

Date : February 23, 2018

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 18B20-PLG10-1-CC

Customer identification : Lemongrass

Type : Essential oil

Source : *Cymbopogon flexuosus*

Customer : Plant Guru

ANALYSIS

Method: PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.

Analyst : Sylvain Mercier, M. Sc., Chimiste

Analysis date : February 23, 2018

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Bright yellow liquid

Refractive index: 1.4840 ± 0.0003 (20 °C)

CONCLUSION

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

ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
Methoxyacetone	0.04	0.03	Aliphatic alcohol
Isobutyral	tr		Aliphatic aldehyde
Methacrolein	tr		Aliphatic aldehyde
2-Methyl-3-buten-2-ol	0.03	0.04*	Aliphatic alcohol
Isovaleral	0.01	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	tr	Aliphatic aldehyde
2-Ethylfuran	tr		Furan
Isoamyl alcohol	0.01	0.01*	Aliphatic alcohol
2-Methylbutanol	tr	[0.01]*	Aliphatic alcohol
Toluene	tr	tr	Simple phenolic
Prenal	tr	1.92*	Aliphatic aldehyde
Hexanal	tr	tr	Aliphatic aldehyde
(2E)-Hexenal	tr	[0.01]*	Aliphatic aldehyde
Furfuryl alcohol	tr	0.06	Furan
(3Z)-Hexenol	0.01	0.01	Aliphatic alcohol
4-Heptanone	0.01	0.01	Aliphatic ketone
(E)-2,4-Dimethyl-2,4-heptadiene	0.08*	[0.04]*	Alkene
Tricyclene	[0.08]*	0.08	Monoterpene
α-Pinene	0.11	0.12	Monoterpene
Camphene	0.65	0.65	Monoterpene
Benzaldehyde	tr	0.01	Simple phenolic
β-Pinene	0.04*	0.02	Monoterpene
Sabinene	[0.04]*	0.01	Monoterpene
6-Methyl-5-hepten-2-one	1.20	1.22*	Aliphatic ketone
Dehydro-1,8-cineole	1.13*	0.02	Monoterpenic ether
Myrcene	[1.13]*	1.15	Monoterpene
6-Methyl-5-hepten-2-ol	0.05	0.06	Aliphatic alcohol
Unknown	0.07	[1.22]*	Aliphatic ester
Octanal	0.04	0.04	Aliphatic aldehyde
α-Terpinene	0.01	0.01	Monoterpene
para-Cymene	0.03	0.03	Monoterpene
Limonene	1.95*	[1.92]*	Monoterpene
1,8-Cineole	[1.95]*	0.09	Monoterpenic ether
(Z)-β-Ocimene	0.18	0.18	Monoterpene
(E)-β-Ocimene	0.12	0.12	Monoterpene
2,6-Dimethyl-5-heptenal (melonal)	0.02	0.02	Aliphatic aldehyde
γ-Terpinene	0.01	0.01	Monoterpene
cis-Linalool oxide (fur.)	0.02	0.02	Monoterpenic alcohol
4-Nonanone	0.57	0.58	Aliphatic ketone
Terpinolene	0.05	0.05	Monoterpene
trans-Linalool oxide (fur.)	0.02	0.07	Monoterpenic alcohol
Rosefuran	0.14*	0.08	Monoterpenic ether
4-Nonanol	[0.14]*		Aliphatic alcohol
Linalool	1.96	2.03	Monoterpenic alcohol
cis-Chrysanthemal?	0.05	0.07	Monoterpenic aldehyde
6-Methyl-3,5-heptadien-2-one	0.03	0.63*	Aliphatic ketone
trans-para-Mentha-2,8-dien-1-ol	0.02*	0.01	Monoterpenic alcohol
Unknown	[0.02]*	0.01	Unknown

