Date : March 07, 2019

Certificate of Analysis – GC Profiling

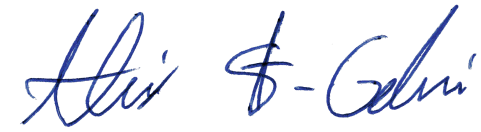
Sample identification

Internal code : 19C04-PTH07-1-SCC
Customer identification : Yuzu - Japan - Y40101812R
Type : Essential oil
Source : *Citrus junos* ct. Distilled
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 : Lindsay Girard, B. Sc.
Analysis date : March 07, 2019

Checked and approved by :



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

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PHYSICOCHEMICAL DATA

Physical aspect: Clear liquid
Refractive index: 1.4728 ± 0.0003 (20 °C)

CONCLUSION

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

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ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
α-Thujene	0.34	0.32	Monoterpene
α-Pinene	1.20	1.18	Monoterpene
Camphene	0.01	0.01	Monoterpene
Sabinene	0.84*	0.21	Monoterpene
β-Pinene	[0.84]*	0.62	Monoterpene
Myrcene	1.50	1.50	Monoterpene
Pseudolimonene	0.37*	0.02	Monoterpene
α-Phellandrene	[0.37]*	0.33	Monoterpene
Δ3-Carene	0.02	0.02	Monoterpene
α-Terpinene	0.17	0.18	Monoterpene
para-Cymene	82.77	0.73	Monoterpene
Limonene	[82.77]*	79.47	Monoterpene
1,8-Cineole	[82.77]*	2.42*	Monoterpenic ether
β-Phellandrene	[82.77]*	[2.42]*	Monoterpene
(*Z*)-β-Ocimene	0.01	8.86*	Monoterpene
(*E*)-β-Ocimene	0.17	0.18	Monoterpene
γ-Terpinene	8.85	[8.86]*	Monoterpene
Terpinolene	0.37*	0.34	Monoterpene
para-Cymenene	[0.37]*	0.03*	Monoterpene
Linalool	1.11	1.13	Monoterpenic alcohol
Nonanal	0.01	0.01	Aliphatic aldehyde
trans-para-Mentha-2,8-dien-1-ol	0.02	0.01	Monoterpenic alcohol
cis-Limonene oxide	0.03	[0.03]*	Monoterpenic ether
trans-Limonene oxide	0.02	0.02	Monoterpenic ether
trans-Sabinol	0.02	0.12*	Monoterpenic alcohol
Epoxyterpinolene	0.01	0.01	Monoterpenic ether
Terpinen-4-ol	0.06	0.06	Monoterpenic alcohol
α-Terpineol	0.06	0.06	Monoterpenic alcohol
Decanal	0.02	0.03	Aliphatic aldehyde
Thymol methyl ether	0.02	0.13*	Monoterpenic ether
Carvone	0.01	0.01	Monoterpenic ketone
Ascaridole glycol isomer I	0.01		Monoterpenic alcohol
Geranial	0.01	0.34*	Monoterpenic aldehyde
Thymol	0.06	0.07	Monoterpenic alcohol
Carvacrol	0.01	0.01*	Monoterpenic alcohol
δ-Elemene isomer	0.05*	0.04	Sesquiterpene
δ-Elemene	[0.05]*	0.01	Sesquiterpene
α-Cubebene	0.01	0.02	Sesquiterpene
α-Copaene	0.02	0.02	Sesquiterpene
β-Cubebene	0.02	0.02	Sesquiterpene
β-Elemene	0.03	[0.13]*	Sesquiterpene
Sesquithujene	0.01	0.01	Sesquiterpene
β-Caryophyllene	0.11	[0.13]*	Sesquiterpene
γ-Elemene	0.01	0.01*	Sesquiterpene
allo-Aromadendrene	0.01	[0.01]*	Sesquiterpene
(*E*)-β-Farnesene	0.26	0.26*	Sesquiterpene
Germacrene D	0.11	[0.12]*	Sesquiterpene
Bicyclogermacrene	0.33*	[0.34]*	Sesquiterpene

Viridiflorene	[0.33]*	[0.26]*	Sesquiterpene
α-Muurolene	0.01	[0.34]*	Sesquiterpene
δ-Cadinene	0.07	0.06	Sesquiterpene
β-Sesquiphellandrene	0.03	0.03	Sesquiterpene
Germacrene B	0.09	0.09	Sesquiterpene
Spathulenol	0.13	0.13	Sesquiterpenic alcohol
Isospathulenol	0.01	0.01	Sesquiterpenic alcohol
τ-Muurolol	0.02*	0.01	Sesquiterpenic alcohol
τ-Cadinol	[0.02]*	0.01	Sesquiterpenic alcohol
β-Eudesmol	0.01	[0.01]*	Sesquiterpenic alcohol
α-Cadinol	0.03	0.03	Sesquiterpenic alcohol
Oplopanone	0.05		Sesquiterpenic alcohol
Total identified	**99.52%**	**99.22%**	

