CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 22A07-PTH01
Customer identification : Oregano ORGANIC - Spain - O5011128R
Type : Essential oil
Source : *Origanum vulgare* ct. Carvacrol
Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-014 ✳ISO - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Sarah-Eve Tremblay, M. Sc. A., Chimiste
Analysis date : January 11, 2022

Checked and approved by :

_____
Alexis St-Gelais, Ph. D., Chimiste 2013-174

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MÉTHODE CERTIFIÉE
✳ISO 17025:2017
CERTIFIED METHOD

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Oregano ORGANIC - Spain - O5011128R

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PHYSICOCHEMICAL DATA

Physical aspect: Light orange liquid
Refractive index: 1.5092 ± 0.0003 (20 °C; method PC-MAT-016)

CONCLUSION

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

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Internal code: 22A07-PTH01

Oregano ORGANIC - Spain - O5011128R

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ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

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

Identification	%	Class
Isobutyral	0.01	Aliphatic aldehyde
Isovaleral	0.02	Aliphatic aldehyde
2-Methylbutyral	0.02	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Isoamyl alcohol	tr	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Methyl 2-methylbutyrate	0.07	Aliphatic ester
(2*E*)-Hexenal	tr	Aliphatic aldehyde
(3*Z*)-Hexenol	tr	Aliphatic alcohol
Hexanol	tr	Aliphatic alcohol
Heptan-3-one	0.01	Aliphatic ketone
Hashishene	0.01	Monoterpene
Tricyclene	0.01	Monoterpene
α-Thujene	0.74	Monoterpene
α-Pinene	1.27	Monoterpene
Camphene	0.14	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
Sabinene	0.01	Monoterpene
β-Pinene	0.10	Monoterpene
Octen-3-ol	0.52	Aliphatic alcohol
Octan-3-one	0.23	Aliphatic ketone
Myrcene	1.63	Monoterpene
α-Phellandrene	0.17	Monoterpene
Pseudolimonene	0.01	Monoterpene
Octan-3-ol	0.06	Aliphatic alcohol
Δ3-Carene	0.08	Monoterpene
α-Terpinene	1.14	Monoterpene
para-Cymene	6.99	Monoterpene
Limonene	0.20	Monoterpene
1,8-Cineole	0.23	Monoterpenic ether
β-Phellandrene	tr	Monoterpene
(*Z*)-β-Ocimene	0.02	Monoterpene
(*E*)-β-Ocimene	0.05	Monoterpene
γ-Terpinene	5.29	Monoterpene
cis-Sabinene hydrate	0.22	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.01	Monoterpenic alcohol
trans-Linalool oxide (fur.)	0.19	Monoterpenic alcohol
trans-Sabinene hydrate	0.14	Monoterpenic alcohol
Linalool	1.08	Monoterpenic alcohol
Hotrienol	0.03	Monoterpenic alcohol
endo-Fenchol	0.02	Monoterpenic alcohol
cis-para-Menth-2-en-1-ol	0.03	Monoterpenic alcohol
trans-Pinocarveol	0.01	Monoterpenic alcohol
Camphor	0.02	Monoterpenic ketone
trans-para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol

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Internal code: 22A07-PTH01

Oregano ORGANIC - Spain - O5011128R

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Isoborneol	tr	Monoterpenic alcohol
Borneol	0.21	Monoterpenic alcohol
Umbellulone	tr	Monoterpenic ketone
Terpinen-4-ol	0.84	Monoterpenic alcohol
para-Cymen-8-ol	0.03	Monoterpenic alcohol
α-Terpineol	0.08	Monoterpenic alcohol
Myrtenal	0.03	Monoterpenic aldehyde
cis-Dihydrocarvone	0.10	Monoterpenic ketone
trans-Dihydrocarvone	0.08	Monoterpenic ketone
Carvone	0.02	Monoterpenic ketone
Carvacrol methyl ether	0.03	Monoterpenic ether
Geraniol	0.03	Monoterpenic alcohol
Geranial	0.01	Monoterpenic aldehyde
(E)-Anethole	0.02	Phenylpropanoid
Cuminol	0.01	Monoterpenic alcohol
Thymol analogue I (isothymol?)	0.02	Monoterpenic alcohol
Thymol	3.71	Monoterpenic alcohol
Carvacrol	69.49	Monoterpenic alcohol
α-Terpinyl acetate	0.01	Monoterpenic ester
α-Copaene	0.01	Sesquiterpene
Carvacryl acetate	0.02	Monoterpenic ester
β-Bourbonene	0.01	Sesquiterpene
Geranyl acetate	0.01	Monoterpenic ester
β-Elemene	0.02	Sesquiterpene
Isocaryophyllene	0.01	Sesquiterpene
cis-α-Bergamotene	0.03	Sesquiterpene
β-Caryophyllene	2.19	Sesquiterpene
β-Copaene	0.02	Sesquiterpene
Aromadendrene	0.02	Sesquiterpene
α-Humulene	0.13	Sesquiterpene
