Date : August 10, 2020

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 20G27-PSC01
Customer identification : Eucalyptus - Rwanda - 07132020
Type : Essential oil
Source : *Eucalyptus globulus*
Customer : Pacha Soap Co.

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 : Fanny Charlier, B. Sc., chimiste à l'entraînement
Analysis date : July 28, 2020

Checked and approved by :

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

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Méthode certifiée ISO 17025:2017 Certified method

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PHYSICOCHEMICAL DATA

Physical aspect: Fainty yellow liquid
Refractive index: 1.4640 ± 0.0003 (20 °C; method PC-MAT-016)
Optical rotation: +8.0° (*c* = 18.0, methanol, 25 °C)

ISO 770:2002 - CRUDE OIL OF EUCALYPTUS GLOBULUS

Compound	Min. %	Max. %	Observed %	Complies?
Globulol	0.5	1.5	0.2	No
Aromadendrene	0.5	10.0	0.6	Yes
trans-Pinocarveol	1	6	0.2	No
para-Cymene	1.0	2.0	1.5	Yes
1,8-Cineole	60		64	Yes
Limonene	1	8	6	Yes
α-Phellandrene	0.1	1.0	0.3	Yes
α-Pinene	10	22	13	Yes
Optical rotation	+2.0°	+8.0°	+8.0°	Yes
Refractive index	1.4570	1.4750	1.4640	Yes

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil does not comply with the ISO standard for crude Eucalyptus globulus oil.

Analysis summary – Consolidated contents

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

Identification	%	Class
Isovaleral	0.32	Aliphatic aldehyde
Isoamyl alcohol	0.02	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Toluene	tr	Simple phenolic
(3*Z*)-Hexenol	0.01	Aliphatic alcohol
Hashishene	0.04	Monoterpene
α-Thujene	0.03	Monoterpene
α-Pinene	13.36	Monoterpene
Camphene	0.06	Monoterpene
α-Fenchene	0.01	Monoterpene
Thuja-2,4(10)-diene	0.02	Monoterpene
β-Pinene	0.35	Monoterpene
Sabinene	tr	Monoterpene
trans-para-Menthane	0.02	Monoterpene
Myrcene	0.38	Monoterpene
trans-Dehydroxylinalool oxide	0.03	Monoterpenic ether
α-Phellandrene	0.29	Monoterpene
Pseudolimonene	0.02	Monoterpene
Δ3-Carene	0.02	Monoterpene
α-Terpinene	0.08	Monoterpene
para-Cymene	1.51	Monoterpene
Limonene	5.74	Monoterpene
1,8-Cineole	64.11	Monoterpenic ether
(*Z*)-β-Ocimene	0.17	Monoterpene
(*E*)-β-Ocimene	0.05	Monoterpene
γ-Terpinene	5.14	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Terpinolene	0.13	Monoterpene
trans-Linalool oxide (fur.)	0.04	Monoterpenic alcohol
para-Cymenene	0.05	Monoterpene
α-Pinene oxide	0.02	Monoterpenic ether
Linalool	0.13	Monoterpenic alcohol
Unknown	0.04	Unknown
Isoamyl isovalerate	0.04	Aliphatic ester
endo-Fenchol	0.05	Monoterpenic alcohol
trans-Pinocarveol	0.18	Monoterpenic alcohol
Isopulegol	0.02	Monoterpenic alcohol
Pinocarvone	0.08	Monoterpenic ketone
Borneol	0.05	Monoterpenic alcohol
δ-Terpineol	0.10	Monoterpenic alcohol
Terpinen-4-ol	0.73	Monoterpenic alcohol
para-Cymen-8-ol	0.02	Monoterpenic alcohol
α-Terpineol	2.46	Monoterpenic alcohol
Myrtenal	0.01	Monoterpenic aldehyde