Unknown	0.14	0.11	Unknown
exo-Isocitral	0.31*	0.06*	Monoterpenic aldehyde
trans-Chrysanthemal	[0.31]*	0.17	Monoterpenic aldehyde
Citronellal	0.20	0.16	Monoterpenic aldehyde
Borneol	0.17	1.58*	Monoterpenic alcohol
Isoneral	0.49*	0.32	Monoterpenic aldehyde
α-Phellandren-8-ol	[0.49]*	42.66*	Monoterpenic alcohol
Rosefuran oxide	0.27*	0.06	Monoterpenic ether
Unknown	[0.27]*	0.27	Oxygenated monoterpene
Isogeranial	0.71*	[0.63]*	Monoterpenic aldehyde
Terpinen-4-ol	[0.71]*	0.17	Monoterpenic alcohol
Unknown	0.14		Unknown
α-Terpineol	1.30	[1.58]*	Monoterpenic alcohol
γ-Terpineol	0.22	0.22	Monoterpenic alcohol
Unknown	0.12		Oxygenated monoterpene
Decanal	[0.12]	0.07	Aliphatic aldehyde
2,3-Epoxyneral?	0.04		Monoterpenic aldehyde
Nerol	0.78	0.92	Monoterpenic alcohol
Citronellol	0.15	0.17	Monoterpenic alcohol
Neral	29.04	28.85*	Monoterpenic aldehyde
Piperitone	0.05	0.09*	Monoterpenic ketone
Geraniol	4.39	4.50	Monoterpenic alcohol
Geranial	42.81	[42.66]*	Monoterpenic aldehyde
Unknown	[42.81]	0.08	Oxygenated monoterpene
Geranyl formate	0.04	[0.09]*	Monoterpenic ester
Unknown	0.18	0.08	Unknown
Neric acid	[0.18]	0.08	Monoterpenic acid
α-Cubebene	0.01	0.01	Sesquiterpene
Citronellyl acetate	0.11	[28.85]*	Monoterpenic ester
Geranic acid	0.47*	0.37	Aliphatic acid
α-Copaene	[0.47]*	0.02	Sesquiterpene
β-Bourbonene	0.03	[0.06]*	Sesquiterpene
Geranyl acetate	2.76	2.75	Monoterpenic ester
β-Cubebene	0.08*	0.05	Sesquiterpene
β-Elemene	[0.08]*	1.10*	Sesquiterpene
β-Caryophyllene	1.05	[1.10]*	Sesquiterpene
β-Copaene	0.02	[0.63]*	Sesquiterpene
α-Humulene	0.11	0.12	Sesquiterpene
(E)-Isoeugenol	0.24	0.26	Phenylpropanoid
cis-Muurola-4(15),5-diene	0.03	0.04	Sesquiterpene
trans-Cadina-1(6),4-diene	0.02	0.03	Sesquiterpene
Germacrene D	0.15	[1.58]*	Sesquiterpene
epi-Cubebol	0.09	0.09	Sesquiterpenic alcohol
δ-Amorphene	0.01	0.01	Sesquiterpene
γ-Cadinene	0.66	0.88*	Sesquiterpene
Cubebol	0.25	0.24	Sesquiterpenic alcohol
δ-Cadinene	0.17	[0.88]*	Sesquiterpene
10-epi-Cubebol?	0.09		Sesquiterpenic alcohol
(E)-γ-Bisabolene	0.09	[0.88]*	Sesquiterpene
α-Elemol	0.03	0.03	Sesquiterpenic alcohol
Geranyl butyrate	0.04	0.06	Monoterpenic ester
Caryophyllene oxide	0.39*	0.35	Sesquiterpenic ether

Caryophyllene oxide isomer	[0.39]*	0.06	Sesquiterpenic ether
Humulene epoxide II	0.03	0.21	Sesquiterpenic ether
Selin-6-en-4 α -ol?	0.02		Sesquiterpenic alcohol
1-epi-Cubenol	0.01	0.02	Sesquiterpenic alcohol
Cubenol	0.01	0.01	Sesquiterpenic alcohol
Farnesal isomer	0.07		Sesquiterpenic aldehyde
meta-Camphorene	0.06	0.06	Diterpene
para-Camphorene	0.02	0.03	Diterpene
Unknown	0.04		Unknown
Dicital	0.03	0.02	Aliphatic alcohol
Unknown	0.09		Unknown
Total identified	96.74%	96.34%	

