

Date : 2023-11-27

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23K20-PTH03

Customer Identification : Cardamom - India - CA3110R

Type : Essential Oil

Source : *Elettaria cardamomum*

Customer : Plant Therapy

Checked and approved by:

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

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GAS CHROMATOGRAPHIC ANALYSIS

Method : PC-MAT-014 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID

✖ISO

Results : See analysis summary (next page)

Analyst : Sylvain Mercier, M. Sc., Chimiste 2014-005

Date : 2023-11-23

PHYSICOCHEMICAL DATA

Refractive index : 1.4638 ± 0.0003 (20 °C)

Method : PC-MAT-016 - Measure of the refractive index of a liquid.

Analyst : Cindy Caron B. Sc.

Date : 2023-11-22

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
Isobutyral	tr	Aliphatic aldehyde
Ethyl acetate	tr	Aliphatic ester
Isovaleral	0.03	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
Isoamyl alcohol	0.01	Aliphatic alcohol
2-Methylbutanol	0.01	Aliphatic alcohol
2-Butyl acetate	tr	Aliphatic ester
Hexanal	0.02	Aliphatic aldehyde
Isoamyl acetate	0.01	Aliphatic ester
2-Methylbutyl acetate	0.01	Aliphatic ester
Methyl 2-hydroxy-3-methylbutyrate	0.01	Aliphatic ester
Heptanal	0.01	Aliphatic aldehyde
α -Thujene	0.29	Monoterpene
α -Pinene	1.82	Monoterpene
α -Fenchene	0.01	Monoterpene
Camphene	0.03	Monoterpene
Sabinene	3.58	Monoterpene
β -Pinene	0.40	Monoterpene
6-Methyl-5-hepten-2-one	0.04	Aliphatic ketone
Methyl 2-hydroxy-3-methylvalerate	0.01	Aliphatic ester
Myrcene	2.30	Monoterpene
α -Phellandrene	0.03	Monoterpene
Octanal	0.10	Aliphatic aldehyde
Δ^3 -Carene	0.02	Monoterpene
α -Terpinene	0.48	Monoterpene
<i>para</i> -Cymene	0.20	Monoterpene
Limonene	3.11	Monoterpene
1,8-Cineole	33.63	Monoterpenic ether
(<i>Z</i>)- β -Ocimene	0.03	Monoterpene
(<i>E</i>)- β -Ocimene	0.07	Monoterpene
γ -Terpinene	0.83	Monoterpene
<i>cis</i> -Sabinene hydrate	0.27	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Octanol	0.04	Aliphatic alcohol
<i>trans</i> -Linalool oxide (fur.)	0.01	Monoterpenic alcohol
<i>para</i> -Cymenene	tr	Monoterpene
Terpinolene	0.34	Monoterpene
6,7-Epoxymyrcene	0.01	Monoterpenic ether
<i>trans</i> -Sabinene hydrate	0.19	Monoterpenic alcohol
Linalool	0.80	Monoterpenic alcohol

