

Date : April 02, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19C22-PTH11-1-SCC

Customer identification : Turmeric Organic CO2 - Indonesia - TK010785R

Type : CO2 extract

Source : *Curcuma longa*

Customer : Plant Therapy

ANALYSIS

Method: PC-PA-014-17J19 - 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

Analysis date : April 01, 2019

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Bright yellow viscous liquid

Refractive index: 1.5125 ± 0.0003 (20 °C)

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Acetic acid	0.03	0.03	Aliphatic acid
Toluene	0.01	0.01	Simple phenolic
2,3-Butanediol isomer I	0.05	0.08	Aliphatic alcohol
2,3-Butanediol isomer II	0.04	0.06	Aliphatic alcohol
Angelic acid	0.01	0.01	Aliphatic acid
α -Thujene	tr	tr	Monoterpene
α -Pinene	0.06	0.06	Monoterpene
Camphene	0.01	0.01	Monoterpene
β -Pinene	0.01*	0.01	Monoterpene
Sabinene	[0.01]*	tr	Monoterpene
6-Methyl-5-hepten-2-one	0.01	0.01	Aliphatic ketone
Myrcene	0.05	0.05	Monoterpene
α -Phellandrene	0.72	0.75	Monoterpene
Δ^3 -Carene	0.02	0.03	Monoterpene
α -Terpinene	0.02	0.02	Monoterpene
para-Cymene	0.50	0.53	Monoterpene
Limonene	0.75*	0.09	Monoterpene
1,8-Cineole	[0.75]*	0.68	Monoterpenic ether
γ -Terpinene	0.03	0.04	Monoterpene
Terpinolene	0.14	0.15	Monoterpene
Unknown	0.01		Oxygenated monoterpene
cis-para-Menth-2-en-1-ol	0.01	0.02	Monoterpenic alcohol
Camphor	0.05	0.05	Monoterpenic ketone
Borneol	0.01	0.06*	Monoterpenic alcohol
δ -Terpineol	0.01	0.01*	Monoterpenic alcohol
Terpinen-4-ol	0.04	0.04	Monoterpenic alcohol
4-Methylacetophenone	0.02	0.02	Simple phenolic
para-Cymen-8-ol	0.07	0.07	Monoterpenic alcohol
α -Terpineol	0.06	[0.06]*	Monoterpenic alcohol
α -Phellandrene epoxide	0.06	0.06	Monoterpenic ether
trans-Piperitol	0.01	0.02	Monoterpenic alcohol
Unknown	0.01	0.01	Oxygenated monoterpene
Carvotanacetone	0.01	[0.01]*	Monoterpenic ketone
Thymol	0.04	0.16	Monoterpenic alcohol
Carvacrol	0.03	0.76*	Monoterpenic alcohol
Unknown	0.08	0.18	Unknown
Unknown	0.04	0.07	Terpene derivative
Unknown	0.02	0.01	Terpene derivative
Unknown	0.03	0.17*	Terpene derivative
Unknown	0.09	0.08	Unknown
Unknown	0.02	0.03	Sesquiterpene
Acora-3,7(14)-diene	0.08*	0.02	Sesquiterpene
(Z?)-Vestitenone, or analog	[0.08]*	[0.17]*	Terpenic ketone
β -Caryophyllene	0.35*	0.40*	Sesquiterpene
(trans?)-6-Hydroxypiperitone	[0.35]*	0.14	Monoterpenic alcohol
(cis?)-6-Hydroxypiperitone	0.03*	0.02	Monoterpenic alcohol
Caryophylla-4(12),8(13)-diene	[0.03]*	0.01	Sesquiterpene
γ -Elemene	0.02	0.01	Sesquiterpene

