Date : July 17, 2020

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 20G16-PTH15
Customer identification : Clove Bud Organic - Indonesia - CH0109203R
Type : Essential oil
Source : *Syzygium aromaticum*
Customer : Plant Therapy

Analysis

Method: PC-MAT-014 ISO - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Fanny Charlier, B. Sc., chimiste à l'entraînement
Analysis date : July 16, 2020

Checked and approved by :

Alexis St-Gelais, M. Sc., chimiste 2013-174

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Laboratoire PhytoChemia
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PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid
Refractive index: 1.5358 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 3142:1997 - OIL OF CLOVE BUD

Compound	Min. %	Max. %	Observed %	Complies?
Eugenyl acetate	8	15	9	Yes
β-Caryophyllene	2	7	6	Yes
Eugenol	75	87	81	Yes
Refractive index	1.5280	1.5380	1.5358	Yes

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
Furfural	0.03	Furan
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Limonene	tr	Monoterpene
Terpinolene	tr	Monoterpene
Linalool	0.01	Monoterpenic alcohol
(*E*)-4,8-Dimethylnona-1,3,7-triene	0.01	Terpene derivative
Ethyl benzoate	tr	Phenolic ester
Methyl salicylate	0.10	Phenolic ester
Chavicol	0.09	Phenylpropanoid
α-Cubebene	0.03	Sesquiterpene
Eugenol	81.23	Phenylpropanoid
α-Copaene	0.22	Sesquiterpene
β-Bourbonene	0.02	Sesquiterpene
β-Elemene	0.03	Sesquiterpene
Isocaryophyllene	0.02	Sesquiterpene
Methyleugenol	0.06	Phenylpropanoid
β-Caryophyllene	5.52	Sesquiterpene
Caryophylla-4(12),8(13)-diene	0.03	Sesquiterpene
α-Humulene	0.73	Sesquiterpene
allo-Aromadendrene	0.02	Sesquiterpene
trans-Cadina-1(6),4-diene	0.03	Sesquiterpene
γ-Muurolene	0.02	Sesquiterpene
Germacrene D	0.01	Sesquiterpene
β-Selinene	0.01	Sesquiterpene
α-Muurolene	0.02	Sesquiterpene
γ-Cadinene	0.06	Sesquiterpene
trans-Calamenene	0.05	Sesquiterpene
δ-Cadinene	0.05	Sesquiterpene
Eugenyl acetate	9.26	Phenylpropanoid ester
α-Calacorene	0.04	Sesquiterpene
Unknown	0.09	Unknown
Unknown	0.01	Phenylpropanoid
Caryophyllenyl alcohol	0.01	Sesquiterpenic alcohol
Unknown	0.08	Oxygenated sesquiterpene
Caryophyllene oxide	0.39	Sesquiterpenic ether
Caryophyllene oxide isomer	0.02	Sesquiterpenic ether
Humulene epoxide I	0.02	Sesquiterpenic ether
Widdrol	0.03	Sesquiterpenic alcohol
Humulene epoxide II	0.06	Sesquiterpenic ether
(*E*)-Isoeugenyl acetate	0.02	Phenylpropanoid ester
1-epi-Cubenol	0.03	Sesquiterpenic alcohol
Caryophylladienol II	0.06	Sesquiterpenic alcohol
τ-Cadinol	0.02	Sesquiterpenic alcohol
α-Muurolol	0.01	Sesquiterpenic alcohol
Unknown	0.01	Sesquiterpenic alcohol

14-Hydroxy-(*Z*)-caryophyllene	0.11	Sesquiterpenic alcohol
14-Hydroxy-9-epi-(*E*)-caryophyllene	0.02	Sesquiterpenic alcohol
14-Hydroxy-(*E*)-caryophyllene	0.08	Sesquiterpenic alcohol
Trimethoxypropylbenzene analog	0.04	Phenylpropanoid
(*E*)-Coniferyl alcohol	0.05	Phenylpropanoid
Benzyl benzoate	0.02	Phenolic ester
Unknown	0.01	Oxygenated sesquiterpene
(*E*)-4-(3-Hydroxy-1-propenyl)-2-methoxyphenyl acetate	0.01	Phenylpropanoid ester
Unknown	0.01	Lignan
Unknown	0.02	Lignan
Squalene	0.04	Triterpene
Consolidated total	**99.01%**	