Thymohydroquinone isomer?	0.14	Simple phenolic
(E)-β-Farnesene	0.03	Sesquiterpene
γ-Muurolene	0.01	Sesquiterpene
allo-Aromadendr-9-ene	0.01	Sesquiterpene
α-Selinene	0.01	Sesquiterpene
(3Z,6E)-α-Farnesene	0.01	Sesquiterpene
β-Bisabolene	0.26	Sesquiterpene
γ-Cadinene	0.01	Sesquiterpene
δ-Cadinene	0.02	Sesquiterpene
Spathulenol	0.01	Sesquiterpenic alcohol
Caryophyllene oxide isomer	tr	Sesquiterpenic ether
Caryophyllene oxide	0.22	Sesquiterpenic ether
Unknown	0.01	Oxygenated sesquiterpene
Humulene epoxide I	0.01	Sesquiterpenic ether
Humulene epoxide II	0.01	Sesquiterpenic ether
Caryophylladienol I	0.01	Sesquiterpenic alcohol
Caryophylladienol II	0.02	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
(3Z)-Caryophylla-3,8(13)-dien-5β-ol	0.02	Sesquiterpenic alcohol
α-Bisabolol	0.01	Sesquiterpenic alcohol
Phytone	0.01	Terpenic ketone
Unknown	tr	Unknown

Essential oil, *Origanum vulgare* ct. Carvacrol
Internal code: 22A07-PTH01

Oregano ORGANIC - Spain - O5011128R

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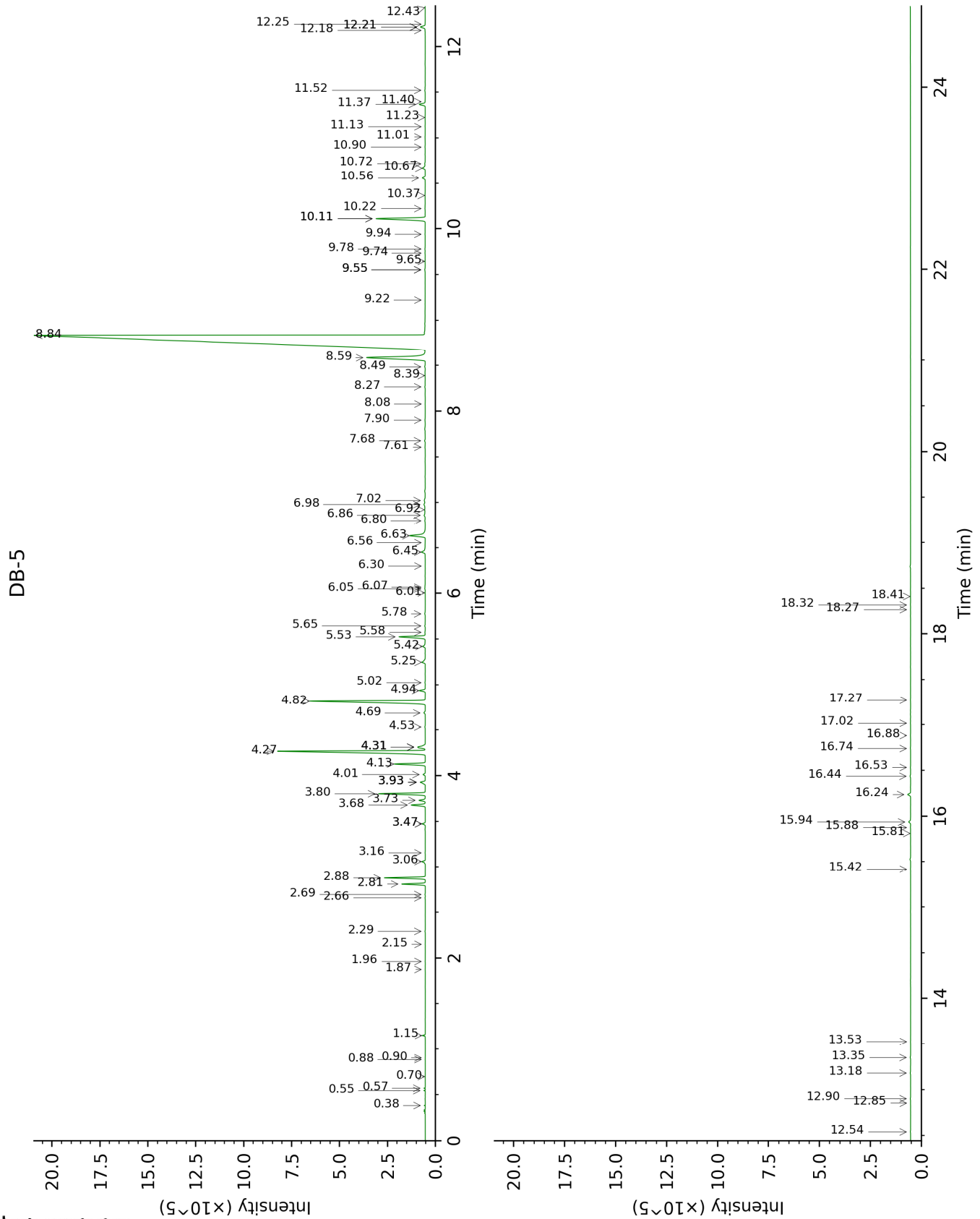|		
Unknown	0.01	Unknown
Unknown	0.09	Unknown
Unknown	0.13	Unknown
Unknown	0.03	Unknown
meta-Camphorene	0.01	Diterpene
Unknown	0.01	Unknown
para-Camphorene	0.01	Diterpene
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Consolidated total	**99.21%**	

