

Date : January 29, 2021

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 21A28-PTH05


Customer identification : Bergamot organic (Bergaptene Free) - Italy - BQ0106204R

Type : Essential oil

Source : *Citrus bergamia*

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 : Sylvain Mercier, M. Sc., Chimiste

Analysis date : January 29, 2021

Checked and approved by :

Alexis St-Gelais, M. Sc., 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Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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: Clear liquid

Refractive index: 1.4640 ± 0.0003 (20 °C; method PC-MAT-016)

NFT 75-215:2009 - OIL OF BERGAMOT - ITALY

Compound	Min. %	Max. %	Observed %	Complies?
β-Bisabolene	0.3	0.6	0.1	No
Geranial	0.25	0.50	0.28	Yes
Linalyl acetate	22	36	26	Yes
Linalool	3	15	14	Yes
γ-Terpinene	6	10	6	Yes
Limonene	30	45	39	Yes
β-Pinene	5.5	9.5	7.2	Yes
Refractive index	1.4650	1.4700	1.4640	No

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
Nonane	tr	Alkane
Tricyclene	tr	Monoterpene
α -Thujene	0.20	Monoterpene
α -Pinene	1.49	Monoterpene
Camphene	0.04	Monoterpene
Sabinene	1.32	Monoterpene
β -Pinene	7.21	Monoterpene
6-Methyl-5-hepten-2-one	0.05	Aliphatic ketone
Myrcene	0.93	Monoterpene
α -Phellandrene	0.02	Monoterpene
Octanal	0.01	Aliphatic aldehyde
Δ^3 -Carene	0.01	Monoterpene
α -Terpinene	0.07	Monoterpene
para-Cymene	0.77	Monoterpene
Limonene	38.56	Monoterpene
β -Phellandrene	0.31	Monoterpene
(Z)- β -Ocimene	0.05	Monoterpene
(E)- β -Ocimene	0.12	Monoterpene
γ -Terpinene	5.91	Monoterpene
cis-Sabinene hydrate	0.03	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.03	Monoterpenic alcohol
Octanol	0.01	Aliphatic alcohol
Terpinolene	0.22	Monoterpene
trans-Linalool oxide (fur.)	0.04	Monoterpenic alcohol
Linalool	14.08	Monoterpenic alcohol
Nonanal	0.02	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.02	Monoterpenic alcohol
cis-Limonene oxide	0.02	Monoterpenic ether
trans-Limonene oxide	0.02	Monoterpenic ether
Camphor	0.02	Monoterpenic ketone
Epoxyterpinolene	0.01	Monoterpenic ether
Citronellal	0.02	Monoterpenic aldehyde
Terpinen-4-ol	0.03	Monoterpenic alcohol
α -Terpineol	0.15	Monoterpenic alcohol
Hodiendiol	0.02	Monoterpenic alcohol
Unknown	0.01	Unknown
Decanal	0.04	Aliphatic aldehyde
Octyl acetate	0.27	Aliphatic ester
Nerol	0.04	Monoterpenic alcohol
Unknown	0.01	Unknown
Neral	0.22	Monoterpenic aldehyde
(trans?)-Linalool oxide acetate (fur.)?	0.10	Monoterpenic ester
Geraniol	0.04	Monoterpenic alcohol
Linalyl acetate	25.89	Monoterpenic ester
Geranial	0.28	Monoterpenic aldehyde

Bornyl acetate	tr	Monoterpenic ester
Linalyl propionate	tr	Monoterpenic ester
Hodiendiol derivative	0.02	Oxygenated monoterpene
α -Terpinyl acetate	0.07	Monoterpenic ester
Unknown	0.02	Monoterpenic ester
Unknown	0.02	Oxygenated monoterpene
Neryl acetate	0.27	Monoterpenic ester
Geranyl acetate	0.19	Monoterpenic ester
β -Caryophyllene	0.11	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.06	Sesquiterpene
(<i>E</i>)- β -Farnesene	0.01	Sesquiterpene
β -Bisabolene	0.06	Sesquiterpene
Consolidated total	99.55%	