<i>trans</i> - α -Bergamotene	0.03	[0.40]*	Sesquiterpene
(<i>E</i>)-Vestitenone	0.29*	0.07	Terpenic ketone
Unknown	[0.29]*		Unknown
α -Humulene	0.06	0.04	Sesquiterpene
β -Acoradiene	0.24*	0.34	Sesquiterpene
(<i>E</i>)- β -Farnesene	[0.24]*	0.14	Sesquiterpene
γ -Curcumene	0.11	0.09	Sesquiterpene
<i>trans</i> - β -Bergamotene	2.05*	0.04	Sesquiterpene
<i>ar</i> -Curcumene	[2.05]*	2.05	Sesquiterpene
α -Zingiberene	1.81	1.71	Sesquiterpene
Unknown	0.06	0.06	Sesquiterpene
β -Bisabolene	0.41	0.41	Sesquiterpene
β -Curcumene	0.65*	0.63	Sesquiterpene
Unknown	[0.65]*		Oxygenated sesquiterpene
Unknown	0.08	0.13*	Oxygenated sesquiterpene
β -Sesquiphellandrene	2.04	2.08*	Sesquiterpene
Selina-4(15),7(11)-diene	0.09	[2.08]*	Sesquiterpene
Selina-3,7(11)-diene	0.06	[2.08]*	Sesquiterpene
Germacrene B	0.18*	0.13	Sesquiterpene
Unknown	[0.18]*	0.02	Sesquiterpene
<i>cis</i> -Sesquisabinene hydrate	0.07	[0.13]*	Sesquiterpenic alcohol
Unknown	0.14	0.10	Oxygenated sesquiterpene
(<i>E</i>)-Nerolidol	0.14*	0.04	Sesquiterpenic alcohol
Unknown	[0.14]*		Unknown
Caryophyllene oxide	1.10*	0.08	Sesquiterpenic ether
Caryophyllene oxide isomer	[1.10]*	0.01	Sesquiterpenic ether
Unknown	[1.10]*	0.19	Oxygenated sesquiterpene
<i>ar</i> -Turmerol	[1.10]	[0.76]*	Sesquiterpenic alcohol
<i>trans</i> -Sesquisabinene hydrate	0.35*	0.25	Sesquiterpenic alcohol
Unknown	[0.35]*		Oxygenated sesquiterpene
<i>ar</i> -Dihydroturmerone	0.16	0.18	Sesquiterpenic ketone
Unknown	0.38	1.43	Oxygenated sesquiterpene
Unknown	0.33		Oxygenated sesquiterpene
<i>cis</i> -Zingiberenol	0.44	0.76	Sesquiterpenic alcohol
Unknown	0.59	0.50	Oxygenated sesquiterpene
<i>trans</i> -Zingiberenol	0.51	0.78	Sesquiterpenic alcohol
Unknown	0.96	0.50	Oxygenated sesquiterpene
Unknown	0.51	[0.63]	Oxygenated sesquiterpene
<i>ar</i> -Turmerone	44.56	24.05	Sesquiterpenic ketone
α -Turmerone	[44.56]	19.28	Sesquiterpenic ketone
Unknown	0.16	0.63	Oxygenated sesquiterpene
Unknown	0.80	0.68	Oxygenated sesquiterpene
Unknown	0.84	0.30	Oxygenated sesquiterpene
β -Turmerone	15.47	14.69	Sesquiterpenic ketone
Curcuphenol	0.29*	0.19	Sesquiterpenic alcohol
(<i>Z</i>)- α -Atlantone	[0.29]*	0.14	Sesquiterpenic ketone
(6 <i>S</i> ,7 <i>R</i>)-Bisabolone	0.85		Sesquiterpenic ketone
Unknown	0.14	0.13	Oxygenated sesquiterpene
Unknown	0.99		Unknown
Xanthorizzhol?	0.58	0.54	Sesquiterpenic alcohol
Unknown	1.06	1.15	Oxygenated sesquiterpene
Unknown	1.35		Oxygenated sesquiterpene

(E)- α -Atlantone	1.07	0.96	Sesquiterpenic ketone
Unknown	0.66	0.52	Oxygenated sesquiterpene
Unknown	0.41*		Oxygenated sesquiterpene
Unknown	[0.41]*		Oxygenated sesquiterpene
Unknown	1.43*		Unknown
Unknown	[1.43]*	0.70	Oxygenated sesquiterpene
Unknown	0.18	0.15	Oxygenated sesquiterpene
Unknown	0.14		Oxygenated sesquiterpene
Unknown	0.17		Oxygenated sesquiterpene
Unknown	0.15		Oxygenated sesquiterpene
Unknown	0.13	0.48	Oxygenated sesquiterpene
Unknown	1.00		Unknown
Unknown	0.01		Oxygenated sesquiterpene
Unknown	0.09		Oxygenated sesquiterpene
Unknown	0.56		Oxygenated sesquiterpene
Unknown	0.04		Oxygenated sesquiterpene
Unknown	0.39		Oxygenated sesquiterpene
Unknown	0.10	0.09	Oxygenated sesquiterpene
Unknown	0.11		Oxygenated sesquiterpene
Total identified	79.13%	74.46%	

