

Date : June 27, 2019

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 19F26-PTH06-1-SCC

Customer identification : Clove Bud Org - CH0106811R

Type : Essential oil

Source : *Syzygium aromaticum*

Customer : Plant Therapy

ANALYSIS

Method: PC-PA-014 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Lindsay Girard, B. Sc.

Analysis date : June 27, 2019

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Light yellow viscous liquid

Refractive index: 1.5343 ± 0.0003 (20 °C)

ISO 3142:1997 - OIL OF CLOVE BUD

Compound	Min. %	Max. %	Observed %	Complies?
Eugenyl acetate	8	15	14	Yes
β-Caryophyllene	2	7	4	Yes
Eugenol	75	87	78	Yes
Refractive index	1.5280	1.5380	1.5343	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
Isobutyral	tr	Aliphatic aldehyde
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Furfural	0.03	Aliphatic alcohol
α -Pinene	0.01	Monoterpene
5-Methylfurfural	0.01	Furan
6-Methyl-5-hepten-2-one	0.01	Aliphatic ketone
Limonene	0.02*	Monoterpene
1,8-Cineole	[0.02]*	Monoterpenic ether
(E)- β -Ocimene	0.01	Monoterpene
Terpinolene	0.01	Monoterpene
Linalool	0.02	Monoterpenic alcohol
(E)-4,8-Dimethylnona-1,3,7-triene	0.01	Terpene derivative
Methyl salicylate	0.20	Phenolic ester
Chavicol	0.19	Phenylpropanoid
α -Cubebene	0.01	Sesquiterpene
Eugenol	78.44	Phenylpropanoid
Dihydroeugenol	0.59	Phenylpropanoid
α -Copaene	0.05	Sesquiterpene
Isocaryophyllene	0.05	Sesquiterpene
Methyleugenol	tr	Phenylpropanoid
β -Caryophyllene	3.57	Sesquiterpene
Caryophylla-4(12),8(13)-diene	0.01	Sesquiterpene
9-epi-Isocaryophyllene	0.10	Sesquiterpene
α -Humulene	0.48	Sesquiterpene
allo-Aromadendrene	0.01	Sesquiterpene
trans-Cadina-1(6),4-diene	0.01	Sesquiterpene
γ -Muuroolene	0.01	Sesquiterpene
β -Selinene	0.01	Sesquiterpene
α -Muuroolene	0.06	Sesquiterpene
γ -Cadinene	0.05	Sesquiterpene
trans-Calamenene	0.01	Sesquiterpene
δ -Cadinene	0.02	Sesquiterpene
Eugenyl acetate	13.55	Phenylpropanoid ester
Unknown	0.07	Unknown
Unknown	0.01	Phenylpropanoid
Caryophyllenyl alcohol	0.03	Sesquiterpenic alcohol
Caryophyllene oxide	0.52	Sesquiterpenic ether
Unknown	0.06	Oxygenated sesquiterpene
Humulene epoxide I	0.01	Sesquiterpenic ether
Humulene epoxide II	0.06	Sesquiterpenic ether
(E)-Isoeugenyl acetate	0.02	Phenylpropanoid ester
Caryophylladienol I	0.11	Sesquiterpenic alcohol
Caryophylladienol II	0.16	Sesquiterpenic alcohol
τ -Muurolol	0.11	Sesquiterpenic alcohol
14-Hydroxy-(Z)-caryophyllene	0.02	Sesquiterpenic alcohol
14-Hydroxy-9-epi-(E)-caryophyllene	0.12	Sesquiterpenic alcohol

Germacra-4(15),5,10(14)-trien-1 α -ol	0.02	Sesquiterpenic alcohol
Trimethoxypropylbenzene analog	0.01	Phenylpropanoid
(<i>E</i>)-Coniferyl alcohol	0.01	Phenylpropanoid
Benzyl benzoate	0.01	Phenolic ester
Unknown	0.01	Oxygenated sesquiterpene
(<i>E</i>)-2-Methoxy-4-(3-oxo-1-propenyl)phenyl acetate	0.01	Phenylpropanoid ester
Squalene	0.01	Triterpene
14-Hydroxy-(<i>E</i>)-caryophyllene	0.12	Sesquiterpenic alcohol
Consolidated total	99.06%	

