

Date : 2026-06-30

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 26E04-PTH01

**Customer Identification** : Fennel - Spain - F10116

**Type** : Essential Oil

**Source** : *Foeniculum vulgare var. amara*

**Customer** : Plant Therapy

Checked and approved by:

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

*Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia.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. The results only describe the samples that were submitted to the assays. The compliance status of the sample is provided to facilitate the reading of the report. The client remains ultimately responsible for reviewing the results presented within this report and to establish compliance of the tested batch against relevant quality criteria.*

*This report is an update of the version first issued on 2026-05-07 to make a modification in the sample identification section.*

## 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 :** Jean-Christophe Fortin, M. Sc.

**Date :** 2026-05-07

## PHYSICOCHEMICAL DATA

**Refractive index :**  $1.5334 \pm 0.0003$  (20 °C)

**Method :** PC-MAT-016 - Measure of the refractive index of a liquid.

**Analyst :** Cindy Caron B. Sc.

**Date :** 2026-05-01

## CONCLUSION

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

## ANALYSIS SUMMARY - CONSOLIDATED CONTENTS

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

Identification	%	Class
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
Toluene	tr	Simple phenolic
Tricyclene	0.02	Monoterpene
$\alpha$ -Thujene	0.02	Monoterpene
$\alpha$ -Pinene	5.10	Monoterpene
$\alpha$ -Fenchene	0.02	Monoterpene
Camphene	0.19	Monoterpene
Sabinene	0.07	Monoterpene
$\beta$ -Pinene	0.21	Monoterpene
Myrcene	1.00	Monoterpene
Pseudolimonene	tr	Monoterpene
$\alpha$ -Phellandrene	1.09	Monoterpene
$\Delta^3$ -Carene	0.04	Monoterpene
$\alpha$ -Terpinene	0.03	Monoterpene
<i>para</i> -Cymene	0.24	Monoterpene
1,8-Cineole	0.05	Monoterpenic ether
Limonene	3.80	Monoterpene
$\beta$ -Phellandrene	0.35	Monoterpene
( <i>Z</i> )- $\beta$ -Ocimene	0.13	Monoterpene
( <i>E</i> )- $\beta$ -Ocimene	0.01	Monoterpene
$\gamma$ -Terpinene	0.47	Monoterpene
<i>cis</i> -Sabinene hydrate	0.03	Monoterpenic alcohol
Fenchone	12.88	Monoterpenic ketone
Terpinolene	0.10	Monoterpene
Linalool	0.03	Monoterpenic alcohol
<i>endo</i> -Fenchol	0.03	Monoterpenic alcohol
<i>trans</i> -Pinene hydrate	0.03	Monoterpenic alcohol
<i>trans-para</i> -Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol
Camphor	0.33	Monoterpenic ketone
Unknown	0.02	Oxygenated monoterpene
Borneol	0.01	Monoterpenic alcohol
Terpinen-4-ol	0.09	Monoterpenic alcohol
<i>para</i> -Cymen-8-ol	0.01	Monoterpenic alcohol
$\alpha$ -Terpineol	0.03	Monoterpenic alcohol
Methylchavicol	2.21	Phenylpropanoid
<i>cis</i> - $\alpha$ -Phellandrene epoxide (iPr vs Me)	0.01	Monoterpenic ether
Dihydroanethole	0.03	Phenylpropanoid
<i>trans</i> -Carveol	0.01	Monoterpenic alcohol
Carvone	0.01	Monoterpenic ketone

(Z)-Anethole	0.12	Phenylpropanoid
<i>para</i> -Anisaldehyde	0.41	Simple phenolic
(E)-Anethole	70.20	Phenylpropanoid
Unknown	0.01	Phenylpropanoid
<i>para</i> -Acetonylanisole	0.05	Phenylpropanoid
Methyleugenol	0.01	Phenylpropanoid
$\beta$ -Caryophyllene	0.01	Sesquiterpene
<i>trans</i> - $\alpha$ -Bergamotene	0.01	Sesquiterpene
$\alpha$ -Humulene	0.01	Sesquiterpene
(Z)- <i>para</i> -Methoxycinnamaldehyde?	0.01	Phenylpropanoid
Unknown	0.01	Phenylpropanoid
1-(4-Methoxyphenyl)propane-1,2-diol isomer I	0.05	Phenylpropanoid
1-(4-Methoxyphenyl)propane-1,2-diol isomer II	0.03	Phenylpropanoid
Unknown	0.01	Phenylpropanoid
Phytadiene isomer I	tr	Diterpene
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer I	0.02	Lignan
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer II	0.02	Lignan
<b>Consolidated total</b>	<b>99.71</b>	