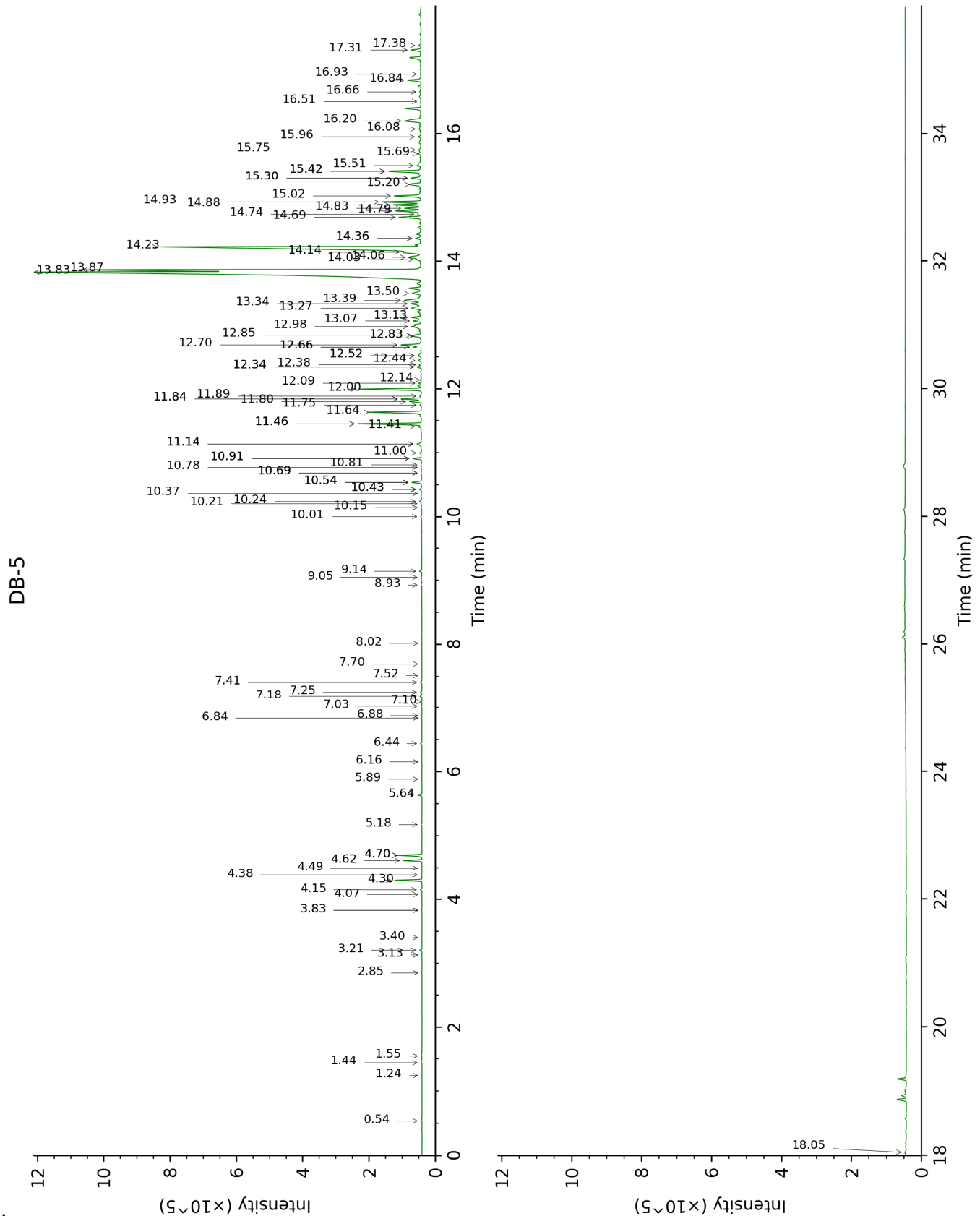
*: Two or more compounds are coeluting on this column

