

Date : 2023-08-08

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23G20-NPA01

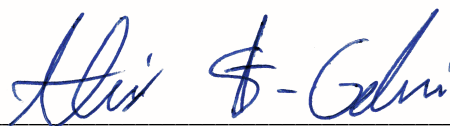
Customer Identification : Lime - Citrus aurantifolia - Italy - NPS00084 - Lot # NP0021

Type : Essential Oil

Source : Citrus aurantifolia

Customer : Nature Packaged

Checked and approved by:



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

Notes: This report is digitally signed, it is only considered valid if the digital signature is intact. The results only describe the samples that were submitted to the assays.

This report is an update from the first version issued on 2023-08-03 to format it for online publication.



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 : 2023-08-01

PHYSICOCHEMICAL DATA

Refractive index : 1.4772 ± 0.0003 (20 °C)

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

Analyst : Cindy Caron B. Sc.

Date : 2023-07-20

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
2-Methyl-3-buten-2-ol	tr	Aliphatic alcohol
Nonane	tr	Alkane
Tricyclene	0.01	Monoterpene
α -Thujene	0.37	Monoterpene
α -Pinene	1.77	Monoterpene
α -Fenchene	0.01	Monoterpene
Camphene	0.06	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
Sabinene	1.54	Monoterpene
β -Pinene	12.62	Monoterpene
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
<i>trans</i> -Dehydroxylinool oxide	0.01	Monoterpenic ether
Myrcene	1.36	Monoterpene
α -Phellandrene	0.04	Monoterpene
Pseudolimonene	0.01	Monoterpene
Octanal	0.04	Aliphatic aldehyde
Δ^3 -Carene	0.02	Monoterpene
α -Terpinene	0.16	Monoterpene
<i>para</i> -Cymene	0.86	Monoterpene
Limonene	60.32	Monoterpene
(<i>Z</i>)- β -Ocimene	0.04	Monoterpene
(<i>E</i>)- β -Ocimene	0.09	Monoterpene
γ -Terpinene	9.83	Monoterpene
<i>cis</i> -Sabinene hydrate	0.02	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
Octanol	0.01	Aliphatic alcohol
Terpinolene	0.35	Monoterpene
<i>para</i> -Cymenene	0.01	Monoterpene
<i>trans</i> -Sabinene hydrate	0.02	Monoterpenic alcohol
Linalool	0.09	Monoterpenic alcohol
Nonanal	0.02	Aliphatic aldehyde
endo-Fenchol	tr	Monoterpenic alcohol
<i>trans-para</i> -Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol
4-Hydroxy-4-methylcyclohex-2-enone	0.01	Aliphatic alcohol
<i>cis</i> -Limonene oxide	0.06	Monoterpenic ether
1-Terpineol	0.03	Monoterpenic alcohol
<i>trans</i> -Limonene oxide	0.06	Monoterpenic ether
Epoxyterpinolene	0.03	Monoterpenic ether
Citronellal	0.02	Monoterpenic aldehyde
Pinocarvone	0.01	Monoterpenic ketone

