

Date : November 03, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 20K02-PTH01

Customer identification : Lemongrass Organic - India - L90109207R

Type : Essential oil

Source : *Cymbopogon flexuosus*

Customer : Plant Therapy

ANALYSIS

Method: PC-MAT-014  - 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 : November 03, 2020

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Yellow liquid

Refractive index: 1.4846 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 4718:2004 - OIL OF LEMONGRASS

Compound	Min. %	Max. %	Observed %	Complies?
Geraniol	1.5	8.0	7.5	Yes
Geranyl acetate	0.5	6.0	3.4	Yes
Geranial	35.0	47.0	39.8	Yes
Neral	25.0	35.0	30.5	Yes
β-Caryophyllene	0.2	3.5	1.6	Yes
6-Methyl-5-hepten-2-one	0.1	2.0	1.0	Yes
Limonene	0.5	3.5	0.2	No
Refractive index	1.4830	1.4890	1.4846	Yes

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
Ethanol	tr	Aliphatic alcohol
Isobutyral	tr	Aliphatic aldehyde
Methacrolein	tr	Aliphatic aldehyde
2-Methyl-3-buten-2-ol	0.03	Aliphatic alcohol
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
2-Ethylfuran	tr	Furan
Isoamyl alcohol	tr	Aliphatic alcohol
2-Methylbutanol	0.01	Aliphatic alcohol
Hexanal	0.01	Aliphatic aldehyde
Unknown	tr	Unknown
(3Z)-Hexenol	tr	Aliphatic alcohol
4-Heptanone	0.01	Aliphatic ketone
Tricyclene	0.10	Monoterpene
α -Pinene	0.13	Monoterpene
Camphene	0.73	Monoterpene
β -Pinene	0.01	Monoterpene
Sabinene	tr	Monoterpene
6-Methyl-5-hepten-2-one	0.99	Aliphatic ketone
Dehydro-1,8-cineole	0.04	Monoterpenic ether
Myrcene	0.07	Monoterpene
6-Methyl-5-hepten-2-ol	0.07	Aliphatic alcohol
Octanal	0.07	Aliphatic aldehyde
α -Phellandrene	0.01	Monoterpene
Δ^3 -Carene	0.01	Monoterpene
α -Terpinene	0.01	Monoterpene
para-Cymene	tr	Monoterpene
Limonene	0.19	Monoterpene
β -Phellandrene	0.03	Monoterpene
Benzeneacetaldehyde	0.01	Simple phenolic
(Z)- β -Ocimene	0.32	Monoterpene
(E)- β -Ocimene	0.18	Monoterpene
2,6-Dimethyl-5-heptenal (melonal)	0.03	Aliphatic aldehyde
γ -Terpinene	0.01	Monoterpene
cis-Sabinene hydrate	0.01	Monoterpenic alcohol
cis-Linalool oxide (fur.)	0.02	Monoterpenic alcohol
4-Nonanone	0.91	Aliphatic ketone
Camphenilone	0.02	Normonoterpenic ketone
Terpinolene	0.05	Monoterpene
4-Nonanol	0.02	Aliphatic alcohol
Rosefuran	0.21	Monoterpenic ether
Linalool	1.04	Monoterpenic alcohol
cis-Chrysanthamal?	0.02	Monoterpenic aldehyde
(Z)-6-Methyl-3,5-heptadien-2-one	0.03	Aliphatic ketone
trans-para-Mentha-2,8-dien-1-ol	0.01	Monoterpenic alcohol