(E)-4,8-Dimethylnona-1,3,7-triene	0.16	Terpene derivative
<i>cis-para</i> -Menth-2-en-1-ol	0.09	Monoterpenic alcohol
<i>trans-para</i> -Menth-2-en-1-ol	0.05	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Borneol	0.03	Monoterpenic alcohol
δ -Terpineol	0.07	Monoterpenic alcohol
Terpinen-4-ol	1.51	Monoterpenic alcohol
<i>para</i> -Cymen-8-ol	0.01	Monoterpenic alcohol
α -Terpineol	1.27	Monoterpenic alcohol
<i>cis</i> -Piperitol	0.08	Monoterpenic alcohol
Decanal	0.07	Aliphatic aldehyde
Octyl acetate	0.10	Aliphatic ester
<i>cis</i> -Carveol	0.02	Monoterpenic alcohol
Neral	0.15	Monoterpenic aldehyde
Geraniol	0.77	Monoterpenic alcohol
Linalyl acetate	1.17	Monoterpenic ester
(2E)-Decenal	0.07	Aliphatic aldehyde
Geranial	0.21	Monoterpenic aldehyde
Bornyl acetate	0.04	Monoterpenic ester
2-Undecanone	0.02	Aliphatic ketone
Terpinen-4-yl acetate	0.02	Monoterpenic ester
Geranyl formate	0.01	Monoterpenic ester
δ -Terpinyl acetate	0.18	Monoterpenic ester
Methyl geranate	0.18	Monoterpenic ester
δ -Elemene	0.02	Sesquiterpene
α -Terpinyl acetate	40.33	Monoterpenic ester
Neryl acetate	0.03	Monoterpenic ester
α -Copaene	0.05	Sesquiterpene
β -Cubebene	0.05	Sesquiterpene
Geranyl acetate	0.89	Monoterpenic ester
Dodecenylyl acetate isomer?	0.08	Aliphatic ester
β -Elemene	0.17	Sesquiterpene
β -Caryophyllene	0.03	Sesquiterpene
α -Terpinyl propionate	0.09	Monoterpenic ester
Unknown	0.01	Sesquiterpene
α -Humulene	0.01	Sesquiterpene
Geranylacetone	0.01	Monoterpenic ketone
8-Acetoxy- <i>trans-para</i> -Menth-2-en-1-ol [2-(4-Hydroxy-4-methylcyclohex-2-enyl)propan-2-yl acetate]	0.02	Monoterpenic ester
Germacrene D	0.04	Sesquiterpene
Geranyl propionate	0.03	Monoterpenic ester
β -Selinene	0.54	Sesquiterpene
α -Selinene	0.19	Sesquiterpene
δ -Amorphene	0.03	Sesquiterpene

γ -Cadinene	0.13	Sesquiterpene
Cubebol	tr	Sesquiterpenic alcohol
δ -Cadinene	0.04	Sesquiterpene
Germacrene B	0.07	Sesquiterpene
(E)-Nerolidol	0.65	Sesquiterpenic alcohol
(3E,7E)-4,8,12-Trimethyl-1,3,7,11-tridecatetraene	0.08	Terpene derivative
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.01	Unknown
Unknown	0.02	Unknown
Unknown	0.01	Oxygenated sesquiterpene
(2E,6Z)-Farnesal	0.03	Sesquiterpenic aldehyde
(2E,6E)-Farnesol	0.07	Sesquiterpenic alcohol
(2E,6E)-Farnesal	0.03	Sesquiterpenic aldehyde
(2E,6E)-Farnesyl acetate	0.03	Sesquiterpenic ester
<i>meta</i> -Camphorene	0.01	Diterpene
(E,E)-Geranylinalool	0.01	Diterpenic alcohol
Coronarin E	0.03	Diterpene
Tricosane	0.01	Alkane
Consolidated total	98.94	