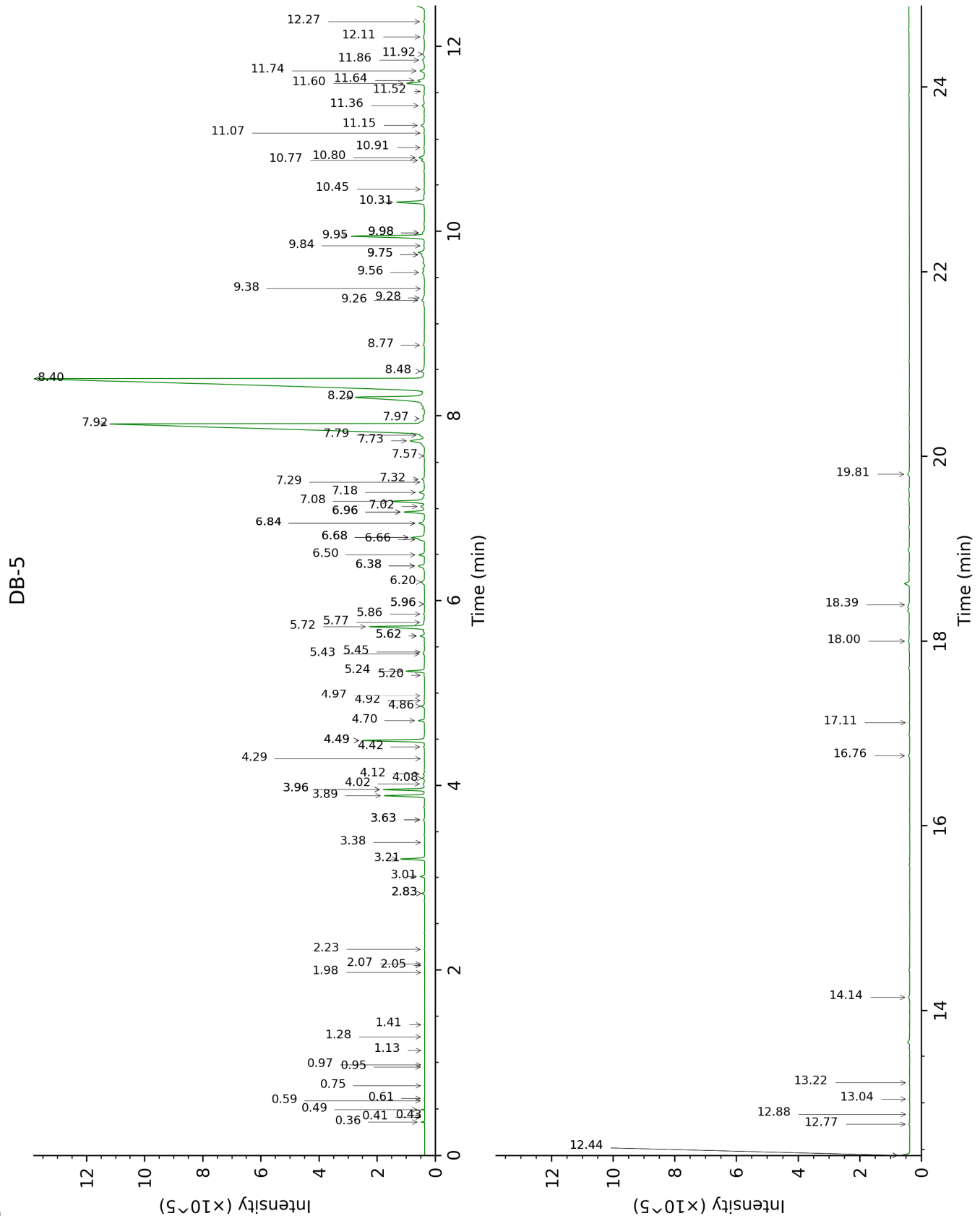
*: Two or more compounds are coeluting on this column