Unknown	0.02	Unknown
Unknown	0.11	Unknown
Unknown	0.01	Unknown
exo-Isocitral	0.15	Monoterpenic aldehyde
<i>trans</i> -Chrysanthemal	0.02	Monoterpenic aldehyde
Citronellal	0.26	Monoterpenic aldehyde
Borneol	0.16	Monoterpenic alcohol
Isoneral	1.03	Monoterpenic aldehyde
α -Phellandren-8-ol	0.06	Monoterpenic alcohol
Rosefuran oxide	0.04	Monoterpenic ether
Terpinen-4-ol	0.26	Monoterpenic alcohol
Unknown	0.02	Oxygenated monoterpene
Isogeranial	1.58	Monoterpenic aldehyde
Unknown	0.09	Unknown
α -Terpineol	0.13	Monoterpenic alcohol
Myrtenal	0.07	Monoterpenic aldehyde
<i>trans</i> -Isopiperitenol	0.04	Monoterpenic alcohol
Unknown	0.04	Oxygenated monoterpene
Decanal	0.15	Aliphatic aldehyde
<i>cis</i> -Isopiperitenol	0.01	Monoterpenic alcohol
2,3-Epoxyneral?	0.04	Monoterpenic aldehyde
Nerol	0.24	Monoterpenic alcohol
Citronellol	0.12	Monoterpenic alcohol
Neral	30.46	Monoterpenic aldehyde
Piperitone	0.05	Monoterpenic ketone
Geraniol	7.51	Monoterpenic alcohol
Geranial	39.77	Monoterpenic aldehyde
Unknown	0.01	Oxygenated monoterpene
Bornyl acetate	0.04	Monoterpenic ester
Geranyl formate	0.01	Monoterpenic ester
α -Cubebene	0.02	Sesquiterpene
Citronellyl acetate	0.05	Monoterpenic ester
Cyclosativene I	0.09	Sesquiterpene
Cyclosativene II	0.04	Sesquiterpene
Neryl acetate	0.07	Monoterpenic ester
Geranic acid	0.25	Aliphatic acid
α -Copaene	0.02	Sesquiterpene
β -Bourbonene	0.02	Sesquiterpene
1,5-diepi- β -Bourbonene	0.01	Sesquiterpene
Geranyl acetate	3.43	Monoterpenic ester
β -Cubebene	0.09	Sesquiterpene
β -Elemene	0.08	Sesquiterpene
β -Longipinene	0.02	Sesquiterpene
β -Caryophyllene	1.56	Sesquiterpene
β -Copaene	0.04	Sesquiterpene
<i>trans</i> - α -Bergamotene	0.02	Sesquiterpene
α -Humulene	0.15	Sesquiterpene
(<i>E</i>)-Isoeugenol	0.44	Phenylpropanoid
<i>cis</i> -Muurolo-4(15),5-diene	0.04	Sesquiterpene
<i>trans</i> -Cadina-1(6),4-diene	0.04	Sesquiterpene
Germacrene D	0.25	Sesquiterpene
γ -Amorphene	0.03	Sesquiterpene

epi-Cubebol	0.12	Sesquiterpenic alcohol
α-Muurolene	0.11	Sesquiterpene
δ-Amorphene	0.02	Sesquiterpene
γ-Cadinene	0.97	Sesquiterpene
Cubebol	0.29	Sesquiterpenic alcohol
δ-Cadinene	0.28	Sesquiterpene
10-epi-Cubebol?	0.04	Sesquiterpenic alcohol
(E)-γ-Bisabolene	0.12	Sesquiterpene
α-Cadinene	0.04	Sesquiterpene
Neryl butyrate	0.02	Monoterpenic ester
α-Elemol	0.05	Sesquiterpenic alcohol
Germacrene B	0.04	Sesquiterpene
Geranyl butyrate	0.05	Monoterpenic ester
Caryophyllene oxide	0.41	Sesquiterpenic ether
Caryophyllene oxide isomer	0.11	Sesquiterpenic ether
Humulene epoxide II	0.05	Sesquiterpenic ether
Selin-6-en-4α-ol isomer	0.01	Sesquiterpenic alcohol
1-epi-Cubenol	0.04	Sesquiterpenic alcohol
Cubenol	0.02	Sesquiterpenic alcohol
τ-Cadinol	0.02	Sesquiterpenic alcohol
β-Eudesmol	0.04	Sesquiterpenic alcohol
7-epi-α-Eudesmol	0.02	Sesquiterpenic alcohol
Farnesal isomer	0.02	Sesquiterpenic aldehyde
(2E,6E)-Farnesal	0.02	Sesquiterpenic aldehyde
Neophytadiene	0.03	Diterpene
Phytone	0.01	Terpenic ketone
Unknown	0.03	Unknown
Dicitral	0.04	Diterpenic aldehyde
Phytol	0.01	Diterpenic alcohol
Unknown	0.04	Unknown
Phytol isomer	0.04	Diterpenic alcohol
Unknown	0.19	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Consolidated total	98.04%	

