PLANT THERAPY
100% PURE ESSENTIAL OILS

GC/MS BATCH NUMBER: CG0105

ESSENTIAL OIL: CLOVE BUD
BOTANICAL NAME: SYZGIUM AROMATICUM
ORIGIN: INDONESIA

KEY CONSTITUENTS PRESENT IN THIS BATCH OF CLOVE BUD OIL	%
EUGENOL	80.3
EUGENYL ACETATE	9.6
β-CARYOPHYLLENE	6.7
α-HUMULENE	1.1

Comments from Robert Tisserand: Rich, sweet-spicy odor profile. All three key ISO constituents are within range.

Date : August 17, 2018

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 18H09-PTH10-1-DM
Customer identification : Clove Bud - Indonesia - CG010584R
Type : Essential oil
Source : *Syzygium aromaticum*
Customer : Plant Therapy

Analysis

Method: PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Sarah-Eve Tremblay, M. Sc. A., Chimiste
Analysis date : August 13, 2018

Checked and approved by :

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

Note: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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

Laboratoire PhytoChemia
628 Boulevard du Saguenay Ouest, Saguenay (Qc) G7J 1H4 | www.phytochemia.com

PHYSICOCHEMICAL DATA

Physical aspect: Faintly yellow liquid
Refractive index: 1.5340 ± 0.0003 (20 °C)

CONCLUSION

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

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Isovaleral	tr		Aliphatic aldehyde
Furfural	0.01		Aliphatic alcohol
Benzaldehyde	tr		Simple phenolic
6-Methyl-5-hepten-2-one	tr	tr	Aliphatic ketone
Limonene	tr	tr	Monoterpene
Benzyl alcohol	tr		Simple phenolic
(*E*)-β-Ocimene	tr		Monoterpene
Linalool	0.01	0.01	Monoterpenic alcohol
(*E*)-4,8-Dimethylnona-1,3,7-triene	0.01	0.01	Terpene derivative
Ethyl benzoate	tr	1.14*	Phenolic ester
Methyl salicylate	0.05	0.05	Phenolic ester
Chavicol	0.09	0.10*	Phenylpropanoid
Eugenol	80.26	80.50	Phenylpropanoid
Dihydroeugenol	0.14	0.13	Phenylpropanoid
α-Copaene	0.14	0.11	Sesquiterpene
β-Bourbonene	tr	tr	Sesquiterpene
1,5-diepi-β-Bourbonene	tr		Sesquiterpene
Vanillin	0.01		Simple phenolic
Methyleugenol	0.03	0.03	Phenylpropanoid
β-Caryophyllene	6.74	6.68	Sesquiterpene
Caryophylla-4(12),8(13)-diene	0.01	0.01	Sesquiterpene
9-epi-Isocaryophyllene	0.01	0.01	Sesquiterpene
α-Humulene	1.14	[1.14]*	Sesquiterpene
allo-Aromadendrene	0.01	0.02	Sesquiterpene
trans-Cadina-1(6),4-diene	0.03	[1.14]*	Sesquiterpene
γ-Muurolene	0.01	0.02	Sesquiterpene
Germacrene D	0.01	tr	Sesquiterpene
β-Selinene	0.02	0.01	Sesquiterpene
α-Selinene	0.02	0.02	Sesquiterpene
α-Muurolene	0.02	0.02	Sesquiterpene
γ-Cadinene	0.07*	0.06	Sesquiterpene
Cubebol	[0.07]*	0.01	Sesquiterpenic alcohol
trans-Calamenene	0.04	0.05	Sesquiterpene
β-Sesquiphellandrene	0.14*	0.02	Sesquiterpene
δ-Cadinene	[0.14]*	0.12	Sesquiterpene
Eugenyl acetate	9.62	9.58	Phenylpropanoid ester
α-Calacorene	0.02	0.01	Sesquiterpene
Unknown	0.08	0.04	Unknown
Unknown	0.02		Phenylpropanoid
(*E*)-Nerolidol	0.03	0.03	Sesquiterpenic alcohol
Caryophyllene oxide	0.38*	0.31	Sesquiterpenic ether
Caryophyllene oxide isomer	[0.38]*	0.03	Sesquiterpenic ether
Unknown	0.02	0.02	Oxygenated sesquiterpene
Unknown	tr		Unknown
Humulene epoxide I	0.01	0.01	Sesquiterpenic ether
Widdrol	0.01		Sesquiterpenic alcohol
Humulene epoxide II	0.04	0.05	Sesquiterpenic ether
(*E*)-Isoeugenyl acetate	tr	0.01	Phenylpropanoid ester