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

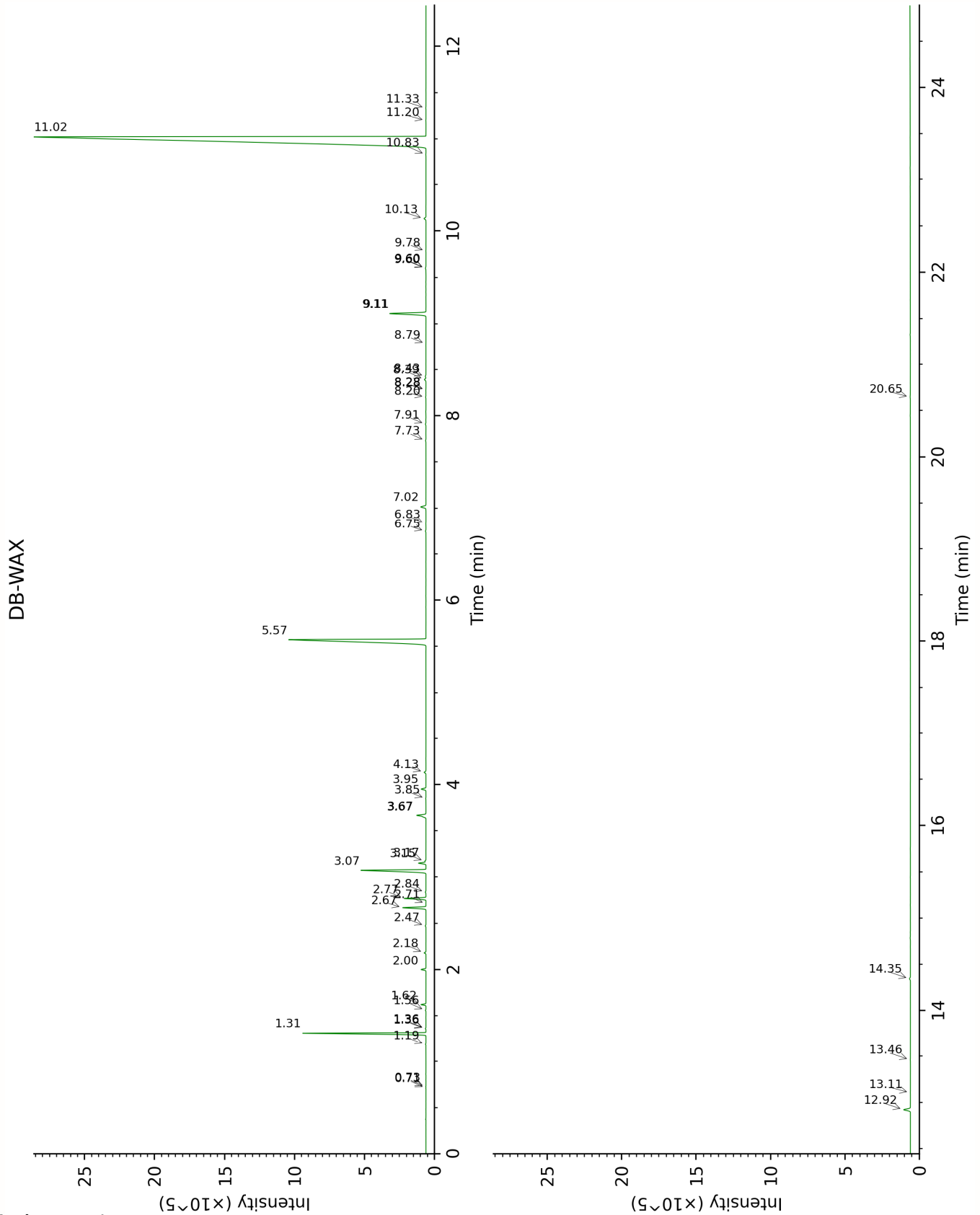
Note: no correction factor was applied

