Date : 2024-09-12

Certificate of Analysis - GC Profiling

Sample Identification

Internal code : 24H28-NPA02
Customer Identification : Star Anise - Vietnam - NP0368 - NPS00172
Type : Essential Oil
Source : *Illicium verum*
Customer : Nature Packaged

Checked an approved by:

Sylvain Mercier, M. Sc., Chimiste 2014-005

Notes: This report is digitally signed, it is only considered valid if the digital signature is intact. The results only describe the samples that were submitted to the assays.

This report is an update from the first version issued on 2024-09-12 to format it for online publication.

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

Gas Chromatographic Analysis

Method : PC-MAT-014 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID
ISO
Results : See analysis summary (next page)
Analyst : Sylvain Mercier, M. Sc., Chimiste 2014-005
Date : 2024-09-12

Physicochemical data

Refractive index : 1.5549 ± 0.0003 (20 °C)
Method : PC-MAT-016 - Measure of the refractive index of a liquid.
Analyst : Cindy Caron B. Sc.
Date : 2024-09-03

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 - Consolidated Contents

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

Identification	%	Class
2-Methyl-3-buten-2-ol	tr	Aliphatic alcohol
Isovaleral	tr	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Hexanal	tr	Aliphatic aldehyde
Furfural	0.01	Furan
α-Thujene	0.01	Monoterpene
α-Pinene	0.53	Monoterpene
Camphene	0.01	Monoterpene
α-Fenchene	tr	Monoterpene
Sabinene	0.04	Monoterpene
β-Pinene	0.04	Monoterpene
Myrcene	0.06	Monoterpene
α-Phellandrene	0.25	Monoterpene
Δ3-Carene	0.11	Monoterpene
α-Terpinene	0.03	Monoterpene
para-Cymene	0.09	Monoterpene
1,8-Cineole	0.36	Monoterpenic ether
Limonene	0.25	Monoterpene
(*Z*)-β-Ocimene	0.01	Monoterpene
(*E*)-β-Ocimene	0.01	Monoterpene
γ-Terpinene	0.05	Monoterpene
cis-Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Terpinolene	0.04	Monoterpene
trans-Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Methyl benzoate	tr	Phenolic ester
Linalool	0.80	Monoterpenic alcohol
trans-Pinocarveol	0.01	Monoterpenic alcohol
Borneol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.14	Monoterpenic alcohol
α-Terpineol	0.09	Monoterpenic alcohol
Methylchavicol	1.81	Phenylpropanoid
Dihydroanethole	0.01	Phenylpropanoid
(*Z*)-Anethole	0.24	Phenylpropanoid
para-Anisaldehyde	0.77	Simple phenolic
(*E*)-Anethole	90.24	Phenylpropanoid
Methyl *meta*-anisate	0.01	Phenolic ester
α-Copaene	0.10	Sesquiterpene
Unknown	0.24	Phenylpropanoid
para-Acetonylanisole	0.12	Phenylpropanoid
β-Elemene	0.04	Sesquiterpene

β-Caryophyllene	0.41	Sesquiterpene
cis-α-Bergamotene	0.08	Sesquiterpene
trans-α-Bergamotene	0.56	Sesquiterpene
cis-β-Bergamotene?	0.01	Sesquiterpene
α-Humulene	0.06	Sesquiterpene
Unknown	0.07	Sesquiterpene
Methyl (*Z*)-isoeugenol	tr	Phenylpropanoid
(*E*)-β-Farnesene	0.04	Sesquiterpene
Germacrene D	0.03	Sesquiterpene
Bicyclogermacrene	0.08	Sesquiterpene
Viridiflorene	0.02	Sesquiterpene
α-Muurolene	0.03	Sesquiterpene
Methyl (*E*)-isoeugenol	0.05	Phenylpropanoid
β-Bisabolene	0.07	Sesquiterpene
γ-Cadinene	0.04	Sesquiterpene
(3*E*,6*E*)-α-Farnesene	0.03	Sesquiterpene
trans-Calamenene	0.08	Sesquiterpene
δ-Cadinene	0.01	Sesquiterpene
α-Elemol	0.01	Sesquiterpenic alcohol
(*E*)-Nerolidol	0.11	Sesquiterpenic alcohol
1-(4-Methoxyphenyl)propane-1,2-diol isomer I	0.21	Phenylpropanoid
1-(4-Methoxyphenyl)propane-1,2-diol isomer II	0.07	Phenylpropanoid
Globulol	0.03	Sesquiterpenic alcohol
(*Z*)-Foeniculin	0.02	Phenylpropanoid
Viridiflorol	0.02	Sesquiterpenic alcohol
γ-Eudesmol	0.01	Sesquiterpenic alcohol
τ-Cadinol	0.03	Sesquiterpenic alcohol
β-Eudesmol	0.02	Sesquiterpenic alcohol
α-Eudesmol	0.01	Sesquiterpenic alcohol
α-Cadinol	0.05	Sesquiterpenic alcohol
(*E*)-Foeniculin	0.45	Phenylpropanoid
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer I	0.06	Lignan
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer II	0.05	Lignan
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer III	0.02	Lignan
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer IV	0.01	Lignan
Consolidated total	**99.38**	