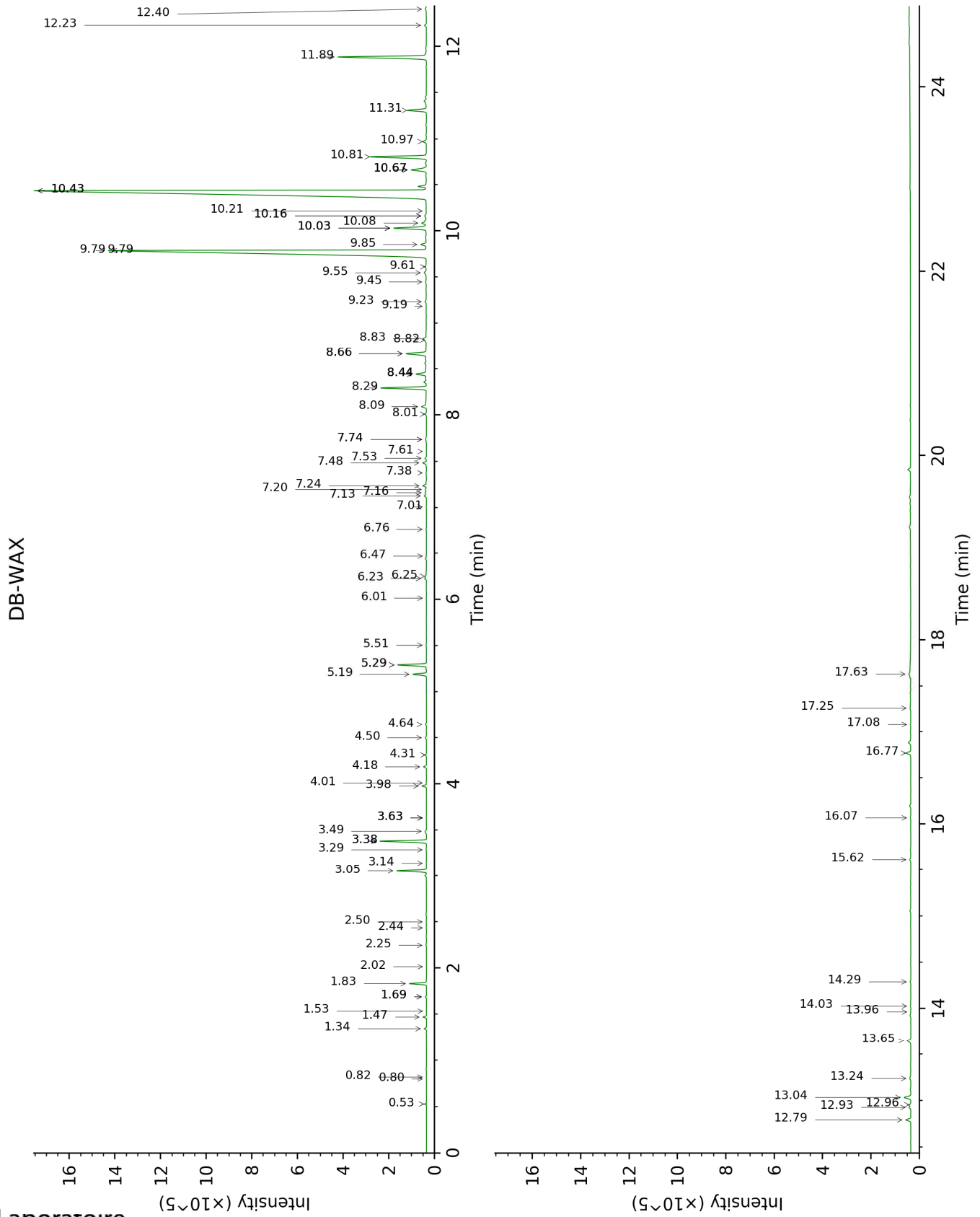
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