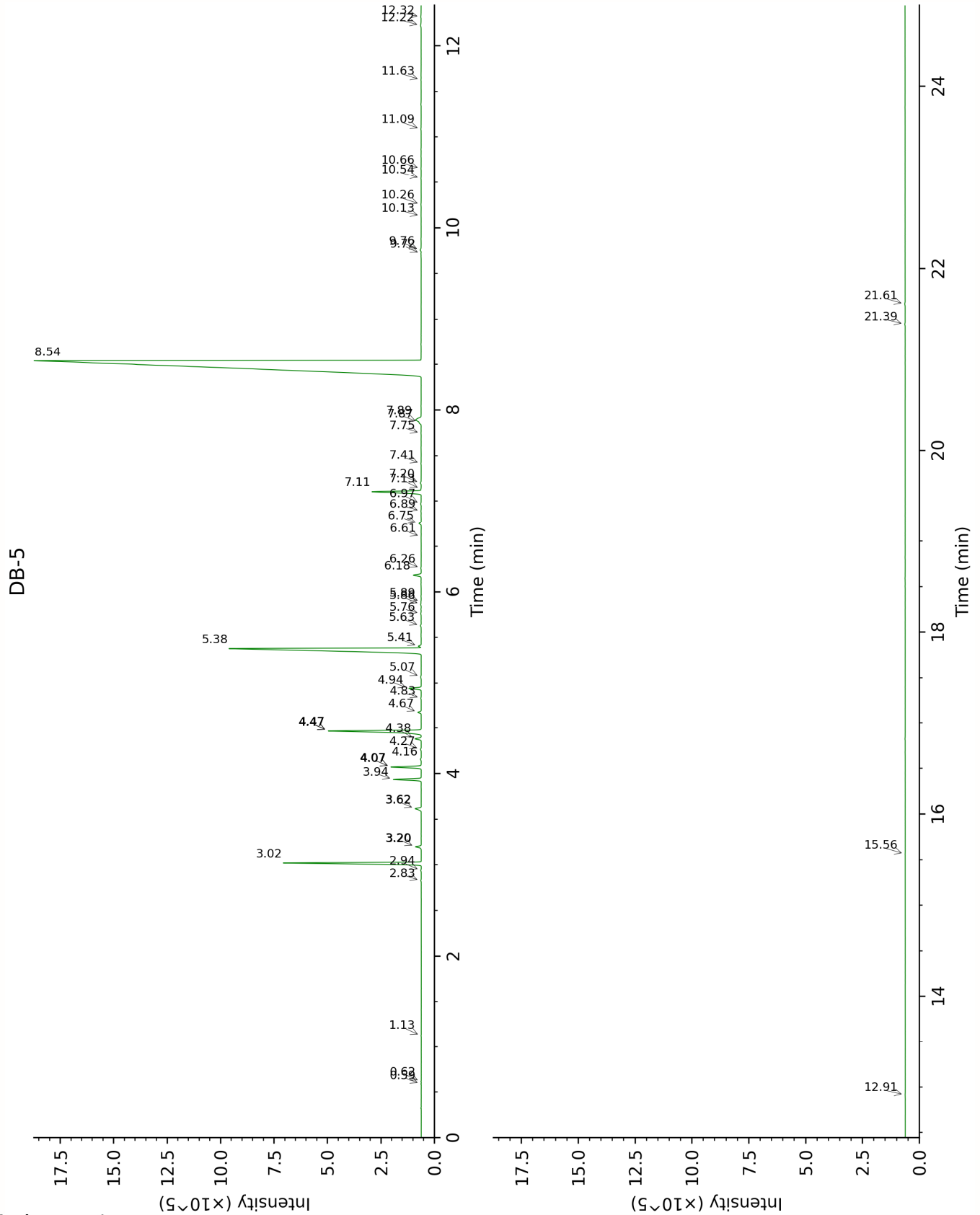
**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm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