tr: The compound has been detected below 0.005% of the 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

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

chromatograms in this report to access the full untreated data and perform their own calculations if needed.

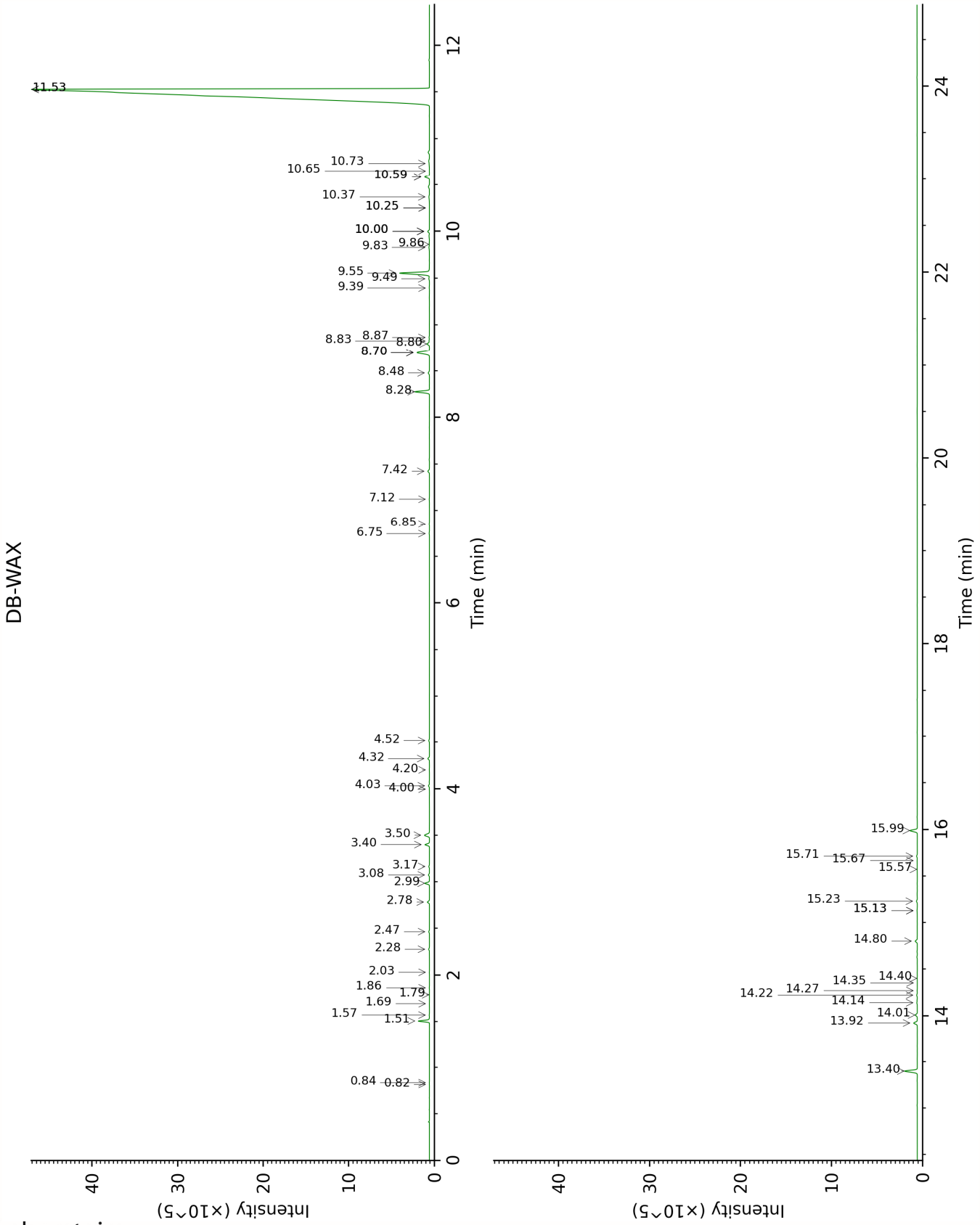
Unknowns: Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

