

**Date :** March 30, 2020

**CERTIFICATE OF ANALYSIS – GC PROFILING**

*SAMPLE IDENTIFICATION*

**Internal code :** 20C27-PTH01

**Customer identification :** Clove Bud Organic - Indonesia - CH010894R

**Type :** Essential oil

**Source :** *Syzygium aromaticum*

**Customer :** Plant Therapy

*ANALYSIS*

**Method:** PC-MAT-007 - 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.

**Analysis date :** March 30, 2020

Checked and approved by :

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

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*PHYSICOCHEMICAL DATA*

**Physical aspect:** Faintly yellow liquid

**Refractive index:** 1.5345 ± 0.0003 (20 °C)

*ISO 3142:1997 - OIL OF CLOVE BUD*

<b>Compound</b>	<b>Min. %</b>	<b>Max. %</b>	<b>Observed %</b>	<b>Complies?</b>
Eugenyl acetate	8	15	9	Yes
β-Caryophyllene	2	7	7	Yes
Eugenol	75	87	81	Yes
<b>Refractive index</b>	1.5280	1.5380	1.5345	Yes

*CONCLUSION*

No adulterant, contaminant or diluent has been detected using this method. The oil complies with the ISO standard for clove bud oil.

## ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

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

Identification	%	Classe
Acetone	tr	Aliphatic ketone
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Furfural	tr	Furan
Linalool	0.01	Monoterpenic alcohol
(E)-4,8-Dimethylnona-1,3,7-triene	tr	Terpene derivative
Methyl salicylate	0.05	Phenolic ester
Chavicol	0.10	Phenylpropanoid
$\alpha$ -Cubebene	0.04	Sesquiterpene
Eugenol	80.75	Phenylpropanoid
Dihydroeugenol	0.11	Phenylpropanoid
$\alpha$ -Copaene	0.16	Sesquiterpene
Vanillin	0.02	Simple phenolic
Isocaryophyllene	0.02	Sesquiterpene
Methyleugenol	0.02	Phenylpropanoid
$\beta$ -Caryophyllene	7.35	Sesquiterpene
Caryophylla-4(12),8(13)-diene	0.03	Sesquiterpene
9-epi-Isocaryophyllene	0.01	Sesquiterpene
$\alpha$ -Humulene	0.53	Sesquiterpene
(E)-Isoeugenol	0.05	Phenylpropanoid
allo-Aromadendrene	0.04	Sesquiterpene
trans-Cadina-1(6),4-diene	0.04	Sesquiterpene
$\gamma$ -Murolene	0.02	Sesquiterpene
$\beta$ -Selinene	0.02	Sesquiterpene
$\delta$ -Selinene	0.01	Sesquiterpene
$\alpha$ -Selinene	0.02	Sesquiterpene
(3Z,6E)- $\alpha$ -Farnesene	0.01	Sesquiterpene
$\alpha$ -Murolene	0.01	Sesquiterpene
$\gamma$ -Cadinene	0.09	Sesquiterpene
trans-Calamenene	0.05	Sesquiterpene
$\delta$ -Cadinene	0.16	Sesquiterpene
Eugenyl acetate	9.12	Phenylpropanoid ester
$\alpha$ -Calacorene	0.04	Sesquiterpene
Unknown	0.05	Unknown
Unknown	0.02	Phenylpropanoid
Caryophyllenyl alcohol	0.03	Sesquiterpenic alcohol
Caryophyllene oxide	0.18	Sesquiterpenic ether
Caryophyllene oxide isomer	0.03	Sesquiterpenic ether
Unknown	0.08	Oxygenated sesquiterpene
Humulene epoxide I	0.01	Sesquiterpenic ether
Humulol	0.02	Sesquiterpenic alcohol
Humulene epoxide II	0.02	Sesquiterpenic ether
1-epi-Cubenol	0.04	Sesquiterpenic alcohol
1,10-diepi-Cubenol	tr	Sesquiterpenic alcohol
Caryophylladienol I	0.02	Sesquiterpenic alcohol
Caryophylladienol II	0.03	Sesquiterpenic alcohol
$\tau$ -Cadinol	0.01	Sesquiterpenic alcohol