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Myrtenol	0.03	Monoterpenic alcohol
cis-α-Phellandrene epoxide (IPP vs Me)	0.03	Monoterpenic ether
Unknown	0.03	Oxygenated monoterpene
exo-2-Hydroxycineole	0.02	Monoterpenic alcohol
cis-Isocarveol	0.02	Monoterpenic alcohol
trans-α-Phellandrene epoxide (IPP vs Me)	0.01	Monoterpenic ether
Carvone	0.02	Monoterpenic ketone
Carvotanacetone	0.02	Monoterpenic ketone
Unknown	0.01	Unknown
Geraniol	0.12	Monoterpenic alcohol
Vitispirane?	0.02	Terpenic ether
cis-Ascaridole glycol	0.04	Monoterpenic alcohol
δ-Terpinyl acetate	0.01	Monoterpenic ester
α-Terpinyl acetate	0.07	Monoterpenic ester
Unknown	0.01	Unknown
α-Copaene	0.05	Sesquiterpene
Geranyl acetate	0.01	Monoterpenic ester
Unknown	0.01	Sesquiterpene
α-Gurjunene	0.10	Sesquiterpene
β-Caryophyllene	0.06	Sesquiterpene
γ-Maaliene	0.02	Sesquiterpene
β-Gurjunene	0.06	Sesquiterpene
α-Maaliene	0.01	Sesquiterpene
Aromadendrene	0.58	Sesquiterpene
α-Humulene	0.03	Sesquiterpene
allo-Aromadendrene	0.17	Sesquiterpene
Valerena-4,7(11)-diene	0.02	Sesquiterpene
γ-Gurjunene	0.01	Sesquiterpene
γ-Muurolene	0.02	Sesquiterpene
allo-Aromadendr-9-ene	0.03	Sesquiterpene
Viridiflorene	0.10	Sesquiterpene
α-Muurolene	0.01	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
δ-Cadinene	0.03	Sesquiterpene
Maaliol	0.03	Sesquiterpenic alcohol
Spathulenol	0.02	Sesquiterpenic alcohol
Globulol	0.18	Sesquiterpenic alcohol
Viridiflorol	0.04	Sesquiterpenic alcohol
Ledol	0.02	Sesquiterpenic alcohol
Eudesm-5-en-11-ol analog	0.02	Sesquiterpenic alcohol
Eudesm-5-en-11-ol	0.01	Sesquiterpenic alcohol
Muurola-4,10(14)-dien-1β-ol?	0.12	Sesquiterpenic alcohol
γ-Eudesmol	0.11	Sesquiterpenic alcohol
β-Eudesmol	0.39	Sesquiterpenic alcohol
α-Eudesmol	0.26	Sesquiterpenic alcohol
Selin-11-en-4α-ol	0.01	Sesquiterpenic alcohol
Consolidated total	**98.95%**	

