

Date : July 13, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 20G10-PTH02


Customer identification : Cardamom - Guatemala - CA3106201R

Type : Essential oil

Source : *Elettaria cardamomum*

Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-014  - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.

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

Analysis date : July 13, 2020

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid

Refractive index: 1.4630 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 4733:2004 - OIL OF CARDAMOM - CENTRAL AMERICA

Compound	Min. %	Max. %	Observed %	Complies?
(E)-Nerolidol	0.5	1.0	0.8	Yes
α-Terpinyl acetate	35	45	39	Yes
α-Terpineol	tr	2.50	1.81	Yes
Terpinen-4-ol	0.8	1.5	0.8	Yes
Linalyl acetate	4	6	5	Yes
Linalool	3	6	4	Yes
1,8-Cineole	27	35	29	Yes
Limonene	2.0	3.0	2.4	Yes
Myrcene	tr	2.50	2.31	Yes
Sabinene	3	5	4	Yes
α-Pinene	1.0	2.0	1.5	Yes
Refractive index	1.4600	1.4670	1.4630	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
Isovaleral	0.02	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
2-Methylbutanol	0.01	Aliphatic alcohol
Hexanal	0.02	Aliphatic aldehyde
Isoamyl acetate	0.01	Aliphatic ester
α -Thujene	0.22	Monoterpene
α -Pinene	1.54	Monoterpene
Camphene	0.03	Monoterpene
α -Fenchene	0.02	Monoterpene
Sabinene	4.45	Monoterpene
β -Pinene	0.38	Monoterpene
6-Methyl-5-hepten-2-one	0.05	Aliphatic ketone
Methyl 2-hydroxy-3-methylvalerate	0.02	Aliphatic ester
Myrcene	2.31	Monoterpene
α -Phellandrene	0.01	Monoterpene
Octanal	0.13	Aliphatic aldehyde
Δ^3 -Carene	0.01	Monoterpene
α -Terpinene	0.20	Monoterpene
para-Cymene	0.09	Monoterpene
1,8-Cineole	29.18	Monoterpenic ether
Limonene	2.35	Monoterpene
(Z)- β -Ocimene	0.05	Monoterpene
(E)- β -Ocimene	0.08	Monoterpene
γ -Terpinene	0.39	Monoterpene
cis-Sabinene hydrate	0.46	Monoterpenic alcohol
Octanol	0.08	Aliphatic alcohol
Terpinolene	0.14	Monoterpene
6,7-Epoxymyrcene	0.03	Monoterpenic ether
trans-Sabinene hydrate	0.27	Monoterpenic alcohol
Linalool	3.68	Monoterpenic alcohol
(E)-4,8-Dimethylnona-1,3,7-triene	0.09	Terpene derivative
cis-para-Menth-2-en-1-ol	0.04	Monoterpenic alcohol
cis-Limonene oxide	0.01	Monoterpenic ether
trans-para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol
Borneol	0.02	Monoterpenic alcohol
δ -Terpineol	0.13	Monoterpenic alcohol
Terpinen-4-ol	0.83	Monoterpenic alcohol
para-Cymen-8-ol	0.03	Monoterpenic alcohol
α -Terpineol	1.81	Monoterpenic alcohol
γ -Terpineol	0.07	Monoterpenic alcohol
cis-Piperitol	0.03	Monoterpenic alcohol
trans-Piperitol	0.04	Monoterpenic alcohol
Octyl acetate	0.06	Aliphatic ester
cis-Sabinene hydrate acetate?	0.33	Monoterpenic ester
cis-Carveol	0.01	Monoterpenic alcohol

