

Date : June 22, 2022

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 22F16-PTH03


Customer identification : Goldenrod - USA - GG2100R

Type : Essential oil

Source : *Solidago canadensis*

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 : Pamela Lavoie, M.Sc., Chimiste

Analysis date : June 22, 2022

Checked and approved by :



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

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PHYSICOCHEMICAL DATA

Physical aspect: Light yellow liquid

Refractive index: 1.4806 ± 0.0003 (20 °C; method PC-MAT-016)

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
Butyral	0.01	Aliphatic aldehyde
2-Butanone	tr	Aliphatic ketone
Isovaleral	0.02	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
2-Ethylfuran	0.04	Furan
Toluene	0.01	Simple phenolic
Hexanal	0.02	Aliphatic aldehyde
Octane	0.01	Alkane
(2E)-Hexenal	0.05	Aliphatic aldehyde
(3Z)-Hexenol	0.15	Aliphatic alcohol
(2E)-Hexenol	0.04	Aliphatic alcohol
Hexanol	0.11	Aliphatic alcohol
3-Acetyl-3-methylcyclopentene	0.01	Aliphatic ketone
Nonene	0.02	Alkene
Tricyclene	0.04	Monoterpene
α -Thujene	0.13	Monoterpene
α -Pinene	19.07	Monoterpene
Camphene	0.86	Monoterpene
α -Fenchene	tr	Monoterpene
Thuja-2,4(10)-diene	0.02	Monoterpene
β -Pinene	3.10	Monoterpene
Sabinene	8.88	Monoterpene
Myrcene	7.81	Monoterpene
Pseudolimonene	0.02	Monoterpene
α -Phellandrene	0.45	Monoterpene
Δ^3 -Carene	0.01	Monoterpene
(3Z)-Hexenyl acetate	0.03	Aliphatic ester
α -Terpinene	0.11	Monoterpene
para-Cymene	0.10	Monoterpene
Limonene	19.54	Monoterpene
β -Phellandrene	1.68	Monoterpene
(Z)- β -Ocimene	0.05	Monoterpene
(E)- β -Ocimene	0.87	Monoterpene
γ -Terpinene	0.18	Monoterpene
cis-Sabinene hydrate	0.06	Monoterpenic alcohol
Terpinolene	1.10	Monoterpene
para-Cymenene	tr	Monoterpene
trans-Sabinene hydrate	0.03	Monoterpenic alcohol
Linalool	0.07	Monoterpenic alcohol
Nonanal	0.04	Aliphatic aldehyde
Verbenol analog?	0.01	Monoterpenic alcohol
β -Thujone	0.06	Monoterpenic ketone
trans-para-Mentha-2,8-dien-1-ol	0.04	Monoterpenic alcohol
(E)-4,8-Dimethyl-1,3,7-nonatriene	0.19	Monoterpene
cis-para-Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol

Camphor	0.02	Monoterpenic ketone
<i>trans</i> -para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol
<i>trans</i> -Verbenol	0.05	Monoterpenic alcohol
Borneol	0.34	Monoterpenic alcohol
Unknown	0.01	Unknown
Terpinen-4-ol	0.29	Monoterpenic alcohol
Cryptone	0.01	Normonoterpenic ketone
para-Cymen-8-ol	0.01	Monoterpenic alcohol
α -Terpineol	0.02	Monoterpenic alcohol
Myrtenal	0.01	Monoterpenic aldehyde
Myrtenol	0.03	Monoterpenic alcohol
<i>trans</i> -Piperitol	0.01	Monoterpenic alcohol
Decanal	0.01	Aliphatic aldehyde
Octyl acetate	0.02	Aliphatic ester
Unknown	0.26	Unknown
Geraniol	0.01	Monoterpenic alcohol
Bornyl acetate	3.93	Monoterpenic ester
Dihydroedulan I	tr	Terpenic ether
Lavandulyl acetate	0.03	Monoterpenic ester
<i>trans</i> -Pinocarvyl acetate	0.04	Monoterpenic ester
Undecanal	0.01	Aliphatic aldehyde
Myrtenyl acetate	0.03	Monoterpenic ester
Bicycloelemene	0.04	Sesquiterpene
δ -Elemene	0.31	Sesquiterpene
α -Cubebene	0.04	Sesquiterpene
Neryl acetate	0.01	Monoterpenic ester
α -Ylangene	0.01	Sesquiterpene
α -Copaene	0.09	Sesquiterpene
β -Bourbonene	0.08	Sesquiterpene
<i>cis</i> - β -Elemene	0.05	Sesquiterpene
β -Cubebene	0.39	Sesquiterpene
β -Elemene	0.34	Sesquiterpene
Unknown	0.02	Unknown
α -Gurjunene	0.33	Sesquiterpene
Dodecanal	0.26	Aliphatic aldehyde
Unknown	0.03	Sesquiterpene
<i>cis</i> - α -Bergamotene	tr	Sesquiterpene
β -Ylangene	0.19	Sesquiterpene
β -Caryophyllene	0.69	Sesquiterpene
β -Copaene	0.08	Sesquiterpene
γ -Elemene	0.05	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.29	Sesquiterpene
Isogermacrene D	0.01	Sesquiterpene
6,9-Guaiadiene	0.03	Sesquiterpene
Unknown	0.04	Sesquiterpene
α -Humulene	0.23	Sesquiterpene
<i>cis</i> -Muurolo-4(15),5-diene	0.02	Sesquiterpene
Unknown	0.12	Unknown
γ -Gurjunene	0.31	Sesquiterpene
Germacrene D	17.24	Sesquiterpene
γ -Muurolole	0.34	Sesquiterpene
β -Selinene	0.27	Sesquiterpene