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

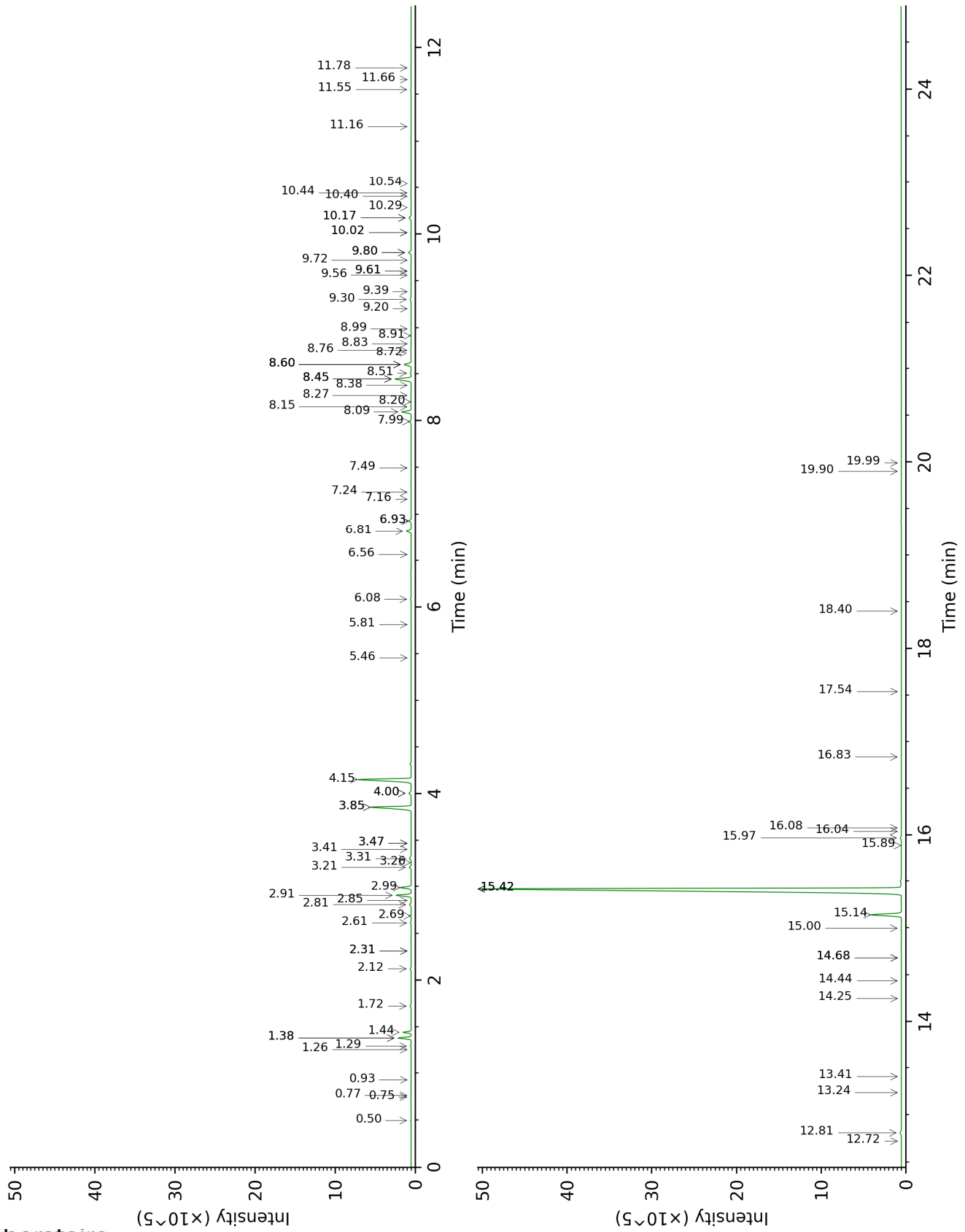Note: no correction factor was applied

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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Internal code: 22A07-PTH01

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Internal code: 22A07-PTH01

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DB-WAX

Time (min)

Intensity (×10^5)

0.50
0.77 0.75
0.93
1.26 1.29
1.38 1.44
1.72
2.12
2.31
2.61 2.69
2.81 2.85
2.91 2.99
3.21 3.26
3.41 3.31 3.47
3.85
4.00
4.15
5.46
5.81
6.08
6.56
6.81 6.93
7.24 7.16
7.49
7.99
8.09 8.20
8.15 8.27 8.38
8.45 8.51
8.60 8.72
8.76 8.83
8.99 8.91
9.30 9.39 9.20
9.56 9.61
9.72 9.80
10.02
10.17 10.29
10.44 10.40 10.54
11.16
11.55 11.66
11.78

Time (min)

Intensity (×10^5)

12.81 12.72
13.24
13.41
14.25
14.44
14.68
15.00
15.14
15.42
15.97 16.08 16.04
15.89
16.83
17.54
18.40
19.90 19.99