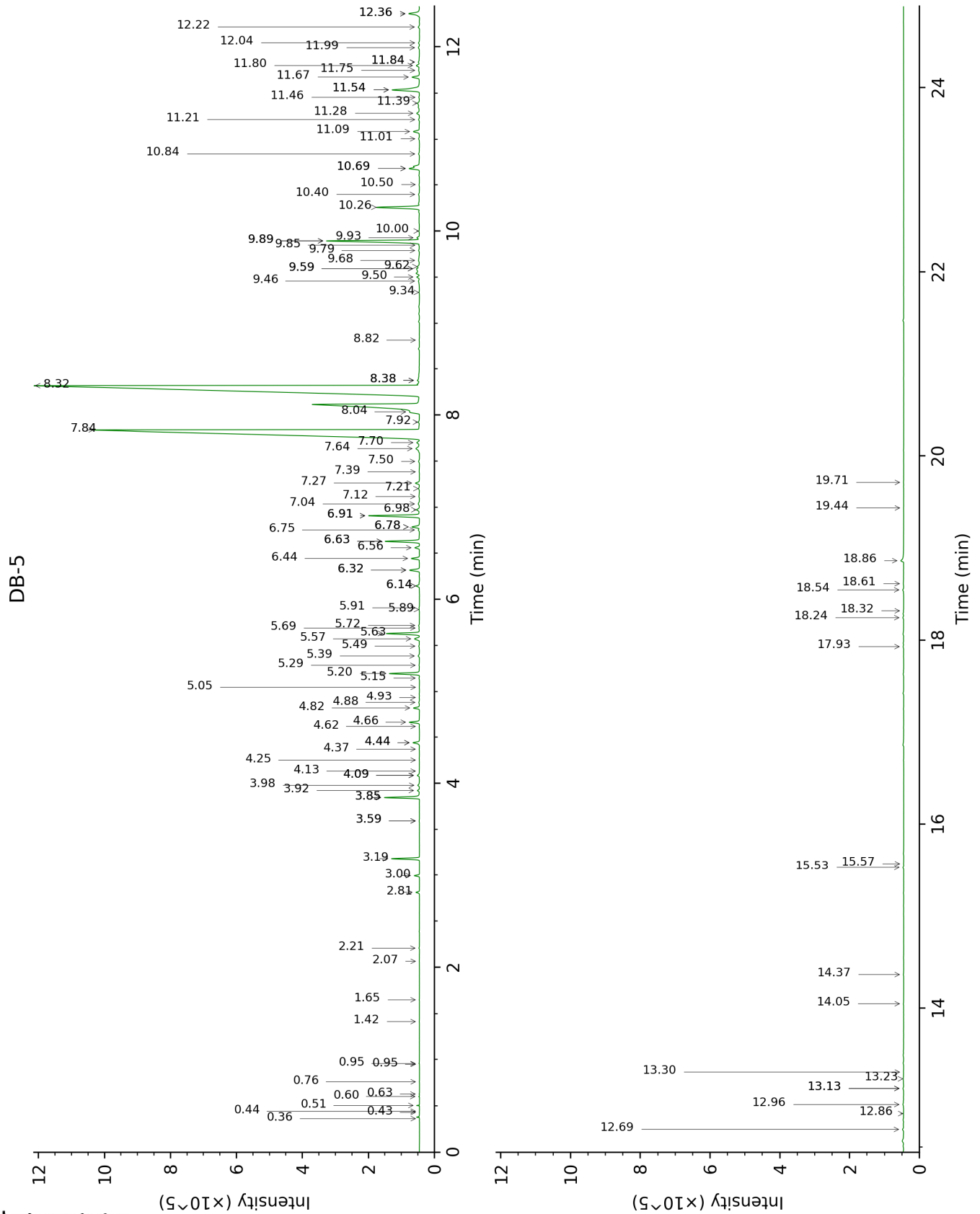
tr: The compound has been detected below 0.005% of total signal.

