Date : July 07, 2021

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 21F22-PTH02
Customer identification : Star Anise - China - A2010588R
Type : Essential oil
Source : *Illicium verum*
Customer : Plant Therapy

Analysis

Method: PC-MAT-014 ISO - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Seydou Ka, Ph. D.
Analysis date : July 06, 2021

Checked and approved by :

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

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

Méthode certifiée ISO 17025:2017 Certified method

Laboratoire PhytoChemia
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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid
Refractive index: 1.5544 ± 0.0003 (20 °C; method PC-MAT-016)

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

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Analysis summary – Consolidated contents

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Class
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Furfural	0.01	Furan
α-Thujene	0.01	Monoterpene
α-Pinene	0.43	Monoterpene
Camphene	0.01	Monoterpene
β-Pinene	0.04	Monoterpene
Sabinene	0.03	Monoterpene
Myrcene	0.06	Monoterpene
α-Phellandrene	0.27	Monoterpene
Pseudolimonene	tr	Monoterpene
Δ3-Carene	0.12	Monoterpene
α-Terpinene	0.04	Monoterpene
para-Cymene	0.06	Monoterpene
Limonene	0.21	Monoterpene
β-Phellandrene	0.18	Monoterpene
1,8-Cineole	0.13	Monoterpenic ether
(*Z*)-β-Ocimene	0.01	Monoterpene
(*E*)-β-Ocimene	0.01	Monoterpene
γ-Terpinene	0.05	Monoterpene
cis-Linalool oxide (fur.)	0.02	Monoterpenic alcohol
para-Cymenene	tr	Monoterpene
Terpinolene	0.04	Monoterpene
trans-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
Methyl benzoate	0.01	Phenolic ester
Linalool	1.12	Monoterpenic alcohol
trans-Pinocarveol	0.01	Monoterpenic alcohol
Borneol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.13	Monoterpenic alcohol
α-Terpineol	0.09	Monoterpenic alcohol
Methylchavicol	3.33	Phenylpropanoid
Dihydroanethole	0.01	Phenylpropanoid
(*Z*)-Anethole	0.23	Phenylpropanoid
para-Anisaldehyde	0.48	Simple phenolic
(*E*)-Anethole	89.08	Phenylpropanoid
α-Copaene	0.07	Sesquiterpene
Unknown	0.19	Phenylpropanoid
Methyl para-anisate	0.08	Phenolic ester
β-Elemene	0.03	Sesquiterpene
cis-α-Bergamotene	0.01	Sesquiterpene
β-Caryophyllene	0.36	Sesquiterpene
Aromadendrene	0.02	Sesquiterpene
trans-α-Bergamotene	0.35	Sesquiterpene
α-Humulene	0.04	Sesquiterpene
Methyl (*Z*)-isoeugenol	0.05	Phenylpropanoid

Bicyclogermacrene	0.01	Sesquiterpene
Viridiflorene	0.01	Sesquiterpene
α-Muurolene	0.07	Sesquiterpene
β-Bisabolene	0.08	Sesquiterpene
(3*E*,6*E*)-α-Farnesene	0.07	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
δ-Cadinene	0.08	Sesquiterpene
α-Elemol	0.06	Sesquiterpenic alcohol
1-(4-Methoxyphenyl)propane-1,2-diol isomer I	0.03	Phenylpropanoid
(*E*)-Nerolidol	0.09	Sesquiterpenic alcohol
1-(4-Methoxyphenyl)propane-1,2-diol isomer II	0.03	Phenylpropanoid
(*Z*)-Foeniculin	0.03	Phenylpropanoid
Viridiflorol	0.05	Sesquiterpenic alcohol
γ-Eudesmol	0.02	Sesquiterpenic alcohol
τ-Muurolol	0.01	Sesquiterpenic alcohol
τ-Cadinol	0.01	Sesquiterpenic alcohol
α-Muurolol	0.02	Sesquiterpenic alcohol
α-Cadinol	0.05	Sesquiterpenic alcohol
(*E*)-Foeniculin	1.01	Phenylpropanoid
(2*E*,6*E*)-Farnesol	0.01	Sesquiterpenic alcohol
Consolidated total	**99.19%**	

