

Date : October 02, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 20118-PTH13


**Customer identification** : Amyris - Haiti - AH0105192R

**Type** : Essential oil

**Source** : *Amyris balsamifera*

**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** : Fanny Charlier, B. Sc., chimiste à l'entraînement

**Analysis date** : September 23, 2020

Checked and approved by :

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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Faintly yellow viscous liquid

**Refractive index:** 1.5060 ± 0.0003 (20 °C; method PC-MAT-016)

*ISO 3525:2008 - OIL OF AMYRIS*

Compound	Min. %	Max. %	Observed %	Complies?
Drimenol	0.7	5.0	1.3	Yes
β-Eudesmol	2.5	11.0	3.2	Yes
7-epi-α-Eudesmol	7.0	15.0	6.8	No
α-Eudesmol	3.0	9.0	3.9	Yes
Valerianol	15.0	35.0	22.0	Yes
γ-Eudesmol	4.0	12.0	6.5	Yes
10-epi-γ-Eudesmol	6.0	12.0	8.9	Yes
α-Elemol	5.0	15.0	9.3	Yes
<b>Refractive index</b>	1.5040	1.5120	1.5060	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
Limonene	0.01	Monoterpene
$\alpha$ -Terpineol	0.01	Monoterpenic alcohol
Unknown	0.07	Ionone or analog
Unknown	0.04	Sesquiterpene
$\alpha$ -Copaene	0.02	Sesquiterpene
Unknown	0.07	Sesquiterpene
$\beta$ -Cubebene	0.01	Sesquiterpene
$\beta$ -Elemene	0.14	Sesquiterpene
$\alpha$ -Gurjunene	0.03	Sesquiterpene
Sesquithujene	0.04	Sesquiterpene
<i>cis</i> - $\alpha$ -Bergamotene	0.13	Sesquiterpene
$\beta$ -Caryophyllene	0.21	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.02	Sesquiterpene
Unknown	0.09	Sesquiterpene
epi- $\beta$ -Santalene	0.05	Sesquiterpene
Cadina-4,11-diene	0.58	Sesquiterpene
Unknown	0.09	Sesquiterpenic ether
$\alpha$ -Humulene	0.10	Sesquiterpene
Muurolo-4,11-diene	1.26	Sesquiterpene
Amorpha-4,11-diene	0.17	Sesquiterpene
Unknown	0.04	Sesquiterpenic ether
Selina-4,11-diene	0.32	Sesquiterpene
Unknown	0.43	Sesquiterpene
$\gamma$ -Curcumene	0.67	Sesquiterpene
$\beta$ -Selinene	0.52	Sesquiterpene
ar-Curcumene	0.73	Sesquiterpene
Valencene	0.61	Sesquiterpene
Unknown	0.38	Oxygenated sesquiterpene
Unknown	0.34	Oxygenated sesquiterpene
4-epi- <i>cis</i> -Dihydroagarofuran	0.20	Sesquiterpenic ether
$\alpha$ -Zingiberene	1.80	Sesquiterpene
$\beta$ -Dihydroagarofuran	0.12	Sesquiterpenic ether
$\beta$ -Bisabolene	0.57	Sesquiterpene
Unknown	0.57	Oxygenated sesquiterpene
7-epi- $\alpha$ -Selinene	0.20	Sesquiterpene
Liguloxide analog III	0.07	Sesquiterpenic ether
$\beta$ -Sesquiphellandrene	2.96	Sesquiterpene
Unknown	0.21	Oxygenated sesquiterpene
$\alpha$ -Agarofuran	0.46	Sesquiterpenic ether
Selina-3,7(11)-diene	2.97	Sesquiterpene
$\alpha$ -Elemol	9.31	Sesquiterpenic alcohol
Unknown	0.24	Unknown
( <i>E</i> )-Nerolidol	0.57	Sesquiterpenic alcohol
Spathulenol	0.10	Sesquiterpenic alcohol
Caryophyllene oxide	0.05	Sesquiterpenic ether

Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Eudesm-5-en-11-ol	0.03	Sesquiterpenic alcohol
Eudesm-5-en-11-ol analog	0.64	Sesquiterpenic alcohol
Humulene epoxide II	0.14	Sesquiterpenic ether
Unknown	0.84	Oxygenated sesquiterpene
10-epi- $\gamma$ -Eudesmol	8.93	Sesquiterpenic alcohol
Unknown	1.54	Oxygenated sesquiterpene
Eremoligenol?	0.36	Sesquiterpenic alcohol
$\gamma$ -Eudesmol	6.51	Sesquiterpenic alcohol
Eremoligenol	0.24	Sesquiterpenic alcohol
Hinesol	0.17	Sesquiterpenic alcohol
Agarospinol?	0.18	Sesquiterpenic alcohol
Unknown	1.48	Oxygenated sesquiterpene
$\beta$ -Eudesmol	3.22	Sesquiterpenic alcohol
7-epi- $\alpha$ -Eudesmol	6.82	Sesquiterpenic alcohol
$\alpha$ -Eudesmol	3.93	Sesquiterpenic alcohol
Valerianol	21.95	Sesquiterpenic alcohol
4 $\alpha$ -Hydroxydihydroagarofuran	0.12	Sesquiterpenic alcohol
<i>trans</i> -Calamene-10-ol	0.20	Sesquiterpenic alcohol
Dehydrojinkoh-eremol	0.20	Sesquiterpenic alcohol
Unknown	0.49	Oxygenated sesquiterpene
Unknown	0.18	Oxygenated sesquiterpene
Unknown	0.08	Oxygenated sesquiterpene
Caryophyllene acetate	0.11	Sesquiterpenic ester
3 $\beta$ ,4 $\beta$ -Oxidoagarofuran?	0.17	Sesquiterpenic ether
Unknown	0.27	Oxygenated sesquiterpene
(2Z,6E)-Farnesol	0.08	Sesquiterpenic alcohol
(2E,6E)-Farnesol	0.16	Sesquiterpenic alcohol
(6R,7R)-Bisabolone	0.38	Sesquiterpenic ketone
(6S,7R)-Bisabolone	0.42	Sesquiterpenic ketone
Drimenol	1.27	Sesquiterpenic alcohol
Cryptomeridiol analog	0.07	Sesquiterpenic alcohol
Cryptomeridiol	0.03	Sesquiterpenic alcohol
Unknown	0.07	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.04	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Carissone analog II	0.02	Sesquiterpenic alcohol
Unknown	0.02	Oxygenated sesquiterpene
<b>Consolidated total</b>	<b>89.01%</b>	