γ -Amorphene	0.06	Sesquiterpene
epi-Cubebol	0.07	Sesquiterpenic alcohol
Bicyclogermacrene	0.50	Sesquiterpene
α -Zingiberene	0.72	Sesquiterpene
α -Muurolene	0.08	Sesquiterpene
Germacrene A	0.23	Sesquiterpene
δ -Amorphene	0.10	Sesquiterpene
γ -Cadinene	0.06	Sesquiterpene
Cubebol	0.11	Sesquiterpenic alcohol
(3E,6E)- α -Farnesene	0.11	Sesquiterpene
δ -Cadinene	0.27	Sesquiterpene
β -Sesquiphellandrene	0.45	Sesquiterpene
Unknown	0.01	Sesquiterpene
<i>trans</i> -Cadina-1,4-diene	0.04	Sesquiterpene
α -Cadinene	0.04	Sesquiterpene
α -Calacorene	0.01	Sesquiterpene
α -Elemol	0.04	Sesquiterpenic alcohol
Germacrene B	0.46	Sesquiterpene
Palustrol	0.02	Sesquiterpenic alcohol
(E)-Nerolidol	0.08	Sesquiterpenic alcohol
Spathulenol	0.13	Sesquiterpenic alcohol
Caryophyllene oxide	0.04	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Humulene epoxide I	0.02	Sesquiterpenic ether
Ledol	0.09	Sesquiterpenic alcohol
Unknown	0.90	Sesquiterpenic alcohol
Junenol	0.02	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
1-epi-Cubenol	0.06	Sesquiterpenic alcohol
Alismol	0.02	Sesquiterpenic alcohol
Unknown	0.07	Unknown
τ -Cadinol	0.06	Sesquiterpenic alcohol
τ -Muurolol	0.02	Sesquiterpenic alcohol
α -Muurolol	0.03	Sesquiterpenic alcohol
β -Eudesmol	0.05	Sesquiterpenic alcohol
α -Cadinol	0.05	Sesquiterpenic alcohol
Unknown	0.08	Unknown
(3Z)-Caryophylla-3,8(13)-dien-5 β -ol	0.03	Sesquiterpenic alcohol
Germacra-4(15),5,10(14)-trien-1 α -ol	0.10	Sesquiterpenic alcohol
Mint sulfide?	0.02	Sesquiterpenic sulfide
(6S,7R)-Bisabolone	0.10	Sesquiterpenic ketone
Cyclocolorone	0.24	Sesquiterpenic ketone
Unknown	0.01	Unknown
Neophytadiene	0.05	Diterpene
Phytone	0.02	Terpenic ketone
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
meta-Camphorene	0.05	Diterpene
para-Camphorene	0.02	Diterpene
Phytol	0.01	Diterpenic alcohol
Consolidated total	97.95%	