*: Individual compounds concentration could not be found due to overlapping coelutions on columns considered [xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total

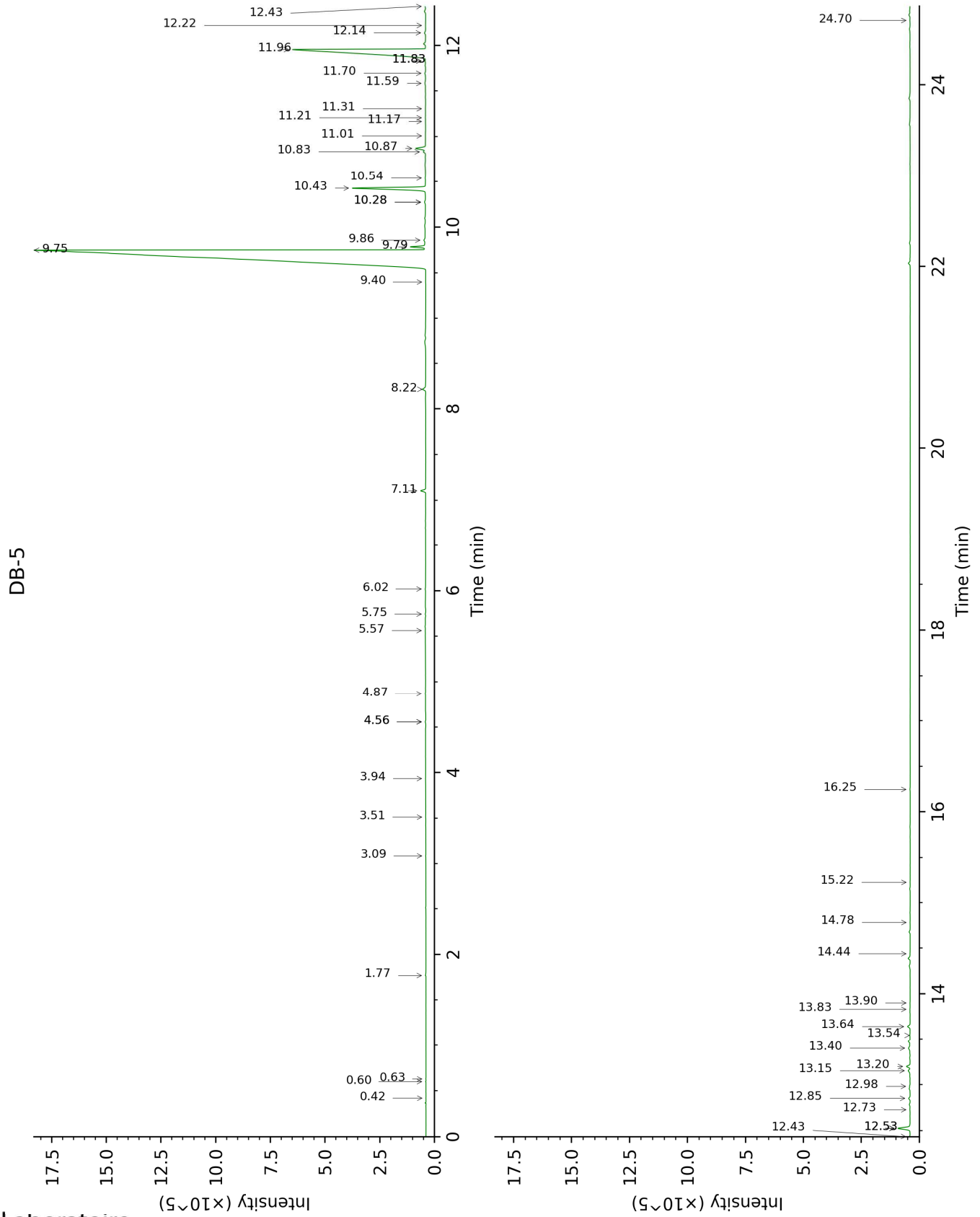
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