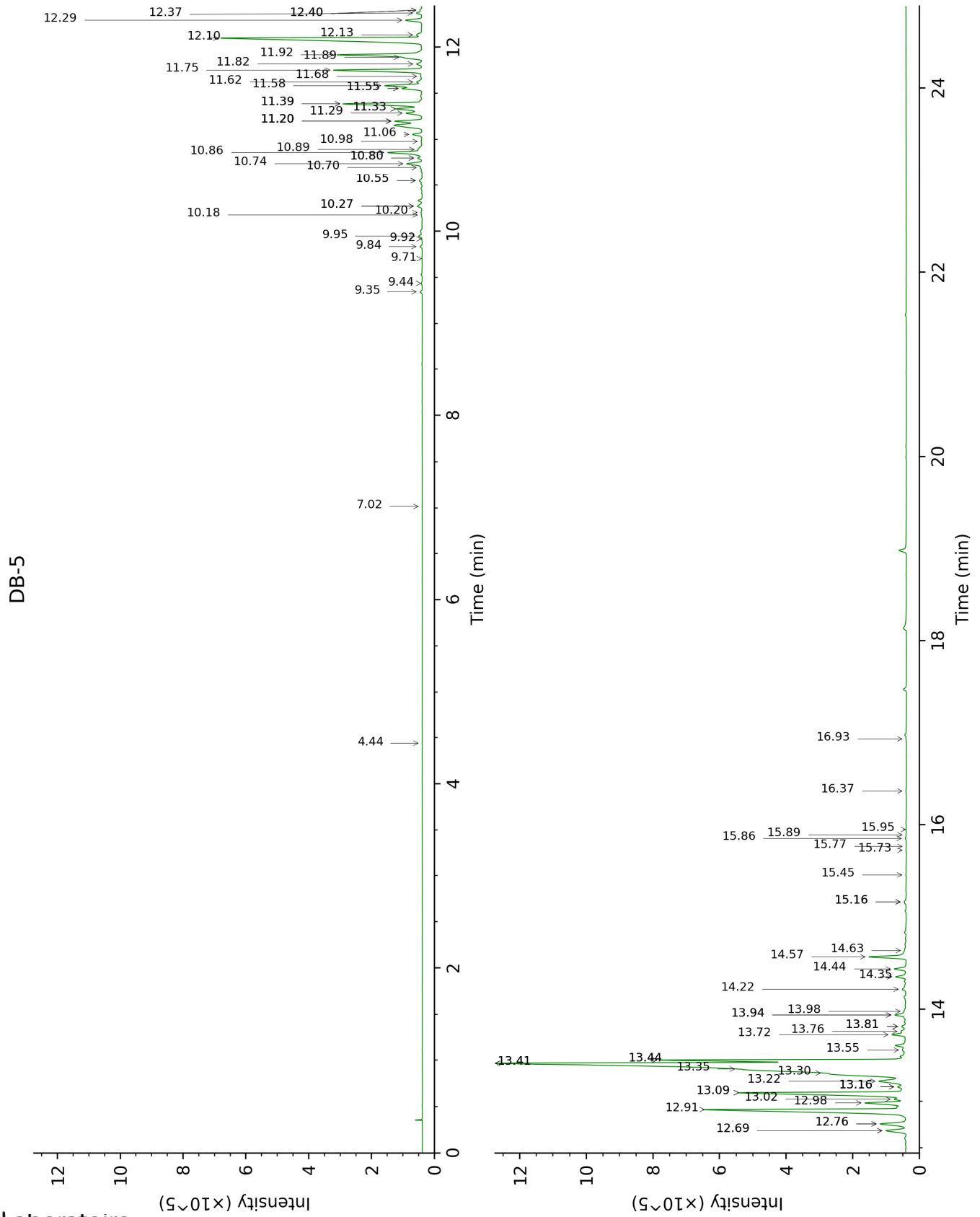
Note: no correction factor was applied

**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.

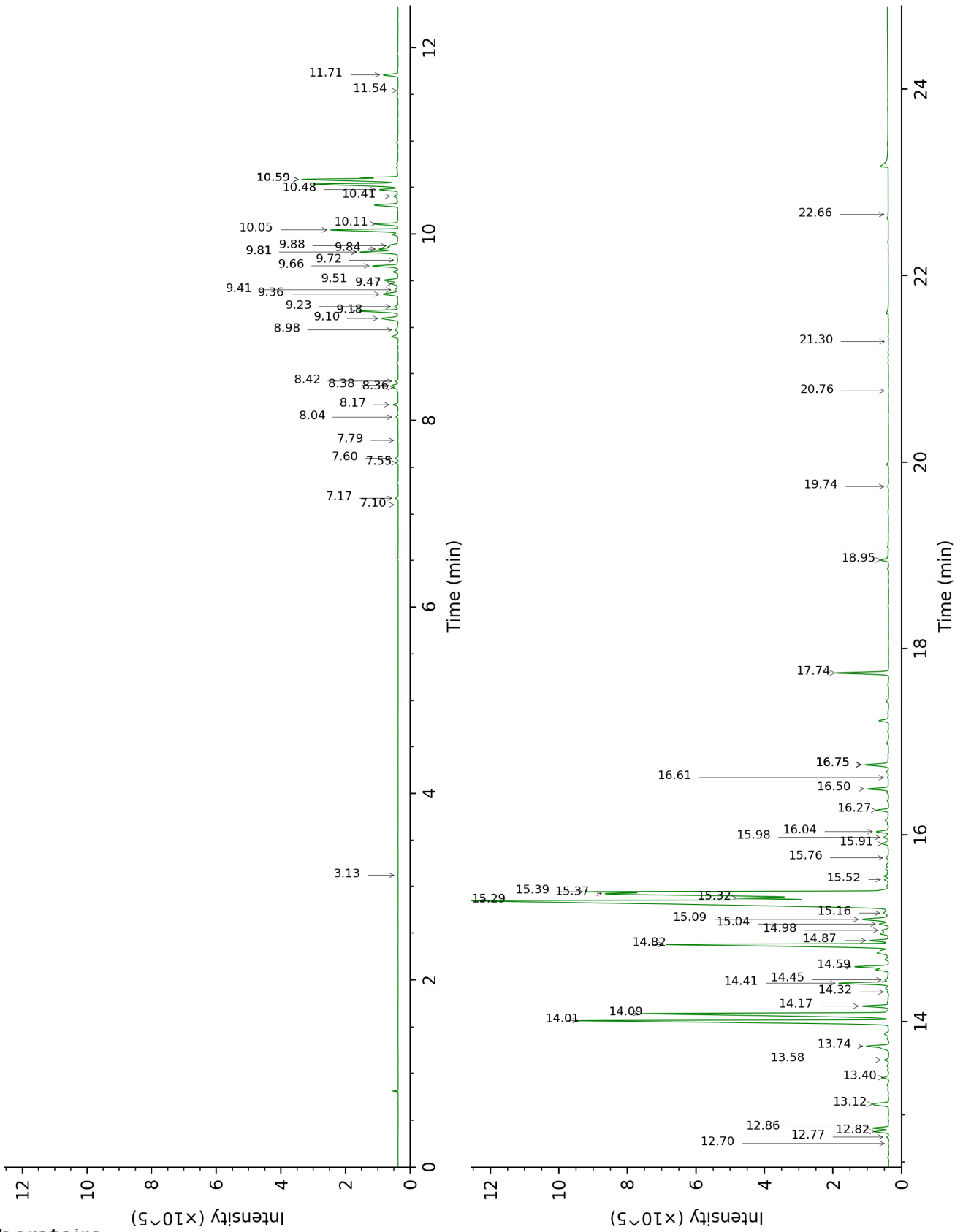
**Unknowns:** Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.