Neral	0.24	Monoterpenic aldehyde
Geraniol	1.20	Monoterpenic alcohol
Linalyl acetate	5.12	Monoterpenic ester
Geranial	0.34	Monoterpenic aldehyde
Bornyl acetate	0.02	Monoterpenic ester
Terpinen-4-yl acetate	0.04	Monoterpenic ester
Geranyl formate	0.01	Monoterpenic ester
δ-Terpinyl acetate	0.13	Monoterpenic ester
Methyl geranate	0.06	Monoterpenic ester
δ-Elemene	0.02	Sesquiterpene
α-Terpinyl acetate	38.87	Monoterpenic ester
Neryl acetate	0.03	Monoterpenic ester
α-Copaene	0.03	Sesquiterpene
Geranyl acetate	0.67	Monoterpenic ester
Dodecanyl acetate isomer?	0.05	Aliphatic ester
β-Elemene	0.01	Sesquiterpene
Dodecenal isomer	0.06	Aliphatic aldehyde
β-Caryophyllene	0.05	Sesquiterpene
α-Terpinyl propionate	0.10	Monoterpenic ester
α-Humulene	0.01	Sesquiterpene
Unknown	0.02	Sesquiterpene
Geranylacetone	0.02	Monoterpenic ketone
Germacrene D	0.08	Sesquiterpene
β-Selinene	0.18	Sesquiterpene
α-Selinene	0.06	Sesquiterpene
δ-Amorphene	0.03	Sesquiterpene
γ-Cadinene	0.12	Sesquiterpene
δ-Cadinene	0.02	Sesquiterpene
Germacrene B	0.08	Sesquiterpene
(E)-Nerolidol	0.85	Sesquiterpenic alcohol
(3E,7E)-4,8,12-Trimethyl-1,3,7,11-tridecatetraene	0.13	Terpene derivative
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.02	Oxygenated sesquiterpene
(2E,6Z)-Farnesal	0.03	Sesquiterpenic aldehyde
(2E,6E)-Farnesol	0.11	Sesquiterpenic alcohol
(2E,6E)-Farnesal	0.04	Sesquiterpenic aldehyde
(2E,6E)-Farnesyl acetate	0.03	Sesquiterpenic ester
Coronarín E	0.05	Diterpene
Consolidated total	98.71%	

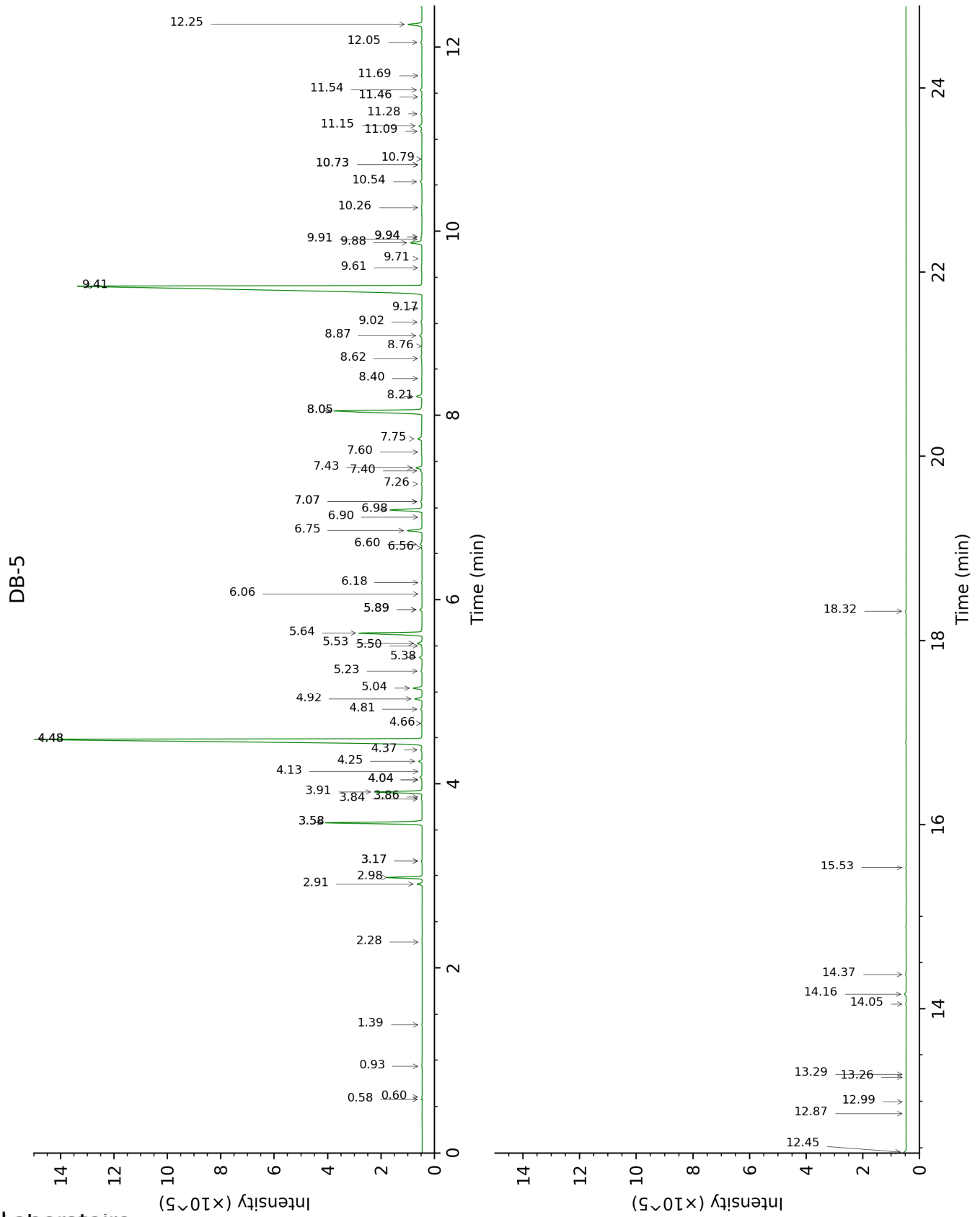
tr: The compound has been detected below 0.005% of total signal.