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





FULL ANALYSIS DATA

Isovaleral	Column DB-WAX			Column DB-5		
	0.73	885.3	tr	0.59	643.4	0.01
2-Methylbutyral	0.71	879.7	tr	0.62	653.4	0.01
Toluene	1.36*	1000.3	[0.02]	1.13	759.4	tr
Tricyclene	1.19	972.1	0.02	2.83	919.0	0.02
$\alpha$ -Thujene	1.36*	1000.3	[0.02]	2.94	926.5	0.02
$\alpha$ -Pinene	1.31	992.3	5.09	3.02	932.0	5.10
$\alpha$ -Fenchene	1.56	1022.3	0.02	3.20*	943.9	[0.22]
Camphene	1.62	1028.3	0.19	3.20*	943.9	[0.22]
Sabinene	2.18	1083.3	0.07	3.62*	972.0	[0.28]
$\beta$ -Pinene	2.00	1065.6	0.21	3.62*	972.0	[0.28]
Myrcene	2.77	1134.1	0.99	3.94	993.5	1.00
Pseudolimonene	2.71	1129.6	tr	4.07*	1002.8	[1.11]
$\alpha$ -Phellandrene	2.67	1126.3	1.09	4.07*	1002.8	[1.11]
$\Delta^3$ -Carene	2.47	1111.0	0.03	4.16	1008.3	0.04
$\alpha$ -Terpinene	2.84	1139.5	0.03	4.27	1015.1	0.03
<i>para</i> -Cymene	3.95	1225.9	0.24	4.38	1022.5	0.24
1,8-Cineole	3.17	1165.7	0.05	4.47*	1028.0	[4.22]
Limonene	3.07	1158.0	3.80	4.47*	1028.0	[4.22]
$\beta$ -Phellandrene	3.15	1164.1	0.35	4.47*	1028.0	[4.22]
( <i>Z</i> )- $\beta$ -Ocimene	3.67*	1204.9	[0.59]	4.67	1040.9	0.13
( <i>E</i> )- $\beta$ -Ocimene	3.85	1218.4	0.01	4.82	1050.7	0.01
$\gamma$ -Terpinene	3.67*	1204.9	[0.59]	4.94	1058.1	0.47
<i>cis</i> -Sabinene hydrate	6.75	1427.5	0.03	5.07	1066.1	0.03
Fenchone	5.57	1341.0	13.07	5.38	1086.0	12.88
Terpinolene	4.13	1239.3	0.10	5.40	1087.6	0.10
Linalool	7.91	1515.5	0.03	5.63	1101.9	0.03
endo-Fenchol	8.20	1538.5	0.02	5.76	1110.6	0.03
<i>trans</i> -Pinene hydrate	7.73	1501.8	0.03	5.86	1117.2	0.03
<i>trans-para</i> -Mentha-2,8-dien-1-ol	8.79	1584.5	tr	5.89	1119.1	0.01
Camphor	7.02	1447.7	0.32	6.18	1137.9	0.33
Unknown CALU I [m/z 95, 43 (74), 109 (72), 82 (62), 110 (50)... 152 (14)]	6.83	1433.7	0.01	6.26	1142.9	0.02
Borneol	9.60*	1650.1	[0.03]	6.61	1165.5	0.01
Terpinen-4-ol	8.39	1553.4	0.09	6.75	1175.0	0.09
<i>para</i> -Cymen-8-ol	11.33	1796.4	0.01	6.89	1184.2	0.01
$\alpha$ -Terpineol	9.60*	1650.1	[0.03]	6.97	1189.4	0.03
Methylchavicol	9.11*	1610.1	[2.21]	7.11	1198.1	2.21
<i>cis</i> - $\alpha$ -Phellandrene epoxide (iPr vs Me)	10.83	1753.2	0.01	7.14	1200.0	0.01
Dihydroanethole	8.43	1556.2	0.04	7.20	1204.4	0.03
<i>trans</i> -Carveol	11.20	1784.9	0.01	7.41	1218.8	0.01

Carvone	9.78	1665.3	0.01	7.75	1241.5	0.01
(Z)-Anethole	10.13	1694.1	0.12	7.87†	1249.8	0.08
<i>para</i> -Anisaldehyde	12.92	1939.2	0.41	7.89†	1251.6	0.45
(E)-Anethole	11.02	1769.7	70.10	8.54	1296.2	70.20
Unknown FOVU I [121, 91 (60), 120 (39), 164 (37), 77 (34), 135 (26)]	13.46	1989.6	0.01	9.72	1375.8	0.01
<i>para</i> -Acetonylanisole	14.34	2074.6	0.05	9.76	1378.8	0.05
Methyleugenol	13.11	1956.4	0.01	10.13	1405.2	0.01
β-Caryophyllene	8.28*	1544.8	[0.01]	10.26	1414.6	0.01
<i>trans</i> -α-Bergamotene	8.28*	1544.8	[0.01]	10.54	1436.0	0.01
α-Humulene	9.11*	1610.1	[2.21]	10.66	1444.6	0.01
(Z)- <i>para</i> -Methoxycinnamaldehyde?				11.09	1477.1	0.01
Unknown FOVU IV [m/z 137, 148 (14), 121 (14), 208 (13)]				11.63	1518.2	0.01
1-(4-Methoxyphenyl)propane-1,2-diol isomer I				12.22	1565.3	0.05
1-(4-Methoxyphenyl)propane-1,2-diol isomer II	20.65	2771.2	0.02	12.32	1572.7	0.03
Unknown FOVU V [m/z 137, 131 (46), 166 (44), 109 (26), 77 (21)...]				12.92	1620.5	0.01
Phytadiene isomer I				15.56	1849.1	tr
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer I				21.39	2449.5	0.02
2,4-Bis-(4-methoxyphenyl)-3,5-dimethyltetrahydrofuran isomer II				21.61	2475.0	0.02
Total reported		99.59%			99.76%	

\*: 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