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total
Note: no correction factor was applied

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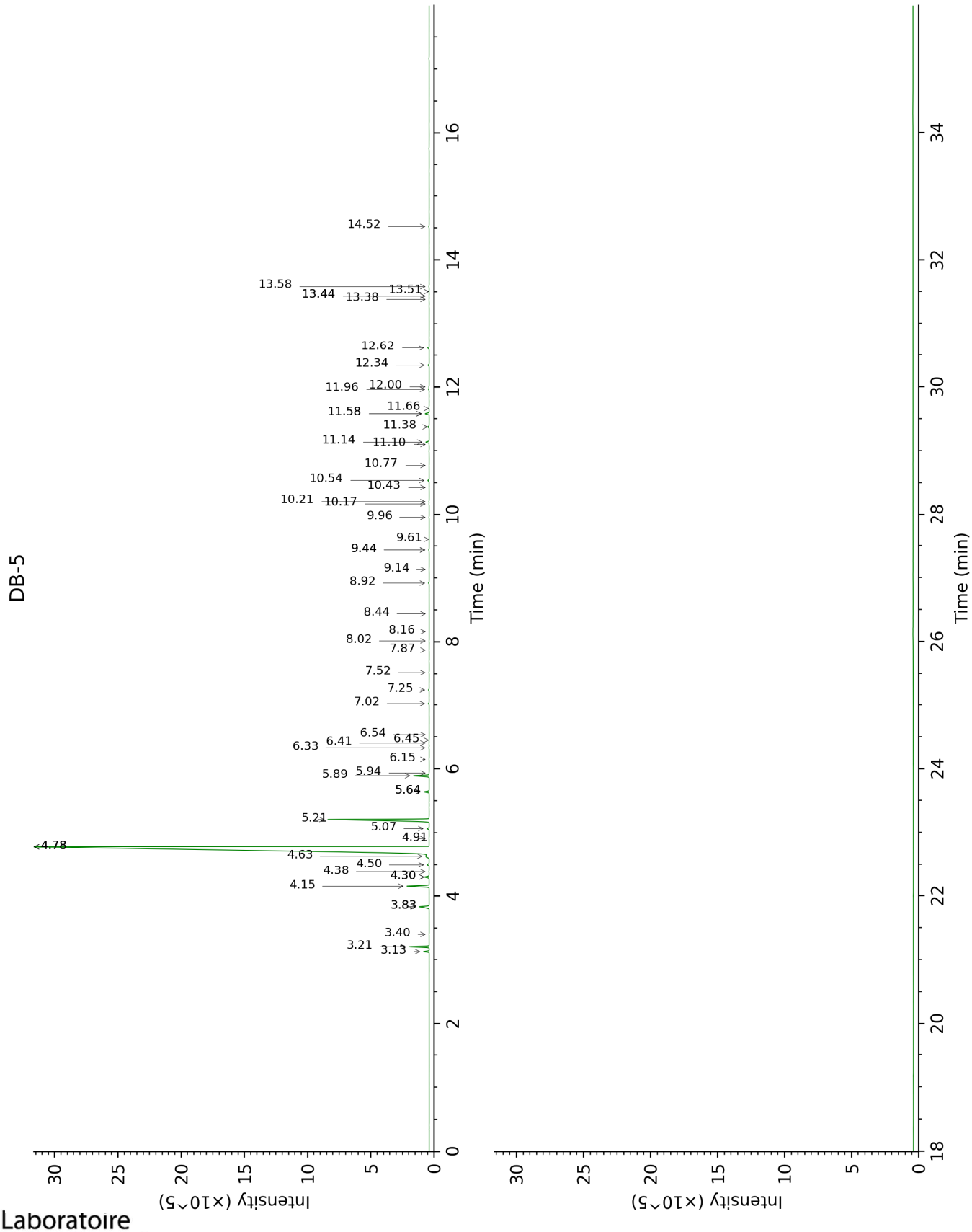
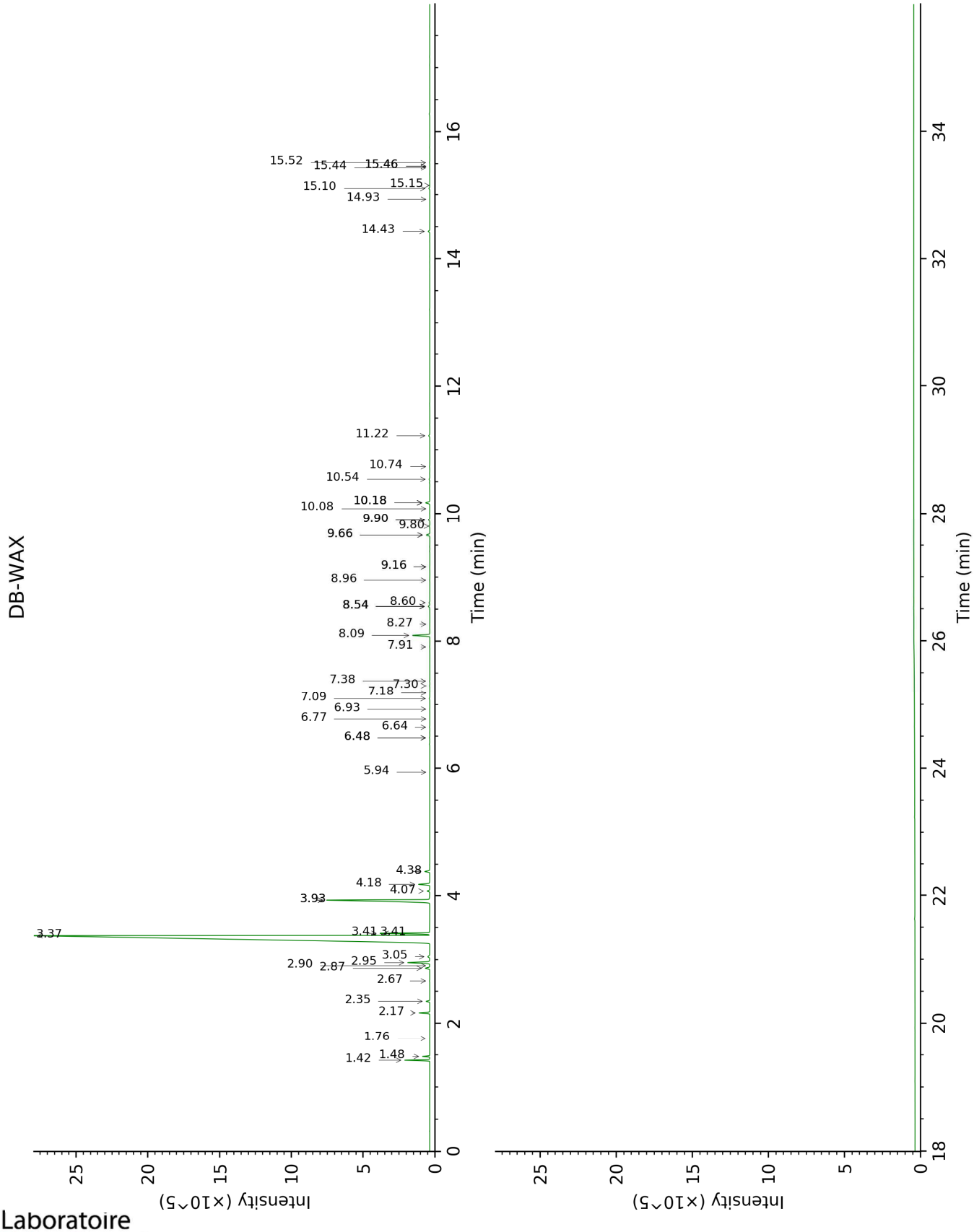

