	0.04			
Carissone analog I	16.15	1910	0.02	21.35	2837	0.02
Unknown [m/z 59, 121 (66), 218 (27), 136 (26), 178 (26), 43 (24), 91 (24), 123 (23)... 238 (t)]	16.80	1972	0.03			
Total identified		**89.96%**			**83.47%**	
Total reported		**93.83%**			**89.53%**	

*: 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