Isoneral	0.01	Monoterpenic aldehyde
Borneol	0.03	Monoterpenic alcohol
Terpinen-4-ol	0.08	Monoterpenic alcohol
<i>para</i> -Cymen-8-ol	0.01	Monoterpenic alcohol
α -Terpineol	0.13	Monoterpenic alcohol
Decanal	0.03	Aliphatic aldehyde
<i>trans</i> -Carveol	0.02	Monoterpenic alcohol
2,3-Epoxyneral?	0.02	Monoterpenic aldehyde
Nerol	0.06	Monoterpenic alcohol
2,3-Epoxygeranial?	0.03	Monoterpenic aldehyde
Neral	1.50	Monoterpenic aldehyde
Geraniol	0.04	Monoterpenic alcohol
Geranial	2.41	Monoterpenic aldehyde
Unknown	0.02	Oxygenated monoterpene
<i>cis</i> -Ascaridole glycol	0.01	Monoterpenic alcohol
Unknown	0.01	Unknown
Undecanal	0.01	Aliphatic aldehyde
Unknown	0.01	Monoterpenic alcohol
δ -Elemene	0.03	Sesquiterpene
Unknown	0.05	Unknown
Citronellyl acetate	0.02	Monoterpenic ester
Neryl acetate	0.57	Monoterpenic ester
Geranyl acetate	0.27	Monoterpenic ester
β -Elemene	0.05	Sesquiterpene
Dodecanal	0.02	Aliphatic aldehyde
β -Caryophyllene	0.27	Sesquiterpene
<i>cis</i> - α -Bergamotene	0.03	Sesquiterpene
α -Santalene	0.01	Sesquiterpene
γ -Elemene	0.01	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.51	Sesquiterpene
α -Humulene	0.03	Sesquiterpene
β -Santalene	0.01	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.07	Sesquiterpene
Germacrene D	0.03	Sesquiterpene
β -Selinene	0.02	Sesquiterpene
<i>trans</i> - β -Bergamotene	0.04	Sesquiterpene
α -Selinene	tr	Sesquiterpene
Bicyclogermacrene	0.02	Sesquiterpene
(<i>Z</i>)- α -Bisabolene	0.07	Sesquiterpene
(3 <i>E</i> ,6 <i>E</i>)- α -Farnesene	0.10	Sesquiterpene
γ -Cadinene	0.02	Sesquiterpene
β -Bisabolene	0.82	Sesquiterpene
(<i>Z</i>)- γ -Bisabolene	0.02	Sesquiterpene
δ -Cadinene	0.01	Sesquiterpene
Selina-4(15),7(11)-diene	0.01	Sesquiterpene

(E)- α -Bisabolene	0.03	Sesquiterpene
Germacrene B	0.06	Sesquiterpene
Caryophyllene oxide	0.03	Sesquiterpenic ether
Tetradecanal	0.02	Aliphatic aldehyde
Alismol	0.03	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.03	Sesquiterpenic alcohol
Unknown	0.05	Oxygenated sesquiterpene
α -Bisabolol	0.05	Sesquiterpenic alcohol
Herniarin	0.01	Coumarin
Myristic acid	0.01	Aliphatic acid
<i>meta</i> -Camphorene	0.01	Diterpene
Citropten	0.09	Furanocoumarin
Palmitic acid	0.04	Aliphatic acid
Bergapten	0.04	Furanocoumarin
Linoleic acid	0.02	Aliphatic acid
Oleic acid	0.01	Aliphatic acid
<i>cis</i> -Vaccenic acid?	0.01	Aliphatic acid
Stearic acid	0.04	Aliphatic acid
Isopimpinellin	0.03	Furanocoumarin
Tricosane	0.01	Alkane
Consolidated total	98.09	