DB-5
Intensity (×10^5)
Time (min)
14.52
13.58
13.44
13.38
13.51
12.62
12.34
11.96
12.00
11.58
11.66
11.38
11.14
11.10
10.77
10.54
10.43
10.21
10.17
9.96
9.61
9.44
9.14
8.92
8.44
8.16
8.02
7.87
7.52
7.25
7.02
6.54
6.33
6.41
6.45
6.15
5.89
5.94
5.64
5.21
5.07
4.91
4.78
4.63
4.38
4.50
4.30
4.15
3.83
3.40
3.21
3.13


DB-WAX
Intensity (×10^5)
Time (min)
15.52
15.44
15.46
15.10
15.15
14.93
14.43
11.22
10.74
10.54
10.08
10.18
9.90
9.80
9.66
9.16
8.96
8.54
8.60
8.27
8.09
7.91
7.38
7.30
7.18
7.09
6.93
6.77
6.64
6.48
5.94
4.38
4.18
4.07
3.93
3.37
3.41
3.41
2.90
2.87
2.95
3.05
2.67
2.35
2.17
1.76
1.42
1.48

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
α-Thujene	3.13	924	0.34	1.48	1002	0.32
α-Pinene	3.21	929	1.20	1.42	994	1.18
Camphene	3.40	941	0.01	1.76	1028	0.01
Sabinene	3.83*	970	0.84	2.35	1084	0.21
β-Pinene	3.83*	970	[0.84]	2.17	1067	0.62
Myrcene	4.15	991	1.50	2.95	1134	1.50
Pseudolimonene	4.30*	1000	0.37	2.90	1130	0.02
α-Phellandrene	4.30*	1000	[0.37]	2.86	1127	0.33
Δ3-Carene	4.38	1005	0.02	2.67	1112	0.02
α-Terpinene	4.50	1013	0.17	3.05	1141	0.18
para-Cymene	4.63†	1021	82.77	4.18	1230	0.73
Limonene	4.78*†	1030	[82.77]	3.37	1167	79.47
1,8-Cineole	4.78*†	1030	[82.77]	3.41*	1170	2.42
β-Phellandrene	4.78*†	1030	[82.77]	3.41*	1170	[2.42]
(*Z*)-β-Ocimene	4.91	1038	0.01	3.93*	1212	8.86
(*E*)-β-Ocimene	5.07	1048	0.17	4.07	1222	0.18
γ-Terpinene	5.21	1057	8.85	3.93*	1212	[8.86]
Terpinolene	5.64*	1084	0.37	4.38	1246	0.34
para-Cymenene	5.64*	1084	[0.37]	6.48*	1388	0.03
Linalool	5.89	1100	1.11	8.09	1511	1.13
Nonanal	5.94	1102	0.01	5.94	1349	0.01
trans-para-Mentha-2,8-dien-1-ol	6.15	1116	0.02	8.96	1579	0.01
cis-Limonene oxide	6.33	1128	0.03	6.48*	1388	[0.03]
trans-Limonene oxide	6.41	1132	0.02	6.64	1400	0.02
trans-Sabinol	6.45	1135	0.02	9.90*	1656	0.12
Epoxyterpinolene	6.54	1141	0.01	6.77	1410	0.01
Terpinen-4-ol	7.02	1172	0.06	8.60	1551	0.06
α-Terpineol	7.25	1187	0.06	9.80	1648	0.06
Decanal	7.52	1204	0.02	7.38	1456	0.03
Thymol methyl ether	7.87	1228	0.02	8.54*	1547	0.13
Carvone	8.02	1238	0.01	10.08	1671	0.01
Ascaridole glycol isomer I	8.16	1248	0.01			
Geranial	8.44	1266	0.01	10.18*	1679	0.34
Thymol	8.92	1299	0.06	15.10	2127	0.07
Carvacrol	9.14	1310	0.01	15.46*	2164	0.01
δ-Elemene isomer	9.44*	1332	0.05	7.09	1435	0.04
δ-Elemene	9.44*	1332	[0.05]	7.18	1442	0.01
α-Cubebene	9.61	1344	0.01	6.93	1422	0.02
α-Copaene	9.96	1369	0.02	7.30	1450	0.02
β-Cubebene	10.17	1383	0.02	7.91	1497	0.02
β-Elemene	10.21	1386	0.03	8.54*	1547	[0.13]
Sesquithujene	10.43	1402	0.01	8.27	1525	0.01
β-Caryophyllene	10.54	1410	0.11	8.54*	1547	[0.13]
γ-Elemene	10.77	1427	0.01	9.16*	1595	0.01

allo-Aromadendrene	11.10	1452	0.01	9.16*	1595	[0.01]
(*E*)-β-Farnesene	11.14	1454	0.26	9.66*	1636	0.26
Germacrene D	11.38	1472	0.11	9.90*	1656	[0.12]
Bicyclogermacrene	11.58*	1488	0.33	10.18*	1679	[0.34]
Viridiflorene	11.58*	1488	[0.33]	9.66*	1636	[0.26]
α-Muurolene	11.66	1494	0.01	10.18*	1679	[0.34]
δ-Cadinene	11.96	1517	0.07	10.54	1709	0.06
β-Sesquiphellandrene	12.00	1520	0.03	10.74	1726	0.03
Germacrene B	12.34	1546	0.09	11.22	1768	0.09
Spathulenol	12.62	1568	0.13	14.43	2062	0.13
Isospathulenol	13.38	1629	0.01	15.44	2161	0.01
τ-Muurolol	13.44*	1634	0.02	15.15	2132	0.01
τ-Cadinol	13.44*	1634	[0.02]	14.93	2110	0.01
β-Eudesmol	13.51	1640	0.01	15.46*	2164	[0.01]
α-Cadinol	13.58	1646	0.03	15.52	2169	0.03
Oplopanone	14.52	1725	0.05			
Total identified		**99.52%**			**99.22%**	
Total reported		**99.52%**			**99.22%**	

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total
†: Peaks apexes were resolved, but peaks overlapped and were summed for analysis

Note: no correction factor was applied
R.T.: Retention time (minutes)
R.I.: Retention index