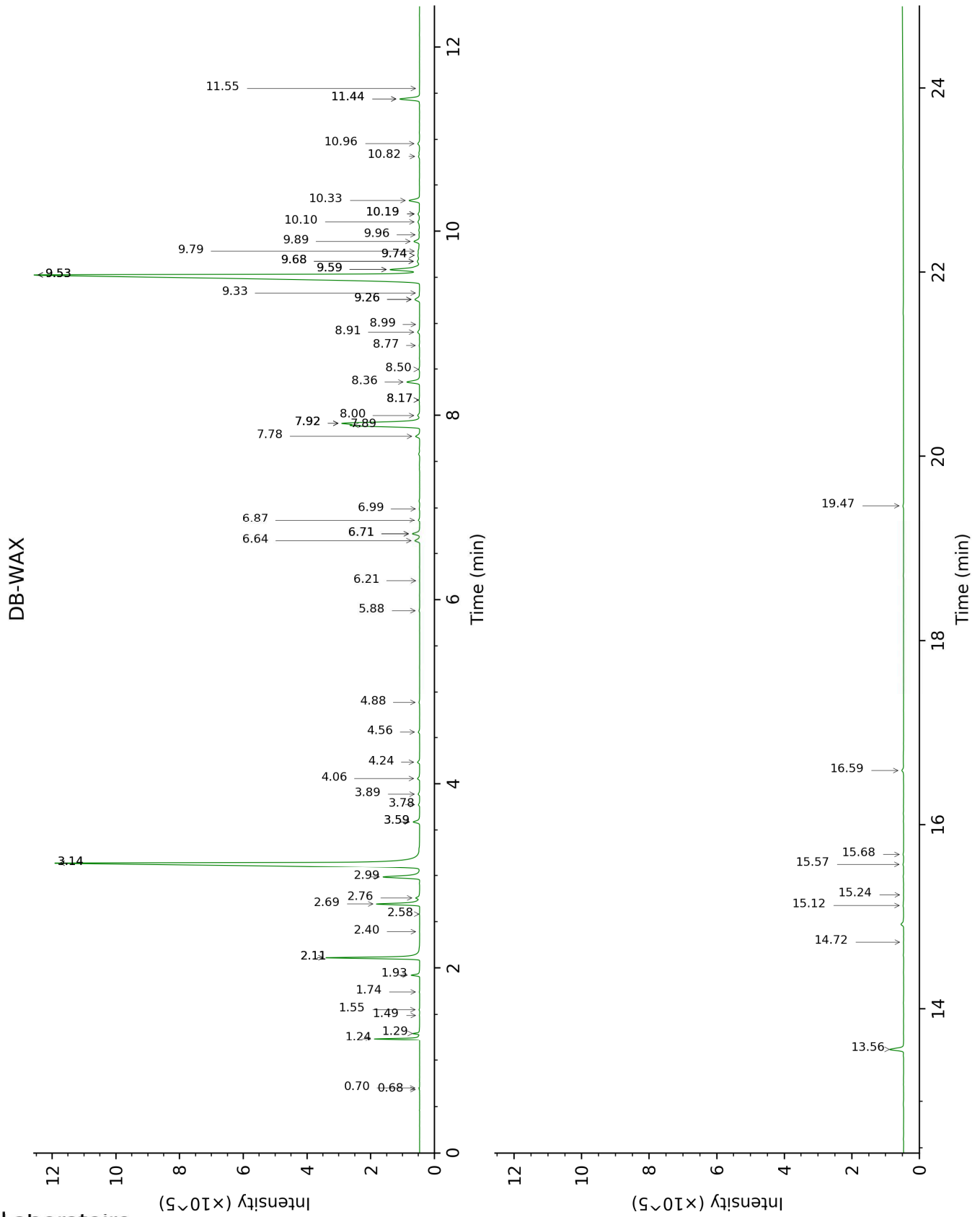
Note: no correction factor was applied

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	%
Isovaleral	0.58	639	0.02	0.70	883	0.02
2-Methylbutyral	0.60	651	0.01	0.68	876	0.01
2-Methylbutanol	0.93	740	0.01	3.14*	1168	29.19
Hexanal	1.39	804	0.02	1.74	1042	0.02
Isoamyl acetate	2.28	879	0.01	2.11*	1081	4.45
α -Thujene	2.91	926	0.22	1.29	995	0.25
α -Pinene	2.98	930	1.54	1.24	985	1.45
Camphene	3.17*	943	0.04	1.55	1022	0.03
α -Fenchene	3.17*	943	[0.04]	1.49	1016	0.02
Sabinene	3.58*	970	4.93	2.11*	1081	[4.45]
β -Pinene	3.58*	970	[4.93]	1.92	1062	0.38
6-Methyl-5-hepten-2-one	3.84	987	0.05	4.88	1294	0.05
Methyl 2-hydroxy-3-methylvalerate	3.86	988	0.02			
Myrcene	3.91	992	2.31	2.70	1132	2.18
α -Phellandrene	4.04*†	1000	0.15	2.58	1123	0.01
Octanal	4.04*†	1000	[0.15]	4.24	1252	0.13
Δ 3-Carene	4.14	1006	0.01	2.40	1108	tr