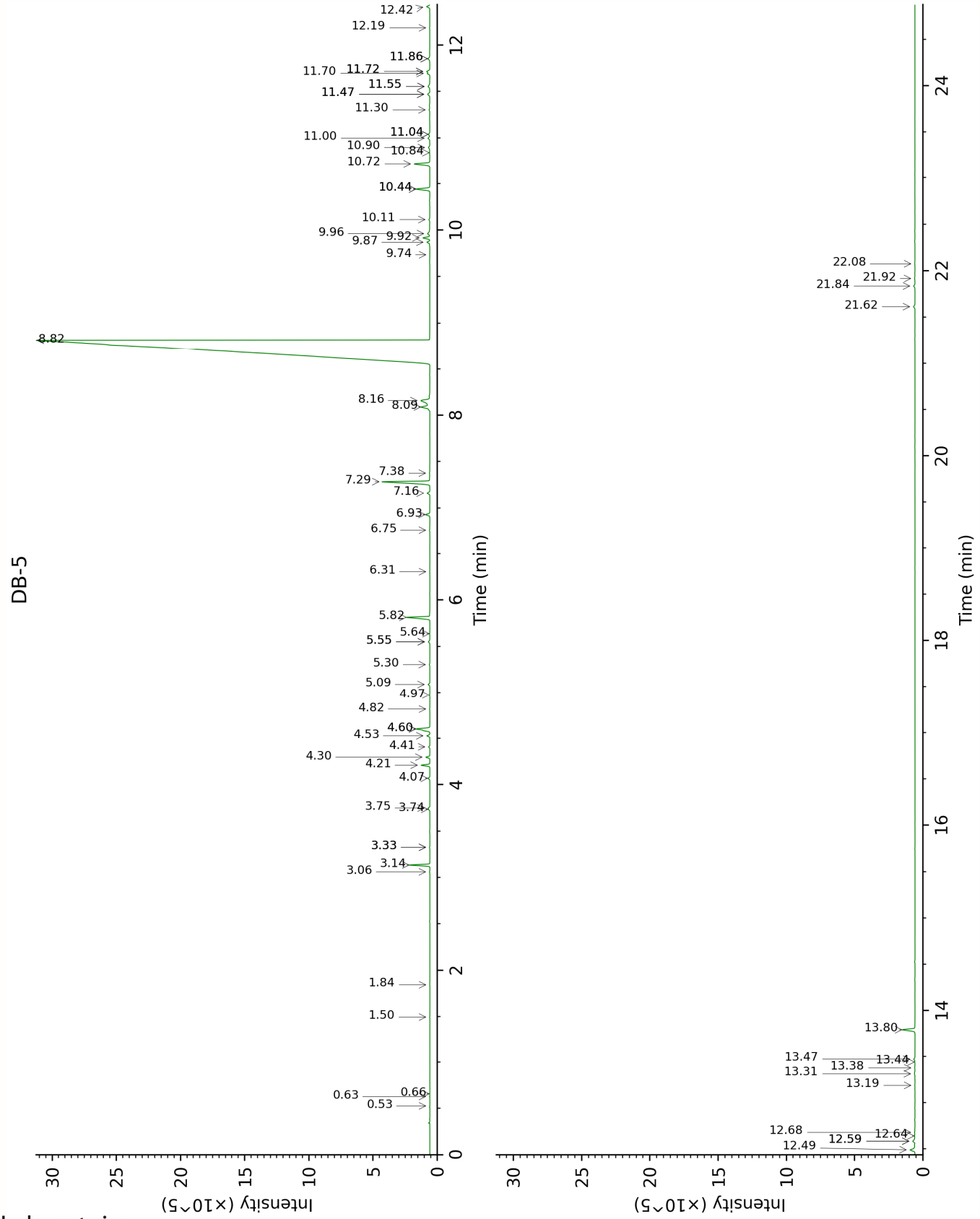
Bracketed value ([xx]): A bracketed percent value indicate that two or more compound percentage could not be solved due to coelution.