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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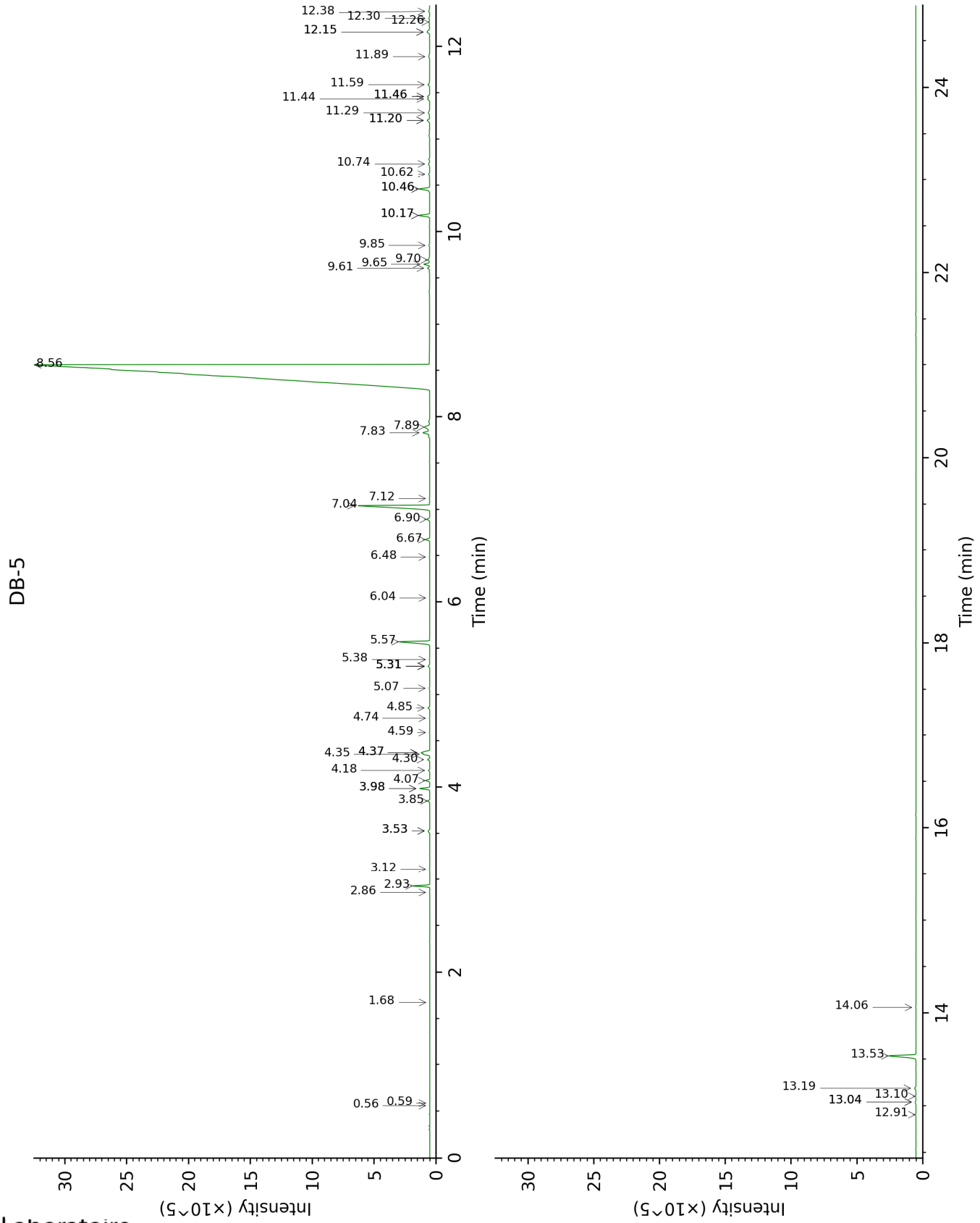
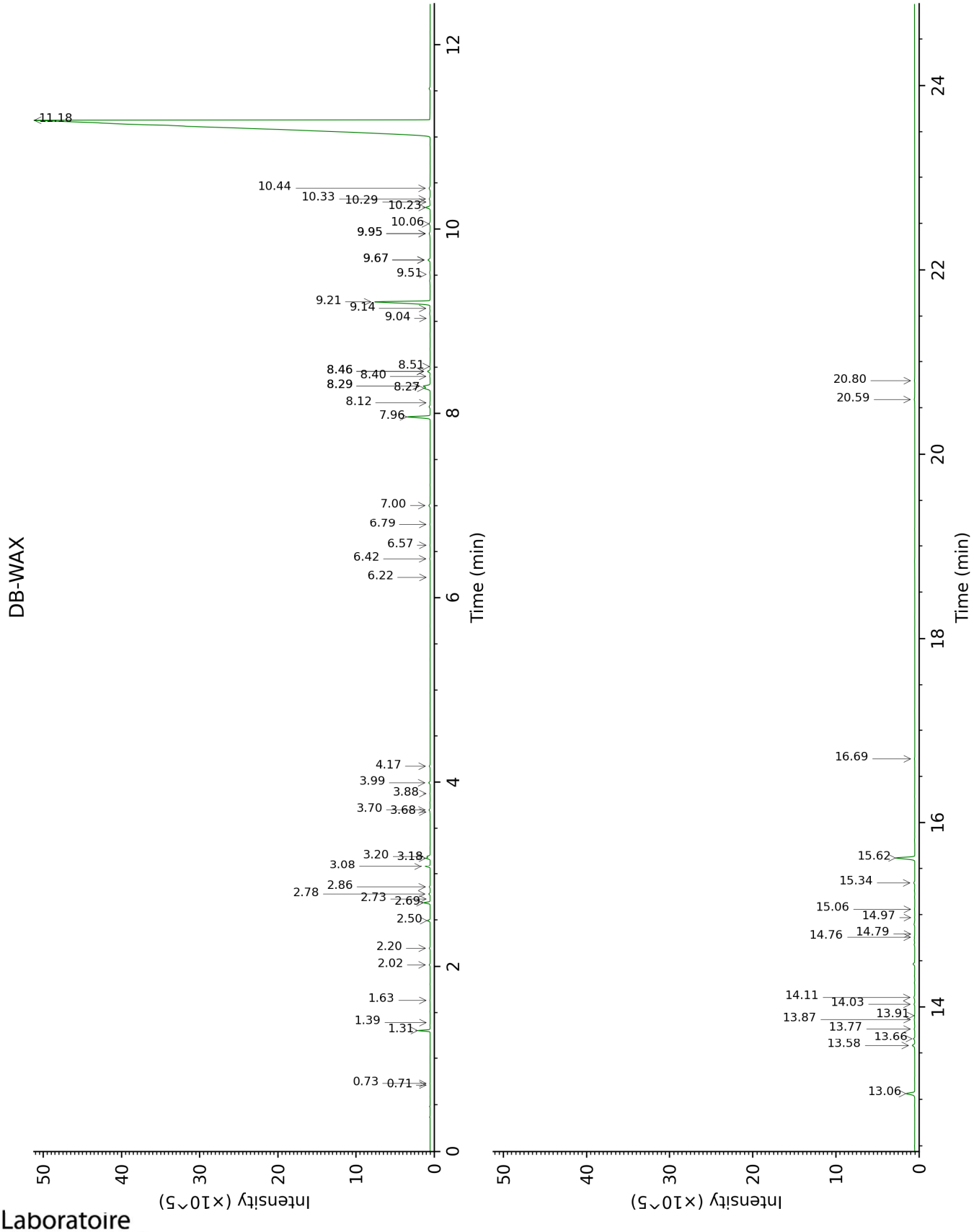