α -Terpinene	4.24	1013	0.20	2.76	1137	0.24
para-Cymene	4.37	1021	0.09	3.89	1226	0.09
1,8-Cineole	4.48*	1028	31.87	3.14*	1168	[29.19]
Limonene	4.48*	1028	[31.87]	2.99	1155	2.35
(Z)- β -Ocimene	4.66	1039	0.05	3.59*	1204	0.40
(E)- β -Ocimene	4.81	1048	0.08	3.78	1218	0.07
γ -Terpinene	4.92	1055	0.39	3.59*	1204	[0.40]
cis-Sabinene hydrate	5.04	1063	0.46	6.71*	1428	0.49
Octanol	5.23	1075	0.08	7.92*	1518	5.16
Terpinolene	5.38	1084	0.14	4.06	1238	0.14
6,7-Epoxy-myrcene	5.50	1092	0.03	5.88	1366	0.04
trans-Sabinene hydrate	5.53	1094	0.27	7.78	1507	0.28
Linalool	5.64	1101	3.68	7.89	1517	3.51
(E)-4,8-Dimethylnona-1,3,7-triene	5.89*	1117	0.12	4.56	1276	0.09
cis-para-Menth-2-en-1-ol	5.89*	1117	[0.12]	7.92*	1518	[5.16]
cis-Limonene oxide	6.06	1128	0.01	6.21	1390	0.01
trans-para-Menth-2-en-1-ol	6.18	1136	0.02	8.76	1584	0.04
Borneol	6.56	1160	0.02	9.59*	1650	2.11