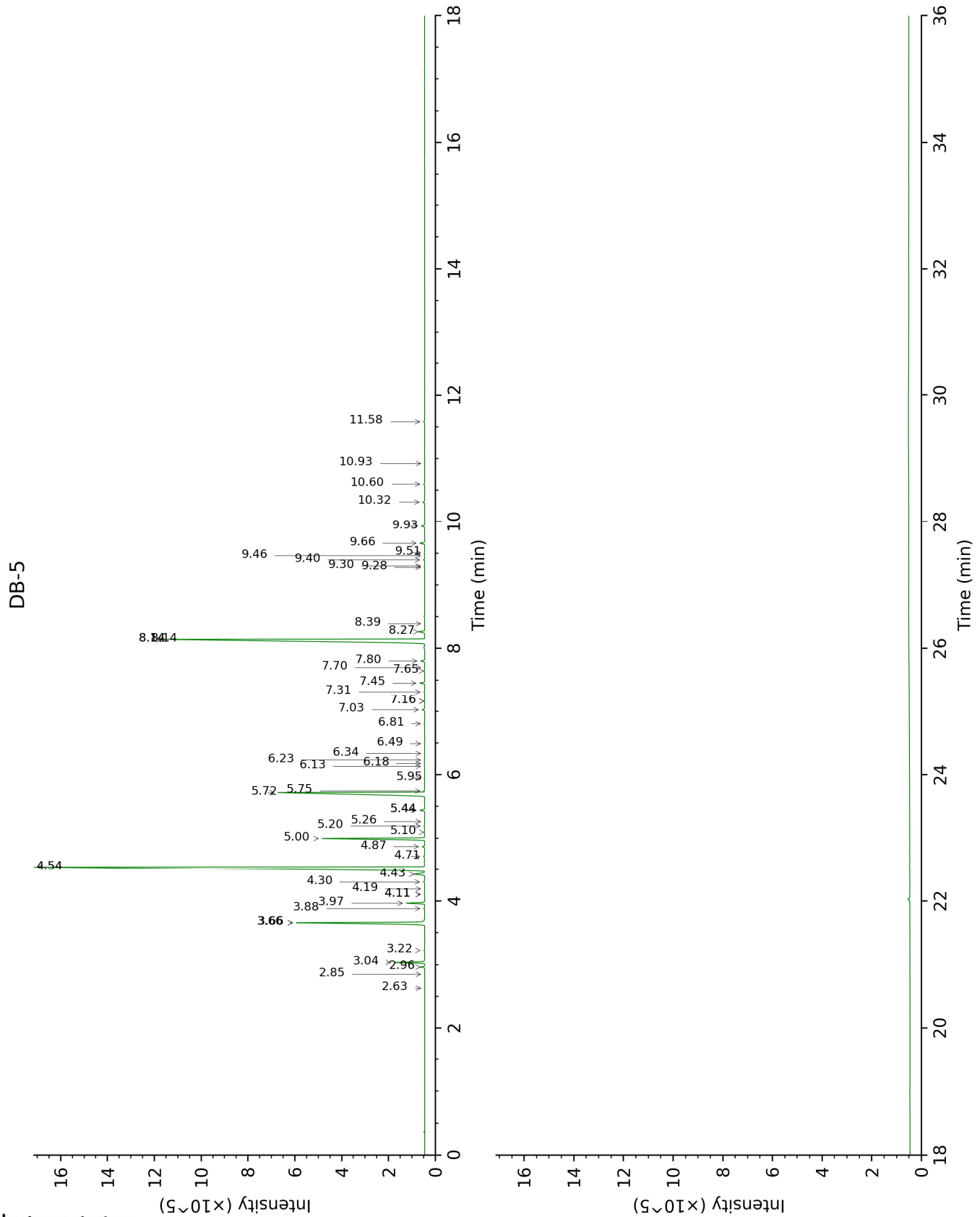
tr: The compound has been detected below 0.005% of total signal.

