

Date : December 08, 2022

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 22K24-PTH02


Customer identification : Spanish Marjoram - Spain - SJ4100R

Type : Essential oil

Source : *Thymus mastichina*

Customer : Plant Therapy

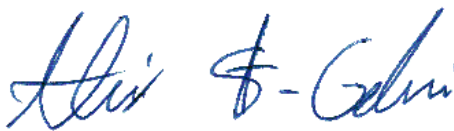
ANALYSIS

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 : Amélie Simard, Analyste

Analysis date : December 05, 2022

Checked and approved by :



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

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia. 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.

PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid

Refractive index: 1.4645 ± 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
Isovaleral	tr	Aliphatic aldehyde
Isoamyl alcohol	tr	Aliphatic alcohol
Methyl 2-methylbutyrate	tr	Aliphatic ester
(2E)-Hexenal	tr	Aliphatic aldehyde
Ethyl isovalerate	tr	Aliphatic ester
(3Z)-Hexenol	0.01	Aliphatic alcohol
Hashishene	0.04	Monoterpene
Tricyclene	0.02	Monoterpene
α -Thujene	0.08	Monoterpene
α -Pinene	4.17	Monoterpene
Camphene	0.65	Monoterpene
α -Fenchene	0.04	Monoterpene
Thuja-2,4(10)-diene	0.02	Monoterpene
Sabinene	1.21	Monoterpene
β -Pinene	2.86	Monoterpene
3-Methylpentyl acetate	0.01	Aliphatic ester
Octan-3-one	0.09	Aliphatic ketone
Myrcene	0.96	Monoterpene
α -Phellandrene	0.23	Monoterpene
Pseudolimonene	0.03	Monoterpene
Δ^3 -Carene	0.03	Monoterpene
α -Terpinene	0.21	Monoterpene
para-Cymene	2.44	Monoterpene
Limonene	3.68	Monoterpene
1,8-Cineole	52.21	Monoterpenic ether
(Z)- β -Ocimene	0.22	Monoterpene
(E)- β -Ocimene	0.72	Monoterpene
γ -Terpinene	1.29	Monoterpene
cis-Sabinene hydrate	0.16	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.08	Monoterpenic alcohol
Fenchone	0.01	Monoterpenic ketone
para-Cymenene	0.02	Monoterpene
trans-Linalool oxide (fur.)	0.08	Monoterpenic alcohol
Terpinolene	0.12	Monoterpene
trans-Sabinene hydrate	0.06	Monoterpenic alcohol
Linalool	13.49	Monoterpenic alcohol
Hotrienol	0.15	Monoterpenic alcohol
Phenylethyl alcohol	0.03	Simple phenolic
Octen-3-yl acetate	0.03	Aliphatic ester
cis-para-Menth-2-en-1-ol	0.04	Monoterpenic alcohol
α -Campholenal	0.02	Monoterpenic aldehyde
trans-Pinocarveol	0.07	Monoterpenic alcohol
Camphor	1.27	Monoterpenic ketone
trans-para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol
Nerol oxide	0.02	Aliphatic ether