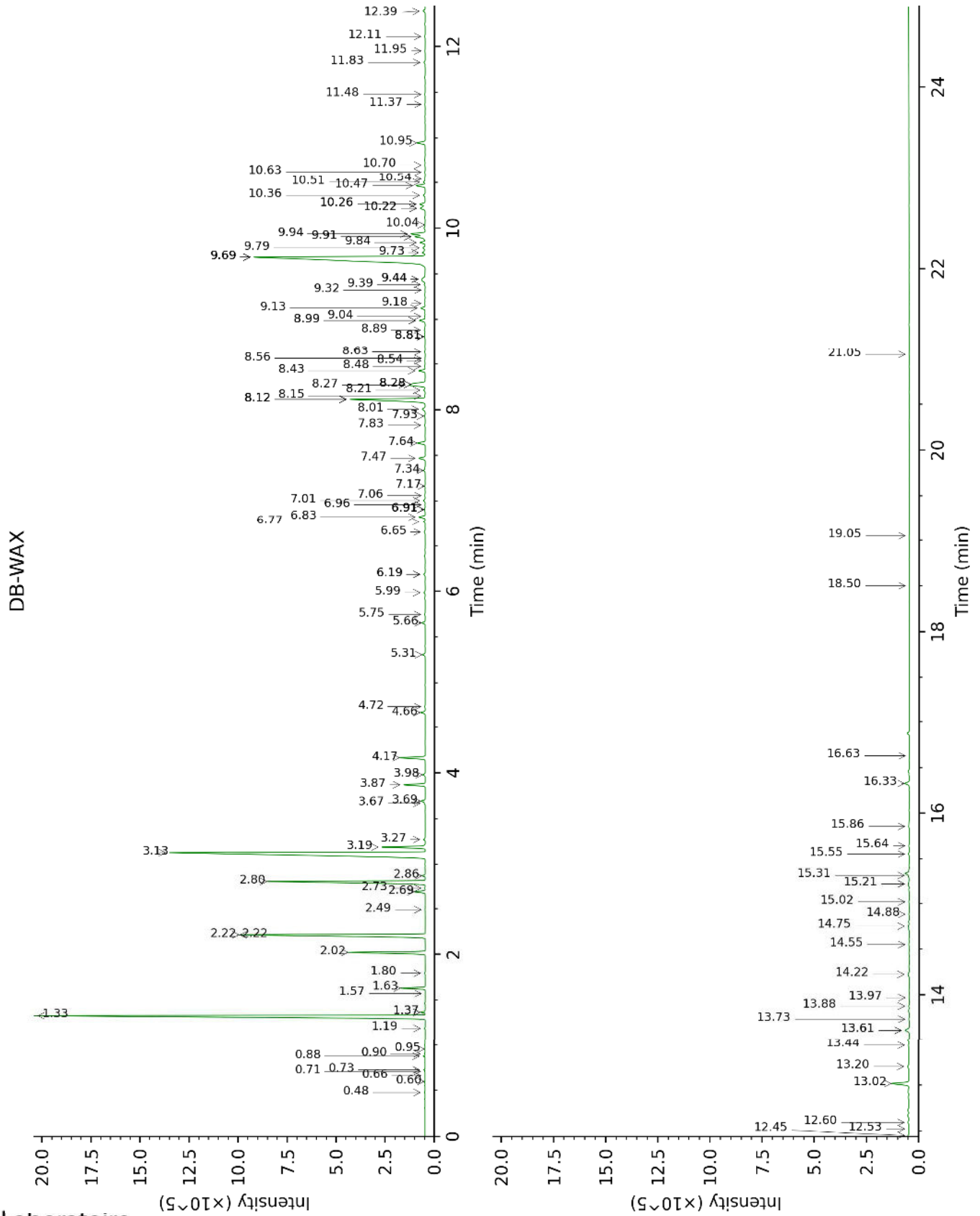
tr: The compound has been detected below 0.005% of total signal.

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.