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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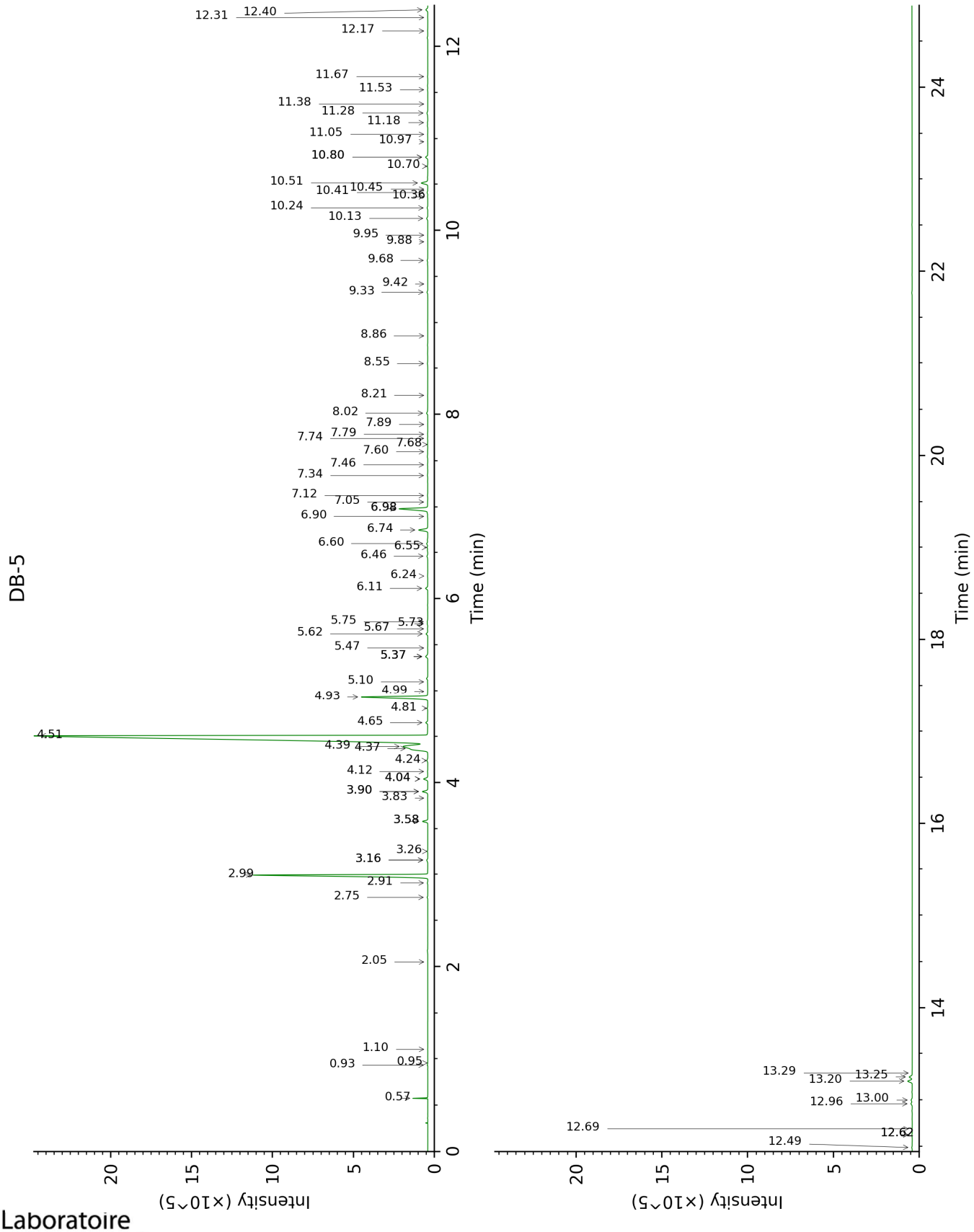
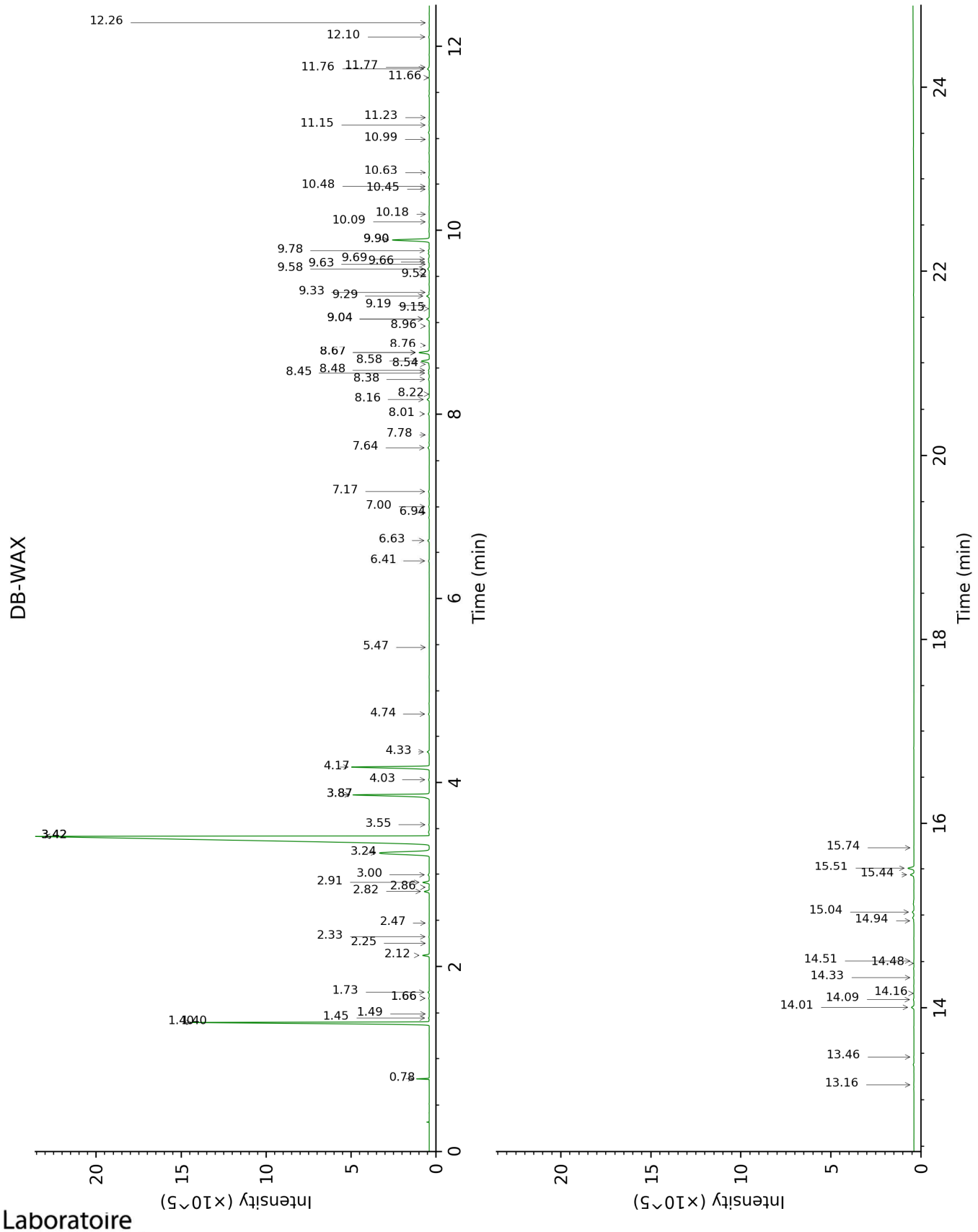