Pinocarvone	0.03	Monoterpenic ketone
Borneol	0.53	Monoterpenic alcohol
<i>cis</i> -Linalool oxide (pyr.)	0.01	Monoterpenic alcohol
δ -Terpineol	0.50	Monoterpenic alcohol
Terpinen-4-ol	0.51	Monoterpenic alcohol
<i>para</i> -Cymen-8-ol	0.04	Monoterpenic alcohol
α -Terpineol	4.27	Monoterpenic alcohol
Myrtenal	0.05	Monoterpenic aldehyde
Myrtenol	0.07	Monoterpenic alcohol
Verbenone	0.02	Monoterpenic ketone
<i>trans</i> -Carveol	0.03	Monoterpenic alcohol
<i>exo</i> -2-Hydroxycineole	0.03	Monoterpenic alcohol
Bornyl formate	0.01	Monoterpenic ester
Nerol	0.02	Monoterpenic alcohol
Citronellol	0.02	Monoterpenic alcohol
Carvone	0.06	Monoterpenic ketone
Geraniol	0.05	Monoterpenic alcohol
Linalyl acetate	1.83	Monoterpenic ester
Geranial	0.04	Monoterpenic aldehyde
Bornyl acetate	0.14	Monoterpenic ester
Thymol	0.13	Monoterpenic alcohol
δ -Terpinyl acetate	0.24	Monoterpenic ester
<i>exo</i> -2-Hydroxycineole acetate	0.01	Monoterpenic ester
α -Terpinyl acetate	0.79	Monoterpenic ester
Neryl acetate	0.02	Monoterpenic ester
α -Copaene	0.02	Sesquiterpene
β -Bourbonene	0.03	Sesquiterpene
Geranyl acetate	0.04	Monoterpenic ester
β -Elemene	0.02	Sesquiterpene
α -Gurjunene	0.05	Sesquiterpene