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Internal code: 22A07-PTH01

Oregano ORGANIC - Spain - O5011128R

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isobutyral	0.38	536	0.01	0.50	784	0.03
Isovaleral	0.55	640	0.02	0.76	888	0.02
2-Methylbutyral	0.57	650	0.02	0.75	881	0.02
2-Ethylfuran	0.70	700	tr	0.93	919	tr
Isoamyl alcohol	0.88	732	tr	3.47*	1179	tr
2-Methylbutanol	0.90	735	tr	3.47*	1179	[tr]
Methyl 2-methylbutyrate	1.15	773	0.07	1.30	978	0.06
(2*E*)-Hexenal	1.87	850	tr	3.41	1174	0.01
(3*Z*)-Hexenol	1.96	858	tr	5.81	1348	0.01
Hexanol	2.15	874	tr	5.46	1322	0.01
Heptan-3-one	2.29	886	0.01	2.69	1117	0.01
Hashishene	2.66	915	0.01	1.38*	992	1.28
Tricyclene	2.69	918	0.01	1.26	972	0.01
α-Thujene	2.81	926	0.74	1.44	1000	0.73
α-Pinene	2.88	930	1.27	1.38*	992	[1.28]
Camphene	3.06	943	0.14	1.72	1027	0.11
Thuja-2,4(10)-diene	3.16	949	0.01	2.31*	1085	0.01
Sabinene	3.47*	971	0.11	2.31*	1085	[0.01]
β-Pinene	3.47*	971	[0.11]	2.12	1066	0.10
Octen-3-ol	3.68	985	0.52	6.81	1421	0.53
Octan-3-one	3.73	988	0.23	4.00*	1220	0.28
Myrcene	3.80	993	1.63	2.91	1134	1.60
α-Phellandrene	3.93*	1002	0.24	2.81	1126	0.17
Pseudolimonene	3.93*	1002	[0.24]	2.85	1130	0.01
Octan-3-ol	3.93*	1002	[0.24]	6.08	1368	0.06
Δ3-Carene	4.01	1007	0.08	2.61	1111	0.08
α-Terpinene	4.13	1014	1.14	2.99	1141	1.14
para-Cymene	4.27	1023	6.99	4.15	1231	6.98
Limonene	4.31*	1026	0.45	3.21	1158	0.20
1,8-Cineole	4.31*	1026	[0.45]	3.31	1166	0.23
β-Phellandrene	4.31*	1026	[0.45]	3.26	1163	tr
(*Z*)-β-Ocimene	4.53	1040	0.02	3.86*	1209	5.29
(*E*)-β-Ocimene	4.69	1050	0.05	4.00*	1220	[0.28]
γ-Terpinene	4.82	1058	5.29	3.86*	1209	[5.29]
cis-Sabinene hydrate	4.94	1066	0.22	6.93*	1429	0.24
cis-Linalool oxide (fur.)	5.02	1071	0.01	6.56	1402	0.01
trans-Linalool oxide (fur.)	5.25	1085	0.19	6.93*	1429	[0.24]
trans-Sabinene hydrate	5.42	1096	0.14	7.99	1509	0.15
Linalool	5.53	1103	1.08	8.09	1517	1.07
Hotrienol	5.58	1106	0.03	8.83	1574	0.01
endo-Fenchol	5.65	1111	0.02	8.38	1539	tr
cis-para-Menth-2-en-1-ol	5.78	1119	0.03	8.15	1521	0.04
trans-Pinocarveol	6.01	1134	0.01	9.20	1603	0.01

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Internal code: 22A07-PTH01

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Camphor	6.05	1137	0.02	7.24	1452	0.02
trans-para-Menth-2-en-1-ol	6.07	1138	0.02	8.99	1586	0.01
Isoborneol	6.30	1153	tr	9.39	1618	0.01
Borneol	6.45	1163	0.21	9.80*	1652	0.32
Umbellulone	6.56	1169	tr	8.92	1581	tr
Terpinen-4-ol	6.63	1174	0.84	8.60*	1556	0.86
para-Cymen-8-ol	6.80	1185	0.03	11.55	1798	0.05
α-Terpineol	6.86	1189	0.08	9.80*	1652	[0.32]
Myrtenal	6.92	1193	0.03	8.72	1566	0.04
cis-Dihydrocarvone	6.98	1196	0.10	8.51	1549	0.09
trans-Dihydrocarvone	7.02	1199	0.08	8.76	1568	0.04
Carvone	7.61	1238	0.02	10.02*	1669	0.03
Carvacrol methyl ether	7.68	1243	0.03	8.60*	1556	[0.86]
Geraniol	7.90	1258	0.03	11.66	1808	0.01
Geranial	8.08	1270	0.01	10.17*	1682	0.26
(*E*)-Anethole	8.27	1282	0.02	11.16	1765	0.02
Cuminol	8.39	1291	0.01	14.25	2045	0.01
Thymol analogue I (isothymol?)	8.49	1297	0.02	15.00	2118	0.04
Thymol	8.59	1304	3.71	15.14	2133	3.64
Carvacrol	8.84	1322	69.49	15.42*	2160	69.48
α-Terpinyl acetate	9.22	1349	0.01	9.72	1645	0.01
α-Copaene	9.55*	1372	0.03	7.16	1447	0.01
Carvacryl acetate	9.55*	1372	[0.03]	11.78	1819	0.02
β-Bourbonene	9.65	1379	0.01	7.49	1471	0.01
Geranyl acetate	9.74	1385	0.01	10.54	1712	0.01
β-Elemene	9.78	1389	0.02	8.44*	1544	2.23
Isocaryophyllene	9.94	1400	0.01	8.20	1525	0.01
cis-α-Bergamotene	10.11*	1412	2.24	8.27	1530	0.03
β-Caryophyllene	10.11*	1412	[2.24]	8.44*	1544	[2.23]
β-Copaene	10.22	1421	0.02	8.44*	1544	[2.23]
Aromadendrene	10.37	1431	0.02	8.60*	1556	[0.86]
α-Humulene	10.56	1446	0.13	9.30	1611	0.12
Thymohydroquinone isomer?	10.67	1454	0.14			
(*E*)-β-Farnesene	10.72	1458	0.03	9.56	1632	0.03
γ-Muurolene	10.90	1471	0.01	9.60*	1636	0.02
allo-Aromadendr-9-ene	11.01	1480	0.01	9.60*	1636	[0.02]
α-Selinene	11.13	1488	0.01	10.02*	1669	[0.03]
(3*Z*,6*E*)-α-Farnesene	11.23	1496	0.01	10.28	1691	0.02
β-Bisabolene	11.37	1506	0.26	10.17*	1682	[0.26]
γ-Cadinene	11.40	1509	0.01	10.40	1701	0.02
δ-Cadinene	11.52	1519	0.02	10.44	1704	0.03
Spathulenol	12.18	1570	0.01	14.44	2063	0.01
Caryophyllene oxide isomer	12.21*	1573	0.23	12.72	1902	tr
Caryophyllene oxide	12.21*	1573	[0.23]	12.81	1911	0.22