DB-5
Time (min)
Intensity (×10^5)
12.31
12.40
12.17
11.67
11.53
11.38
11.28
11.18
11.05
10.97
10.80
10.70
10.51
10.41
10.45
10.36
10.24
10.13
9.95
9.88
9.68
9.42
9.33
8.86
8.55
8.21
8.02
7.89
7.74
7.79
7.68
7.60
7.46
7.34
7.12
7.05
6.98
6.90
6.74
6.60
6.55
6.46
6.24
6.11
5.75
5.67
5.73
5.62
5.47
5.37
5.10
4.93
4.99
4.81
4.65
4.51
4.39
4.37
4.24
4.12
4.04
3.90
3.83
3.58
3.26
3.16
2.99
2.91
2.75
2.05
1.10
0.93
0.95
0.57
13.29
13.20
13.25
12.96
13.00
12.69
12.62
12.49


DB-WAX
Time (min)
Intensity (×10^5)
12.26
12.10
11.76
11.77
11.66
11.23
11.15
10.99
10.63
10.48
10.45
10.18
10.09
9.90
9.78
9.69
9.66
9.58
9.63
9.52
9.33
9.29
9.19
9.15
9.04
8.96
8.76
8.67
8.58
8.54
8.45
8.48
8.38
8.22
8.16
8.01
7.78
7.64
7.17
7.00
6.94
6.63
6.41
5.47
4.74
4.33
4.17
4.03
3.87
3.55
3.42
3.24
3.00
2.91
2.82
2.86
2.47
2.33
2.25
2.12
1.73
1.66
1.45
1.49
1.40
0.78
15.74
15.51
15.44
15.04
14.94
14.51
14.48
14.33
14.16
14.09
14.01
13.46
13.16