β -Caryophyllene	0.73	Sesquiterpene
Aromadendrene	0.02	Sesquiterpene
α -Humulene	0.06	Sesquiterpene
<i>allo</i> -Aromadendrene	0.07	Sesquiterpene
<i>cis</i> -Muurolo-4(15),5-diene	0.02	Sesquiterpene
γ -Muurolole	0.01	Sesquiterpene
Germacrene D	0.09	Sesquiterpene
Viridiflorene	0.01	Sesquiterpene
Bicyclogermacrene	0.24	Sesquiterpene
α -Muurolole	0.02	Sesquiterpene
Germacrene A	0.03	Sesquiterpene
γ -Cadinene	0.07	Sesquiterpene
Geranyl isobutyrate	0.02	Monoterpenic ester
δ -Cadinene	0.07	Sesquiterpene
α -Cadinene	0.01	Sesquiterpene
α -Elemol	0.13	Sesquiterpenic alcohol
Geranyl butyrate	0.04	Monoterpenic ester
Spathulenol	0.08	Sesquiterpenic alcohol
Caryophyllene oxide	0.08	Sesquiterpenic ether
Caryophyllene oxide isomer	0.03	Sesquiterpenic ether
Viridiflorol	0.10	Sesquiterpenic alcohol
Ledol	0.03	Sesquiterpenic alcohol

Geranyl isovalerate	0.02	Monoterpenic ester
γ -Eudesmol	0.03	Sesquiterpenic alcohol
τ -Muurolol	0.03	Sesquiterpenic alcohol
β -Eudesmol	0.05	Sesquiterpenic alcohol
α -Eudesmol	0.03	Sesquiterpenic alcohol
Selin-11-en-4 α -ol	0.07	Sesquiterpenic alcohol
Consolidated total	98.69%	

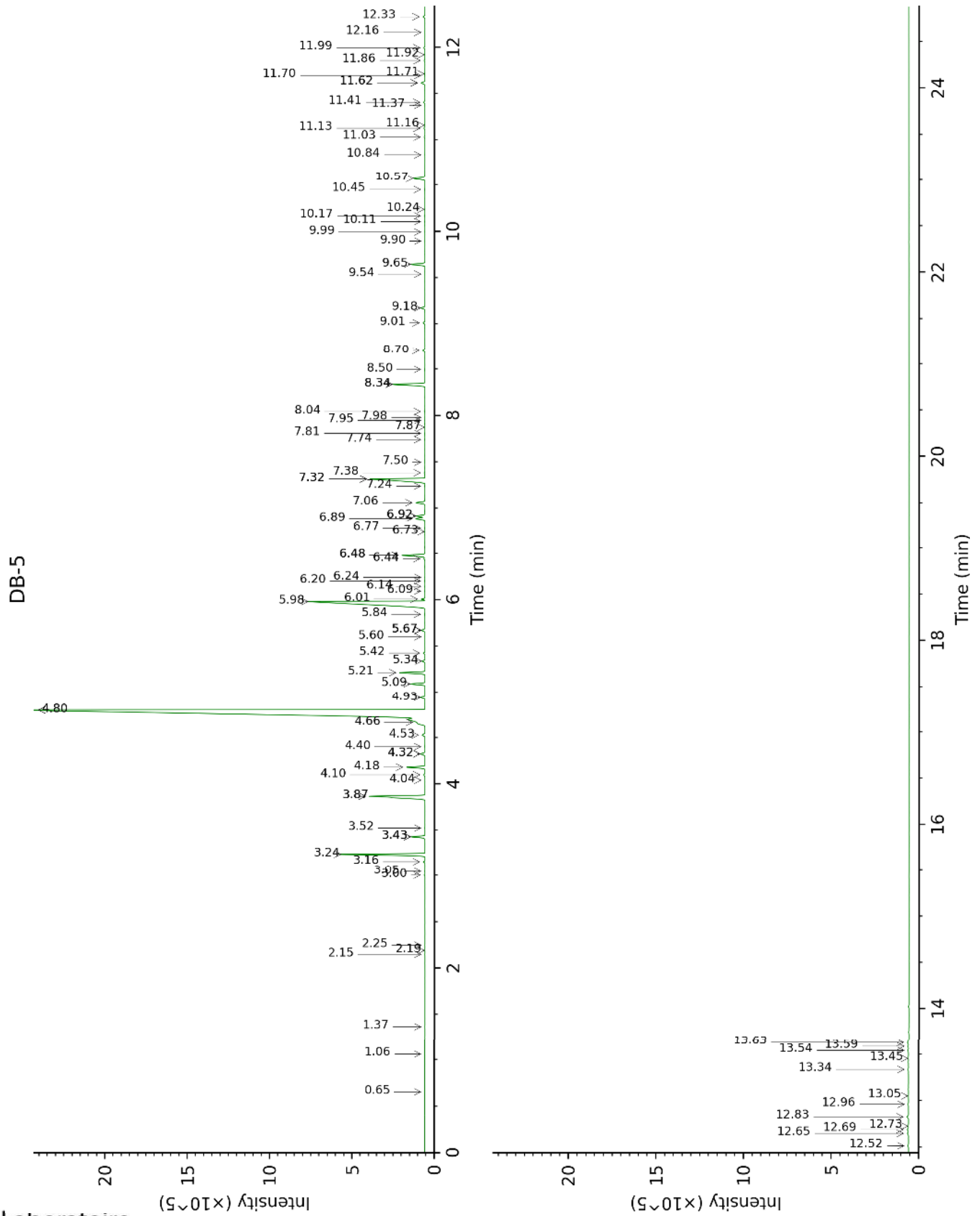
tr: The compound has been detected below 0.005% of total signal.