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DB-WAX





FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Limonene	4.44	1025	0.01	3.13	1154	0.01
$\alpha$ -Terpineol	7.02	1188	0.01	9.72	1647	0.01
Unknown [m/z 177, 107 (57), 81 (55), 95 (50), 41 (34), 93 (34), 123 (32)... 192 (23)]	9.35	1344	0.07	7.17	1449	0.07
Unknown [m/z 123, 81 (45), 107 (30), 79 (28), 41 (28)... 204 (5)]	9.44	1350	0.04			
$\alpha$ -Copaene	9.70	1369	0.02	7.10	1444	0.01
Unknown [m/z 189, 105 (79), 91 (73), 107 (67), 93 (65), 133 (65)... 204 (38)]	9.84	1378	0.07	7.60	1481	0.07
$\beta$ -Cubebene	9.92	1384	0.01	7.79	1495	0.02
$\beta$ -Elemene	9.95	1386	0.14	8.38†	1541	[0.36]
$\alpha$ -Gurjunene	10.18	1403	0.03	7.55	1477	0.03
Sesquithujene	10.20	1405	0.04	8.04	1514	0.06
<i>cis</i> - $\alpha$ -Bergamotene	10.27*†	1410	0.34	8.17	1525	0.13
$\beta$ -Caryophyllene	10.27*†	1410	[0.34]	8.36†	1539	0.36
<i>trans</i> - $\alpha$ -Bergamotene	10.55*	1430	0.10	8.42†	1544	[0.36]
Unknown [m/z 121, 93 (80), 91 (25), 79 (20), 77 (16), 119 (15)... 202 (3)]	10.55*	1430	[0.10]			
epi- $\beta$ -Santalene	10.70	1442	0.05	8.98	1587	0.09
Cadina-4,11-diene	10.74	1445	0.58	9.10	1597	0.58
Unknown [m/z 109, 81 (84), 207 (73), 43 (55), 41 (52), 69 (48), 55 (47), 124 (39)]	10.80*	1449	0.15	9.41	1622	0.09
$\alpha$ -Humulene	10.80*	1449	[0.15]	9.23	1607	0.10
Muurola-4,11-diene	10.86	1454	1.26	9.18	1603	1.03
Amorpha-4,11-diene	10.89	1456	0.17	9.47†	1627	0.62
Unknown [m/z 109, 207 (91), 81 (91), 43 (79), 41 (71), 69 (57), 55 (54), 124 (47)]	10.98	1463	0.04	9.51†	1630	[0.62]
Selina-4,11-diene	11.06	1468	0.32	9.36	1618	0.51
Unknown [m/z 189, 91 (95), 105 (93), 133 (84), 119 (75), 41 (59), 93 (46)... 204 (33)]	11.20*†	1479	2.35	9.81*	1654	1.04
$\gamma$ -Curcumene	11.20*†	1479	[2.35]	9.66	1642	0.67
$\beta$ -Selinene	11.20*†	1479	[2.35]	9.84	1657	0.52
ar-Curcumene	11.20*†	1479	[2.35]	10.59*	1718	2.90
Valencene	11.29	1485	0.61	9.81*	1654	[1.04]
Unknown [m/z 71, 69 (84), 93 (82), 109 (82), 41 (72), 43 (69), 81 (66), 55 (56), 79	11.33*	1489	0.97	12.86	1917	0.38