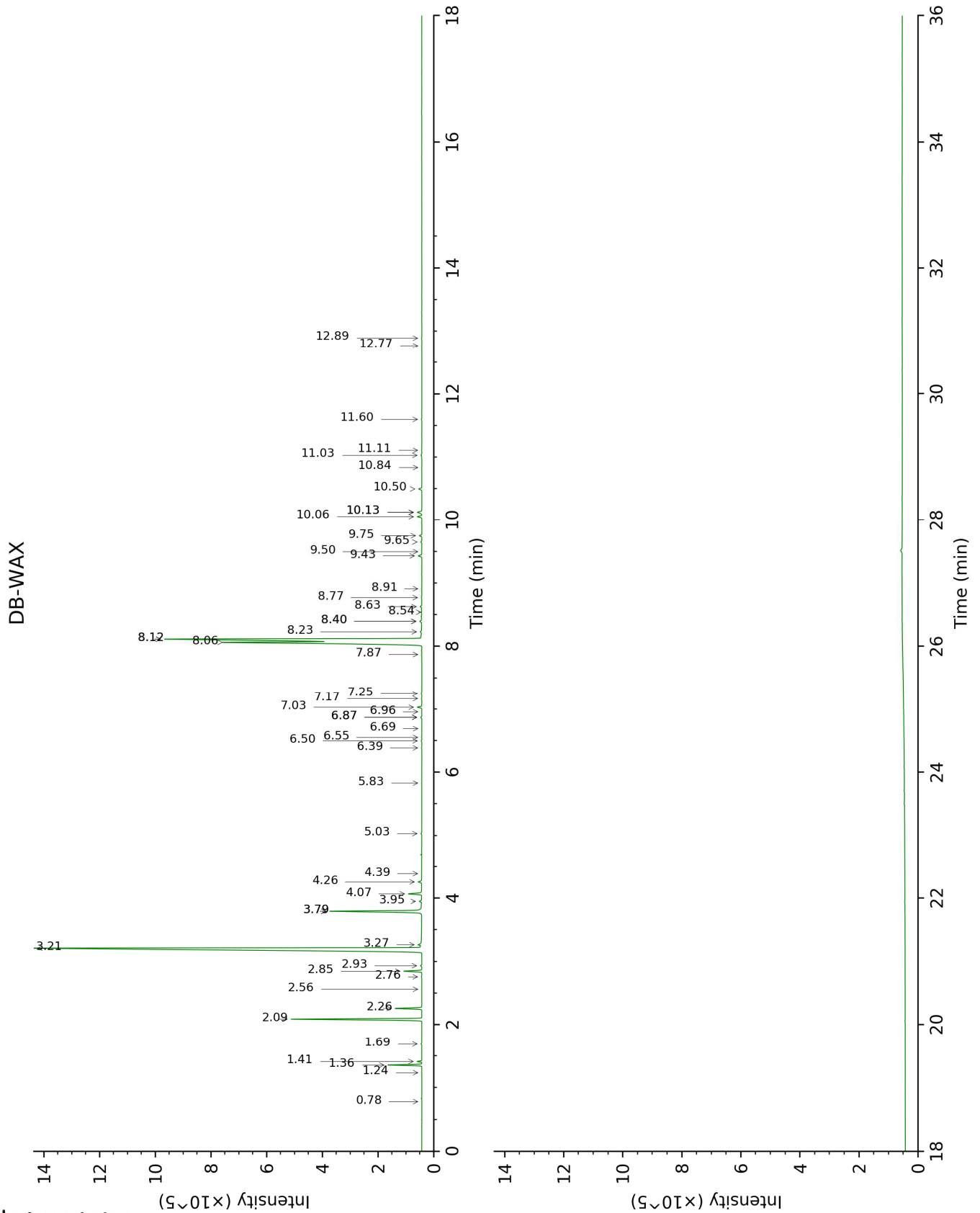
Note: no correction factor was applied

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.