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

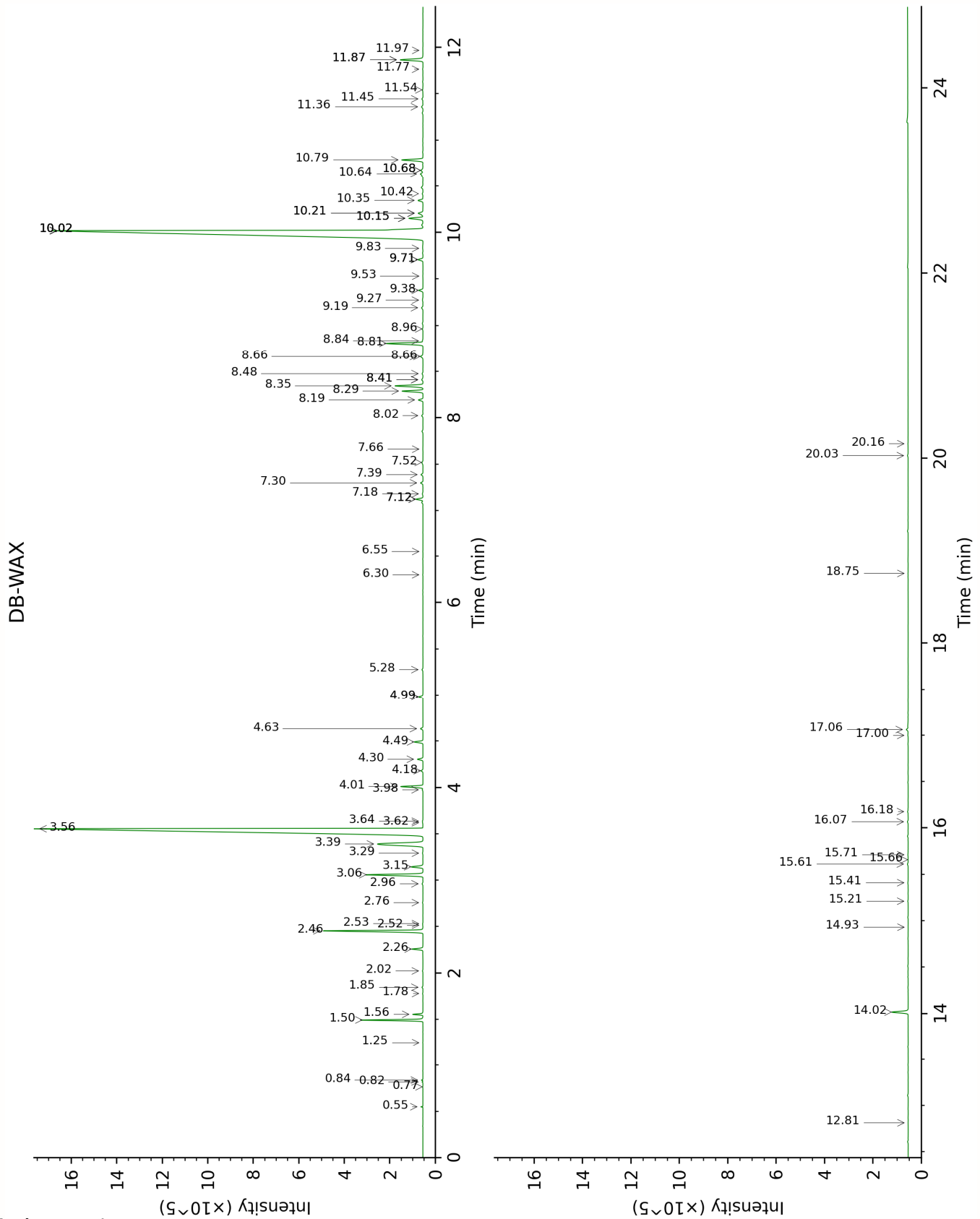
Note: no correction factor was applied

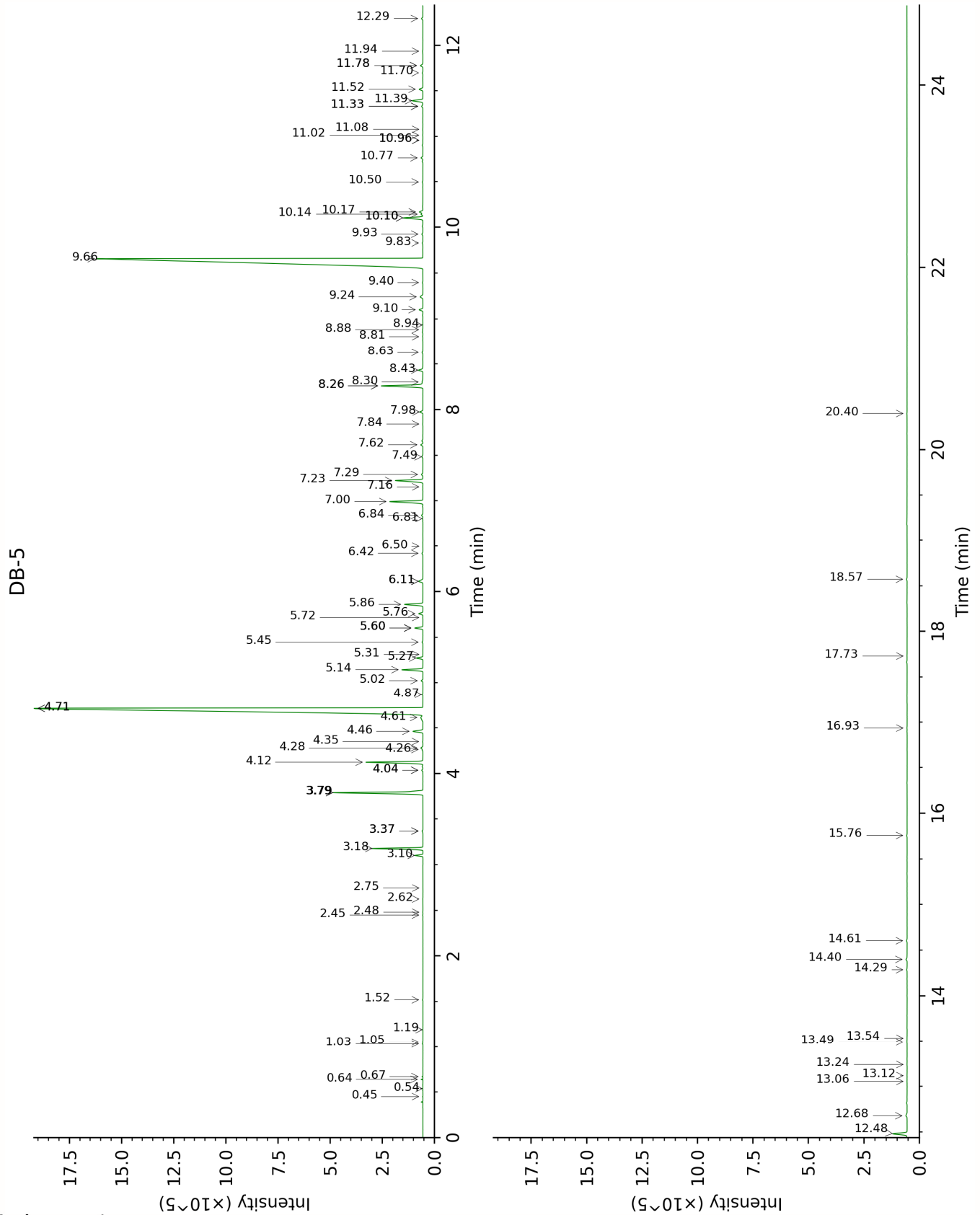
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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.