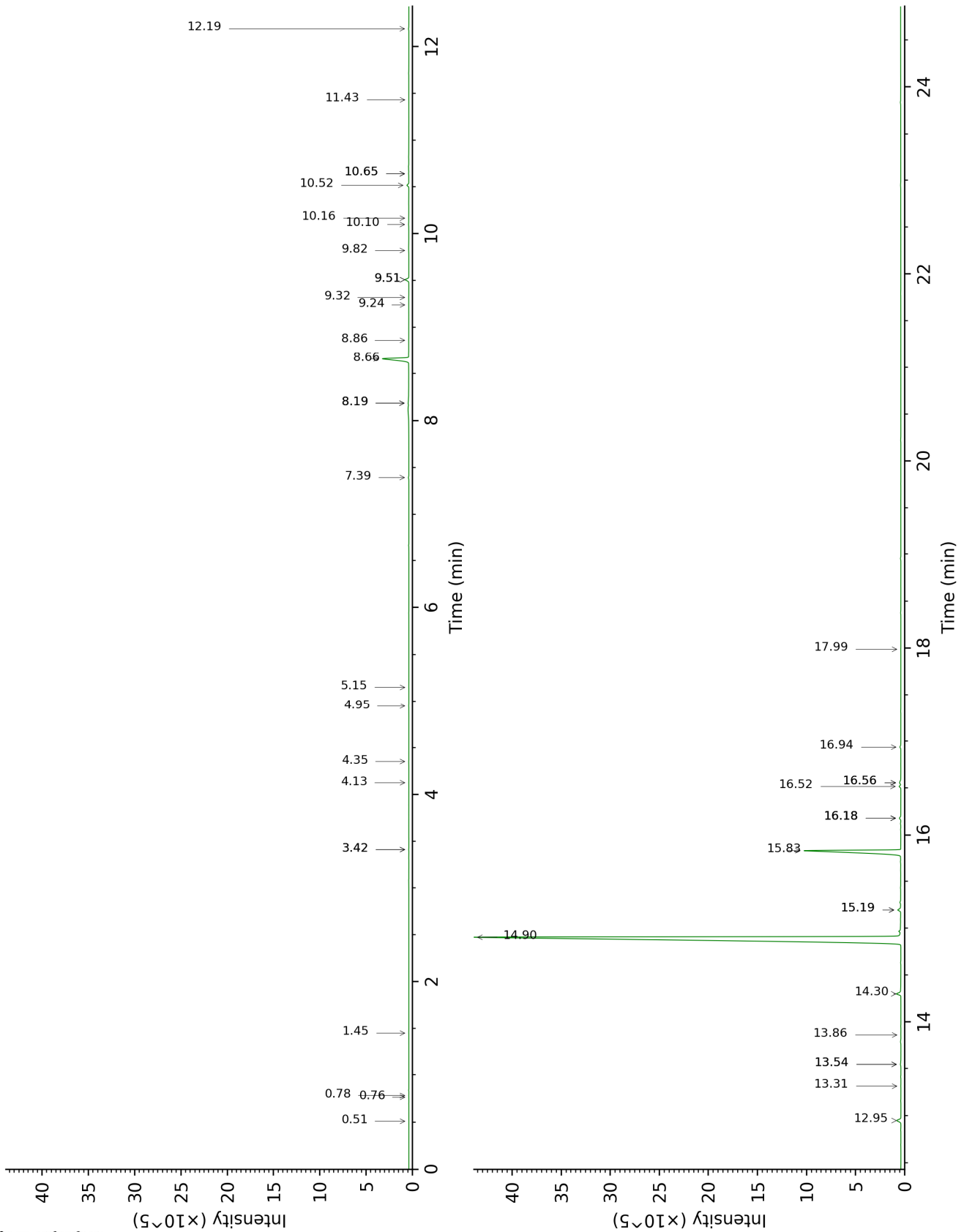
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm 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	%
Isobutylal	0.42	528	tr	0.51	782	tr
Isovaleral	0.60	638	0.01	0.76	878	tr
2-Methylbutylal	0.63	649	tr	0.78	884	0.01
Furfural	1.77	827	0.03			
α -Pinene	3.09	928	0.01	1.45	995	0.01
5-Methylfurfural	3.51	956	0.01	8.19*	1513	0.07
6-Methyl-5-hepten-2-one	3.94	984	0.01	5.15	1299	0.01
Limonene	4.56*	1024	0.02	3.42*	1168	0.02
1,8-Cineole	4.56*	1024	[0.02]	3.42*	1168	[0.02]
(E)- β -Ocimene	4.87	1043	0.01	4.13	1222	0.01
Terpinolene	5.56	1087	0.01	4.35	1239	0.01
Linalool	5.75	1098	0.02	8.19*	1513	[0.07]
(E)-4,8-Dimethylnona-1,3,7-triene	6.02	1116	0.01	4.95	1283	0.02
Methyl salicylate	7.10	1186	0.20	10.52	1699	0.22
Chavicol	8.22	1261	0.19	16.56*	2263	0.20
α -Cubebene	9.40	1338	0.01			
Eugenol	9.75†	1362	78.43	14.90	2096	78.44
Dihydroeugenol	9.79†	1365	[78.43]	14.30	2038	0.59
α -Copaene	9.86	1370	0.05	7.39	1453	0.06
Isocaryophyllene	10.28*	1399	0.06			
Methyleugenol	10.28*	1399	[0.06]	13.54*	1966	0.07
β -Caryophyllene	10.43	1411	3.57	8.66	1550	3.48
Caryophylla-4(12),8(13)-diene	10.54	1419	0.01	8.86	1566	0.01
9-epi-Isocaryophyllene	10.83	1441	0.10	9.32	1602	0.02
α -Humulene	10.87	1444	0.48	9.51*	1617	0.44
allo-Aromadendrene	11.01	1454	0.01	9.24	1595	0.01
trans-Cadina-1(6),4-diene	11.17	1465	0.01	9.51*	1617	[0.44]
γ -Muurolene	11.21	1468	0.01	9.82	1643	0.02
β -Selinene	11.31	1476	0.01	10.10	1665	0.06
α -Muurolene	11.58	1496	0.06	10.16	1671	0.04
γ -Cadinene	11.70	1505	0.05	10.65*	1710	0.03
trans-Calamenene	11.83*	1515	0.03	11.43	1777	0.01
δ -Cadinene	11.83*	1515	[0.03]	10.65*	1710	[0.03]
Eugenyl acetate	11.96	1525	13.55	15.83	2189	13.23
Unknown [m/z 164, 135 (98), 93 (86), 107 (83), 79 (69)...]	12.14	1539	0.07	12.19	1844	0.05
Unknown [m/z 180, 93 (70), 55 (62), 77 (55), 164 (55), 103 (50)]	12.22	1546	0.01			
Caryophyllenyl alcohol	12.43	1562	0.03	13.86	1996	0.01
Caryophyllene oxide	12.52*	1569	0.58	12.95	1912	0.52
Unknown [m/z 161, 187 (32), 105 (30), 205 (24)... 222 (3)]	12.52*	1569	[0.58]	15.19*	2125	0.33
Humulene epoxide I	12.73	1585	0.01	13.31	1945	0.01