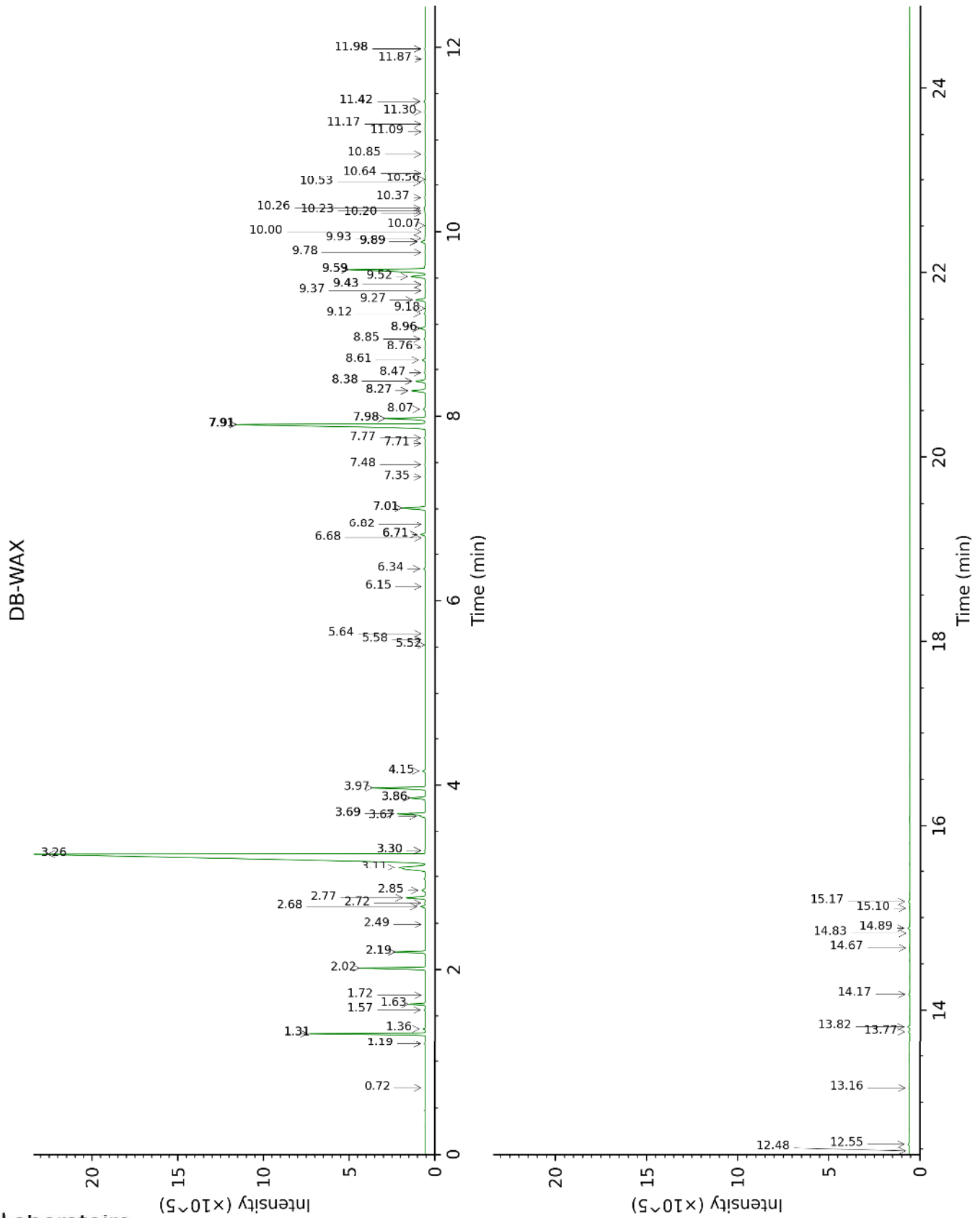
Note: no correction factor was applied

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	0.65	643	tr	0.72	887	tr
Isoamyl alcohol	1.06	732	tr	3.30*	1178	0.05
Methyl 2-methylbutyrate	1.37	773	tr	1.19*	974	0.02
(2E)-Hexenal	2.15	848	tr	3.30*	1178	[0.05]
Ethyl isovalerate	2.19	852	tr	1.72	1038	tr
(3Z)-Hexenol	2.25	856	0.01	5.64	1349	0.02
Hashishene	3.00	915	0.04	1.31*	995	4.24
Tricyclene	3.05	918	0.02	1.19*	974	[0.02]
α -Thujene	3.16	925	0.08	1.36	1002	0.07
α -Pinene	3.24	931	4.17	1.31*	995	[4.24]
Camphene	3.43*	943	0.69	1.63	1029	0.65
α -Fenchene	3.43*	943	[0.69]	1.57	1022	0.04
Thuja-2,4(10)-diene	3.52	949	0.02	2.19*	1086	1.25
Sabinene	3.87*	971	4.06	2.19*	1086	[1.25]
β -Pinene	3.87*	971	[4.06]	2.02	1068	2.86
3-Methylpentyl acetate	4.04	983	0.01	3.69*	1210	1.32
Octan-3-one	4.10	986	0.09	3.86*	1222	0.73
Myrcene	4.18	992	0.96	2.77	1135	0.95
α -Phellandrene	4.32*	1001	0.29	2.68	1128	0.23
Pseudolimonene	4.32*	1001	[0.29]	2.72	1131	0.03
Δ 3-Carene	4.40	1006	0.03	2.49	1112	0.01
α -Terpinene	4.53	1014	0.21	2.85	1142	0.20
para-Cymene	4.66	1022	2.44	3.97	1231	2.57
Limonene	4.80*	1031	55.80	3.11	1162	3.68
1,8-Cineole	4.80*	1031	[55.80]	3.26	1175	52.21
(Z)- β -Ocimene	4.93	1039	0.22	3.67	1208	0.20
(E)- β -Ocimene	5.09	1049	0.72	3.86*	1222	[0.73]
γ -Terpinene	5.21	1057	1.29	3.69*	1210	[1.32]
cis-Sabinene hydrate	5.34	1064	0.16	6.71*	1427	0.23
cis-Linalool oxide (fur.)	5.42	1070	0.08	6.34	1400	0.08
Fenchone	5.60	1081	0.01	5.52	1340	0.01
para-Cymenene	5.67*	1085	0.22	6.15	1386	0.02
trans-Linalool oxide (fur.)	5.67*	1085	[0.22]	6.71*	1427	[0.23]
Terpinolene	5.67*	1085	[0.22]	4.15	1244	0.12
trans-Sabinene hydrate	5.84	1096	0.06	7.77	1507	0.05
Linalool	5.98	1105	13.49	7.91*	1518	13.63
Hotrienol	6.01	1106	0.15	8.60	1572	0.15
Phenylethyl alcohol	6.09	1112	0.03	11.87	1847	0.01
Octen-3-yl acetate	6.14	1115	0.03	5.58	1344	0.01