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



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Butyral	0.52	582	0.01	0.60	838	0.01
2-Butanone	0.53	593	tr	0.66	862	tr
Isovaleral	0.66	643	0.02	0.73	886	0.03
2-Methylbutyral	0.69	653	0.01	0.71	879	0.01
2-Ethylfuran	0.85	702	0.04	0.88	918	0.04
Toluene	1.27	758	0.01	1.37*	1000	0.14
Hexanal	1.57	799	0.02	1.80	1043	0.03
Octane	1.60	803	0.01	0.48	783	0.01
(2E)-Hexenal	2.15	848	0.05	3.27	1172	0.07
(3Z)-Hexenol	2.23	854	0.15	5.66	1347	0.15
(2E)-Hexenol	2.39	867	0.04	5.99	1371	0.06
Hexanol	2.43	870	0.11	5.31	1322	0.12
3-Acetyl-3-methylcyclopentene	2.57	881	0.01	0.95	932	0.01
Nonene	2.71	893	0.02	0.90	923	0.02
Tricyclene	3.07	918	0.04	1.19	971	0.03
α-Thujene	3.18	926	0.13	1.37*	1000	[0.14]
α-Pinene	3.29	932	19.07	1.33	994	18.94
Camphene	3.46*	943	0.87	1.63	1027	0.86
α-Fenchene	3.46*	943	[0.87]	1.57	1021	tr
Thuja-2,4(10)-diene	3.55	949	0.02	2.22*	1085	8.89
β-Pinene	3.89*†	972	12.05	2.02	1066	3.10
Sabinene	3.89*†	972	[12.05]	2.22*	1085	[8.89]
Myrcene	4.22	994	7.81	2.80	1135	7.78
Pseudolimonene	4.34*	1002	0.48	2.73	1129	0.02
α-Phellandrene	4.34*	1002	[0.48]	2.69	1126	0.45
Δ3-Carene	4.43	1008	0.01	2.49	1110	0.01
(3Z)-Hexenyl acetate	4.46	1009	0.03	4.72	1282	0.02
α-Terpinene	4.54	1014	0.11	2.86	1140	0.11
para-Cymene	4.66	1022	0.10	3.98	1226	0.10
Limonene	4.78*	1029	21.31	3.13	1161	19.54
β-Phellandrene	4.78*	1029	[21.31]	3.19	1166	1.68
(Z)-β-Ocimene	4.95	1040	0.05	3.67†	1203	0.23
(E)-β-Ocimene	5.11	1050	0.87	3.87	1218	0.89
γ-Terpinene	5.22	1057	0.18	3.69†	1205	[0.23]
cis-Sabinene hydrate	5.34	1064	0.06	6.77	1428	0.09
Terpinolene	5.69*	1086	1.11	4.17	1240	1.10
para-Cymenene	5.69*	1086	[1.11]	6.19*	1385	0.07
trans-Sabinene hydrate	5.83	1095	0.03	7.83	1508	0.03
Linalool	5.92	1101	0.07	7.93	1516	0.04
Nonanal	5.98	1105	0.04	5.75	1353	0.03
Verbenol analog?	6.04	1109	0.01	8.15	1533	0.02
β-Thujone	6.10	1112	0.06	6.19*	1385	[0.07]
trans-para-Mentha-2,8-dien-1-ol	6.20*	1119	0.23	8.82*	1585	0.06