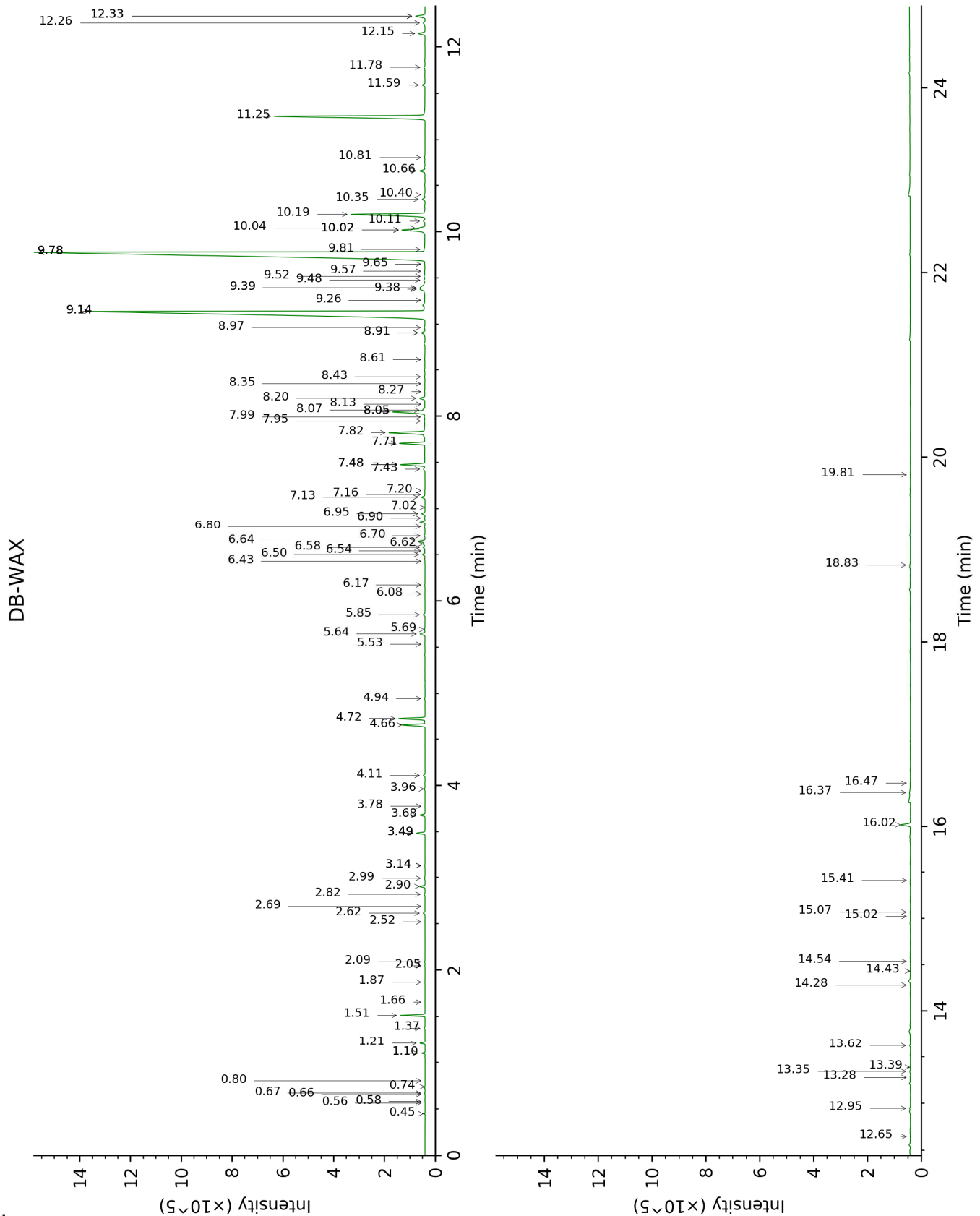
Note: no correction factor was applied

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.

