Date : May 31, 2023

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 23E26-NPA05
Customer identification : Clove - Indonesia - NPS00055
Type : Essential oil
Source : *Syzygium aromaticum*
Customer : Nature Packaged

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 : Sylvain Mercier, M. Sc., Chimiste 2014-005
Analysis date : May 29, 2023

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 May 30, 2023, to format it for online publication.

Laboratoire PhytoChemia
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PHYSICOCHEMICAL DATA

Physical aspect: Yellow liquid
Refractive index: 1.5352 ± 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	0.01	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Furfural	0.05	Furan
Benzaldehyde	0.01	Simple phenolic
5-Methylfurfural	0.02	Furan
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Benzyl alcohol	0.04	Simple phenolic
(*E*)-β-Ocimene	0.01	Monoterpene
Terpinolene	0.02	Monoterpene
Linalool	0.02	Monoterpenic alcohol
(*E*)-4,8-Dimethylnona-1,3,7-triene	0.01	Terpene derivative
Benzyl acetate	0.01	Phenolic ester
Menthol	0.04	Monoterpenic alcohol
Methyl salicylate	0.06	Phenolic ester
Chavicol	0.22	Phenylpropanoid
Chavicyl acetate	0.04	Phenylpropanoid ester
Eugenol	80.86	Phenylpropanoid
Dihydroeugenol	0.14	Phenylpropanoid
α-Copaene	0.19	Sesquiterpene
β-Elemene	0.01	Sesquiterpene
Vanillin	0.01	Simple phenolic
Methyleugenol	0.03	Phenylpropanoid
β-Caryophyllene	6.50	Sesquiterpene
Caryophylla-4(12),8(13)-diene	0.05	Sesquiterpene
Unknown	0.06	Sesquiterpene
α-Humulene	0.87	Sesquiterpene
allo-Aromadendrene	0.02	Sesquiterpene
trans-Cadina-1(6),4-diene	0.07	Sesquiterpene
γ-Muurolene	0.03	Sesquiterpene
β-Selinene	0.02	Sesquiterpene
(3*Z*,6*E*)-α-Farnesene	0.01	Sesquiterpene
α-Muurolene	0.02	Sesquiterpene
γ-Cadinene	0.05	Sesquiterpene
Cubebol	0.01	Sesquiterpenic alcohol
δ-Cadinene	0.21	Sesquiterpene
trans-Calamenene	0.06	Sesquiterpene
Eugenyl acetate	8.45	Phenylpropanoid ester
Dihydroeugenyl acetate	0.04	Phenylpropanoid ester
α-Calacorene	0.04	Sesquiterpene
Unknown	0.11	Unknown
Unknown	0.01	Phenylpropanoid
Caryophyllenyl alcohol	0.04	Sesquiterpenic alcohol
(*E*)-Nerolidol	0.03	Sesquiterpenic alcohol
Caryophyllene oxide	0.09	Sesquiterpenic ether
Unknown	0.01	Oxygenated sesquiterpene

Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
Humulene epoxide I	0.01	Sesquiterpenic ether
Unknown	0.02	Unknown
Humulene epoxide II	0.02	Sesquiterpenic ether
(*E*)-Isoeugenyl acetate	0.02	Phenylpropanoid ester
Caryophylladienol I	0.03	Sesquiterpenic alcohol
Caryophylladienol II	0.03	Sesquiterpenic alcohol
τ-Muurolol	0.01	Sesquiterpenic alcohol
Cubenol	0.02	Sesquiterpenic alcohol
14-Hydroxy-(*Z*)-caryophyllene	0.04	Sesquiterpenic alcohol
14-Hydroxy-9-epi-(*E*)-caryophyllene	0.01	Sesquiterpenic alcohol
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	0.02	Sesquiterpenic alcohol
Trimethoxypropylbenzene analog	0.22	Phenylpropanoid
Unknown	0.04	Lignan
Unknown	0.01	Lignan
Unknown	0.08	Unknown
(*E*)-Coniferyl alcohol	0.05	Phenylpropanoid
Consolidated total	**99.23%**	