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

Note: no correction factor was applied

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FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Methoxyacetone	0.36	495	0.04	0.53	768	0.03
Isobutyral	0.41	538	tr			
Methacrolein	0.43	551	tr			
2-Methyl-3-buten-2-ol	0.49	605	0.03	1.69*	1016	0.04
Isovaleral	0.59	638	0.01	0.82	885	0.01
2-Methylbutyral	0.61	647	0.01	0.80	878	tr
2-Ethylfuran	0.75	695	tr			
Isoamyl alcohol	0.95	727	0.01	3.63*	1178	0.01
2-Methylbutanol	0.97	730	tr	3.63*	1178	[0.01]
Toluene	1.13	753	tr	1.53	1001	tr
Prenal	1.28	776	tr	3.38*	1159	1.92
Hexanal	1.41	795	tr	2.02	1047	tr
(2E)-Hexenal	1.98	844	tr	3.63*	1178	[0.01]
Furfuryl alcohol	2.05	851	tr	9.23	1588	0.06
(3Z)-Hexenol	2.07	852	0.01	6.01	1349	0.01
4-Heptanone	2.22	866	0.01	2.50	1092	0.01
(E)-2,4-Dimethyl-2,4-heptadiene	2.83*	913	0.08	1.69*	1016	[0.04]
Tricyclene	2.83*	913	[0.08]	1.34	974	0.08
α-Pinene	3.01	925	0.11	1.47	994	0.12
Camphene	3.21	938	0.65	1.83	1030	0.65
Benzaldehyde	3.38	950	tr	7.61	1465	0.01
β-Pinene	3.63*	966	0.04	2.25	1069	0.02
Sabinene	3.63*	966	[0.04]	2.44	1086	0.01
6-Methyl-5-hepten-2-one	3.89	984	1.20	5.29*	1297	1.22
Dehydro-1,8-cineole	3.96*	988	1.13	3.29	1152	0.02
Myrcene	3.96*	988	[1.13]	3.05	1134	1.15
6-Methyl-5-hepten-2-ol	4.02	992	0.05	7.20	1434	0.06
Unknown [m/z 67, 82 (50), 41 (47), 55 (31), 98 (14)]	4.08	996	0.07	5.29*	1297	[1.22]
Octanal	4.12	999	0.04	4.64	1251	0.04
α-Terpinene	4.29	1010	0.01	3.14	1141	0.01
para-Cymene	4.42	1018	0.03	4.31	1228	0.03
Limonene	4.48*	1022	1.95	3.38*	1159	[1.92]
1,8-Cineole	4.48*	1022	[1.95]	3.49	1167	0.09
(Z)-β-Ocimene	4.70	1035	0.18	3.98	1204	0.18
(E)-β-Ocimene	4.86	1045	0.12	4.18	1219	0.12
2,6-Dimethyl-5-heptenal (melonal)	4.92	1049	0.02	5.51	1312	0.02
γ-Terpinene	4.97	1052	0.01	4.01	1206	0.01
cis-Linalool	5.20	1066	0.02	6.76	1402	0.02

oxide (fur.)						
4-Nonanone	5.24	1069	0.57	5.19	1290	0.58
Terpinolene	5.43	1081	0.05	4.50	1241	0.05
<i>trans</i> -Linalool oxide (fur.)	5.45	1082	0.02	7.16	1432	0.07
Rosefuran	5.62*	1093	0.14	6.23	1364	0.08
4-Nonanol	5.62*	1093	[0.14]			
Linalool	5.72	1099	1.96	8.29	1516	2.03
<i>cis</i> - Chrysanthemal?	5.77	1102	0.05	6.25	1366	0.07
6-Methyl-3,5- heptadien-2-one	5.86	1108	0.03	8.44*	1528	0.63
<i>trans</i> -para- Mentha-2,8- dien-1-ol	5.96*	1115	0.02	9.18	1585	0.01
Unknown [m/z 81, 79 (19), 41 (12), 92 (8), 77 (8)...]	5.96*	1115	[0.02]	6.47	1381	0.01
Unknown [m/z 81, 70 (98), 67 (63), 82 (53), 41 (46), 69 (46), 109 (43)...]	6.20	1130	0.14	7.13	1429	0.11
exo-Isocitral	6.38*	1141	0.31	7.74*	1474	0.06
<i>trans</i> - Chrysanthemal	6.38*	1141	[0.31]	7.48	1456	0.17
Citronellal	6.50	1149	0.20	7.24	1437	0.16
Borneol	6.66	1159	0.17	10.03*	1652	1.58
Isoneral	6.68*	1161	0.49	8.09	1501	0.32
α -Phellandren-8- ol	6.68*	1161	[0.49]	10.43*	1685	42.66
Rosefuran oxide	6.84*†	1170	0.27	8.82	1556	0.06
Unknown [m/z 84, 83 (74), 137 (56), 41 (47), 93 (43), 108 (40)... 152 (2)]	6.84*†	1170	[0.27]	9.85	1638	0.27
Isogeranial	6.96*	1179	0.71	8.44*	1528	[0.63]
Terpinen-4-ol	6.96*	1179	[0.71]	8.83	1558	0.17
Unknown [m/z 69, 41 (65), 109 (36), 67 (16), 84 (11), 43 (10), 55 (9)...]	7.02	1182	0.14			
α -Terpineol	7.08	1186	1.30	10.03*	1652	[1.58]
γ -Terpineol	7.18	1192	0.22	10.08	1657	0.22
Unknown [m/z 84, 41 (83), 83 (79), 91 (76), 93 (67), 119 (64), 137 (63), 109	7.29†	1199	0.12			