Humulene epoxide II	12.85	1595	0.06	13.54*	1966	[0.07]
(E)-Isoeugenyl acetate	12.98	1605	0.02			
Caryophylladienol I	13.15	1619	0.11	16.18*	2224	0.16
Caryophylladienol II	13.20	1623	0.16	16.18*	2224	[0.16]
τ-Muurolol	13.40	1640	0.11	15.19*	2125	[0.33]
14-Hydroxy-(Z)-caryophyllene	13.54	1651	0.02	16.56*	2263	[0.20]
14-Hydroxy-9-epi-(E)-caryophyllene	13.64	1659	0.12	16.52	2259	0.17
Germacra-4(15),5,10(14)-trien-1α-ol	13.83	1675	0.02	16.18*	2224	[0.16]
Trimethoxypropylbenzene analog	13.90	1681	0.01	17.99	2416	0.01
(E)-Coniferyl alcohol	14.44	1726	0.01			
Benzyl benzoate	14.78	1756	0.01			
Unknown [m/z 109, 123 (96), 127 (95), 55 (87), 81 (85), 41 (69)...220 (5)]	15.22	1794	0.01			
(E)-2-Methoxy-4-(3-oxo-1-propenyl)phenyl acetate	16.25	1886	0.01			
Squalene	24.70	2820	0.01			
14-Hydroxy-(E)-caryophyllene				16.94	2303	0.12
Total identified		98.26%			98.41%	
Total reported		98.35%			98.46%	

*: 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