(49)... 189 (37), 204 (3), 207 (3)]						
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)]	11.33*	1489	[0.97]	12.82	1914	0.34
4-epi-cis-Dihydroagarofuran	11.39*	1493	2.85	9.88	1660	0.20
α-Zingiberene	11.39*	1493	[2.85]	10.05	1674	1.80
β-Dihydroagarofuran	11.55*†	1506	1.86	10.41	1703	0.12
β-Bisabolene	11.55*†	1506	[1.86]	10.11	1679	0.57
Unknown [m/z 136, 121, (59), 93 (55), 80 (51), 81 (50), 71 (44), 123 (40)... 204 (3), 207 (1)]	11.58†	1508	[1.86]	13.12	1941	0.57
7-epi-α-Selinene	11.62	1511	0.20	10.48	1709	0.47
Liguloxide analog III	11.68	1516	0.07			
β-Sesquiphellandrene	11.75	1521	2.96	10.59*	1718	[2.90]
Unknown [m/z 124, 109 (77), 123 (62), 105 (56), 91 (56), 41 (55), 43 (51), 205 (50)... 220 (21)]	11.82	1526	0.21	11.54	1800	0.04
α-Agarofuran	11.89	1532	0.46	11.71	1814	0.40
Selina-3,7(11)-diene	11.92	1534	2.97	10.59*	1718	[2.90]
α-Elemol	12.10	1548	9.31	14.01	2024	9.33
Unknown [m/z 123, 81 (30), 93 (19), 121 (17), 43 (16), 95 (14)...]	12.13	1551	0.24			
(E)-Nerolidol	12.29	1564	0.57	13.74	1998	0.60
Spathulenol	12.37†	1570	0.26	14.45	2066	0.10
Caryophyllene oxide	12.40*†	1572	[0.26]	12.77	1908	0.05
Caryophyllene oxide isomer	12.40*†	1572	[0.26]	12.70	1902	0.01
Eudesm-5-en-11-ol	12.69*	1594	0.80	14.32	2054	0.03
Eudesm-5-en-11-ol analog	12.69*	1594	[0.80]	14.17	2039	0.64
Humulene epoxide II	12.76*	1600	1.06	13.40	1966	0.14
Unknown [m/z 59, 91 (59), 105 (53), 93 (48), 161 (46), 79 (39), 123 (37)... 204 (12), 222 (1)]	12.76*	1600	[1.06]	14.59	2080	0.84
10-epi-γ-Eudesmol	12.91	1613	8.93	14.09	2032	8.46
Unknown [m/z 161, 59 (59), 81 (50), 204 (49), 93 (36), 189 (34)... 220 (t)]	12.98	1619	1.54	14.41	2063	1.23
Eremoligenol?	13.02	1622	0.36	14.87	2107	0.43
γ-Eudesmol	13.09*	1628	6.88	14.82	2103	6.51
Eremoligenol	13.09*	1628	[6.88]	15.04	2125	0.24
Hinesol	13.16*	1633	0.33	14.98	2118	0.17
Agarospinol?	13.16*	1633	[0.33]	15.16	2136	0.18
Unknown [m/z 105, 59 (72), 161 (65), 147 (64), 91	13.22	1638	1.48	15.09	2130	0.86