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

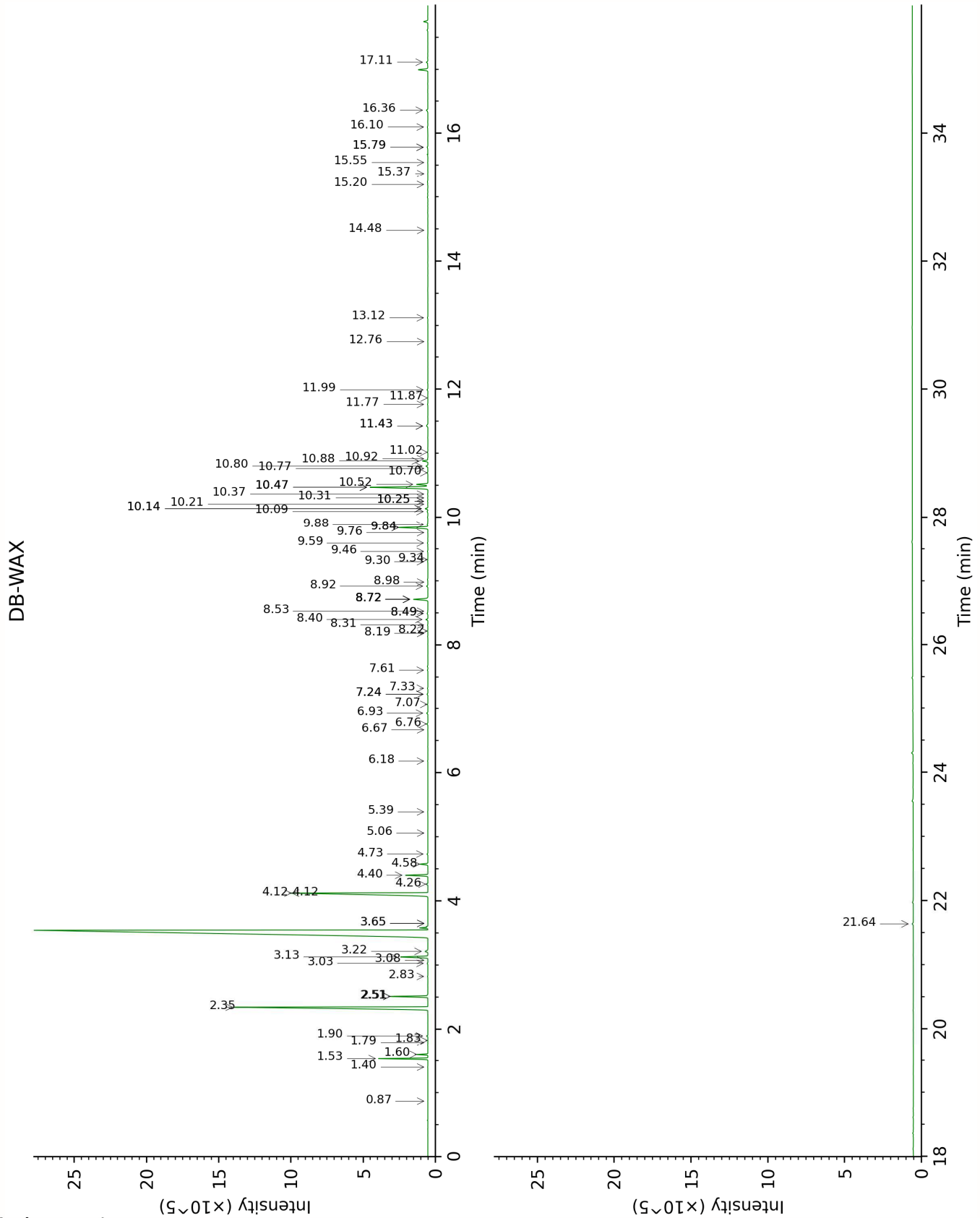
Note: no correction factor was applied

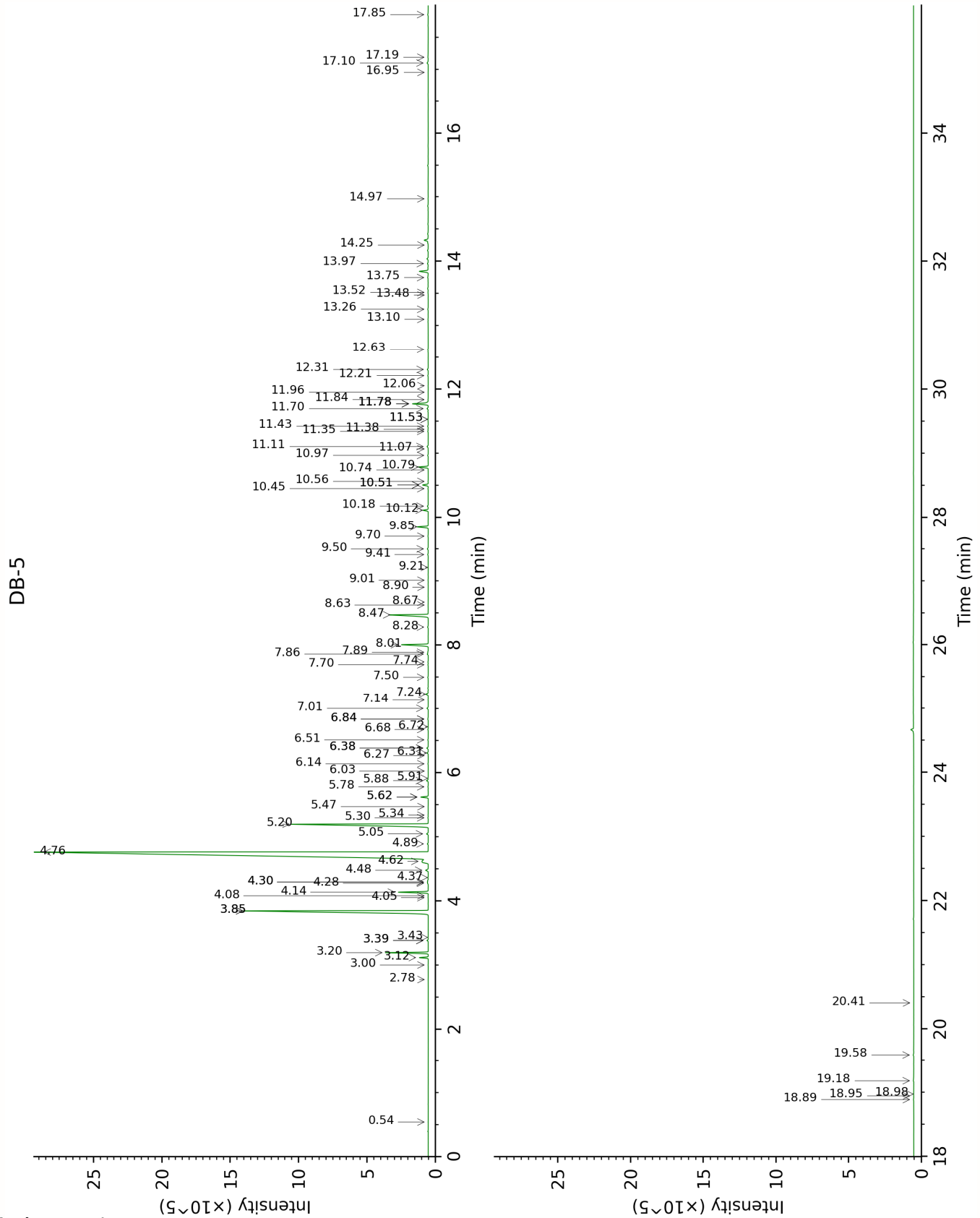
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

2-Methyl-3-buten-2-ol	Column DB-WAX			Column DB-5		
	1.79	1015.5	tr	0.54	606.7	tr
Nonane	0.87	888.7	tr	2.78	903.8	tr
Tricyclene	1.40	970.7	0.01	3.00	918.7	0.01
α -Thujene	1.60	997.0	0.37	3.12	926.3	0.37
α -Pinene	1.53	990.7	1.77	3.20	931.4	1.77
α -Fenchene	1.83	1018.7	0.01	3.39*	943.9	[0.06]
Camphene	1.90	1025.4	0.06	3.39*	943.9	[0.06]
Thuja-2,4(10)-diene	2.51*	1084.3	[1.57]	3.43	947.1	0.01
Sabinene	2.51*	1084.3	[1.57]	3.85*	974.2	[14.16]
β -Pinene	2.35	1068.2	12.62	3.85*	974.2	[14.16]
6-Methyl-5-hepten-2-one	5.39	1296.2	0.01	4.05	987.7	0.01
<i>trans</i> -Dehydroxylinalool oxide	3.65*	1173.5	[tr]	4.08	989.7	0.01
Myrcene	3.13	1133.1	1.37	4.14	993.4	1.36
α -Phellandrene	3.03	1125.4	0.04	4.28*†	1002.5	[0.04]
Pseudolimonene	3.08	1129.1	0.01	4.30*†	1003.7	[0.04]