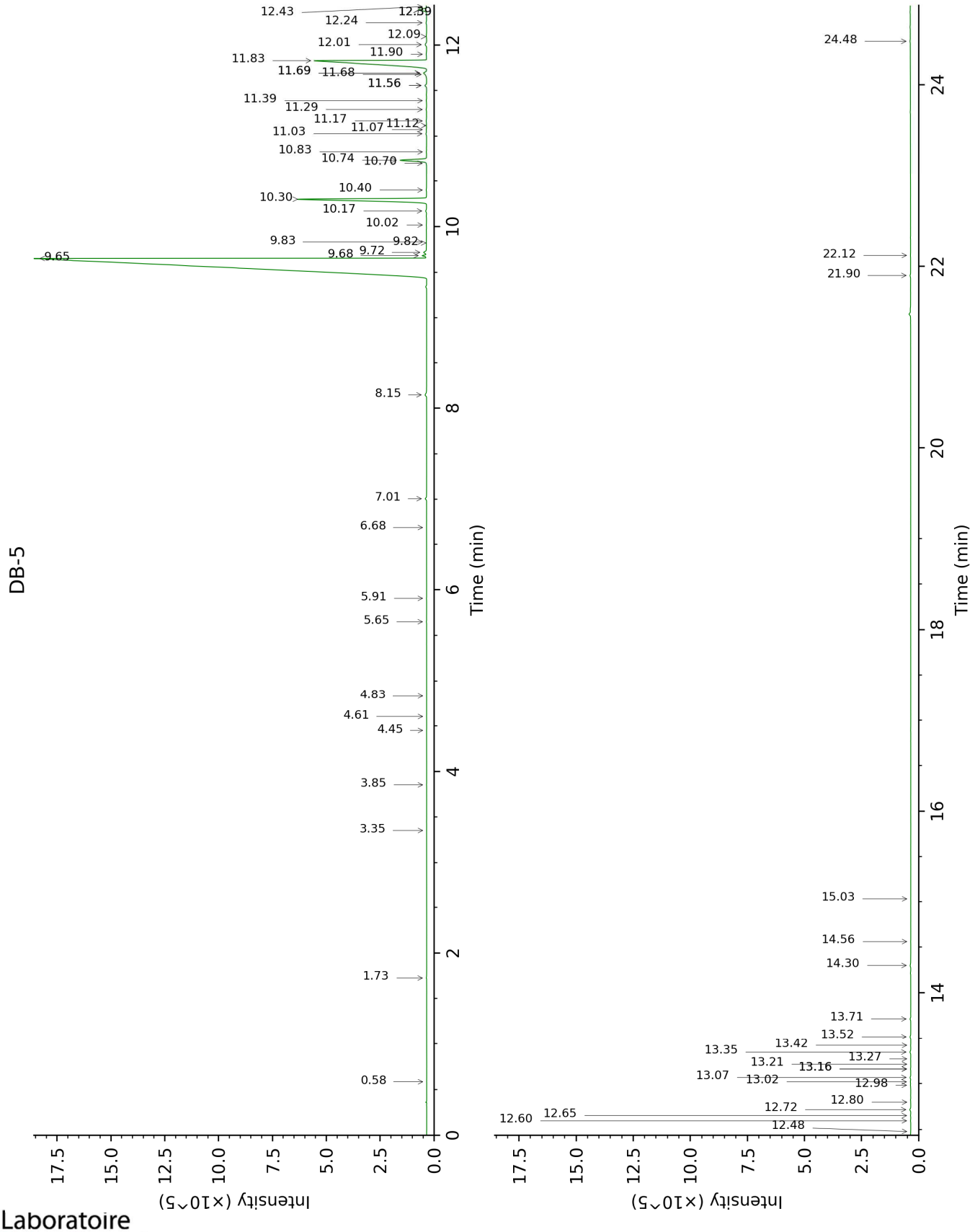
1-epi-Cubenol	0.02	0.01	Sesquiterpenic alcohol
Caryophylladienol I	0.02	0.01	Sesquiterpenic alcohol
Caryophylladienol II	0.03	0.03	Sesquiterpenic alcohol
τ-Cadinol	0.01*	0.11	Sesquiterpenic alcohol
τ-Muurolol	[0.01]*	tr	Sesquiterpenic alcohol
α-Muurolol	tr	0.01*	Sesquiterpenic alcohol
Unknown	0.01	[0.01]*	Sesquiterpenic alcohol
14-Hydroxy-(*Z*)-caryophyllene	0.04	0.06	Sesquiterpenic alcohol
14-Hydroxy-9-epi-(*E*)-caryophyllene	0.01	[0.10]*	Sesquiterpenic alcohol
14-Hydroxy-(*E*)-caryophyllene	0.04	0.04	Sesquiterpenic alcohol
Germacra-4(15),5,10(14)-trien-1α-ol	0.03	0.01	Sesquiterpenic alcohol
(*E*)-Coniferyl alcohol	0.04		Phenylpropanoid
Benzyl benzoate	0.01	0.01	Phenolic ester
Unknown	tr		Oxygenated sesquiterpene
Unknown	0.03		Lignan
Unknown	0.01		Lignan
Squalene	0.02	0.03	Triterpene
Total identified	**99.44%**	**99.47%**	