Bracketed value ([xx]): A bracketed percent value indicate that two or more compound percentage could not be solved due to coelution.

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





FULL ANALYSIS DATA

Isobutyral	Column DB-WAX			Column DB-5		
	0.55	777.0	0.03	0.45	537.7	tr
Ethyl acetate	0.77	861.6	tr	0.54	607.8	tr
Isovaleral	0.84	886.1	0.03	0.64	641.9	0.03
2-Methylbutyral	0.82	879.4	0.01	0.67	651.9	0.01
Isoamyl alcohol	3.62	1175.5	0.01	1.03	733.5	0.01
2-Methylbutanol	3.64	1176.7	0.02	1.06	736.5	0.01
2-Butyl acetate	1.25	955.1	tr	1.19	755.5	tr
Hexanal	2.02	1044.2	0.01	1.52	800.4	0.02
Isoamyl acetate	2.53	1092.3	0.01	2.45	878.5	0.01
2-Methylbutyl acetate	2.52	1090.6	0.01	2.48	881.1	0.01
Methyl 2-hydroxy-3-methylbutyrate				2.62	892.9	0.01
Heptanal	3.29	1150.7	0.02	2.75	902.7	0.01
α -Thujene	1.56	1000.2	0.28	3.10	926.7	0.29
α -Pinene	1.50	992.2	1.81	3.18	931.7	1.82
α -Fenchene	1.78	1021.3	0.01	3.37*	944.2	[0.04]
Camphene	1.85	1027.7	0.03	3.37*	944.2	[0.04]
Sabinene	2.46	1085.0	3.58	3.79*	971.9	[3.99]
β -Pinene	2.26	1066.5	0.40	3.79*	971.9	[3.99]
6-Methyl-5-hepten-2-one	5.28	1293.9	0.04	4.04*	987.9	[0.05]
Methyl 2-hydroxy-3-methylvalerate	7.66	1468.4	0.01	4.04*	987.9	[0.05]
Myrcene	3.06	1133.2	2.22	4.12	993.7	2.30
α -Phellandrene	2.96	1125.7	0.04	4.26	1002.9	0.03
Octanal	4.64	1248.5	0.10	4.28	1004.0	0.10
Δ^3 -Carene	2.76	1110.4	0.02	4.35	1008.4	0.02
α -Terpinene	3.15	1139.6	0.47	4.46	1015.4	0.48
<i>para</i> -Cymene	4.30	1225.2	0.21	4.61	1024.9	0.20
Limonene	3.39	1158.1	3.11	4.71*	1031.1	[36.96]
1,8-Cineole	3.56	1170.5	33.63	4.71*	1031.1	[36.96]
(Z)- β -Ocimene	3.98	1201.9	0.03	4.87	1040.8	0.03
(E)- β -Ocimene	4.18	1216.4	0.07	5.02	1050.4	0.07
γ -Terpinene	4.01	1204.4	0.83	5.14	1058.0	0.83
<i>cis</i> -Sabinene hydrate	7.12*	1428.8	[0.28]	5.27	1066.0	0.27
Unknown PIMA I [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26),	4.98*	1273.2	[0.17]	5.31	1068.4	0.01