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Internal code: 22A07-PTH01

Oregano ORGANIC - Spain - O5011128R

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Unknown [m/z 109, 43 (95), 81 (81), 93 (76), 69 (75), 95 (74), 107 (71)... 204 (22), 220 (6)]	12.25	1575	0.01			
Humulene epoxide I	12.43	1590	0.01	13.24	1950	0.02
Humulene epoxide II	12.54	1599	0.01	13.41	1966	0.02
Caryophylladienol I	12.85	1624	0.01	16.04	2224	0.01
Caryophylladienol II	12.90	1628	0.02	16.08	2228	0.02
Unknown [m/z 161, 59 (67), 95 (45), 93 (40), 105 (40), 149 (39), 81 (39), 43 (38), 204 (37)... 220 (5)]	13.18	1651	0.03	14.68*	2087	tr
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	13.35	1665	0.02	16.83	2307	0.03
α-Bisabolol	13.53	1680	0.01	15.42*	2160	[69.48]
Phytone	15.42	1845	0.01	14.68*	2087	[tr]
Unknown [m/z 93, 135 (57), 43 (41), 91 (39), 150 (22)...]	15.81	1881	tr			
Unknown [m/z 133, 150 (34), 105 (22), 135 (16), 134 (12)...]	15.88	1887	0.01			
Unknown [m/z 81, 150 (83), 136 (81), 135 (67), 93 (48), 121 (36)...]	15.94	1893	0.09			
Unknown [m/z 136, 81 (81), 150 (74), 135 (52), 93 (46), 121 (42)...]	16.24	1921	0.13	15.97	2217	0.14
Unknown [m/z 81, 136 (71), 150 (57), 93 (47), 135 (42)...]	16.44	1940	0.03			
meta-Camphorene	16.53	1949	0.01	15.42*	2160	[69.48]
Unknown [m/z 151, 135 (46), 109 (41), 43 (26), 150 (24), 107 (23)...]	16.74	1968	0.01			
para-Camphorene	16.88	1982	0.01	15.89	2208	0.02
Unknown [m/z 99, 43 (43), 69 (37), 71 (37), 41 (28)...]	17.02	1995	0.01	17.54	2383	0.01
Unknown [m/z 135, 150 (66), 43 (38), 109 (27), 93 (25), 137 (20)...]	17.27	2020	0.01	18.40	2479	0.01
Unknown [m/z 69, 41 (81), 91 (37), 166 (35), 105 (33), 43 (30)...]	18.27	2119	0.01	19.90	2654	0.01

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Plant Therapy

	R.T.	R.I.	%	R.T.	R.I.	%
Unknown [m/z 69, 41 (74), 166 (36), 91 (32), 105 (28), 43 (25)...]	18.32	2125	0.01	19.99	2665	0.01
Unknown [m/z 201, 241 (93), 159 (74), 302 (57), 259 (38), 43 (29)...]	18.41	2134	0.01			
Total identified	**98.91%**			**98.35%**		
Total reported	**99.24%**			**98.53%**		

*: Two or more compounds are coeluting on this column

[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
R.T.: Retention time (minutes)
R.I.: Retention index

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