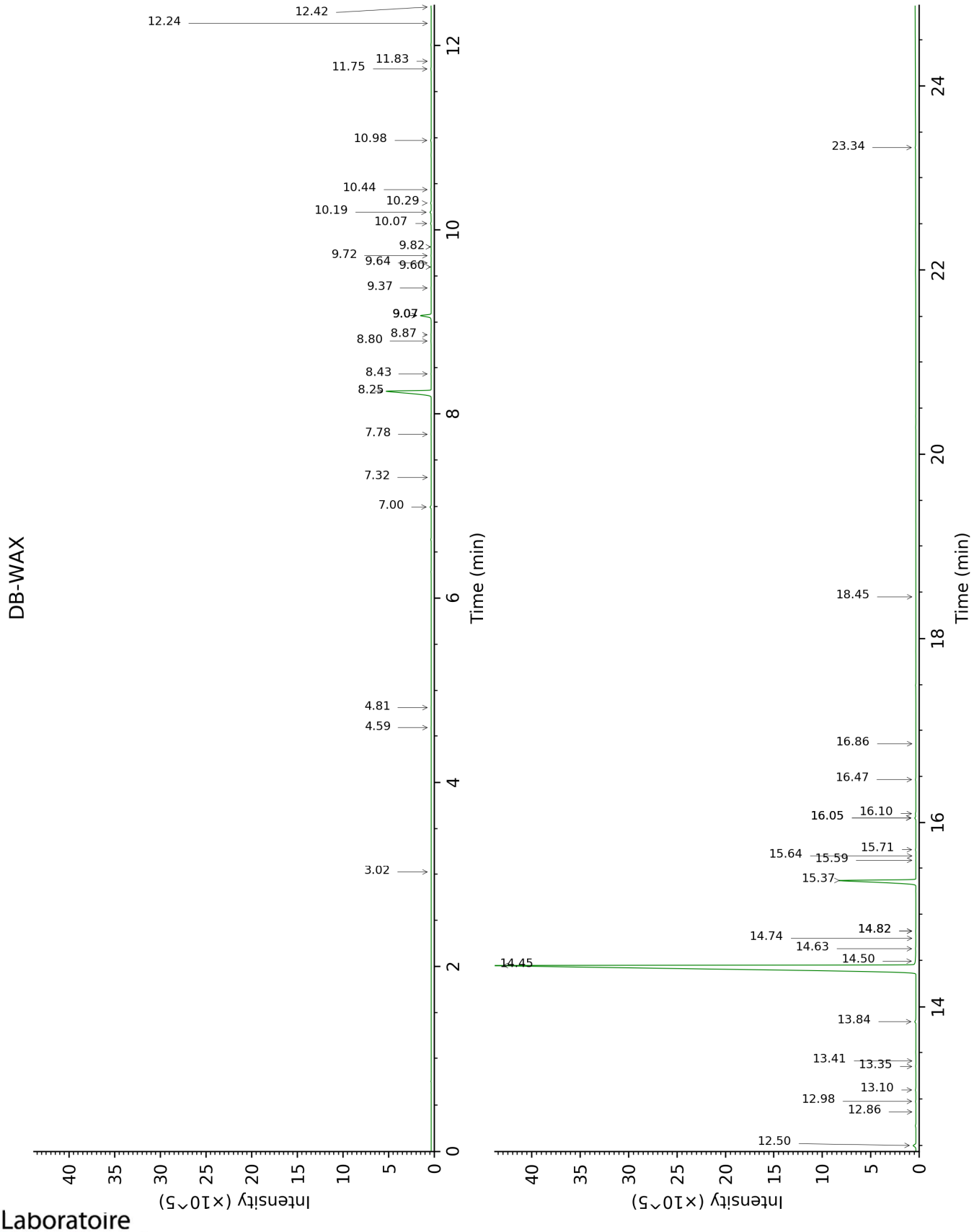
*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