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.57	642	0.32	0.78	888	0.33
Isoamyl alcohol	0.93	733	0.02	3.55	1182	0.03
2-Methylbutanol	0.95	737	tr	3.42*	1172	60.69
Toluene	1.10	758	tr	1.49	1001	tr
(3*Z*)-Hexenol	2.05	858	0.01			
Hashishene	2.75	915	0.04	1.40*	992	13.16
α-Thujene	2.91	925	0.03	1.45	997	0.03
α-Pinene	2.99	931	13.36	1.40*	992	[13.16]
Camphene	3.16*	942	0.09	1.72	1025	0.06
α-Fenchene	3.16*	942	[0.09]	1.66*	1018	0.02
Thuja-2,4(10)-diene	3.26	949	0.02	2.33	1085	0.02
β-Pinene	3.58*	970	0.36	2.12	1065	0.35
Sabinene	3.58*	970	[0.36]	2.25	1078	tr
trans-para-Menthane	3.83	987	0.02	1.66*	1018	[0.02]
Myrcene	3.90*	992	0.41	2.91	1133	0.38
trans-Dehydroxylinalool oxide	3.90*	992	[0.41]	3.42*	1172	[60.69]
α-Phellandrene	4.04*	1001	0.34	2.82	1125	0.29
Pseudolimonene	4.04*	1001	[0.34]	2.86	1128	0.02
Δ3-Carene	4.12	1006	0.02	2.47	1098	0.01
α-Terpinene	4.24	1014	0.08	3.00	1139	0.08
para-Cymene	4.37	1022	1.51	4.17	1228	5.00
Limonene	4.39†	1024	69.84	3.24	1158	5.74
1,8-Cineole	4.51†	1031	[69.84]	3.42*	1172	[60.69]
(*Z*)-β-Ocimene	4.65	1040	0.17	3.87*	1206	5.28
(*E*)-β-Ocimene	4.81	1050	0.05	4.03	1218	0.04
γ-Terpinene	4.93	1058	5.14	3.87*	1206	[5.28]
cis-Sabinene hydrate	4.99	1062	0.01	6.94	1426	0.01
cis-Linalool oxide (fur.)	5.10	1068	0.02	6.63	1404	0.10
Terpinolene	5.37*	1086	0.22	4.33	1240	0.13
trans-Linalool oxide (fur.)	5.37*	1086	[0.22]	7.00	1431	0.04
para-Cymenene	5.37*	1086	[0.22]	6.41	1388	0.05
α-Pinene oxide	5.47	1092	0.02	5.47	1321	0.01
Linalool	5.62	1102	0.13	8.16	1519	0.14
Unknown [m/z 43, 59 (37), 79 (33), 91 (32), 119 (31)...]	5.67	1105	0.04	9.04*	1586	0.20
Isoamyl isovalerate	5.73	1109	0.04	4.74	1269	0.05
endo-Fenchol	5.75	1110	0.05	8.45	1541	0.06
trans-Pinocarveol	6.11	1134	0.18	9.29	1606	0.18
Isopulegol	6.24	1142	0.02	8.22	1524	0.01