<i>cis</i> -para-Menth-2-en-1-ol	6.20	1119	0.04	7.98*	1523	1.87
α -Campholenal	6.24	1121	0.02	6.82	1436	0.02
<i>trans</i> -Pinocarveol	6.44	1134	0.07	8.96*	1600	0.29
Camphor	6.48*	1136	1.32	7.01*	1450	1.29
<i>trans</i> -para-Menth-2-en-1-ol	6.48*	1136	[1.32]	8.76	1584	0.02
Nerol oxide	6.73	1152	0.02	6.68	1425	0.01
Pinocarvone	6.77	1155	0.03	7.71	1502	0.03
Borneol	6.89	1162	0.53	9.59*	1652	4.89
<i>cis</i> -Linalool oxide (pyr.)	6.92*	1164	0.49	10.07	1691	0.01
δ -Terpineol	6.92*	1164	[0.49]	9.27	1625	0.50
Terpinen-4-ol	7.06	1173	0.51	8.38*	1555	0.51
para-Cymen-8-ol	7.24	1185	0.04	11.30	1796	0.03
α -Terpineol	7.32*	1190	4.37	9.59*	1652	[4.89]
Myrtenal	7.32*	1190	[4.37]	8.47	1562	0.05
Myrtenol	7.38	1194	0.07	10.64	1740	0.04
Verbenone	7.50	1201	0.02	9.37	1634	0.01
<i>trans</i> -Carveol	7.74	1217	0.03	11.17	1785	0.02
exo-2-Hydroxycineole	7.81	1222	0.03	11.42*	1806	0.07
Bornyl formate	7.87	1226	0.01	7.91*	1518	[13.63]
Nerol	7.95	1231	0.02	10.85	1757	0.03
Citronellol	7.98	1233	0.02	10.53	1730	0.06
Carvone	8.04	1238	0.06	9.78	1667	0.04
Geraniol	8.34*	1257	1.90	11.42*	1806	[0.07]
Linalyl acetate	8.34*	1257	[1.90]	7.98*	1523	[1.87]
Geranial	8.50	1268	0.04	9.93	1680	0.05
Bornyl acetate	8.70	1282	0.14	8.08	1531	0.13
Thymol	9.01	1302	0.13	14.89	2132	0.11
δ -Terpinyl acetate	9.18	1313	0.24	8.96*	1600	[0.29]
exo-2-Hydroxycineole acetate	9.54	1339	0.01	9.89*	1677	0.27
α -Terpinyl acetate	9.65	1346	0.79	9.52	1646	0.80
Neryl acetate	9.90	1364	0.02	10.00	1685	0.02
α -Copaene	9.99	1371	0.02	7.01*	1450	[1.29]
β -Bourbonene	10.11	1379	0.03	7.35	1475	0.03
Geranyl acetate	10.17	1383	0.04	10.37	1716	0.04
β -Elemene	10.24	1388	0.02	8.27*	1546	0.75
α -Gurjunene	10.45	1403	0.05	7.48	1485	0.04
β -Caryophyllene	10.57	1412	0.73	8.27*	1546	[0.75]
Aromadendrene	10.84	1432	0.02	8.38*	1555	[0.51]
α -Humulene	11.03	1446	0.06	9.12	1613	0.06
allo-Aromadendrene	11.13	1453	0.07	8.85	1591	0.08
<i>cis</i> -Muurolo-4(15),5-diene	11.16	1456	0.02	9.18	1618	0.01
γ -Muurolole	11.37	1472	0.01	9.43*	1639	0.05
Germacrene D	11.41	1474	0.09	9.59*	1652	[4.89]
Viridiflorene	11.62*	1490	0.25	9.43*	1639	[0.05]

Bicyclogermacrene	11.62*	1490	[0.25]	9.89*	1677	[0.27]
α-Muurolene	11.70	1496	0.02	9.89*	1677	[0.27]
Germacrene A	11.71	1497	0.03	10.20	1702	0.01
γ-Cadinene	11.86	1508	0.07	10.23	1704	0.05
Geranyl isobutyrate	11.92	1513	0.02	11.09	1778	0.02
δ-Cadinene	11.99	1519	0.07	10.26	1707	0.08
α-Cadinene	12.16	1532	0.01	10.56	1733	0.01
α-Elemol	12.33	1545	0.13	13.82	2028	0.12
Geranyl butyrate	12.52	1560	0.04	11.98*	1857	0.04
Spathulenol	12.65	1570	0.08	14.17	2062	0.07
Caryophyllene oxide	12.69	1573	0.08	12.55	1908	0.08
Caryophyllene oxide isomer	12.73	1576	0.03	12.48	1902	0.01
Viridiflorol	12.83	1584	0.10	13.77	2023	0.09
Ledol	12.96	1594	0.03	13.16	1964	0.03
Geranyl isovalerate	13.05	1601	0.02	11.98*	1857	[0.04]
γ-Eudesmol	13.34	1625	0.03	14.67	2111	0.03
τ-Muurolol	13.45	1634	0.03	14.83	2127	0.01
β-Eudesmol	13.54	1642	0.05	15.17	2161	0.09
α-Eudesmol	13.58	1645	0.03	15.10	2154	0.04
Selin-11-en-4α-ol	13.63	1649	0.07			
Total identified		98.72%			98.68%	
Total reported		98.72%			98.68%	

*: 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