This page was intentionally left blank. The following pages present the complete data of the analysis.

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com


DB-5
12.43
12.39
12.24
12.09
12.01
11.90
11.83
11.69
11.68
11.56
11.39
11.29
11.17
11.12
11.07
11.03
10.83
10.74
10.70
10.40
10.30
10.17
10.02
9.83
9.82
9.72
9.68
9.65
8.15
7.01
6.68
5.91
5.65
4.83
4.61
4.45
3.85
3.35
1.73
0.58
Time (min)
Intensity (×10^5)
24.48
22.12
21.90
15.03
14.56
14.30
13.71
13.52
13.42
13.35
13.27
13.21
13.16
13.07
13.02
12.98
12.80
12.72
12.65
12.60
12.48
Time (min)
Intensity (×10^5)


DB-WAX
12.42
12.24
11.83
11.75
10.98
10.44
10.29
10.19
10.07
9.82
9.72
9.64
9.60
9.37
9.07
8.87
8.80
8.43
8.25
7.78
7.32
7.00
4.81
4.59
3.02
Time (min)
Intensity (×10^5)
23.34
18.45
16.86
16.47
16.10
16.05
15.71
15.64
15.59
15.37
14.82
14.74
14.63
14.50
14.45
13.84
13.41
13.35
13.10
12.98
12.86
12.50
Time (min)
Intensity (×10^5)

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.58	640	tr			
Furfural	1.73	827	0.01			
Benzaldehyde	3.35	952	tr			
6-Methyl-5-hepten-2-one	3.85	986	tr	4.81	1290	tr
Limonene	4.45	1024	tr	3.02	1158	tr
Benzyl alcohol	4.60	1034	tr			
(*E*)-β-Ocimene	4.83	1048	tr			
Linalool	5.65	1100	0.01	7.78	1513	0.01
(*E*)-4,8-Dimethylnona-1,3,7-triene	5.91	1117	0.01	4.59	1275	0.01
Ethyl benzoate	6.68	1166	tr	9.07*	1614	1.14
Methyl salicylate	7.01	1187	0.05	10.29	1717	0.05
Chavicol	8.15	1263	0.09	16.05*	2267	0.10
Eugenol	9.65	1367	80.26	14.45	2103	80.50
Dihydroeugenol	9.68	1369	0.14	13.84	2043	0.13
α-Copaene	9.72	1372	0.14	7.00	1452	0.11
β-Bourbonene	9.82	1379	tr	7.32	1477	tr
1,5-diepi-β-Bourbonene	9.83	1380	tr			
Vanillin	10.02	1393	0.01			
Methyleugenol	10.17	1404	0.03	12.98	1960	0.03
β-Caryophyllene	10.30	1414	6.74	8.25	1547	6.68
Caryophylla-4(12),8(13)-diene	10.40	1421	0.01	8.43	1562	0.01
9-epi-Isocaryophyllene	10.70	1444	0.01	8.87	1597	0.01
α-Humulene	10.74	1446	1.14	9.07*	1614	[1.14]
allo-Aromadendrene	10.83	1453	0.01	8.80	1592	0.02
trans-Cadina-1(6),4-diene	11.03	1468	0.03	9.07*	1614	[1.14]
γ-Muurolene	11.07	1471	0.01	9.37	1639	0.02
Germacrene D	11.12	1475	0.01	9.60	1659	tr
β-Selinene	11.17	1478	0.02	9.64	1662	0.01
α-Selinene	11.29	1488	0.02	9.72	1669	0.02
α-Muurolene	11.39	1495	0.02	9.82	1677	0.02
γ-Cadinene	11.56*	1508	0.07	10.07	1698	0.06
Cubebol	11.56*	1508	[0.07]	12.24	1892	0.01
trans-Calamenene	11.68	1517	0.04	10.98	1777	0.05
β-Sesquiphellandrene	11.69*	1519	0.14	10.44	1730	0.02
δ-Cadinene	11.69*	1519	[0.14]	10.19	1709	0.12
Eugenyl acetate	11.83	1529	9.62	15.37	2196	9.58
α-Calacorene	11.90	1535	0.02	11.83	1854	0.01
Unknown [m/z 164, 135 (98), 93 (86),	12.01	1543	0.08	11.75	1846	0.04