Octanal	4.73	1253.6	0.04	4.30*†	1003.7	[0.04]
Δ 3-Carene	2.82	1109.6	0.02	4.37	1008.1	0.02
α -Terpinene	3.22	1139.8	0.17	4.48	1015.2	0.16
<i>para</i> -Cymene	4.40	1229.5	1.00	4.62	1023.9	0.86
Limonene	3.65*	1173.5	[tr]	4.76	1032.9	60.32
(<i>Z</i>)- β -Ocimene	4.12*	1209.1	[9.85]	4.89	1040.9	0.04
(<i>E</i>)- β -Ocimene	4.26	1219.3	0.10	5.05	1050.7	0.09
γ -Terpinene	4.12*	1209.1	[9.85]	5.20	1060.0	9.83
<i>cis</i> -Sabinene hydrate	7.24*	1429.8	[0.05]	5.30	1066.3	0.02
Unknown PIMA I [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	5.06	1277.5	0.01	5.34	1068.8	0.01
Octanol	8.53	1527.0	0.01	5.47	1077.2	0.01
Terpinolene	4.58	1242.1	0.35	5.62*	1086.5	[0.35]
<i>para</i> -Cymenene	6.67	1387.9	0.01	5.62*	1086.5	[0.35]
<i>trans</i> -Sabinene hydrate	8.32	1510.4	0.02	5.78	1096.5	0.02
Linalool	8.40	1517.1	0.09	5.88	1102.5	0.09
Nonanal	6.18	1353.0	0.02	5.91	1104.7	0.02
endo-Fenchol	8.72*	1541.3	[0.80]	6.03	1111.9	tr
<i>trans-para</i> -	9.30	1586.4	0.02	6.14	1119.1	0.02