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





FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethanol	0.36	506	tr	0.74	905	tr
Isobutyral	0.43	538	tr	0.45	778	0.02
Methacrolein	0.44	549	tr	0.58	845	tr
2-Methyl-3-buten-2-ol	0.50	602	0.03	1.37	1011	0.03
Isovaleral	0.60	642	0.01	0.67	883	0.01
2-Methylbutyral	0.63	652	tr	0.66	877	tr
2-Ethylfuran	0.76	702	tr	0.80	916	tr
Isoamyl alcohol	0.95	732	tr	3.14*	1175	0.01
2-Methylbutanol	0.96	733	0.01	3.14*	1175	[0.01]
Hexanal	1.42	801	0.01	1.66	1041	tr
Unknown [m/z 81, 69 (80), 41 (65), 83 (52), 109 (48), 55 (47)...]	1.65	822	tr	0.56	838	tr
(3Z)-Hexenol	2.07	858	tr	5.53	1351	0.01
4-Heptanone	2.21	870	0.01	2.09	1087	0.02
Tricyclene	2.81	918	0.10	1.10	970	0.08
α-Pinene	3.00	930	0.13	1.21	990	0.13
Camphene	3.19	942	0.73	1.51	1026	0.72
β-Pinene	3.59*	970	0.02	1.87	1063	0.01
Sabinene	3.59*	970	[0.02]	2.05	1082	tr
6-Methyl-5-hepten-2-one	3.85*	987	1.00	4.72	1297	0.99
Dehydro-1,8-cineole	3.85*	987	[1.00]	2.82	1149	0.04
Myrcene	3.92	992	0.07	2.62	1132	0.07
6-Methyl-5-hepten-2-ol	3.98	996	0.07	6.58	1428	0.09
Octanal	4.09*	1003	0.08	4.11	1250	0.07
α-Phellandrene	4.09*	1003	[0.08]	2.52	1125	0.01
Δ3-Carene	4.13	1006	0.01			
α-Terpinene	4.25	1013	0.01	2.69	1138	0.01
para-Cymene	4.37	1021	tr	3.78	1225	0.01
Limonene	4.44*	1025	0.22	2.90	1156	0.19
β-Phellandrene	4.44*	1025	[0.22]	2.99	1163	0.03
Benzeneacetaldehyde	4.62	1036	0.01	8.43	1570	0.02
(Z)-β-Ocimene	4.66	1039	0.32	3.49*	1203	0.31
(E)-β-Ocimene	4.82	1049	0.18	3.68	1218	0.18
2,6-Dimethyl-5-heptenal (melonal)	4.88	1053	0.03	4.94	1308	0.02
γ-Terpinene	4.93	1056	0.01	3.49*	1203	[0.31]
cis-Sabinene hydrate	5.05	1064	0.01	6.54	1425	0.02
cis-Linalool oxide (fur.)	5.15	1070	0.02	6.17	1398	0.02
4-Nonanone	5.20	1073	0.91	4.66	1291	0.91
Camphenilone	5.29	1079	0.02	6.08	1390	0.01
Terpinolene	5.39	1085	0.05	3.96	1239	0.04
4-Nonanol	5.49	1092	0.02			
Rosefuran	5.57	1097	0.21	5.64	1359	0.21