(E)-4,8-Dimethyl-1,3,7-nonatriene	6.20*	1119	[0.23]	4.66	1277	0.19
cis-para-Mentha-2,8-dien-1-ol	6.43	1134	0.02	9.32	1625	0.01
Camphor	6.48*	1137	0.04	7.06	1450	0.02
trans-para-Menth-2-en-1-ol	6.48*	1137	[0.04]	8.82*	1585	[0.06]
trans-Verbenol	6.55	1142	0.05	9.39	1630	0.05
Borneol	6.86	1162	0.34	9.68*	1655	17.80
Unknown [m/z 109, 95 (29), 110 (22), 81 (21), 79 (18), 91 (13)...]	6.90	1165	0.01			
Terpinen-4-ol	7.06	1174	0.29	8.43	1554	0.30
Cryptone	7.15	1180	0.01	9.04	1602	0.03
para-Cymen-8-ol	7.19	1183	0.01	11.37	1796	0.02
α-Terpineol	7.27	1188	0.02	9.68*	1655	[17.80]
Myrtenal	7.29	1189	0.01	8.54	1563	0.02
Myrtenol	7.35	1193	0.03	10.70	1740	0.02
trans-Piperitol	7.50	1203	0.01	10.26*	1702	0.28
Decanal	7.54	1206	0.01	7.17	1458	0.02
Octyl acetate	7.72	1218	0.02	6.96	1442	0.01
Unknown [m/z 108, 107 (86), 93 (69), 167 (33), 91 (29), 109 (25)...]	8.05	1240	0.26	8.12*	1530	4.26
Geraniol	8.38	1263	0.01	11.48	1806	0.03
Bornyl acetate	8.74*	1287	3.94	8.12*	1530	[4.26]
Dihydroedulan I	8.74*	1287	[3.94]	6.91*	1439	0.06
Lavandulyl acetate	8.85	1295	0.03	8.64	1571	0.03
trans-Pinocarvyl acetate	8.87	1297	0.04	8.99*	1598	0.31
Undecanal	9.08	1306	0.01	8.56	1565	0.01
Myrtenyl acetate	9.30	1322	0.03	9.44*†	1635	0.37
Bicycloelemene	9.46	1333	0.04	6.91*	1439	[0.06]
δ-Elemene	9.49	1335	0.31	6.83	1432	0.30
α-Cubebene	9.66	1347	0.04	6.65	1419	0.06
Neryl acetate	9.91	1365	0.01	10.04	1684	0.01
α-Ylangene	9.95	1368	0.01	6.91*	1439	[0.06]
α-Copaene	10.01	1372	0.09	7.01	1446	0.09
β-Bourbonene	10.12	1380	0.08	7.34	1471	0.10
cis-β-Elemene	10.15	1382	0.05	8.12*	1530	[4.26]
β-Cubebene	10.22	1387	0.39	7.64	1493	0.39
β-Elemene	10.25	1389	0.34	8.28*†	1543	[1.32]
Unknown [m/z 161, 105 (83), 119 (69), 81 (34), 91 (29), 93 (28)...204]	10.30	1393	0.02			
α-Gurjunene	10.47	1405	0.33	7.47	1481	0.32
Dodecanal	10.53*	1409	0.29	9.84	1668	0.26
Unknown [m/z 81, 123 (77), 80 (74), 161	10.53*	1409	[0.29]			

(37), 79 (29), 105 (20), 91 (16), 77 (12) ...204 (2)]						
<i>cis</i> - α -Bergamotene	10.59*	1414	0.89	8.12*	1530	[4.26]
β -Ylangene	10.59*	1414	[0.89]	8.01	1522	0.19
β -Caryophyllene	10.59*	1414	[0.89]	8.27†	1542	1.32
β -Copaene	10.73	1424	0.08	8.22	1538	0.07
γ -Elemene	10.82	1431	0.05	8.89	1590	0.07
<i>trans</i> - α - Bergamotene	10.86	1434	0.29	8.28*†	1543	[1.32]
Isogermacrene D	10.93*	1439	0.04	8.82*	1585	[0.06]
6,9-Guaiadiene	10.93*	1439	[0.04]	8.48	1558	0.03
Unknown [m/z 161 ,120 (82), 105 (61), 91 (39), 119 (36), 81 (32), 93 (32), 79 (25), 41 (22) ...204 (14)]	11.01	1445	0.04			
α -Humulene	11.04	1448	0.23	9.13	1609	0.23
<i>cis</i> -Muurolo-4(15),5- diene	11.18	1457	0.02	9.18	1614	0.02
Unknown [m/z 57, 71 (88), 43 (64), 93 (49), 85 (45), 41 (31), 55 (24)...]	11.20	1459	0.12			
γ -Gurjunene	11.31	1467	0.31	8.99*	1598	[0.31]
Germacrene D	11.47*	1479	17.57	9.68*	1655	[17.80]
γ -Muurolole	11.47*	1479	[17.57]	9.44*†	1635	[0.37]
β -Selinene	11.50	1482	0.27	9.73	1659	0.17
γ -Amorphene	11.56	1486	0.06	9.68*	1655	[17.80]
epi-Cubebol	11.63*	1491	0.66	11.83	1837	0.07
Bicyclogermacrene	11.63*	1491	[0.66]	9.91*	1673	0.58
α -Zingiberene	11.67	1494	0.72	9.94	1676	0.70
α -Muurolole	11.70	1497	0.08	9.91*	1673	[0.58]
Germacrene A	11.73	1499	0.23	10.22*	1698	0.34
δ -Amorphene	11.79	1503	0.10	9.79	1663	0.14
γ -Cadinene	11.87†	1509	0.28	10.22*	1698	[0.34]
Cubebol	11.88*†	1510	[0.28]	12.39	1887	0.11
(3 <i>E</i> ,6 <i>E</i>)- α -Farnesene	11.88*†	1510	[0.28]	10.36	1710	0.11
δ -Cadinene	12.00†	1520	0.72	10.26*	1702	[0.28]
β - Sesquiphellandrene	12.03†	1522	[0.72]	10.47	1719	0.45
Unknown [m/z 119, 105 (53), 161 (33), 93 (28), 91 (25), 40 (20)...204]	12.11	1528	0.01	10.54	1726	0.02
<i>trans</i> -Cadina-1,4- diene	12.12	1529	0.04	10.51	1723	0.10
α -Cadinene	12.17	1533	0.04	10.63	1733	0.02
α -Calacorene	12.21	1536	0.01	11.95	1848	0.02
α -Elemol	12.32	1545	0.04	13.88	2026	0.03
Germacrene B	12.38	1550	0.46	10.95	1761	0.43
Palustrol	12.50	1559	0.02	12.11	1862	0.03