(54), 43 (34), 189 (34)... 204 (30), 220 (1)]						
β-Eudesmol	13.30	1645	3.22	15.39†	2159	[16.09]
7-epi-α-Eudesmol	13.35	1649	6.82	15.37†	2157	16.09
α-Eudesmol	13.41*	1654	24.94	15.32	2152	3.93
Valerianol	13.41*	1654	[24.94]	15.29	2149	21.95
4α-Hydroxydihydroagarofuran	13.44*†	1657	7.22	15.52	2172	0.12
<i>trans</i> -Calamene-10-ol	13.44*†	1657	[7.22]	16.75*	2299	0.70
Dehydrojinkoh-eremol	13.55	1666	0.20	16.27	2249	0.30
Unknown [m/z 109, 81 (67), 69 (64), 41 (63), 95 (46), 67 (35)... 207 (15)...]	13.72	1680	0.49	16.50	2272	0.54
Unknown [m/z 69, 41 (90), 123 (74), 122 (51)... 206 (14), 218 (2)]	13.76	1683	0.18	15.76	2196	0.08
Unknown [m/z 69, 41 (59), 118 (33), 43 (32), 55 (31)... 234? (t)]	13.81*	1688	0.19	16.75*	2299	[0.70]
Caryophyllene acetate	13.81*	1688	[0.19]	13.58	1984	0.11
3β,4β-Oxidoagarofuran?	13.94*	1698	0.43	15.98	2219	0.17
Unknown [m/z 81, 136 (77), 109 (68), 121 (61), 41 (48), 93 (41), 79 (35), 107 (34), 123 (30)... 222 (1)]	13.94*	1698	[0.43]	16.75*	2299	[0.70]
(2Z,6E)-Farnesol	13.98	1701	0.08	16.61	2285	0.03
(2E,6E)-Farnesol	14.22	1722	0.16	16.75*	2299	[0.70]
(6R,7R)-Bisabolone	14.35	1734	0.38	15.91	2212	0.20
(6S,7R)-Bisabolone	14.44	1741	0.42	16.04	2225	0.34
Drimenol	14.57	1752	1.27	17.74	2406	1.37
Cryptomeridiol analog	14.64	1758	0.07	18.95	2541	0.25
Cryptomeridiol	15.16*	1804	0.10	19.74	2634	0.03
Unknown [m/z 69, 43 (95), 41 (84), 109 (78), 95 (54), 93 (49)... 177 (36), 220 (2)...]	15.16*	1804	[0.10]			
Unknown [m/z 177, 43 (51), 138 (40), 59 (40), 205 (32)... 238 (5)]	15.45	1831	0.02	20.76	2758	0.01
Unknown [m/z 59, 43 (75), 121 (73), 105 (68), 107 (57), 177 (55), 123 (46)... 220 (39), 236 (1)]	15.73	1856	0.01	21.30	2824	0.01
Unknown [m/z 43, 109 (77), 69 (65), 41 (60), 55 (51), 95 (44), 135 (43)... 207 (19)...]	15.77	1860	0.01			
Unknown [m/z 59, 45 (92), 43 (70), 177 (58), 121 (58), 220 (57)... 236 (3)]	15.86	1868	0.04			
Unknown [m/z 43, 59 (60), 123 (45), 176 (40)... 208 (10)...]	15.89	1871	0.01			

Unknown [m/z 43, 109 (75), 59 (55), 41 (51), 69 (48), 152 (42)... 236 (5)]	15.95	1876	0.01			
Carissone analog II	16.37	1915	0.02			
Unknown [m/z 59, 121 (66), 218 (27), 136 (26), 178 (26), 43 (24), 91 (24), 123 (23)... 238 (t)]	16.93	1969	0.02	22.66	3000	0.02
<b>Total identified</b>		<b>92.57%</b>			<b>84.75%</b>	
<b>Total reported</b>		<b>97.02%</b>			<b>89.89%</b>	

\*: 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

Note: no correction factor was applied

R.T.: Retention time (minutes)

R.I.: Retention index