Mentha-2,8-dien-1-ol						
4-Hydroxy-4-methylcyclohex-2-enone	14.48	2033.1	0.01	6.27	1127.4	0.01
<i>cis</i> -Limonene oxide	6.76	1394.7	0.06	6.31	1129.9	0.06
1-Terpineol	8.72*	1541.3	[0.80]	6.38*	1134.7	[0.09]
<i>trans</i> -Limonene oxide	6.93	1407.1	0.06	6.38*	1134.7	[0.09]
Epoxyterpinolene	7.07	1417.3	0.02	6.51	1143.0	0.03
Citronellal	7.33	1436.6	0.02	6.68	1153.3	0.02
Pinocarvone	8.22	1503.2	0.02	6.72	1155.9	0.01
Isoneral	8.18	1500.4	0.01	6.84*	1163.6	[0.03]
Borneol	10.14*	1653.6	[0.13]	6.84*	1163.6	[0.03]
Terpinen-4-ol	8.92	1557.1	0.07	7.01	1174.3	0.08
<i>para</i> -Cymen-8-ol	11.87	1797.2	0.01	7.14	1182.8	0.01
α -Terpineol	10.14*	1653.6	[0.13]	7.24	1188.9	0.13
Decanal	7.61	1457.5	0.03	7.50	1205.9	0.03
<i>trans</i> -Carveol	11.77	1788.4	0.02	7.70	1218.9	0.02
2,3-Epoxyneral?				7.74	1221.8	0.02
Nerol	11.43*	1760.2	[0.11]	7.86	1230.0	0.06
2,3-Epoxygeranial?				7.89	1232.0	0.03
Neral	9.84*	1629.4	[1.55]	8.01	1239.8	1.50
Geraniol	11.99	1808.3	0.04	8.28	1258.1	0.04
Geranial	10.47*	1680.5	[3.29]	8.47	1270.8	2.41
Unknown CIAU V [m/z 95, 67 (45), 41 (42), 110 (42), 43 (41), 59 (36)]	12.76	1874.7	0.01	8.63	1281.1	0.02
<i>cis</i> -Ascaridole glycol	15.20	2101.0	0.02	8.67	1284.1	0.01
Unknown CICA VI [m/z 112, 97 (93), 83 (60), 43 (46), 41 (20), 69 (19)...]				8.90	1299.6	0.01
Undecanal	8.98	1561.9	0.01	9.01	1307.1	0.01
Unknown MEAL I [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	15.37	2118.2	0.01	9.21	1321.1	0.01
δ -Elemene	7.24*	1429.8	[0.05]	9.41	1335.2	0.03
Unknown CIAU VI [m/z 133, 105 (45), 91 (38), 119 (36)...]				9.50	1341.5	0.05