τ-Muurolol	0.03	Sesquiterpenic alcohol
α-Muurolol	0.02	Sesquiterpenic alcohol
Unknown	0.02	Sesquiterpenic alcohol
α-Cadinol	0.02	Sesquiterpenic alcohol
14-Hydroxy-(Z)-caryophyllene	0.06	Sesquiterpenic alcohol
14-Hydroxy-9-epi-(E)-caryophyllene	0.01	Sesquiterpenic alcohol
14-Hydroxy-(E)-caryophyllene	0.06	Sesquiterpenic alcohol
(E)-Coniferyl alcohol	0.01	Phenylpropanoid
(E)-4-(3-Hydroxy-1-propenyl)-2-methoxyphenyl acetate	0.01	Phenylpropanoid ester
Unknown	0.02	Lignan
Unknown	0.01	Lignan
Squalene	0.03	Triterpene
<b>Consolidated total</b>	<b>99.70%</b>	

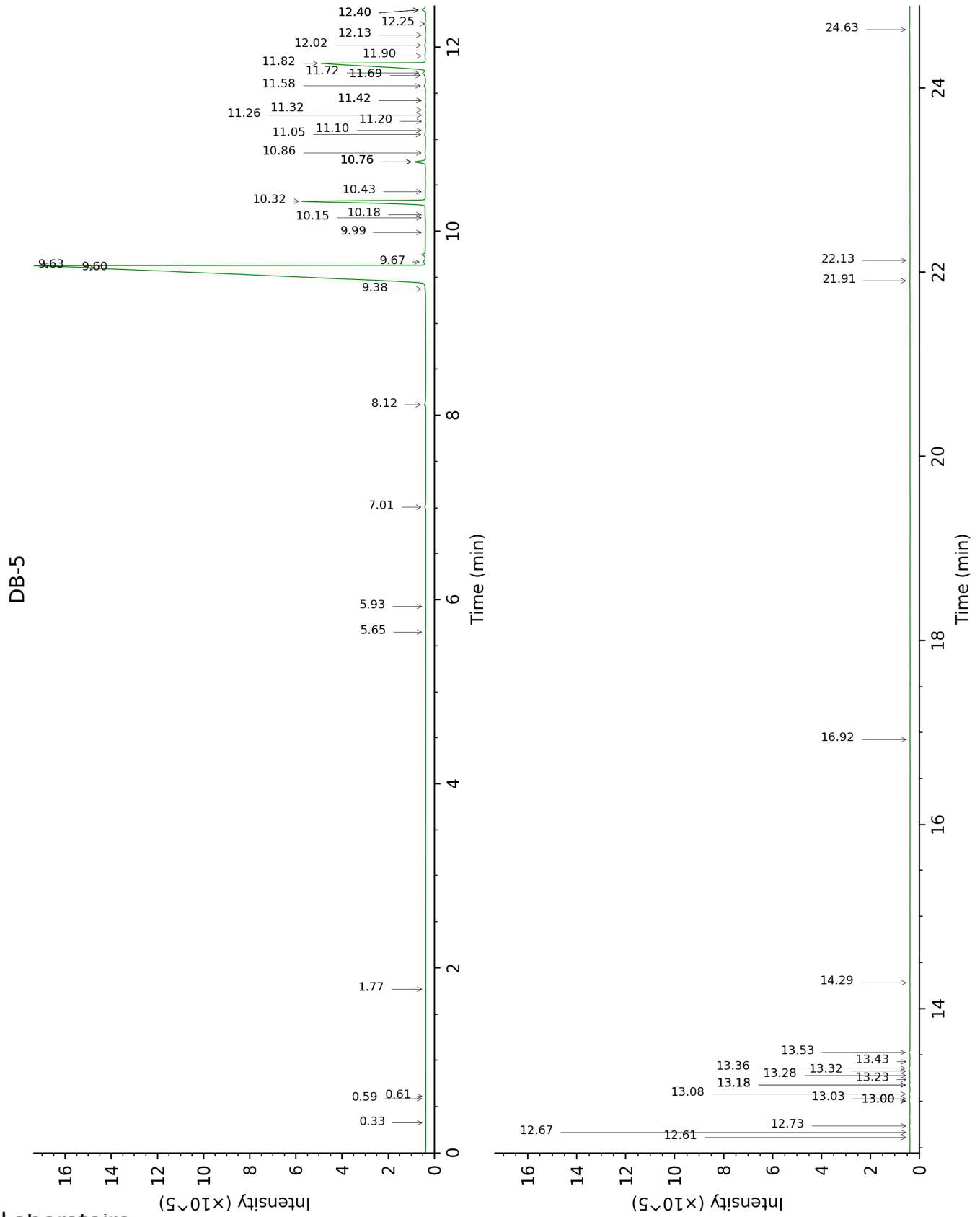
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