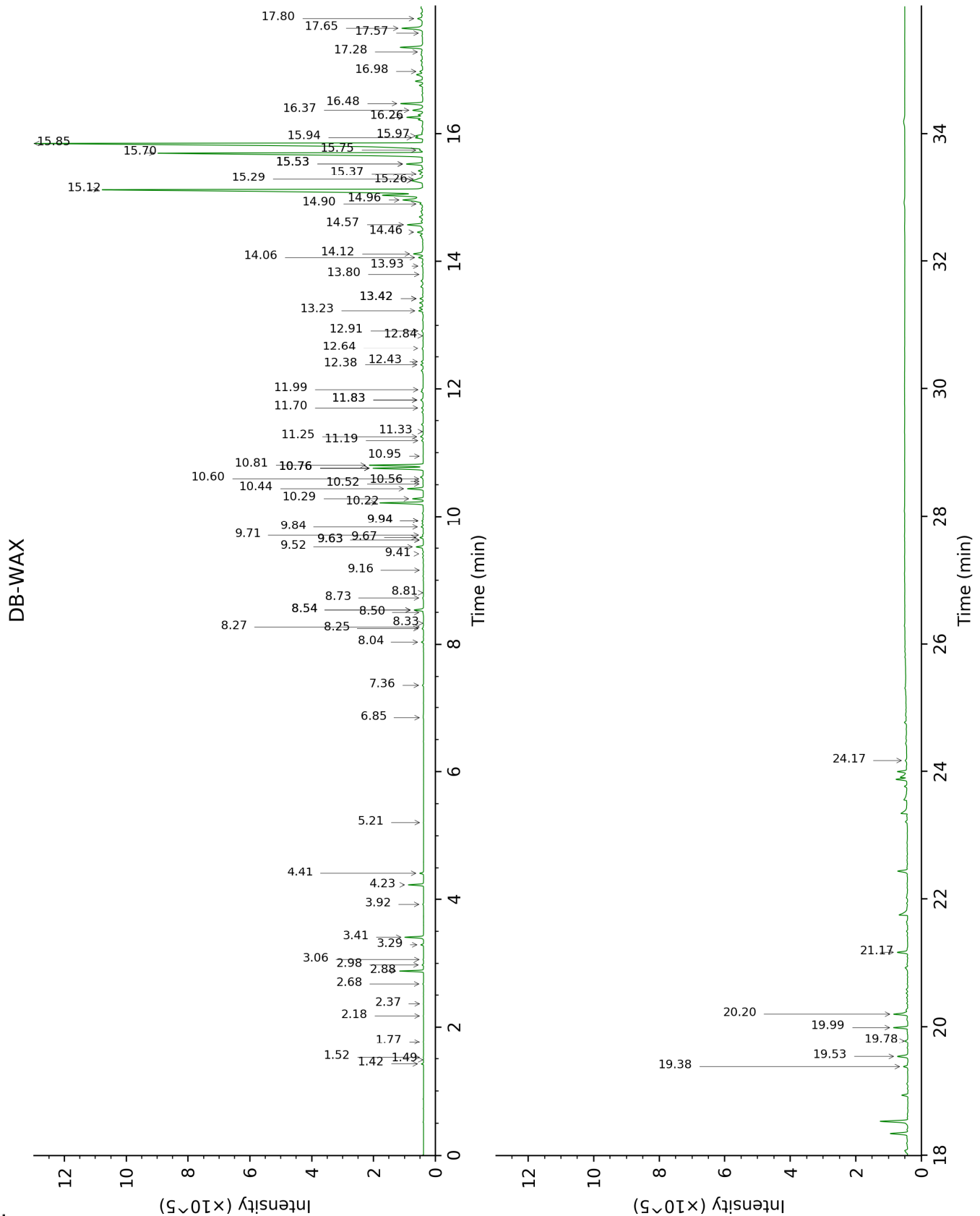
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Acetic acid	0.54	606	0.03	6.85	1416	0.03
Toluene	1.24	757	0.01	1.52	1002	0.01
2,3-Butanediol isomer I	1.44	784	0.05	8.04	1504	0.08
2,3-Butanediol isomer II	1.55	799	0.04	8.25	1520	0.06
Angelic acid	2.85	906	0.01	10.95	1737	0.01
α -Thujene	3.13	924	tr	1.49	998	tr
α -Pinene	3.21	929	0.06	1.42	992	0.06
Camphene	3.40	942	0.01	1.77	1026	0.01
β -Pinene	3.83*	970	0.01	2.18	1066	0.01
Sabinene	3.83*	970	[0.01]	2.37	1085	tr
6-Methyl-5-hepten-2-one	4.07	986	0.01	5.21	1298	0.01
Myrcene	4.15	992	0.05	2.98	1133	0.05
α -Phellandrene	4.30	1001	0.72	2.88	1126	0.75
Δ^3 -Carene	4.38	1007	0.02	2.68	1110	0.03
α -Terpinene	4.49	1014	0.02	3.06	1140	0.02
para-Cymene	4.62	1021	0.50	4.23	1227	0.53
Limonene	4.70*	1026	0.75	3.29	1158	0.09
1,8-Cineole	4.70*	1026	[0.75]	3.41	1167	0.68
γ -Terpinene	5.18	1057	0.03	3.92	1205	0.04
Terpinolene	5.64	1086	0.14	4.41	1240	0.15
Unknown [m/z 95, 150 (45), 110 (35), 107 (23), 109 (21)]	5.89	1102	0.01			
cis-para-Menth-2-en-1-ol	6.16	1119	0.01	8.27	1522	0.02
Camphor	6.44	1137	0.05	7.36	1454	0.05
Borneol	6.84	1163	0.01	9.94*	1653	0.06
δ -Terpineol	6.88	1166	0.01	9.63*	1628	0.01
Terpinen-4-ol	7.02	1175	0.04	8.73	1557	0.04
4-Methylacetophenone	7.10	1180	0.02	10.60	1707	0.02
para-Cymen-8-ol	7.18	1185	0.07	11.70	1801	0.07
α -Terpineol	7.25	1190	0.06	9.94*	1653	[0.06]
α -Phellandrene epoxide	7.41	1200	0.06	11.19	1757	0.06
trans-Piperitol	7.52	1207	0.01	10.56	1704	0.02
Unknown [m/z 43, 111 (88), 126 (74), 125 (61)... 168? (2)]	7.70	1219	0.01	11.33	1769	0.01
Carvotanacetone	8.02	1241	0.01	9.63*	1628	[0.01]
Thymol	8.93	1303	0.04	15.28	2134	0.16
Carvacrol	9.05	1307	0.03	15.53*	2158	0.76
Unknown [m/z 111, 126 (93), 43 (90), 71 (60)...]	9.14	1314	0.08	15.37	2143	0.18