107 (83), 79 (69)...]						
Unknown [m/z 180, 93 (70), 55 (62), 77 (55), 164 (55), 103 (50)]	12.09	1550	0.02			
(*E*)-Nerolidol	12.24	1562	0.03	13.35	1996	0.03
Caryophyllene oxide	12.39*	1573	0.38	12.50	1915	0.31
Caryophyllene oxide isomer	12.39*	1573	[0.38]	12.42	1908	0.03
Unknown [m/z 161, 187 (32), 105 (30), 205 (24)... 222 (3)]	12.42	1576	0.02	14.63	2121	0.02
Unknown [m/z 151, 178 (54), 123 (20), 55 (13), 161 (11), 77 (10)...]	12.48	1580	tr			
Humulene epoxide I	12.60	1589	0.01	12.86	1949	0.01
Widdrol	12.65	1594	0.01			
Humulene epoxide II	12.72	1599	0.04	13.10	1972	0.05
(*E*)-Isoeugenyl acetate	12.80	1606	tr	16.86	2353	0.01
1-epi-Cubenol	12.98	1621	0.02	13.41	2002	0.01
Caryophylladienol I	13.02	1624	0.02	15.64	2224	0.01
Caryophylladienol II	13.07	1628	0.03	15.71	2231	0.03
τ-Cadinol	13.16*	1636	0.01	14.50	2108	0.11
τ-Muurolol	13.16*	1636	[0.01]	14.74	2132	tr
α-Muurolol	13.21	1640	tr	14.82*	2140	0.01
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109)40)... 204 (35), 222 (2)]	13.27	1645	0.01	14.82*	2140	[0.01]
14-Hydroxy-(*Z*)-caryophyllene	13.34	1651	0.04	16.10	2272	0.06
14-Hydroxy-9-epi-(*E*)-caryophyllene	13.42	1657	0.01	16.05*	2267	[0.10]
14-Hydroxy-(*E*)-caryophyllene	13.52	1665	0.04	16.47	2311	0.04
Germacra-4(15),5,10(14)-trien-1α-ol	13.71	1681	0.03	15.59	2219	0.01
(*E*)-Coniferyl alcohol	14.30	1731	0.04			
Benzyl benzoate	14.56	1754	0.01	18.45	2531	0.01
Unknown [m/z 109, 123 (96), 127 (95), 55 (87), 81 (85), 41 (69)...220 (5)]	15.03	1795	tr			

Unknown [m/z 326, 148 (67), 147 (41), 117 (30), 91 (22)...]	21.90	2502	0.03			
Unknown [m/z 326, 150 (54), 161 (42), 202 (41), 201 (28)]	22.12	2529	0.01			
Squalene	24.48	2827	0.02	23.34	3140	0.03
Total identified		**99.44%**			**99.47%**	
Total reported		**99.62%**			**99.54%**	

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