150 (3)]						
Citronellyl acetate	9.76	1622.9	0.01	9.70	1355.4	0.02
Neryl acetate	10.52	1684.1	0.59	9.85	1365.7	0.57
Geranyl acetate	10.88	1714.5	0.27	10.12	1384.7	0.27
β-Elemene	8.72*	1541.3	[0.80]	10.18	1389.1	0.05
Dodecanal	10.31	1667.1	0.01	10.45	1408.7	0.02
β-Caryophyllene	8.72*	1541.3	[0.80]	10.51*	1412.9	[0.30]
cis-α-Bergamotene	8.50*	1524.3	[0.05]	10.51*	1412.9	[0.30]
α-Santalene	8.50*	1524.3	[0.05]	10.56	1417.0	0.01
γ-Elemene	9.34	1588.9	0.01	10.74	1430.3	0.01
trans-α-Bergamotene	8.72*	1541.3	[0.80]	10.79	1433.7	0.51
α-Humulene	9.59	1609.8	0.03	10.97	1447.2	0.03
β-Santalene	9.46	1599.2	0.02	11.07	1454.7	0.01
(E)-β-Farnesene	9.84*	1629.4	[1.55]	11.11	1457.4	0.07
Germacrene D	10.09	1650.0	0.05	11.34	1475.0	0.03
β-Selinene	10.21	1659.2	0.01	11.38	1477.3	0.02
trans-β-Bergamotene	9.88	1633.0	0.04	11.43	1481.0	0.04
α-Selinene	10.25*	1662.7	[0.02]	11.53*	1489.0	[0.02]
Bicyclogermacrene	10.37	1671.8	0.02	11.53*	1489.0	[0.02]
(Z)-α-Bisabolene	10.47*	1680.5	[3.29]	11.70	1501.3	0.07
(3E,6E)-α-Farnesene	10.80	1707.8	0.10	11.78*	1507.2	[0.94]
γ-Cadinene	10.70	1699.0	0.02	11.78*	1507.2	[0.94]
β-Bisabolene	10.47*	1680.5	[3.29]	11.78*	1507.2	[0.94]
(Z)-γ-Bisabolene	10.25*	1662.7	[0.02]	11.84	1512.2	0.02
δ-Cadinene	10.77	1704.6	0.01	11.96	1521.2	0.01
Selina-4(15),7(11)-diene	10.92	1717.3	0.02	12.06	1529.2	0.01
(E)-α-Bisabolene	11.02	1725.9	0.02	12.21	1541.5	0.03
Germacrene B	11.43*	1760.2	[0.11]	12.31	1549.1	0.06
Caryophyllene oxide	13.12	1907.9	0.03	12.63	1573.9	0.03
Tetradecanal				13.10	1611.4	0.02
Alismol	16.10	2190.0	0.04	13.26	1624.3	0.03
Unknown CILI I [m/z 94, 43 (89), 41 (67), 122 (46), 69 (41)...222]				13.48	1642.4	0.01
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109 (40)... 204 (35),	15.55	2135.4	0.01	13.52	1645.8	0.03

222 (2)]						
Unknown CILI II [m/z 69, 95 (100), 41 (89), 109 (68), 67 (61)...222]	16.36	2216.6	0.10	13.75	1664.9	0.05
α -Bisabolol	15.78*	2158.6	[0.05]	13.97	1682.7	0.05
Herniarin	21.64	2804.1	0.07	14.25	1706.6	0.01
Myristic acid				14.97	1768.8	0.01
<i>meta</i> -Camphorene	15.78*	2158.6	[0.05]	16.95	1948.9	0.01
Citropten				17.10	1962.8	0.09
Palmitic acid				17.19	1971.4	0.04
Bergapten				17.85	2035.8	0.04
Linoleic acid				18.89	2140.0	0.02
Oleic acid				18.95	2145.9	0.01
<i>cis</i> -Vaccenic acid?				18.98	2148.8	0.01
Stearic acid				19.18	2170.4	0.04
Isopimpinellin				19.58	2212.2	0.03
Tricosane	17.11	2293.1	0.09	20.41	2300.9	0.01
Total reported		37.53%			98.06%	

*: 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