Linalool	5.63	1100	1.04	7.71	1514	1.01
<i>cis</i> -Chrysanthemal?	5.69	1104	0.02	5.69	1363	0.02
(<i>Z</i>)-6-Methyl-3,5-heptadien-2-one	5.72	1106	0.03	7.95	1532	0.04
<i>trans</i> -para-Mentha-2,8-dien-1-ol	5.89	1117	0.01	8.61	1584	0.01
Unknown [m/z 81, 79 (19), 41 (12), 92 (8), 77 (8)...]	5.91	1118	0.02	5.85	1374	0.08
Unknown [m/z 81, 70 (98), 67 (63), 82 (53), 41 (46), 69 (46), 109 (43)...]	6.14*	1134	0.11	6.50	1422	0.11
Unknown [m/z 95, 67 (86), 41 (68), 82 (64), 123 (62)...]	6.14*	1134	[0.11]	7.20	1475	0.01
exo-Isocitral	6.32*	1145	0.36	7.13	1469	0.15
<i>trans</i> -Chrysanthemal	6.32*	1145	[0.36]	6.90	1452	0.02
Citronellal	6.44	1153	0.26	6.64	1433	0.26
Borneol	6.56	1160	0.16	9.39*	1648	0.36
Isoneral	6.63*	1165	1.09	7.48*	1496	1.04
α -Phellandren-8-ol	6.63*	1165	[1.09]	9.78*	1679	39.37
Rosefuran oxide	6.75	1173	0.04	8.27	1557	0.03
Terpinen-4-ol	6.78*	1175	0.27	8.20	1552	0.26
Unknown [m/z 84, 83 (74), 137 (56), 41 (47), 93 (43), 108 (40)... 152 (2)]	6.78*	1175	[0.27]	9.26	1637	0.02
Isogeranial	6.91*	1183	1.68	7.82	1523	1.58
Unknown [m/z 69, 41 (65), 109 (36), 67 (16), 84 (11), 43 (10), 55 (9)...]	6.91*	1183	[1.68]			
α -Terpineol	6.98	1188	0.13	9.39*	1648	[0.36]
Myrtenal	7.04	1192	0.07	8.35	1564	0.01
<i>trans</i> -Isopiperitenol	7.12	1197	0.04	10.02*†	1699	1.33
Unknown [m/z 84, 41 (83), 83 (79), 91 (76), 93 (67), 119 (64), 137 (63), 109 (54), 108 (54)... 152 (4)]	7.21	1202	0.04			
Decanal	7.27	1206	0.15	6.95	1456	0.14
<i>cis</i> -Isopiperitenol	7.39	1215	0.01	10.04†	1700	[1.33]
2,3-Epoxyneral?	7.50	1222	0.04			
Nerol	7.64	1232	0.24	10.66	1754	0.24
Citronellol	7.70	1236	0.12	10.35	1727	0.12
Neral	7.84	1246	30.46	9.14*	1627	30.10
Piperitone	7.92	1251	0.05	9.52	1658	0.04
Geraniol	8.04	1259	7.51	11.25	1804	7.55
Geranial	8.32	1278	39.77	9.78*	1679	[39.37]