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

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-WAX
Time (min)
Intensity (×10^5)
11.53
10.73
10.65
10.59
10.37
10.25
10.00
9.83
9.86
9.55
9.49
9.39
8.83
8.87
8.80
8.70
8.48
8.28
7.42
7.12
6.85
6.75
4.52
4.32
4.20
4.03
4.00
3.50
3.40
3.17
3.08
2.99
2.78
2.47
2.28
2.03
1.86
1.79
1.69
1.57
1.51
0.84
0.82
15.99
15.71
15.67
15.57
15.23
15.13
14.80
14.40
14.35
14.22
14.27
14.14
14.01
13.92
13.40


DB-5
Time (min)
Intensity (×10^5)
12.42
12.19
11.86
11.70
11.72
11.55
11.47
11.30
11.00
11.04
10.90
10.84
10.72
10.44
10.11
9.96
9.87
9.92
9.74
8.82
8.16
8.09
7.38
7.29
7.16
6.93
6.75
6.31
5.82
5.64
5.55
5.30
5.09
4.97
4.82
4.60
4.53
4.41
4.30
4.21
4.07
3.75
3.74
3.33
3.14
3.06
1.84
1.50
0.63
0.66
0.53
22.08
21.92
21.84
21.62
13.80
13.47
13.44
13.38
13.31
13.19
12.68
12.64
12.59
12.49

FULL ANALYSIS DATA

	Column DB-WAX			Column DB-5		
2-Methyl-3-buten-2-ol	1.69	1013.2	tr	0.53	605.6	tr
Isovaleral	0.84	885.4	tr	0.63	640.6	tr
2-Methylbutyral	0.82	878.8	tr	0.66	650.9	tr
Hexanal	2.03	1045.4	0.01	1.50	799.7	tr
Furfural	6.85	1409.1	0.02	1.84	830.1	0.01
α-Thujene	1.57	1001.5	0.01	3.06	925.6	0.01
α-Pinene	1.51	994.7	0.53	3.14	930.5	0.53
Camphene	1.86	1029.5	0.01	3.33*	943.1	[0.01]
α-Fenchene	1.79	1022.4	tr	3.33*	943.1	[0.01]
Sabinene	2.47	1086.8	0.04	3.74	970.2	0.04
β-Pinene	2.28	1068.9	0.04	3.75	971.1	0.04
Myrcene	3.08	1134.9	0.05	4.07	992.3	0.06
α-Phellandrene	2.99	1128.2	0.25	4.21	1001.7	0.25
Δ3-Carene	2.78	1112.9	0.11	4.30	1007.2	0.11
α-Terpinene	3.17	1141.8	0.04	4.41	1014.2	0.03
para-Cymene	4.32	1226.8	0.09	4.53	1021.6	0.09
1,8-Cineole	3.50	1167.1	0.36	4.60*	1026.3	[0.59]
Limonene	3.40	1159.5	0.25	4.60*	1026.3	[0.59]
(*Z*)-β-Ocimene	4.00	1203.7	0.01	4.82	1039.8	0.01
(*E*)-β-Ocimene	4.20	1218.2	0.01	4.97	1049.5	0.01
γ-Terpinene	4.03	1206.2	0.06	5.09	1056.8	0.05
cis-Linalool oxide (fur.)	6.75	1401.1	0.02	5.30	1070.3	0.02
Terpinolene	4.52	1240.3	0.04	5.55*	1085.7	[0.05]
trans-Linalool oxide (fur.)	7.12	1428.9	0.02	5.55*	1085.7	[0.05]
Methyl benzoate	8.87	1560.7	0.03	5.64	1091.2	tr
Linalool	8.28	1515.2	0.83	5.82	1102.2	0.80
trans-Pinocarveol	9.39	1601.9	0.01	6.31	1133.6	0.01
Borneol	10.00*	1650.8	[0.10]	6.75	1162.2	0.01
Terpinen-4-ol	8.80	1555.4	0.15	6.93	1173.5	0.14
α-Terpineol	10.00*	1650.8	[0.10]	7.16	1188.3	0.09
Methylchavicol	9.55	1614.8	1.90	7.28	1196.1	1.81
Dihydroanethole	8.83	1557.8	0.02	7.38	1202.1	0.01
(*Z*)-Anethole	10.58*	1698.3	[0.28]	8.09*†	1249.7	[0.43]
para-Anisaldehyde	13.40	1944.8	0.77	8.16*†	1254.4	[0.59]
(*E*)-Anethole	11.53*	1778.1	[90.33]	8.82	1298.3	90.24
Methyl *meta*-anisate				9.74	1362.9	0.01
α-Copaene	7.42	1451.2	0.10	9.87	1372.4	0.10
Unknown FOVU I [121, 91 (60), 120 (39), 164 (37), 77 (34), 135 (26)]	13.92	1993.1	0.23	9.92	1375.7	0.24
para-Acetonylanisole	14.80	2077.5	0.13	9.96	1378.9	0.12
β-Elemene	8.70*	1547.8	[0.97]	10.11	1389.6	0.04
β-Caryophyllene	8.70*	1547.8	[0.97]	10.44*	1413.3	[0.49]