(E)-Nerolidol	12.55	1563	0.08	13.61*	2000	0.27
Spathulenol	12.64	1570	0.13	14.22	2059	0.11
Caryophyllene oxide	12.70*	1574	0.05	12.60	1906	0.04
Caryophyllene oxide isomer	12.70*	1574	[0.05]	12.53	1899	0.01
Humulene epoxide I	12.89	1590	0.02	13.02	1945	0.88
Ledol	12.96	1595	0.09	13.20	1962	0.07
Unknown [m/z 93, 119 (79), 132 (78), 91 (74), 105 (58), 92 (45), 77 (42), 43 (28)... 220 (t)]	13.08	1605	0.90			
Junenol	13.14	1609	0.02	13.44	1984	0.02
Unknown [m/z 179, 161 (30), 109 922), 95 (18), 81 (17)... 204 (5), 222 (3)]	13.15	1611	0.01	13.97	2034	0.02
1-epi-Cubenol	13.30	1623	0.06	13.61*	2000	[0.27]
Alismol	13.33	1625	0.02	15.55	2191	0.06
Unknown [m/z 43, 93 (89), 91 (88), 79 (87), 123 (76), 81 (75)...]	13.41	1632	0.07	13.73	2012	0.03
τ -Cadinol	13.45*	1635	0.08	14.75	2110	0.06
τ -Muurolol	13.45*	1635	[0.08]	14.88	2123	0.02
α -Muurolol	13.53*	1642	0.08	15.02	2137	0.03
β -Eudesmol	13.53*	1642	[0.08]	15.21*†	2157	0.11
α -Cadinol	13.61	1648	0.05	15.31	2166	0.05
Unknown [m/z 81, 41 (46), 79 (46), 93 (39), 91 (33), 107 (33)... 206 (8)]	13.75	1660	0.08			
(3Z)-Caryophylla-3,8(13)-dien-5 β -ol	13.81	1665	0.03	16.63	2304	0.01
Germacra-4(15),5,10(14)-trien-1 α -ol	13.97	1678	0.10	15.86	2223	0.08
Mint sulfide?	14.52	1725	0.02			
(6S,7R)-Bisabolone	14.68	1739	0.10			
Cyclocolorenone	14.78	1747	0.24	16.33	2272	0.26
Unknown [m/z 123, 191 (88), 81 (86), 41 (86), 151 (80), 91 (76)...]	15.66	1825	0.01	18.50	2511	0.01
Neophytadiene	15.85	1842	0.05	12.45	1893	0.03
Phytone	15.90	1846	0.02	14.55	2090	0.03
Unknown [m/z 123, 81 (96), 41 (74), 43 (64), 91 (62), 95 (57)...]	16.38	1890	0.01			
Unknown [m/z 123, 81 (47), 43 (35), 91	16.49	1901	0.01	21.05	2818	0.01

(30), 41 (27), 79 (24)...						
Unknown [m/z 43, 93 (95), 91 (69), 41 (67), 107 (62), 81 (62)...	16.68	1918	0.01			
meta-Camphorene	17.02	1951	0.05	15.21*†	2157	[0.11]
para-Camphorene	17.38	1984	0.02	15.64	2201	0.04
Phytol	18.68	2113	0.01	19.05	2574	0.01
Total identified		96.68%			97.57%	
Total reported		98.24%			97.65%	

*: 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