91 (20), 152 (18)]						
Octanol	8.41*	1524.4	[0.06]	5.45	1076.8	0.04
<i>trans</i> -Linalool oxide (fur.)	7.12*	1428.8	[0.28]	5.60*	1086.5	[0.34]
<i>para</i> -Cymenene	6.55	1387.3	tr	5.60*	1086.5	[0.34]
Terpinolene	4.49	1238.3	0.34	5.60*	1086.5	[0.34]
6,7- Epoxymyrcene	6.30	1369.5	0.01	5.72	1093.6	0.01
<i>trans</i> -Sabinene hydrate	8.19	1507.8	0.19	5.76	1096.3	0.19
Linalool	8.29	1515.1	0.79	5.86	1102.6	0.80
(<i>E</i>)-4,8- Dimethylnona- 1,3,7-triene	4.98*	1273.2	[0.17]	6.11*	1118.7	[0.25]
<i>cis-para</i> -Menth- 2-en-1-ol	8.41*	1524.4	[0.06]	6.11*	1118.7	[0.25]
<i>trans-para</i> - Menth-2-en-1-ol	9.19	1584.3	0.07	6.42	1138.2	0.05
Unknown PLOR I [m/z 109, 43 (73), 71 (54), 124 (51), 69 (37), 41 (35)...152 (5)]				6.50	1143.2	0.01
Borneol	10.02*	1650.2	[41.58]	6.81	1162.8	0.03
δ -Terpineol	9.71*	1625.2	[0.21]	6.84	1165.1	0.07
Terpinen-4-ol	8.81	1554.9	1.51	7.00	1174.8	1.51
<i>para</i> -Cymen-8- ol	11.76	1794.8	0.01	7.16	1185.0	0.01
α -Terpineol	10.02*	1650.2	[41.58]	7.23	1189.5	1.27
<i>cis</i> -Piperitol	9.83	1634.9	0.04	7.29	1193.6	0.08
Decanal	7.52	1457.9	0.06	7.48	1206.0	0.07
Octyl acetate	7.30	1441.7	0.09	7.62	1214.8	0.10
<i>cis</i> -Carveol	11.97	1812.7	0.01	7.84	1230.0	0.02
Neral	9.71*	1625.2	[0.21]	7.98	1238.8	0.15
Geraniol	11.87*	1803.8	[0.97]	8.26*	1257.9	[1.95]
Linalyl acetate	8.34	1519.4	1.17	8.26*	1257.9	[1.95]
(<i>2E</i>)-Decenal	9.27	1590.5	0.03	8.30	1260.7	0.07
Geranial	10.34	1676.3	0.21	8.43	1269.3	0.21
Bornyl acetate	8.48	1529.5	0.04	8.63	1282.4	0.04
2-Undecanone	8.84	1557.0	0.02	8.81	1294.2	0.02
Terpinen-4-yl acetate	8.96	1566.9	0.03	8.88	1299.3	0.02
Geranyl formate	10.15*	1660.8	[0.60]	8.94	1302.8	0.01
δ -Terpinyl acetate	9.38	1598.8	0.18	9.10	1314.4	0.18