(54), 108 (54)...						
152 (4)]						
Decanal	7.32†	1201	[0.12]	7.53	1459	0.07
2,3-Epoxyneral?	7.57	1218	0.04			
Nerol	7.73	1229	0.78	11.31	1758	0.92
Citronellol	7.79	1233	0.15	10.97	1730	0.17
Neral	7.92	1241	29.04	9.79*	1633	28.85
Piperitone	7.97	1245	0.05	10.16*	1663	0.09
Geraniol	8.20	1260	4.39	11.89	1808	4.50
Geranial	8.40†	1274	42.81	10.43*	1685	[42.66]
Unknown [m/z 43, 69 (77), 41 (70), 109 (54)...	8.48†	1279	[42.81]	13.24	1928	0.08
152 (6)]						
Geranyl formate	8.77	1298	0.04	10.16*	1663	[0.09]
Unknown [m/z 82, 59 (44), 41 (43), 95 (31), 43 (29), 81 (24)...	9.26†	1332	0.18	12.93	1900	0.08
Neric acid	9.28†	1334	[0.18]	17.25	2326	0.08
α-Cubebene	9.38	1341	0.01	7.01	1420	0.01
Citronellyl acetate	9.56	1354	0.11	9.79*	1633	[28.85]
Geranic acid	9.75*†	1367	0.47	17.63	2367	0.37
α-Copaene	9.75*†	1367	[0.47]	7.38	1448	0.02
β-Bourbonene	9.84	1374	0.03	7.74*	1474	[0.06]
Geranyl acetate	9.95	1381	2.76	10.81	1716	2.75
β-Cubebene	9.98*	1384	0.08	8.01	1494	0.05
β-Elemene	9.98*	1384	[0.08]	8.66*	1545	1.10
β-Caryophyllene	10.31	1407	1.05	8.66*	1545	[1.10]
β-Copaene	10.45	1418	0.02	8.44*	1528	[0.63]
α-Humulene	10.77	1441	0.11	9.55	1614	0.12
(E)-Isoeugenol	10.80	1444	0.24	16.77	2274	0.26
cis-Muurola- 4(15),5-diene	10.91	1452	0.03	9.61	1619	0.04
trans-Cadina- 1(6),4-diene	11.07	1463	0.02	9.45	1606	0.03
Germacrene D	11.15	1469	0.15	10.03*	1652	[1.58]
epi-Cubebol	11.36	1485	0.09	12.23	1838	0.09
δ-Amorphene	11.52	1496	0.01	10.21	1667	0.01
γ-Cadinene	11.60	1503	0.66	10.67*	1704	0.88
Cubebol	11.64	1506	0.25	12.79	1888	0.24
δ-Cadinene	11.74	1514	0.17	10.67*	1704	[0.88]
10-epi-Cubebol?	11.86	1523	0.09			
(E)-γ-Bisabolene	11.92	1528	0.09	10.67*	1704	[0.88]
α-Elemol	12.10	1542	0.03	14.29	2026	0.03
Geranyl butyrate	12.27	1555	0.04	12.40	1853	0.06
Caryophyllene oxide	12.44*	1568	0.39	13.04	1910	0.35
Caryophyllene oxide isomer	12.44*	1568	[0.39]	12.96	1902	0.06
Humulene	12.77	1595	0.03	13.65	1966	0.21

epoxide II						
Selin-6-en-4 α -ol?	12.88	1603	0.02			
1-epi-Cubenol	13.04	1616	0.01	14.03	2001	0.02
Cubenol	13.22	1631	0.01	13.96	1995	0.01
Farnesal isomer	14.14	1707	0.07			
meta-Camphorene	16.76	1942	0.06	15.62	2156	0.06
para-Camphorene	17.11	1975	0.02	16.07	2202	0.03
Unknown [m/z 93, 69 (95), 135 (76), 107 (53), 41 (53), 109 (50)... 235 (10)...]	18.00	2062	0.04			
Dicitral	18.39	2101	0.03	17.08	2307	0.02
Unknown [m/z 123, 94 (100), 43 (86), 69 (75), 95 (47), 41 (47), 93 (45)...]	19.81	2249	0.09			
Total identified		96.74%			96.34%	
Total reported		97.52%			96.89%	

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified 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