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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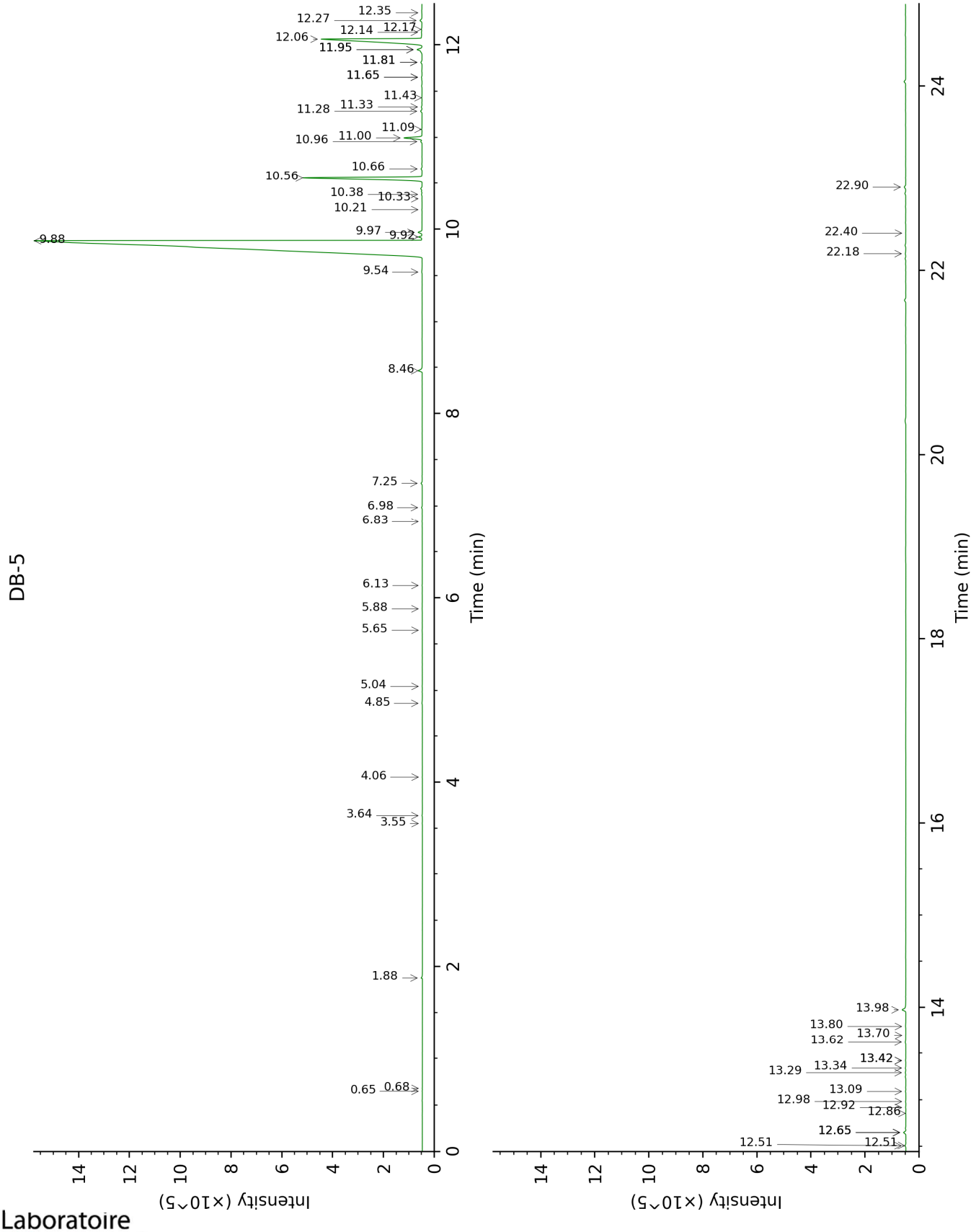
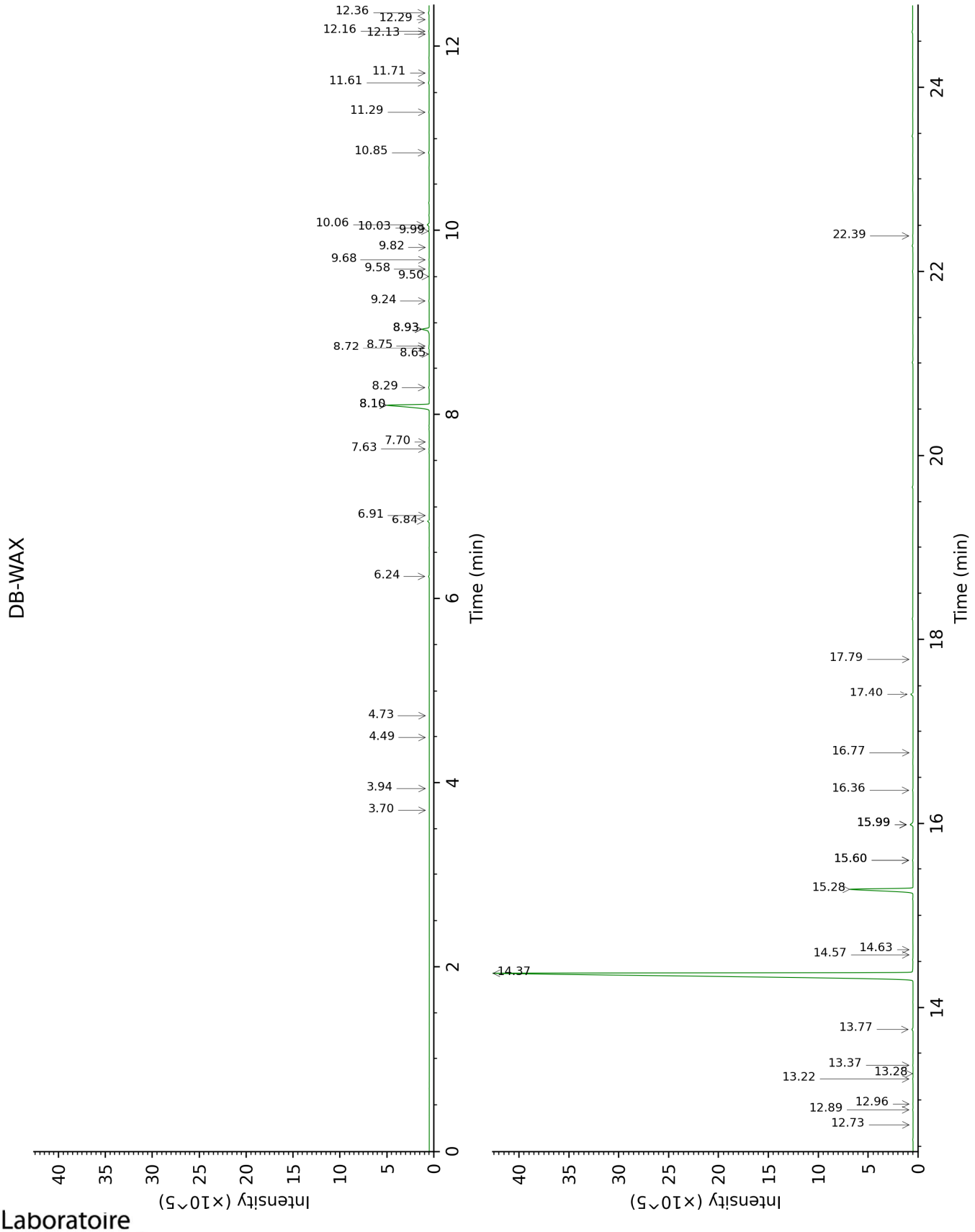