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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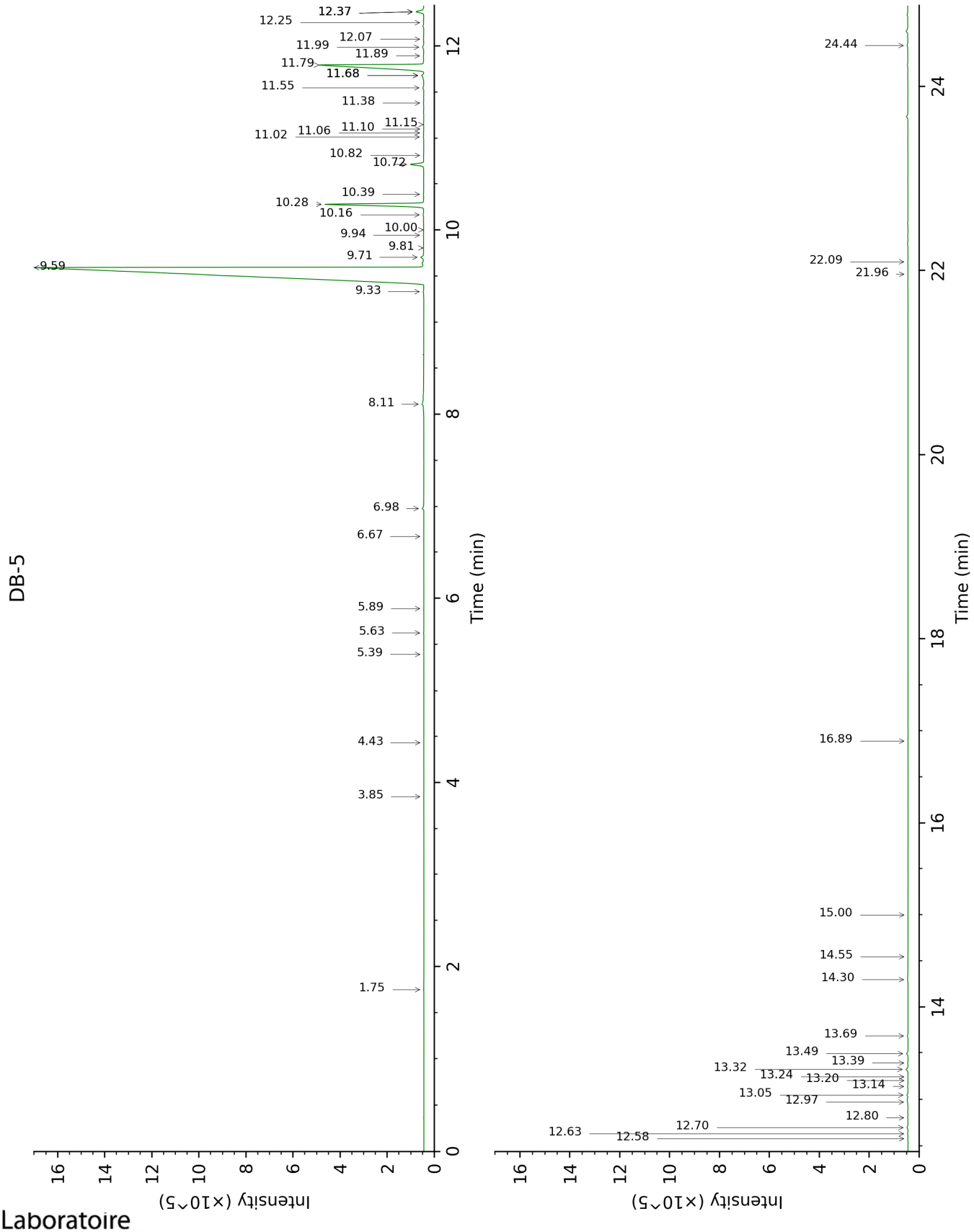
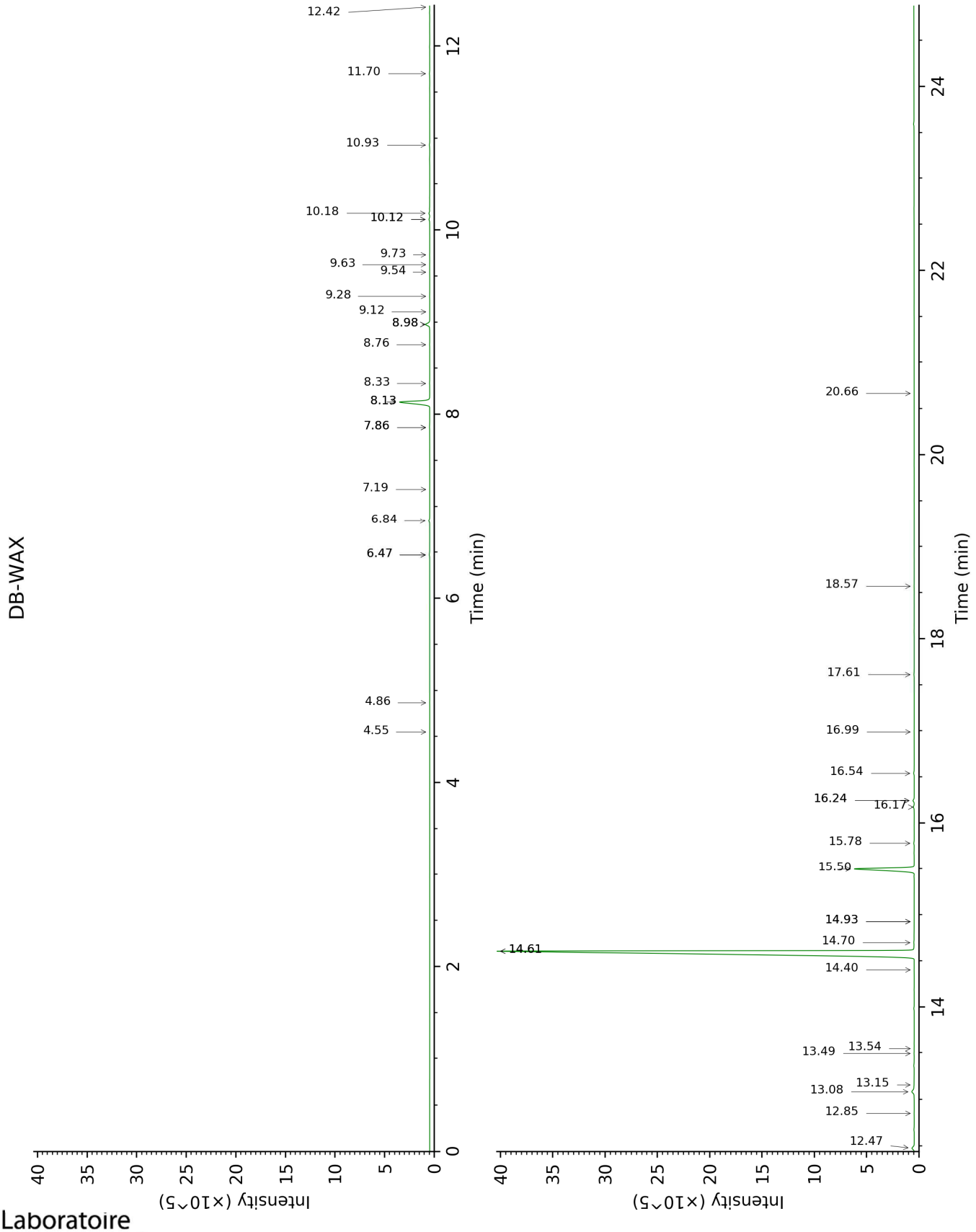