Unknown [m/z 43, 69 (77), 41 (70), 109 (54)... 152 (6)]	8.38*	1282	0.08	12.65	1930	0.01
Bornyl acetate	8.38*	1282	[0.08]	7.99	1536	0.04
Geranyl formate	8.82	1309	0.01	9.57	1662	0.01
α -Cubebene	9.34	1346	0.02	6.43	1417	0.01
Citronellyl acetate	9.46	1354	0.05	9.14*	1627	[30.10]
Cyclosativene I	9.50	1358	0.09	6.62	1431	0.08
Cyclosativene II	9.59*†	1364	0.36	6.70	1438	0.04
Neryl acetate	9.59*†	1364	[0.36]	9.81	1681	0.07
Geranic acid	9.62†	1366	[0.36]	16.37†	2300	[0.78]
α -Copaene	9.68	1370	0.02	6.80	1445	0.03
β -Bourbonene	9.79	1378	0.02	7.16	1472	0.02
1,5-diepi- β -Bourbonene	9.85	1382	0.01	7.02	1461	tr
Geranyl acetate	9.89*	1385	3.46	10.19	1713	3.43
β -Cubebene	9.89*	1385	[3.46]	7.43	1492	0.09
β -Elemene	9.93	1388	0.08	8.07	1542	0.08
β -Longipinene	10.00	1393	0.02	7.48*	1496	[1.04]
β -Caryophyllene	10.26	1412	1.56	8.05*	1540	1.52
β -Copaene	10.40	1422	0.04	8.05*	1540	[1.52]
<i>trans</i> - α -Bergamotene	10.50	1430	0.02	8.13	1547	0.02
α -Humulene	10.68*†	1443	0.59	8.91*	1608	0.20
(<i>E</i>)-Isoeugenol	10.68*†	1443	[0.59]	16.02†	2263	0.78
<i>cis</i> -Muurolo-4(15),5-diene	10.84	1455	0.04	8.97	1612	0.03
<i>trans</i> -Cadina-1(6),4-diene	11.01	1467	0.04	8.91*	1608	[0.20]
Germacrene D	11.08	1473	0.25	9.38	1646	0.24
γ -Amorphene	11.21	1483	0.03	9.48	1654	0.05
epi-Cubebol	11.28	1488	0.12	11.59	1835	0.12
α -Muurolole	11.39	1496	0.11	9.78*	1679	[39.37]
δ -Amorphene	11.46	1501	0.02	9.65	1668	0.02
γ -Cadinene	11.54*	1507	1.26	10.02*†	1699	[1.33]
Cubebol	11.54*	1507	[1.26]	12.15	1884	0.29
δ -Cadinene	11.67	1518	0.28	10.02*†	1699	[1.33]
10-epi-Cubebol?	11.75	1524	0.04	13.34	1995	0.04
(<i>E</i>)- γ -Bisabolene	11.80	1528	0.12	10.11	1707	0.08
α -Cadinene	11.84*	1531	0.06	10.40	1731	0.04
Neryl butyrate	11.84*	1531	[0.06]			
α -Elemol	11.99	1543	0.05	13.62	2022	0.04
Germacrene B	12.04	1547	0.04	10.81	1766	0.03
Geranyl butyrate	12.22	1561	0.05	11.78	1852	0.06
Caryophyllene oxide	12.36*	1572	0.53	12.33*	1901	0.44
Caryophyllene oxide isomer	12.36*	1572	[0.53]	12.26	1894	0.11
Humulene epoxide II	12.69	1598	0.05	12.95	1958	0.04
Selin-6-en-4 α -ol isomer	12.86	1612	0.01	14.43	2101	0.01
1-epi-Cubebol	12.96	1620	0.04	13.39	2000	0.02
Cubebol	13.13*	1634	0.04	13.28	1989	0.02
τ -Cadinol	13.13*	1634	[0.04]	14.54	2112	0.02

β-Eudesmol	13.23	1643	0.04	15.07	2165	0.02
7-epi-α-Eudesmol	13.30	1649	0.02	15.02	2160	0.01
Farnesal isomer	14.05	1711	0.02			
(2E,6E)-Farnesal	14.37	1739	0.02	15.41	2200	0.01
Neophytadiene	15.53	1841	0.03	12.33*	1901	[0.44]
Phytone	15.57	1845	0.01	14.28	2086	0.02
Unknown [m/z 93, 69 (95), 135 (76), 107 (53), 41 (53), 109 (50)... 235 (10)...]	17.93	2070	0.03			
Dicitral	18.24	2102	0.04	16.47	2311	0.02
Phytol	18.32	2109	0.01	18.83	2576	0.03
Unknown [m/z 69, 41 (38), 151 (36), 123 (34), 82 (24), 43 (23), 109 (21)...]	18.54	2133	0.04	19.81	2694	0.01
Phytol isomer	18.61	2140	0.04			
Unknown [m/z 94, 43 (85), 93 (81), 69 (76), 137 (76), 95 (60), 134 (51)...]	18.86	2165	0.19			
Unknown [m/z 94, 43 (56), 123 (55), 69 (53), 95 (42), 79 (39)...]	19.44	2226	0.01			
Unknown [m/z 123, 94 (100), 43 (86), 69 (75), 95 (47), 41 (47), 93 (45)...]	19.72	2256	0.01			
Total identified		97.80%			96.23%	
Total reported		98.15%			96.46%	

*: 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