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Nonane	2.63	904	tr	0.78	897	tr
Tricyclene	2.85	918	tr	1.24	972	tr
α -Thujene	2.96	926	0.20	1.41	1001	0.20
α -Pinene	3.04	930	1.49	1.36	992	1.51
Camphene	3.22	943	0.04	1.69	1028	0.04
Sabinene	3.66*	971	8.41	2.26	1084	1.32
β -Pinene	3.66*	971	[8.41]	2.09	1067	7.21
6-Methyl-5-hepten-2-one	3.88	986	0.05	5.03	1299	0.05
Myrcene	3.97	992	0.93	2.85	1134	0.93
α -Phellandrene	4.11*	1001	0.03	2.76	1127	0.02
Octanal	4.11*	1001	[0.03]	4.39	1251	0.01
Δ^3 -Carene	4.19	1006	0.01	2.56	1112	0.01
α -Terpinene	4.30	1013	0.07	2.93	1141	0.07
para-Cymene	4.43	1021	0.77	4.07	1228	0.75
Limonene	4.54*	1028	38.92	3.21	1162	38.56
β -Phellandrene	4.54*	1028	[38.92]	3.26	1166	0.31
(Z)- β -Ocimene	4.71	1039	0.05	3.79*	1208	5.81
(E)- β -Ocimene	4.87	1049	0.12	3.95	1219	0.14
γ -Terpinene	5.00	1057	5.91	3.79*	1208	[5.81]
cis-Sabinene hydrate	5.10	1063	0.03	6.87*	1431	0.07
cis-Linalool oxide (fur.)	5.20	1070	0.03	6.50	1403	0.04
Octanol	5.26	1074	0.01	8.12*†	1524	[39.99]
Terpinolene	5.44*	1085	0.27	4.26	1242	0.22
trans-Linalool oxide (fur.)	5.44*	1085	[0.27]	6.87*	1431	[0.07]
Linalool	5.72†	1103	14.10	8.06†	1520	39.99
Nonanal	5.75†	1105	[14.10]	5.83	1355	0.02
trans-para-Mentha-2,8-dien-1-ol	5.95	1118	0.02	8.91	1587	0.01
cis-Limonene oxide	6.13	1130	0.02	6.39	1395	0.02
trans-Limonene oxide	6.18	1133	0.02	6.55	1407	0.02
Camphor	6.23	1136	0.02	7.17	1453	0.02
Epoxyterpinolene	6.34	1143	0.01	6.69	1417	0.01
Citronellal	6.49	1153	0.02	6.96	1437	0.01
Terpinen-4-ol	6.81	1174	0.03	8.54	1558	0.03
α -Terpineol	7.03	1188	0.15	9.75	1654	0.15
Hodiendiol	7.16*	1197	0.02	12.77	1914	0.02
Unknown [m/z 43, 71 (80), 67 (55), 59 (51), 68 (44), 41 (43)...]	7.16*	1197	[0.02]	10.84	1744	0.01
Decanal	7.31	1207	0.04	7.25	1459	0.04

Octyl acetate	7.45	1217	0.27	7.03	1442	0.26
Nerol	7.65	1230	0.04	11.03	1761	0.06
Unknown [m/z 43, 71 (64), 68 (54), 81 (49), 93 (34), 121 (33)...]	7.70	1234	0.01	7.87	1506	0.01
Neral	7.80	1241	0.22	9.43	1628	0.23
(<i>trans</i> ?) - Linalool oxide acetate (<i>fur</i> .)?	8.14*†	1265	26.31	8.63	1564	0.10
Geraniol	8.14*†	1265	[26.31]	11.60	1809	0.04
Linalyl acetate	8.14*†	1265	[26.31]	8.12*†	1524	[39.99]
Geranial	8.26†	1273	[26.31]	10.06	1679	0.28
Bornyl acetate	8.39	1282	tr	8.23	1534	0.08
Linalyl propionate	9.28	1339	tr	8.77	1576	0.03
Hodiendiol derivative	9.30	1341	0.02	12.89	1925	0.02
α -Terpinyl acetate	9.40	1347	0.07	9.65	1646	0.07
Unknown [m/z 43, 121 (52), 93 (48), 79 (33), 41 (30), 136 (26), 81 (25)...]	9.46	1352	0.02			
Unknown [m/z 43, 79 (46), 71 (30), 94 (25), 41 (23), 81 (21)... 197 (0)]	9.51	1355	0.02	11.11	1768	0.03
Neryl acetate	9.66	1366	0.27	10.13*	1685	0.34
Geranyl acetate	9.93	1385	0.19	10.50	1716	0.20
β -Caryophyllene	10.32	1413	0.11	8.40*	1546	0.13
<i>trans</i> - α - Bergamotene	10.60	1434	0.06	8.40*	1546	[0.13]
(<i>E</i>)- β -Farnesene	10.92	1458	0.01	9.50	1633	0.01
β -Bisabolene	11.58	1508	0.06	10.13*	1685	[0.34]
Total identified		99.43%			99.45%	
Total reported		99.49%			99.50%	

*: 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