Unknown [m/z 119, 161 (36), 43 (33), 176 (26), 91 (24), 105 (22)]	10.01	1375	0.04	12.64	1883	0.07
Unknown [m/z 119, 145 (75), 105 (40), 91 (38), 120 (26), 117 (18)... 178 (8)]	10.15	1385	0.02	13.80	1990	0.01
Unknown [m/z 43, 105 (50), 120 (40), 145 (36), 119 (33), 93 (30)... 176 (6)]	10.21	1389	0.03	11.83*	1812	0.17
Unknown [m/z 71, 100 (92), 111 (79), 69 (46), 109 (45)...]	10.24	1391	0.09	17.28	2341	0.08
Unknown [m/z 119, 93 (83), 91 (51), 77 (32), 41 (31)... 202 (16)]	10.37	1400	0.02	8.50	1540	0.03
Acora-3,7(14)-diene	10.43*	1405	0.08	8.33	1527	0.02
(Z?)-Vestitenone, or analog	10.43*	1405	[0.08]	11.83*	1812	[0.17]
β -Caryophyllene	10.54*	1413	0.35	8.54*	1542	0.40
(trans?)-6-Hydroxypiperitone	10.54*	1413	[0.35]	16.98	2308	0.14
(cis?)-6-Hydroxypiperitone	10.69*	1424	0.03	17.57	2373	0.02
Caryophylla-4(12),8(13)-diene	10.69*	1424	[0.03]	8.81	1563	0.01
γ -Elemene	10.78	1431	0.02	9.16	1590	0.01
trans- α -Bergamotene	10.81	1434	0.03	8.54*	1542	[0.40]
(E)-Vestitenone	10.91*	1441	0.29	12.42	1864	0.07
Unknown [m/z 91, 129 (98), 143 (94), 185 (81), 200 (76)...]	10.91*	1441	[0.29]			
α -Humulene	11.00	1447	0.06	9.41	1611	0.04
β -Acoradiene	11.14*	1458	0.24	9.52	1620	0.34
(E)- β -Farnesene	11.14*	1458	[0.24]	9.67	1631	0.14
γ -Curcumene	11.41	1478	0.11	9.84	1645	0.09
trans- β -Bergamotene	11.46*	1481	2.05	9.71	1634	0.04
ar-Curcumene	11.46*	1481	[2.05]	10.81	1725	2.05
α -Zingiberene	11.64	1495	1.81	10.22	1676	1.71
Unknown [m/z 119, 91 (14), 120 (10), 117 (9)... 200? (2)]	11.75	1503	0.06	11.99	1826	0.06
β -Bisabolene	11.80	1508	0.41	10.28	1681	0.41
β -Curcumene	11.84*	1511	0.65	10.44	1694	0.63
Unknown [m/z 93, 91 (62), 119 (57), 105 (44), 43 (43)... 220? (1)]	11.84*	1511	[0.65]			
Unknown [m/z 121, 93 (56), 91 (12), 94	11.89	1514	0.08	13.42*	1955	0.13