DB-5
Time (min)
Intensity (×10^5)
12.38
12.30
12.26
12.15
11.89
11.59
11.44
11.46
11.29
11.20
10.74
10.62
10.46
10.17
9.85
9.70
9.65
9.61
8.56
7.89
7.83
7.12
7.04
6.90
6.67
6.48
6.04
5.57
5.38
5.31
5.07
4.85
4.74
4.59
4.37
4.35
4.30
4.18
4.07
3.98
3.85
3.53
3.12
2.93
2.86
1.68
0.59
0.56
14.06
13.53
13.19
13.10
13.04
12.91


DB-WAX
Time (min)
Intensity (×10^5)
11.18
10.44
10.33
10.29
10.23
10.06
9.95
9.67
9.51
9.21
9.14
9.04
8.51
8.46
8.40
8.29
8.27
8.12
7.96
7.00
6.79
6.57
6.42
6.22
4.17
3.99
3.88
3.70
3.68
3.20
3.18
3.08
2.86
2.78
2.73
2.69
2.50
2.20
2.02
1.63
1.39
1.31
0.73
0.71
20.80
20.59
16.69
15.62
15.34
15.06
14.97
14.76
14.79
14.11
14.03
13.91
13.87
13.77
13.66
13.58
13.06

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.56	642	tr	0.73	888	tr
2-Methylbutyral	0.59	653	tr	0.71	881	tr
Furfural	1.68	829	0.01	6.57	1414	0.01
α-Thujene	2.86	926	0.01	1.39	1002	tr
α-Pinene	2.93	930	0.43	1.31	991	0.42
Camphene	3.12	943	0.01	1.63	1026	0.01
β-Pinene	3.53*	971	0.07	2.02	1065	0.04
Sabinene	3.53*	971	[0.07]	2.20	1084	0.03
Myrcene	3.85	993	0.06	2.78	1134	0.05
α-Phellandrene	3.98*	1002	0.28	2.69	1126	0.27
Pseudolimonene	3.98*	1002	[0.28]	2.73	1129	tr
Δ3-Carene	4.07	1008	0.12	2.50	1111	0.12
α-Terpinene	4.18	1014	0.04	2.86	1140	0.03
para-Cymene	4.30	1022	0.06	3.99	1229	0.06
Limonene	4.35†	1026	0.53	3.08	1158	0.21
β-Phellandrene	4.37*†	1026	[0.53]	3.18	1166	0.18
1,8-Cineole	4.37*†	1026	[0.53]	3.20	1167	0.13
(*Z*)-β-Ocimene	4.59	1040	0.01	3.68	1205	0.01
(*E*)-β-Ocimene	4.74	1050	0.01	3.88	1220	0.01
γ-Terpinene	4.85	1057	0.05	3.70	1207	0.05
cis-Linalool oxide (fur.)	5.07	1071	0.02	6.42	1403	0.02
para-Cymenene	5.31*	1086	0.06	6.22	1388	tr
Terpinolene	5.31*	1086	[0.06]	4.17	1242	0.04
trans-Linalool oxide (fur.)	5.31*	1086	[0.06]	6.79	1431	0.01
Methyl benzoate	5.38	1091	0.01	8.51	1561	0.02
Linalool	5.57	1103	1.12	7.96	1519	1.12
trans-Pinocarveol	6.04	1134	0.01	9.04	1602	tr
Borneol	6.48	1162	0.01	9.67*	1653	0.12
Terpinen-4-ol	6.67	1175	0.13	8.46*	1557	0.13
α-Terpineol	6.90	1189	0.09	9.67*	1653	[0.12]
Methylchavicol	7.04	1199	3.33	9.21	1616	3.34
Dihydroanethole	7.12	1204	0.01	8.46*	1557	[0.13]
(*Z*)-Anethole	7.83†	1252	0.60	10.23	1699	0.23
para-Anisaldehyde	7.89†	1256	[0.60]	13.06	1947	0.48
(*E*)-Anethole	8.56	1302	89.08	11.18	1780	89.12
α-Copaene	9.61	1373	0.07	7.00	1446	0.07
Unknown [121, 91 (60), 120 (39), 164 (37), 77 (34), 135 (26)]	9.65	1376	0.19	13.58	1995	0.14
Methyl para-anisate	9.70	1379	0.08	13.76	2013	0.03
β-Elemene	9.85	1390	0.03	8.30*†	1544	[0.69]
cis-α-Bergamotene	10.17*	1413	0.37	8.12	1530	0.01
β-Caryophyllene	10.17*	1413	[0.37]	8.30*†	1544	[0.69]
Aromadendrene	10.46*	1435	0.38	8.40	1553	0.02
trans-α-Bergamotene	10.46*	1435	[0.38]	8.27†	1543	0.69
α-Humulene	10.62	1447	0.04	9.14	1611	0.03
Methyl (*Z*)-isoeugenol	10.74	1456	0.05	14.03	2038	0.03
Bicyclogermacrene	11.20*	1491	0.11	9.95*	1676	0.08

Viridiflorene	11.20*	1491	[0.11]	9.51	1641	0.01
α-Muurolene	11.29	1497	0.07	9.95*	1676	[0.08]
β-Bisabolene	11.44	1508	0.08	10.06	1685	0.06
(3*E*,6*E*)-α-Farnesene	11.46*	1510	0.08	10.44	1717	0.07
γ-Cadinene	11.46*	1510	[0.08]	10.29	1704	0.02
δ-Cadinene	11.59	1520	0.08	10.33	1707	0.06
α-Elemol	11.89	1544	0.06	13.91	2026	0.01
1-(4-Methoxyphenyl)propane-1,2-diol isomer I	12.16*	1565	0.14	20.59	2752	0.03
(*E*)-Nerolidol	12.16*	1565	[0.14]	13.66	2002	0.09
1-(4-Methoxyphenyl)propane-1,2-diol isomer II	12.26	1574	0.03	20.80	2776	0.01
(*Z*)-Foeniculin	12.30	1577	0.03	14.11	2045	0.06
Viridiflorol	12.38	1583	0.05	13.87	2022	0.04
γ-Eudesmol	12.91	1625	0.02	14.76	2108	0.02
τ-Muurolol	13.04*	1636	0.04	14.97	2129	0.01
τ-Cadinol	13.04*	1636	[0.04]	14.79	2112	0.01
α-Muurolol	13.10	1642	0.02	15.06	2138	0.01
α-Cadinol	13.19	1649	0.05	15.34	2167	0.05
(*E*)-Foeniculin	13.53	1678	1.01	15.62	2194	1.02
(2*E*,6*E*)-Farnesol	14.06	1722	0.01	16.69	2306	0.02
Total identified		**99.03%**			**98.82%**	
Total reported		**99.22%**			**98.96%**	

*: 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