DB-5
12.37
12.25
12.07
11.99
11.89
11.79
11.68
11.55
11.38
11.15
11.10
11.06
11.02
10.82
10.72
10.39
10.28
10.16
10.00
9.94
9.81
9.71
9.59
9.33
8.11
6.98
6.67
5.89
5.63
5.39
4.43
3.85
1.75
Time (min)
Intensity (×10^5)
24.44
22.09
21.96
16.89
15.00
14.55
14.30
13.69
13.49
13.39
13.32
13.24
13.20
13.14
13.05
12.97
12.80
12.70
12.63
12.58
Time (min)
Intensity (×10^5)


DB-WAX
12.42
11.70
10.93
10.18
10.12
9.73
9.63
9.54
9.28
9.12
8.98
8.76
8.33
8.13
7.86
7.19
6.84
6.47
4.86
4.55
Time (min)
Intensity (×10^5)
20.66
18.57
17.61
16.99
16.54
16.24
16.17
15.78
15.50
14.93
14.70
14.61
14.40
13.54
13.49
13.15
13.08
12.85
12.47
Time (min)
Intensity (×10^5)

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Furfural	1.75	836	0.03	6.47*	1413	0.08
6-Methyl-5-hepten-2-one	3.85	987	0.01	4.86	1302	0.02
Limonene	4.43	1025	tr			
Terpinolene	5.39	1085	tr			
Linalool	5.63	1100	0.01	7.86*	1517	0.04
(*E*)-4,8-Dimethylnona-1,3,7-triene	5.89	1117	0.01	4.55	1278	0.01
Ethyl benzoate	6.67	1167	tr	9.12	1616	tr
Methyl salicylate	6.98	1188	0.10	10.18	1704	0.11
Chavicol	8.11	1264	0.09	16.24*	2274	0.17
α-Cubebene	9.33	1345	0.03	6.47*	1413	[0.08]
Eugenol	9.59	1364	81.23	14.61*	2106	81.08
α-Copaene	9.71	1372	0.22	6.84	1441	0.14
β-Bourbonene	9.81	1379	0.02	7.19	1466	0.01
β-Elemene	9.94	1388	0.03	8.13*	1539	5.48
Isocaryophyllene	10.00	1393	0.02	7.86*	1517	[0.04]
Methyleugenol	10.16	1404	0.06	13.16	1967	0.05
β-Caryophyllene	10.28	1413	5.52	8.13*	1539	[5.48]
Caryophylla-4(12),8(13)-diene	10.39	1421	0.03	8.33	1554	0.03
α-Humulene	10.72	1446	0.73	8.98*	1605	0.72
allo-Aromadendrene	10.82	1453	0.02	8.76	1588	0.02
trans-Cadina-1(6),4-diene	11.02	1468	0.03	8.98*	1605	[0.72]
γ-Muurolene	11.06	1471	0.02	9.28	1630	0.02
Germacrene D	11.10	1474	0.01	9.54	1651	0.01
β-Selinene	11.15	1478	0.01	9.63	1658	0.02
α-Muurolene	11.38	1495	0.02	9.73	1667	0.02
γ-Cadinene	11.55	1508	0.06	10.12*	1698	0.11
trans-Calamenene	11.68*	1518	0.13	10.93	1767	0.05
δ-Cadinene	11.68*	1518	[0.13]	10.12*	1698	[0.11]
Eugenyl acetate	11.79	1527	9.26	15.50	2196	9.23
α-Calacorene	11.89	1535	0.04			
Unknown [m/z 164, 135 (98), 93 (86), 107 (83), 79 (69)...]	11.99	1542	0.09	11.70	1835	0.05
Unknown [m/z 180, 93 (70), 55 (62), 77 (55), 164 (55), 103 (50)]	12.07	1549	0.01	20.66	2781	0.01
Caryophyllenyl alcohol	12.25	1563	0.01	13.49	1998	0.03
Unknown [m/z 161, 187 (32), 105 (30), 205 (24)... 222 (3)]	12.37*	1572	0.48	14.70	2116	0.08
Caryophyllene oxide	12.37*	1572	[0.48]	12.48	1904	0.39
Caryophyllene oxide isomer	12.37*	1572	[0.48]	12.42	1899	0.02
Humulene epoxide I	12.58	1589	0.02	12.85	1939	0.02
Widdrol	12.63	1593	0.03	14.40	2086	0.02
Humulene epoxide II	12.70	1598	0.06	13.08	1960	0.55

(*E*)-Isoeugenyl acetate	12.80	1607	0.02	16.99	2353	0.02
1-epi-Cubenol	12.97	1621	0.03	13.54	2004	0.01
Caryophylladienol II	13.05	1627	0.06	15.78	2225	0.06
τ-Cadinol	13.14	1635	0.02	14.61*	2106	[81.08]
α-Muurolol	13.20	1640	0.01	14.93*	2138	0.03
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109)40)... 204 (35), 222 (2)]	13.24	1643	0.01	14.93*	2138	[0.03]
14-Hydroxy-(*Z*)-caryophyllene	13.32	1650	0.11	16.17	2266	0.12
14-Hydroxy-9-epi-(*E*)-caryophyllene	13.39	1655	0.02	16.24*	2274	[0.17]
14-Hydroxy-(*E*)-caryophyllene	13.49	1664	0.08	16.54	2305	0.08
Trimethoxypropylbenzene analog	13.69	1680	0.04	17.61	2422	0.04
(*E*)-Coniferyl alcohol	14.30	1732	0.05			
Benzyl benzoate	14.55	1753	0.02	18.57	2530	0.02
Unknown [m/z 109, 123 (96), 127 (95), 55 (87), 81 (85), 41 (69)...220 (5)]	15.00	1793	0.01			
(*E*)-4-(3-Hydroxy-1-propenyl)-2-methoxyphenyl acetate	16.89	1967	0.01			
Unknown [m/z 326, 148 (67), 147 (41), 117 (30), 91 (22)...]	21.96	2507	0.01			
Unknown [m/z 326, 150 (54), 161 (42), 202 (41), 201 (28)]	22.10	2523	0.02			
Squalene	24.44	2817	0.04			
Total identified		**98.87%**			**98.82%**	
Total reported		**99.02%**			**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