(11), 122 (10)...220]						
β - Sesquiphellandrene	12.00	1523	2.04	10.76*	1721	2.08
Selina-4(15),7(11)- diene	12.09	1530	0.09	10.76*	1721	[2.08]
Selina-3,7(11)-diene	12.14	1534	0.06	10.76*	1721	[2.08]
Germacrene B	12.34*	1550	0.18	11.25	1762	0.13
Unknown [m/z 91, 93 (82), 79 (79), 77 (68), 67 (55), 41 (49)... 202 (12)]	12.34*	1550	[0.18]	10.52	1700	0.02
<i>cis</i> -Sesquisabinene hydrate	12.38	1553	0.07	13.42*	1955	[0.13]
Unknown [m/z 138, 96 (100), 95 (85), 109 (74), 110 (60), 105 (57)... 220 (10)]	12.44	1558	0.14	12.38	1860	0.10
(<i>E</i>)-Nerolidol	12.52*	1564	0.14	13.93	2002	0.04
Unknown [m/z 109, 67 (30), 43 (24), 91 (19)...]	12.52*	1564	[0.14]			
Caryophyllene oxide	12.66*†	1575	1.10	12.92	1908	0.08
Caryophyllene oxide isomer	12.66*†	1575	[1.10]	12.84	1901	0.01
Unknown [m/z 105, 83 (65), 120 (41), 119 (35), 91 (29), 55 (22)... 218? (t)]	12.66*†	1575	[1.10]	13.23	1937	0.19
ar-Turmerol	12.70†	1578	[1.10]	15.53*	2158	[0.76]
<i>trans</i> -Sesquisabinene hydrate	12.83*	1589	0.35	14.46	2053	0.25
Unknown [m/z 43, 91 (63), 41 (61), 79 (58), 95 (49), 93 (47)... 202 (36)...]	12.83*	1589	[0.35]			
ar-Dihydroturmerone	12.85	1590	0.16	14.06	2015	0.18
Unknown [m/z 119, 132 (17), 91 (12), 120 (10), 117 (9)... 216? (2)]	12.98	1600	0.38	14.96	2101	1.43
Unknown [m/z 43, 93 (88), 91 (76), 79 (73), 69 (64), 41 (63), 95 (53).. 220 (3)]	13.07	1608	0.33			
<i>cis</i> -Zingiberenol	13.13	1612	0.44	14.57	2064	0.76
Unknown [m/z 119, 85 (92), 105 (37), 120 (36), 91 (28)... 218 (6)]	13.27	1624	0.59	16.37	2244	0.50
<i>trans</i> -Zingiberenol	13.34	1630	0.51	15.26	2132	0.78
Unknown [m/z 120, 91 (29), 43 (25), 93 (23), 77 (21)... 218 (1)]	13.39	1634	0.96	14.12	2020	0.50