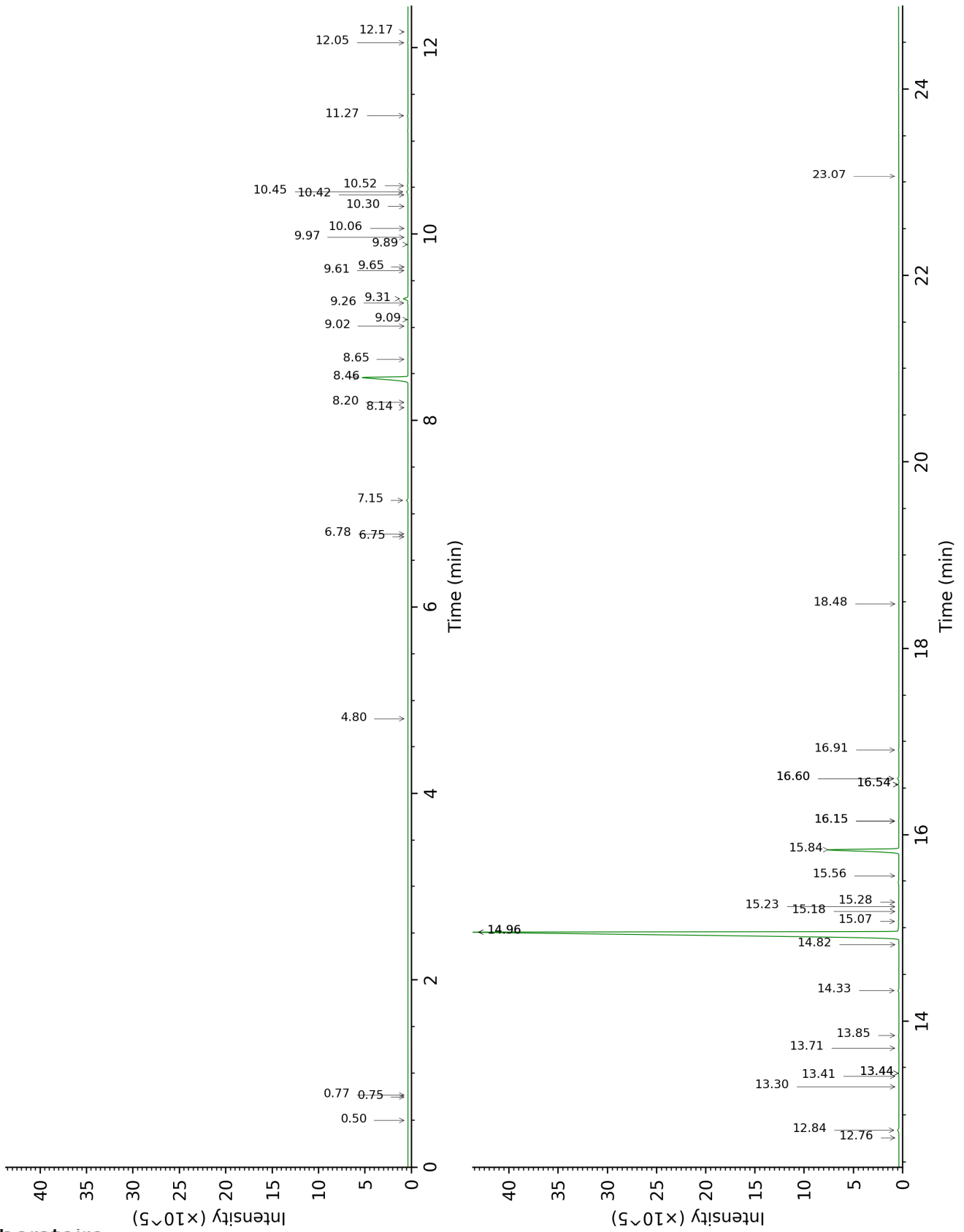
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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-WAX



FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Acetone	0.33	522	tr	0.50	786	tr
Isovaleral	0.59	640	tr	0.77	892	tr
2-Methylbutyral	0.61	651	tr	0.75	884	tr
Furfural	1.77	834	tr	6.75	1414	0.02
Linalool	5.65	1100	0.01	8.14	1518	0.01
(E)-4,8-Dimethylnona-1,3,7-triene	5.93	1118	tr	4.80	1274	0.01
Methyl salicylate	7.01	1189	0.05	10.52	1707	0.08
Chavicol	8.12	1265	0.10	16.60*	2276	0.15
α-Cubebene	9.38	1348	0.04	6.78	1417	0.03
Eugenol	9.60†	1364	81.02	14.96*	2108	80.63
Dihydroeugenol	9.63†	1366	[81.02]	14.33	2048	0.11
α-Copaene	9.67†	1368	[81.02]	7.15	1444	0.16
Vanillin	9.99	1391	0.02	18.48	2480	0.01
Isocaryophyllene	10.15	1402	0.02	8.20	1522	0.02
Methyleugenol	10.18	1404	0.02	13.41	1961	0.02
β-Caryophyllene	10.32	1415	7.35	8.46	1543	7.15
Caryophylla-4(12),8(13)-diene	10.43	1423	0.03	8.65	1558	0.02
9-epi-Isocaryophyllene	10.76*	1448	0.59	9.09	1591	0.01
α-Humulene	10.76*	1448	[0.59]	9.31	1609	0.53
(E)-Isoeugenol	10.76*	1448	[0.59]	16.54*	2269	0.06
allo-Aromadendrene	10.86	1455	0.04	9.02	1586	0.02
trans-Cadina-1(6),4-diene	11.05	1470	0.04	9.26	1605	0.05
γ-Murolene	11.10	1473	0.02	9.61	1633	0.01
β-Selinene	11.20	1480	0.02	9.89	1656	0.02
δ-Selinene	11.26	1485	0.01	9.65	1636	tr
α-Selinene	11.32	1489	0.02	9.97	1662	0.01
(3Z,6E)-α-Farnesene	11.42*	1497	0.02	10.30	1688	0.01
α-Murolene	11.42*	1497	[0.02]	10.06	1670	0.01
γ-Cadinene	11.58	1509	0.09	10.42	1699	0.03
trans-Calamenene	11.69	1518	0.05	11.27	1771	0.06
δ-Cadinene	11.72	1520	0.16	10.45	1702	0.15
Eugenyl acetate	11.82	1528	9.12	15.84	2197	9.03
α-Calacorene	11.90	1534	0.04	12.17	1849	0.01
Unknown [m/z 164, 135 (98), 93 (86), 107 (83), 79 (69)...]	12.02	1544	0.05	12.05	1838	0.04
Unknown [m/z 180, 93 (70), 55 (62), 77 (55), 164 (55), 103 (50)]	12.13	1552	0.02			



Caryophyllenyl alcohol	12.25	1562	0.03	13.71	1989	0.03
Caryophyllene oxide	12.40*	1574	0.21	12.84	1908	0.18
Caryophyllene oxide isomer	12.40*	1574	[0.21]	12.76	1901	0.03
Unknown [m/z 161, 187 (32), 105 (30), 205 (24)... 222 (3)]	12.40*	1574	[0.21]	15.07	2120	0.08
Humulene epoxide I	12.61	1590	0.01	13.30	1951	0.02
Humulol	12.67	1594	0.02	14.82	2095	0.02
Humulene epoxide II	12.74	1600	0.02	13.44*	1964	0.03
1-epi-Cubenol	13.00*	1622	0.04	13.85	2002	0.04
1,10-diepi-Cubenol	13.00*	1622	[0.04]	13.44*	1964	[0.03]
Caryophylladienol I	13.03	1624	0.02	16.15*	2229	0.04
Caryophylladienol II	13.08	1628	0.03	16.15*	2229	[0.04]
τ-Cadinol	13.18*	1636	0.04	14.96*	2108	[80.63]
τ-Muurolol	13.18*	1636	[0.04]	15.18	2130	0.03
α-Muurolol	13.23	1641	0.02	15.28	2140	0.05
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109 )40)... 204 (35), 222 (2)]	13.28	1644	0.02	15.23	2136	0.01
α-Cadinol	13.32	1648	0.02	15.56	2169	0.05
14-Hydroxy-(Z)-caryophyllene	13.36	1651	0.06	16.60*	2276	[0.15]
14-Hydroxy-9-epi-(E)-caryophyllene	13.42	1656	0.01	16.54*	2269	[0.06]
14-Hydroxy-(E)-caryophyllene	13.52	1665	0.06	16.91	2308	0.06
(E)-Coniferyl alcohol	14.28	1729	0.01	23.07	3051	0.02
(E)-4-(3-Hydroxy-1-propenyl)-2-methoxyphenyl acetate	16.92	1969	0.01			
Unknown [m/z 326, 148 (67), 147 (41), 117 (30), 91 (22)...]	21.91	2504	0.02			
Unknown [m/z 326, 150 (54), 161 (42), 202 (41), 201 (28)]	22.13	2530	0.01			

Squalene	24.63	2850	0.03	
<b>Total identified</b>		<b>99.51%</b>		<b>99.00%</b>
<b>Total reported</b>		<b>99.63%</b>		<b>99.14%</b>

\*: 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