Methyl geranate	10.02*	1650.2	[41.58]	9.24	1324.3	0.18
δ-Elemene	7.18	1433.0	0.03	9.40	1335.2	0.02
α-Terpinyl acetate	10.02*	1650.2	[41.58]	9.66	1353.5	40.33
Neryl acetate	10.42	1682.0	0.03	9.83	1365.6	0.03
α-Copaene	7.39	1448.3	0.08	9.93	1372.4	0.05
β-Cubebene	8.02	1494.9	0.05	10.10*	1384.9	[0.88]
Geranyl acetate	10.79	1712.7	0.89	10.10*	1384.9	[0.88]
Dodecenyl acetate isomer?				10.14	1387.7	0.08
β-Elemene	8.66*	1543.7	[0.13]	10.17	1389.5	0.17
β-Caryophyllene	8.66*	1543.7	[0.13]	10.50	1412.9	0.03
α-Terpinyl propionate	10.68*	1703.2	[0.11]	10.77	1433.1	0.09
Unknown ELCA I [m/z 43, 109 (35), 96 (23), 93 (22), 137 (21), 81 (20)...204 (5)]				10.96*	1447.4	[0.02]
α-Humulene	9.53	1611.0	0.01	10.96*	1447.4	[0.02]
Geranylacetone	11.87*	1803.8	[0.97]	11.02	1451.5	0.01
8-Acetoxy-trans-para-Menth-2-en-1-ol [2-(4-Hydroxy-4-methylcyclohex-2-enyl)propan-2-yl acetate]	15.41	2132.5	0.02	11.08	1456.3	0.02
Germacrene D	10.02*	1650.2	[41.58]	11.33*	1475.0	[0.07]
Geranyl propionate	11.54	1776.0	0.03	11.33*	1475.0	[0.07]
β-Selinene	10.15*	1660.8	[0.60]	11.39	1479.7	0.54
α-Selinene	10.21*	1665.2	[0.25]	11.52	1488.9	0.19
δ-Amorphene	10.21*	1665.2	[0.25]	11.70	1502.2	0.03
γ-Cadinene	10.64	1699.9	0.13	11.78*	1508.4	[0.13]
Cubebol	12.81	1887.0	tr	11.78*	1508.4	[0.13]
δ-Cadinene	10.68*	1703.2	[0.11]	11.94	1520.7	0.04
Germacrene B	11.36	1760.7	0.07	12.29	1548.7	0.07
(E)-Nerolidol	14.02	1997.4	0.69	12.48	1563.6	0.65
(3E,7E)-4,8,12-Trimethyl-1,3,7,11-tridecatetraene	11.44	1767.8	0.05	12.68	1579.0	0.08
Unknown MECA V [m/z 179, 161]	14.93	2084.9	0.01	13.06	1608.7	0.01

(66), 119 (44), 95 (38), 105 (35)... 204 (24), 222 (1)] Unknown SWGL V [m/z 81, 43 (52), 161 (49), 105 (30), 207 (27), 95 (26), 93 (24), 109 (24)...]	15.21	2112.7	0.02	13.12	1613.9	0.01
Unknown ELCA II [m/z 43, 71 (53), 108 (47), 126 (41), 109 (35), 93 (25)...]	20.16	2653.4	0.01	13.24	1624.0	0.01
Unknown ELCA III [m/z 43, 135 (59), 94 (33), 59 (25), 137 (25), 93 (19)...]				13.49	1644.6	0.02
Unknown JUVI XVI [m/z 43, 81 (84), 41 (64), 67 (62), 95 (58), 79 (58)... 204 (48), 220 (2)]	15.71	2162.6	0.02	13.54	1648.2	0.01
(2E,6Z)-Farnesal	15.61	2152.7	0.04	14.29	1710.5	0.03
(2E,6E)-Farnesol	17.06	2302.2	0.09	14.40	1720.4	0.07
(2E,6E)-Farnesal	16.07	2198.6	0.04	14.60	1738.0	0.03
(2E,6E)-Farnesyl acetate	16.18	2209.9	0.03	15.76	1839.6	0.03
<i>meta</i> - Camphorene	15.66	2157.3	0.01	16.94	1948.5	0.01
(<i>E,E</i>)- Geranyllinalool	18.75	2488.1	0.01	17.73	2025.1	0.01
Coronarín E	20.03	2638.0	0.03	18.57	2108.6	0.03
Tricosane	17.00	2295.4	0.02	20.40	2301.4	0.01
Total reported		98.62%			99.09%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, only the first one is 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