Unknown [m/z 83, 109 (45), 43 (43), 55 (36), 41 (35)... 220 (3)]	13.50	1643	0.51	15.97†	2203	[0.63]
ar-Turmerone	13.83†	1671	44.56	15.85	2191	24.05
α-Turmerone	13.87†	1674	[44.56]	15.12	2117	19.28
Unknown [m/z 69, 41 (90), 123 (74), 122 (51)... 206 (14), 218 (2)]	14.03	1687	0.16	15.94†	2200	0.63
Unknown [m/z 137, 119 (70), 84 (69), 41 (68), 69 (53), 55 (45), 109 (38)... 222 (2)]	14.06	1690	0.80	16.26	2233	0.68
Unknown [m/z 199, 132 (99), 59 (25), 91 (20), 117 (19), 43 (14)... 216? (6)]	14.14	1696	0.84	17.80	2398	0.30
β-Turmerone	14.23	1703	15.47	15.70	2175	14.69
Curcuphenol	14.36*	1715	0.29	19.38	2576	0.19
(Z)-α-Atlantone	14.36*	1715	[0.29]	15.75	2180	0.14
(6S,7R)-Bisabolone	14.69	1743	0.85			
Unknown [m/z 120, 91 (22), 59 (20), 121 (19), 105 (15)... 218 (1)]	14.74	1747	0.14	14.90	2095	0.13
Unknown [m/z 83, 105 (81), 93 (74), 120 (71), 109 (65), 91 (58)...]	14.79	1752	0.99			
Xanthorizzhol?	14.83	1755	0.58	19.99	2650	0.54
Unknown [m/z 83, 55 (21), 43 (13), 41 (9), 91 (8)... 234? (1)]	14.88	1760	1.06	17.65	2381	1.15
Unknown [m/z 119, 83 (30), 91 (14), 120 (11), 114 (9)... 234 (1)]	14.93	1764	1.35			
(E)-α-Atlantone	15.02	1772	1.07	16.48	2255	0.96
Unknown [m/z 95, 136 (77), 83 (68), 125 (55), 109 (40), 110 (39)... 234 (7)]	15.20	1788	0.66	19.53	2595	0.52
Unknown [m/z 83, 93 (61), 55 (24), 94 (24), 43 (22), 91 (19)... 234? (1)]	15.30*	1796	0.41			
Unknown [m/z 83, 120 (39), 121 (38), 119 (30), 123 (29), 55 (19)...218 (5)]	15.30*	1796	[0.41]			
Unknown [m/z 83, 121 (74), 114 (74), 93 (40), 55 (20), 91	15.42*	1807	1.43			

(20)...						
Unknown [m/z 69, 43 (95), 41 (84), 109 (78), 95 (54), 93 (49)... 177 (36), 220 (2)...	15.42*	1807	[1.43]	20.20	2675	0.70
Unknown [m/z 83, 119 (56), 95 (53), 234 (32), 91 (30)]	15.51	1815	0.18	19.78	2625	0.15
Unknown [m/z 83, 136 (51), 43 (46), 109 (29), 55 (26), 119 (22)...234 (1)]	15.69	1832	0.14			
Unknown [m/z 83, 136 (36), 55 (26), 109 (21), 79 (17), 43 (16)... 232 (11)]	15.75	1837	0.17			
Unknown [m/z 83, 107 (37), 43 (32), 135 (30), 55 (27)...	15.96	1856	0.15			
Unknown [m/z 118, 83 (68), 55 (25), 117 (20), 43 (16)... 232 (1)]	16.08	1867	0.13	21.17	2795	0.48
Unknown [m/z 118, 83 (89), 135 (58), 117 (20), 55 (19), 136 (18)...	16.20	1878	1.00			
Unknown [m/z 83, 43 (14), 55 (14), 92 (7), 91 (7)... 232 (1)]	16.51	1906	0.01			
Unknown [m/z 83, 55 (15), 43 (14), 91 (8)... 232 (1)]	16.66	1920	0.09			
Unknown [m/z 83, 149 (24), 135 (24), 55 (24), 43 (13)... 232 (3)]	16.84	1938	0.56			
Unknown [m/z 83, 55 (18), 43 (14), 84 (6)... 232 (t)]	16.93	1946	0.04			
Unknown [m/z 83, 55 (22), 43 (22), 119 (19), 41 (10)...	17.31	1982	0.39			
Unknown [m/z 83, 43 (22), 55 (20), 98 (14), 119 (14)...	17.38	1989	0.10	24.17	3198	0.09
Unknown [m/z 83, 135 (32), 55 (26), 125 (18), 41 (13), 109 (12)... 248 (1)]	18.04	2054	0.11			
Total identified		79.13%			74.46%	
Total reported		91.19%			82.47%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified 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