cis-α-Bergamotene	8.48	1530.9	0.08	10.44*	1413.3	[0.49]
trans-α-Bergamotene	8.70*	1547.8	[0.97]	10.72	1434.0	0.56
cis-β-Bergamotene?				10.84	1442.9	0.01
α-Humulene	9.49	1609.9	0.05	10.90	1447.1	0.06
Unknown MISC CLXVI [m/z 93, 107 (79), 69 (68), 91 (66), 105 (64), 161 (63), 204 (57)]				11.00	1454.6	0.07
Methyl (*Z*)-isoeugenol	14.35	2034.5	tr	11.04*	1457.7	[0.05]
(*E*)-β-Farnesene	9.83	1637.0	0.04	11.04*	1457.7	[0.05]
Germacrene D	10.00*	1650.8	[0.10]	11.30	1477.4	0.03
Bicyclogermacrene	10.25*	1671.1	[0.01]	11.47*	1489.8	[0.09]
Viridiflorene	9.86	1639.7	0.02	11.47*	1489.8	[0.09]
α-Muurolene	10.25*	1671.1	[0.01]	11.56*	1496.1	[0.08]
Methyl (*E*)-isoeugenol	15.23	2119.7	0.05	11.56*	1496.1	[0.08]
β-Bisabolene	10.37	1680.7	0.07	11.70*†	1506.8	[0.08]
γ-Cadinene	10.58*	1698.3	[0.28]	11.72*†	1508.5	[0.12]
(3*E*,6*E*)-α-Farnesene	10.73	1710.9	0.03	11.72*†	1508.5	[0.12]
trans-Calamenene	11.53*	1778.1	[90.33]	11.86*	1519.3	[0.09]
δ-Cadinene	10.65	1703.9	0.01	11.86*	1519.3	[0.09]
α-Elemol	14.27	2026.5	0.01	12.19	1545.4	0.01
(*E*)-Nerolidol	14.01	2001.3	0.12	12.42	1563.4	0.11
1-(4-Methoxyphenyl)propane-1,2-diol isomer I				12.49	1569.2	0.21
1-(4-Methoxyphenyl)propane-1,2-diol isomer II				12.58*	1576.6	[0.10]
Globulol	14.14	2014.0	0.03	12.58*	1576.6	[0.10]
(*Z*)-Foeniculin	14.40	2039.1	0.01	12.64	1581.0	0.02
Viridiflorol	14.22	2021.8	0.04	12.68	1584.1	0.02
γ-Eudesmol	15.13*	2109.6	[0.04]	13.19	1625.0	0.01
τ-Cadinol	15.13*	2109.6	[0.04]	13.31	1635.3	0.03
β-Eudesmol	15.67	2163.2	0.01	13.38	1640.6	0.02
α-Eudesmol	15.57	2153.8	0.01	13.44	1645.9	0.01
α-Cadinol	15.71	2167.9	0.04	13.47	1648.4	0.05
(*E*)-Foeniculin	15.99	2195.5	0.44	13.80	1675.2	0.45
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer I				21.62	2448.3	0.06
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer II				21.84	2474.2	0.05

2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer III				21.92	2483.6	0.02
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer IV				22.08	2502.0	0.01
Total reported	98.93%			99.44%		

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, only the first one is 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

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