Pinocarvone	6.46	1156	0.08	8.01	1507	0.07
Borneol	6.55	1162	0.05	9.90*	1655	2.55
δ-Terpineol	6.60	1165	0.10	9.58	1630	0.13
Terpinen-4-ol	6.74	1174	0.73	8.67*	1558	0.71
para-Cymen-8-ol	6.90	1184	0.02	11.66	1802	0.02
α-Terpineol	6.98*	1190	2.47	9.90*	1655	[2.55]
Myrtenal	6.98*	1190	[2.47]	8.76	1564	0.01
Myrtenol	7.05	1195	0.03	10.99	1745	0.01
cis-α-Phellandrene epoxide (IPP vs Me)	7.12	1199	0.03	11.15	1758	0.02
Unknown [m/z 107, 79 (99), 91 (57), 94 (54), 135 (44), 150 (44)]	7.34	1214	0.03			
exo-2-Hydroxycineole	7.46	1222	0.02	11.77	1811	0.02
cis-Isocarveol	7.60	1229	0.02	12.10	1840	0.04
trans-α-Phellandrene epoxide (IPP vs Me)	7.68	1234	0.01	12.26	1853	0.01
Carvone	7.74	1239	0.02	10.09	1670	0.02
Carvotanacetone	7.79	1242	0.02	9.52	1624	0.02
Unknown [m/z 43, 97 (69), 107 (46), 41 (28), 55 (21), 109 (20)...]	7.89	1249	0.01	11.23	1765	0.01
Geraniol	8.02	1257	0.12	11.76	1810	0.13
Vitispirane?	8.21	1270	0.02	7.78	1488	0.01
cis-Ascaridole glycol	8.55	1293	0.04	14.94	2102	0.03
δ-Terpinyl acetate	8.86	1314	0.01	9.19	1598	0.01
α-Terpinyl acetate	9.33	1347	0.07	9.78	1646	0.06
Unknown [m/z 43, 95 (62), 107 (45), 110 (41), 55 (28), 67 (25)...]	9.42	1354	0.01	14.16	2027	0.02
α-Copaene	9.68	1371	0.05	7.17	1443	0.05
Geranyl acetate	9.88	1386	0.01	10.63	1715	0.01
Unknown [m/z 93, 122 (98), 161 (98), 107 (86), 95 (46), 105 (72)... 204 (34)]	9.95	1391	0.01			
α-Gurjunene	10.13	1404	0.10	7.64	1478	0.10
β-Caryophyllene	10.24	1412	0.06	8.48	1543	0.05
γ-Maaliene	10.36	1421	0.02	8.54	1548	0.03
β-Gurjunene	10.41	1424	0.06	8.38	1536	0.06
α-Maaliene	10.45	1427	0.01	8.67*	1558	[0.71]
Aromadendrene	10.51	1432	0.58	8.58	1551	0.58

α-Humulene	10.70	1446	0.03	9.33	1609	0.03
allo-Aromadendrene	10.80*	1453	0.20	9.04*	1586	[0.20]
Valerena-4,7(11)-diene	10.80*	1453	[0.20]	8.96	1580	0.02
γ-Gurjunene	10.97	1466	0.01	9.15	1595	0.02
γ-Muurolene	11.05	1472	0.02	9.63	1634	0.01
allo-Aromadendr-9-ene	11.18	1481	0.03	9.66	1636	0.06
Viridiflorene	11.28	1489	0.10	9.69	1638	0.08
α-Muurolene	11.38	1496	0.01	10.18	1677	0.01
γ-Cadinene	11.53	1508	0.02	10.48	1702	0.02
δ-Cadinene	11.67	1519	0.03	10.45	1699	0.02
Maaliol	12.17	1558	0.03	13.16	1934	0.02
Spathulenol	12.31	1569	0.02	14.51	2060	0.02
Globulol	12.40	1576	0.18	14.00	2012	0.17
Viridiflorol	12.49	1583	0.04	14.09	2020	0.04
Ledol	12.62*	1594	0.04	13.46	1962	0.02
Eudesm-5-en-11-ol analog	12.62*	1594	[0.04]	14.33	2043	0.02
Eudesm-5-en-11-ol	12.69	1599	0.01	14.48	2058	0.01
Muurola-4,10(14)-dien-1β-ol?	12.96	1621	0.12			
γ-Eudesmol	13.00	1624	0.11	15.04	2111	0.11
β-Eudesmol	13.20	1641	0.39	15.51	2158	0.43
α-Eudesmol	13.25	1645	0.26	15.44	2151	0.27
Selin-11-en-4α-ol	13.29	1648	0.01	15.74	2181	0.01
Total identified		**98.94%**			**98.63%**	
Total reported		**99.03%**			**98.67%**	

*: 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