δ -Terpineol	6.60	1163	0.13	9.26*	1624	0.37
Terpinen-4-ol	6.75	1172	0.83	8.36	1553	0.89
para-Cymen-8-ol	6.90	1182	0.03			
α -Terpineol	6.98	1188	1.81	9.59*	1650	[2.11]
γ -Terpineol	7.07*	1193	0.10	9.74*	1663	0.20
<i>cis</i> -Piperitol	7.07*	1193	[0.10]	9.33	1630	0.03
<i>trans</i> -Piperitol	7.26	1206	0.04	10.19*	1700	0.13
Octyl acetate	7.40	1216	0.06	6.86	1439	0.09
<i>cis</i> -Sabinene hydrate acetate?	7.44	1218	0.33	6.64	1422	0.32
<i>cis</i> -Carveol	7.60	1230	0.01	11.55	1816	0.01
Neral	7.75	1239	0.24	9.26*	1624	[0.37]
Geraniol	8.05*	1260	6.32	11.44*	1806	1.22
Linalyl acetate	8.05*	1260	[6.32]	7.92*	1518	[5.16]
Geranial	8.21	1271	0.34	9.89	1675	0.42
Bornyl acetate	8.40	1284	0.02	8.00	1525	0.15
Terpinen-4-yl acetate	8.62	1299	0.04	8.50	1564	0.06
Geranyl formate	8.76	1304	0.01	9.78	1667	0.18
δ -Terpinyl acetate	8.87	1312	0.13	8.91	1596	0.16
Methyl geranate	9.02	1323	0.06	9.53*	1646	38.35
δ -Elemene	9.17	1333	0.02	6.71*	1428	[0.49]
α -Terpinyl acetate	9.41	1350	38.87	9.53*	1646	[38.35]
Neryl acetate	9.60	1364	0.03	9.96	1681	0.05
α -Copaene	9.70	1372	0.03	6.99	1448	0.03
Geranyl acetate	9.88	1384	0.67	10.33	1712	0.70
Dodecenyl acetate isomer?	9.92	1386	0.05			
β -Elemene	9.94*	1388	0.07	8.17*	1538	0.06
Dodecenal isomer	9.94*	1388	[0.07]			
β -Caryophyllene	10.26	1411	0.05	8.17*	1538	[0.06]
α -Terpinyl propionate	10.54	1432	0.10			
α -Humulene	10.73*	1446	0.03	8.99	1602	0.01
Unknown [m/z 43, 109 (35), 96 (23), 93 (22), 137 (21), 81 (20)...204 (5)]	10.73*	1446	[0.03]			
Geranylacetone	10.79	1451	0.02	11.44*	1806	[1.22]
Germacrene D	11.09	1473	0.08	9.53*	1646	[38.35]
β -Selinene	11.15	1478	0.18	9.68*	1658	0.22
α -Selinene	11.28	1487	0.06	9.74*	1663	[0.20]
δ -Amorphene	11.46	1501	0.03	9.68*	1658	[0.22]

γ-Cadinene	11.54	1507	0.12	10.10	1692	0.18
δ-Cadinene	11.69	1519	0.02	10.19*	1700	[0.13]
Germacrene B	12.05	1547	0.08	10.82	1753	0.07
(E)-Nerolidol	12.25	1563	0.85	13.56	1998	0.86
(3E,7E)-4,8,12-Trimethyl-1,3,7,11-tridecatetraene	12.45	1579	0.13	10.96	1765	0.13
Unknown [m/z 81, 43 (52), 161 (49), 105 (30), 207 (27), 95 (26), 93 (24), 109 (24)...]	12.87	1612	0.01	14.72	2111	0.01
Unknown [m/z 43, 71 (53), 108 (47), 126 (41), 109 (35), 93 (25)...]	12.99	1622	0.01			
Unknown [m/z 43, 135 (59), 94 (33), 59 (25), 137 (25), 93 (19)...]	13.26	1644	0.01			
Unknown [m/z 43, 81 (84), 41 (64), 67 (62), 95 (58), 79 (58)... 204 (48), 220 (2)]	13.29	1647	0.02	15.24	2162	0.01
(2E,6Z)-Farnesal	14.05	1711	0.03	15.12	2150	0.03
(2E,6E)-Farnesol	14.16	1720	0.11	16.59	2301	0.13
(2E,6E)-Farnesal	14.37	1738	0.04	15.57	2195	0.04
(2E,6E)-Farnesyl acetate	15.53	1841	0.03	15.68	2206	0.03
Coronarín E	18.32	2107	0.05	19.47	2623	0.04
Total identified		99.10%			98.39%	
Total reported		99.16%			98.41%	

*: 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