DB-5
12.35
12.27
12.14
12.17
12.06
11.95
11.81
11.65
11.43
11.28
11.33
11.09
10.96
11.00
10.66
10.56
10.38
10.33
10.21
9.97
9.92
9.88
9.54
8.46
7.25
6.98
6.83
6.13
5.88
5.65
5.04
4.85
4.06
3.64
3.55
1.88
0.65
0.68
Time (min)
Intensity (×10^5)
22.90
22.40
22.18
13.98
13.80
13.70
13.62
13.42
13.29
13.34
13.09
12.98
12.92
12.86
12.65
12.51
12.51
Time (min)
Intensity (×10^5)


DB-WAX
Intensity (×10^5)
Time (min)
12.36
12.29
12.16
12.13
11.71
11.61
11.29
10.85
10.06
10.03
9.99
9.82
9.68
9.58
9.50
9.24
8.93
8.72
8.75
8.65
8.29
8.10
7.70
7.63
6.91
6.84
6.24
4.73
4.49
3.94
3.70
22.39
17.79
17.40
16.77
16.36
15.99
15.60
15.28
14.63
14.57
14.37
13.77
13.37
13.28
13.22
12.96
12.89
12.73

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.65	641	0.01			
2-Methylbutyral	0.68	651	tr			
Furfural	1.88	829	0.05	6.24	1406	0.06
Benzaldehyde	3.55	954	0.01	6.91	1456	0.01
5-Methylfurfural	3.64	959	0.02	7.63	1511	0.03
6-Methyl-5-hepten-2-one	4.06	987	0.01	4.73	1302	tr
Benzyl alcohol	4.85	1037	0.04	11.29	1813	0.03
(*E*)-β-Ocimene	5.04	1049	0.01	3.70	1222	0.01
Terpinolene	5.65	1087	0.02	3.94	1240	0.01
Linalool	5.88	1102	0.02	7.70	1517	0.01
(*E*)-4,8-Dimethylnona-1,3,7-triene	6.14	1118	0.01	4.49	1283	0.01
Benzyl acetate	6.83	1162	0.01	9.58	1668	0.03
Menthol	6.98	1172	0.04	8.75	1599	0.03
Methyl salicylate	7.25	1188	0.06	10.02	1704	0.05
Chavicol	8.46	1269	0.22	15.99*	2269	0.33
Chavicyl acetate	9.54	1343	0.04	12.16	1892	0.04
Eugenol	9.88	1366	80.86	14.37	2102	80.58
Dihydroeugenol	9.92	1369	0.14	13.77	2043	0.12
α-Copaene	9.97	1373	0.19	6.84	1451	0.18
β-Elemene	10.21	1390	0.01	8.10*	1548	6.46
Vanillin	10.33	1398	0.01	17.79	2466	0.02
Methyleugenol	10.38	1402	0.03	12.89	1960	0.04
β-Caryophyllene	10.56	1415	6.50	8.10*	1548	[6.46]
Caryophylla-4(12),8(13)-diene	10.66	1423	0.05	8.29	1563	0.06
Unknown [m/z 91, 93 (92), 105 (79), 133 (70), 79 (70), 92 (65)... 204 (5)]	10.96	1445	0.06	8.72	1597	0.06
α-Humulene	11.00	1448	0.87	8.93*	1614	0.90
allo-Aromadendrene	11.09	1454	0.02	8.65	1592	0.02
trans-Cadina-1(6),4-diene	11.28	1469	0.07	8.93*	1614	[0.90]
γ-Muurolene	11.33	1472	0.03	9.24	1639	0.04
β-Selinene	11.43	1480	0.02	9.50	1661	0.01
(3*Z*,6*E*)-α-Farnesene	11.65*	1496	0.03	9.82	1687	0.01
α-Muurolene	11.65*	1496	[0.03]	9.68	1676	0.02
γ-Cadinene	11.81*	1508	0.06	9.99	1702	0.05
Cubebol	11.81*	1508	[0.06]	12.13	1889	0.01
δ-Cadinene	11.95*	1519	0.32	10.06	1707	0.21
trans-Calamenene	11.95*	1519	[0.32]	10.85	1775	0.06
Eugenyl acetate	12.06	1528	8.45	15.28	2194	8.35
Dihydroeugenyl acetate	12.14	1534	0.04			
α-Calacorene	12.17	1536	0.04	11.71	1851	0.02
Unknown [m/z 164, 135 (98), 93 (86), 107 (83), 79 (69)...]	12.26	1544	0.11	11.61	1842	0.08

Unknown [m/z 180, 93 (70), 55 (62), 77 (55), 164 (55), 103 (50)]	12.35	1550	0.01			
Caryophyllenyl alcohol	12.51*	1563	0.04	13.22	1991	0.04
(*E*)-Nerolidol	12.51*	1563	[0.04]	13.37	2004	0.03
Caryophyllene oxide	12.65*	1574	0.12	12.36	1910	0.09
Unknown [m/z 161, 187 (32), 105 (30), 205 (24)... 222 (3)]	12.65*	1574	[0.12]	14.57	2122	0.01
Caryophyllene oxide isomer	12.65*	1574	[0.12]	12.29	1903	0.02
Humulene epoxide I	12.86	1590	0.01	12.73	1944	0.02
Unknown [m/z 164, 93 (48), 43 (44), 91 (27), 55 (27)...]	12.92	1595	0.02			
Humulene epoxide II	12.98	1600	0.02	12.96	1965	0.02
(*E*)-Isoeugenyl acetate	13.09	1609	0.02	16.77	2353	0.01
Caryophylladienol I	13.29	1626	0.03	15.60*	2228	0.04
Caryophylladienol II	13.34	1630	0.03	15.60*	2228	[0.04]
τ-Muurolol	13.42*	1636	0.02	14.63	2128	0.01
Cubenol	13.42*	1636	[0.02]	13.28	1996	0.02
14-Hydroxy-(*Z*)-caryophyllene	13.62	1653	0.04	15.99*	2269	[0.33]
14-Hydroxy-9-epi-(*E*)-caryophyllene	13.70	1659	0.01	15.99*	2269	[0.33]
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	13.80	1667	0.02	16.36	2308	0.04
Trimethoxypropylbenzene analog	13.98	1682	0.22	17.40	2422	0.25
Unknown [m/z 326, 148 (67), 147 (41), 117 (30), 91 (22)...]	22.18	2501	0.04			
Unknown [m/z 326, 150 (54), 161 (42), 202 (41), 201 (28)]	22.40	2527	0.01			
Unknown [m/z 164, 165 (12), 55 (11), 81 (10), 69 (10), 95 (10)...]	22.90	2588	0.08			
(*E*)-Coniferyl alcohol				22.38	3042	0.05
Total identified		**98.87%**			**98.46%**	
Total reported		**99.19%**			**98.61%**	

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total
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